Appendix A

Response to Comments on the DEIS for the NorthMet Mining Project and SDEIS for the NorthMet Mining Project and Land Exchange

A. RESPONSE TO COMMENTS ON THE DEIS FOR THE NORTHMET MINING PROJECT AND SDEIS FOR THE NORTHMET MINING PROJECT AND LAND EXCHANGE

A.1 INTRODUCTION

The Supplemental Draft Environmental Impact Statement (SDEIS) for the NorthMet Mining Project and Land Exchange was published on December 13, 2013. A 90-day public comment period followed publication of the SDEIS, extending from December 14, 2014, to March 13, 2014. This Appendix summarizes the process used by the Co-lead Agencies' Final EIS (FEIS) to organize, analyze, and respond to the comments received on the SDEIS, and includes the responses to those comments. This Appendix also includes the comment themes received on the 2009 Draft EIS (DEIS) and shows the relationship between those DEIS comment themes and the SDEIS comments themes and responses.

A.1.1 Opportunities for Public Comment on the Supplemental Draft EIS

The SDEIS was made available to the public for download on MDNR's Project-specific website, http://www.dnr.state.mn.us/input/environmentalreview/polymet/index.html. Paper copies of the SDEIS were also sent to Cooperating Agencies and other entities that requested them, as described in FEIS Section 2.3.4. Public review copies of the SDEIS were also placed in libraries in Minnesota: St. Paul, Grand Rapids, Hibbing, Hoyt Lakes, Babbitt, Duluth, and Minneapolis. A limited number of paper copies and multiple CD-ROMs were distributed by MDNR upon request.

As discussed in the FEIS Section 2.3.5, three public meetings were held during the public comment period:

- January 16, 2014, at the Duluth Entertainment Convention Center;
- January 22, 2014, at Mesabi East High School in Aurora, MN; and
- January 28, 2014, at the Saint Paul River Center.

Attendees were provided three options to submit public comments at these meetings:

- Public oral testimony, transcribed by a court reporter;
- Individual oral testimony, also transcribed by a court reporter; and/or
- Written comments, placed in designated collection boxes.

In addition to the testimony and comments received at the public meetings, commenters were instructed to submit comments via a Project-specific email address or via mail.

A.1.2 Amount and Type of Input Received

In total, the Co-lead Agencies received 57,703 e-mails, written and typed letters, postcards, and instances of public testimony (henceforth referred to as *submissions*) during the public comment period for the SDEIS. Senders included federal, state, and local representatives; members of the public; federal, state, and local government agencies; American Indian tribes; non-governmental

organizations (NGOs); and other interested groups and stakeholders. Table A-1 summarizes the number and type of submissions received. Copies of these submissions are available in Attachment 1.

Table A-1 Number and Type of Public Comment Submissions on the SDEIS

Submission Type	Definition	Number	Percent of Total
All Submissions		57,703	100%
Form Letters	Identical or substantively identical submissions	53,901	93%
Form Letter Variants	Standard form letter text that was altered by the sender by deleting standard text and/or by adding sender-composed text	3,464	6%
Form Letter Non-Variants	Standard form letter text was not substantively altered.	50,437	87%
Unique Submissions	Submissions composed entirely by the sender.	3,802	7%
Comments	Unique, substantive comments extracted from within the submissions		16,469

Of the 57,703 total submissions, 53,901 submissions (93 percent of the total) were duplicate *form letters* sponsored by outside entities (NGOs, unions, and other groups). A total of 43 distinct form letters were received from 14 outside entities, in addition to 6 form letters whose source could not be determined. Form letters were identified when two or more unrelated individuals submitted identical or substantively identical submissions, or when a submission was determined to consist entirely (or nearly so) of text provided by a website (such as a website maintained by an NGO) for the purpose of mass e-mailing.

Within the 53,901 form letter submissions were 3,464 form letter *variants,* submissions that consist of standard form letter text that was altered by the sender by deleting standard text and/or by adding sender-composed text (the remaining 50,437 form letters are referred to as *non-variant*). Variants were identified through use of a computer algorithm that evaluated the similarity of a submission against the known form letter "template." The algorithm's results were confirmed through a manual review of a statistically significant sample of submissions.

The 3,802 submissions (7 percent of the total) not identified as form letters were *unique* submissions composed entirely by the sender (including oral testimony at public meetings).

The 57,703 submissions, including both form letters and unique submissions, contained 16,469 unique, substantive comments. However, not all unique submissions contained substantive comments. For example, many only stated an opinion as to whether the proposed Project should or should not be built, with minimal or no additional content. A *comment* is defined as an individual statement, question, or concern within a submission that substantively addresses the proposed Project and that contains more than just a statement of approval or disapproval of the Project. Comments were extracted from all unique and variant submissions. One copy of each standard form letter was also used for the purpose of extracting comments. Each unique, substantive comment received on the SDEIS is provided in Attachment 1.

Previously published materials, such as newspaper or journal articles, website content, or submissions provided during previous phases of the EIS process were not reviewed for comments, but were retained for reference by the Co-lead Agencies. In cases where the same comment appeared more than once in a submission, only one instance was recorded.

A.2 COMMENT REVIEW METHODOLOGY

As required under MEPA (*Minnesota Rules*, part 4410.2600, subpart 10) and NEPA (40 CFR 1503.4), the Co-lead Agencies considered and responded to all substantive comments received during the SDEIS public comment period. Given the large number of submissions and individual comments received on the SDEIS, the Co-lead Agencies determined that it was necessary to group similar comments into *themes* and respond to those themes, instead of responding to each comment individually.

Initially, the text of all submissions was entered into a database to facilitate the review. Non-variant form letters were identified via computer matching algorithm. Each unique and variant submission was reviewed in order to identify substantive comments.

Each comment was categorized according to the overall topic area, or *issue*, addressed in the comment. Issues are listed in Table A-2 and generally correspond to the resource areas addressed in Chapters 4, 5, and 6. Issue codes were used for ease of comment management. A total of 23 issue areas were identified. In many cases, a comment was categorized as applicable to more than one issue. Submissions and issue assignments were each reviewed at least twice to ensure accuracy. The unique, substantive SDEIS comments, grouped by commenter and their associated theme linkages (described below) are provided in Attachment 1.

Table A-2 Issue Codes for Public Comments on the SDEIS

Issue	Issue Code	Description (Comments related to…)
Air Quality	AIR	The Project's impacts on local and regional air quality and visibility.
Alternatives	ALT	Alternatives to the proposed Project such as underground mining, as well as the No Action Alternative.
Aquatic Species	AQ	The Project's effects on aquatic species.
US Army Corps of Engineers 404 Permit	COE	The USACE permit issued under Section 404 of the Clean Water Act.
Cultural Resources	CR	The Project's impacts on historic and cultural resources, including Tribal resources, as well as the process for interacting with the Bands and other Tribal entities.
Financial Assurance	FIN	The Co-lead Agencies' approach to, and/or the proponent's ability to provide sufficient financial assurance for potential impacts of the Project.
General Topics	GEN	General statements regarding the Project that are substantive (i.e., that express more than simple approval or disapproval), but that are too general to belong in other issue areas.
Geotechnical Stability	GT	The geotechnical stability of the stockpiles, mine pits, Tailings Basin, and other elements of the NorthMet Project Proposed Action.
Hazardous Materials	HAZ	Hazardous materials used, generated, transported, and/or disposed of as part of the NorthMet Project Proposed Action.
Human Health and Safety	HU	The Project's effects on human health and safety.

Issue	Issue Code	Description (Comments related to…)
US Forest Service Land Exchange	LAN	The nature, extent, and/or appropriateness of, and/or the process for defining the Land Exchange Proposed Action
Land Use, Recreation, and Visual Resources	LU	The Project's effects on private land use, recreational resources and activities, and visual resources (except for regional visibility issues addressed in AIR).
Mercury	MERC	The generation, removal, management, and consequences of Mercury from the NorthMet Project Proposed Action.
Noise and Vibration	N	The nature, extent, and impacts of noise and vibration generated by the NorthMet Project Proposed Action
NEPA and MEPA Topics	NEPA	Purpose and Need statements, the public engagement process, and the SDEIS's adherence to NEPA and MEPA requirements, guidelines, and principles.
Project Description	PD	The description of the NorthMet Project Proposed Action and/or Land Exchange Proposed Action, including suggested revisions to the proposed actions.
Permitting and Regulatory Considerations	PER	The type and appropriateness of permits that the Project would need (except for the USACE 404 Permit), as well as the relationship of the Project and SDEIS process to existing regulations.
Socioeconomics and Environmental Justice	SO	The Project's impacts on economic factors (such as employment, income, public tax revenues), as well as public services, housing, and the SDEIS's evaluation of Environmental Justice considerations under Executive Order 12898.
Vegetation	VEG	The Project's impacts on vegetation, including threatened and endangered species.
Wetlands	WET	The Project's impacts on wetlands (except for comments related to the USACE 404 Permit).
Terrestrial Wildlife	WI	The Project's impacts on terrestrial wildlife, including threatened and endangered species.
Wilderness and Special Designation Areas	WILD	The Project's impacts on the Boundary Waters Canoe Area Wilderness (BWCAW), national, state, and local parks, portions of Superior National Forest designated for environmental conservation, and other special-designated areas.
Water Resources	WR	The Project's impacts on water quality, water quantity, and the modeling of water resources conditions and effects.

Some comments that did not fall within one of the issue areas listed in Table A-2 were tracked to ensure that they received consideration by the Co-lead Agencies. These include the categories listed below (issue codes are listed in parentheses):

- Suggestions for editorial changes (EDIT), such as grammar, punctuation, or word choice, or suggested text revisions (as long as those suggested revisions did not constitute a change in the intent of the FEIS's findings or conclusions).
- Requests for information (RFIs), such as requests for CD-ROM copies of the SDEIS.
- Suggestions that the Co-lead Agencies review specific publications or other references (REF).

The comment evaluation process used a thematic response approach. Subject matter experts from the Co-lead Agencies and their consultants reviewed and grouped comments within each issue area according to the common topic they addressed; each common topic area is referred to as a *theme*. Each of the 23 issue areas includes multiple themes in order to characterize the specific topics addressed by comments. Each comment was assigned to at least one theme. In cases where a comment addressed more than one theme, it was either assigned to the most appropriate theme or, in some cases, was assigned concurrently to multiple themes. A total of 580 themes were identified. For ease of sorting, each theme was given a code corresponding to its issue; for example, the third theme in the Financial Assurance issue is referred to as FIN 03.

For each theme, the Co-lead Agencies developed a concise statement that paraphrased and/or summarized the intent of each group of similar comments. Subject matter experts developed a *thematic response* for each theme statement. The response briefly describes how the theme is addressed in the FEIS. Where applicable, the actual text of the FEIS is referenced for a more complete response to comments. Theme statements and responses are provided in Section A.4.

Comments characterized as REF were addressed by FEIS authors; RFIs were processed by representatives from the Co-lead Agencies. Editorial (EDIT) comments received direct responses. Comments from Cooperating Agencies were assigned to issues and themes as described above, but also received direct responses (see Section A.3).

A.3 COMMENTS RECEIVED AFTER END OF PUBLIC COMMENT PERIOD

The public comment period on the SDEIS closed on March 13, 2014. Comments received after this date were retained and were provided to FEIS authors for their review; however, these comments are not included in the theme statements and responses in Section A.4, nor in the list of individual comments in Section A.6.

A.4 COOPERATING AGENCY COMMENTS AND RESPONSES

Cooperating Agencies provided seven submissions, within which 466 discrete comments were identified. Table A-3 lists each of these comments, the response to each comment, and the theme(s) to which each Cooperating Agency comment was assigned.

Table A-3 Cooperating Agency Comments and Responses

Comment ID	Comment	Response	Theme(s)
Comments from the USEPA (Submission ID 47834)			
2981	Comment # 1. Spill prevention is an important part of the mitigation for this project. Using new or retrofit side dump rail cars (possibly with hydraulic air-operation conversions) should be considered as part of the mitigation package for the proposed action. Proactive mitigation through the use of updated rail infrastructure would help reduce spillage and subsequent environmental concerns, possibly including the need for additional long-term water treatment. Recommendation: Consider use of new or retrofit side-dump rail cars when producing the spilled ore plan.	To guard against possible adverse effects from spilled ore, PolyMet plans to refurbish the ore cars, tightening or replacing the couplings and linkages to minimize gaps along the hinges and joint areas where spillage would occur. The quantity of ore that could potentially spill through the door and hinge gaps of a refurbished ore car is estimated to be 0.20 ton per year. This is a 97 percent reduction from the originally calculated value of 6.14 tons per year. Water quality monitoring is identified downstream from the rail line on the Partridge River tributary streams to check for any potential deteriorations of water quality over time from ore spillage, and, if detected, adaptive water management measures would be implemented. Dust could be mitigated by spraying water on the loaded ore prior to transport. If significant accumulation of ore spillage occurs, it would be removed. The Permit to Mine would further address rail cars design in a section titled Ore Management, Handling and Transport.	WR 151
2982	Comment # 2. Pages 5-50 forward describe how the company has classified its waste rock and tailings into four categories based on their likelihood to generate acid rock drainage. We understand from discussion with the co-lead agencies that lime will be added to Category l waste rock, which is expected to result in neutral to slightly basic pH. Recommendation: The FEIS should indicate that Category I waste rock leachate is expected to have a neutral to slightly basic pH due to the addition of lime.	Mine waste rock would be sorted and stored into four categories based on its sulfur content. Category 1 waste rock would not produce acid leachate. Category 2/3 waste rock may produce acid leachate if allowed to weather for several years. Category 4 waste rock would produce acidic leachate if allowed to weather for several years. Category 1 waste rock would be stored in a permanent stockpile that would be encompassed by a water containment system to capture surface water and groundwater from the stockpile and direct it to a water treatment facility and would have a geomembrane cover at closure. Because Category 1 waste rock would not generate acid, and because water from the stockpile would be captured and treated, lime is not anticipated to be needed for neutralization, and, therefore, the addition of lime for Category 1 waste rock is not proposed. Category 2/3 and Category 4 waste rock would be stored temporarily in lined stockpiles, and then backfilled into the East Pit following completion of mining there. Lime may be added to the waste rock during East Pit backfilling to maintain pH in the pit pore water as needed. The volume of lime required would be based on monitoring results. Waste rock characterization and categorization, as well as management and storage	WR 027

Comment ID	Comment	Response	Theme(s)
		during operations and closure, and water management at the stockpiles, are addressed in FEIS Sections 3.2.2.1.7, 3.2.2.1.8, 3.2.2.1.9, and 3.2.2.1.10.	
2983	Comment # 3. Page 5-157, Section 5.2.2.3.3, 2nd Paragraph: information on the design, operations, and monitoring plans for the hydrometallurgical research facility (HRF) is insufficiently detailed. Recommendation: The FEIS should provide information on the HRF's design and operations in sufficient detail for the reader to understand potential impacts associated with this facility and how those impacts will be avoided or mitigated. This includes explaining that a detailed Residue Management Plan for this facility will be required during permitting.	FEIS Section 5.2.14.2.3, which expands upon the discussion from the SDEIS on the design and construction of the Hydrometallurgical Residue Facility, and Geotechnical Data Package Volume 2 (PolyMet 2014c, as cited in the FEIS), indicate that the design would meet appropriate factors of safety. The Hydrometallurgical Residue Facility would be constructed over the LTVSMC emergency basin. During operations, the double liner system for the Hydrometallurgical Residue Facility would minimize release of residue leachate, and any collected leakage through the primary liner would be collected in the leakage collection and recovery system (LCRS) and pumped back to the Hydrometallurgical Residue Facility pond. During reclamation and closure and long-term maintenance, any leakage would be routed and cycled through the WWTP. The Hydrometallurgical Residue Facility would be double-lined at the bottom to facilitate collection of water that has contacted the hydrometallurgical residue. More specifically, the double liner would consist of a composite liner system that utilizes a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a LCRS, substantially reducing hydraulic head from the lower liner. This design is intended to mitigate leakage from the Hydrometallurgical Residue Facility to groundwater resources. The collection system capture rate was calculated and included in Appendix E of Geotechnical Data Package Volume 2 (PolyMet 2014c, as cited in the FEIS). The Residue Management Plan (PolyMet 2014r, as cited in the FEIS) includes a description of the operating plans, monitoring procedures, and adaptive management approaches for the Hydrometallurgical Residue Facility. Information on the design of the Hydrometallurgical Residue Facility is in FEIS Section 3.2.2.3.10. The FEIS includes available details from Plant Site Water Management Plan (PolyMet 2015i, as cited in the FEIS), which is updated from the version used in the SDEIS. The management plan details proposed operational plans, monitoring activities, annual reporting requirements, and plans for reclamation and closure and long-term maintenance for the Hydrometallurgical Residue Facility. Details would be finalized in permitting and be subject to periodic reassessment.	PD 17 WR 066
2984	Comment # 4. Page 4-336 discusses the possibility of inundating an existing coal ash landfill located	The coal ash landfill (landfill) is located on the east side of the former LTVSMC Tailings Basin Cell 1E in approximately the northeast quarter.	WR 028

Comment ID	Comment	Response	Theme(s)
	within the proposed tailings basin. Based on current knowledge of leachate concentrations found in groundwater at such landfills, inundation may lead to future water quality impacts. Recommendation: The FEIS should discuss how constituents found in the coal ash landfill may impact water quality in the Embarrass River, how this landfill will be protectively managed, and how any impacts will be mitigated.	The landfill was operated by LTVSMC to accept coal ash from LTVSMC's Taconite Harbor facility, and coal contaminated soil from the LTVSMC abandoned coal yard. The landfill was closed per the "Closure Plan for the Tailings Basin Coal Ash Disposal Area." The final footprint of the landfill (AOC 36) is estimated to cover approximately 4 acres and contain approximately 260,000 cubic yards total of material (including coal ash, tailings, and soil covers). As the current footprint of the landfill lies within the future footprint of an area to be inundated by placement of NorthMet Project flotation tailings, the plan is to relocate the contents of the landfill to the future NorthMet Hydrometallurgical Residue Facility, which has a design capacity of 6,170,000 cubic yards, and would be a double-lined storage facility. The double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner, with a second liner placed above the first, separated by a leakage collection system. This would substantially remove hydraulic head from the lower liner and thereby virtually eliminate leakage to groundwater from the Hydrometallurgical Residue Facility. Leakage that is collected would be pumped back to the Hydrometallurgical Residue Facility pond, which is collected and pumped back for use at the Hydrometallurgical Plant. This facility is currently planned to be constructed and in use prior to the time period at which the landfill would be inundated with NorthMet flotation tailings (mine year 7).	
2985	Comment # 5. CWA requirements for antidegradation ("nondegradation" in Minnesota' s terminology) help ensure that a proposed project will not result in a loss of existing uses of surface waters, and preclude reduced water quality unless the State determines it is necessary to accommodate important social and economic development (see 40 CFR 131.12). This review must occur before project activity that may result in a new or increased discharge commences, and should not be deferred until NPDES permitting. EPA understands from discussion with MPCA that much, if not all, of the information needed for an antidegradation review is already contained in the SDEIS. Recommendation: The FEIS should include an evaluation of which of Minnesota's	*Minnesota Rules*, part 7050.0180 describes the nondegradation rules applicable to discharges to Outstanding Resource Value Waters (ORWV) and waters upstream of ORVWs. The NorthMet Project Proposed Action would not discharge to listed ORVWs, nor would there be any deterioration of water quality in Lake Superior, the nearest ORVW downstream of the proposed NorthMet Project area. Thus, the requirements of this rule are not applicable. *Minnesota Rules*, part 7080.0185 describes the nondegradation requirements applicable to discharges to all waters of the state. As part of the permitting process for the project, the MPCA would determine whether additional control measures are required to minimize the impact of the project on downstream waters while considering the factors identified in the rule. *Minnesota Rules*, part 7052.0300 describes the nondegradation requirements applicable to waters in the Lake Superior basin for bioaccumulative chemicals of concern (BCCs) and bioaccumulative substances of immediate concern (BSICs) of which mercury is the only one applicable to the NorthMet Project Proposed Action. As part of the permitting process, the MPCA would apply these requirements to mercury	PER 09 WR 109

Comment ID	Comment	Response	Theme(s)
	nondegradation rules (7050.0180, 7050.0185, 7052.0300) apply to this project, and explain how the project complies with the applicable nondegradation rules	discharges as appropriate.	
2986	Comment # 6. The proposed project provides significant overall environmental improvements over the proposal in the DEIS through installation of seepage containment and other controls at the former LTV tailings basin. However, the SDEIS modeling predicts increases in aluminum (Al) and lead (Pb) in surface waters affected by the proposed project- including exceedances of evaluation criteria for Al and Pb at locations on four tributaries to the Embarrass River (p. 5-7 to 5-8). These predicted increases are based on a number of assumptions, including the contribution from remediation of the former LTV tailings basin. The SDEIS modeling also predicts other increases and exceedances of evaluation criteria based on the "Continuation of Existing Conditions" scenario. EPA understands that monitoring of receiving waters downgradient of the existing tailings basin is being carried out now. This monitoring data will be an important source of information to consider along with modeling results. Recommendation: Available monitoring data should be used to inform NPDES permitting. Monitoring should continue throughout the life of the project to inform permitting, adaptive management, and additional measures to prevent or mitigate impacts to aquatic life as necessary.	Monitoring would be a critical component of the NorthMet Project Proposed Action to better understand impacts and to inform facility operation and maintenance and the selection and implementation of possible adaptive or contingency mitigation measures. Overviews of the water monitoring plans at the Mine Site and Plant Site, with PolyMet proposed monitoring locations and frequencies, are presented in the FEIS. The specifics of monitoring—including specific locations, frequencies, and parameters—would be finalized during the permitting process after a detailed evaluation. An NPDES permit would be required for any point source water discharge that adds pollutants to waters of the United States.	AQ 12 AQ 30 WR 139
2987	Comment # 7. The SDEIS anticipates that pollutants will be discharged from mine site features, travel via groundwater pathways and reach the Partridge River several years following the start of the mining project. See SDEIS Table 5.2.2-26. However, as EPA has stated previously, the pollutants originating from mine site features	It is acknowledged that while there could be a groundwater discharge to jurisdictional wetlands along a flowpath, this process is not incorporated into the GoldSim model because it is considered speculative and quantitatively uncertain. The EIS considers that permitting for the NorthMet Project Proposed Action, if approved, would require monitoring that would likely include water levels and water quality in groundwater and potentially affected waters of the U.S., including wetlands and tributaries.	PER 05

Comment ID	Comment	Response	Theme(s)
	may discharge to jurisdictional wetlands and tributaries prior to reaching the Partridge River. CWA Section 301 prohibits any point source discharge of pollutants to waters of the United States, either directly or via directly connected groundwater, unless the discharge complies with a NPDES permit. Waters of the United States include jurisdictional wetlands and tributaries. See 40 CFR 122.2. Recommendation: The FEIS should reflect the fact that a NPDES permit is required before the pollutants from the mine site reach waters of the U.S. (including jurisdictional wetlands and tributaries). Statements in the SDEIS about when discharges will reach waters of the U.S. should be revised, and these changes should be reflected in the FEIS.	The goal of this monitoring is to anticipate or predict the potential for an NPDES discharge so that the NPDES discharge can either be eliminated, or alternatively permitted with NPDES permit coverage prior to its occurrence. See FEIS Section 5.2.2.3.6 for more information on groundwater and wetland monitoring and possible future mitigations. The FEIS states that an NPDES permit would be required for any point source water discharge that adds pollutants to waters of the U.S. The Final EIS correctly identifies the waters of the U.S.	
2988	Comment # 8. The Tribal Cooperating Agencies Cumulative Effects Analysis (September 2013) included in Appendix C of the SDEIS states: "PSDEIS Table 4.2.2-18 reports Colby Lake as currently having an observed mean for Arsenic of 0.78 to 1.4 ug/L (depending on the data set), whereas Figure 5.2.2-35, the No-Action (continuation of current conditions)" P50 model for Colby Lake Arsenic shows annual maximum values of 0.5 ug/L." In addition, the SDEIS shows Colby Lake's current mean arsenic concentration as 0.78-1.4 ug/L on Table 4.2.2-18, with a range of 0.25-2.3 ug/L, while the modeled P90 maximum value in Figure 5.2.2-35 lists the maximum concentration of arsenic in Colby Lake as 0.70 ug/L. Comparing the modeled mean for arsenic in Colby Lake to existing site-specific data in the SDEIS, the model outputs underestimate arsenic concentrations by up to l 00%. Colby Lake is currently modeled as a continuation of the Partridge River because there is insufficient data to model it as a lake, which may be causing this	The Mine Site GoldSim model used for the SDEIS was modified for the FEIS (PolyMet 2015m, as cited in the FEIS) to include a new chemical loading source in Colby Lake and was calibrated to the measured chemical concentrations in the lake. This calibration considered new surface water chemistry data collected through the end of 2013. The same chemical loading source was applied to both the Continuation of Existing Conditions model and Proposed Action model (PolyMet 2015m, as cited in the FEIS). The chemical loading source was constant and did not exhibit seasonal or long-term variations for future conditions. Incorporation of the loading source addressed the issue by providing predicted chemical concentrations in Colby Lake for existing conditions that are similar to currently measured concentrations. The average arsenic concentration based on 33 samples in Colby Lake is 0.95 µg/L. The GoldSim Continuation of Existing Conditions modeling scenario predicts an average concentration of 0.80 µg/L at P50 over the 200 year modeling period.	WR 046

Comment ID	Comment	Response	Theme(s)
	discrepancy. We understand that monitoring is ongoing, which may provide additional information on observed arsenic concentrations. Recommendation: The FEIS should document an analysis that addresses this discrepancy between existing conditions in Colby Lake and modeling results, taking into account all necessary data. The FEIS should include any follow-up actions that will be necessary based on this analysis.		
2989	Comment # 9. Modeling using MODFLOW assumes no seepage through the berm on the east side of the tailings basin. The co-lead agencies have agreed to reexamine this assumption. MODFLOW outputs are used as an input to the GoldSim model, so changes to these outputs may require updated GoldSim modeling as well. Recommendation: Recalibrate MODFLOW as necessary to reflect seepage on the east side of the tailings basin, and update GoldSim modeling as necessary. The FEIS should explain how this comment was addressed.	The Plant Site MODFLOW and GoldSim water quality models were updated to incorporate the east side of the Tailings Basin to reflect a surficial material layer at this site. The FEIS also addresses inclusion of a new containment system at this site in Section 5.2.2.	WR 054 WR 102
2990	Comment #10. Modeling of water quality parameters is subject to inherent uncertainties that call for ongoing evaluation. For example, acid rock drainage (ARD) in cold, wet climates raises uncertainty due to climatic factors including distinct freeze-thaw cycles, varying contributions from rain and snow, and a period of significant melting during the spring thaw. Recommendation: The permit to mine should require water quality modeling throughout the life of the mine, assuring that the model uses input from actual monitoring discharge data as it becomes available, so this information can be used to support adaptive management. The model should accommodate specific climatic factors associated with the site.	The NPDES/SDS permit and MDNR Permit to Mine would require a periodic 'model verification analysis' for as long as is necessary (during both operation and closure) to compare actual monitoring data against model assumptions, inputs and predictions generated during the EIS process. This analysis can then be used to support adaptive mitigation as appropriate. The details of the analysis procedures and methods would be developed during permitting but are likely to utilize on-site 'internal' performance data and groundwater data in addition to discharge monitoring data.	WR 130 WR 139

Comment ID	Comment	Response	Theme(s)
2991	Comment #11. MDNR has collected new Partridge River flow data that vary from the base flow calculations used for modeling in the SDEIS. The co-lead agencies have explained that the model accounts for this discrepancy, which is correlated with pit dewatering from the upstream Peter Mitchell Pit, a factor that was not present during the time period used for continuous flow data in the SDEIS (1978-1987), Details are provided in a technical memorandum from the Co-lead Agencies. While the flow data used in the S DEIS was appropriate, low-flow conditions may not represent the most conservative conditions, though they are conservative in that they assume less dilution of contaminants. However, dilution is the only variable considered. High-flow conditions, while increasing dilution, may mobilize contaminants to a greater extent than expected under low-flow conditions. Recommendation: The FEIS should evaluate how base flow affects variables other than dilution, taking into account high-flow as well as low-flow scenarios.	The FEIS reports a formal sensitivity analysis of groundwater baseflow for the Partridge River. The analysis used the FEIS Mine Site GoldSim model (PolyMet 2015m, as cited in the FEIS) with groundwater baseflows at all locations on the Partridge River artificially increased by a factor of 4 (e.g., from 0.5 to 2 cfs at SW-003 and 5.3 to 21 cfs at SW-006). Other hydrologic parameters affected under the sensitivity analysis include aquifer recharge values and hydraulic conductivities of surficial deposits. Both of these increased by a factor of 3 to 4 as a function of recalibrating the Mine Site MODFLOW model to measured groundwater heads and the higher groundwater baseflows. The higher values of groundwater baseflow, aquifer recharge, and hydraulic conductivity of surficial deposits were input into the Mine Site GoldSim model (PolyMet 2014v, as cited in the FEIS). In a separate but related analysis using the GoldSim existing conditions model, surface runoff concentrations were also recalibrated to new values based on higher groundwater baseflows and these were also incorporated into the GoldSim Mine Site model to create the "high groundwater baseflow scenario." This scenario accounted for all GoldSim parameters that would be directly or indirectly affected by considering higher groundwater baseflows in the Partridge River, not just the dilution effect. Results of the GoldSim high groundwater baseflow scenario were compared with the best-estimate scenario to evaluate the degree to which predicted Proposed Action impacts are sensitive to groundwater baseflow and related inputs. The sensitivity GoldSim run indicated that groundwater and surface water concentrations did not change appreciably when higher groundwater baseflow (and associated input parameters) were modeled for the Mine Site (i.e., water quality impacts were not sensitive to groundwater baseflow). The only substantive changes in GoldSim results were: 1) migration velocities in the surficial groundwater flowpaths increased by approximately a factor of 3-4, 2) groundwater travel times to evaluation locations and the Partridge River were reduced by approximately a factor of 3-4, 3) peak groundwater concentrations increased for some constituents at some locations, and 4) mine pit groundwater inflow rates increased nominally. The HGB results showed that, although the estimated concentrations in the groundwater and surface water are moderately sensitive to Partridge River baseflows, the NorthMet Project Proposed Action's ability to comply with the applicable groundwater and surface water evaluation criteria is not a concern .	WR 091 WR 165

Comment ID	Comment	Response	Theme(s)
		The interpretation of these results is that the increased chemical loadings at the upgradient end of the flowpaths (due to higher groundwater flow rates) are offset by: 1) increased dilution from aquifer recharge water along the flowpath, and 2) increased dilution in the river from higher groundwater baseflows during winter low-flow conditions. In other words, for low (i.e., winter) streamflow conditions, the higher chemical mass loading into the river was offset by dilution associated with the higher river groundwater baseflows. In regard to chemical concentrations and FEIS evaluation criteria, it is reasonable to conclude from the results of the sensitivity analysis that the Mine Site GoldSim model is relatively insensitive to the Partridge River groundwater baseflow variable. By analogy, the Plant Site GoldSim model is also considered insensitive to groundwater baseflows in the Embarrass River (PolyMet 2015j, as cited in the FEIS). The FEIS reports the results of the Partridge River groundwater baseflow sensitivity analysis in Section 5.2.2.3.2.	
2992	Comment # 12. There is insufficient detail to explain why "outlier" data were excluded from consideration in the GoldSim model. Recommendation: The FEIS should provide a specific justification to support excluding any such data from modeling.	Various data sufficiency documents within the FEIS record support decisions related to the exclusion or inclusion of data. The primary data sufficiency document for the FEIS is titled, "Technical Memorandum: Ongoing Groundwater and Surface Water Data Collection for NorthMet Water Quality Modeling Version 1" (Barr 2014d, as cited in the FEIS). The FEIS does not provide specific justification to include or exclude data from modeling because the FEIS is focused on evaluating effects to the human and natural environment, alternatives, and mitigation.	WR 072
2993	Comment # 13. Page 5-61: the SDEIS shows that tailings leachate pH increases after 300 weeks, but does not show how leachate pH was extrapolated to the longer term, such as 50-100 years. We understand this data is already available. Recommendation: The FEIS should show how leachate pH was extrapolated to the longer term, such as 50-100 years, through a graph or chart.	The pH in leachate from the various mining features was not predicted by the GoldSim model. However, the permanent subaerial waste facilities (e.g., Category 1 Stockpile and Tailings Basin) would contain material that testing results indicate would not produce acidic leachate. The nonacid generating waste was identified using multi-year kinetic tests (humidity cells) on NorthMet Project Proposed Action rock samples. The long-term humidity cell tests on NorthMet waste rock consist of 38 samples of Category 1 waste rock, with tests that have run for up to 337 weeks; and 33 NorthMet tailings humidity cell tests run between 84 and 304 weeks. This information is presented Attachment C and F, respectively, of PolyMet 2015q, as cited in the FEIS. These tests demonstrate that tailings and Category 1 waste rock do not generate acidic leachate, and acid generation rates decrease by depletion of sulfide S minerals. Regarding the tailings in particular, the pH in the flotation tailings humidity	WR 001 WR 025-14

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		cells have been observed to be stable or increasing between 100 and 300 weeks of humidity cell testing. However, pH of the flotation tailings in the GoldSim model is not directly based on, or extrapolated from, the observed pH in the humidity cells. This is because the neutralization mechanism for NorthMet Project Proposed Action tailings is understood to be silicate mineral dissolution, not carbonate weathering. As noted above, the humidity cells provide information on rates of acid producing and acid neutralizing reactions, which are similar for flotation tailings and Category 1 waste rock due to the similar sulfur content of these materials. A separate geochemical model was used to estimate long-term pH resulting from these reactions, including the conservative assumption that CO_2 is elevated above atmospheric levels throughout the tailings. See FEIS Section 5.2.2.2.3 for more information.	
2994	Comment # 14. The SDEIS could be interpreted to imply that the plant site is expected to need water treatment for up to 500 years and the mine site for up to 200 years. We understand from discussion with the co-lead agencies that this interpretation is incorrect. Recommendation: The FEIS should clearly explain the timeframe during which water treatment is projected, for both the plant and mine sites.	The water quality objective of closure is to provide mechanical or non-mechanical treatment for as long as necessary to protect regulatory standards at applicable groundwater and surface water compliance points. Water quality modeling performed in support of the FEIS indicates that water treatment systems would be needed at the Mine Site and Plant Site indefinitely. The water models constructed to assess the potential effects from the NorthMet Project Proposed Action were not designed to predict the duration of treatment nor do they capture all the factors that influence the duration of treatment, for example potential future regulatory and technological changes. Therefore, the models cannot be used to predict when treatment would end. Actual treatment requirements would be assessed on a recurring basis throughout operation and closure based on results of ongoing discharges, performance, and water resource monitoring, ensuring continuous protection of ground and surface water quality and compliance with applicable water quality standards. This reassessment process would rely on measured monitoring results rather than the results of the predictive modeling included in the FEIS. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there are measures available to address impacts to natural resources, such as those identified in the Adaptive Water Management Plan (PolyMet 2015d, as cited in the FEIS) and permit conditions. PolyMet would be held accountable for maintenance and monitoring required under the permit and would not be released until all conditions have been met. PolyMet would be required to provide financial assurance to MDNR (managed independently) for closure and maintenance costs as a contingency if PolyMet or the operating company at that time were unable to fulfill the obligations under	WR 036

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		the Permit to Mine.	
2995	Comment # 15. Page 5-20: the SDEIS states that "mercury was not included in the GoldSim model, as insufficient data and a general lack of definitive understanding of mercury dynamics prevented modeling mercury like the other solutes." It also states that "regardless, the NorthMet Project Proposed Action would still need to demonstrate consistency with the mercury evaluation criteria (see Section 5.2.2.1)." Given the absence of modeling data for mercury, it is unclear how consistency with mercury evaluation criteria will be determined. Recommendation: The FEIS should either provide a supporting rationale that explains why elemental mercury does not warrant modeling, and how consistency with mercury evaluation criteria will be determined; or include modeling and evaluation of elemental mercury. If GoldSim is not suitable to model this pollutant, elemental mercury can be modeled using a different water quality model, such as the Water Quality Analysis Simulation Program (WASP), which is commonly used by EPA to model elemental mercury.	Elemental mercury is unlikely to exist in the water column. However, elemental mercury was evaluated using the MPCA's Mercury Risk Estimation Method to assess the potential incremental change in fish mercury concentrations and the potential incremental risks to human health. The results indicate that impacts would be small and would not result in the need for additional precautions to protect human health, The FEIS assesses NorthMet Project Proposed Action-related mercury contributions using a mass-balance methodology. This approach was identified during scoping of this EIS as the appropriate analytic tool for predicting mercury concentrations and it is a common and reliable analytical tool used by agencies to assess mercury impacts in impact assessments. This estimation method is preferred over a detailed mechanistic model because it incorporates the important input and removal processes for mercury, it is transparent with regard to data inputs, it typically provides conservative estimates of aqueous mercury concentrations, and it allows for easy assessment of the effect of changing parameter values on mercury concentrations. The RO treatment plant is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site, including water used for flow augmentation. Mercury loadings from the Mine Site are projected to decrease due to the NorthMet Project Proposed Action and the combined contributions from the Embarrass River and Partridge River are unchanged when estimated at the St. Louis River at the Fond du Lac reservation boundary. Therefore, the potential effects are expected to be less than significant, and the mass balance approach is appropriate to provide a reasonable estimate of potential contributions for purposes of environmental review. West Pit inflows during pit flooding are not projected to exceed the 1.3 ng/L water quality evaluation criterion; RO (or equivalent performing technology) would further reduce these concentrations in closure. The WWTP and WWTF would use mercury-capturing greensand filtration for pretreatment prior to RO. Adaptive management would be implemented as necessary based on monitoring for total mercury to determine whether the treated water could be discharged to surface waters, or whether some additional treatment is needed. PolyMet has identified the following adaptive management strategies: • Pretreatment modifications such as chemical scavenger addition to	MERC 13

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		obtain additional metals; • Use of tighter RO membranes for the primary RO system; • Treatment of some portion of the VSEP permeate by the primary RO system to further remove some dissolved constituents; and • Addition of polishing treatment units for removal of trace metals (e.g., ion exchange).	
2996	Comment # 16. Page 5-509, Section 5.2.10.2.6, 5th paragraph: The SDEIS states that "increased mercury concentrations, and associated increases in mercury bioaccumulation in fish tissue could therefore constitute an environmental justice impact for Band members and other subsistence consumers of fish;" and that "deposition of mercury from the NorthMet Project Proposed Action would cease at closure, but mercury bioaccumulation in fish tissue and existing fish consumption limits could persist beyond the mine's operational life." Table 5.2.2-51 shows how much elemental mercury is expected to leave the project site under currently-proposed control measures. Further consideration of mercury impacts is needed. Recommendation: The FEIS should refine the quoted statement to more clearly characterize the risks associated with mercury releases. Based on this risk characterization, the FEIS should explain what has been and will be done to avoid, minimize, and mitigate mercury releases from the project.	FEIS Table 1.7-1 provides a summary of FEIS sections that address mercury. Specifically, FEIS Section 5.2.7.2.5 discloses results of the MPCA's Mercury Risk Estimation Method to assess the potential incremental change in fish mercury concentrations and the potential incremental risks to human health; and FEIS Section 5.2.2.3.4 explains the status of mercury science. FEIS Section 5.2.2.3.5 lists methods to reduce mercury discharges, and FEIS Section 5.2.7.2.5 identifies mercury air emissions controls. Adaptive management would be implemented as necessary based on monitoring for total mercury to determine whether the treated water could be discharged to surface waters, or whether some additional treatment is needed. Adaptive management strategies would include pretreatment modifications such as chemical scavenger addition to obtain additional metals, the use of tighter reverse osmosis membranes for the primary reverse osmosis system, treatment of some portion of the Vibratory Shear Enhanced Processing (VSEP) permeate by the primary reverse osmosis system to further remove some dissolved constituents, and addition of polishing treatment units for removal of trace metals (e.g., ion exchange).	MERC 02 MERC 24
2997	Comment # 17. The SDEIS describes current site conditions, including the acreage, type, and quality of the wetland resources at the tailings basin and mine sites. The SDEIS also describes the proposed direct impacts remaining after measures to avoid or minimize direct impacts. However, the SDEIS does not quantitatively assess indirect impacts or measures to minimize and mitigate these impacts,	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. In addition, the SDEIS and FEIS Section 5.2.3 quantitatively assessed all potential indirect wetland effects from the NorthMet Project Proposed Action that may result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology	COE 02 WET 18

<table>
<tr><th>Comment ID</th><th>Comment</th><th>Response</th><th>Theme(s)</th></tr>
<tr><td></td><td>except with respect to wetland losses due to fragmentation. The SDEIS also omits all indirect impacts from the cumulative impacts analysis for wetlands (Section 6.2.3.4).

Recommendation: The FEIS should quantitatively assess all indirect impacts. The FEIS should more clearly describe the proposed mitigation plan, including mitigation for indirect impacts. The monitoring and mitigation plans in the CWA Section 404 permit should clearly explain proposed measures to minimize and mitigate indirect wetland impacts during the project.

Recommendation: The FEIS should include indirect impacts in the analysis of cumulative impacts to wetlands.</td><td>from groundwater drawdown resulting from operation of the Plant Site, including groundwater mounding and seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however only wetland acreages were provided for change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The following table summarizes the page location of where the indirect wetland effects were discussed in the SDEIS.

<table>
<tr><th>Indirect Effects Factor Assessed</th><th>Mine Site</th><th>Transportation and Utility Corridor</th><th>Plant Site</th><th>Second Creek</th></tr>
<tr><td>Wetland fragmentation</td><td>page 5-239</td><td>page 5-239</td><td>page 5-291</td><td>page 5-291</td></tr>
<tr><td>Change in wetland hydrology from changes in watershed area</td><td>page 5-243</td><td>---</td><td>---</td><td>---</td></tr>
<tr><td>Changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering</td><td>pages 5-247, 5-259, 5-260; Tables 5.2.3-3, 5.2.3-4</td><td>---</td><td>---</td><td>---</td></tr>
<tr><td>Changes in wetland hydrology from groundwater drawdown resulting from operation of the plant site including groundwater seepage containment</td><td>---</td><td>---</td><td>pages 5-297 and 5-298; Table 5.2.3-10</td><td>pages 5-297 and 5-298</td></tr>
<tr><td>Changes in stream flow near the Mine Site and Plant Site and associated effects to wetlands abutting the streams</td><td>page 5-273</td><td>---</td><td>page 5-299</td><td>page 5-299</td></tr>
<tr><td>Change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations as well as leakage from Stockpiles/Mine Features and Seepage from Mine Pits</td><td>page 5-276, 5-284; Table 5.2.3-7</td><td>page 5-277</td><td>page 5-302, 5-307; Table 5.2.3-13</td><td>page 5-291</td></tr>
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		It is difficult to predict potential indirect wetland effects within the CEAA, as well as to know what the potential indirect wetland effects would be for the projects assessed other than the NorthMet Project Proposed Action. However, based on the amount of potential indirect wetland effects that could occur from the NorthMet Proposed Action, there could be 0.1 to 12.0 percent cumulatively lost, in addition to the direct wetland impacts assessed, within the Partridge and Embarrass River watersheds as a result of the NorthMet Project Proposed Action. The total wetland resources within the two watersheds during the time periods assessed are as follows: • Pre-settlement wetland resources - 68,251 acres; • Existing conditions wetland resources - 65,567 acres; • Foreseeable future conditions with the NorthMet Project Proposed Action and the other foreseeable projects assessed, which includes direct wetland impacts and future deepwater habitat - 64,979 acres; and • Foreseeable future conditions without the NorthMet Project Proposed Action but with the other foreseeable projects assessed, which includes direct wetland impacts and future deepwater habitat (No Action Alternative) - 65,292 acres. Based on the wetlands crossing analog zones analysis approach, the acreage of wetlands whose hydrology would have a high likelihood of being affected by drawdown at the Mine Site is 866.9 acres. The wetlands categorized as high likelihood are dominated by one alder thicket (848 acres) that has approximately 4 acres (less than 1 percent) within the 0-1,000 ft analog impact zone. The remainder of this wetland (more than 99 percent) is located more than 1,000 ft away from the edge of the mine pits and extends out to the edge of Area 1 (see Figure 5.2.3-6 in the FEIS). Furthermore, based on this method, there would be 1,854.5 acres of wetlands within the 0-2,000 ft zone and 2,147.6 acres within the 0-3,500 ft zone that could be affected by potential drawdown. Based on this approach, the total projected potential indirect effects from all six factors that were assessed under this method could be up to 7,694.2 acres of wetlands potentially indirectly affected by the NorthMet Project Proposed Action. Therefore, the potential indirect cumulative effect from the NorthMet Project Proposed Action, in addition to the direct wetland impacts assessed, under this method would range between 1.3 to 12.0 percent. Based on the method approach of wetlands within analog zones, the	

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		acreage of wetlands whose hydrology would have a high likelihood of being affected by drawdown at the Mine Site is 46.4 acres. Furthermore, based on this method, there would be 348.4 acres of wetlands within the 0-2,000 ft zone and 733.3 acres within the 0-3,500 ft zone that could be affected by potential drawdown. Based on this approach, the total projected potential indirect effects from all six factors that were assessed under this method could be up to 6,568.8 acres of wetlands potentially indirectly affected by the NorthMet Project Proposed Action. Therefore, the potential indirect cumulative effect from the NorthMet Project Proposed Action, in addition to the direct wetland impacts assessed, under this method would range between 0.1 to 10.2 percent.	
2999	Comment # 18. The SDEIS uses wetland assessment sites as an approach for evaluating impacts. The location of these assessment sites is discussed in the SDEIS, and Figure 4.2.3-2 shows locations of wetland assessment sites as points in a diagram. There are few wetland assessment site locations north and south of the mine site, and those shown on Figure 4.2.3-2 are far from the site boundary. The SDEIS does not sufficiently explain the assessment approach. Recommendation: The FEIS should describe in more detail the wetland assessment protocol and the assessment sites used, including the assessment methods used at those locations, why these locations were chosen, and how will they be used (e.g., for monitoring future wetland conditions).	FEIS Section 4.2.3 provides a discussion of the wetland functional assessment that was performed for the wetlands in the NorthMet Project areas; this discussion notes that the MnRAM was used to assess wetland functions on the Mine Site, along the Transportation and Utility Corridor, and the Plant Site. During the field wetland surveys for the NorthMet Project areas, data was collected related to the functions of each wetland within the proposed Project areas (i.e., Mine Site, Transportation and Utility Corridor, Plant Site) under an abbreviated MnRAM approach. A total of 87 wetlands were evaluated at the Mine Site for vegetative diversity/integrity and overall functional quality rating and is summarized in FEIS Table 4.2.3-4. Wetland data forms with the MnRAM information collected in the field was presented in Wetland Delineation and Wetland Functional Assessment Report (Barr 2006d, as cited in the FEIS). Approximately 92 percent of the wetland resources in the Mine Site are of high overall wetland quality and 8 percent are of moderate overall wetland quality. The wetlands along the Transportation and Utility Corridor have all been rated as high quality. The wetland resources along the Railroad Connection Corridor are moderately affected and have a high vegetative diversity/integrity. The majority (92 percent) of the wetlands within the Plant Site are currently rated as low-quality with low vegetative diversity/integrity. Eight percent are rated as moderate quality. The wetlands within the Hydrometallurgical Residue Facility are currently rated as low-quality. FEIS Section 5.2.3 discusses the percentage of high, medium, low quality wetlands to be affected by the mine features. In addition, FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The wetland assessment sites that were shown on SDEIS Figure 4.2.3-2 are	WET 21

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		wetland assessment sites, using MnRAM, that were collected for the federal lands and are now shown on FEIS Figure 4.3.3-1. FEIS Section 4.3.3 includes a discussion on these findings.	
3000	Comment # 19. Section 5.2.3 states that 26.9 acres will be impacted by fragmentation, and that these losses will be mitigated. The criteria used to determine fragmentation are broadly described in Section 5.2.3.1.2, but lack sufficient detail. Recommendation: The FEIS should describe in more detail the criteria used to determine fragmentation losses.	For each wetland that would not be directly impacted at the Mine Site, along the Transportation and Utility Corridor, or at the Plant Site, an estimate of indirect wetland effects (wetland acres by wetland type, and type of effect) from wetland fragmentation by NorthMet Project area features (e.g., open pits, stockpiles, haul roads) was determined based on an analysis of the various factors that may contribute to fragmentation. A wetland may be fragmented as the result of direct impacts that may split a wetland resource area into multiple parts. These fragmented parts could potentially be isolated from other wetlands and would no longer have any adjacent upland watershed area, which could result in the loss of functions in the wetland fragments. While a wetland may be fragmented by direct impacts, this does not necessarily mean the remaining fragmented part of the wetland resource area would be affected. These fragmented parts therefore required further evaluation to determine if these areas would remain viable and/or would retain its functions (PolyMet 2015b, as cited in the FEIS; PolyMet 2015j, as cited in the FEIS). PolyMet's evaluation (PolyMet 2015b, as cited in the FEIS; PolyMet 2015j, as cited in the FEIS) to determine if a wetland resources area would remain viable included the following criteria: change in the size of remaining wetland, wetland type, source of hydrology, direction of flow in the area, location in the current watershed, location in the future watershed, and connectivity to other wetlands. The criteria used are described below: • **The Size of Remaining Wetland:** Wetland fragments that were identified using GIS as having less than about 0.5 acres in size were determined to small to retain their functions. These wetlands were determined for the analysis to be considered fragmented. • **Wetland Type:** The wetland types for the wetland fragments that were greater than 0.5 acres in size were reviewed to determine if they were bogs vs. non-bogs. Ombrotrophic bogs that would become fragmented were not identified as indirectly impacted by fragmentation because they would maintain their functions since their sole source of hydrology is precipitation (see below). Minerotrophic bogs and small non-bog wetlands that were fragmented were further evaluated to determine their hydrologic sustainability. • **Source of Hydrology:** Wetlands were further subclassified as	WET 08

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		ombrotrophic (solely precipitation-fed) or minerotrophic (receives surface and/or groundwater inputs). The hydrology of ombrotrophic bogs is solely supported by precipitation; therefore, these wetlands are not dependent on the watershed size to maintain their functions and were not identified as indirectly impacted by fragmentation. The hydrology of minerotrophic bogs and non-bog wetlands is primarily supported by shallow, groundwater systems that are connected within different scales – wetland watershed, local (e.g., Mine Site) watershed, or regional watershed. Therefore, these minerotrophic bogs and non-bog wetlands were further evaluated because they are considered to be dependent on their watershed size to maintain their functions and their watersheds would be altered due to construction of Project infrastructure. • **Direction of Flow in the Area:** The Mine Site is located in the Upper Partridge River watershed and water on the Mine Site eventually drains to the Partridge River. Under this criterion, PolyMet evaluated the locations of the minerotrophic bogs and non-bog wetlands relative to the sub-watersheds on each side of the Mine Site groundwater divide which is generally located from southwest to northeast near the northern boundary of the Mine Site. Under existing conditions, water in the northernmost area of the Mine Site generally drains (flows) north and water in the southern area of the Mine Site generally drains (flows) south. There are several sub-watersheds on each side of the divide. Based on the location of predicted wetland fragments on the Mine Site, their locations within the sub-watersheds in relation to direct impacts within that same sub-watershed and the direction of flow were noted. A wetland is more likely to retain its function if the fragment that remains is located in the upper portion of its sub-watershed than in the lower portion. Ultimately, if the area of the wetland's watershed is modified, it could result in a change to the equivalent flow (expressed as ac-ft/yr per acre of wetland), a measure of hydrologic support. • **Determination of the Wetland's Current Watershed:** The current watersheds for ombrotrophic bog wetlands were not analyzed since they are not dependent on watershed area for their hydrology as they are precipitation-fed. The current (existing) conditions include the wetlands and watersheds which represent the existing, relatively undisturbed conditions in the Mine Site Area. The watersheds for the	

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		minerotrophic bogs and non-bog wetlands are the land areas that contribute surface water to the wetlands (upland areas and wetland areas). For each minerotrophic bog and non-bog wetland in the analysis, GIS was used to determine the acreage of its watershed area. The location of each minerotrophic bog and non-bog wetland in its current (existing) watershed was compared with its location in the future watershed. • **Location of the Minerotrophic Bog and Non-bog Wetland Fragment in the Wetland's Future Watershed:** During operations, some watershed areas would be directly impacted by the NorthMet Project Proposed Action and would no longer be considered as tributary areas to the minerotrophic bogs and non-bog wetlands. Using the same methodology as in the previous criteria, for each minerotrophic bog and non-bog wetland in the analysis, GIS was used to determine the acreage of upland area and wetland area within its watershed area. As a result, the amount of water potentially contributed by the watershed to support the hydrology of the remaining wetland may also change (increase or decrease). If the wetland fragments had a change in equivalent yield of plus or minus 20 percent, the minerotrophic bogs and non-bog wetlands were further determined to have a potential for indirect impacts. Depending on the results of the other criteria, the minerotrophic bog and non-bog wetland fragments were either considered to be indirectly affected or included as a monitoring location in the wetland hydrology monitoring plan. • **Connectivity to Other Wetlands:** Each wetland fragment was evaluated based on its location, adjacency to upland, and adjacent infrastructure characteristics to determine if it would be expected to maintain its functions. Some of the wetland fragments as a result being divided by Mine Site infrastructure would become isolated from other wetlands; therefore, no longer located within or adjacent to an intact, relatively undisturbed upland. These wetland fragments were not expected to maintain their functions. However, other wetland fragments would still be hydrologically connected to wetlands and would be located within or adjacent to an intact, relatively undisturbed upland. These fragmented wetlands would be located in the vicinity of the haul roads on the Mine Site. Construction of the haul roads would require excavation and fill with blasted rock that would allow	

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		groundwater connectivity for wetlands on either side of the haul road. The purpose of this analysis for the fragmentation factor was to provide an estimate of potential indirect wetland effects from fragmentation. The wetland fragments that are not expected to maintain their functions, approximately 26.9 acres, have been identified in FEIS Section 5.2.3 and on FEIS Figure 5.2.3-1. PolyMet's proposed mitigation for the NorthMet Project Proposed Action would be providing upfront compensatory mitigation for the 26.9 acres of wetland fragmentation. The monitoring and mitigation requirements for potential indirect effects, including fragmentation, would be determined during permitting. The wetland fragments that have not been accounted for in the upfront mitigation would be included in the wetland hydrology and vegetation monitoring plan that would be developed and implemented for the NorthMet Project Proposed Action. FEIS Section 5.2.3.3 includes a detailed discussion on the monitoring and mitigation plan for the potential indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation, and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.	
3001	Comment # 20. Figure 5.2.3-4 highlights wetland acres at the mine site where the proposed mine features would indirectly impact wetlands by fragmentation. Fragmentation is defined in the SDEIS as causing a change in the watershed area by greater than 20%. The SDEIS (Page 5-226) briefly describes how fragmented wetlands were identified, but does not explain the method for determining the 20% threshold. Indirect impacts from fragmentation at the mine site will also include habitat fragmentation, divisions in vegetative communities, and the general loss of functions in wetlands that are divided from adjacent wetlands and made smaller by mine features. Wetland acres that are surrounded on all sides by mine features will be fragmented because their ecological functions will be impaired. Recommendation: The FEIS should explain how the 20% threshold was determined. The FEIS	Figure 5.2.3-4 of the FEIS has been clarified. The potential indirect wetland effects as a result of: 1) fragmented wetlands; and 2) change in watershed area, share a common graphic and the title of the figure has been revised. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. The Co-lead Agencies agree that multiple factors can affect whether a wetland would experience indirect effects due to a project. Fragmentation and a change in watershed area (20 percent or greater) are two of the six factors being considered in the identification of potential indirect wetland effects that would be actively monitored due to the NorthMet Project Proposed Action, if the project were to be permitted. Other factors in the consideration of monitoring for potential indirect wetland effects as described in the FEIS: changes in hydrology at the mine site (drawdown), changes in hydrology at	WET 01 WET 08

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	should also recognize that the term "fragmentation" may define indirect impacts other than changes in watershed size. These other factors should be included when estimating fragmentation impacts. Compensatory mitigation should also be proposed for all losses of wetland functions due to wetland fragmentation (in addition to adverse impacts from changes to a wetland's watershed).	the Plant Site (mounding or drawdown), changes in stream or river flow, and changes in water quality. PolyMet proposes that if a wetland would potentially experience three or more of these factors, a monitoring well and a vegetation plot would be installed at that wetland for use in monitoring for indirect effects. A rating system (0-6) was developed for the wetlands based on the number of factors that may potentially affect it. Wetlands that were not determined to be potentially indirectly affected would be rated as zero, and wetlands that were determined to be potentially indirectly affected by all six factors would be rated as a six; however, no wetlands were rated as a six (see FEIS Figures 5.2.3-24 through 5.2.3-29). Monitoring is proposed within all wetlands with a factor rating of 3 to 5 and also for a subset of those wetlands with factor ratings of 1 or 2 as described in FEIS Section 5.2.3.3 (see Figures 5.2.3-31 and 5.2.3-32). The 20 percent change in watershed area is a metric used to assist in identifying wetlands to be monitored for indirect effects (see FEIS Figure 5.2.3-4). It comes from a scientific paper (Richter et al. 2011) and its use in the EIS indirect effects wetland assessment is based on the assessment of potential water-related impacts (including to aquatics) in the EIS. With regard to daily flow alterations (i.e., in streams or rivers), the paper states that, "Alterations greater than 20 percent will likely result in moderate to major changes in natural structure and ecosystem functions." Though the 20 percent metric discussed in this paper is applied to streams and rivers, the Co-lead Agencies believe that a 20 percent change is a reasonable metric to apply when identifying wetlands for monitoring, in particular with respect to potential ecological changes that may be triggered with a change in watershed contribution (water yield) of this magnitude or greater. As stated above, the 20 percent change in watershed is just one of six factors used to identify which wetlands would be proposed to be actively monitored for indirect effects. Fragmentation is another of the six factors described above. As noted in FEIS Section 5.2.3.2.2, wetlands were determined to be fragmented, and their associated remaining acreage identified as being indirectly affected if the remaining portions of the wetlands were small remnants of a directly impacted wetland located between project features (e.g., in the area between the Category 1 Waste Rock Stockpile and the West Pit). FEIS Section 5.3.2.1.2 provides a discussion of the criteria considered in identifying a wetland as fragmented.	

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		As noted in the FEIS, compensatory mitigation for the 26.9 acres of wetland fragmentation (see FEIS Figure 5.2.3-1) estimated to occur due to the NorthMet Project Proposed Action is proposed to occur up front (see FEIS Tables 5.2.3-17, 5.2.3-18, 5.2.3-19). Potential indirect effects to wetlands due to factors other than fragmentation would be identified through monitoring. The monitoring and mitigation for potential indirect effects would be determined during permitting. Additional compensatory mitigation for indirect wetland effects would also be addressed in permitting. When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used as well as other suggested approaches have been carefully considered. The Co-lead Agencies ultimately decided the use of the 20 percent metric described in Section 5.2.3 as one of the factors considered in identifying potential indirect effects to wetlands is a credible and reasonable approach consistent with the requirements of NEPA.	
3002	Comment # 21. Section 5.2.3 describes the proposed wetland mitigation plan. EPA previously commented on the proposed mitigation ratios, and supports the mitigation ratios proposed in USACE's May 29,2013 Draft Memorandum on The Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation, as described on page 5-	The USACE has determined—based on the mitigation plans, information gathered on site, and review of the monitoring reports—that the three mitigation sites selected (Aitkin, Hinckley, and Zim) and the wetland mitigation credits generated at these sites would be acceptable for use in compensating for direct wetland losses. The USACE has not made a final decision on the mitigation ratios that would be required to compensate for direct wetland impacts; however, if fully successful, it is likely these mitigation sites would generate sufficient credits to compensate for the 940	WET 04

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	316. The SDEIS describes the proposed ratios, but also states, "The determination of final mitigation credits...would be determined during permitting" (p 5-224). Recommendation: The FEIS should provide a status update on development of final wetland mitigation credits. EPA will work with USACE during CWA Section 404 permitting to determine the final wetland mitigation credits needed, including mitigation for indirect impacts.	acres of direct and fragmented wetland impacts. In the event that not all of the credits generated at these sites are utilized to compensate for direct wetland impacts, any excess credits could be used to compensate for indirect losses (USACE 2015a, as cited in the FEIS). The FEIS (see FEIS Section 5.2.3.3) includes the proposed direct compensatory mitigation credits and ratios for the NorthMet Project Proposed Action (see FEIS Tables 5.2.3-17, 5.2.3-18, and 5.2.3-19), which are based on the federal guidance policies and state replacement ratio rules. The amount of credit generated by the mitigation sites would ultimately be determined by the permitting agencies. This would be based on the extent to which the sites meet the target goals established during permitting. These include, among other things, restoration of wetland appropriate hydrology and the establishment of a target plant community or type. Financial assurances for the direct wetland impact mitigation would be required until success of the mitigation sites can be assured. While this wetland mitigation is expected to be approved and constructed in advance of any authorized wetland impacts, it is unclear whether these sites would be well enough established for financial assurances to be waived. The USACE would also consider the application of financial assurances for potential indirect wetland effects and monitoring. Both the USACE and state would require consideration of financial assurances during the permitting process. The NorthMet Project Proposed Action is estimated to directly impact 913.8 acres of wetlands. Depending on the location, type, and timing of compensatory mitigation, the minimum required amount of replacement wetlands for direct impacts could range from 913.8 acres up to 1,827.6 acres (i.e., 1:1 up to 2:1 compensation ratios). In addition, compensatory mitigation for the 26.9 acres of wetland fragmentation would also be provided up front. The USACE St. Paul District guidance allows for in-kind, in-place, and in-advance incentives to reduce the recommended base ratios and these would be considered at the time of permitting. Please refer to the response to theme WET 01.	
3003	Comment # 22. The proposed mitigation plan includes post-mining on-site wetland mitigation. Restoration of wetlands on the site as part of reclamation is positive and important, but EPA and USACE have agreed that mitigation credits are not appropriate given how long it will be before this mitigation is carried out. The SDEIS contains	The post-closure establishment of the estimated 101.8 acres of on-site wetland is not included in the wetland mitigation credits. The generation of wetland credits in these areas has the potential to be used on a contingency basis, but compensatory credit would not be considered at this time for a variety of reasons including the fact that any restoration efforts would not occur for many years. The summary of proposed wetland mitigation credits, presented in FEIS Table 5.2.3-17, does not include the on-site	COE 01

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	inconsistent statements regarding whether or not on-site mitigation is proposed to generate mitigation credits. Recommendation: The FEIS should be clear that post-mining, on-site mitigation will not be used for mitigation credits. The mitigation plan in the CWA Section 404 permit should exclude mitigation credits for post-mining, on-site wetland mitigation.	wetland restoration. The Executive Summary and FEIS Section 5.2.3.3.3 have been updated to also note that the on-site wetland would not be considered in the wetland mitigation credits at this time.	
3004	Comment# 23. Page 6-36, Table 6.2-8 and Pages 6-40 to 6-42, Table 6.2-11: There appear to be some inconsistencies between Table 6.2-8 and Table 6.2-11 with respect to reported future wetland and water resource numbers, including the bullet summaries for the Partridge River (Page 6-40) and Embarrass River (Page 6-42). For the Partridge River, Table 6.2-11 and bullet summary text note future condition with 3,516 acres of deepwater resources, while Table 6.2-8 indicates 1,922 acres. Recommendation: The FEIS should resolve or explain these inconsistencies.	FEIS Table 6.2.3-1 (formerly Table 6.2-8 in the SDEIS) shows the proposed net change in wetland and water resources for the eight specific projects that were included in the wetlands cumulative effects analysis. Table 6.2.3-4 (formerly Table 6.2-11 in the SDEIS) shows the projected future resources in total for the two watersheds when combined with the eight projects that were assessed. For example, the 1,922 acres of deepwater resources shown in FEIS Table 6.2.3-1 is the amount that would be added to the Partridge River watershed from the projects that were evaluated, which would result in a net increase of 370 acres of deepwater habitat from these projects (existing deepwater habitat from these projects is 1,552 acres). The 3,516 acres of deepwater habitat discussed in the bullets on page 6-40 and in FEIS Table 6.2.3-4 is correct. There is a total of 3,146 acres of existing deepwater resources in the Partridge River watershed, which, when combined with the net increase of 370 acres of deepwater habitat from the four projects, results in 3,516 acres. Section 6.2.3 of the FEIS has been updated to clarify the information presented in the tables.	EDIT 01
3005	Comment# 24. Page 6-21, Section 6.2.3.3.2: the "Contributing Past, Present, and Reasonably Foreseeable Actions" section, lists twelve foreseeable future actions with potential cumulative effects on surface water hydrology and quality in the Partridge River and Embarrass River watersheds. There is some inconsistency between this list and Table 6.2-1 (Page 6-7). "Cliffs Erie, LLC- Hoyt Lakes Area (former LTVSMC)," and "Cliffs Erie, LLC- Area 5 NW Pit" are not included in the table, at least not by these names.	The FEIS has been revised to ensure consistency with project names.	EDIT 01

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	Recommendation: The FEIS should resolve or explain these inconsistencies, and use consistent names for foreseeable future actions to simplify cross-referencing by the reader.		
3006	Comment # 25. Page 6-26 states: "In summary, the maximum cumulative effects of the NorthMet Project Proposed Action, plus present and reasonably foreseeable future actions on the hydrology of the Partridge River, would be expected to reduce average annual flow in the Lower Partridge River at any time during operations by no more than 8.4 cubic feet per second (cfs) and 2.4 cfs (2 percent) during closure of the NorthMet Project Proposed Action, based on average annual flow of 112 cfs at USGS gauging station 04016000 downstream of Colby Lake." In some cases, this effect is well above the mean recorded flow of the Upper Partridge River during certain times of the year. The SDEIS does not address how flow reductions will affect the Partridge River and its resources. Recommendations: The FEIS should include a total or net effect calculation for each table in the water resources section, similar to that provided for the wetlands analysis in Table 6.2-8, (Page 6-36) which shows total and incremental cumulative effects. The FEIS should add a row for the total or net effect to Table 6.2.2. The FEIS should discuss the magnitude and significance of these flow reductions, including additional analysis or information as necessary. Potential impacts caused by these reductions should be discussed in section 6.2.3.3.3.	Upper Partridge River flows are currently influenced by the timing and magnitude of Northshore Mine discharges from the Peter Mitchell Pit at SD-009 and SD-010 and would be influenced by the cessation of those discharges in approximately mine year 52. Available records show an average annual discharge to the Partridge River ranging from 6.8 to 15.1 cfs, with a highest reported monthly discharge of 34 cfs (Barr 2008f, as cited in the FEIS). Over the past several years (2004 to present), the average annual daily discharge from the Northshore Mine has been approximately 5.0 cfs, but this rate is quite variable, ranging from zero (mostly during the winter and summer droughts) to as high as approximately 20 cfs. These flow contributions would cease around 2070. Additional evaluation is offered in Section 6.2.2.3.1 on the cumulative effects to the flow of the Upper Partridge River.	WR 024
3008	Comment # 26. Pages 6-22 to 6-25 and 6-27 to 6-28, Section 6.2.3.3.3: This text does not reference sources of hydrological effects data for each	Change has been made, as requested.	EDIT 01

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	action. Recommendation: The FEIS should reference sources of hydrological effects data for each action.		
3009	Comment# 27. Table 6.2-15 shows the direct effect of other actions in terms of populations of each plant species affected. However, the SDEIS notes that for 4 out of 9 potentially contributing actions, "The NHIS data and MDNR take permit data were reviewed and no vegetation records were available for these actions. As a result, these actions are not considered in the cumulative effects analysis for vegetation." Recommendation: The FEIS should indicate whether the lack of vegetation records indicate no cumulative effects on vegetation, or simply lack of data on the subject.	The FEIS uses MDNR Natural Heritage Information System (NHIS) data to analyze the statewide status of each species, and Table 6.2.4-3 summarizes the percentage of statewide populations affected. The NHIS data also clarifies whether there is a lack of data in the cumulative project footprints or an absence of species in surveys conducted on site. The FEIS has been updated to include the new state ETSC status listings from August 19, 2013, as well as any new federal status listing changes to assess effects to species in the cumulative analysis.	VEG 08
3010	Comment # 28. We understand that MDNR will not calculate detailed financial assurance until the Permit to Mine process, although it may have additional information before the FEIS is issued. Recommendation: The FEIS should include additional information on financial assurance as available.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates and calculations that would be required for the project would be addressed during permitting. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine.	FIN 01 FIN 08
3011	Comment # 29. The SDEIS does not identify the least environmentally damaging practicable alterative (LEDPA). This information will be required for CWA Section 404 permitting under CWA Section 404(b)(l). Recommendation: The FEIS should describe the process that will be used to determine the LEDPA, and should provide LEDPA information to the extent it is available.	The LEDPA process is described in FEIS Section 7.5. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of the Project.	COE 02
3012	Comment # 30. The Noise section and page 5-370 of the SDEIS does not sufficiently describe potential noise impacts from blasting and vibrations on wildlife. A cited Federal Highway	FEIS section 5.2.5 (Wildlife Impacts) has been updated to include noise and vibration impacts to wildlife, including Canada lynx and song birds at the local and regional level. Appropriate mitigation and impact areas have been clearly defined. For more details please see response to Theme Code	N 04

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	Administration technical document in Appendix C of the SDEIS provides information on the sound threshold and frequency range for four biologic classes (mammals, birds, reptiles, and amphibians). Recommendation: The FEIS should contain analyses of noise and vibration impacts to wildlife based on the above biologic classes' sound threshold and frequency range, based on information included and cited in the SDEIS. Any impacts and/or mitigation measures should be noted in the FEIS.	WI 05 (under wildlife). In addition, please see the Biological Assessment (Appendix D of the FEIS) for further details on noise impacts to the Canada lynx, gray wolf, and northern long-eared bat, as well as the Biological Evaluation (also in Appendix D of the FEIS) for details on noise impacts to wildlife.	
3013	Comment # 31. On pages 1-14 and 1-15, the SDEIS notes that the USFS must determine that "the public interest will be well served" before it can enter into a discretionary, voluntary real estate transfer (36 CFR 254.3(b)). This analysis is included in the SDEIS, but should be made clearer and more focused. Recommendation: The FEIS should clearly and concisely summarize the analysis of the proposed land exchange (Alternative A) and Alternative B under 36 CFR 254.3(b), including a clear explanation of the rationale and criteria for selecting the preferred land exchange alternative, and of how protecting cultural resources is included in the public interest determination.	CEQ regulations (40 CFR 1502.14) state that an EIS should present the environmental impacts of a proposal and its alternatives in comparative form to provide a clear basis for choice among the alternative options by the decision makers and the public. The regulations further state (40 CFR 1502.14(e)) that agencies shall identify their preferred alternative (or alternatives, if one or more exists) in the DEIS as well as the FEIS, unless another law prohibits the expression of such a preference; however, the regulations do not require a rationale for the choice. The ROD from the USFS would contain the rationale for the selected alternative, as well as a discussion of how the public interest is served under 36 CFR 254.3(b). The FEIS includes the factors relating to how the public interest would be served by the Land Exchange Proposed Action, Land Exchange Alternative B, and the Land Exchange No Action Alternative. The ROD would incorporate these findings in its determination. As stated in FEIS Section 1.4.3, factors that must be considered include: • the opportunity to achieve better management of federal lands and resources; • to meet the needs of state and local residents and their economies; and • to secure important objectives, including but not limited to: protection of fish and wildlife habitats, cultural resources, watersheds, and wilderness and aesthetic values; enhancement of recreation opportunities and public access; consolidation of lands and/or interests in lands, such as mineral and timber interests, for more logical and efficient management and development; consolidation of split estates; expansion of communities; accommodation of existing or planned land use authorizations; promotion of multiple-use values; implementations of applicable Forest Land and Resource Management Plans; and fulfillment of public needs. See 36 CFR	LAN 01

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		254.3(b) and 254.4(c)(4). Table 7.3.5-1 of the FEIS presents a comparison of how the alternatives address these factors. To determine that a land exchange serves the public interest, the authorized officer must find that: 1. The resource values and the public objectives served by the non-federal lands or interests to be acquired must equal or exceed the resource values and the public objectives served by the federal lands to be conveyed; and 2. The intended use of the conveyed federal land will not substantially conflict with established management objectives on adjacent federal lands, including Indian Trust lands (36 CFR 254.3(b)(2)). The findings and supporting rationale for the public interest determination would be documented and made part of the administrative record pursuant to 36 CFR 254.3(b)(3).	
3014	Comment# 32. The SDEIS states that modeled groundwater capture system efficiency at the tailings basin is at least 90%. However, it does not explain the basis for this estimate. Recommendation: The FEIS should provide the specific model assumptions that were used to make this determination. Recommendation: The FEIS should indicate that any discharge not captured by the proposed capture systems and entering waters of the U.S. (e.g., jurisdictional wetlands, the Partridge and Embarrass Rivers and their tributaries) is subject to NPDES permitting.	The design of the Tailings Basin capture system includes: 1) a slurry wall keyed into bedrock, 2) a collection trench on the tailings side, and 3) permanent pumping of the collection trench to depress the groundwater level on the tailings side. The proposed capture system uses pumping on the tailings side of the slurry wall to reverse hydraulic gradients across the slurry wall and in underlying bedrock inward back toward the Tailings Basin. The conceptual hydraulics of this type of system predicts that it would achieve complete or nearly complete groundwater capture in the surficial aquifer. See FEIS Figure 5.2.2-7. To more fully assess capture efficiencies, the FEIS relies on revising cross-section models from the SDEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin. The updated modeling relies on data from a 2014 field program that investigated bedrock along the alignment of the proposed capture system on the northern, northwestern, and western sides of the Tailings Basin. New data were collected on bedrock hydraulic conductivity, Rock Quality Designation, and depth to top of bedrock. Along with the new data, the revised model also considers the presence of an upper more permeable bedrock zone directly below the slurry wall. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The cross-section model results predict that the groundwater capture efficiencies of the proposed Tailings Basin capture systems would be	PER 05 WR 018

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		substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency of groundwater in the surficial aquifer is justified. If the NorthMet Project Proposed Action moves ahead with permitting, the MPCA would issue a combined NPDES/SDS permit. The requirements of such a combined NPDES/SDS permit would directly address the potential for contaminants in the groundwater to impact surface waters. The NPDES/SDS permit covering the facility would prohibit a point source water discharge from the containment system that adds pollutants to waters of the U.S. See response to comment 2987 for more information.	
3016	Comment # 33. Pages 4-261 through 4-264 refer to cultural resources/Section 106 resources solely as historic properties. Recommendation: The FEIS should make it clear that cultural resources include archaeological resources.	Change has been made, as requested.	EDIT 01
3017	Comment # 34. Moose is a culturally-important species that has traditionally been subsistence hunted by the Chippewa Tribe. The SDEIS does not adequately describe how the proposed project will impact moose population and habitat of moose. Based on information in the SDEIS, it appears that there are unconsidered impacts to moose population and habitat, such as the proposed impacts to two local wildlife corridors, moose reliance on wetlands during warm weather, and impacts on foraging. Recommendation: The FEIS should more completely explain how the proposed action will impact moose population and habitat.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement.	WI 01
3018	Comment# 35. On March 13, 2014, MPCA released preliminary findings on the effects of sulfate on wild rice growth. Recommendation: The FEIS should provide the most current available information on MPCA's findings, and on next steps based on these findings.	The MPCA is overseeing a variety of studies on wild rice. At applicable surface water locations, the FEIS evaluates impacts using an evaluation criterion based on the current MPCA 10 mg/L standard for sulfate concentration in waters used for production of wild rice. This impact assessment metric is keyed to the current regulation. It is recognized that the MPCA is currently evaluating the current wild rice sulfate water quality standard and, as part of that process, new information	WR 152

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		on potential contributing factors on the growth of wild rice has been generated. However, that information has not yet been holistically reviewed in the context of its possible influence on the wild rice standard. Future change to the wild rice sulfate standard, if any, is speculative and outside the scope of the FEIS; applying research findings outside the basis of the current rule is not appropriate.	
3019	Comment # 36. Section 5.2.14 addresses geotechnical issues at the mine. Reasonable stability analyses were conducted for the permanent waste rock pile, but it is unclear if the company has committed to designing this unit so it meets conservative static stability Factors of Safety (FOS) (static FOS of 1.5 and seismic FOS >1). The company has committed to meeting conservative FOS for both the tailings basin and the HRF. Recommendation: The FEIS should clarify the company's commitment with respect to design of the permanent waste rock pile.	The design of the Category 1 Stockpile would need to conform to *Minnesota Rules*, part 6132.2400. FEIS Section 5.2.14.2.1 provides a summary of the design requirements for the stockpiles, including angles of repose, configured stockpile slopes, factors of safety, as well as the material tests that have occurred to date and that would be required prior to stockpile construction approval under the Permit to Mine. The Category 1 Stockpile would be progressively reclaimed and at closure would be covered with a geomembrane system that would be vegetated to meet the requirements of *Minnesota Rules*, part 6132.2200, subpart 2, item B. The design of the Category 1 Stockpile cover system was derived from landfill requirements in *Minnesota Rules*, part 7035.2815, subpart 6, item D. Long-term maintenance of the Category 1 Stockpile would include repair of erosional damage and removal of woody species and trees from the stockpile cover system. The Factors of Safety estimated during slope stability are not anticipated to change due to long-term performance variation in the geomembrane. FEIS Sections 3.2.2.1.7 and 3.2.2.1.10 provide a summary of the Category 1 Stockpile, including reclamation. Further information on the design and management of the stockpiles is provided in the Geotechnical Data Package, Volume 3 (Stockpiles) (PolyMet 2014p, as cited in the FEIS) and the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS). Additional geotechnical investigations to address site conditions, materials and design would be required prior to stockpile construction approval under the Permit to Mine.	GT 04
3020	Comment # 37. Liquefaction analyses were not conducted for the HRF, based on the assumption that those wastes could compress and that the likelihood of liquefaction is remote. However, liquefaction and liner leakage could occur at the HRF because the HRF is proposed to be located above a hydraulically-active seep, which will place inward hydraulic pressure on the HRF liners.	The Hydrometallurgical Residue Facility would be constructed using the downstream construction method, whereby dams would be built from dense, well-compacted materials prior to the placement of hydrometallurgical residue. This allows for a constructed dam that is discrete from the residue it holds. The potential for liquefaction in the dams is very low due to the proposed downstream construction method, upstream liners, seepage collection system, and well-compacted materials. While liquefaction may happen in the residue, it would not affect the integrity of	GT 11

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	Recommendation: The potential for liquefaction should be analyzed. The FEIS should clearly summarize the results of this analysis, including next steps in response to this analysis.	the separate dam materials. FEIS Section 5.2.14.2.3 expands upon the SDEIS discussion of the design and construction of the Hydrometallurgical Residue Facility. The Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS) indicates the design would meet appropriate factors of safety. The current Hydrometallurgical Residue Facility design acknowledges the presence of an active seep in the proposed area of construction. As such, a collection drain has been designed to collect water from the active seep below the proposed constructed embankment and liner systems, and to transmit the collected seep to the exterior of the facility. This seepage collection system would include a layer of free-draining soil that would reduce the potential for phreatic build-up below the liner. Details on this design consideration are provided in Section 5.1 of the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS). FEIS Section 4.2.14.3 describes the details of the existing conditions at the location of the proposed Hydrometallurgical Residue Facility, including the fact that it is proposed to be constructed at the location of the LTVSMC Emergency Basin. FEIS Section FEIS 3.2.2.3.7 broadly describes the Hydrometallurgical Residue Facility, while Section 5.2.14.2.3 provides details on the construction, operation, monitoring, and maintenance for geotechnical stability, including potential liquefaction. Additional technical details on design and construction, factors of safety analysis, operation and management, and reclamation and closure are found in the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS) the Residue Management Plan (PolyMet 2014r, as cited in the FEIS). Details would be finalized in permitting and would be subject to periodic reassessment.	

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Comments from the USEPA Regarding Section 404 Permit (Submission ID 47835)			
3021	The alternatives analysis in the application references the 2009 Draft Environmental Impact Statement (DEIS) and 2013 Supplemental Draft Environmental Impact Statement (SDEIS), but does not include the necessary detail to determine that the preferred alternative is the Least Environmentally Damaging Practicable Alternative (LEDPA). Since the DEIS was published in 2009, the project has evolved and many alterative have been eliminated. Chapter 6 in the application describes some of those alternatives as they relate to direct wetland impacts; it is not a comprehensive list of alternatives, and it does not consider indirect impacts to wetlands and streams. EPA recommends that the applicant develop a table describing all alternatives considered during the environmental review process (e.g., mine methods, mine configurations, tailings processing options). The table would assist EPA in determining whether or not the preferred alternative is the LEDPA. The table should also include the reasons each alternative was eliminated, including references, and the potential direct and indirect effects to wetlands and streams.	The LEDPA process is described in FEIS Section 7.5. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of the Project. Please also refer to FEIS Sections 3.2.3, FEIS Tables 3.2-16 and 3.2-17 for information on alternatives for the NorthMet Project and Section 3.3.3 for information on alternatives for the Land Exchange and Chapter 7 for additional information on alternatives. This would be considered during the Section 404 permitting process.	COE 04
3022	The application does not provide a quantitative assessment of all indirect impacts (except for fragmentation impacts). We recognize that the heterogeneity of the project site and the complexity of the wetlands and hydrology make it difficult to quantity indirect impact, but we recommend that specific impacts to wetlands within the mine site be identified to the extent possible. The application should better estimate the changes in functions and values at wetlands, especially those surrounded by mine features.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in	COE 02

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		watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater mounding and seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for factor 6 (change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations). Dust, ore spillage, and stockpile leakage is not a regulated discharge to wetlands under the Section 404 of the CWA; however, USACE would consider these types of potential effects in their determination of the LEDPA under the Section 404(b)(1) permit alternative analysis. The potential effects of dust, ore spillage, and stockpile leakage would be evaluated by MPCA under the Section 401 Water Quality Certification and NPDES permitting.	
3023	Specifically, EPA is concerned that there will be indirect impacts to remaining wetland areas in Wetlands Nos. 33A, 45, 48, 57, 68, 101, 88, 96, and 107. Indirect impacts in these wetland areas will include habitat fragmentation, divisions in vegetative communities, and the general loss of functions in wetlands that are separated from adjacent wetlands and made smaller by mine features. Specific compensatory mitigation should be proposed for all losses of wetland functions (including identification of ratios and site locations).	FEIS Section 5.2.3.1.2 has been updated to provide more information on the methodology and criteria for determining potential indirect fragmented wetland effects. The wetland fragments that are not expected to maintain their functions, approximately 26.9 acres, have been identified in FEIS Section 5.2.3 and on Figure 5.2.3-1. PolyMet's proposed mitigation for the NorthMet Project Proposed Action would be providing upfront compensatory mitigation for the 26.9 acres of wetland fragmentation (see FEIS Tables 5.2.3-17, 5.2.3-18, 5.2.3-19). The monitoring and mitigation requirements for indirect effects, including fragmentation, would be determined during permitting. The wetland fragments that have not been accounted for in the upfront mitigation would be included in the wetland hydrology and vegetation monitoring plan that would be developed and implemented for the NorthMet Project Proposed Action. FEIS Section 5.2.3.3 includes a detailed discussion on the monitoring and mitigation plan for the indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.	COE 01
3024	Large Figure 9 and 10 and Large Table 2 in the	FEIS Section 5.2.3.1.2 has been updated to provide more information on	COE 02

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	application highlight wetland areas at the mine and plant sites where the proposed mine features would indirectly impact wetlands by fragmentation. Compensatory mitigation is proposed for those areas. Page 3 of the Wetland Analysis Workplan (Attachment B) gives a brief description of how fragmented wetlands were identified, but the application should also describe the impact thresholds and how the fragmentation impact criteria were developed.	the methodology and criteria for determining potential indirect fragmented wetland effects. The wetland fragments that are not expected to maintain their functions, approximately 26.9 acres, have been identified in FEIS Section 5.2.3 and on Figure 5.2.3-1. PolyMet's proposed mitigation for the NorthMet Project Proposed Action would be providing upfront compensatory mitigation for the 26.9 acres of wetland fragmentation (see FEIS Tables 5.2.3-17, 5.2.3-18, 5.2.3-19). The monitoring and mitigation requirements for indirect effects, including fragmentation, would be determined during permitting. The wetland fragments that have not been accounted for in the upfront mitigation would be included in the wetland hydrology and vegetation monitoring plan that would be developed and implemented for the NorthMet Project Proposed Action. FEIS Section 5.2.3.3 includes a detailed discussion on the monitoring and mitigation plan for the indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.	
3025	Page 58 of the application states that the purpose of the indirect impacts analysis is to inform the monitoring plan for indirect wetland impacts. The application should include a description of how the impacts analysis will be used to ensure that indirect impacts are avoided, minimized, and mitigated. Section 11-5 in the application implies that the indirect impact monitoring plan will focus on wetlands that are under threat by multiple indirect impact factors (Table 11-1); this is not a valid approach because even wetlands that are under risk of one factor (such as only drawdown or only decreased water quality) would result in a loss of wetland function. We recommend more comprehensive monitoring for indirect impacts at the plant and mine sites.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater mounding and seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for factor 6 (change in wetland water	COE 02

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		quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations).	
3026	The application does not describe monitoring for stream impacts surrounding the project areas. We recommend that the U.S. Army Corps of Engineers (Corps) require monitoring for indirect impacts to headwater streams surrounding the site as well as impacts to wetlands.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. Proposed wetland hydrology monitoring locations for determining whether potential indirect effects are occurring are shown on Figures 5.2.3-31 and 5.2.3-32 of the FEIS. Wetland hydrology and vegetation would be monitored, and additional monitoring locations may be considered during permitting. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process.	COE 02
3027	There is a potential for indirect impacts to wetlands, Spring Mine Creek, and Spring Mine Lake on the east side of the tailings basin, but no monitoring sites are proposed for that area. Wetland and stream monitoring sites should be required for the east side of the tailings basin.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. Proposed wetland hydrology monitoring locations for determining whether potential indirect effects are occurring are shown on Figures 5.2.3-31 and 5.2.3-32 of the FEIS which includes a wetland hydrology monitoring well located east of the Plant Site along Spring Mine Creek and west of Spring Mine Lake. Wetland hydrology and vegetation would be monitored, and additional monitoring locations may be considered during permitting. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process.	COE 02
3028	Section 17.1 of the application describes that wetland monitoring wells 1, 4a, 6, 10, 12, 15, and 21 are "being removed because they are either within the direct project impacts or areas where no potential indirect impacts are anticipated". Figure 16 shows Wells 4a, 6, 10, 12, and 15 just outside the project boundary and between mine features and Yelps Creek and the Partridge River. These wells are in wetland areas that would likely be impacted by adjacent mine features because of their close proximity to the mine features and wetland areas. For a more comprehensive impacts analysis, we recommend that the applicant continues to monitoring at the existing wells where they are outside the direct mine impact locations. Because there are baseline hydrologic data at these	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. Proposed wetland hydrology monitoring locations for determining whether potential indirect effects are occurring are shown on Figures 5.2.3-31 and 5.2.3-32 of the FEIS. Wetland hydrology and vegetation would be monitored, and additional monitoring locations may be considered during permitting. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process.	COE 06

Comment ID	Comment	Response	Theme(s)
	locations, changes in wetland hydrology, if they occur, should be evident.		
3029	Some wetland types, such as coniferous and open bogs, are sensitive to subtle changes in hydrology. A 50% change in hydroperiod (the proposed impact criteria) may not be an adequate measure of adverse impacts to the wetland vegetation communities. The applicant should include a more complete description of impact criteria and rationale for the proposed monitoring and reporting schedule.	The wetland mitigation and monitoring section of the FEIS, Section 5.2.3.3, has been revised to include additional details on the proposed monitoring and wetland adaptive monitoring plan. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process. Please refer to the response to theme COE 06.	COE 02
3030	Section 17.4 of the application states that wetland baseline conditions for wetland vegetation will be established during the first growing season after permit issuance. EPA recommends that the Corps require baseline vegetation monitoring prior to permitted impacts to ensure that a true pre-impact baseline is established.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan, which includes vegetation monitoring, for the potential indirect wetland effects.	COE 06
3031	The vegetation monitoring is proposed for every 5 years. The basis for the proposed monitoring frequency is not clear from the application. Effectively managing certain threats to the wetlands, such as invasive species or vegetation changes due to drawdown, requires early detection, and monitoring every 5 years might not be sufficient to adequately manage the threat. EPA recommends increasing monitoring for vegetation changes to every 2 years to better be able to identify and manage any adverse impacts to wetlands early.	The wetland mitigation and monitoring section of the FEIS, Section 5.2.3.3, has been revised to include additional details on the proposed monitoring and wetland adaptive monitoring plan. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process.	COE 06
3032	The adaptive management plan described in Section 17.8 uses a phased approach to assessing indirect impacts and providing compensatory mitigation for adverse impacts to aquatic resources. Phase I is described a broad based monitoring; while Phase II would be a more detailed assessment. In order to determine if the adaptive management plan is sufficient, EPA	The wetland mitigation and monitoring section of the FEIS, Section 5.2.3.3, has been revised to include additional details on the proposed monitoring and wetland adaptive plan. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process.	COE 02

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	needs more information on the timing and methodology of Phases I and II of the monitoring plan. EPA is concerned that Phase II monitoring would not be designed unless deemed necessary, and that the threshold for determining a need for Phase II is not described. Clear impact criteria must be established and potential mitigation options must be developed prior to permit issuance. EPA recommends that Phase II be planned prior to permit issuance to ensure that wetland and stream impacts are not missed.		
3033	The application lacks a description of cumulative effects to the aquatic resources within the watersheds except as they apply to wildlife corridors (Section 12.1.2.3). Cumulative Wetland Impacts (Section 5.3) is included in the March 1, 2013 Wetland Data Package V.7, but it is not referenced in the application. It is not clear if this analysis includes recently proposed projects, as it seems to be missing projects in the iron range (e.g., MINNTAC and UTAC). The cumulative effect assessment in the application should include the most recent and comprehensive information.	FEIS Section 6.2.3.1 provides a description of the approach that was used for the wetland cumulative analysis. The direct, indirect, and cumulative assessments that were performed for the NorthMet Project Proposed Action were agreed upon by the Wetland Impact Assessment Planning Group and per the Wetland Analysis Work Plan (PolyMet 2011m). The following projects were not considered in the wetland resources cumulative analysis as they are outside the Partridge and Embarrass River watersheds: U.S. Steel Minntac mine expansion, U.S. Steel Keetac expansion, United Taconite Tailings Basin, and Cliffs Erie's mine pit expansion. Those projects that were considered reasonably foreseeable and within the Partridge and Embarrass River watersheds were considered in the wetland cumulative analysis. Please refer to the response to themes COE 07, CU 02, and WET 18. Please refer to FEIS Section 6.2.6 for a discussion of aquatic resources.	COE 07
3034	Indirect impacts are not included in the cumulative impacts assessment for wetlands in the Wetlands Data Package V. 7. All adverse impacts to aquatic resources should be considered in this assessment.	It is difficult to predict potential indirect wetland effects within the CEAA, as well as to know what the potential indirect wetland effects would be for the projects assessed other than the NorthMet Project Proposed Action. However, based on the amount of potential indirect wetland effects that could occur from the NorthMet Proposed Action, there could be 0.1 to 12.0 percent cumulatively lost, in addition to the direct wetland impacts assessed, within the Partridge and Embarrass River watersheds as a result of the NorthMet Project Proposed Action. The total wetland resources within the two watersheds during the time periods assessed are as follows: • Pre-settlement wetland resources - 68,251 acres;	COE 07

Comment ID	Comment	Response	Theme(s)
		• Existing conditions wetland resources - 65,567 acres; • Foreseeable future conditions with the NorthMet Project Proposed Action and the other foreseeable projects assessed, which includes direct wetland impacts and future deepwater habitat - 64,979 acres; and • Foreseeable future conditions without the NorthMet Project Proposed Action but with the other foreseeable projects assessed, which includes direct wetland impacts and future deepwater habitat (No Action Alternative) - 65,292 acres. Based on the wetlands crossing analog zones analysis approach, the acreage of wetlands whose hydrology would have a high likelihood of being affected by drawdown at the Mine Site is 866.9 acres. The wetlands categorized as high likelihood are dominated by one alder thicket (848 acres) that has approximately 4 acres (less than 1 percent) within the 0-1,000 ft analog impact zone. The remainder of this wetland (more than 99 percent) is located more than 1,000 ft away from the edge of the mine pits and extends out to the edge of Area 1 (see Figure 5.2.3-6 in the FEIS). Furthermore, based on this method, there would be 1,854.5 acres of wetlands within the 0-2,000 ft zone and 2,147.6 acres within the 0-3,500 ft zone that could be affected by potential drawdown. Based on this approach, the total projected potential indirect effects from all six factors that were assessed under this method could be up to 7,694.2 acres of wetlands potentially indirectly affected by the NorthMet Project Proposed Action. Therefore, the potential indirect cumulative effect from the NorthMet Project Proposed Action, in addition to the direct wetland impacts assessed, under this method would range between 1.3 to 12.0 percent. Based on the method approach of wetlands within analog zones, the acreage of wetlands whose hydrology would have a high likelihood of being affected by drawdown at the Mine Site is 46.4 acres. Furthermore, based on this method, there would be 348.4 acres of wetlands within the 0-2,000 ft zone and 733.3 acres within the 0-3,500 ft zone that could be affected by potential drawdown. Based on this approach, the total projected potential indirect effects from all six factors that were assessed under this method could be up to 6,568.8 acres of wetlands potentially indirectly affected by the NorthMet Project Proposed Action. Therefore, the potential indirect cumulative effect from the NorthMet Project Proposed Action, in addition to the direct wetland impacts assessed, under this method would range between 0.1 to 10.2 percent.	

Comment ID	Comment	Response	Theme(s)
3035	The analysis of cumulative effects in the Wetland Data Package V.7 evaluates the percentage loss of all wetland types. Many of the wetlands proposed to be impacted at the PolyMet site are high quality bog and forested resources, and indirect impacts of mining often include wetland type changes due to changes in hydrology. The cumulative loss of different wetland types should also be evaluated.	It is difficult to predict potential indirect wetland effects within the CEAA, as well as to know what the potential indirect wetland effects would be for the projects assessed other than the NorthMet Project Proposed Action. However, based on the amount of potential indirect wetland effects that could occur from the NorthMet Proposed Action, there could be 0.1 to 12.0 percent cumulatively lost, in addition to the direct wetland impacts assessed, within the Partridge and Embarrass River watersheds as a result of the NorthMet Project Proposed Action. The total wetland resources within the two watersheds during the time periods assessed are as follows: • Pre-settlement wetland resources - 68,251 acres; • Existing conditions wetland resources - 65,567 acres; • Foreseeable future conditions with the NorthMet Project Proposed Action and the other foreseeable projects assessed, which includes direct wetland impacts and future deepwater habitat - 64,979 acres; and • Foreseeable future conditions without the NorthMet Project Proposed Action but with the other foreseeable projects assessed, which includes direct wetland impacts and future deepwater habitat (No Action Alternative) - 65,292 acres. Based on the wetlands crossing analog zones analysis approach, the acreage of wetlands whose hydrology would have a high likelihood of being affected by drawdown at the Mine Site is 866.9 acres. The wetlands categorized as high likelihood are dominated by one alder thicket (848 acres) that has approximately 4 acres (less than 1 percent) within the 0-1,000 ft analog impact zone. The remainder of this wetland (more than 99 percent) is located more than 1,000 ft away from the edge of the mine pits and extends out to the edge of Area 1 (see Figure 5.2.3-6 in the FEIS). Furthermore, based on this method, there would be 1,854.5 acres of wetlands within the 0-2,000 ft zone and 2,147.6 acres within the 0-3,500 ft zone that could be affected by potential drawdown. Based on this approach, the total projected potential indirect effects from all six factors that were assessed under this method could be up to 7,694.2 acres of wetlands potentially indirectly affected by the NorthMet Project Proposed Action. Therefore, the potential indirect cumulative effect from the NorthMet Project Proposed Action, in addition to the direct wetland impacts assessed, under this method would range between 1.3 to 12.0 percent. Based on the method approach of wetlands within analog zones, the	COE 07

Comment ID	Comment	Response	Theme(s)
		acreage of wetlands whose hydrology would have a high likelihood of being affected by drawdown at the Mine Site is 46.4 acres. Furthermore, based on this method, there would be 348.4 acres of wetlands within the 0-2,000 ft zone and 733.3 acres within the 0-3,500 ft zone that could be affected by potential drawdown. Based on this approach, the total projected potential indirect effects from all six factors that were assessed under this method could be up to 6,568.8 acres of wetlands potentially indirectly affected by the NorthMet Project Proposed Action. Therefore, the potential indirect cumulative effect from the NorthMet Project Proposed Action, in addition to the direct wetland impacts assessed, under this method would range between 0.1 to 10.2 percent.	
3036	The mitigation ratios proposed in the application conform to the conditions included in the Corps' May 29, 2013 Memorandum: Application of the Federal Mitigation Rule and St. Paul District Policy Guidance on Compensatory Mitigation-Compensation Ratios for Loss of Wetlands/Aquatic Resources. EPA agrees that the mitigation ratios proposed in the Corps' Memorandum were reasonable.	The USACE has not made a final decision on the mitigation ratios that would be required to compensate for direct wetland impacts. The FEIS (see Section 5.2.3.3) includes the proposed direct compensatory mitigation credits and ratios for the NorthMet Project Proposed Action (see FEIS Tables 5.2.3-17, 5.2.3-18, 5.2.3-19), which are based on the federal guidance policies and state replacement ratio rules. The amount of credit generated by the mitigation sites would ultimately be determined by the permitting agencies. This would be based on the extent to which the sites meet the target goals established during permitting. These include, among other things, restoration of wetland appropriate hydrology and the establishment of a target plant community or type.	COE 12
3037	One concern that remains is that no compensatory mitigation plan exists for indirect impacts to wetlands and streams. Table 11-1 of the application indicates that more than 7,300 acres of wetland would be potentially impacted by the proposed project. Because in-watershed mitigation is so difficult to find, mitigation options for indirect impacts must be discussed in the application.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The USACE would also consider the application of financial assurances for potential indirect wetland effects and monitoring. Both the USACE and state would require consideration of financial assurances during the permitting process.	COE 02
3038	EPA remains concerned that a majority of the compensatory mitigation for impacted wetlands will occur outside the St. Louis River and Lake Superior Watersheds. This constitutes a permanent loss of aquatic resources within these watersheds. EPA understands that it is difficult to find in-watershed wetland mitigation opportunities, but	This comment provides general information regarding mitigation that should be considered for wetland mitigation in the future. No changes were made to the FEIS as a result of this comment.	COE 13

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	the soon to be implemented Northeast Minnesota Wetland Mitigation Strategy may support the Corps and permit applicants to better implement a watershed approach to mitigation. Once implemented, EPA recommends that the strategy be used to find additional wetland mitigation sites within the St. Louis and Lake Superior Watersheds to compensate for indirect wetland impacts at the PolyMet Site.		

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Comments from the Bois Forte Band (Submission ID 42979)			
2974	The Area of Potential Effect (APE) for cultural resources divided the project into two separate sections surrounding the proposed mine site and the proposed plant site should be revised….An APE that encompasses the Mine and Plant sites and surrounding area affected by operations would better describe the undertaking for cultural resource investigations.	FEIS Section 4.2.9.2.3 provides a detailed discussion and analysis of the area in which cultural resources may be affected by the NorthMet Project Proposed Action. The APE takes into account both direct and indirect effects using a geographically expansive area that accounts for direct effects, as well as visual, audible, atmospheric, hydrological, and water quality effects. The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been modified to encompass the proposed Mine Site and Plant Site, the Dunka Road corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline.	CR 02
2975	Mesabe Widjiu is correctly identified as a sacred landform, but needs to be considered in its entirety (see attached map as an example). The segment encountered within the project area is small, but integral to the property. Adverse effects to any portion impact the entire feature.	The federal Co-lead Agencies have determined the Partridge River section of the Mesabe Widjiu to be eligible for inclusion in the NRHP under Criterion A for its association with important Ojibwe spiritual and cultural practices. Although the federal Co-lead Agencies are assessing the effects of the NorthMet Project Proposed Action on only the portion of the Mesabe Widjiu within the APE, it is recognized that the property and its significance extends beyond the APE. The federal Co-lead Agencies have updated the FEIS to include a graphic of the entire Mesabe Widjiu, as provided by the consulting Bands.	CR 02 CR 05
2976	The Beaver Bay to Lake Vermilion Trail requires further clarification….Additional fieldwork should be conducted in the spring or fall when ephemeral features such as foot trails are less easily concealed by vegetation and more easily discerned.	The federal Co-lead Agencies believe that the work to justify consideration of the BBLV Trail Segment as an historic property is complete. There has been sufficient background research and fieldwork completed to date as discussed in FEIS Section 4.2.9.2.3. Additional research and fieldwork may be part of any resolution of adverse effect.	CR 05
2977	The Bois Forte THPO is skeptical of the co-leads claim that there will be no effect to the Spring Lake Mine Sugarbush from the proposed NorthMet Project. Indirect effects through dust deposition and unauthorized collection are anticipated since the Sugarbush is situated immediately adjacent to the proposed plant site. While the lead agencies dismiss particulate accumulation as a problem, based on visual effects analysis conducted for the project and a site visit in 2010, their lack of concern seems speculative.	As discussed in FEIS Section 5.2.9.2.1, the federal Co-lead Agencies have determined that the NorthMet Project Proposed Action would adversely affect the Spring Mine Lake Sugarbush. As part of an MOA, the federal Co-lead Agencies would ensure the avoidance, minimization, and mitigation of impacts to cultural resources that may be encountered, such as unauthorized collection, during construction or operation of the NorthMet Project Proposed Action. The federal Co-lead Agencies, in consultation with the Bands, SHPO, and PolyMet, are currently working to resolve adverse effects on this property. The NorthMet project would have fugitive dust emissions. To evaluate the impact of those fugitive dust emissions, air quality modeling was conducted	AIR 04 AIR 05

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	The proximity of the plant site to the Sugarbush and the cumulative effects of dust on leaves, trees and understory flora have not been examined in detail and their long term effects may well be detrimental to vegetation, other than maples, that comprise the Sugarbush. Furthermore, the potential for artifact collection is quite real. When the land containing the site was owned by Cleveland Cliffs, persons employed by the mine removed artifacts associated with Band member use of the Sugarbush. This assertion is based on a donation made to the Bois Forte Heritage Museum by an individual who conducted logging operations on LTV property in the 1970's. When asked where he had found the items, a ladle, bowl, birch bark sap baskets and cedar spiles, he described the location of the Spring Lake Mine Sugarbush and the wooden structure remnants noted by Michael Loftus (1977). Remnants of the structure still exist (see SDEIS 4.2.9.2.4). Loftus also removed artifacts when he visited the Sugarbush in the 1960's.	to assess impacts from those emissions. The modeled results determined impacts to be below applicable air quality standards. The FEIS used the evaluation criteria available to determine impacts. Secondary ambient air quality standards are used to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Significant impact on water resources or historic properties from dust is not expected because areas with the potential to generate dust would be controlled by a Fugitive Dust Control Plan and any dust leaving the site would most likely come from sources that would be characterized as having low sulfide/low metal content, All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project Proposed Action area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6 and 4.3.9 of PolyMet 2015a, as cited in the FEIS).	
2978	the three properties [Mesabe Widjiu, Beaver Bay to Lake Vermillion Trial, and Spring Lake Mine Sugarbush] would benefit from additional investigation; the sugarbush has not been formally recorded, the trail has been adequately documented within the SNF proposed land exchange, but requires additional survey in the upland sections of the project area and Mesabe Widjiu should be considered in its entirety. Finally, all three must be formally nominated to the National Register of Historic Places.	The federal Co-lead Agencies have officially documented the Spring Lake Mine Sugarbush with the SHPO. The federal Co-lead Agencies believe that there has been sufficient background research and fieldwork to justify consideration of the BBLV Trail Segment as an historic property. Additional research and fieldwork may be part of any resolution of adverse effect. The federal Co-lead Agencies have determined the Partridge River section of the Mesabe Widjiu and the Partridge River section of the BBLV Trail Segment to be eligible for inclusion in the NRHP under Criterion A; however, the federal Co-lead Agencies are assessing the effects of the NorthMet Project Proposed Action on only the portion of those properties within the APE. The federal Co-lead Agencies recognize that the two properties discussed above extend beyond the APE. All three historic properties have been determined eligible for the NRHP. The Co-lead Agencies, in consultation with the Bands, SHPO, and PolyMet, are currently working to resolve adverse effects on these properties. National Register Nomination of these properties may be part of an MOA; however, the federal Co-lead agencies are currently in the process of considering	CR 02 CR 05

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		what mitigations may be appropriate.	
2979	Acknowledgement by the SDEIS authors that adjacent habitat is available signifies a lack of analytical rigor in effects assessment of wholesale population displacement in response to mining activity….The SDEIS fails to assess cumulative effects to wildlife population changes, not only in the project area, but the entire region. The co-lead agencies should document how habitat destruction and concomitant wildlife migration will affect local and regional ecology.	The FEIS wildlife sections include an analysis of wildlife displacement effects due to the NorthMet Project Proposed Action. FEIS Section 5.2.5.2.3 discusses the potential effects to species at the NorthMet Project area based on habitat preferences, and uses available scientific literature to analyze displacement effects on local and regional ecology due to noise or increased human activities. FEIS Section 6.2.5.4.2 discusses displacement of wildlife by effects to wildlife corridors across the Mesabi Iron Range.	WI 05
2980	Cooperating agencies' concerns with cumulative effects remain valid and germane, but have yet to be addressed by the Lead Agencies.	The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or conclusions.	CU 12
3097	A 216,300 acres area bounded by the St Louis River, Lake Superior, Lake Vermilion and the Beaver Bay to Vermilion Trail better describes cultural resources to be effected by the NorthMet project.	The historic district proposed by the Grand Portage Band in a June 27, 2013 letter was addressed (Grand Portage 2013, as cited in the FEIS). The federal Co-lead Agencies have considered an expanded area for analysis of cumulative effects on cultural resources and natural resources of significance to the Bands, including use of the 1854 Ceded Territory as the CEAA. Use of the 1854 Ceded Territory as the CEAA for cultural resources would actually diminish the significance of any cumulative effects. By evaluating the effects of the NorthMet Project Proposed Action along with other past, present, and reasonably foreseeable future projects in the context of a much larger area with a much larger number of resources similar to those affected by the NorthMet Project Proposed Action, the effect of the NorthMet Project Proposed Action on those resources is diminished. The cumulative effects analysis focuses on the specific resources, or types of resources, affected by the NorthMet Project Proposed Action within an area that is geographically meaningful considering the project under review. Cumulative effects are discussed and addressed differently based on the affected resource. Discussions related to socioeconomics, for instance, use an expanded analysis area compared to other resources. Such expanded analysis areas are used as appropriate. The Cultural Resources sections in FEIS Chapters 4, 5, and 6 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's direct, indirect, and cumulative areas of potential effect.	CR 04

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Comments from the Grand Portage Band (Submission ID 42994)			
2362	Regardless of the time taken to prepare it, the Band is reissuing many of the same comments on the SDEIS that it has issued on the last DEIS calling for basic evaluation of Project impacts and application of well-established CEQ standards for EIS preparation, and incorporates all those comments by reference here. See Band's Cmts. on DEIS at Ex. A (Band's Cmts. on June 2008 PDEIS) and Ex. B (Band's Cmts. on Jan. 2009 PDEIS).	Comments provided by the Cooperating Agencies were considered. FEIS Chapter 8 outlines the engagement process with the Cooperating Agencies through the development of the EIS. During the development of the SDEIS, MDOs regarding the analysis presented in the document were identified. These MDOs are between the Co-lead Agencies and the Bands, GLIFWC, and the 1854 Treaty Authority, and represent comments from the Tribal Cooperating Agencies that the Co-lead Agencies determined were adequately addressed in the existing analysis. The MDOs are discussed in SDEIS (and FEIS) Chapter 8. Comments submitted by the Bands on the SDEIS included comments reflecting the MDOs. In addressing and developing detailed responses to those comments, the Co-lead Agencies also addressed many aspects of the MDOs. In developing the FEIS, the Co-lead Agencies engaged in ongoing interaction regarding MDOs with the Bands/Tribal Cooperating Agencies. The Co-lead Agencies shared with the Bands how they intended to respond to the Bands' comments, how the MDOs were addressed in the FEIS, and which MDOs had achieved some resolution. FEIS Table 8-1 in Chapter 8 notes where and how the MDOs are addressed in the FEIS. Although it is beneficial to resolve differences of opinion on a project, MDOs often remain unresolved throughout the analysis process. In making decisions on proposed activities, responsible officials utilize information in the FEIS addressing differences of opinion to inform their decisions and to support rationale for those decisions. The Co-lead Agencies believe that they have adequately considered all Cooperating Agency comments. The Co-lead Agencies have also determined that the evaluation of impacts in the EIS meets and exceeds CEQ regulations for NEPA analysis.	NEPA 12
2364	The co-lead agencies have refused to extend the 90-day comment period on the SDEIS, despite repeated requests.	The SDEIS was circulated for public comment for 90 days, which is twice the amount of time required by the federal regulations, and three times the amount of time required by state regulations.	NEPA 07
2365	The SDEIS does not take the required "hard look" at all the environmental consequences of the Project, including polluting surface and groundwater resources and drying up or inundating thousands of acres of wetlands in the 1854 Ceded Territory.	The Co-lead Agencies believe that the EIS contains adequate information and analyses consistent with NEPA and MEPA guidance and best practices. Please refer to the response to themes NEPA 14 and NEPA 09 for more detail.	NEPA 14

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2366	The lead agencies must significantly supplement the SDEIS [with study of the adverse effects and determination of possible mitigation measures] and provide a full opportunity for agency and public review before issuing a final EIS.	The Co-lead Agencies believe that the EIS contains the best available data and analyses, consistent with NEPA and MEPA guidance and best practices. The Co-lead Agencies reviewed all applicable documentation submitted by the proposer to fully understand the NorthMet Project Proposed Action. These included detailed technical design documents, including the Project Description, Mine Plan, and several resource-specific management plans, all of which are summarized in FEIS Chapter 3. The level of detail describing the NorthMet Project Proposed Action provided in the EIS is consistent with the requirements of NEPA/MEPA for similar projects at this stage of environmental review. The Co-lead Agencies believe that the project description was sufficient to support a comprehensive scientific analysis of potential impacts to allow decision makers to make informed decisions on the NorthMet Project Proposed Action. The proposer would be required to provide more detailed information as the project is refined during the permit process, much of which would require additional public review.	NEPA 09
2372	In the SDEIS's evaluation of the underground mining alternative, the North Met Deposit is characterized as a "low- to medium-grade mineral resource," a far cry from the "one of the largest untapped deposits of copper and nickel, and other precious metals" or "world class resource" that is repeated throughout the SDEIS and in media coverage. The distinction is critical, as mining must provide sufficient profit to cover costs for adequate environmental protections and financial assurance.	Information obtained through preliminary exploration in the region show that the area potentially contains one of the largest untapped deposits of copper, nickel, and other precious metals in the world. The NorthMet Deposit is characterized as a low- to medium-grade mineral resource. These two characterizations are not in conflict as the commenter seems to suggest. One is a regional characterization while the other applies to the specific NorthMet Deposit being proposed by PolyMet to be mined. See the response to theme ALT 01 for more details on the Underground Mining Alternative. FEIS Section 3.2.3.4.1 states that tonnage/volume and grade of rock would not generate enough revenue to pay for costs associated with underground mining. The FEIS Executive Summary and FEIS Section 3.2.2.1.2 states that the NorthMet Deposit is a low- to medium-grade deposit, matching the language in Appendix B. FEIS Section 3.2.2.4 includes available details regarding financial assurance. Additional details on the cost estimates and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, as well as for monitoring and mitigation costs. FEIS Section 3.2.2.4.1 discusses the activities that would be considered in cost estimates, and states that cost	PD 25

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		estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate.	
2373	The financial assurance for long-term treatment presented in the SDEIS, ranging from $3.5 to 6 million appears to be an estimate for monitoring activities only, without any long-term wastewater treatment costs.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides the annual financial assurance cost estimates for various years of closure, including long term water treatment and replacement costs, as well as monitoring and mitigation costs. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine.	FIN 05
2374	Perpetual operation and maintenance of mechanical wastewater treatment is an additional cost that must be represented in the estimate of financial assurance.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides the annual financial assurance cost estimates for various years of closure, including long term water treatment and replacement costs, as well as monitoring and mitigation costs. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. The WWTP and WWTF would undergo continued inspection and maintenance during operations, long-term treatment, and in closure. WWTP and WWTF replacement costs would be included in long-term financial assurance estimates.	FIN 05
2375	The cursory estimate of financial assurance in the SDEIS provides little detail about how the dollar amount was derived. Instead, discussions have been postponed for the permitting phase of this Project. This approach fundamentally contradicts federal and state environmental policy and the SDEIS must be revised, with significant additional study, to appropriately evaluate closure, mitigation, reclamation, and perpetual treatment cost estimates.	FEIS Section 3.2.2.4 provides available details regarding financial assurance as required under NEPA/MEPA. *Minnesota Rules*, part 6132.1200, subpart 4 states that the Commissioner shall evaluate all financial assurance cost estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs. Additional details on the financial assurance that would be required for the project would be addressed during permitting. The Permit to Mine, which would include financial assurance information, includes an opportunity for public input. Neither NEPA nor MEPA rules require that all financial assurance mechanisms be in place before the EIS is finalized.	FIN 13
2377	Although the SDEIS was revised to reflect the	The DEIS and SDEIS considered many different alternatives, which are	ALT 01

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	Project proponents' preferred action, still, the only alternative analyzed in any detail concerns the acreage of the proposed land exchange. This failure is a serious violation of NEPA and must be remedied before the SDEIS can be finalized.	discussed in FEIS Section 3.2.3 for the NorthMet Project and Section 3.3.3 for the Land Exchange. Neither Minnesota Rules nor CEQ regulations required the Co-lead Agencies to identify a preferred alternative in the SDEIS (40 CFR 1502.14(e)). FEIS Section 7.4 includes details regarding the identification of an Agency Preferred Alternative. The USFS has identified a preferred alternative for the Land Exchange in FEIS Section 3.3.2. The Minnesota Department of Natural Resources (MDNR) is not required to identify a preferred alternative under MEPA.	ALT 02 ALT 03 ALT 04 ALT 20 COE 04
2389	PolyMet proposes to build a reverse osmosis ("RO") wastewater treatment plant near the tailings basin to treat process water and tailings basin seepage. RO is very effective if sized correctly. While RO could successfully treat wastewater to comply with Minnesota WQS, it can only treat polluted water that has been collected. Therefore, the Project is not relying on RO during operations to comply with WQS; instead, it would rely on seepage capture efficiency. But as stated previously, seepage capture rates provided in the SDEIS are not realistic. After operations, the SDEIS contemplates that the RO plant would continue to treat tailings basin seepage and begin treating tailings pond water. The treated water would be used for augmentation of streams near the plant site. Colby Lake water is also proposed for stream augmentation. However, because Colby Lake water exceeds WQS for many pollutants including mercury, it would also need to be RO-treated before being used for augmentation.	Although relatively few containment systems have been built with this degree of pumping, the conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete capture. The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the revised NorthMet Project Proposed Action Water Management Plan - Plant Site (PolyMet 2015i, as cited in the FEIS). These new models consider the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified. Colby Lake water would no longer be directly discharged to the tributaries for augmentation. All augmentation water would be treated with the reverse osmosis water treatment system or equivalent technology that will meet water treatment targets	WR 124 WR 125 WR 189
2391	In order to ensure compliance with Minnesota WQS, and based on the Projects own modeling, adequate financial assurance must be set aside to maintain and operate perpetual RO treatment at both the mine and plant sites.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides the annual financial assurance cost estimates for various years of closure, including long term water treatment and	FIN 05 FIN 06

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		replacement costs, as well as monitoring and mitigation costs. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. FEIS Sections 3.2.2.1.10, 3.2.2.3.12, and 5.2.2.3.1 provide available information regarding long-term water treatment and maintenance. Temporal aspects of financial assurance are addressed in *Minnesota Rules*, part 6132.3200, subpart 2, item E, which states that financial assurance is required for all areas that require continued maintenance following closure, and that no release from the Permit to Mine would be granted for portions of mining areas that require post-closure maintenance until the maintenance activities are no longer necessary.	
2395	While the use of RO is encouraged, further analysis and application is needed.	Reverse osmosis is a well-tested water treatment technology. Pilot-testing results enhance the Co-lead Agencies' knowledge of its performance relative to the NorthMet Project Proposed Action. Further analysis of the proposed system would occur in permitting.	WR 143
2399	The conclusion that underground mining is not viable, or preferable, remains substantially unjustified, despite repeated requests for further analysis… As the Band already argued in the Tribal Position, significant additional study of the underground mining alternative is mandated, and the SDEIS offers no new discussion of the reasons for rejecting the alternative.	The Underground Mine alternative was first considered but eliminated during the FSDD process. The FEIS Section 3.2.3.4.1 describes how it was reconsidered during the DEIS phase as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. The FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the	ALT 01

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		cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may result from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the 'cost') of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
2422	Exchanging thousands of acres of diverse, high-quality land--land with some of the few remaining large game corridors in northeastern Minnesota that are available to the Bands to exercise reserved 1854 Treaty rights--for lands that have moderate diversity and lack big-game corridors is inconsistent with the fiduciary responsibilities that are shared by all federal agencies.	The FEIS wildlife sections include an analysis of the wildlife corridors, including their use by various species. The FEIS wildlife sections also include information about NorthMet Project Proposed Action impacts to wildlife habitat types and Minnesota Biological Survey (MBS) Sites of Biodiversity Significance. FEIS Sections 4.2.4 and 4.3.4 provide maps of the MBS Sites (Figures 4.2.4-1, 4.2.4-4, 4.3.4-1, 4.3.4-2). The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). The entire Tract 1 (Hay Lake lands) parcel is preliminarily listed as a MBS Site of Outstanding Biodiversity Significance, should the land exchange occur. It occurs in close proximity to two wildlife corridors (corridors 11 and 12). *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.	CR 01 WI 02 WI 03
2655	It is well known that wetlands play an important role in the condition of downstream waters by retaining floodwaters, sediment, nutrients, and other pollutants, thereby benefitting the quality of	This comment has been received and acknowledged by the Co-lead Agencies. The Co-lead Agencies believe the identification of wetlands at the NorthMet Project area is accurately and adequately depicted in Section 4.2.3 for the purpose of the EIS.	WET 24

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	downstream waters.		
2656	Wetlands may also function as thermal refuge for moose when summertime temperatures exceed 14 o C, the point at which moose become thermally stressed. Additionally, wetlands with aquatic vegetation provide an important forage resource for moose during the open-water season.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement. The FEIS Section 4.2.5.1.1 discusses the role of wetlands with moose and thermal stress.	WI 01 WI 02
2658	[The SDEIS (Pg 5-643)] underestimates the impacts [to aquatic species due to the decrease of first-order streams to the federal estate]. While greater diversity is desirable, protection of headwater streams is critical because they powerfully influence both the character and functions of downstream waters. Headwater streams transport vegetation, woody debris, organic matter, macroinvertebrates, and other organisms downstream, while providing spawning areas for brook trout. Headwaters provide most of the water to rivers, which in turn provides temperature mitigation and oxygenation which are necessary for healthy fish communities.	Effects of the Land Exchange Proposed Action on headwater streams are discussed in detail in Sections 5.3.6.2.2 and 5.3.6.3.2 of the FEIS. A paragraph in FEIS Section 5.3.6.2.2 has been edited to state "...however, the net reduction to the Superior National Forest of 0.3 miles of first order streams may result in slightly less habitat available for headwater stream dependent species". There are no designated trout streams in the Land Exchange Proposed Action parcels or the Federal parcel.	AQ 29
2660	The loss of critical wildlife corridors, along with high quality and diverse land and water resources, directly connects the federal regulatory agencies' trust responsibilities to the Bands. The land exchange, and the Project, cannot proceed where they require the agencies to approve permits that will have impacts to treaty resources without additional evaluation and mitigation.	The FEIS wildlife sections include an analysis of the wildlife corridors, including their use by various species. The FEIS wildlife sections also include information about NorthMet Project Proposed Action impacts to wildlife habitat types and Minnesota Biological Survey (MBS) Sites of Biodiversity Significance. FEIS Sections 4.2.4 and 4.3.4 provide maps of the MBS Sites (Figures 4.2.4-1, 4.2.4-4, 4.3.4-1, 4.3.4-2). The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be	CR 01 WI 03

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		included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.	
2686	Also ignored [in the design of the Project] was experience with the Dunka Pit, located on the old LTVSMC site approximately five miles north and east of the PolyMet Project mine site.	NEPA/MEPA regulations do not require discussion or comparisons to other mining projects, as it is outside the scope of the project (see Minnesota Statutes 116D.04 and 40 CFR 1500). PolyMet would be required to address on-site legacy contamination and would provide financial assurance for the legacy components under a Permit to Mine application. The NorthMet Project design and mitigation is based on the site specific conditions. FEIS Section 5.2.2 discusses how the NorthMet Project would address existing water contamination and/or comply with water standards.	PD 26 WR 023
2689	The cumulative public information regarding risks to area hydrology from mining the PolyMet site cannot be dismissed by inserting extrapolated data in place of measured data, or by cherry-picking measured data. Impacts to surface waters, groundwater, and wetlands for a project of this size and complexity demand a scientific, data-driven approach, rather than one based on opinion and selectively used data.	Where field measurements were not available, model assumptions were reviewed and approved for use in impact analyses. The Co-lead Agencies believe that the FEIS contains adequate information and analyses consistent with the NEPA and MEPA guidance and best practices. Also refer to the response to theme NEPA 09 for more detail.	WR 072 WR 073
2694	Some of the wetlands that will be directly and indirectly impacted at the mine site are part of the 100 Mile Swamp, identified by a United States Fisheries Service biologist in 1997 as "lacking ecosystem representation in protected areas."	FEIS Section 5.2.3, Table 5.2.3-1, indicates that there would be a total of 758.2 acres of direct wetland impacts at the Mine Site. A portion of the approximate boundary for the One Hundred Mile Swamp would be located within the Mine Site boundary. PolyMet would ultimately need to satisfy both the federal and state mitigation requirements for providing compensatory mitigation for impacts to wetlands. The number of mitigation credits to be earned by replacement wetlands would be determined during permitting by the appropriate agencies reviewing the wetland mitigation plan.	WET 19
2700	In response to the Co-Lead Agencies desire to use only analogue data to determine the Project dewatering effects, GLIFWC provided an independent analysis using information from other mine pits located on the Mesabi Range…The only substantial changes in GLIFWC's method of analogue assessment were to use all available drawdown data for the Mesabi Iron Range, and to not automatically exclude wetlands classified as ombrotrophic from being considered impacted by	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence,	WET 08

Comment ID	Comment	Response	Theme(s)
	drawdown…All analogue data must be used to estimate wetland impacts, and additional hydrologic data collected from the mine site should be required.	is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
2701	The CWA does not allow a permit when there are practicable alternatives that would have fewer adverse effects, when the Project would lead to a violation of state water quality standards, or when a permit would cause or contribute to significant degradation of waters of the United States.	The USACE is the federal agency responsible for regulating the discharge of dredged or fill material into Waters of the United States, including wetlands under Section 404 of the Clean Water Act. PolyMet has applied for a Section 404 Individual Permit from the USACE for the proposed fill into the Waters of the United States. In addition, if a permit from the USACE is issued, it is not valid until the State has either certified under Section 401 of the CWA that the proposed discharges to aquatic resources comply with the State's water quality standards or waived the 401	COE 03

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		certification requirements. When making a decision, the USACE takes into consideration numerous factors. Permit decisions are based on the probable expected effects associated with a proposed project including direct, indirect, and cumulative impacts. Public interest review factors include: conservation, economics, aesthetics, general environment, wetlands, cultural values, fish and wildlife, land use, flood hazards, property ownership, flood plain values, navigation, recreation, shore erosion and accretion, water supply and water quality, energy needs, safety, mineral needs, safety, food and fiber production, and the needs and welfare of the people. The decision to grant or deny a permit by the USACE is explained and described in a ROD. If the permit is issued, a copy of the permit is sent to the project sponsor for their signature, which signifies that they accept the permit requirements. If the USACE decides to deny the permit or the project sponsor does not agree with the conditions contained in the permit, the project sponsor may request an administrative appeal of the permit decision. A decision by the USACE on whether to grant or deny a Section 404 Individual Permit has not yet been made.	
2702	An agency-preferred alternative must be provided in addition to the LEDPA's before wetland impacts resulting from the Project can adequately be assessed, and before a 404 permit can be issued.	Neither Minnesota Rules nor CEQ regulations require the Co-lead Agencies to identify a preferred alternative in the SDEIS (40 CFR 1502.14(e)). The FEIS includes available details regarding the identification of an Agency Preferred Alternative. The FEIS contains sufficient information to identify and substantiate the LEDPA. The USACE is not required to identify a LEDPA in the FEIS; the final determination on the LEDPA would be made in the ROD for the USACE which serves as the USACE's decision document and the basis for the Department of the Army permit decision. The USFS will utilize the FEIS to show the factors relating to how the public interest would be served by the Land Exchange and the ROD would incorporate the findings of those factors and identify the preferred alternative. The MDNR is not required to identify a preferred alternative under MEPA. The FEIS Sections 3.2 and 3.3 further detail this process. The agency preferred alternative and LEDPA process is described in FEIS Sections 7.4 and 7.5. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30-day period may be considered in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of	COE 04

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		the Project.	
2707	During the EIS scoping process for the Project, the Co-Leads failed to ever identify any cumulative impact issues associated with cultural resources, and Tribal Cooperating Agencies were not invited to participate in scoping. The Band's and other Tribal Cooperating Agencies' comments on the June 2008 PDEIS, the 2009 CPDEIS, and the 2009 DEIS detailed the nature of these substantial cumulative impacts and the need for further analysis, and are forced to do so yet again here.	Section 6.2.9 of the Final EIS provides a detailed discussion and analysis of the potential cumulative effects on cultural resources from the NorthMet undertaking within a defined cumulative effects analysis area. That discussion includes past, present, and reasonably foreseeable future federal, state, and private actions within that area. The approach to cumulative effects has been informed through consultation between the Co-lead Agencies and the Bands. Section 6.2.9 of the Final EIS acknowledges cumulative effects on cultural resources.	CR 03
2713	This omission [the SDEIS does not determine climate change implications of the proposed Project] undermines even the MDNR's own work. The MNDNR's Moose Advisory Committee, which studies the decline of the moose population in northeastern Minnesota, has recommended preserving wetlands as sanctuaries for moose from heat stress related to climate change.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement. The FEIS Section 4.2.5.1.1 discusses the role of wetlands with moose and thermal stress.	WI 01 WI 02
2715	A substantial moose population has been identified in the mine site area by aerial and ground surveys. Moose are likely to be impacted by the disturbance of two of the few wildlife corridors remaining along the Mesabi Range, not to mention by the massive wetland impacts of this project…There is no basis to dispute that the Project will have cumulative effects on the moose herd and Tribal harvest in the 1854 Ceded Territory. At a time when moose populations in Minnesota are declining, this analysis is particularly important and should have been done as part of this SDEIS.	The FEIS wildlife sections provide an analysis of wildlife species used for subsistence/harvest, as well as those culturally important to the Bands, such as moose. FEIS Section 4.2.9.3.3 identifies species potentially harvested in the 1854 Ceded Territory, while FEIS Section 5.2.9.2.2 explains that a lack of data regarding use of such species in the NorthMet Project area likely indicates limited present day use in that area due to general inaccessibility. FEIS Section 5.2.5.2.5 discusses the types of potential effects to common and/or game species, which are similar to effects on ETSC species. The FEIS has been revised to include additional detail regarding moose, and this discussion has been moved to the state ETSC species discussion, due to its new state listing status. The response to theme CR 01 also discusses effects to resources important to the Bands.	WI 01 WI 02 WI 03 WI 09
2721	The cumulative impacts assessment deficiencies identified above and within Appendix C are not exhaustive. Instead, they are solely an attempt to illustrate the incredible lack of cumulative effects analysis in the SDEIS. Profound revision is needed to this section.	The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or conclusions.	CU 12

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2723	Additionally, the lead agencies must consult with any tribes that attach "religious or cultural significance to historic properties that may be affected by an undertaking," regardless of the location of the historic property.	The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting on the NorthMet Project Proposed Action. Historic properties affected by the NorthMet Project Proposed Action have been identified and the impacts to those properties have been assessed. This also includes an assessment of actual use of those historic properties, as well as other resources in the APE, by tribal members. Effects on historic properties would be fully considered prior to the issuance of any permit or land exchange, pursuant to the NHPA and its implementing regulations. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.	CR 06
2729	Mesabe Widjiu is correctly identified as a sacred landform but needs to be considered in its entirety instead of looking at only the area within the Project. The segment that is within the project area is small, but vital to the property. Adverse effects to any portion of the Mesabe Widjiu will negatively impact the entire feature.	The federal Co-lead Agencies have determined the Partridge River section of the Mesabe Widjiu to be eligible for inclusion in the NRHP under Criterion A for its association with important Ojibwe spiritual and cultural practices. In addition, the Co-lead Agencies have determined, in consultation with the Bands, that the Partridge River segment of the Mesabi Widjiu would be adversely affected by the NorthMet undertaking. Although the federal Co-lead Agencies are assessing the effects of the NorthMet Project Proposed Action on only the portion of the Mesabe Widjiu within the APE, it is recognized that the property and its significance extends beyond the APE. The federal Co-lead Agencies have updated the FEIS to include a graphic of the entire Mesabe Widjiu, as provided by the consulting Bands.	CR 02 CR 05
2738	Any increase of methylmercury bioavailability in the Embarrass River, Partridge River, or St. Louis River watersheds constitutes a significant adverse impact to a critical trust resource [(subsistence fisheries)]. Not only must this impact be fully evaluated, but it must be fully mitigated	The Cultural Resources sections in FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6, also address effects on and any proposed mitigation for cultural resources and culturally significant natural resources. Effects from mercury deposition on fish, in particular, are addressed in Section 6.2.6.3.3, in the Human Health Impacts summary, Section 7.3.4.4.2, and in responses to Themes HU02, 03 and 04. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations pertaining to the federal authorities for the NorthMet Project Proposed Action review.	CR 01 HU 02 HU 03 HU 06
2742	Wild rice waters are not only protected under the 1854 Treaty but under Minnesota State law. Given	Potential effects and mitigation actions are included in the FEIS. Wild rice beds impacts are addressed from an economic, environmental, and cultural	WR 156

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	the obviousness of the threatened impact to such wild rice beds, additional analysis and mitigation must be included throughout the SDEIS.	perspective with input from the Bands. The FEIS compares sulfate concentrations predicted to result from the NorthMet Project Proposed and the 10 mg/L evaluation criterion, which reflects the state water quality standard for waters used for production of wild rice.	WR 157
2745	The Project will certainly do nothing to aid in the recovery of moose and is likely to reduce available habitat, impact travel corridors, and increase greenhouse gases. Impacts on moose and habitat are impacts on the Band's cultural resources and must be analyzed as such in the SDEIS.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement. The FEIS Section 5.2.5.2.2 discusses effects to moose due to loss of habitat. The FEIS Sections 5.2.5.2.3 and 6.2.5.4.2 discuss effects to wildlife corridors.	WI 01 WI 02 WI 03 WI 09
2746	The APE for the Project was not determined until August 11, 2009, after tribal cooperators insisted upon it, and tribal consultation is ongoing. Since 2009, the size of the APE has been significantly diminished to the point of being the Project permitted area and nothing more.	The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting on the NorthMet Project Proposed Action. Historic properties affected by the NorthMet Project Proposed Action have been identified and the impacts to those properties have been assessed. This also includes an assessment of actual use of those historic properties, as well as other resources in the APE, by tribal members. Effects on historic properties would be fully considered prior to the issuance of any permit or land exchange, pursuant to the NHPA and its implementing regulations. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6. The APE takes into account both direct and indirect effects using a geographically expansive area that accounts for direct effects as well as visual, audible, atmospheric, hydrological, and water quality effects. The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange, and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been revised slightly to include the Dunka Road corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline.	CR 02 CR 06
3039	The land exchange will cause irretrievable losses of resources for the Bands [including loss of the land itself, SDEIS pg 7-10]… Further, the SDEIS provides that the land exchange proposal could have direct and indirect effects on tribal cultural resources by creating noise, impeding access to area that are traditionally or culturally important to	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois	CR 01 CR 05

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	the bands and affecting species of importance to the Bands.	Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be	

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		accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
2697	[The decision to use an analogue method came from the Wetlands Impact Assessment Planning work group process, in spite of Tribal Cooperating Agency objections. These objections include:] (1) the PolyMet proposed mine pit will be hundreds of feet deeper than any of the "analogue" mine pits;	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-	WET 08

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		lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
3098	[The decision to use an analogue method came from the Wetlands Impact Assessment Planning work group process, in spite of Tribal Cooperating Agency objections. These objections include:] (2) PolyMet mine pit walls will be crystalline and sedimentary bedrock versus the analogue mine pits in sedimentary bedrock only;	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland	WET 08

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		effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
3099	[The decision to use an analogue method came from the Wetlands Impact Assessment Planning work group process, in spite of Tribal Cooperating Agency objections. These objections include:] (3) data collected from the site would be relatively inexpensive and should be used to inform impact assessment;	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered	WET 08

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		throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS but are monitoring wetlands for potential indirect effects. In the event that the required wetland monitoring identifies additional indirect effects, permit conditions would likely include a plan for adaptive management practices to be implemented. Additional compensatory mitigation would be required if indirect wetland impacts are identified during monitoring and annual reporting.	
3100	[The decision to use an analogue method came from the Wetlands Impact Assessment Planning work group process, in spite of Tribal Cooperating Agency objections. These objections include:] (4) relying on only a partial set of available "analogue" data as the source of information to estimate dewatering impacts is selective and not scientifically robust.	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence,	WET 08

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		is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
3112	The SDEIS also does not provide any rationale for more mercury to be added to a system that is already so high in mercury, only suggesting that a future TMDL should take care of the problem. A more through cumulative effects analysis is required for mercury and the appropriate spatial scale for considering cumulative impacts includes the entire St. Louis River watershed.	This comment was originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. MPCA's goal is to protect high-quality waters and improve the quality of impaired waters, so water quality standards are met and beneficial uses are maintained and restored, where these uses are attainable. As summarized in FEIS Section 5.2.7.2.5, widespread contamination of fish from atmospheric pollution is why Minnesota established a statewide mercury TMDL. The	MERC 10 MERC 22

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		TMDL seeks to reduce atmospheric deposition everywhere in the state, in order to make the state's lakes and streams fishable, as required by federal regulations, and is intended to provide the long-term framework to reduce mercury in fish. The MPCA published Guidelines for New and Modified Mercury Air Emission Sources, and revised those guidelines in 2012 (MPCA 2012g, as cited in the FEIS). The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions of 789 lbs/year by 2025. The MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions, and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS). Furthermore, WWTF and WWTP discharges are expected to meet the 1.3 ng/L standard for mercury, and overall the NorthMet Project Proposed Action is predicted to result in a net decrease of mercury-loading.	
3117	While the incremental risk [of mercury loading] from the Project may be small, the existing risk is large and has not yet been addressed through a total maximum daily load ("TMDL") or other reduction program.	The comments in this theme were originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in Table 8-1 of the SDEIS. Further explanation is provided below. MPCA's goal is to protect high-quality waters and improve the quality of impaired waters, so water quality standards are met and beneficial uses are maintained and restored, where these uses are attainable. As summarized in FEIS Section 5.2.7.2.5, widespread contamination of fish from atmospheric pollution is why Minnesota established a statewide mercury TMDL. The TMDL seeks to reduce atmospheric deposition everywhere in the state, in order to make the state's lakes and streams fishable, as required by federal regulations, and is intended to provide the long-term framework to reduce mercury in fish. The MPCA published Guidelines for New and Modified Mercury Air Emission Sources, and revised those guidelines in 2012 (MPCA 2012h, as cited in the FEIS). The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions of 789 lbs/year by 2025. The MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions, and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS). Accordingly, no minimization and mitigation plan is required for the NorthMet Project Proposed Action. Based on the results of MPCA's review, the NorthMet Project Proposed Action should not be required to buy mercury offsets at this time. Should an evaluation of the NorthMet Project Proposed Action determine that an additional mercury source has been added, mercury offsets would be sought in accordance with the	MERC 22

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		Implementation Plan for Minnesota's Statewide Mercury Total Maximum Daily Load (MPCA 2009c, as cited in the FEIS). Further, the NorthMet Project Proposed Action is not anticipated to be a major source of mercury into the environment. The RO treatment is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site, including water used for flow augmentation. Mercury loadings from the Mine Site are projected to decrease due to the NorthMet Project Proposed Action. The combined contributions from the Embarrass River and Partridge River are unchanged when modeled for the St. Louis River at the Fond du Lac reservation boundary; therefore, further degradation of surface water quality, and by extension increased mercury in fish, is not expected.	
9007	In the SDEIS, there is no discussion regarding the type of financial assurance that would be used. No detail is provided regarding the estimated amount of financial assurance that would be sufficient for reclamation, closure, mitigation, and remediation of adverse effects from the Project. Even though the MNDNR has stated that PolyMet financial assurance will include clean-up costs for contamination resulting from LTVSMC operations, the SDEIS provides no discussion regarding financial assurance for the existing contamination associated with previous mining activities at the site.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, time frames, contingency plan amounts for unforeseen challenges, calculations that would be required for the project, monitoring, mitigation, and legacy contamination would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. Maintenance, mitigation, and cleanup of legacy contamination, would be covered by financial assurance.	FIN 01 FIN 05 FIN 08 FIN 11
9008	Mining need not be synonymous with pollution: "In the right place – and with conscientious companies, new technologies and good planning – many of the potential impacts are avoidable. In fact, most mine pollution arises from negligence, not necessity." The NEPA "hard look" requires agencies to "exercise a degree of skepticism in dealing with self-serving statements from the prime beneficiary of a project" when analyzing alternatives. The SDEIS does not evaluate or examine Project alternatives in any substantive way; even the no-	The original project proposal and alternatives were developed during project scoping in 2005. The NorthMet Project Proposed Action was refined at various points in response to public and agency input. As a result, the NorthMet Project Proposed Action studied in the SDEIS is not identical to the proposed action in the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Some alternatives to the proposed action were considered and eliminated during the scoping and DEIS phases of the NorthMet Project Proposed Action, so did not require re-evaluation in the SDEIS. Alternatives were eliminated from detailed evaluation if they did not offer substantial environmental or socioeconomic benefits, were not reasonable (technically or economically feasible), were not available, or would not	ALT 01 ALT 03 ALT 14 ALT 20

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	action alternative is lacking in detail and analysis. Instead, the SDEIS states: Consistent with the CEQ regulations, the federal Co-lead Agencies are required to identify an agency-preferred alternative in a DEIS, if one exists, and in the FEIS unless another law prohibits the expression of such a preference. At this time, the Co-lead Agencies have not identified a preferred alternative, and for the USACE, Appendix B of 33 CFR Part 325 supersedes the CEQ requirement to identify an agency-preferred alternative. Part 57(4) of 33 C.F.R. Part 325 at Appendix B, NEPA Implementation, only states: Alternatives. See 40 CFR 1502.14. The Corps is neither an opponent nor a proponent of the applicant's proposal; therefore, the applicant's final proposal will be identified as the "applicant's preferred alternative" in the final EIS. Decision options available to the district engineer, which embrace all of the applicant's alternatives, are issue the permit, issue with modifications or conditions or deny the permit. To the extent this limits USACE's obligation to identify an agency-preferred alternative, which is not clear, nothing there limits the USFS's obligation to do so. Moreover, Part 57(4) of Appendix B does require that "reasonable alternatives" must be considered in detail, along with "geographic alternatives, e.g., changes in location and other site specific variables, and functional alternatives, e.g., project substitutes and design modifications." The Band has long cited this defect in its comments,21 and EPA cited the lack of alternatives as a factor when issuing an EU-3 rating for the DEIS. Although the SDEIS was revised to reflect the Project proponents' preferred	meet the Purpose and Need. This review—beginning during the scoping process and concluding with the FEIS—is consistent with the alternatives review required by NEPA and MEPA, and with the CEQ rules for analyzing alternatives. Refer to FEIS Section 3.2.3 for a discussion on the process and outcomes for consideration of the NorthMet Project alternatives, and Section 3.3.3 for a discussion on the Land Exchange alternatives. FEIS discusses in section 3.2.3.2 how the Consent Decree under the NorthMet Project No Action Alternative would require Cliffs Erie to complete closure and reclamation activities at the Plant Site. This would include completing activities for the localized affected areas under the Minnesota VIC Program, removal of the former Plant Site facilities that are not going to be reused, and management of seepage at the Tailings Basin embankment. The FEIS mentions in Table 3.2-1 that under the NorthMet Project No Action Alternative, there would be no mining activities, and that existing management and land use of the federal lands would continue. The NorthMet Project No Action Alternative is also analyzed under each resource area in the FEIS Chapter 5, and summarized in the FEIS Table 7.2.4-1. Several other alternatives for both the NorthMet Mining Project and Land Exchange were screened before the FEIS (see FEIS Section 3.2.3.3).	

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	action, still, the only alternative analyzed in any detail concerns the acreage of the proposed land exchange. This failure is a serious violation of NEPA and must be remedied before the SDEIS can be finalized.		
9011	No effort was made to discuss or evaluate the least environmentally damaging practicable alternative ("LEDPA") required before rendering a Clean Water Act Section 404 Permit.	The LEDPA process is described in FEIS Section 7.5. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of the permit.	COE 04
9014	The SDEIS failed to substantively consider many alternatives that may provide mitigation for, or prevent long-term environmental damage. Some of these alternatives include: paste tailings to reduce the project footprint and use less water thus decreasing risk of water pollution; perpetual pumping of the mine pit to prevent a pit lake from forming and by doing so protecting groundwater; back-filling waste rock into the east, central, and west mine pits to reduce the mine foot print and restore wetlands; engineered liners; providing reverse osmosis treatment at the mine site beginning in year one of operations to augment water loss in nearby high quality wetlands in the Partridge River watershed; and underground mining.	A thickened tailings (paste tailings) alternative (A1) was considered but eliminated in the DEIS and post-DEIS as it was determined not to offer significant environmental benefits over the NorthMet Project Proposed Action. See the response to Theme ALT 04, which describes the West Pit Water Elevation Alternative (see also MDNR et al. 2014, as cited in the FEIS). FEIS Section 3.2.2.1.10 states that waste rock would be backfilled into the East Pit starting at year 11 and in the combined East Central Pit starting in year 16. After backfilling is complete, a wetland would be constructed over the combined East Central Pit. See the response to Theme ALT03 for more information about the West Pit backfill alternative. The 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) discussed a liner system as part of its consideration of a modified design or layout at the Mine Site. Key aspects of this alternative from the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) were incorporated into the NorthMet Project Proposed Action and studied in the SDEIS. Liners would be installed for stockpiles or areas where there is a potential to generate acid and metal leachate from potentially reactive waste. The Hydrometallurgical Residue Facility would contain a double-liner system. Temporary stockpiles (Category 2/3 and Category 4) and the Ore Surge Pile would contain a liner. The Category 1 Stockpile would have a containment system to collect seepage, which would be pumped to the WWTF. The Overburden Storage and Laydown Area would hold peat soils and unsaturated overburden, which would not be expected to be reactive. During operations, effluent from the WWTF and runoff from the	ALT 01 ALT 04 ALT 06 ALT 10 ALT 13

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		Overburden Storage and Laydown Area would be pumped to the Tailings Basin for reuse. During this time, extensive monitoring would be required, and adaptive management would be used to ensure minimization of effects and compliance into the future. During reclamation, water from the West Pit would be treated at the WWTF, which would be upgraded to include a RO treatment unit (or equivalent performing technology). Treatment at this unit would result in an effluent that meets all applicable water quality standards. See the response to Theme ALT01 for more information about the underground mining alternative.	
9020	The SDEIS summarily dismissed the possibility of backfilling: The opportunity to reclaim wetlands and vegetation at the Category 1 Stockpile footprint area would be the only measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, because of the temporal effect that the stockpile would have, those effects would be required to be mitigated regardless of future backfilling or not. Furthermore, the potential environmental benefit is moot or outweighed because encumbrance is not allowed in PolyMet's private mineral leases and because the costs associated with backfilling, additional water treatment (rates), and encumbrance compensation determined in revised lease agreements may affect the ability of PolyMet to secure financing (MDNR et al. 2013b). As such, the option to backfill the West Pit was eliminated from further consideration in the SDEIS. Back-filling all of the mine pits with waste rock would reduce the surface footprint of the mine and make possible 526 acres of wetland restoration where the Category 1 stockpile is now proposed to be stored without a liner in perpetuity.	The West Pit Backfill alternative (E20) was considered but eliminated during the development of the DEIS. It was eliminated from further consideration because it was determined that it would not offer significant environmental or socioeconomic benefits compared to the NorthMet Project Proposed Action and because backfilling the West Pit would prevent recovery of additional mineral resources. These factors are sufficient to qualify the West Pit Backfill alternative as unreasonable under NEPA, and justify its exclusion under *Minnesota Rules*, part 4410.2300, subpart G. It was reconsidered in the SDEIS in response to comments from the Cooperating Agencies. A Co-lead Agencies memorandum (MDNR et al. 2013b, as cited in the FEIS) was prepared to summarize the decision-making process, which is referenced in the FEIS Section 3.2.3.4.2. The Co-lead Agencies screened the alternative against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The opportunity to reclaim wetlands and vegetation at the Category 1 Stockpile footprint area would be the only measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, because of the temporal impact that the stockpile would have, these impacts would be required to be mitigated regardless of future backfilling or not.	ALT 03 ALT 06
9022	Engineered liners for the Category 1 Waste rock Stockpile and the Overburden Storage Layout Area ("OSLA") would ensure that seepage would	Liners would be installed for temporary stockpiles where there is a potential to generate acid and metal leachate. The permanent Category 1 Stockpile would have a containment system to collect seepage, which	PD 16

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	not migrate into fractures below the storage facilities and increase the effectiveness of seepage capture...If the Category 1 Stockpile were lined, seepage capture efficiency would increase and less water carrying pollution would migrate from the pile into the fractures below the storage area thereby protecting groundwater.	would be pumped to the WWTF for treatment. The Category 1 stockpile would contain material that is not expected to produce acidic leachate. The non-acid generating waste was identified using multi-year kinetic tests (humidity cells) on NorthMet rock samples. Waste rock with 0.12 percent sulfide S or less is the threshold for selecting non-acid generation mine waste and is supported by long-term humidity cell tests on NorthMet waste (i.e., 42 samples of Category 1 waste rock, with tests now run between 187 and 337 weeks ([PolyMet 2015q Attachments C]) The Overburden Storage and Laydown Area would hold peat soils and unsaturated overburden, which is not expected to be reactive.	
9025	After operations, the SDEIS contemplates that the RO plant would continue to treat tailings basin seepage and begin treating tailings pond water. The treated water would be used for augmentation of streams near the plant site. Colby Lake water is also proposed for stream augmentation. However, because Colby Lake water exceeds WQS for many pollutants including mercury, it would also need to be RO-treated before being used for augmentation. RO-treated water should be used to augment stream flow at both the plant site and mine site. Colby Lake water should not be used for stream augmentation unless it is RO-treated first. RO will not cause waters in the vicinity of the plant site to comply with WQS due to low seepage capture efficiency at the tailings basin.	The NorthMet Project Proposed Action described in the FEIS includes treatment of all water that would be discharged at the Plant Site including water used for flow augmentation. The amount of water from Colby Lake used for flow augmentation would be low; however, any water used for augmentation would be treated prior to discharge. PolyMet recommends that tributaries that extend from the Tailings Basin be monitored, see FEIS Section 5.2.2.3.6 and comment ID 9022.	WR 018 WR 124 WR 184
9029	The MNDNR and USACE considered underground mining as an alternative to the proposed open pit(s) for the DEIS in 2009, but eliminated it because it would have had "a significantly reduced rate of operation that would not be considered economically feasible, and, therefore, would not meet the Purpose and Need of the Project." Even though underground mining was reconsidered for the SDEIS, the Co-Lead Agencies did not "exercise a degree of skepticism in dealing with self-serving statements from the prime beneficiary of a project" when analyzing	The Underground Mine alternative was first considered but eliminated during the FSDD process. The FEIS Section 3.2.3.4.1 describes how it was reconsidered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer	ALT 06

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	alternatives. The Project proponent eliminated the alternative based solely on an economic decision that underground mining would not be as profitable as open pit mining. The co-leads state that "it was not possible to undertake a quantitative, side-by-side assessment of the underground mining alternative."37 An underground mine would have a reduced mining rate and life of mine, employed fewer workers for a shorter period of time, and reduced state and local tax revenues. Conversely, although the underground mining alternative would offer environmental benefits, the SDEIS includes no economic analysis of those benefits. Still, the Co-Lead Agencies determined that underground mining would result in reduced socioeconomic benefits, and "PolyMet would not move forward with an unprofitable project, thus any potential environmental or socioeconomic benefits associated with this alternative are moot."	environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may result from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
9031	Although underground mining was considered technically feasible, the Co-Leads provided that: PolyMet is a private sector and for-profit company, the value of the saleable material would need to provide sufficient income to cover operating cost (which includes, but is not limited to, the cost of mining, processing, transportation, and waste management), capital cost (to build and sustain facilities), an adequate return to investors, reclamation, and closure costs and taxes. Using underground mining would result in most of the NorthMet Deposit left unmined because of its low metal value (i.e., less value than the cost of mining and mineral processing). Other material would have to be left in place for safety reasons, to prevent collapse. Therefore: …the Co-lead Agencies found that while underground mining is technically feasible,	The Underground Mine alternative was first considered but eliminated during the FSDD process. FEIS Section 3.2.3.4.1 describes how it was reconsidered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration.	ALT 01

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	available, and would offer significant environmental benefits over the proposed NorthMet Project, it would not be economically feasible and would not meet the Purpose and Need. Since the underground mining alternative would not meet all of the screening criteria, it is not considered to be a reasonable alternative. Therefore, the underground mining alternative was eliminated from further evaluation in the SDEIS. In no way does this constitute an appropriate level of detail. The conclusion that underground mining is not viable, or preferable, remains substantially unjustified, despite repeated requests for further analysis. Without considering the economics of perpetual treatment the economic analysis provided by the Project proponent concludes that underground mining is "[n]ot economically viable," while simultaneously claiming that backfilling the west pit would create encumbrances not allowed in their lease due to minerals located below the west pit that can only be accessed through underground mining. This is not the appropriate use of a cost-benefit analysis for purposes of analyzing an EIS alternative. The CEQ regulations require that, where a cost-benefit analysis is "relevant to the choice among environmentally different alternatives," there are a variety of additional requirements, including "analysis of un-quantified environmental impacts, values, and amenities,"42 in addition to other CEQ alternatives rules.	FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may result from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
9033	Additionally, the SDEIS does not provide adequate discussion of the adverse effects of the proposed land exchange on wetlands and headwater streams within the St. Louis River	The SDEIS FEIS Section 5.3.3 included a discussion of wetland resources to be gained or lost as part of the proposed action land exchange. The Land Exchange Proposed Action represents a transfer of surface rights of 6,495.4 acres from the SNF to PolyMet to eliminate the conflict between federal surface and private mineral estate. This action, if approved, would remove those acres from SNF management and public use and transfer them to private ownership. Effects to wetland resources as a result of the mining activities are discussed in FEIS Section 5.2.3. SDEIS Section 5.3.6	WET 14

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		included a discussion of headwater streams to be gained or lost from the Land Exchange Proposed Action.	
9036	The SDEIS attempts to diminish the significance of the loss of these high-quality lands by stating that "[g]iven the existing lack of overland public access and actual use of the federal lands, as well as historic use of this area for mineral exploration (see Section 4.2.9), the Land Exchange Proposed Action represents little to no change in the actual level of recent or current use of the federal lands." In fact, historic trails key to both the exercise of treaty rights and of historic significance connect what is now Beaver Bay with Lake Vermillion.	As discussed in FEIS Section 5.3.1.2.1, the only public access to the federal lands is via the Partridge and Embarrass rivers. The remainder of the federal lands is surrounded by private lands (or by other public lands that are themselves surrounded by private lands) (see Figure 4.3.1-1). While members of the public may obtain permission to cross these private lands and access the federal lands, there is no designated land-based access for the federal lands.	CR 05
9037	The Project proponent provides that "three monitoring wells were installed in 2005 and sampled quarterly or less frequently prior to 2011; an additional 21 wells were installed between October 2011 and February 2012 and were sampled monthly through August 2012. All 24 wells are currently sampled three times per year (quarterly, excluding winter (1st) quarter)." But no bedrock monitoring wells were installed near the tailings basin. Only nine bedrock wells were installed for the entire Project, all in the area where the proposed mine pit(s) would be located. Moreover, data collected specifically for the Project was selectively used, with several well and surface water monitoring stations' data completely excluded from the water quality models used to predict Project impacts.	The SDEIS was based on data generally collected through October 2012. The FEIS relied on new data collected through the end of 2013, which included 12 new monitoring wells at the Mine Site. In addition, the FEIS made use of new geotechnical data collected in 2014 along the north, northwest, and west perimeter of the Tailings Basin, including: geologic logs, ten new surficial aquifer piezometers, slug tests in the piezometers, and ten bedrock packer tests performed in five boreholes advanced into upper bedrock. Hydrogeologic site characterization was sufficient for purposes of environmental review. All publically available and relevant studies were considered in developing the SDEIS and FEIS. These include technical reports prepared by PolyMet, reports from state and federal agencies, technical papers in peer reviewed journals, and technical reports associated with other mine sites. The SDEIS and FEIS preparers drew on these information sources to the degree that they were reliable and relevant to the assessment of potential NorthMet Project Proposed Action impacts. The FEIS record provided a description of data used to assess impacts. It is correct that currently there are no bedrock monitoring wells at the Plant Site. Installation of bedrock monitoring wells would be specified as part of the permitting process, with the results used to assess NorthMet Project Proposed Action performance on an ongoing basis.	WR 008 WR 071 WR 072
9046	Baseflow is the component of streamflow attributed to groundwater discharge from both deep subsurface and delayed shallow subsurface	Groundwater baseflows used in the SDEIS are best-estimate values and should be retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88	WR 003 WR 175

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	flow. It is established by measuring the rate of stream flow during low flow conditions; either in the winter months when groundwater continues flowing under the frozen surface, or in warmer months during periods of time when there is no precipitation. Baseflow is used to define the amount of groundwater contribution to streamflow, and helps determine the speed at which groundwater travels. The baseflow rate predicted by XP-SWMM is three times lower than flow data indicates, and implies recharge to the groundwater system from precipitation that is not consistent with published literature.	stream gaging in the Partridge River at SW-006 that occurred when there were no discharges from Northshore Mine; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTV tailings basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The only other available gaging data is from a station installed during 2011 at SW-003 on the Partridge River. Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-87 USGS data for the FEIS is reliable (PolyMet 2015m, as cited in the FEIS). To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. It also reflected consideration of the flow data collected at SW-003 in requiring groundwater baseflows at all locations on the Partridge River be increased by a factor of 4 (e.g., 0.5 to 2 cfs at SW-003). The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow (MDNR et al. 2015b, as cited in the FEIS). Evaluation criteria can be found in Section 5.2.2.	
9051	It is widely acknowledged that "[m]ining can deplete surface and groundwater supplies.	Impact assessment modeling relies on site characterization data that indicate the bulk hydraulic conductivity of upper bedrock is two to three	WR 010

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	Groundwater withdrawals may damage or destroy streamside habitat many miles from the actual mine site." The importance of accurate evaluation of geology cannot be underestimated in modeling: Hydrogeologic characterization studies should include geological descriptions of the site, including descriptions of rock types, intensity and depth of weathering, and the abundance and orientation of faults, fractures, and joints. Although difficult to evaluate, the hydrologic effects of fractures, joints, and faults are especially important to distinguish and characterize. Water moves more easily through faults, fractures, and dissolution zones, collectively termed secondary permeability, than through rock matrices. Secondary permeability can present significant problems for a mining facility because it can result in a greater amount of groundwater discharge to a mine than originally predicted. However, the SDEIS indicates that mine pit dewatering impacts will be very limited or non-existent based on the assumption that there is little or no connection between the bedrock and surficial aquifers. This assumption is not supported by the data used to characterize mine site hydrology; instead, it is based on an unsupported "professional opinion."	orders-of-magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at both the Mine Site and Plant Site are dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting site-derived chemicals to the Partridge and Embarrass Rivers. It is acknowledge that there could be some hydraulic connections between bedrock and the surficial aquifer where transport is expected to be negligible. Given these factors, the approach was to not consider this possible connection in the NorthMet Project Proposed Action water quality models, but to recommend extensive monitoring during operations and closure to assess if interactions occur and if they would raise concerns for permitting agencies. If monitoring data indicate trends toward permit non-compliance, adaptive mitigation measures would be implemented to prevent or eliminate what is expected to be a small transport-related bedrock impact relative to surficial flows. See FEIS Section 5.2.2.3.5 for more information on adaptive mitigation measures and Section 5.2.2.3.6 for more information on monitoring. The FEIS further evaluated the possibility of fractures and faults at the Mine Site and Plant Site to determine what (if any) changes need to be made to model assumptions to accurately predict potential environmental effects for purposes of environmental review. Although no change was made to the Plant Site GoldSim model, the FEIS Mine Site GoldSim model was modified to include a flow/transport zone 15 meters thick from that present in the SDEIS. The results of the analysis are included in FEIS Section 5.2.2.3.2. The response to theme WR169 also contains additional information on fractures and faults. The SDEIS disclosed that bedrock is variably fractured. The effects of fracturing are incorporated into the bulk hydraulic conductivity values used to characterize bedrock for the water quality impact assessment modeling. This is common practice in large-scale evaluations of bedrock hydraulics and the Mine Site GoldSim model was updated for the FEIS to better represent the likelihood of an upper zone of more fractured bedrock than deeper in the formation. Background bedrock-related conductivity information was also updated for the FEIS. Structural faults may exist between mine facilities and perennial streams that receive groundwater discharge. Because the landscape is covered with surficial deposits and there are few bedrock outcrops, the existence of faults is conjectural and locations at best can only be inferred. It is unknown if	WR 012

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		faults (if and where they exist) behave as conduits or barriers to groundwater flow. Given these uncertainties, it is unlikely that any reasonable field program would be able to identify the existence, location, and hydraulic characteristics of faults that may or may not be present at the site. The FEIS documents the need to require a robust monitoring program during operations and closure to provide direct or indirect evidence on the existence of hydrologically significant faults. If significant faults are identified (that is, faults which could lead to violation of water quality standards), then adaptive measures would be employed to mitigate the fault-related effects. See FEIS Section 5.2.2.3.5 and theme WR169 for additional information.	
9052	In fact, information beyond the flow data collected by PolyMet implies that there may be substantial connection between the bedrock and surficial aquifers and that groundwater travel time will be exponentially faster than predicted. Water quality data collected from two deep boreholes in the area where the Project mine pit(s) will be located found tritium and un-ionized ammonia nitrogen. Both tritium and un-ionized ammonia indicate a strong connection with surface water. Tritium indicates that the water found in the deep boreholes was on the surface sometime after 1950, during or after nuclear testing when atmospheric deposition of this pollutant occurred. Un-ionized ammonia is produced by ore blasting activities. The bore holes where this pollution was measured are approximately one mile southwest of the Peter Mitchell Pit, which is the closest potential source of this pollution. Therefore, this data indicates that the PolyMet mine site is already hydrologically connected to the Peter Mitchell Pit through fractures. Upon review of the Peter Mitchell pit discharge monitoring data for SD001, the Band found that the average concentration of un-ionized ammonia exceeded the 0.04 mg/l NPDES permit in 2006 and 2008. The distance between the Peter Mitchell pit and the Project proposed pit(s) is approximately one mile, indicating that	Tritium and non-ionized ammonia can be indicators of relatively young water. However, when these constituents are identified in water extracted from a borehole, the overriding question is whether or not foreign (young) water was introduced during the drilling process. There are many documented cases where tritium in borehole water could be traced to makeup water introduced during the drilling process to help maintain circulation. Experience indicates that conclusions about the age of groundwater based on tritium and non-ionized ammonia are unreliable unless it can be absolutely verified that no foreign (makeup) water was introduced during the drilling process. Given the isolated occurrences additional verification is not warranted for the EIS. Impact assessment modeling relies on site characterization data that indicate the bulk hydraulic conductivity of upper bedrock is two to three orders-of-magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at both the Mine Site and Plant Site are dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting site-derived chemicals to the Partridge and Embarrass Rivers. It is acknowledged that there could be some hydraulic connections between bedrock and the surficial aquifer where transport is expected to be negligible. Given these factors, the approach was to not consider this possible connection in the NorthMet Project Proposed Action water quality models, but to recommend extensive monitoring during operations and closure to assess if interactions occur and if they would raise concerns for permitting agencies. If monitoring data indicate trends toward permit non-compliance, adaptive mitigation measures would be implemented to prevent or eliminate what is expected to be a small transport-related	WR 010 WR 011 WR 012 WR 013 WR 061 WR 071 WR 087 WR 099 WR 168 WR 169

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	groundwater travel time through bedrock fractures will be orders of magnitude faster than Project modeling suggests. Such a connection means that dewatering of the mine pits will cause significant drawdown of the water table in the surficial aquifer, potentially dewatering wetlands and ephemeral streams. This also indicates that when the mine pit(s) refill, polluted water will seep and leak out into groundwater surrounding the project.	bedrock impact relative to surficial flows. See FEIS Section 5.2.2.3.5 for more information on adaptive mitigation measures and FEIS Section 5.2.2.3.6 for more information on monitoring. The FEIS further evaluated the possibility of fractures and faults at the Mine Site and Plant Site to determine what (if any) changes need to be made to model assumptions to accurately predict potential environmental effects for purposes of environmental review. Although no change was made to the Plant Site GoldSim model, the FEIS Mine Site GoldSim model was modified to include a flow/transport zone 15 meters thick from that present in the SDEIS. The results of the analysis are included in FEIS Section 5.2.2.3.5. The response to theme WR 169 also contains additional information on faults and fractures.	
9054	Groundwater is an important source of drinking water in the Great Lakes Basin…Glacial aquifers are commonly thin and limited in their extent and yield. Bedrock aquifers have limited yield, generally from fractures; groundwater movement is difficult to define. There are no large-scale regional aquifers. The Biwabik Iron Formation is the only source of groundwater for many Iron Range cities…Over the decades of operations at the LTVSMC tailings basin, thousands of gallons per minute of polluted tailings basin water were discharged through the bottom of the basin into groundwater…The monitoring wells that do exist near the tailings basin have concentrations of pollutants including iron, sulfate, manganese, aluminum, and fluoride that exceeded drinking water standards. But because of the limited distribution of monitoring wells, the extent of the existing contaminant plume is not known. No bedrock monitoring wells have been drilled in the vicinity of the tailings basin. However, domestic wells near the northern property line show substantial contamination of the groundwater aquifer…Despite this, the SDEIS entirely skirts the question of overall impacts on the groundwater aquifer from putting an already-contaminated [tailings basin] site back into production...Blasting	The Plant Site water quality model (GoldSim) properly accounts for the existence of the LTVSMC tailings that are currently disposed in the Tailings Basin. The solute release rates from tailings (NorthMet Project Proposed Action and existing LTVSMC) were based directly on laboratory measurements conducted on representative samples of these two materials, including tailings generated as part of the Proposer's processing and metallurgical pilot-testing. Specific measurements included total concentrations of metals and other elements in the tailings (e.g., based on elements extracted in dissolution by a strong acid "aqua regia" digest), or for the more soluble constituents, the rate at which they leach in multi-year humidity cell tests (Table 1-13 of PolyMet 2015j, as cited in the FEIS). Modeled groundwater concentrations at the Plant Site of the NorthMet Project Proposed Action are described in Section 5.2.2.3.3. This assessment of the GoldSim results provides strong evidence that the NorthMet Project Proposed Action would not cause impacts to Plant Site groundwater quality above and beyond what would occur without the NorthMet Project Proposed Action. Moreover, bedrock monitoring wells are likely to be included in the water quality permit. Case histories of open pit excavations show that effects of blasting and shoveling do not extend very far from the pit walls, extending at most, several tens of meters.	WR 016 WR 030 WR 060 WR 071

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	and shoveling ore will increase both the number of fractures and the connectivity of fractures potentially increasing baseflow and pit leakage into the bedrock layers below the bottom of the pit		
9056	Project baseline data used for both the Mine Site and the Tailings Basin are insufficient. A comparison of hydrologic data that was collected for two other projects in the region demonstrates that the PolyMet project is data-poor in the area of basic hydrology, much less mitigation. Moreover, given the utility of the many existing studies of area hydrology, it is perplexing that the preparers have continually refused to use them, even as tribal cooperating agencies have repeatedly requested that they be used. Just a few publicly available examples include: the Minnamax Project; the LTVSMC Dunka Pit; historic MNDNR fisheries documents; and data required under the Cliffs Erie Consent Decree. All these resources should be used to supplement the hydrologic analysis and fully inform the permitting agencies and the public.	The Co-lead Agencies rely upon the expertise and experience of their staff that bring to bear their knowledge of various studies and analyses performed on mine sites in Minnesota and elsewhere. This knowledge is applied in the review of documents prepared to evaluate the NorthMet Project Proposed Action potential effects. It should be noted that the NorthMet Project Proposed Action is different from other mining projects in this part of Minnesota in the following ways: different ore type, designs for groundwater containment systems, and use of long-term mechanical treatment. While experiences gained on other projects are informative, they do not necessarily apply to the NorthMet Project Proposed Action. This is particularly true for groundwater containment systems because the NorthMet Project Proposed Action uses a design that differs from those at other Iron Range mine sites. The mitigation designs of the NorthMet Project Proposed Action are unlike measures discussed in the Regional Copper-Nickel Study (MEQB 1979, as cited in the FEIS). The NorthMet Project Proposed Action measures include: long-term mechanical water treatment, uniquely designed groundwater containment systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet Project Proposed Action Site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the NorthMet Project Proposed Action Site would necessarily entail the same types of failures that have occurred at some historical Iron Range mines. In fact, the unique designs and high-quality construction measures proposed are a response to past events. The detailed and sophisticated modeling work performed to support the FEIS exceed those conducted for some existing mines in Minnesota. The models used for the NorthMet Project Proposed Action represent years of development, with input from PolyMet, Co-lead Agencies and Cooperating Agencies. Based on comments received on the SDEIS, modifications were made to the models to improve FEIS impact evaluations. It is the Co-lead Agencies' position that incomplete or inaccurate predictions made in the	WR 023 WR 071

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		past at historical mining operations do not provide a basis for judging the quality of modeling to be used in the NorthMet FEIS. The FEIS reflects consideration of information pertaining to the Dunka Pit that was directly relevant to the NorthMet Project Proposed Action. It is noteworthy that many aspects of operations at the Dunka Pit are dissimilar to the NorthMet Project Proposed Action in terms of hydrogeology and mine design.	
9059	The proponent's claim that 90 percent of the seepage from this tailings basin can be captured is unrealistic, to say the least. Tribes requested any example of the "90 percent or better" capture efficiency rate to be provided by the Co-Lead Agencies, but they were not able to provide a single example anywhere in the world. In fact, the only authority the Co-Leads have ever cited is from an EPA guidance document that provided: Most barriers in the study have been in place for fewer than 10 years; therefore, long-term performance can only be extrapolated… All sites included in the study were existing sites that had vertical barriers and, in many cases, caps. None of the sites has an engineered bottom barrier. Therefore, the effect of leakage through aquitards was not evaluated in this study. That report also indicated that "10% of the containment systems reviewed failed to meet the performance objectives and required corrective action, and 19% of the evaluated facilities did not have sufficient data to conclude whether the containment system was operating successfully or not." In other words, even the Co-Leads' own authority does not support a 90 percent capture efficiency rate here. Actual examples in northeastern Minnesota, from U.S. Steel Minntac and the LTVSMC tailings basin seep SD0026 (the very tailings basin PolyMet proposes to re-use), demonstrate capture rates of less than 60 percent. Elsewhere, and similar to the Project's proposal, the Zortman-Landusky Mine in Montana installed containment	The design of the Tailings Basin capture system includes: 1) a slurry wall keyed into bedrock, 2) a collection trench on the tailings side, 3) permanent pumping of the collection trench to depress the groundwater level on the tailings side, and 4) a discharge pipe on the downgradient side to raise groundwater levels to near ground surface. As shown by the cross-section MODFLOW models, this design insures a reversal of hydraulic gradients across the slurry wall (complete capture in surficial deposits) and complete or very high capture efficiency in bedrock below the slurry wall. The examples cited in the comment for Northeastern Minnesota are very different designs and cannot be compared to the proposed design for the Tailings Basin. Modeling performed for the NorthMet Project Proposed Action capture system indicates that the overall capture efficiency would be substantially greater than 90 percent.	WR 017 WR 018 WR 020

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	and pump-back systems to be used in conjunction with a wastewater treatment facility. However, they "did not capture all surface and subsurface drainage." The Molycorp, Inc. Mine site in New Mexico concluded that "[t]he pathway for contaminant migration is the leaching of tailing seepage downward from the tailing facility to ground water that migrates through fractures to surface water." Therefore, it appears extremely unlikely that PolyMet will be able to capture 97 percent of the shallow seepage and 90 percent of the deep seepage from an unlined, leaking tailings basin.		
9062	The SDEIS provides that seepage from the existing LTV tailings basin continues to drain south to Second Creek long after LTVSMC operations have ceased. Because the seepage will continue to be pumped back under the PolyMet Proposed Action, it "is not considered further in this discussion." In Chapter 5, the SDEIS ensures the reader that the seepage collection system installed at the south side of the existing tailings basin has "essentially eliminated the flow of Tailings Basin seepage into Second Creek." However, the Project proponent is well aware that that the seepage pump-back system is not nearly as effective as claimed in the SDEIS. Because the pump-back system hasn't created the water quality improvements that were needed, the current owner of the tailings basin, Cliffs Erie, now offers two proposed modifications: (1) dewater the pond that is an additional source of water contributing to water quality concerns (pending an EPA wetlands determination); or (2) create another barrier (dam) for collection and pump back between the existing dam and monitoring station SD026. Contrary to SDEIS claims, all of the seepage from SD026 is not being captured and therefore must be considered further in the SDEIS and project	It is acknowledged that there is currently incomplete capture of impacted water at SD-026. The FEIS has been modified to reflect this fact. Cliffs Erie is currently addressing this issue by upgrading the performance of the existing capture system and, if necessary, constructing new systems to enhance capture. If 100 percent capture is not attained by the Cliffs Erie upgrades, PolyMet has committed to installing additional systems in Second Creek to achieve this level of performance regardless of the types of measures required.	WR 117

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	modeling. In fact, most of the tailings basin seepage flowing to SD026 is not being captured. Additional work will have to be done to achieve desired water quality improvements. It is unknown at this time if the modifications to the seepage capture system that have been proposed for SD026 will result in the required water quality improvements, or substantially increase capture efficiency. Contrary to SDEIS claims, all of the seepage from SD026 is not being captured and therefore must be considered further in the SDEIS and project modeling.		
9063	The SDEIS provides that construction of a groundwater containment system along the north, northwest, and west sides of its unlined tailings basin "would capture virtually all of the Tailings Basin seepage"… without installing a single monitoring well in the bedrock to test this assumption...the SDEIS's conclusion that the method would be effective essentially is unsupported.	The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in PolyMet 2015j, as cited in the FEIS. These new models consider the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed capture system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin capture systems would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed capture system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation, and depth to top of bedrock. This information was used to develop MODFLOW cross-section models at three locations on the alignment to assess capture efficiency. The models included bedrock below the slurry wall.	WR 010 WR 018 WR 061 WR 071 WR 079 WR 090 WR 099 WR 108
9069	Moreover, the tailings basin model uses storage coefficients that are not found anywhere in peer-reviewed scientific literature. This is significant because how much groundwater a geologic formation can contain (storativity or storage	In response to these issues, the Plant Site MODFLOW model was modified and recalibrated as follows: 1) Updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain and river cells along the East Embankment to allow surface seepage of tailings water, 4)	WR 018 WR 019 WR 093 WR 095 WR 097

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	coefficient) and the rate of flow (hydraulic conductivity) is a function of the amount of open-pore spaces or fractures/faults in rock, the amount of water that infiltrates from the surface, and the groundwater gradient. The storage coefficients claimed for the entire plant site including the tailings basins is 0.20 for bedrock and 0.0002 for the surficial deposits, meaning that the bedrock contains orders of magnitude more water than the surficial deposits. When questioned about these extraordinary storage coefficients the explanation was that the model was calibrated to match predicted and measured groundwater levels. In sum, this model simulates a bedrock storage tank where lots of water goes in and virtually nothing comes out. Because this is not possible, these modeled hydraulic conductivity and/or modeled storage coefficients cannot reliably estimate the amount of seepage that will bypass the seepage capture system, nor the amount of time before seepage upwells in nearby wetlands or in the Embarrass River. Additionally, the model, although using "artesian" coefficients, does not allow the artesian water to surface, even in an area east of the tailings basin where head pressure suggests that the water would be 150 feet above the ground surface.	incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use of river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin. As a result of these changes, the FEIS Plant Site MODFLOW model no longer has a no-flow boundary condition at the toe of the East Embankment, and river and drain cells in surficial deposits are in place to allow the potential for surface seepage along the embankment toes (See Attachment A, Plant Site Water Modeling Data Package [PolyMet 2015j, as cited in the FEIS]). The model was checked to ensure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	
9073	There is unquestionably a need for a slurry wall at the existing tailings basin if it is to be re-used by PolyMet - but in order to work even reasonably well, it would have to be flawlessly "keyed" into the bedrock without creating new fractures, and operate at an unrealistically high efficiency, in order to capture most of the seepage from the surficial aquifer. As noted previously, "[t]he pathway for contaminant migration is the leaching of tailing seepage downward from the tailing facility to ground water that migrates through fractures to surface water, and even though the	The design of the Tailings Basin capture system includes: 1) a slurry wall keyed into bedrock, 2) a collection trench on the tailings side, 3) permanent pumping of the collection trench to depress the groundwater level on the tailings side, and 4) a discharge pipe on the opposite side to raise groundwater levels to near ground surface. As shown by the cross-section MODFLOW models, this design insures a reversal of hydraulic gradients across the slurry wall (complete capture in surficial deposits) and complete or very high capture efficiency in bedrock below the slurry wall. The model results predict that the overall capture efficiencies of the proposed Tailings Basin capture systems would be substantially greater than 90 percent. The design and modeling analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified.	WR 019 WR 020 WR 102

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	SDEIS states that 90% of the seepage from the surficial aquifer will be captured there are no plans to capture any seepage flowing through bedrock fractures. In fact, bedrock is the part of this seepage capture system that is supposed to prevent seepage from escaping from the east side of the tailings basin. At the Plant Site, most groundwater flow occurs in an unconfined surficial groundwater system composed of unconsolidated sands, silts, and clays, and has a saturated thickness on the order of 7 meters. Below the surficial groundwater system is a low-permeability fractured bedrock unit consisting of several rock types. Groundwater flow rates in the bedrock unit are much less than flow in the overlying surficial groundwater system.		
9074	"Semi-analytical flowpaths" for the tailings basin have been constrained in the Modflow model so that water cannot seep out of the east side of the tailings basin. However, winding underneath the east side of the tailings basin is a bedrock valley that used to be the headwaters of Trimble Creek…More water likely flows out of the east side of the tailings basin than does out the southern toe at monitoring site SD026. Therefore, without constructing the slurry wall containment system around the east end of the tailings basin, hundreds of gallons per minute of polluted water will drain into the Embarrass River watershed.	The water quality modeling has been updated for the FEIS to include the potential for water to seep from the east side of the Tailings Basin. The FEIS Section 5.2.2.3.3 describes that a containment system would be constructed around a portion of the east side of the Tailings Basin for seepage collection.	WR 102 WR 104 WR 133
9077	Even though the PolyMet project proposes to use a double-liner to prevent leakage from the [HRF], head pressure from the existing seeps and springs at this site mean that the liners, even installed perfectly will not last long before rupturing.	Comment themes GT11 and GT12 also provide information pertaining to the design, installation, and operation of the Hydrometallurgical Residue Facility with respect to seeps and stability considerations. Monitoring and maintenance would include routine inspections of the Hydrometallurgical Residue Facility, including the liners and collection system. The Residue Management Plan (PolyMet 2014r, as cited in the FEIS) presents the monitoring and maintenance plan proposed for the Hydrometallurgical Residue Facility at this time. Additional monitoring and maintenance requirements would be outlined by the responsible	PD 17

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		regulatory agency as part of facility permitting. The liner system components have been selected specifically to perform well, given the characteristics of the residue, which consists primarily of gypsum. The liner system components selected for the Hydrometallurgical Residue Facility are routinely used for similar facilities in other industries and have demonstrated the expected levels of performance. The design produces a liner system with virtually no leakage due to the system's ability to maintain a very low hydraulic head on the composite liner portion of the overall liner system. The two liner layers on the Hydrometallurgical Residue Facility would be separated by a leakage collection system, which is designed to collect any potential leakage from the bottom of the cell, as well as leakage from LTVSMC Cell 2W. Each liner layer would consist of a geomembrane layer above a geosynthetic clay layer. A drainage collection system would also be installed during reclamation to collect drainage above the upper liner. The cap would consist of a geotextile fabric, overlain by a clay barrier layer, and a 40-mil low-density polyethylene layer. This would be covered with additional LTVSMC coarse tailings or common borrow and cover soils to sustain a vegetated cover. During reclamation and long-term closure, leakage would be routed and cycled through the Plant Site WWTP. The FEIS includes additional details from the updated Residue Management Plan.	
9081	20 feet of pit wall will never be submerged and as such constitutes a perpetual source of mine related contaminants. Because of continued inputs from the stockpiles, the tailings basins, and the pit walls, the pit lake could exceed surface water quality standards for thousands of years. Therefore, it is likely that the wastewater treatment facility ("WWTF") would need to operate for thousands of years in order to treat leachate from the tailing basin, stockpiles, and contaminated pit water.	When the West Pit Lake water level reaches the outlet elevation (between 1573 and 1578 ft amsl), approximately 200,000 ft^2 of wall rock would remain above the water level and exposed to the atmosphere, including some Category 1, Category 2/3, Category 4 Duluth Complex, and ore (See Figure 1-4 and Figure 1.3b, respectively, in Barr 2012c, as cited in the FEIS). The load to the West Pit Lake produced by oxidation in this wall rock above the lake surface is incorporated explicitly in the GoldSim model of the Mine Site. The model estimates for loads from each wall rock type (along with other sources to the West Pit) are presented in Attachment I, figures I-02-01.2 through I-02.27.2 in PolyMet 2015m, as cited in the FEIS. The estimate of load from exposed wall rock in the West Pit Lake decreases over time in the GoldSim Mine Site model, reflecting the depletion of sulfide minerals in wall rock by oxidation. Wall-rock loading continues beyond mine-year 40, when the West Pit would be full; but for most solutes the predicted wall rock loading is much smaller than the load expected for	WR 035 WR 036 WR 173

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		water flow to the West Pit Lake from the East Pit wetland. Thus results presented in the FEIS, including predicted solute concentrations in the West Pit Lake, the West Pit groundwater flowpath, and the Partridge River, do include the load from wall rock exposed above the pit lake surface. Water quality modeling performed in support of the FEIS indicates that water treatment systems in some form and at some scale would be needed at the Mine Site and Plant Site indefinitely. The water models constructed to assess the potential effects from the NorthMet Project Proposed Action were not designed to predict the duration of treatment nor do they capture all the factors that influence the duration of treatment, for example potential future regulatory and technological changes. Therefore, the models cannot be used to predict a year treatment would end. Actual treatment requirements would be assessed on a reoccurring basis throughout operations and closure based on results of ongoing discharges, performance and water resource monitoring ensuring continuous protection of ground and surface water quality and compliance with applicable water quality standards. This reassessment process would rely on measured monitoring results (evaluated through modeling) rather than the results of the predictive modeling included in the FEIS. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there are adaptive and contingency mitigation measures available to address unexpected impacts to water resources.	
9083	As stated previously, many mitigation measures were not identified in the SDEIS, including the LEDPAs, nor are they evaluated using the required NEPA "hard look." There is no agency-preferred alternative identified in the SDEIS either. Combined, this makes it exceptionally difficult, and meaningless, to provide any input on the 404 permit or the corresponding 401 certification.	Neither Minnesota Rules nor CEQ regulations require the Co-lead Agencies to identify a preferred alternative in the SDEIS (40 CFR 1502.14(e)). The FEIS includes available details regarding the identification of an Agency Preferred Alternative. The FEIS contains sufficient information to identify and substantiate the LEDPA. The USACE is not required to identify a LEDPA in the FEIS; the final determination on the LEDPA would be made in the ROD for the USACE, which serves as the USACE's decision document and the basis for the Department of the Army permit decision. The USFS would utilize the FEIS to show the factors relating to how the public interest would be served by the Land Exchange and the ROD for the USFS would incorporate the findings of those factors and identify the preferred alternative. The MDNR is not required to identify a preferred alternative under MEPA. The FEIS Sections 3.2 and 3.3 further detail this process. The agency preferred alternative and LEDPA process is described in FEIS Sections 7.4 and 7.5. The ROD would include the Section 404(b)(1)	COE 04

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		analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD for the USACE. The ROD would recommend issuance, issuance with conditions, or denial of the Project. The USACE is not anticipating the need to re-issue the Section 404 public notice for the NorthMet Project Proposed Action. However, MPCA would need to re-issue the Section 401 public notice for the Project. Under the provisions of the Clean Water Act, the MPCA has one year from the public notice (December 3, 2014) to act upon an application for 401 Certification. However, the MEPA (*Minnesota Statutes*, dvision116.04, subdivision 2b) and rules regarding environmental review (*Minnesota Rules*, part 4410.3100) prohibit final agency decisions, such as the Section 401 Certification, until all environmental review steps are completed. The environmental review process being undertaken by the Co-lead Agencies would not be completed within the one year time frame for issuance of the Section 401 Certification. Therefore, PolyMet has made a procedural decision to withdraw the Section 401 application before MPCA and resubmit it in the near future to allow for processing of the application.	
20089	After an agency preferred alternative and the LEDPAs are identified, the USACE should re-notice the 404 permit and MPCA should re-notice the 401 certification.	The agency preferred alternative and LEDPA process is described in FEIS Sections 7.4 and 7.5. The ROD for the USACE will include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD. The ROD for the USACE will recommend issuance, issuance with conditions, or denial of the Project. The USACE is not anticipating the need to re-issue the Section 404 public notice for the NorthMet Project Proposed Action. However, MPCA will need to re-issue the Section 401 public notice for the Project. Under the provisions of the Clean Water Act, the MPCA has one year from the public notice (December 3, 2014) to act upon an application for 401 Certification. However, the MEPA (*Minnesota Statutes*, division 116.04, subdivision 2b) and rules regarding environmental review (*Minnesota Rules*, part 4410.3100) prohibit final agency decisions, such as the Section 401 Certification, until all environmental review steps are completed. The environmental review process being undertaken by the Co-lead Agencies will not be completed within the one year time frame for issuance of the Section 401 Certification. Therefore, PolyMet has made a procedural	COE 04

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		decision to withdraw the Section 401 application before MPCA and resubmit it in the near future to allow for processing of the application.	
9091	There has been no analysis of the 1854 Ceded Territory as a discrete area of impact. The Band continues to ask that it be included. Tribal Cooperating Agencies believe the Cumulative Effects Analysis for land use should encompass the 1854 Ceded Territory	The Co-lead Agencies have previously consulted with the Bands on the 1854 Ceded Territory as a discrete area of impact (i.e., traditional cultural property) and its use as an expanded area for determination of potential resource-specific Project effects. With regards to the 1854 Ceded Territory as a discrete area of impact, the Cultural Resources sections of FEIS Chapters 4 and 5 address the Co-lead Agencies' consideration of the 1854 Ceded Territory as a traditional cultural property. With regards to the 1854 Ceded Territory's use as the cumulative effects analysis area for land use, the vast majority of the 1854 Ceded Territory, along with the potential resources that may be within these areas, would not be directly or cumulatively affected by the Proposed Connected Actions. At this time, the Co-lead agencies believe that additional identification and evaluation efforts within these areas would be outside of the scope of this review. The Land Use section of FEIS Chapters 4, 5, and 6 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's direct, indirect, and cumulative areas of potential effect.	PER 08
9093	Tribal Cooperating Agencies consider a 216,300 acre area bounded by the St. Louis River, Lake Superior, Lake Vermilion and the Beaver Bay to Vermilion Trail to be a Tribal Historic District, and the pertinent area for consideration of cumulative effects to cultural resources.	The historic district proposed by the Grand Portage Band in a June 27, 2013 letter was addressed (Grand Portage 2013, as cited in the FEIS). The federal Co-lead Agencies have considered an expanded area for analysis of cumulative effects on cultural resources and natural resources of significance to the Bands, including use of the 1854 Ceded Territory as the CEAA. Use of the 1854 Ceded Territory as the CEAA for cultural resources would actually diminish the significance of any cumulative effects. By evaluating the effects of the NorthMet Project Proposed Action along with other past, present, and reasonably foreseeable future projects in the context of a much larger area with a much larger number of resources similar to those affected by the NorthMet Project Proposed Action, the effect of the NorthMet Project Proposed Action on those resources is diminished. The cumulative effects analysis focuses on the specific resources, or types of resources, affected by the NorthMet Project Proposed Action within an area that is geographically meaningful considering the project under review. Cumulative effects are discussed and addressed differently based on the affected resource. Discussions related to socioeconomics, for instance, use an expanded analysis area compared to other resources. Such expanded analysis areas are used as appropriate. The Cultural Resources sections in	CR 04

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		FEIS Chapters 4, 5, and 6 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's direct, indirect, and cumulative areas of potential effect.	
9097	The SDEIS also fails to analyze cumulative effects on water quality and quantity. The relevant spatial scale for water quality and hydrologic cumulative effects analysis is the entire St. Louis River watershed.	The cumulative effects section in the FEIS (Section 6.1.1.1) describes the rationale for the identification of Cumulative Effects Assessment Areas (CEAAs). The CEAAs for individual resource areas vary based on the potential for cumulative effects, and not on a single overall assessment area. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area. Please also refer to Section 8.3, MDO 12 for the Co-lead Agencies' rationale for the CEAA identified for water resources.	CU 01
9101	Also missing is cumulative-impacts analysis of culturally-important plant and animal species that are listed as "Species of Concern." There is no basis to dispute that the Project will have cumulative effects on the moose herd and Tribal harvest in the 1854 Ceded Territory. At a time when moose populations in Minnesota are declining, this analysis is particularly important and should have been done as part of this SDEIS.	The FEIS wildlife sections provide an analysis of wildlife species used for subsistence/harvest, as well as those culturally important to the Bands. FEIS Section 4.2.9.3.3 identifies species potentially harvested in the 1854 Ceded Territory, while FEIS Section 5.2.9.2.2 explains that a lack of data regarding use of such species in the NorthMet Project area likely indicates limited present day use in that area due to general inaccessibility. FEIS Section 5.2.5.2.5 discusses the types of potential effects to common and/or game species, which are similar to effects on ETSC species. The FEIS has been revised to include additional detail regarding moose, and this discussion has been moved to the state ETSC species discussion, due to its new state listing status.	WI 03
9104	The Cumulative Effects Assessment Area defined by the Co-Leads for impacts to aquatic species is overly limited. It includes only the Partridge and Embarrass Rivers...The appropriate spatial scale for considering cumulative impacts to aquatic species is the entire St. Louis River watershed and Lake Superior Basin.	The NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the lower St. Louis River Watershed (below the confluence with the Embarrass River). As a result, the Cumulative Effects Assessment Area (CEAA) for aquatic species is defined by the Partridge River and Embarrass River watersheds.	AQ 26
9105	The SDEIS states that the current fish tissue concentration in five local lakes results in Hazard Quotients ("HQs") that exceed 1, but gives no further information...In fact, Barr Engineering's July 2012 "Cumulative Impacts Analysis, Local Deposition and Bioaccumulation in Fish" showed modeled contributions from both the Mesabi Nugget Large Scale Demonstration Plant ("LDSP") on the site and PolyMet. And the Barr	Information pertaining to the specific Hazard Quotients summarized in Barr 2012b, as cited in the FEIS, has been included in FEIS Section 6.2.6, summarizing the cumulative effects assessment for mercury deposition.	MERC 02

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	report further provides the actual HQs, rather than just saying "they exceed 1."...This information should be explicitly included in the SDEIS for public review.		
9107	Meeting ambient noise standards is a different question than assessing impacts. Impacts should be fully characterized and contour maps showing overlapping noise pollution from different projects provided. Without this information, it is not possible to review the cumulative impacts of noise.	FEIS Section 6.2.8 has been updated, and provides more detailed analysis on the cumulative noise and vibration impacts on nearby residents and recreational visitors. In addition, see the response to theme N 03.	N 03
9109	The cumulative risk analysis of transportation of hazardous materials has not been analyzed. This should include rail car spills, pipeline ruptures, and truck transport accidents.	FEIS Section 5.2.13.2.1 addresses transportation and incident response of hazardous materials. Accidental spills or incidents resulting from rail or truck transportation of hazardous material or any materials would initially be assessed by the nearest local community fire department or other emergency responder, using the 2012 Emergency Response Guidebook (PHMSA 2012c, as cited in the FEIS), if necessary. The NorthMet Project Proposed Action would not involve the use of pipelines for hazardous materials. Depending on the severity of the local responder's initial assessment, additional resources may be requested via the State Duty Officer and/or the National Response Center. If needed, the Homeland Security and Emergency Management Division of the Minnesota Department of Public Safety, along with other appropriate state and federal agencies and the carrier company, among others, would be notified. Additional emergency resources would come from the City of Duluth-based HazMat team.	HAZ 06
9111	Post-closure impacts should also be included in the cumulative effects analysis because some mine features (e.g., pit lakes) would become permanent features of the landscape.	The FEIS describes the cumulative effects of the NorthMet Project Proposed Action, including those expected during closure and post-closure. The FEIS discloses post-closure effects in Section 6.2.	CU 16
9115	A key piece of the work that still has not been completed, despite some progress, is the traditional cultural property ("TCP") studies...An appropriate investigation of the Project site using this standard, and in cooperation with all involved THPOs, must be performed and properly documented. As noted in the chapter, consultation is underway on this topic, but is far from complete.	The federal Co-lead Agencies have made a reasonable and good-faith effort to identify cultural resources potentially affected by the NorthMet Project Proposed Action. The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting on the NorthMet Project Proposed Action. Historic properties affected by the NorthMet Project Proposed Action have been identified and the impacts to those properties have been assessed through the traditional Section 106 methods/process. This also includes an assessment of actual use of those historic properties, as well as other resources in the APE, by	CR 05 CR 06

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		tribal members. In addition to traditional methods, elder interviews were conducted in 2010 and 2011 with members of the Bois Forte, Fond du Lac, and Grand Portage. Elders recalled that some Band members had utilized the general NorthMet Project area for hunting, fishing, and plant gathering of wild rice, maple-sugar, berries, and birch bark; however, they could not provide specific locations or uses within the NorthMet Project area. The federal Co-lead Agencies also conducted reconnaissance of trail corridors with participation from the Bands. The purpose of the traditional research and survey was to provide historic documentation and context for and to identify places important to the Bands. The elder interviews were to be used to further identify and understand tribal use areas and places of importance. The field investigation component was informed by the results of those efforts.	
9117	The SDEIS must include language to the effect that the Band continues to take the position that the Ceded Territory is itself a TCP and does not agree with the USACE's determination that it is not.	FEIS Section 4.2.9.2.3 states that the "the consulting Bands [have] proposed the 1854 Ceded Territory as a historic property."	CR 02 CR 05 CR 06
9120	The Project Area of Potential Effect ("APE") for cultural resources is divided into two separate sections surrounding the proposed mine site and the proposed plant site. These areas do not encompass the true extent of the APE...Until the cumulative effects analysis of the Project is better represented, the agency preferred alternative is defined, and the LEDPAs identified, it is premature to delineate the APE.	FEIS Section 4.2.9.2.3 provides a detailed discussion and analysis of the area in which cultural resources may be affected by the NorthMet Project Proposed Action. The APE takes into account both direct and indirect effects using a geographically expansive area that accounts for direct effects, as well as visual, audible, atmospheric, hydrological, and water quality effects. The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been modified to encompass the proposed Mine Site and Plant Site, the Dunka Road Corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline.	CR 02 CR 03
9124	The Beaver Bay to Lake Vermilion Trail ("BBLVT")...is "associated with the lives of persons significant in our past"...To date, the BBLVT has not been fully researched or rigorously field-verified within the project area. Additional fieldwork should be conducted in the spring or fall when ephemeral features such as foot trails are less easily concealed by vegetation and	The federal Co-lead Agencies believe that the work to justify consideration of the BBLV Trail Segment as an historic property is complete. There has been sufficient background research and fieldwork completed to date as discussed in FEIS Section 4.2.9.2.3. Additional research and fieldwork may be part of any resolution of adverse effect.	CR 05

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	more easily discerned.		
9132	Wild rice is a culturally significant resource for the tribes in Minnesota. From historical reports, Band member accounts, and current MNDNR and tribal reports, wild rice has declined significantly throughout Minnesota, and in southern Minnesota wild rice has virtually disappeared. The Embarrass River, Second Creek, the Partridge River, and the St. Louis River all contain wild rice beds downstream of the Project...The MPCA has determined that the 10 mg/l standard can be applied seasonally, only when wild rice is in its growing season…Correspondingly, the SDEIS provides: PolyMet is not seeking application of the seasonal component of this standard for the NorthMet Proposed Action as currently proposed and evaluated in this SDEIS. During closure, PolyMet has indicated a desire to transition to non-mechanical treatment once pilot-testing and modeling indicate water quality standards could be met, which potentially could include application of the wild rice seasonal standard, but these are beyond the scope of this SDEIS…Several other sections indicate that the Project closure goal is to transition from mechanical water treatment to passive water treatment systems…The Band fundamentally disagrees with any seasonal sulfate release in wild rice waters, whether now or later. There is no scientific basis for stating that seed is not affected by high sulfate levels while it lays dormant over the winter, or that the effects of high-sulfate water would not remain or continue into the summer…Field data collected by Barr Engineering in 2011 indicates that mining effluent has already impacted the Embarrass River, exceeding the Minnesota WQS criteria for the protection of wild rice by orders of magnitude. Any language casting doubt on the current applicability of this standard, or suggesting that	The FEIS recognizes the MPCA is overseeing a variety of studies on wild rice beds. At applicable surface water locations, the FEIS evaluated impacts using an evaluation criterion based on the current MPCA 10 mg/L standard for sulfate concentration in waters used for the production of wild rice. This impact assessment metric is keyed to the current regulation and does not rely upon a seasonal application of the standard for the mechanical or non-mechanical treatment options. It is recognized that MPCA is currently evaluating the current wild rice sulfate water quality standard and as part of that process, new information on potential contributing factors on the growth of wild rice has been generated. However, that information has not yet been holistically reviewed in the context of its possible influence on the wild rice standard. Future change to the wild rice sulfate standard, if any, is speculative and outside the scope of the FEIS; applying research findings outside the basis of the current rule is not appropriate. The FEIS includes descriptions of the Plant Site WWTP and Mine Site WWTF, both of which would be capable of discharging treated wastewater at concentrations at or below 10 mg/L as demonstrated by pilot-testing already conducted. More detailed information on these treatment systems would be available as part of the permitting process. However, should a more stringent standard be developed in the future, operation of the reverse osmosis treatment systems, or equivalently performing technologies, can be adjusted to meet a more stringent effluent limit. FEIS Sections 5.2.2 and 5.2.4 includes a description of the NorthMet Project Proposed Action's effects on wild rice beds. The response to themes WR 152, WR 156, and WR 157 discuss wild rice beds and the sulfate standard for wild rice beds. FEIS Section 5.2.2 states that for MPCA previously recommended wild rice beds, the proposed engineering controls would prevent an increase in sulfate concentrations in the Partridge River and would decrease sulfate concentrations in the Embarrass River.	VEG 04 WR 152 WR 153 WR 157

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	seasonal discharge is acceptable, should be removed. Wild rice in the Embarrass River endures despite degraded water quality…Impacts to wild rice in the vicinity of the Project must be more rigorously analyzed and reported, and cumulative impacts to wild rice in the 1854 Ceded Territory also need to be addressed. The Project must also provide mitigation for impacts to wild rice.		
9135	There still has not yet been sufficient evaluation of Band member use of vegetation and other usufructuary resources in the APE, and there is no permissible basis to omit such evaluation where the USACE and other federal permitting agencies have a trust responsibility to the Band to maintain treaty resources in the 1854 Ceded Territory.	The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6 also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the review of the NorthMet Project Proposed Action. The federal Co-lead Agencies have made a reasonable and good-faith effort to identify natural resources of cultural importance to the federally recognized Bands potentially affected by the NorthMet Project Proposed Action. The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting on the NorthMet Project Proposed Action. This included an assessment of actual use of historic properties, as well as other resources in the APE, by tribal members. Elder interviews were conducted in 2010 and 2011 with members of the Bois Forte, Fond du Lac, and Grand Portage. Elders recalled that some Band members had utilized the general NorthMet Project area for hunting, fishing, and plant gathering of wild rice, maple-sugar, berries, and birch bark; however, they could not provide specific locations or uses within the NorthMet Project area. The elder interviews were to be used to further identify and understand tribal use areas and places of importance.	CR 01
9138	in the SDEIS Socioeconomics chapter, none of the issues identified [in Executive Order 12898] Executive Order have been addressed...It is the Band's position that any impacts to natural	FEIS section 5.2.10.2.6 discusses the NorthMet Project Proposed Action's potential Environmental Justice (EJ) impacts, as required by EO 12898. The NorthMet Project Proposed Action is within the 1854 Ceded Territory. FEIS Section 4.2.10.1.6 as well as Table 4.2.9-1 in FEIS Section 4.2.9	SO 09

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	resources will disproportionately affect tribes due to their subsistence consumption of wild rice, fish, and other wildlife, and gathering of traditional plants and medicines within the 1854 Ceded Territory.	summarize available information about subsistence patterns and resources within the 1854 Ceded Territory. Construction of the NorthMet Project Proposed Action would make the Mine Site unavailable for subsistence use. The degree to which construction of the NorthMet Project Proposed Action would affect individual subsistence resources (i.e., fish, game, and plant species) outside of the Mine Site, Transportation and Utility Corridor, and Plant Site is discussed in FEIS Section 5.2.9 (Cultural Resources). FEIS Section 5.2.10.2.6 discusses consumption of fish. Increased mercury concentrations and associated increases in mercury bioaccumulation in fish tissue could constitute an EJ impact for Band members and other subsistence consumers of fish.	
17731	Furthermore, the tailings basin seepage capture rate of 90 percent assumed in the preferred alternative has not been demonstrated anywhere in the U.S. and is simply not possible because the tailings basin was built without a liner. In fact, at the Project site, the existing seepage capture system that was installed as a requirement of the Cliffs Erie Consent Decree for SD026 is so ineffective that Cliffs Erie is proposing to build an additional dam and capture system further downstream.	The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in PolyMet 2015j, as cited in the FEIS. These new models consider the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed capture system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin capture systems would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed capture system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation data, and depth to top of bedrock. This information was used to develop MODFLOW cross-section models at three locations on the alignment to assess capture efficiency. The models included bedrock below the slurry wall.	PD 08 WR 018
17732	In fact, at the Project site, the existing seepage capture system that was installed as a requirement of the Cliffs Erie Consent Decree for SD026 is so ineffective that Cliffs Erie is proposing to build an additional dam and capture system further downstream. Therefore, paste tailings placed on a	A thickened tailings (paste tailings) alternative (A1) was considered but eliminated in the DEIS and post-DEIS as it was determined not to offer significant environmental benefits over the NorthMet Project Proposed Action. A co-disposal of waste rock and tailings on a lined Tailings Basin alternative (E14) was considered but eliminated in the DEIS because the	ALT 06 ALT 16

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	liner and covered could have a profound, minimizing effect on pollution reaching the Embarrass River watershed wetlands and the Embarrass River. The SDEIS does not even mention this modern technique used by many mines in U.S. and around the world, without justification. Converting to paste tailings technology from conventional slurry tailings at most mines makes sense both environmentally and economically. Paste tailings use less water; require less land; do not require engineered containment dams; generate less acid and contaminants; reduce long-term costs and allow for early reclamation. Slurry tailings use and discharge large volumes of water, require dust control measures, require large land areas and containment dams for disposal, and create contaminated water that must be captured and treated.	technical feasibility and cost of doing so were uncertain. Several different Tailings Basin alternatives (TB2-TB6) were reconsidered but eliminated since the DEIS. These Tailings Basin alternatives did not afford meaningful environmental benefits compared to the enhanced engineering controls (seepage collection and RO mechanical water treatment) built into the NorthMet Project Proposed Action. Dry cap seepage was predicted to result in substantially higher concentrations, which would make the future transition from mechanical to non-mechanical water treatment more difficult during post-closure.	
17733	Perpetual pumping of the mine pits to prevent formation of a pit lake is required by the State of New Mexico, Office of Natural Resource Trustee, for the Chino and Tyrone copper mines expressly to protect groundwater and waterfowl.29 Numerous western mines have discharged plumes of polluted water into the bedrock aquifer from leaking mine pits, tailings basins and waste rock piles, a problem that is not only difficult but expensive to fix. Requiring perpetual pump out of the mine pit would minimize leakage of contaminated water into the surrounding bedrock aquifer thereby protecting groundwater that the State is required to protect as source of drinking water.	An interagency memorandum was prepared regarding the West Pit Water Elevation Alternative (MDNR et al. 2014, as cited in the FEIS). This alternative includes both the option to maintain a dry West Pit through perpetual pumping and maintaining pit water levels below the elevation of the Partridge River. The alternative was screened against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The screening level assessment concluded that the alternative would meet all criteria except for the environmental or socioeconomic benefit criterion. Continuous dewatering of the West Pit would keep the pit walls exposed instead of covered by a pit lake as in the NorthMet Project Proposed Action. This exposure would potentially result in increased solute loading to a smaller pit lake volume, and thus higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time. The Co-lead Agencies recommend that the alternative be considered as an adaptive mitigation measure in the event that monitoring during operations and reclamation indicate that implementing this action is better able to meet future environmental objectives compared to the NorthMet Project Proposed Action.	ALT 04

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17734	This alternative would prevent the need for a separate seepage capture system around an unlined waste rock pile, as proposed in the preferred alternative, that would have to work at an above optimum capture rate in perpetuity. Capping and re-vegetating the mine pits after backfilling with waste rock would prevent deep infiltration of precipitation. In combination, perpetual pumping and backfilling the Category 1 waste rock pile would substantially reduce the risk of polluting groundwater and wetlands in the Partridge River watershed.	The two alternatives are not fully compatible together, as backfilling of the Category 1 waste rock into the West Pit would eliminate the opportunity to perpetually pump the West Pit lake. The West Pit Backfill alternative (E20) was considered but eliminated during the development of the DEIS. It was eliminated from further consideration because it was determined that it would not offer significant environmental or socioeconomic benefits compared to the NorthMet Project Proposed Action and because backfilling the West Pit would prevent recovery of additional mineral resources. These factors are sufficient to qualify the West Pit Backfill alternative as unreasonable under NEPA, and justify its exclusion under *Minnesota Rules*, part 4410.2300, subpart G. It was reconsidered in the SDEIS in response to comments from the Cooperating Agencies. A Co-lead Agencies memorandum (MDNR et al. 2013b, as cited in the FEIS) was prepared to summarize the decision-making process, which is referenced in the FEIS Section 3.2.3.4.2. The Co-lead Agencies screened the alternative against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The opportunity to reclaim wetlands and vegetation at the Category 1 Stockpile footprint area would be the only measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, because of the temporal impact that the stockpile would have, these impacts would be required to be mitigated regardless of future backfilling or not. An interagency memorandum was prepared regarding the West Pit Water Elevation Alternative (MDNR et al. 2014, as cited in the FEIS). This alternative includes both the option to maintain a dry West Pit through perpetual pumping and maintaining pit water levels below the elevation of the Partridge River. The alternative was screened against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The screening level assessment concluded that the alternative would meet all criteria except for the environmental or socioeconomic benefit criterion. Continuous dewatering of the West Pit would keep the pit walls exposed instead of covered by a pit lake as in the NorthMet Project Proposed Action. This exposure would potentially result in increased solute loading to a smaller pit lake volume, and thus higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time. The Co-lead Agencies recommend that the alternative be considered as an adaptive mitigation	ALT 04 ALT 06 ALT 13

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		measure in the event that monitoring during operations and reclamation indicate that implementing this action is better able to meet future environmental objectives compared to the NorthMet Project Proposed Action.	
17735	The OSLA will contain peat that has sequestered mercury. When water flows through the OSLA the seepage will transport some of the mercury from the peat.	This comment was originally presented as part of the Tribal Position Summary included in MDO 2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. Some of the temporarily stored organic material would decompose on site, which would release mercury into solution. Any dissolved mercury would be transported in solution with precipitation that falls on the Overburden Storage and Laydown Area (PolyMet 2015r, as cited in the FEIS). Any mercury released from the peat decomposition process is thought to be transported with precipitation that falls on the Overburden Storage and Laydown Area. The Overburden Storage and Laydown Area would be unlined; therefore, there would be some potential for seepage to enter the groundwater system from peat that has decomposed and released as a pulse of mercury. Water contacting the Overburden Storage and Laydown Area is considered to be process water and would be routed to Pond PW-OSLA. In years 1 to 11, the water from Pond PW-OSLA would be routed to the Tailings Basin, and any mercury in the routed water would have the chance to be sequestered in the tailings. In years 12 to 20, some of the water from Pond PW-OSLA would be used to backfill the East Pit. Any mercury in the water routed to the East Pit would mix with waste rock and become sequestered at depth in the East Pit. In addition, any contributions of water in years 21 to 65 from the East Pit to the West Pit would reflect water from the East Pit and its associated watershed runoff, and would not reflect process water from Pond PW-OSLA. Because peat removal from the areas to be mined would be completed between years 5 and 11, any potential release of mercury from stored peat materials would have occurred, or be ending, by the time water is routed from Pond PW-OSLA to the East Pit beginning in year 12. All water that is discharged would meet the GLI mercury standard of 1.3 ng/L.	MERC 24
17736	As the Project is currently proposed, after operations, the mine site wastewater treatment plant will be converted to RO to treat the west mine pit lake and Category 1 stockpile seepage for discharge to the west pit outlet creek that flows	The WWTP would include an RO treatment unit (or equivalent performing technology) that would provide mechanical treatment of Tailings Basin seepage during operations and closure and tailings pond water in closure. Some of this treated effluent would ultimately be discharged to several Embarrass River tributaries to augment flow. The WWTP would be	ALT 13

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	into the Partridge River. An alternative that was not considered in the SDEIS would use RO at the plant site to begin with to treat storm water, mine infiltration, and waste rock pile seepage. Using RO treated water for stream and wetland water augmentation in the Partridge River watershed would provide mitigation for the some of the adverse effects of mine pit dewatering.	operational from year one. During operations, water from the mine pits and Waste Rock stockpiles would be treated at the WWTF. Effluent from the WWTF and runoff from the Overburden Storage and Laydown Area would be pumped to the Tailings Basin for reuse. During this time, extensive monitoring would be required, and adaptive management would be used to ensure minimization of effects and compliance into the future. During reclamation, water from the West Pit would be treated at the WWTF, which would be upgraded to include an RO treatment unit (or equivalent performing technology). Treatment at this unit would result in an effluent that meets all applicable water quality standards. This effluent would ultimately be discharged to the Partridge River. Responses to comment themes WR186 and WR187 address impacts on flow in Partridge River and describe that augmentation is not required; however, flows would be monitored. Flows in Second Creek, which is a tributary to the Partridge River located to the south of the Tailings Basin would be augmented to pre-containment levels. Many alternatives and mitigation measures were considered throughout the EIS, including many relevant to mitigating potential water impacts, Refer to FEIS Section 3.2.3.3 for more information on the development of the NorthMet Project Proposed Action and alternatives. Refer to FEIS Table 3.2-16 for the engineering controls adopted into the NorthMet Project Proposed Action since the DEIS in order to reduce emissions and mitigate impacts. During operations, extensive monitoring would be required, and adaptive management would be used to ensure minimization of effects and compliance into the future.	
17737	As the Band already argued in the Tribal Position, significant additional study of the underground mining alternative is mandated, and the SDEIS offers no new discussion of the reasons for rejecting the alternative. The economic viability of an underground mine depends on a variety of factors including ore grade, market prices, cost of tailings, and waste rock disposal. A study of this particular deposit was performed by the prior owner of the site, U.S. Steel, which actually recommended underground mining.43 PolyMet is well aware of this study, given that the	The Underground Mine alternative was first considered but eliminated during the FSDD process. FEIS Section 3.2.3.4.1 describes how it was reconsidered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer	ALT 01

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	company included it in a 2003 filing with the Securities and Exchange Commission. In fact, by examining cross-sections showing the distribution of ore by depth,45 it appears that there are substantial ore reserves at depths that likely could not be accessed by the proposed open-pit mine. The ecological costs of open-pit mining and above-ground disposal of tailings and waste rock are immense. This ecological cost, combined with the most current understanding of deposit ore grades and reasonably possible metals prices, and the costs associated with perpetual treatment must be evaluated to determine the viability of [the underground] alternative.	environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. The FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may results from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
17738	the SDEIS does not disclose appraisal information [for the Land Exchange]	Disclosure of appraisal information in the EIS is not required. Any decision, documented in the ROD, to move forward with a land exchange will be supported by a current appraisal, approved by the USFS, which verifies that the exchange meets the equal value requirements of applicable federal law and regulation. Requests for appraisal reports and appraisal review reports are processed under Freedom of Information Act procedures.	LAN 03
17739	Of the approximately 6,025 acres of MCBS Sites of High Biodiversity Significance under the Land Exchange Proposed Action, nearly 2,000 acres of coniferous bog wetlands will be lost to the federal estate, and therefore effectively lost to the Bands, if the proposed land exchange takes place. This is significant because many tribally harvested resources are only available in coniferous bogs (e.g. cranberries, labrador tea, creeping snowberry), and restoration of coniferous bogs is a very difficult and long process that has extremely	FEIS Sections 4.2.4 and 4.3.4 discuss and provide maps of MBS Sites (Figures 4.2.4-1, 4.2.4-2, 4.2.4-5, 4.3.4-1, and 4.3.4-2) to provide clarity on the location and extent. FEIS Sections 5.2.4 and 5.3.4 include information about the impacts to MBS sites and native plant communities. The vegetation analysis cross-references the cultural resources section (5.2.9) to ensure consistency and to discuss potential impacts on tribally harvested resources. FEIS Section 5.2.3 discusses restoration of coniferous bogs in mitigation wetlands. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide	CR 01 WET 05 WET 14 VEG 02

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	low success rates.	for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.	
17740	The proposed action land exchange would trade water resources within the Lake Superior Basin for wetlands and surface water outside the Lake Superior Basin [resulting in] a loss of 3,791 acres of federally-managed wetlands within the Lake Superior Basin under the proposed exchange.	The proposed land exchange non-federal lands are not mitigation sites and are not required to be exchanged within the same watershed. The non-federal lands being considered are all lands that are located within the proclamation boundary of the SNF and would consolidate land ownership management.	WET 15
17741	Furthermore, the SDEIS acknowledges that the Land Exchange Proposed Action would create a "net increase of third-order streams and decrease in first- and second-order streams which would likely add more habitat diversity to the Superior National Forest." But the SDEIS underestimates the impact of this increase: "Headwater streams are the smallest parts of river and stream networks, but make up the majority of river miles in the United States. Many headwater streams have been lost or altered due to human activities … and this can impact species and water quality downstream." The SDEIS states that the decrease of first-order streams to the federal estate would "slightly reduce the amount of available spawning habitat for some aquatic species as headwater streams provide specialized spawning habitat for some species." Again, this underestimates the impacts. While greater diversity is desirable, protection of headwater streams is critical because they powerfully influence both the character and	The SDEIS and FEIS acknowledge a possibility that habitat could be affected from water chemistry changes resulting from the Land Exchange Proposed Action. Habitat loss from flow changes or riparian activities is not expected as a result of the NorthMet Project Proposed Action. It is noted that under the Land Exchange, the net reduction to the Superior National Forest of 0.3 miles of first order streams may result in slightly less habitat available for headwater stream dependent species.	WR 114 AQ 29

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	functions of downstream waters. Headwater streams transport vegetation, woody debris, organic matter, macroinvertebrates, and other organisms downstream, while providing spawning areas for brook trout. Headwaters provide most of the water to rivers, which in turn provides temperature mitigation and oxygenation which are necessary for healthy fish communities.		
17742	The SDEIS also erroneously concludes that no known cultural resources exist on the nonfederal lands, despite impacts to wild rice waters, and the proposed exchange will not sufficiently compensate for the loss. The Land Exchange Proposed Action would result in additional wild rice beds by the acquisition of Tract 1. Tract 1 contains Little Rice Lake, which supports a continuous population of wild rice. Wild rice also grows along the Pike River south of Little Rice Lake and in isolated populations on Hay Lake. The wild rice waters in Tract 1 are accessible to the Bands via the Pike River. Therefore, adding Tract 1 to the federal estate does not provide additional wild rice harvesting opportunities to Band members in the 1854 Ceded Territory.	No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. The Land Exchange Proposed Action would result in the public ownership of additional wild rice beds by the acquisition of Tract 1. Tract 1 contains Little Rice Lake, which supports a continuous population of wild rice. Wild rice also grows along the Pike River south of Little Rice Lake and in isolated populations on Hay Lake. Section 4.3.4.2.5 provides further discussion of wild rice beds on Tract 1. As a result, the public would have better opportunities for wild rice harvesting on Tract 1, where there is currently no opportunity to harvest wild rice directly on the federal lands (i.e., no known wild rice populations) despite the public water access onto the federal lands. A carry-down boat launching access is located on Tract 1, which may provide private access for wild rice harvesting on the Tract 1 lands. Access to wild rice beds on the federal lands would not be lost as a result of the Land Exchange Proposed Action, but access to wild rice beds on Tract 1 would be gained. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice	LAN 05 VEG 08 WR 155

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		stands are known to occur on the federal lands, and suitable habitat is limited.	
17743	It is commonly acknowledged that "[w]ater has been called 'mining's most common casualty'... Mining affects fresh water through heavy use of water in processing ore, and through water pollution from discharged mine effluent and seepage from tailings and waste rock impoundments." Acid mine drainage ("AMD") is one of the greatest environmental liabilities associated with mining, especially in pristine environments like the Project mine site, that have economically and ecologically valuable natural resources. There are no hardrock surface mines that exist today that can demonstrate that AMD can be stopped once it occurs on a large scale. Inaccurate pre-mining characterization and interpretation often results in a failure to recognize or predict impacts to water quality and aquatic life. Evidence from literature and field observations suggests that permitting large scale surface mining in sulfide-hosted rock with the expectation that no degradation of surface water will result due to acid generation imparts a substantial and unquantifiable risk to water quality and fisheries. In a report comparing predicted and actual water quality at hardrock mines, there were two types of characterization failures that were key to explaining differences between the predicted water quality in EIS documents and the actual water quality either during or after mining began. These included: 1. Insufficient or inaccurate characterization of the hydrology: The authors reported primary causes of hydrologic characterization failures as overestimations of dilution, lack of hydrological characterization, overestimations of discharge volumes, and underestimations of storm size. 2. Insufficient or inaccurate geochemical characterization of the	The Co-lead Agencies have requested additional hydrologic and geochemical data and the incorporation of those data into EIS analyses periodically throughout the environmental review process. The criteria the Co-lead Agencies used to determine what data is included in the FEIS are as follows. Is the updated data: • Significantly different than the data already used in the model? • An integral component of a calibrated variable? • Linked to other data such that updating one necessitates updating the other? • Considered background information important to assessing the project's impacts? • Part of a greater dataset such that updating all of the dataset is necessary for consistency? • A type of input variable where GoldSim is sensitive? • Necessary for permitting-level analyses? Data collection and use in the FEIS are summarized in various data sufficiency documents. Nevertheless, a degree uncertainty in the predictions of environmental effects remains, as it would for any study of this type. The Co-lead Agencies have addressed this uncertainty is several ways. Water quality modeling results (concentrations) are presented in terms of a probability, which communicates the likelihood actual concentrations could be higher or lower than best estimate modeling results. Sensitivity analyses were performed on temperature and precipitation inputs, baseflows in the Partridge River and other inputs to provide greater certainty in the model results. The FEIS identifies monitoring and reliable mitigation measures that have been incorporated in the NorthMet Project Proposed Action, possible improvements to these measures and additional mitigation that could be implemented if effects to water quality are worse than predicted. Additionally, on-going monitoring would be used in modeling to help predict any issues before they occur. The Co-lead Agencies have been working to produce accurate predictions of water quality impacts of the NorthMet Project Proposed Action for	AQ 01 AQ 08 WR 071 WR 126 WR 128 WR 134 WR 136

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	proposed mine: The primary causes of geochemical characterization failures were identified as lack of adequate geochemical characterization, in terms of sample representativeness and sample adequacy. The primary causes of mitigation failures were that mitigation measures were not identified, were inadequate, or were not implemented; waste rock mixing and segregation was not effective; liners leaked; tailings were spilled; or embankments failed, and land application discharge was not effective. The SDEIS suffers from all of these characterization failures. An egregious lack of hydrologic characterization allows PolyMet to pretend that there will be no water pollution resulting from the Project. In fact, the SDEIS arbitrarily concludes water quality will actually improve as a result of the Project. The following is a short list of the problems with water modeling in the SDEIS.	nearly a decade. A decrease of concentrations of some water quality parameters at some evaluation locations is not a surprise and PolyMet is adding environmental mitigation measures at an existing tailings basin that has seepage with elevated levels of some water quality parameters. The FEIS considers the release of acidity from proposed NorthMet facilities in that leachate from all acid-generating material (Waste Rock and pit wall rock composed of Category 2/3 and Category 4 material) would be captured and treated prior to discharge. The permanent surficial waste facilities (Category 1 Stockpile and Tailings Basin) would contain material that is not expected to produce acidic leachate. The non-acid generating waste was identified using multi-year kinetic tests (humidity cells) on NorthMet rock samples. Waste rock with 0.12 percent sulfide S or less is the threshold for selecting non-acid generation mine waste and, is supported by long-term humidity cell tests on NorthMet waste (i.e., 38 samples of Category 1 waste rock, with tests now run between 187 and 337 weeks; and 33 humidity cell tests run between 84 and 304 weeks [PolyMet 2015q Attachments C and F, as cited in the FEIS]). These tests demonstrate that tailings and Category 1 waste rock materials do not generate acidic leachate, and acid generation rates decreases over time as sulfide S minerals are depleted. The NorthMet Project Proposed Action design thus prevents the introduction of acidic leachate to surface water that could affect fisheries. A detailed financial assurance analysis would be part of the permitting phase. The financial assurance process would fully consider long-term monitoring and periodic replacement of equipment including, but not limited to, water treatment hardware and synthetic liners/covers. The Financial Assurance package for the NorthMet Project Proposed Action would insure that future funding would be available if and when adaptive mitigation measures or component replacements are needed to achieve performance specifications. Taking the data, modeling, proposed monitoring, mitigation, adaptive management and financial assurance together, the NorthMet EIS sufficiently discloses and accurately predicts to the degree necessary potential effects to water quality for purposes of environmental review.	
17744	Moreover, data collected specifically for the	Data at GW-008, GW-009 and GW-010 were not used for water quality	WR 072

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	Project was selectively used, with several well and surface water monitoring stations' data completely excluded from the water quality models used to predict Project impacts. Specifically, all data collected from groundwater monitoring wells GW008 (13 sampling events), GW009 (12 sampling events), and GW010 (9 sampling events), were excluded from the models. These monitoring wells are northeast and north of the tailings basin between the tailings basin and the Embarrass River. Furthermore, none of the nine surface water quality sampling events collected at PM 11, a sampling station on unnamed creek located northwest of the tailings basin half-way between the tailings basin and the Embarrass River, were used in the Projects models. Also excluded from the models were data from nine sampling events collected at Station PM 12.1 in the Embarrass River upstream of the tailings basins. Instead, the model includes 53 sampling events in the Embarrass River at PM-13.85 PM-13 is 7.3 river miles downstream of the northwest corner of the tailings basin, and 16.2 river miles from monitoring location PM-12.2 - long past the first water quality compliance points in the Embarrass River.	modeling because these wells were not considered useful for developing probabilistic distributions for background surficial groundwater quality or establishing concentration targets for the calibration of existing conditions. For example, GW-009 and GW-010 are out in the adjacent watershed away from the tailings basin, impacted both by tailings basin seepage and background surficial groundwater. GW-008 is located essentially at the toe of the tailings basin, but the water quality data suggests it is not primarily tailings basin seepage but a mixture. Chloride data is around 0.8 mg/L to 1 mg/L. Chloride data in background wells is generally less than 1 mg/L if not non-detect at less than 0.5 mg/L. Chloride data in wells composed of seepage show concentrations closer to 20 mg/L. Therefore GW-008 is closer to background water quality with respect to chloride. However, sulfate data in GW-008 does not appear to show concentrations as low as is observed in the other background wells (GW-002 or GW-015 for example). In GW-008, sulfate concentrations are middle teens to nearly 20 mg/L, whereas sulfate data in the background wells is generally below 10 mg/L and closer to 5 mg/L. Therefore, though this well is close to the tailings basin, it appears to be a mix of seepage and background water, and therefore not useful for characterizing one or the other. Model results were checked against the observed data at PM-11, PM-13, PM-19, and MLC-2 in the validation step which had been presented earlier on in the modeling process. The report "Corroboration of Existing Conditions at the Plant Site", dated June 2012, includes a comparison of the model results to the observed water quality data and was reviewed by the agencies and used in the initial reviews of the modeling work to approve the modeling. Data at PM-12.1 was not used because the major sources of water contributing to this location are the natural contributing watershed and outflow at SD033. The water quality data at PM-12 was used to calibrate the water quality of the natural watershed, and the observed data at SD033 was used to define the water quality input to the model. The observed data at PM-12.1 was not needed to define any additional inputs to the model, but perhaps may have been used to validate the model if this specific location had been modeled. However, this location was not included as one of the modeled surface water locations.	WR 076
17745	An additional problem is that the models intended to predict impacts from the Project were not calibrated to existing water quality in Colby Lake.	The Mine Site GoldSim model used for the SDEIS (Barr 2013f, as cited in the FEIS) was modified for the FEIS (Mine Site GoldSim model) (PolyMet 2014v, as cited in the FEIS) include a new chemical loading source in	WR 046

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	Most of the data used to represent Colby Lake in the model was extrapolated from sampling sites well upstream in the Partridge River.	Colby Lake and was calibrated to the measured chemical concentrations in the lake. This calibration considered new surface water chemistry data collected through the end of 2013. The same chemical loading source was applied to both the Continuation of Existing Conditions model and Proposed Action model (PolyMet 2014v, as cited in the FEIS). The chemical loading source was constant and did not exhibit seasonal or long-term variations for future conditions. Incorporation of the loading source addressed the issue by providing predicted chemical concentrations in Colby Lake for existing conditions that are similar to currently measured concentrations. The average arsenic concentration based on 33 samples in Colby Lake is 0.95 µg/L. The GoldSim Continuation of Existing Conditions modeling scenario (PolyMet 2014v, as cited in the FEIS) predicts an average concentration of 0.80 µg/L at P50 over the 200 year modeling period.	
17746	Despite this selective use of water modeling data, the SDEIS claims "[t]he NorthMet Project Proposed Action is also not predicted to result in any significant changes to groundwater and surface water flows when compared to existing conditions." To achieve this prediction, the hydrologic models for the Project were built using modeled inputs rather than actual measurements or estimates from scientific literature. This makes the Project models unable to accurately characterize groundwater flow direction, water tables, potentiometric surface in the aquifers, fluxes to rivers and streams drawdown mounding impacts to the water tables or surface waters, or to predict water quality impacts. The models for the Project must be re-calibrated using all available measured data and scientifically credible basic model inputs.	The GoldSim models are informed by a combination of groundwater flow (MODFLOW) models, surface water runoff (XP-SWMM) models, and direct field measurements (groundwater levels, field borehole tests, groundwater and surface water sampling, and laboratory geochemical tests). For the FEIS, virtually all models (except XP-SWMM) were re-calibrated based on new field data obtained through the end of 2013. Where field data were not available, GoldSim inputs were based on a combination of literature values, experience at similar field sites, and best professional judgment. Reliance on site-level data provides a finer scale of resolution than afforded by regional assessments and associated estimates from scientific literature. Potentially important factors that are captured using site-level data include geologic, topographic, and hydrologic characteristics of the Partridge and Embarrass Rivers' basins respectively. The hydrologic assessments reflect: 1) the thin, discontinuous glacial drift; 2) the shallow depth to bedrock; 3) the low, hummocky topography; 4) the extensive wetlands; and 5) the generally shallow groundwater table. The re-calibration step allows for the modeling to achieve the most reasonable range of model inputs and outputs as the basis of impact assessment.	WR 056 WR 071 WR 086 WR 105
17747	Chapter 5 of the SDEIS acknowledges that "[t]he NorthMet Project Proposed Action would have the potential to affect groundwater and surface water hydrology and quality in both the Partridge River and Embarrass River watersheds." However, the	The Co-lead Agencies have discussed and assessed the USGS gage data for purposes of predicting potential water quality impacts to the Partridge River and have re-confirmed the use of this data as the best available for its intended purpose (MDNR et al. 2015a, as cited in the FEIS). The GoldSim models are informed by a combination of groundwater flow	WR 003 WR 052 WR 071 WR 073 WR 086

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	hydrology model that was developed to determine Project impacts relied on outdated data collected too far from the site. Because the Project proponent was not required to install stream gauges at the site, they used a model (XP-SWMM) to extrapolate baseflow far upstream from where the data was collected to the areas where the proposed mine pit(s) and tailings basin would be located. The extrapolated baseflow used twenty-year-old stream gauging data collected seventeen miles downstream of the mine site in the Partridge River, and stream gauging data that is more than fifty years old collected eleven miles downstream of the plant site in the Embarrass River... Therefore, the results are highly unlikely to be representative of current conditions at the mine or plant site.	(MODFLOW) models, surface water runoff (XP-SWMM) models, and direct field measurements (groundwater levels, field borehole tests, groundwater and surface water sampling, and laboratory geochemical tests). For the FEIS, virtually all models (except XP-SWMM) were re-calibrated based on new field data obtained through the end of 2013. Where field data were not available, GoldSim inputs were based on a combination of literature values, experience at similar field sites, and best professional judgment. Reliance on site-level data provides a finer scale of resolution than afforded by regional assessments and associated estimates from scientific literature. Potentially important factors that are captured using site-level data include geologic, topographic, and hydrologic characteristics of the Partridge and Embarrass Rivers' basins respectively. The hydrologic assessments reflect: 1) the thin, discontinuous glacial drift; 2) the shallow depth to bedrock; 3) the low, hummocky topography; 4) the extensive wetlands; and 5) the generally shallow groundwater table. The re-calibration step allows for the modeling to achieve the most reasonable range of model inputs and outputs as the basis of impact assessment.	WR 091
17748	During subzero temperatures January 25-26 and February 15-16, 2011, the minimum baseflow measured by the MNDNR in the Partridge River at the point nearest the proposed mine pits was of 3.4 cubic feet per second (cfs). Values calculated by staff from Great Lakes Indian Fish and Wildlife Commission ("GLIFWC") and MNDNR from low flow stream gauge data in the Partridge River ranged from 1.2 to 1.8 cfs, while the XP-SWMM model predicted a baseflow of 0.5 cfs. Not only is the Project modeled baseflow inconsistent with published literature, none of the measured data supports the baseflow predicted by XP-SWMM at SW003 of 0.5 cfs. XP-SWMM's extrapolation of unrealistically low baseflows was used to calibrate the MODFLOW model and therefore influences virtually all aspects of the Project water quality and quantity characterization and impact prediction, including: groundwater flow rates and pit inflow, dewatering impacts to the rivers and wetlands, water treatment needs, contaminant	The GoldSim models are informed by a combination of groundwater flow (MODFLOW) models, surface water runoff (XP-SWMM) models, and direct field measurements (groundwater levels, field borehole tests, groundwater and surface water sampling, and laboratory geochemical tests). For the FEIS, virtually all models (except XP-SWMM) were re-calibrated based on new field data obtained through the end of 2013. Where field data were not available, GoldSim inputs were based on a combination of literature values, experience at similar field sites, and best professional judgment. Reliance on site-level data provides a finer scale of resolution than afforded by regional assessments and associated estimates from scientific literature. Potentially important factors that are captured using site-level data include geologic, topographic, and hydrologic characteristics of the Partridge and Embarrass Rivers' basins respectively. The hydrologic assessments reflect: 1) the thin, discontinuous glacial drift; 2) the shallow depth to bedrock; 3) the low, hummocky topography; 4) the extensive wetlands; and 5) the generally shallow groundwater table. The re-calibration step allows for the modeling to achieve the most reasonable range of model inputs and outputs as the basis of impact assessment. The only other available gaging data is from a station installed during 2011 at SW003 on the Partridge River.	WR 003 WR 004 WR 091

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	transport times and concentrations, and contaminant dilution. Higher baseflows in the Partridge River indicate that the wetlands and river are connected to the groundwater aquifer, that mine pit inflow will be greater; and that groundwater will travel through the aquifer will occur at a much faster rate. During subzero temperatures January 25-26 and February 15-16, 2011, the minimum baseflow measured by the MNDNR four miles south of the LTVSMC tailings basin 13.9 to 15 cfs in the Embarrass River. Model estimated the average annual baseflow for the Embarrass River, based on data more than 50 years old, at 8.7 cfs.	Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore PMP pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. A sensitivity analysis for the Mine Site was also conducted to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. It also reflected consideration of the flow data collected at SW003 in requiring groundwater baseflows at all locations on the Partridge River be increased by a factor of 4 (e.g., 0.5 to 2.0 cfs at SW-003). The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.	
17749	Surface water quality at the Project remains insufficiently characterized or left uncharacterized, and the defects in analysis in this area are profound. The limited data the SDEIS uses indicates that surface waters have already been adversely impacted by mining activity--which should give rise to more scrutiny, not less. Contaminant transport modeling suggests that the Project will cause manganese, aluminum, and sulfate to exceed Minnesota Water Quality Standards ("MN WQS"). Mercury, sulfate, and specific conductance have already exceeded surface water criteria in surface water samples collected near the tailings basin at nearby Area Pit 5, and mercury and aluminum exceed surface water criteria in the Partridge River downstream of Colby Lake. Aluminum, iron, manganese, and mercury all exceed MN WQS in Colby Lake. Contaminants from the Project will likely contribute additional loading to these existing exceedances of MN WQS in the Embarrass River,	The FEIS identifies potential impacts to water resources and measures available to anticipate and control these same impacts. It is a fundamental regulatory premise that water resources are ruled to not be negatively impacted if water quality evaluation criteria are met at applicable evaluation locations. If water quality evaluation criteria are not met under current non-project conditions, it is ruled that project is not creating an impact if the range and average concentrations are not greater for project compared to non-project conditions and the frequency of exceedances are not greater for project compared to non-project conditions. Surface water quality evaluation criteria apply instream after the groundwater discharge has mixed with ambient surface water (independent of proximity to the NorthMet Project Proposed Action property boundary). The evaluation criteria that are used in the FEIS are based on a combination of health-based water quality standards for drinking water sources (such as groundwater and Colby Lake) and mercury in surface water (fish consumption) and on aquatic life-based standards for surface waters. Evaluation criteria can be found in Section 5.2.2. Groundwater evaluation criteria apply to groundwater at the project property boundary and the GoldSim models predict that these criteria would be met. For the different flowpaths, groundwater travel times to	WR 064 WR 075 WR 109 WR 123 WR 197

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	Colby Lake, and the Partridge River. And, as a result of the Project, it appears that arsenic will exceed drinking water standards in Colby Lake. No water samples have been collected from lakes near the tailings basin (including Hiekkilla, Mud, Kaunonen, or Hay Lakes) to determine if the pollutants found in the surface and groundwater at the existing tailings basin have caused contamination of those waterbodies. The SDEIS even acknowledges current exceedances: "…the existing LTVSMC Tailings Basin is not lined and currently releases seepage with elevated concentrations of sulfate, TDS, and hardness, among other constituents." It just does not propose any effective means of remediating them.	groundwater evaluation locations and surface water discharge points are presented in the FEIS, including the times for initial change in chemical concentrations and the times to reach peak concentrations. Once chemicals discharge from groundwater to surface water, it is assumed that migration is instantaneous to surface water evaluation locations. Regarding the lakes listed, sampling of them would not have added substantially to the overall Plant Site characterization for the purpose of impacts assessment. It should be noted that Spring Mine Lake is located upstream of the east side of the Tailings Basin and has been sampled for water quality.	
17800	The Band is profoundly concerned at the preparers' refusal to consider past state agency experience with this site that had disastrous consequences for water quality. The Band has located an MPCA document from the Minnamax Exploration Project, a test shaft drilled into the Duluth Complex, the rock formation where the mine would be sited, by AMAX Corporation in the 1970s, approximately three miles from the Project mine site. This document states that water was encountered 147 feet below the surface infiltrating into the test shaft at approximately 14 gallons per minute and identified another potentially water bearing fracture zone at 900 feet below the surface. This means that the volume of bedrock groundwater that may be encountered by the Project mine pit has been vastly underestimated.	Comments cite MPCA 1976a (Office Memorandum: AMAX Exploration, Incorporated Salt Water Spill. From Curtis Sparks, EIS Coordinator, to Louis Breimhurst, Director. September 8, 1976 [MPCA 1976a]), which pertains to the historical Minnamax/Amax exploration project located 1 to 2 miles east of the NorthMet project sites. The relevant text in this memo is as follows: "The depth of the [exploration] shaft, at the time of the inspection was approximately 520 feet. At the 147 foot level, a fracture zone was encountered. Approximately 14 gallons a minute of water was infiltrating into the shaft. The fracture was grouted and sealed. In the core drilling operation, the fracture was noted, however, it was not identified as a water bearing fracture. In the core drilling, another fracture zone was identified at the 900 foot level. It is possible that additional water would be encountered at 900 feet." It is uncertain if the observations made during this shaft excavation can be realistically applied to bedrock at the NorthMet Project Proposed Action site. The historical Minnamax/Amax project was located many miles away from the NorthMet Project Proposed Action and it is uncertain if geologic units and structures penetrated by the shaft are similar to those in the location of the NorthMet Project Proposed Action. Further, it is not stated in the memo if the 14 gpm inflow was a sustained flow or if it decreased over time as commonly occurs in fractured rocks. The comments do not indicate if the fracture zone identified by core drilling at 900 feet caused	WR 007 WR 010

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		significant inflows when the shaft reached that depth. It would be speculative to characterize the NorthMet Project Proposed Action Site using observations made in the referenced MPCA memorandum. Refer to WR010 and WR007 for additional information on faults and fractures.	
17802	Other MPCA documents detail an unexpected saline water discharge that resulted as part of the AMAX Exploration Project from a water pocket 1,391 feet below the surface. The large quantities of saline water discharged, as much as 275 gallons per minute to Langley Creek, killed much of the vegetation en route. Data show severe impacts to wetlands in the vicinity of the project. Water from stockpiles that were minuscule in comparison to the stockpiles proposed for the PolyMet Project drained water with very high concentrations of nickel, cobalt, copper, zinc, and sulfate, and discharged that water into Langley Creek and the Partridge River. The project polluted streams, groundwater, and a large wetland complex in its vicinity in order for the MNDNR to study potential impacts and mitigation strategies for non-ferrous mining. Yet the data collected from the AMAX project was not used to predict water quality or wetlands impacts presented in the PolyMet SDEIS.	The comment cites MPCA 1976b. (Office Memorandum: Minnamax Exploration Project Tour. From Curtis Sparks, EIS Coordinator, to Louis Breimhurst, Director. November 24, 1976), which discusses saline water encountered in an air-driven downhole hammer borehole at the Minnamax/Amax site. The relevant text in this memorandum is as follows: The [saline] discharge began after hitting a confined pocket of water at the 1391 foot level on July 13, 1976. Although large quantities of water, as much as 275 gallons a minute, were being discharge, the drilling operation was continued to July 15. It is uncertain if observations described in the MPCA memorandum are relevant to the NorthMet Project Proposed Action Site including bedrock types and hydrogeologic conditions. The maximum depths of NorthMet Project Proposed Action pits (approximately 700 feet) would be far less than the 1,391-ft depth at which saline water was encountered at the Minnamax/Amax site. It is also uncertain if the 275 gpm flow rate was short-term or maintained for an extended period of time. Note that inflows to the PolyMet mine pits would be treated by the WWTF during operations, reclamation, and closure, so if saline water were encountered, it would be treated and discharged at concentrations meeting applicable water quality standards. See FEIS Section 5.2.2.3.2 for a discussion of potential impacts from saline waters. The FEIS relies on AMAX-derived data in a variety of circumstances. Examples include: 1) assessment of pH-dependent concentration caps for Category 1 waste rock, 2) use of exploratory shaft data on stockpile hydrology for estimating evapotranspiration rates, and 3) comparison of modeled sulfate release to observed released values in collected drainage from AMAX stockpiles.	WR 007
17807	Also ignored was experience with the Dunka Pit, located on the old LTVSMC site approximately five miles north and east of the PolyMet Project mine site. In the Dunka Pit, LTVSMC contacted the Duluth Complex and the Virginia Formation while mining for taconite in the Biwabik Iron Formation. By 1991, LTVSMC had removed	The Co-lead Agencies rely upon the expertise and experience of their staff that bring to bear their knowledge of various studies and analyses performed on mine sites in Minnesota and elsewhere. This knowledge is applied in the review of documents prepared to evaluate the NorthMet Project Proposed Action potential effects. It should be noted that the NorthMet Project Proposed Action is different	CU 06 WR 023

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	about 50 million tons of Duluth Complex material from the Dunka pit and placed it in "gabbro" stockpiles. Monitoring of the drainage from these stockpiles beginning in 1976 revealed a decrease in pH and an increase in trace metals. Copper and nickel concentrations as high as 1.7 and 40 mg/l respectively were observed in seepage/run-off from the Duluth Complex waste rock stockpiles and pH was observed as low as 5.0 at seep 1 between 1976 and 1980. Most of the seepage from waste rock piles at the Dunka site was discharged to Bob's Bay in Birch Lake via Unnamed Creek. A 1976-1977 study of trace metals in Bob's Bay found that concentrations of copper, nickel, cobalt, and zinc in the water of the Bay were higher than regional average concentrations and decreased with distance from the mouth of Unnamed Creek. Additionally, it was determined that Unnamed Creek contributed more than 90 percent of the trace metals to Bob's Bay load. The October 2001 NPDES permit for this discharge expired in 2005 and another variance request is expected. The 2001 Dunka mine area permit has a variance provision allowing toxic pollutants to exceed the final acute value. A Waste Water Treatment Facility ("WWTF") located at the site has been inactive because Cliffs Erie, LLC, the owner after LTVSMC, declared bankruptcy and claims it is simply too expensive to continue running. Unfortunately, the passive wetland treatment system did not function well enough to remove nickel and copper in waters still discharging from the mine pit and stockpiles to a concentration that comports to comply with Minnesota WQS, and was rebuilt in 2010. Unfortunately, by 2012, copper, nickel, zinc, sulfate, and hardness concentrations from the treatment wetlands discharges (SD 8 and SD 9), were exceeding WQS. In accordance with a Consent Decree with	from other mining projects in this part of Minnesota in the following ways: different ore type, designs for groundwater containment systems, and use of long-term mechanical treatment. While experiences gained on other projects are informative, they do not necessarily apply to the NorthMet Project Proposed Action. This is particularly true for groundwater containment systems because the NorthMet Project Proposed Action uses a design that differs from those at other Iron Range mine sites. The mitigation designs of the NorthMet Project Proposed Action are unlike measures discussed in the Regional Copper-Nickel Study (MEQB 1979, as cited in the FEIS). The NorthMet Project Proposed Action measures include: long-term mechanical water treatment, uniquely designed groundwater containment systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet Project Proposed Action Site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the NorthMet Project Proposed Action Site would necessarily entail the same types of failures that have occurred at some historical Iron Range mines. In fact, the unique designs and high-quality construction measures proposed are a response to past events. The detailed and sophisticated modeling work performed to support the FEIS exceeds that conducted for some existing mines in Minnesota. The models used for the NorthMet Project Proposed Action represent years of development, with input from PolyMet, Co-lead Agencies and Cooperating Agencies. Based on comments received on the SDEIS, modifications were made to the models to improve FEIS impact evaluations. It is the Co-lead Agencies' position that incomplete or inaccurate predictions made in the past at historical mining operations do not provide a basis for judging the quality of modeling used in the NorthMet FEIS. The FEIS reflects consideration of information pertaining to the Dunka Pit that was directly relevant to the NorthMet Project Proposed Action (including Dunka Mine field data that was used to develop scaling factors for the Category 1 Stockpile. It is noteworthy that many aspects of operations at the Dunka Pit are dissimilar to the NorthMet Project Proposed Action in terms of hydrogeology and mine design.	

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	the MPCA, Cliffs Erie is required to submit a plan for compliance with toxicity final concentration limits at SD008 and SD009 without a variance. Water quality impacts from prospecting and mining operations that have contacted the Duluth Complex are well known to the MNDNR and MPCA. The State of Minnesota spent $4.3 million over three years in the late 1970s to produce the Regional Copper-Nickel Study, a 5-volume compilation of technical information regarding the potential impacts of copper-nickel mining in the Duluth Complex. Nevertheless, predicted water quality impacts and ineffective mitigation methods referenced in the Study were ignored when the technical documents and SDEIS were drafted for PolyMet. Therefore, water quality impacts have likely been underestimated and the mitigations proposed may not be effective.		
17811	Similarly, the Mining Simulation Project (funded in part by a Minnesota Legislative appropriation of $185,000 to the MNDNR and MPCA) was a cooperative study to identify and resolve environmental issues associated with non-ferrous mining and to anticipate industry and government data needs to address those issues before commercial development occurred in Minnesota. The study clearly identified those state ground and surface water quality regulations that would apply to copper-nickel mining operations in Minnesota, including applying the 10 mg/l sulfate criterion to effluent discharges where wild rice is present, and prioritized nondegradation of both surface and groundwater and protection of groundwater as a drinking water source, and rejected using natural wetlands for mine effluent treatment ("as a toxic metals dumping ground").	Evaluation criteria are based on applicable water quality standards. Evaluation criteria can be found in Section 5.2.2. Where a water body is classified as Domestic Consumption (1B) or for groundwater, USEPA primary drinking water standards apply. The USEPA primary drinking water standards set mandatory maximum contaminant levels for drinking water to protect the public from consuming water that presents a risk to human health. The MPCA has previously provided draft staff recommendations as to what waters in the Embarrass River and Partridge River should be considered as waters used for production of wild rice to which the current 10 mg/L wild rice sulfate standard applies. The MPCA reviewed all available relevant information in making their recommendation. Water treatment using natural wetlands is not included in the NorthMet Project Proposed Action project description. The NorthMet Project Proposed Action would rely upon mechanical treatment for as long as necessary. During operations and closure, the use of wetland treatment may be considered as an adaptive management measure if pilot and other studies indicate that this method has potential utility and is cost-effective.	WR 110 WR 154

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17812	Finally, the SDEIS lists the sulfur concentrations of Project waste rock ranging between 0.01-5.0% with an average mass-weighted concentration of 0.15%. The Virginia Formation has the highest concentrations of sulfur 0.4 - 5.0%, and the Duluth Complex 0.13 – 0.6% sulfur. These concentrations are much higher than in Montana's Zortman-Landusky Mine waste rock (0.2% sulfur) that has required perpetual wastewater treatment. And, like Zortman-Landusky, the Project proponent has suggested that "most (70 percent) of the NorthMet waste rock would be the low-sulfur, non-acid-generating" and will never cause acid mine drainage. However, the north wall of the east pit is composed of the Virginia Formation meaning that it will be exposed to both air and water and will likely contribute a substantial load of sulfate and metals to mine pit water.	In closure, the Virginia Formation portions of the East Pit highwall would be treated with crushed limestone and capped with overburden and a permanent geomembrane cover. The amount of limestone would be designed to provide sufficient buffering capacity to create neutral or near-neutral conditions along the wall rock, rather than the acidic conditions common for oxidizing Virginia Formation rock. The combined effect of these treatments would be a dramatic reduction in oxidation rates and constituent release from the covered portions of the East Pit highwall." (PolyMet 2015q, as cited in the FEIS, page 106). The comparison between the NorthMet Project Proposed Action and the Zortman-Landusky Mine is misguided. The Zortman-Landusky Mine in Montana used cyanide heap leaching technology, while the NorthMet Project Proposed Action does not. In addition, the 0.2 percent S value stated by the commenter relates to the value that the Zortman-Landusky Mine used to determine non-acid generating rock. The average %S of the deposit was approximately 0.8 percent S.	WR 173
17867	The USACE has not developed a monitoring plan to assess after-the-fact Project impacts to lands, but claims that will be the way to best determine and mitigate indirect wetland impacts...So the SDEIS simply lacks sufficient detail even to comply with NEPA, and contains much less detail than is required to permit sufficient evaluation of potential wetland impacts.	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies ultimately decided the use of the analog method and the 20 percent metric described in Section 5.2.3 as factors considered in identifying potential indirect effects to wetlands is a credible and	COE 02

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		reasonable approach consistent with the requirements of NEPA. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the indirect wetland effects.	
17870	the mitigation measures that the SDEIS does identify are inadequate as to wetlands, just as they are for purposes of water modeling.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the FEIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects. The identification of specific mitigation for indirect effects and a monitoring plan is not a requirement for an EIS; however, the FEIS has been updated with additional information on the approach for determining mitigation if the monitoring shows indirect effects are occurring. The monitoring and mitigation for potential indirect effects would be determined during permitting. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.	WET 01 WET 04
17873	The SDEIS's failure to properly model and mitigate seepage and baseflow rates could result in profound impacts on wetlands. The estimates of groundwater drawdown are currently based on anecdotal and limited observations. Because of the generally flat topography and extensive wetlands, mine pit dewatering would likely cause substantial dewatering in nearby wetlands. Estimated indirect impacts to wetlands due to groundwater drawdown at the mine site are summarized in SDEIS, but without the use of a reliable groundwater model. Instead, dewatering impacts are assessed using an analogue method where wetlands impacted by another "equivalent" site are compared with wetlands surrounding the Project to provide an	Monitoring well response to pit dewatering at the Canisteo Pit, located approximately 65 miles west of the NorthMet Project Proposed Action area in similar surficial geology, indicated significant aquifer heterogeneity. Modeling of aquifer response at the Canisteo site using MODFLOW resulted in differences between simulated and measured water levels ranging from plus 28 ft to minus 4 ft (Jones 2002, as cited in the FEIS). The model clearly could not accurately estimate water level changes of a few feet or less as would be desirable for assessing potential effects on nearby surface water features such as wetlands. Therefore, it was concluded that it was not reasonable to attempt to quantify drawdown at the Mine Site using the MODFLOW model. In lieu of using MODFLOW to estimate pit drawdown at the Mine Site, an analog approach was developed using available well data from the Canisteo Pit, which is the only mine pit within the Mesabi Iron Range that has an associated water balance study with well data that could be used to assess	WR 071 WR 120

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	estimate of both the depth and distance from the mine pit(s) that dewatering occurs. The decision to use an analogue method came from the Wetlands Impact Assessment Planning work group process, in spite of Tribal Cooperating Agency objections. These objections include:(1) the PolyMet proposed mine pit will be hundreds of feet deeper than any of the "analogue" mine pits; (2) PolyMet mine pit walls will be crystalline and sedimentary bedrock versus the analogue mine pits in sedimentary bedrock only; (3) data collected from the site would be relatively inexpensive and should be used to inform impact assessment; and (4) relying on only a partial set of available "analogue" data as the source of information to estimate dewatering impacts is selective and not scientifically robust. Without a quantitative assessment of the mine-related drawdown of the regional water table, there is no mechanism to develop an adequate indirect impact assessment method for wetlands. Based on the vegetation data collected from wetland delineations, it appears that groundwater-supported wetlands are common in the Project area. The hydraulic conductivity in the unconsolidated deposits around the mine site ranges between 0.012 to 31 feet per day, indicating significant water movement within the surficial aquifer. In spite of the range of conductivities provided, however, the SDEIS states that perched wetlands cover over 50% of wetlands at the mine site.	potential drawdown effects. Sixteen Canisteo wells were used for the analog evaluation. An additional shallow well near Kinney, Minnesota, adjacent to Minntac's West Pit, and one deep bedrock well, also near Kinney, were also used for the evaluation. A comparison of the hydrogeologic conditions at the Canisteo Mine Pit, the Kinney area wells, and the Mine Site concluded that the geologic and hydrogeologic settings of the Mine Site are relatively similar to the Canisteo and Minntac sites (Barr 2011i, as cited in the FEIS). The Canisteo Pit is not as deep as the proposed NorthMet mine pits. However, the surficial deposits at the Canisteo site ranges from 50 to 100 ft thick, while the surficial deposits at the Mine Site average only about 14 ft thick. Also, the underlying bedrock at the Canisteo site is composed exclusively of the Biwabik Iron Formation, which generally has a higher hydraulic conductivity than the Duluth Complex, Virginia Formation, and Giants Range Granite that underlie surficial deposits at the Mine Site. Despite the difference in pit depths, it is interpreted that there is potential for greater drawdown at the Canisteo site compared to the Mine Site. Overall, the Canisteo data are believed to provide a reasonably conservative estimate of the maximum extent of surficial aquifer drawdown that would result from the proposed PolyMet mine pits.	
17874	The Co-Lead Agencies suggest ombrotrophic bogs (meaning wetlands that receive all of their water and nutrients from precipitation) have no connection to groundwater, and therefore assume that drawdown will not affect these wetlands. But data supports at least a partial connection between ombrotrophic wetlands and groundwater Therefore, if groundwater under these "perched"	The FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the	WET 09 WR 058 WR 071 WR 166 WR 167 WR 177

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	wetlands was drawn down by several feet, the new head pressure would lead to impacts to the wetlands because water would seep out of ombrotrophic wetlands in areas where there was a hydrologic connection to the saturated layer. Even the SDEIS acknowledges that saturated conditions exist within the unconsolidated deposits and the underlying bedrock, and that that recharge to the bedrock comes from leakage from the overlying surficial aquifer. Given these statements describing vertical movement of water in the mine site area, a vertical hydrologic connection between ombrotrophic wetlands and the surficial aquifer is likely and the extent of the hydrologic connection should be investigated.	ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. Using an observational approach based on data from similar nearby mine sites (i.e., analog method), the Co-lead Agencies concluded that drawdowns in the surficial aquifer would not be expected to extend very far from the mine pits. This is explained by the following factors: 1) the surficial aquifer is thin and moderately permeable, 2) the surficial aquifer is subject to aerial recharge, and 3) the surficial aquifer is underlain by low-permeability bedrock that limits downward leakage from the surficial unit. These factors support the conclusion that wetland drawdown did not need to be included in the Mine Site GoldSim model. See FEIS Section 5.2.2.3.2 for more information on the analog method. It is acknowledged that there is some degree of hydraulic interaction between wetlands and the surficial aquifer at the Mine Site. However, attempts to quantitatively model the effects of these interactions on drawdown and water quality would be highly uncertain and potentially misleading. The FEIS approach was to not model hydraulic connections between wetlands and the surficial aquifer in the Mine Site GoldSim model, but rely on future monitoring and adaptive mitigation measures in the event that some wetlands are affected by the NorthMet Project Proposed Action. See FEIS Sections 5.2.2.3.6 and 5.2.2.3.5 for more information on Closure monitoring and adaptive mitigation.	
17875	Despite specific and repeated requests from tribal cooperating agencies, the Co-Leads did not elect to utilize a tool developed in 2011 by the EPA in cooperation with tribes, Applying Cumulative Impact Analysis Tools to Tribes and Tribal Lands, in order to discern potential cumulative effects to resources important to the tribes who retain usufructuary rights within the 1854 Ceded Territory.	The Co-lead Agencies consulted a wide range of sources to conduct the cumulative effects assessment of the NorthMet Project Proposed Action and Land Exchange Proposed Action. In addition, the Co-lead Agencies followed USEPA (1999b, as cited in the FEIS), CEQ (1997, as cited in the FEIS), and Connaughton (2005, as cited in the FEIS) guidance on how to conduct the cumulative effects analysis. FEIS Section 6.1.1.1 describes the cumulative effects analysis approach. The cumulative effects analysis meets the requirements of MEPA/NEPA. Please also refer to the response to theme CR 08.	CU 03

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17877	The SDEIS failed to take into account most of the issues cited [in Appendix C of the SDEIS].	The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or conclusions.	CU 12
17899	It is reasonably foreseeable that an additional 3,000 acres of wetlands within the watershed will be directly impacted by proposed new mining projects and expansions that are in active permitting and/or environmental review: the Project, U.S. Steel Minntac mine expansion; U.S. Steel Keetac expansion; United Taconite Tailings Basin 3 construction; and Cliffs Erie's mine pit expansion.	The following projects were not considered in the wetland resources cumulative analysis, because they are outside the Partridge and Embarrass River watersheds: U.S. Steel Minntac mine expansion, U.S. Steel Keetac expansion, United Taconite Tailings Basin, and Cliffs Erie's mine pit expansion. Those projects that were considered reasonably foreseeable and within the Partridge and Embarrass River watersheds were considered in the wetland cumulative analysis. Please refer to the responses to themes CU 02 and WET 18, as well as Section 8.3, MDO 12 for more information on the spatial boundary of the CEAA for water resources.	CU 02
17900	The SDEIS also fails to adequately analyze cumulative impacts to the water quality of the Partridge and Embarrass Rivers, much less the St. Louis River.	Section 5.2.2 of the FEIS discloses in-stream water quality concentrations as a result of the NorthMet Project Proposed Action which is added to existing impacted conditions from past projects. The FEIS goes on to discuss loading of sulfate and mercury from future projects in Section 6.2.2. The SDEIS and FEIS provide a rationale for not including the St. Louis River Basin in the cumulative effects analysis in Section 6.2.2.1.1. The SDEIS and FEIS considered in the cumulative effects analysis for water resources all of the facilities identified in FEIS Table 6.2.2-1 (formerly Table 6.2-1 in the SDEIS).	WR 024
17901	In fact, in Colby Lake (the community water supply for the City of Hoyt Lakes), aluminum, iron, copper, and mercury concentrations already exceed Minnesota WQS. Modeled concentrations of arsenic also exceed Minnesota WQS. This existing, large number of water-quality exceedances and the suite of constituents, particularly trace metals, that exceed WQS not only confirm the total lack of remediation for the previous mining activities at the LTVSMC site, but demonstrate the importance of evaluating the cumulative losses to water quality. Community drinking water wells, wetland degradation resulting from dewatering, and pollution of community and private drinking water aquifers by	Groundwater and surface water flow models predict that the NorthMet Project Proposed Action would have a minimal effect on drinking water standard-based evaluation criteria in the groundwater at the project area boundaries or in Colby Lake (the locations at which drinking water standards apply). Based on this, it is therefore expected that the NorthMet Project Proposed Action would not have any significant impacts on water quality downstream of the proposed NorthMet Project area or significantly contribute to any cumulative effects on drinking water resources.	WR 042

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	previous mining activity must be assessed throughout the St. Louis River watershed as part of this Project, as well as for all the other mining projects currently underway.		
17903	The SDEIS does not determine climate change implications of the proposed Project. But the Project has proposed the largest direct wetland fill ever permitted in this region and would disturb extensive areas of peat, which is known to be an important carbon and methane sink. Wetlands in general are recognized as important carbon sinks and areas where wildlife seeks refuge as the climate warms. Nevertheless, to date, virtually all required wetland mitigation for mining impacts has been implemented out of the basin, representing a permanent loss of high quality ecological resources and functions. This omission undermines even the MNDNR's own work. The MNDNR's Moose Advisory Committee, which studies the decline of the moose population in northeastern Minnesota, has recommended preserving wetlands as sanctuaries for moose from heat stress related to climate change.	Estimates of monthly and annual rainfall amounts were based on best available data obtained from weather stations near the Proposed Action site. In the GoldSim models, these parameters were treated as uncertain inputs and assigned probability distributions to capture the range of possible future conditions. While climate change may occur in the future, it cannot be stated at this time if in the long term there would be more or less rainfall. Thus, the probabilistic approach to rainfall used in GoldSim represents a technically defensible method for dealing with this issue. Individual storm events and frequency are not incorporated into the GoldSim models. Rainfall inputs are monthly and annual rainfall amounts. The effects of individual storms are considered by designing facilities to handle a 100-year, 24-hour storm event based on current data. If over time, climate change causes a gradual increase in annual rainfall, the 100 year storm event would be redefined to a larger precipitation value and mine facilities would be upgraded to handle a larger storm. For the Mine Site, a GoldSim sensitivity analysis was conducted to assess the possible effects of future climate change on groundwater and surface water impacts. It was concluded that reasonably foreseeable climate change would have little effect on pit inflows, pit lake water quality, groundwater chemical concentrations, and surface water chemical concentrations. These results are reported in the Sensitivity Analysis of the NorthMet Water Quality Models, Version 2 (Barr 2015d, as cited in the FEIS). By analogy, the Plant Site is also expected to be minimally affected by possible future climate change. The NorthMet Project Proposed Action would not result in the release of methane (CH_4) from the proposed loss of wetland habitats. Wetlands act as carbon sinks that sequester carbon dioxide (CO_2). As a result of carbon cycling through the wetland system, a portion of sequestered carbon is mineralized to gaseous end products resulting in the production of CH_4, which is released to the atmosphere. As such, the assumption that the NorthMet Project Proposed Action would result in an increase of methane stored in the peat bogs is incorrect. The loss of wetland habitat at the NorthMet Project area would result in a one-time release of 12,535 metric tons per year of greenhouse gas emissions (i.e., CO_2-equivalents	WR 077 WR 180

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		approximately stored carbon within those habitats (Barr 2012l, as cited in the FEIS). It is important to note that the loss of carbon sequestration capacity is fundamentally different from emission rates since it represents a loss of greenhouse gas absorptive capability (i.e., how effective the system is at absorbing carbon) and capacity (i.e., the amount of carbon able to be absorbed) as opposed to an actual contributing emission. However, Barr (2012l, as cited in the FEIS) also noted that the net effect of the loss of carbon sequestration capacity is essentially the same as emissions. The Barr report also noted that the projected calculated release of CO_2-equivalents is a one-time event; however, it should not be assumed that all aboveground forest carbon would necessarily be released over a short timescale and that net carbon cycle impacts are highly dependent on the end-use of the cleared vegetation. For example, timber harvested for boards manufactured into furniture or buildings which is typically maintained for an extended period of years or decades, will degrade and decompose (i.e., release their stored carbon) at a much slower pace than timber that is utilized for firewood or woodchips which will ultimately decompose at a much faster rate. Harvested timber is typically utilized for a multitude of purposes dependent on numerous variables including market value, stand quantity and quality, tree species, demand, among others. As such, predetermining the end-use of an entire stand of timber is unfeasible. Additionally, the assumption that the NorthMet Project Proposed Action would result in the destruction of the carbon storage potential of the region is erroneous. That assumption discounts the contributions of the proposed compensatory wetland mitigation. The NorthMet Project Proposed Action would result in the loss of approximately 913.8 acres of directly impacted wetlands whereas the NorthMet Project Proposed Action would result in 1,799.7 acres of wetland mitigation (an impact to mitigation ratio of approximately 2:1). The NorthMet Project Proposed Action would be located within the St. Louis River Watershed (#3) (8-digit HUC) within the Great Lakes Basin (4-digit HUC). The Zim Site is located within the same watershed as the NorthMet Project Proposed Action; however, the Aitkin and Hinckley sites are located within the Mississippi River Basin (4-digit HUC) and 8-digit HUC watersheds of Elk-Nokasippi #10 and Snake River #36, respectively. See also responses to themes WET 05, WET 15, and WET 24.	

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17905	Furthermore, underestimation of storm size and frequency is a serious problem for capture and treatment of polluted water from the Category 1 wasterock pile and tailings basin, tailings basin stability, storm water run-off from the Overburden Storage and Layout Area ("OSLA"), and mine pit dewatering. Storm size and frequency is known to be changing. These and other cumulative effects of climate change must be addressed.	Information in FEIS Section 5.2.7.2.4 addresses the potential for climate change impacts in the area, including the frequency and duration of severe weather events. GHG issues have been assessed in a manner consistent with USEPA and MPCA guidance, as well as CEQ 2010, as cited in the FEIS. Estimates of monthly and annual rainfall amounts were based on best available data obtained from weather stations near the NorthMet Project area from 1981 to 2010, which is the Climate Normal period. In the GoldSim models, these parameters were treated as uncertain inputs and assigned probability distributions to capture the range of possible future conditions. While climate change may occur in the future, it cannot be stated at this time if in the long term there would be more or less rainfall. Thus, the probabilistic approach to rainfall used in GoldSim represents a technically defensible method for dealing with this issue. The effects of individual storms are considered by designing facilities to handle a 100-year, 24-hour storm event based on current data. If over time, climate change causes a gradual increase in annual rainfall, the 100 year storm event would be redefined to a larger precipitation value and mine facilities would be upgraded to handle a larger storm. For the Mine Site, a GoldSim sensitivity analysis was conducted to assess the possible effects of future climate change on groundwater and surface water impacts. It was concluded that reasonably foreseeable climate change would have little effect on pit inflows, pit lake water quality, groundwater chemical concentrations, and surface water chemical concentrations. These results are reported in the Sensitivity Analysis of the NorthMet Water Quality Models, Version 2 (Barr 2015d, as cited in the FEIS). By analogy, the Plant Site is also expected to be minimally affected by possible future climate change. The NorthMet Project Proposed Action facilities would be designed with excess storage to handle large storm events. If climate change gradually increases the frequency and size of storms, there would be ample time to identify the issue and increase storage and treatment requirements at the site.	AIR 01 WR 180
17916	Section 106 consultation between the USACE and Tribes is ongoing. Therefore, despite significant changes through recent, increased consultation with tribal cooperators, the Cultural Resources chapter of the SDEIS is still incomplete, and the	The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting for the NorthMet Project Proposed Action. Historic properties affected by the NorthMet Project Proposed Action have been identified and the impacts to those properties have been assessed. This also includes an assessment of	CR 06

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	requirements of the National Historic Preservation Act ("NHPA") have not yet been fulfilled. The Project cannot proceed until they are.	actual use of those historic properties, as well as other resources in the APE, by tribal members. Effects on historic properties would be fully considered prior to the issuance of any permit or land exchange pursuant to the NHPA and its implementing regulations. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.	
17919	Where, as here, there are historic properties affected, then there is an entirely separate level of adverse-effects assessment that must be performed, again in coordination with consulting agencies.207 In light of these rules, and as the chapter itself acknowledges, it is apparent that far more consultation and site work must be done to comply with Section 106.	The federal Co-lead Agencies have made a reasonable and good-faith effort to identify cultural resources potentially affected by the NorthMet Project Proposed Action and determine which resources qualify for inclusion in the NRHP as historic properties. Impacts to historic properties have been appropriately assessed and the federal Co-lead Agencies are actively consulting with the federally recognized Bands, the SHPO, and other consulting parties to develop appropriate mitigation measures. Effects on resources significant to the Bands that do not qualify as historic properties, as well as general effects on natural resources have been considered within the parameters of the statutes that shape this review. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.	CR 03
17925	The Bands remain skeptical of the Co-Lead Agencies' claim that there will be no adverse effect to the Spring Lake Mine Sugarbush from the Project. Indirect effects, through dust deposition and unauthorized collection of historic objects, are anticipated because the sugarbush is situated immediately adjacent to the proposed plant site.	As discussed in FEIS Section 5.2.9.2.1, the federal Co-lead Agencies have determined that the NorthMet Project Proposed Action would adversely affect the Spring Mine Lake Sugarbush. As part of an MOA, the federal Co-lead Agencies would ensure the avoidance, minimization, and/or mitigation of impacts to cultural resources that may be encountered, such as unauthorized collection, during construction or operation of the NorthMet Project Proposed Action. The federal Co-lead Agencies, in consultation with the Bands, SHPO, and PolyMet, are currently working to resolve adverse effects on this property.	CR 02 CR 05
17929	The three properties would benefit from additional investigation. The sugarbush has not been formally recorded. The trail has been adequately documented within the SNF proposed land exchange, but requires additional survey in the upland areas of the project area. Mesabe Widjiu should be considered in its entirety. All three should be formally nominated to the National Register of Historic Places.	The federal Co-lead agencies have officially documented the Spring Lake Mine Sugarbush with SHPO. The federal Co-lead Agencies believe that there has been sufficient background research and fieldwork to justify consideration of the BBLV Trail Segment as an historic property. Additional research and fieldwork may be part of any resolution of adverse effect. The federal Co-lead Agencies have determined the Partridge River section of the Mesabe Widjiu and the Partridge River section of the BBLV Trail Segment eligible for inclusion in the NRHP under Criterion A; however, the federal Co-lead Agencies are assessing the effects of the NorthMet Project Proposed Action on only the portion of those properties within the APE. The federal Co-lead Agencies recognize that the two	CR 02 CR 05

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		properties discussed above extend beyond the APE. All three historic properties have been determined eligible for the NRHP. The federal Co-lead Agencies, in consultation with the Bands, SHPO, and PolyMet, are currently working to resolve adverse effects on these properties. National Register Nomination of these properties may be part of an MOA; however, the federal Co-lead Agencies are currently in the process of considering what mitigations may be appropriate.	
17932	The Project is predicted to increase mercury loadings in the Embarrass River, but decrease mercury loadings in the Partridge River: Treated effluent would be used to augment flow in several Embarrass River tributary streams and Second Creek in the Partridge River watershed that would otherwise experience reduced flow because of the groundwater containment system. Additional water for flow augmentation in the nearby tributaries would be pumped from Colby Lake at periods during mine operations and reclamation. On the face of it, stream augmentation mitigation seems like a good idea. Unfortunately, Colby Lake water has high mercury concentrations that exceed the Minnesota WQS for wildlife. Colby Lake water used for augmentation will add mercury to the Embarrass River watershed both directly and indirectly by drying and re-wetting peat.	Colby Lake water would not be directly discharged to tributaries north or south of the Tailings Basin under the NorthMet Project Proposed Action, as described in the FEIS. The NorthMet Project Proposed Action includes treatment of all water that would be discharged at the Plant Site, including water used for flow augmentation. Additional information has been included in FEIS Section 5.2.2.3.6. The FEIS recommends that tributaries be monitored that extend from the Tailings Basin. In the event that the monitoring identifies the potential for any water quality standard exceedances, the Proposer would be obligated to take action to ensure compliance. Potential mitigation measures are included in FEIS Section 5.2.2.3.5.	MERC 12 WR 184
17933	High mercury concentrations in fish is a significant concern in the Embarrass River now, and mercury will only increase if the Project is allowed to use Colby Lake water for stream augmentation.	Colby Lake water would not be directly discharged to tributaries north or south of the Tailings Basin under the NorthMet Project Proposed Action, as described in the FEIS. The NorthMet Project Proposed Action described in the FEIS includes treatment of all water that would be discharged at the Plant Site, including water used for flow augmentation. The amount of water from Colby Lake used for flow augmentation would be low; however, any water used for augmentation would be treated prior to discharge. The FEIS recommends that tributaries be monitored that extend from the Tailings Basin. In the event that the monitoring identifies the potential for any water quality standard exceedances, the Proposer would be obligated to take action to ensure compliance. Potential mitigation measures are included in FEIS Section 5.2.2.3.5.	MERC 02 WR 184

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17934	Dewatering peatlands will also amplify water table fluctuations because peat has high water storage capacity and releases water more slowly than other surficial deposits. Drying and re-wetting peat will increase mercury methylation and release. Peatlands store methane and carbon that will be released into the environment when overburden is removed from the mine pits or during periods of dewatering. This is important in the context of subsistence fisheries and climate change because the temperature of water directly affects the oxygen content and defines what fish can survive. Mercury is also known to bioaccumulate in fish at a faster rate in warmer water.	Some of the temporarily stored organic material would decompose on site, which would release mercury into solution. Any dissolved mercury would be transported in solution with precipitation that falls on the Overburden Storage and Laydown Area (PolyMet 2015r, as cited in the FEIS). Any mercury released from the peat decomposition process is thought to be transported with precipitation that falls on the Overburden Storage and Laydown Area. However, water coming in contact with materials in the OSLA is considered to be process water and would not be directly discharged, but rather would be routed to pond PW-OSLA. In years 1 to 11 the water from pond PW-OSLA would be routed to the tailings basin and any mercury in the routed water would have the chance to be sequestered in the tailings. In years 12 to 20 some of the water from pond PW-OSLA would be used to backfill the East Pit. Any mercury in the water routed to the East Pit would have the chance to mix with waste rock and become sequestered at depth in the East Pit. In addition, any contributions of water in year 21 to 65 from the East Pit to the West Pit would reflect water from the East Pit and its associated watershed runoff, and would not reflect process water from pond PW-OSLA. Because peat removal from the areas to be mined would be completed between years 5 and 11, most of the potential release of mercury from stored peat materials would likely have already occurred, or be ending, by the time water is routed from pond PW-OSLA to the East Pit beginning in year 12. The hydrology of the wetlands outside the containment system would be maintained within an established range through flow augmentation so that wetlands would not experience substantial inundation or desiccation. Wetland hydrology is a complex mix of precipitation, surface runoff, and, in some cases, groundwater. Current understanding of how these factors interact at the project site is limited, making it beyond the current ability of the FEIS to predict site-specific changes in wetland hydrology. The FEIS recommends monitoring of wetland water quality at the Mine Site between Dunka Road and the Partridge River as well as the Partridge River itself. Effects of climate change on aquatic species were not identified as a concern during scoping, and are beyond the scope of the FEIS analysis, because the effects to aquatic species under future climate scenarios are speculative. A preliminary qualitative assessment of water resources impacts due to climate change is provided in Attachment W of the NorthMet Project Air Data Package, Version 5. January 15, 2015 (PolyMet 2015e, as cited in the FEIS).	AQ 16 AQ 28 WET 03 WR 086

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		In aquatic systems, there is generally a positive correlation between warmer water temperatures and accumulation of heavy metals. However, studies on the relationship between temperature and bioaccumulation of mercury in aquatic life are ongoing. Therefore, the degree to which the NorthMet Project Proposed Action could potentially affect aquatic species due to changes in temperature cannot be determined. Water monitoring would ensure that water quality standards would be met with engineering controls and adaptive management. Specific monitoring details would be addressed in permitting. In addition, spill prevention plans would be implemented.	
17935	Several lakes and the Partridge River watershed are likely to be negatively affected, which will impact fish species and thus the Band's 1854 Treaty rights to harvest fish in those water bodies. The SDEIS as written fails to mitigate the costs to fisheries and wildlife species that are protected under the 1854 Treaty...Treaty-reserved fishing rights cannot be fully exercised when fish consumption must be restricted for health reasons to one or two meals per week.	The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6 also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the review of the NorthMet Project Proposed Action.	CR 01
17937	The SDEIS does not adequately address the potential impacts to Band members of a significant increase in mercury in fish harvested both on-Reservation and in Ceded Territory waters...Yet the SDEIS offers no mitigation for these known losses. The SDEIS must be revised to include sufficient analysis and mitigation.	Based on the results of water quality modeling, the water quality of the West Pit Lake, East Pit wetland, and Tailings Basin pond is predicted to be at concentrations not injurious to wildlife. On-site monitoring of waterbodies within facility boundaries would likely be a part of a monitoring program. Monitoring details would be finalized in the permitting process. FEIS Section 5.2.5.2.3 discusses potential impacts to wildlife from incidental contact with the Tailings Basin pond and pit lakes. FEIS Section 7.3.4 discusses potential human health impacts. FEIS Section 5.2.2.3.6 discusses on-site monitoring. FEIS Section 5.2.2.3.4 discusses bioaccumulation of methylmercury.	CR 01
17939	Minnesota's mercury TMDL process will not adequately address the fish consumption impairment in these waterbodies, and any new discharges that would result in further degradation to waters with an existing water quality impairment are not be legally permittable under the CWA.	This comment was originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. The MPCA's goal is to protect high-quality waters and improve the quality of impaired waters, so water quality standards are met and beneficial uses are maintained and restored, where these uses are attainable. As summarized in FEIS Section 5.2.7.2.5, widespread contamination of fish from atmospheric pollution is why Minnesota established a statewide mercury TMDL. The TMDL seeks to reduce atmospheric deposition	MERC 11

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		everywhere in the state, in order to make the state's lakes and streams fishable, as required by federal regulations, and is intended to provide the long-term framework to reduce mercury in fish. The MPCA published Guidelines for New and Modified Mercury Air Emission Sources, and revised those guidelines in 2012 (MPCA 2012h, as cited in the FEIS). The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions of 789 lbs/year by 2025. The MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions, and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS). Further, the NorthMet Project Proposed Action is not anticipated to be a major source of mercury into the environment. The RO treatment plant is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site including water used for flow augmentation. Mercury loadings from the Mine Site are projected to decrease due to the NorthMet Project Proposed Action and the combined contributions from the Embarrass River and Partridge River are unchanged when modeled for the St. Louis River at the Fond du Lac reservation boundary. Therefore, further degradation of surface water quality, and by extension increased mercury in fish, is not expected.	
17940	The cumulative effects of invasive species, mining, and Project effects on sturgeon must be considered and the SDEIS revised.	The NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on lake sturgeon. Recent MDNR and Fond du Lac Band of Lake Superior Chippewa sturgeon data provided since the SDEIS indicated sturgeon are not known to occur within the Project Area (see Section 4.2.6).	AQ 02 AQ 26
17944	Although the permitted area is significantly disturbed and will be for the foreseeable future, the closure and reclamation plans will have a significant effect on native vegetation as it is reintroduced. The prevalence of invasive, non-native species and their ability to outcompete native plants in disturbed areas, coupled with PolyMet's plan to introduce non-native and invasive species to this area, would result in significant impacts to cultural resources that have not been discussed in the SDEIS.	The FEIS vegetation sections include new details from the updated Reclamation Plan (PolyMet 2015g, as cited in the FEIS). In particular, invasive species would not be permitted in the seed mix. Some non-native species (e.g., oats, winter wheat) that are commonly used in seed mixes to temporarily stabilize soils in order to reduce erosion or dust potential could be planted. The species to be used for reclamation would be finalized during permitting. The FEIS Section 3.2.2.1.10 describes how the NorthMet Project area facilities would be operated to allow for progressive reclamation during operations. After mining ceases, PolyMet would finish reclamation activities under the Reclamation Plan, which is a required portion of the Permit to Mine. *Minnesota Rules*, part 6132.2700 states that	VEG 09

Comment ID	Comment	Response	Theme(s)
		the establishment of vegetation shall begin during the first normal planting period after site features are determined by the Permit to Mine to be no longer scheduled to be disturbed. Reclaimed areas would be monitored and maintained as needed in the Spring and Fall or as required under the Permit to Mine. Any areas damaged by erosion or that lost vegetation would be identified, and plans to repair or reseed would be developed and implemented.	
17945	While the SDEIS provides that displaced wildlife will face increased competition for resources, no mention is made whether the displaced animals may cause populations in adjoining territory to approach or exceed carrying capacity. The SDEIS fails to assess cumulative effects of wildlife population changes, not only in the project area, but the entire region.	The FEIS wildlife sections include an analysis of wildlife displacement effects due to the NorthMet Project Proposed Action. FEIS Section 5.2.5.2.3 discusses the potential effects to species based on habitat preferences, and uses available scientific literature to analyze displacement effects on local and regional ecology due to noise or increased human activities.	WI 05
17948	the value of natural resources maintained in good condition is simply not represented in the SDEIS. Nor is the economic value of clean water provided or assessed.	EIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may results from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations." The socioeconomic analysis provided in the FEIS satisfies NEPA and MEPA requirements. The NorthMet Project Proposed Action would take place in an area that has experienced mining previously. As discussed in FEIS Section 5.2.11.2.1, the presence of the NorthMet Project Proposed Action would not substantially affect regional recreation or visual resources, nor would it substantially affect air or water quality or increase noise levels in popular regional recreation lands such as the BWCAW (see FEIS Section 5.2.12).	SO 04
17949	The SDEIS also speculates that the tribes will benefit economically from the Project through additional visitation to Band-operated Casinos, but	No change made.	EDIT 01

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	provides no data to back up the statement: "Increased employment and income associated with the NorthMet Project Proposed Action could increase visitation and revenues at [area tribal gaming] facilities." This statement is entirely unsupported by any market analysis and must be deleted from the socioeconomic assessment of the Project.		

Comment ID	Comment	Response	Theme(s)
Comments from the Fond du Lac Band (Submission ID 42920)			
2768	The land Exchange Proposed Action, as described in the SDEIS, serves to confirm our concerns for permanent, unmitigated impacts to treaty resources in the 1854 Ceded Territory. The Band submitted comments on the Feasibility Analysis… including: A full consideration of the fair market value and future use of the federal land in the proposed PolyMet land Exchange would recognize a private windfall instead of an equal exchange, in violation of federal statutes, rules and policies. …The Band is also concerned that most of the non-federal land proposed in the PolyMet land Exchange has a divided mineral estate. Divided ownership raises uncertainties about future benefits that that the non-federal surface could afford to the public, further diminishing the value of the non-federal lands, and is not consistent with Forest Service Conveyance policy (36 CFR 254.15)… Further, any proposed federal land exchange that is not consistent with forest resource management plans must be rejected under 36 CFR. 254.3….The Band expects that the U.S. Forest Service, in facilitating the PolyMet land Exchange, would coordinate with the policies expressed in our plans to protect natural resources on the Reservation and in the Ceded Territories. … The Band is extremely concerned about the loss of high quality, even exceptional, wetlands within the federal estate, without sufficient information to understand whether the proposed non-federal parcels provide equivalent functions and values. Access to treaty-protected resources is of prime importance to Band members. Loss of access to or use of public lands within the Ceded Territory can significantly impact exercise of treaty rights, and this issue should be thoroughly evaluated in the SDEIS process.	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would	LAN 03 LAN 04 LAN 05 WET 14

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		result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
2782	Wetlands also function as thermal refuge for moose when summertime temperatures exceed 14^{o}C, the point at which moose become thermally stressed, and wetlands provide an important forage resource for moose during the open water season.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement. The FEIS Section 4.2.5.1.1 discusses the role of wetlands with moose and thermal stress.	WI 01 WI 02
2788	In the co-lead agency evaluation of the underground mining alternative, the North Met	Information obtained through preliminary exploration in the region has indicated the area potentially contains one of the largest untapped deposits	PD 25

Comment ID	Comment	Response	Theme(s)
	Deposit is described as a "low- to medium-grade mineral resource" which is somewhat at odds with its description as "one of the largest untapped deposits of copper and nickel, and other precious metals" or "world class resource" as it is represented throughout the SDEIS and in continual media coverage. From the SDEIS, we are not able to determine whether mining this mineral deposit in accordance with environmental standards will be profitable enough to provide adequate environmental protections and financial assurance.	of copper, nickel, and other precious metals. The NorthMet Deposit is characterized as a low- to medium-grade mineral resource. These two characterizations are not in conflict as the commenter seems to suggest. One is a regional characterization while the other applies to the NorthMet Deposit proposed by PolyMet to be mined. See the response to theme ALT 01 for more details on the Underground Mining Alternative. FEIS Section 3.2.3.4.1 states that tonnage/volume and grade of rock would not generate enough revenue to pay for costs associated with underground mining. The FEIS Executive Summary and FEIS Section 3.2.2.1.2 states that the NorthMet Deposit is a low- to medium-grade deposit, matching the language in Appendix B. FEIS Section 3.2.2.4 includes available details regarding financial assurance. Additional details on the cost estimates and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, as well as for monitoring and mitigation costs. FEIS Section 3.2.2.4.1 discusses the activities that would be considered in cost estimates, and states that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate.	
2799	while the co-lead agencies stipulate in the SDEIS that PolyMet will bear liability through financial assurance[legacy contamination at LTV], it is troubling to see that apparently, they will not be required to complete remedial activities until closure, many decades from now	FEIS Section 4.2.1.4.2 discusses Legacy Contamination, and states that PolyMet would address AOCs "on a schedule to be approved by the MPCA", some of which would likely occur prior to closure. In addition, FEIS Section 4.2.1.4.2 states that, "all historic and any potentially operational AOCs not already addressed by the start of mine closure would be investigated and remediated as necessary."	LU 02
2845	The mass balance does not take into account seepage from the saturated overburden at the OSLA, or the load of mercury from Colby Lake stream augmentation. Given the known concentrations of mercury in Colby Lake, which consistently exceed the GLI standard, this mitigation measure is clearly not permittable as a discharge that would contribute to an existing water quality exceedance.	Some of the temporarily stored organic material would decompose on site, which would release mercury into solution. Any dissolved mercury would be transported in solution with precipitation that falls on the Overburden Storage and Laydown Area (PolyMet 2015r, as cited in the FEIS). Any mercury released from the peat decomposition process is thought to be transported with precipitation that falls on the Overburden Storage and Laydown Area. The Overburden Storage and Laydown Area would be unlined; therefore, there would be some potential for seepage to enter the groundwater system from peat that has decomposed and releases as a pulse of mercury. However, construction of the Overburden Storage and	MERC 20

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		Laydown Area would result in a compacted bed that would limit downward seepage and facilitate routing of water to storage ponds. Water contacting the Overburden Storage and Laydown Area is considered to be process water and would be routed to Pond PW-OSLA. In years 1 to 11, the water from Pond PW-OSLA would be routed to the Tailings Basin, and any mercury in the routed water would have the chance to be sequestered in the tailings. In years 12 to 20, some of the water from Pond PW-OSLA would be used to backfill the East Pit. Any mercury in the water routed to the East Pit would mix with waste rock and become sequestered at depth in the East Pit. In addition, any contributions of water in years 21 to 65 from the East Pit to the West Pit would reflect water from the East Pit and its associated watershed runoff, and would not reflect process water from Pond PW-OSLA. Because peat removal from the areas to be mined would be completed between years 5 and 11, any potential release of mercury from stored peat materials would have occurred, or be ending, by the time water is routed from Pond PW-OSLA to the East Pit beginning in year 12. All water that is discharged would meet the GLI mercury standard of 1.3 ng/L. Colby Lake water would not be directly discharged to tributaries north or south of the Tailings Basin under the NorthMet Project Proposed Action, as described in the FEIS. The NorthMet Project Proposed Action would include treatment of all water discharged at the Plant Site, including water used for flow augmentation. Additional information has been included in FEIS Section 5.2.2. The FEIS recommends that tributaries that extend from the Tailings Basin be monitored. In the event that the monitoring identifies the potential for any water quality standard exceedances, the Proposer would be obligated to take action to ensure compliance. Potential mitigation measures are included in FEIS Section 5.2.2.3.5.	
2856	Hunting pressure has been ruled out as a major contributing factor to population-level declines, but the appearance of holding a hunt does not sit well with the public, so the DNR, 1854 Treaty Authority and Fond du Lac all closed the 2013 moose season.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement.	WI 01
2860	The Band's consistently expressed concerns for potential air quality impacts from the Proposed Project (a new source of mercury, visibility in a Class 1 airshed, fugitive dust impacts to terrestrial	Air quality impacts from the NorthMet Project are addressed in FEIS Section 5.2.7.	AIR 08

Comment ID	Comment	Response	Theme(s)
	and aquatic resources, asbestos-like mineral fibers) from the Proposed Project remain largely unaddressed in the SDEIS.		
2878	The Plant Site multi-pathway cancer risk for a farmer was found to be equal to the MDH additional lifetime cancer risk guidance level of 1E-05. Although this level is considered "guidance" and not a regulatory action level, the Band believes this value clearly indicates the potential for adverse health effects. The same result was found for the off-site worker inhalation additional lifetime cancer risk. The major drivers for these endpoints were cobalt, nickel, and dioxins (farmers only). Exposure to nickel has been linked with increased risk of lung cancer, cardiovascular disease, neurological and developmental deficits, and high blood pressure.	The calculations for cancer risk are based on an increased risk of contracting cancer using very conservative assumptions. The increased risk of contracting cancer due to the Project's emissions is extremely small. The AERA contains toxicological information for arsenic, diesel, nickel, manganese, mercury, and methylmercury (plus additional chemicals), as well as an analysis of the potential health effects of those chemicals. The toxicological information was included in the AERA summary in FEIS Section 7.3.4. Section 5.2.7.5 also includes a discussion of health risks from airborne fibers, as well as dust suppression measures that would be used to minimize fiber generation.	HU 02 HU 05 HU 07
2879	As shown in SDEIS Table 6.2-22, cumulative inhalation risks for non-cancer chronic and non-cancer acute effects from both the facility and existing sources are equal to the incremental acute risk guideline value of 1. This shows that the predicted impacts of NorthMet, when added to the toxic releases already prevalent in the area, have reached the level where health authorities begin to be concerned about cancer risks.	The cumulative inhalation risk estimate is a combination of modeled facility air emissions and background air concentrations measured at locations reflective of the proposed facility surroundings. These two pieces of information are based on several tiers of health protective (conservative) assumptions. Since there are no state or federal cumulative risk guidelines, the cumulative inhalation risk results are compared to facility risk guidelines for context and information. The cumulative respiratory acute non-cancer and chronic non-cancer risks were equal to facility risk guidelines. The cumulative inhalation cancer risk estimate is above facility risk guidelines (1 additional case of cancer in a population of 100,000 people), but lies within EPA's excess cancer risk goal range of 0.1 in 100,000 and 10 in 100,000. This excess cancer risk range is generally considered to be acceptable by EPA according to the 1999 Residual Risk Report to Congress (http://www.epa.gov/ttn/oarpg/t3/reports/risk_rep.pdf). For further discussions, see FEIS Sections 6.2.3.8.11, and the responses to themes HU02, HU06.	HU 05
2897	Cumulative effects result in a relentless, unmitigated diminishment of treaty resources and access to those resources. Yet across virtually all	The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or	CU 11 CU 12

Comment ID	Comment	Response	Theme(s)
	resource categories, the SDEIS predicts that there will be no adverse impacts….; this conclusion then enables the co-leads to determine 'no cumulative effects' from the project and the land exchange. ….over the course of the DEIS and SDEIS processes that support our misgivings for this circular logic. We presented a substantial alternative analysis of cumulative effects from the NorthMet Project Proposed Action as part of our commenting during the preliminary SDEIS review.	conclusions.	
2905	The Band's comments on the 2009 DEIS related to impacts to the 1854 Ceded Territory stand.	The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6 also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the review of the NorthMet Project Proposed Action.	NEPA 12
2906	The Band's comments on the 2009 DEIS related to environmental justice impacts still stand.	FEIS Sections 5.2.10.2.7 and 5.3.10.2.1 discuss Environmental Justice effects. See also the response to theme NEPA 12.	SO 09 NEPA 12
2907	The Band's comments on the 2009 DEIS related to climate change impacts still stand.	Comments provided on the DEIS were considered for the SDEIS and therefore, in turn, the FEIS. Climate change is addressed in accordance with the requirements of NEPA and MEPA. Please refer to SDEIS comment themes AIR 01, AQ 16, COE 03, PD 22, VEG 03, WET 07, WET 13, WI 02, WI 03, WI 08, and WR 180, and DEIS comment themes AQ 03, and WR2B.	NEPA 12
2909	The Band also shares concerns communicated by the Bois Forte Tribal Historic Preservation Officer: Mesabe Widjiu is correctly identified as a sacred landform, but needs to be considered in its entirety (see attached map as an example). The segment encountered within the project area is small, but integral to the property. Adverse effects to any portion impact the entire feature.	The federal Co-lead Agencies have determined the Partridge River section of the Mesabe Widjiu to be eligible for inclusion in the NRHP under Criterion A for its association with important Ojibwe spiritual and cultural practices. Although the federal Co-lead Agencies are assessing the effects of the NorthMet Project Proposed Action on only the portion of the Mesabe Widjiu within the APE, it is recognized that the property and its significance extends beyond the APE. The federal Co-lead Agencies have updated the FEIS to include a graphic of the entire Mesabe Widjiu, as provided by the consulting Bands.	CR 02 CR 05

Comment ID	Comment	Response	Theme(s)
3102	Multiple mine plan alternatives exist that could provide mitigation for or prevent long-term environmental damage... • paste or dry tailings disposal to reduce the project footprint and use less water (decrease risk of surface and groundwater pollution); • perpetual pumping of the west pit to prevent a pit lake from forming (protect surface and groundwater); • back-filling all waste rock into the east, central and west mine pits (reduce the mine foot print at closure, reduce contaminant runoff to surface and groundwater, reduce volume of water requiring perpetual treatment, restore mine site wetlands); • provide reverse osmosis treatment at the mine site immediately rather than waiting until year 40 (augment water loss in adjacent high quality wetlands in the Partridge River watershed), and; • underground mining (multiple environmental benefits).	The Underground Mine alternative was first considered but eliminated during the Final Scoping Decision Document (FSDD) process. The FEIS Section 3.2.3.4.1 describes how it was re-considered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was re-considered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be economically feasible, regardless of the tonnage extracted. In addition, the lower rate of ore production would not meet the Purpose and Need of the project. Although the Underground Mine alternative would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. The West Pit Backfill alternative (E20) was considered but eliminated during the development of the DEIS. It was eliminated from further consideration because it was determined that it would not offer significant environmental or socioeconomic benefits compared to the NorthMet Project Proposed Action and because backfilling the West Pit would prevent recovery of additional mineral resources. These factors are sufficient to qualify the West Pit Backfill alternative as unreasonable under NEPA, and justify its exclusion under *Minnesota Rules*, part 4410.2300, subpart G. It was re-considered in the SDEIS in response to DEIS comments from the Cooperating Agencies. A Co-lead Agencies memorandum (MDNR et al. 2013b, as cited in the FEIS) was prepared to summarize the decision-making process, which is referenced in FEIS Section 3.2.3.4.2. The Co-lead Agencies screened the alternative against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The opportunity to reclaim wetlands and vegetation at the Category 1 Waste Rock Stockpile footprint area would be a measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, some degree of these vegetation and wetland impacts would occur and would require mitigation regardless of future backfilling or not because of the need to "temporarily" store these	ALT 01 ALT 03 ALT 04 ALT 06

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		materials until mining operations cease. An interagency memorandum was prepared regarding the West Pit Water Elevation Alternative (MDNR et al. 2014, as cited in the FEIS). This alternative includes both the option to maintain a dry West Pit through perpetual pumping and maintaining pit water levels below the elevation of the Partridge River. The alternative was screened against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The screening level assessment concluded that the alternative would meet all criteria except for the environmental or socioeconomic benefit criterion. Continuous dewatering of the West Pit would keep the pit walls exposed instead of covered by a pit lake as in the NorthMet Project Proposed Action. This exposure would potentially result in increased solute loading to a smaller pit lake volume, and thus higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time. The Co-lead Agencies recommend that the Alternative be considered as an adaptive mitigation measure in the event that monitoring during operations and reclamation indicate that implementing this action is better able to meet future environmental objectives compared to the NorthMet Project Proposed Action. See the response to themes ALT 06 and ALT 13 for more details on several other alternatives, including paste tailings, and RO treatment.	
3105	The Fond du Lac Band of Lake Superior Chippewa conducted meetings in February 2011 to discuss past and current traditional uses by the Band of the area in the NorthMet project. It was expected from the beginning that the distance between the NorthMet area and the Fond du Lac Reservation would reduce the chances of documenting specific use of the area by Fond du Lac Band members.	The federal Co-lead Agencies have made a reasonable and good-faith effort to identify cultural resources potentially affected by the NorthMet Project Proposed Action, and to determine which resources qualify for inclusion in the NRHP as historic properties. Impacts to historic properties have been appropriately assessed, and the federal Co-lead Agencies are actively consulting with the federally recognized Bands, the Minnesota SHPO, and other consulting parties to develop appropriate mitigation measures. Effects on resources significant to the Bands that do not qualify as historic properties, as well as general effects on natural resources, are considered within the parameters of the statutes that shape this review. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.	CR 01 CR 05 CR 06
19571	The NEPA “hard look” requires agencies to “exercise a degree of skepticism in dealing with self-serving statements from the prime beneficiary	The original NorthMet Project proposal and alternatives were developed during project scoping in 2005. The NorthMet Project Proposed Action was refined at various points in response to public and agency input. As a result,	ALT 14 ALT 21

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	of a project" when analyzing alternatives. Contrary to the explicit requirements of the Council on Environmental Quality (CEQ) rules, the SDEIS does not evaluate or examine in any substantive way potentially viable Project alternatives. Even the no action alternative is lacking in detail and analysis. Tribal cooperating agencies identified this deficiency in the DEIS, consistently brought it forward for discussions throughout the SDEIS process, and US EPA cited the lack of alternatives as a factor when issuing an EU-3 rating for the DEIS.	the NorthMet Project Proposed Action studied in the SDEIS is not identical to the proposed action in the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Because some of the alternatives to the proposed action were eliminated during the scoping and DEIS phases of the project, they were not re-evaluated in the SDEIS. Alternatives were eliminated from detailed evaluation if they did not offer substantial environmental or socioeconomic benefits, were not reasonable (technically or economically feasible), were not available, or would not meet the Purpose and Need. This review—beginning during the scoping process and concluding with the FEIS—is consistent with the alternatives review required by NEPA and MEPA, and with CEQ rules for analyzing alternatives. FEIS Section 3.2.3.2 discusses how the Consent Decree under the NorthMet Project No Action Alternative would require Cliffs Erie to complete closure and reclamation activities at the Plant Site. This would include completing activities for the localized affected areas under the Minnesota Voluntary Investigation and Cleanup (VIC) Program, removal of the former Plant Site building, and management of seepage at the Tailings Basin embankment. The FEIS mentions in Table 3.2-1 that under the NorthMet Project no Action Alternative, there would be no mining activities, and that existing management and land use of the federal lands would continue. The NorthMet Project No Action Alternative is also analyzed under each resource area in FEIS Chapter 5, and summarized in FEIS Table 7.2.4-1. Several other alternatives for both the NorthMet Mining Project and Land Exchange were screened before the FEIS (see FEIS Section 3.2.3.3). These alternatives were eliminated as they did not offer a substantial environmental or socioeconomic benefit, were not reasonable (economically or technically feasible in accordance with CEQ guidelines), or would not meet the Purpose and Need.	
19573	Although the SDEIS was revised to reflect the Project proponent's preferred action, the only alternative analyzed in any detail concerns simply the acreage of the proposed land exchange. This is not consistent with the CEQ regulations that require federal agencies to identify an agency-preferred alternative in a draft EIS. Yet the SDEIS states "At this time, the Co-lead Agencies have not identified a preferred alternative, and for the	Neither Minnesota Rules nor CEQ regulations required the Co-lead Agencies to identify a preferred alternative in the SDEIS (40 CFR 1502.14(e)). The FEIS includes available details regarding the identification of an Agency Preferred Alternative. Additional Land Exchange alternatives were identified, screened, and eliminated during scoping leading up to the SDEIS (see FEIS Sections 3.3.3 and 7.2). FEIS Section 7.4 includes additional information about the Agency Preferred Alternative. The United States Forest Service (USFS) must identify a preferred alternative for the Land Exchange in the FEIS. The Minnesota	ALT 21 ALT 23

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	USACE, Appendix B of 33 CFR Part 325 supersedes the CEQ requirement to identify an agency-preferred alternative."	Department of Natural Resources (MDNR) is not required to identify a preferred alternative under MEPA. FEIS Sections 3.2 and 3.3 further detail this process.	
19575	There is no evaluation or identification in the SDEIS of the 'least environmentally damaging practicable alternative' ("LEDPA") as required before approving a CWA §404 wetlands permit.	The LEDPA process is described in FEIS Section 7.5. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of the Project.	COE 04
19577	A fundamental operational component of the Proponent's preferred alternative analysis described in the SDEIS is to deposit their reactive slurry tailings on top of existing taconite tailings in an unlined basin that is currently required, under a Consent Decree, to remediate seepage that has already polluted the nearby ground and surface waters. The SDEIS analysis assumes a tailings basin seepage capture rate of 95% – a performance efficiency that has not been demonstrated anywhere in the US, nor is it feasible since the tailings basin was constructed (per standard Minnesota ferrous mining practices) without a liner. There is an existing seepage capture system installed at SD026 as a requirement of the Consent Decree, yet it has proven to be so ineffective that Cliffs Erie LLC (the responsible party) has proposed building an additional dam and capture system further downstream.	The Co-lead Agencies acknowledge that there are existing water containment systems at other mine sites that do not operate with a high degree of capture, but these are different designs and cannot be compared to the system proposed for the NorthMet Project Proposed Action. The proposed containment system uses pumping on the tailings side and discharge on the opposite side to reverse hydraulic gradients across the slurry wall and in underlying bedrock. Relatively few containment systems have been built with this degree of pumping and discharge to ensure effective containment. The conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete capture. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed containment system on the northern, northwestern, and western sides of the Tailings Basin in Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation, and depth to top of bedrock. This information was used to develop revised MODFLOW cross-section models to evaluate containment system efficiencies on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the Plant Site Water Management Plan (PolyMet 2015i, as cited in the FEIS). These new models considered the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. The assumption in the Plant	GT 02 PD 12 WR 020 WR 117

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		Site GoldSim model of 90 percent or greater capture efficiency is justified by the analyses performed.	
19578	Dewatered or paste tailings placed on a liner and covered could substantially minimize the mass and concentration of pollutants reaching the Embarrass River watershed wetlands and the Embarrass River. This is a modern mine waste management technique used by many mines in the US and around the world, yet it has never been evaluated as an alternative for this project. "Converting to paste tailings technology from conventional slurry tailings at most mines makes sense, both environmentally and economically. Paste tailings use less water, require less land, do not require engineered containment dams, generate less acid and contaminants, reduce long-term costs and allow for early reclamation. Slurry tailings use and discharge large volumes of water, require dust control measures, require large land areas and containment dams for disposal, and create contaminated water that must be captured and treated."	A thickened tailings (paste tailings) alternative (A1) was considered but eliminated in the DEIS and post-DEIS as it was determined not to offer significant environmental benefits over the NorthMet Project Proposed Action. A co-disposal of waste rock and tailings on a lined tailings basin alternative (E14) was considered but eliminated in the DEIS because the technical feasibility and cost of doing so were uncertain. Several different tailings basin alternatives (TB2-TB6) were re-considered but eliminated since the DEIS. These Tailings Basin alternatives did not afford meaningful environmental benefits compared to the enhanced engineering controls, such as seepage collection and reverse osmosis [RO] mechanical water treatment (or equivalently performing technologies), built into the NorthMet Project Proposed Action. Dry cap seepage was predicted to result in substantially higher concentrations, under the current modeling approach, which would make the future transition from mechanical to non-mechanical water treatment more difficult during post-closure.	ALT 10 ALT 16
19580	The State of New Mexico, Office of Natural Resource Trustee, requires perpetual pumping of the mine pits to prevent formation of a pit lake at the Chino and Tyrone copper mines, specifically for the protection of groundwater. The experience of numerous western mines discharging plumes of polluted water into the bedrock aquifer from leaking mine pits, tailings basins and waste rock piles, highlights a predictable problem that is not only difficult but expensive to fix. By requiring perpetual pumping [alternative not considered in the SDEIS] of the mine pit, the regulatory agencies would minimize leakage of contaminated water into the surrounding bedrock aquifer, and thereby protect groundwater that the State of Minnesota is required to protect as source of drinking water.	An interagency memorandum was prepared regarding the West Pit Water Elevation Alternative (MDNR et al. 2014). This alternative includes both the option to maintain a dry West Pit through perpetual pumping and maintaining pit water levels below the elevation of the Partridge River. The alternative was screened against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The screening level assessment concluded that the alternative would meet all criteria except for the environmental or socioeconomic benefit criterion. Continuous dewatering of the West Pit would keep the pit walls exposed instead of covered by a pit lake as in the NorthMet Project Proposed Action. This exposure would potentially result in increased solute loading to a smaller pit lake volume, and thus higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time. The Co-lead Agencies recommend that the Alternative be considered as an adaptive mitigation	ALT 04

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		measure in the event that monitoring during operations and reclamation indicate that implementing this action is better able to meet future environmental objectives compared to the NorthMet Project Proposed Action.	
19581	In the 2009 DEIS, the co-lead agencies maintained that all waste rock should be considered reactive. SDEIS Table 3.2-8, Waste Rock Characterization Properties , acknowledges that the Category 1 waste rock (rock that is <0.12% sulfur), which constitutes 70% of the volume of waste rock, has a "low potential to generate acid, but may leach metals." Back-filling all of the mine pits with all of the waste rock would reduce the final surface footprint of the mine at closure, and make possible 526 acres of wetland restoration where the Category 1 stockpile is now proposed to be stored in perpetuity. This alternative would prevent the need for a permanent separate seepage capture system around an unlined waste rock pile, as proposed in the preferred alternative, which would have to perform at an above-optimum capture rate in perpetuity to comply with Minnesota Water Quality Standards ("MN WQS"). Capping and re-vegetating the mine pits after backfilling with waste rock would prevent deep infiltration of precipitation and reduce mobilization of toxic metals.	FEIS Section 3.2.2.1.10 states that waste rock would be backfilled into the East Pit starting at year 11 and in the combined East Central Pit starting in year 16. After backfilling is complete, a wetland would be constructed over the combined East Central Pit. The West Pit Backfill alternative (E20) was considered but eliminated during the development of the DEIS. It was eliminated from further consideration because it was determined that it would not offer significant environmental or socioeconomic benefits compared to the NorthMet Project Proposed Action and because backfilling the West Pit would prevent recovery of additional mineral resources. These factors are sufficient to qualify the West Pit Backfill alternative as unreasonable under NEPA and justify its exclusion under *Minnesota Rules*, part 4410.2300, subpart G. It was reconsidered in the SDEIS in response to comments from the Cooperating Agencies. A Co-lead Agencies memorandum (MDNR et al. 2013b, as cited in the FEIS) was prepared to summarize the decision-making process, which is referenced in FEIS Section 3.2.3.4.2. The Co-lead Agencies screened the alternative against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit (see FEIS section 3.2.3 for more detail and alternative screening process and terms and definitions). The opportunity to reclaim wetlands and vegetation at the Category 1 Waste Rock Stockpile footprint area would be the only measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, because of the temporal impact that the stockpile would have, these impacts would be required to be mitigated regardless of future backfilling or not.	ALT 06
19582	The SDEIS inexplicably removes the stockpile liner described in the 2009 DEIS for Category 1/2 waste rock in the current project proposed action. From Table 3.2-16 Comparison of DEIS and SDEIS NorthMet Project Proposed Action: DEIS: Category 1 and 2 waste rock would be stored in a permanent lined/covered stockpile (Category 1/2 Stockpile) north of the west pit	The Final Scoping Decision Document (FSDD) examined several modified design alternatives, as well as multiple mitigation and monitoring measures. The 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) also discussed a liner system as part of its consideration of a modified design or layout at the Mine Site. Key aspects of this alternative from the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) were incorporated into the NorthMet Project Proposed Action and studied in the SDEIS. As proposed in the FEIS, liners would be installed for stockpiles or areas where there is a potential to generate acid and metal leachate from	ALT 07 ALT 13

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	(years 1-11) SDEIS: Category 1 waste rock mined from years 1-13 would be stored in an unlined, permanent stockpile north of the West Pit. The stockpile would have a geomembrane cover system at completion and surface water and groundwater collection system would encompass the entire stockpile and direct water to the Mine Site WWTF. If not backfilled, the Category 1 waste rock stockpile must be lined.	potentially reactive waste. Temporary stockpiles (Category 2/3 and Category 4) and the Ore Surge Pile would contain a liner. The Category 1 Stockpile would have a containment system to collect seepage, which would be pumped to the Waste Water Treatment Facility (WWTF). The Overburden Storage and Laydown Area would hold peat soils and unsaturated overburden, which are not considered to be reactive.	
19583	However, combining the two alternatives of perpetual pumping and backfilling the Category 1 waste rock pile would substantially reduce the risk of polluting groundwater and wetlands in the Partridge River watershed.	The two alternatives are contradictory together, as backfilling of the Category 1 waste rock into the West Pit would eliminate the opportunity to perpetually pump the West Pit lake. The West Pit Backfill alternative (E20) was considered but eliminated during the development of the DEIS. It was eliminated from further consideration because it was determined that it would not offer significant environmental or socioeconomic benefits compared to the NorthMet Project Proposed Action and because backfilling the West Pit would prevent recovery of additional mineral resources. These factors are sufficient to qualify the West Pit Backfill alternative as unreasonable under NEPA and justify its exclusion under *Minnesota Rules*, part 4410.2300, subpart G. It was reconsidered in the SDEIS in response to comments from the Cooperating Agencies. A Co-lead Agencies memorandum (MDNR et al. 2013b, as cited in the FEIS) was prepared to summarize the decision-making process, which is referenced in the FEIS Section 3.2.3.4.2. The Co-lead Agencies screened the alternative against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The opportunity to reclaim wetlands and vegetation at the Category 1 Waste Rock Stockpile footprint area would be the only measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, because of the temporal impact that the stockpile would have, these impacts would be required to be mitigated regardless of future backfilling or not. An interagency memorandum was prepared regarding the West Pit Water Elevation Alternative (MDNR et al. 2014, as cited in the FEIS). This	ALT 04 ALT 06

Comment ID	Comment	Response	Theme(s)
		alternative includes both the option to maintain a dry West Pit through perpetual pumping and maintaining pit water levels below the elevation of the Partridge River. The alternative was screened against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The screening level assessment concluded that the alternative would meet all criteria except for the environmental or socioeconomic benefit criterion. Continuous dewatering of the West Pit would keep the pit walls exposed instead of covered by a pit lake as in the NorthMet Project Proposed Action. This exposure would potentially result in increased solute loading to a smaller pit lake volume, and thus higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time. The Co-lead Agencies recommend that the Alternative be considered as an adaptive mitigation measure in the event that monitoring during operations and reclamation indicate that implementing this action is better able to meet future environmental objectives compared to the NorthMet Project Proposed Action.	
19584	The Minnesota Department of Natural Resources (DNR) and US Army Corps of Engineers (USACE) superficially evaluated and subsequently dismissed underground mining as an alternative to the proposed open pit Project for the 2009 DEIS. The co-lead agencies eliminated this alternative from further evaluation because it would have had "a significantly reduced rate of operation that would not be considered economically feasible, and, therefore, would not meet the Purpose and Need of the Project." Tribal cooperating agencies urged the co-lead agencies, now including the US Forest Service (USFS), to do a more robust analysis of the underground mining alternative for the SDEIS, but the co-lead agencies did not "exercise a degree of skepticism in dealing with self-serving statements from the prime beneficiary of a project" when analyzing this alternative. This alternative was eliminated by the Project proponent based purely on an economic decision that underground mining would not be as	The Underground Mine alternative was first considered but eliminated during the Final Scoping Decision Document (FSDD) process. The FEIS Section 3.2.3.4.1 describes how it was re-considered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other	ALT 01

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	profitable as open pit mining. The co-lead agencies claim that "it was not possible to undertake a quantitative, side-by-side assessment of the underground mining alternative." An underground mine would have a reduced mining rate and life of mine, employed fewer workers for a shorter period of time, and reduced state and local tax revenues. Although the underground mining alternative would offer substantial environmental benefits (significantly less wetland destruction, less mine-generated waste, less groundwater and surface water pollution generated and requiring treatment and control, less reclamation and closure activities, less nuisance and reactive dust to be controlled, less noise and vibration impacts, less visual impacts), the economic and intrinsic value of those benefits are not even estimated. In addition, an underground mine project would not require a federal land exchange, resulting in lower start-up costs and avoiding the permanent loss of high quality resources (as discussed in later comments on Land Exchange impacts). Based upon an incomplete analysis of the benefits of an underground mine, the co-lead agencies determined that this alternative would result in reduced socioeconomic benefits, and; "PolyMet would not move forward with an unprofitable project, thus any potential environmental or socioeconomic benefits associated with this alternative are moot."	common metric; however, this EIS acknowledges that economic costs and loss of non-market value may results from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
19585	The co-lead agencies determined that underground mining was considered technically feasible, but concluded that "PolyMet is a private sector and for-profit company, the value of the saleable material would need to provide sufficient income to cover operating cost (which includes, but is not limited to, the cost of mining, processing,	The Underground Mine alternative was first considered but eliminated during the Final Scoping Decision Document (FSDD) process. The FEIS Section 3.2.3.4.1 describes how it was re-considered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was re-considered during development of the SDEIS. In response to a request from	ALT 01

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	transportation, and waste management), capital cost (to build and sustain facilities), an adequate return to investors, reclamation, and closure costs and taxes. An underground mining project would leave most of the NorthMet Deposit unmined because of its low metal value relative to the cost of mining and mineral processing. Other material would have to be left in place for safety reasons, to prevent collapse." Therefore, "the Co-lead Agencies found that while underground mining is technically feasible, available, and would offer significant environmental benefits over the proposed NorthMet Project, it would not be economically feasible and would not meet the Purpose and Need. Since the underground mining alternative would not meet all of the screening criteria, it is not considered to be a reasonable alternative. Therefore, the underground mining alternative was eliminated from further evaluation in the SDEIS." The SDEIS does not contain the appropriate level of detail required to eliminate this alternative. The conclusion that underground mining is neither viable nor preferable remains substantially unjustified, despite repeated requests by the tribal cooperating agencies for further analysis.	the Co-lead agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead agencies independently evaluated (see FEIS Appendix B). The Co-lead agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the purpose and need of the project. Though it would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration.	
19587	The Project Proponent, without considering the economics of perpetual treatment, the purchase of thousands of acres of land for the federal land exchange, direct and indirect wetland mitigation costs, etc., concludes in their economic analysis that underground mining is "[n]ot economically viable" while simultaneously claiming that backfilling the west pit would create encumbrances not allowed in their mineral lease due to mineral resources located below the west pit that could only be accessed through underground mining. This is not the appropriate rigor in a cost-	The Underground Mine alternative was first considered but eliminated during the FSDD process. FEIS Section 3.2.3.4.1 describes how it was reconsidered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer	ALT 01 ALT 03

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	benefit analysis for thoroughly evaluating an EIS alternative. The CEQ regulations require that, where a cost-benefit analysis is "relevant to the choice among environmentally different alternatives," there are a variety of additional requirements, including "analysis of un-quantified environmental impacts, values, and amenities," in addition to other CEQ alternatives rules.	environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. The FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may results from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
19588	As already argued in the Tribal Position, significant additional study of the underground mining alternative is mandated, and the SDEIS offers no new discussion of the reasons for rejecting the alternative. The economic viability of an underground mine depends on a variety of factors including ore grade, market prices, cost of tailings management, and waste rock disposal. A study of this particular deposit was performed by the prior owner of the site, US Steel, which actually recommended underground mining. PolyMet is well aware of this study, given that the company included it in a filing with the Securities and Exchange Commission in 2003. In fact, by examining geologic cross-sections showing the distribution of ore by depth, it appears that there are substantial ore reserves at depths that likely could not be accessed by the proposed open-pit	The Underground Mine alternative was first considered but eliminated during the FSDD process. The FEIS Section 3.2.3.4.1 describes how it was reconsidered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was reconsidered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be profitable, regardless of the tonnage extracted. The lower rate of ore production would not meet the Purpose and Need of the project. Though it would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. They accordingly concluded that the Underground Mine alternative was not economically feasible, and would not meet the NorthMet Project's Purpose and Need. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from	ALT 01

Comment ID	Comment	Response	Theme(s)
	mine.	further consideration. The FEIS Section 5.2.10.1.4 states, "Neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may results from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
19589	The environmental costs of open-pit mining and the requisite wetland mitigation and above-ground disposal of tailings and waste rock are immense. These environmental costs, combined with the most current understanding of deposit ore grades, reasonably potential metals prices, and the costs associated with perpetual treatment must all be evaluated to determine the feasibility of this [underground mining] alternative.	The Underground Mine alternative was first considered but eliminated during the Final Scoping Decision Document (FSDD) process. FEIS Section 3.2.3.4.1 describes how it was re-considered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was re-considered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be economically feasible, regardless of the tonnage extracted. In addition, the lower rate of ore production would not meet the Purpose and Need of the project. Although the Underground Mine alternative would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration. FEIS Section 5.2.10.1.4 states, "neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric. However, this EIS acknowledges that economic costs and loss of non-market value may result from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach	ALT 01

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		of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."	
19594	Even the No Action Alternative analysis is deficient: Under the NorthMet Project No Action Alternative, the NorthMet Project Proposed Action would not occur. The consideration of a No Action Alternative is required to be evaluated in the SDEIS in accordance with NEPA and MEPA. If the NorthMet Project Proposed Action is not approved, the Mine Site would be returned to pre-exploration conditions under the requirements of exploration approvals to reclaim surface disturbance associated with exploratory and development drilling activities. Other existing surface uses would be allowed to continue consistent with the Forest Plan. No further upgrades or new segments would be constructed along the existing power transmission line, railroad, or Dunka Road, which would continue to be used by their private owners. At the brownfield Plant Site, Cliffs Erie would continue to complete closure and reclamation activities as specified under state permits and plans and the Cliffs Erie Consent Decree. This would include completing activities for the localized affected areas under the Minnesota Voluntary Investigation and Cleanup (VIC) Program, removal of the former Plant Site building, and management of seepage at the Tailings Basin embankment. This evaluation must also acknowledge that there	The FEIS discusses in Section 3.2.3.2 how the Consent Decree under the NorthMet Project No Action Alternative would require Cliffs Erie to complete closure and reclamation activities at the Plant Site. This would include completing activities for the localized affected areas under the Minnesota Voluntary Investigation and Cleanup (VIC) Program, removal of the former Plant Site building, and management of seepage at the Tailings Basin embankment. The FEIS identifies in Table 3.2-1 that under the NorthMet Project No Action Alternative, there would be no mining activities, and that existing management and land use of the federal lands would continue. The NorthMet Project No Action Alternative is also analyzed under each resource area in the FEIS Chapter 5, and summarized in the FEIS Table 7.2.4-1. FEIS Section 5.2.3.4 identifies that under the NorthMet Project No Action Alternative there would be no direct or indirect effects on wetlands.	ALT 14 WR 108

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	would be no direct disturbance of over 900 acres of high quality wetlands, thousands more wetland acres that would not be indirectly affected, no loss of high quality forested uplands, no further diminishment of wildlife habitat, no permanent loss of treaty resources under the land exchange, no cumulative effects to resources and environmental quality. In fact, water quality should improve substantially under the No Action Alternative, as the Cliffs Erie Consent Decree requires that the closed tailings basin ultimately achieves compliance with MN WQS.		
19595	The SDEIS is approach to considering less environmentally degrading alternatives is fundamentally inadequate. CEQ rules require that the EIS "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public." The SDEIS must be revised to fully evaluate reasonable alternatives in the SDEIS, including identifying the federal agency preferred alternative and the LEDPA.	The original project proposal and alternatives were developed during project scoping in 2005. The NorthMet Project Proposed Action was refined at various points in response to public and agency input. As a result, the NorthMet Project Proposed Action studied in the SDEIS is not identical to the proposed action in the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Because some of the alternatives to the proposed action were eliminated during the scoping and DEIS phases of the project, they were not re-evaluated in the SDEIS. Alternatives were eliminated from detailed evaluation if they did not offer substantial environmental or socioeconomic benefits, were not reasonable (technically or economically feasible), were not available, or would not meet the Purpose and Need. This review—beginning during the scoping process and concluding with the FEIS—is consistent with the alternatives review required by NEPA and MEPA, and with the CEQ rules for analyzing alternatives. The FEIS explains in Section 3.2.3 how alternatives were eliminated or incorporated. Minnesota Rules and CEQ rules (40 CFR 1502.14) require that the effects of the NorthMet Project Proposed Action and alternatives must be compared. The FEIS compares the NorthMet Project Proposed Action, NorthMet Project No Action, Land Exchange Proposed Action, Land Exchange Alternative B, and Land Exchange No Action Alternative separately.	ALT 20
19597	The land Exchange Proposed Action, as described in the SDEIS, serves to confirm our concerns for permanent, unmitigated impacts to treaty resources	As described in the FEIS, there would not be a net loss to the 1854 Ceded Territory. All of the non-federal lands proposed for exchange are located within the 1854 Ceded Territory. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and	LAN 05

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	in the 1854 Ceded Territory.	public objectives of the federal lands. See Section 1.4.3 of the FEIS. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites (Zim Site) for wetland impacts is proposing to compensate for the loss of bogs and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be impacted as a result of the Land Exchange Proposed Action as no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action would result in additional wild rice beds to the federal estate. The FEIS, Section 5.3.2, clarifies that the Land Exchange Proposed Action would not result in a loss of wild rice beds, nor would the use of the wild rice beds change for the Bands. Please refer to theme LAN 01 for more information on the public interest determination as part of the USFS process.	
19599	The land Exchange Proposed Action does not meet the need of the Bands in the 1854 Ceded Territory. It results in a permanent loss of 382 acres, does not protect fish and wildlife habitat within the Mine Site, does not protect important cultural resources such as wild rice beds, historic trails, and a substantial portion of the Mesabi Widjiu, does not protect the Embarrass, Partridge or St. Louis River watersheds, does not consolidate mineral interests in the private parcels that would be conveyed to	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project	LAN 05

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	the federal estate, does not promote multiple-use values, or fulfill public needs.	area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any	

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		cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19600	maintaining public land ownership is critical for the exercise of treaty rights. There are 382 acres of Lake County land proposed for the land exchange (Tract 2). This means a net loss, through the exchange, of publicly accessible land for band members exercising their treaty rights.	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important	LAN 05

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		natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections	

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		5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19601	The Forest Service should consider exchange for private lands only in order to maintain - or better yet, increase - the total public land acreage within the 1854 Ceded Territory.	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to	LAN 05

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		the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19603	This language and description [SDEIS 3.1.2, Land	The FEIS includes information about the baseline conditions of the federal	LAN 06

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	Exchange Overview] is misleading; it downplays the largely undisturbed nature and ecological and biodiversity significance of most of the contiguous lands (i.e., the Hundred Mile Swamp, St. Louis River Headwaters Site).	lands and MBS sites such as the One Hundred Mile Swamp Site in Sections 4.2.4.2.1 (Mine Site) and 4.3.4.1.1 (Federal Lands). The FEIS Sections 4.2.4 and 4.3.4 provide maps of the MBS Sites (Figures 4.2.4-1, 4.2.4-2, 4.2.4-5, 4.3.4-1, and 4.3.4-2) to provide further clarity on locations and extent.	VEG 02
19611	Of the approximately 6,025 acres of MBS Sites of High Biodiversity Significance under the Land Exchange Proposed Action, nearly 2,000 acres of coniferous bog wetlands will be lost to the federal estate and therefore effectively to the Bands, if the Land Exchange Proposed Action is implemented. This is significant because many tribally harvested resources are only available in coniferous bogs (e.g. cranberries, soft-leaved blueberries, sweet flag), and mitigation for coniferous bogs is simply not feasible.	The FEIS includes discussion about NorthMet Project impacts to habitat types, MBS sites, and native plant communities. The vegetation analysis cross-references the FEIS cultural resources section (Section 5.2.9) to ensure consistency and to discuss potential impacts on tribally harvested resources. FEIS Section 5.2.3 discusses restoration of coniferous bogs in mitigation wetlands. The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions. The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and that the Bands' usufructuary rights to resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effect posed to usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands Through consultation, the Co-lead Agencies understand that the Bands' principle	CR 01 WET 05 VEG 02

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		interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing and gathering, cultural or religious resources, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 ceded territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process.	
19612	The exchange of thousands of acres of high quality wetlands and forests containing some of the few remaining wildlife corridors in northeastern Minnesota available to the Bands to exercise reserved 1854 Treaty rights, for lands that have moderate diversity is inconsistent with fiduciary responsibilities that are shared by all federal agencies.	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the	CR 01 LAN 05

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		Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there	

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		would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19613	The SDEIS attempts to diminish the significance of the loss of these high quality lands by stating "Given the existing lack of overland public access and actual use of the federal lands, as well as historic use of this area for mineral exploration (see Section 4.2.9), the Land Exchange Proposed Action represents little to no change in the actual level of recent or current use of the federal lands." In fact, historic trails connect what is now Beaver Bay with Lake Vermillion. These trails "are associated with the lives of persons significant in our past" including John Beargrease, Peter Gagnon, and Alec Posey. In more recent history, Bois Forte Band members used a sugarbush near the plant site and harvested wild rice in the Embarrass River near the LTVSMC tailings basin.	As discussed in FEIS Section 5.3.1.2.1, the only public access to the federal lands is via the Partridge and Embarrass rivers. The remainder of the federal lands are surrounded by private lands (or by other public lands that are themselves surrounded by private lands) (see Figure 4.3.1-1). While members of the public may obtain permission to cross these private lands and access the federal lands, there is no designated land-based access for the federal lands.	CR 04
19614	The SDEIS does not provide adequate discussion of the adverse effects of the proposed land exchange on wetlands and headwater streams within the St. Louis River watershed/Lake Superior Basin, where the loss of first-order headwaters streams, second-order streams and wetlands have the potential to significantly adversely impact downstream water quality, fisheries, and wildlife that are important to the Bands. The Land Exchange Proposed Action would relinquish water resources within the Lake Superior basin for wetlands and surface water resources outside the Lake Superior basin and the St. Louis River watershed, although still within the 1854 Ceded Territory. Federal lands include 4,164 acres of wetlands within the Lake Superior basin;	The SDEIS and FEIS acknowledge a possibility that habitat could be affected from water chemistry changes resulting from the Land Exchange Proposed Action. Habitat loss from flow changes or riparian activities is not expected as a result of the NorthMet Project Proposed Action. It is noted that under the Land Exchange Proposed Action, , the net reduction to the Superior National Forest of 0.3 miles of first order streams may result in slightly less habitat available for headwater stream dependent species. The FEIS Section 5.3.3 included a discussion of wetland resources to be gained or lost as part of the Land Exchange Proposed Action. The Land Exchange Proposed Action represents a transfer of surface rights of 6,495.4 acres from the Superior National Forest to PolyMet to eliminate the conflict between federal surface and private mineral estate. This action, if approved, would remove those acres from Superior National Forest management and public use and transfer them to private ownership. Effects to wetland resources as a result of the mining activities are discussed in FEIS Section 5.2.3. The FEIS Section 5.3.6 included a discussion of headwater streams	AQ 29 CR 01 WET 14 WR 114 WI 02

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	non-federal lands contain 4,669 acres of wetlands, of which only 373 acres are within the Lake Superior Basin, demonstrating there would be a permanent loss of 3,791 acres of federally managed wetlands within the Lake Superior Basin. It is well known that wetlands play an important role in protecting the quality and condition of downstream waters by retaining floodwaters, sediment, nutrients, and other pollutants. wetlands also function as thermal refuge for moose when summertime temperatures exceed 14oC, the point at which moose become thermally stressed, and wetlands provide an important forage resource for moose during the open water season.	to be gained or lost from the proposed land exchange. The proposed land exchange non-federal lands are not mitigation sites and are not required to be exchanged within the same watershed. The non-federal lands being considered are all lands that are located within the proclamation boundary of the Superior National Forest and would consolidate land ownership management.	
19615	the SDEIS concedes that the land exchange will cause irretrievable losses of resources for the Bands	The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6 also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the review of the NorthMet Project Proposed Action.	CR 01
19616	The SDEIS states, "The Land Exchange Proposed Action would result in additional wild rice beds by the acquisition of Tract 1. Tract 1 contains Little Rice Lake, which supports a continuous population of wild rice. Wild rice also grows along the Pike River south of Little Rice Lake and in isolated populations on Hay Lake." However, the wild rice waters in Tract 1 are already accessible to the Bands via the Pike River; adding Tract 1 to the federal estate does not provide additional wild rice harvesting opportunities to Band members in the 1854 Ceded Territories even though it would add an additional 126 acres of wild rice beds to the federal estate.	The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B as no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would result in additional wild rice beds to the federal estate. The FEIS, Sections 5.3.2 and 5.3.4 , clarifies that though the Land Exchange Proposed Action would result in an increase in wild rice beds within the federal estate boundaries there would be no change to the existing public access to Tract 1 wild rice beds via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice beds are known to occur on the federal lands, and suitable habitat is limited.	LAN 05 WR 155

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19617	This is the essential argument against Alternative B, from the Bands' perspective. The additional lands would essentially be permanently removed from tribal access, habitat and resources would be degraded, and there would be no compensation via conveyance of lands to the federal estate.	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland	LAN 05

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		impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19618	The desire to resolve "conflict" between the USFS and the Project proponent, whose goal to develop an open pit mine is barred due to deed restrictions on the federal estate, should not prevail over the federal fiduciary responsibility to the Bands. The potential for more roads and hiking trails may provide more access to the public, but does nothing to promote habitat diversity and long-term ecosystem sustainability that are requirements for the preservation of tribal usufructuary rights. Although the Land Exchange Proposed Action	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great	LAN 05

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	may increase acreage in the federal estate, the countervailing permanent loss of Critical Wildlife corridors, high quality and diverse land and water resources that would result is simply not in the public interest.	Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural	

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		resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19619	Federal land exchanges are discretionary, and federal agencies cannot approve permits that will have impacts to treaty resources without additional evaluation and mitigation. No mitigation has been identified in the SDEIS for this permanent loss of lands and resources (natural and cultural) to the 1854 Ceded Territory. The public interest determination must include a specific finding that "The intended use of the conveyed Federal land will not substantially conflict with established management objectives on adjacent Federal lands, including Indian Trust lands" (36 CFR. 254.3(b)(2)(ii)). This threshold has not been met, and the Fond du Lac Band objects to the implementation of the Land Exchange Proposed Action.	The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies	CR 01 LAN 05

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		have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an	

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		increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6 also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the review of the NorthMet Project Proposed Action. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19620	In the SDEIS, no detail is provided regarding the estimated amount of financial assurance that would be sufficient for reclamation, closure, mitigation, and remediation of adverse effects from the Project...the SDEIS provides neither a timeline nor a discussion regarding financial assurance for the existing contamination associated with previous mining activities at the site.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, time frames, and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. Maintenance, mitigation, and cleanup of legacy contamination, would be covered by financial assurance.	FIN 05
19621	The financial assurance costs for long-term treatment identified in the SDEIS range from $3.5 to $6 million, but appears to be an estimate for monitoring activities only without any long-term wastewater treatment costs.	FEIS Section 3.2.2.4 provides available details regarding financial assurance, including for reclamation of all disturbed areas and ongoing long-term treatment, monitoring and maintenance costs. Additional details on the cost estimates, time frames, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1	FIN 05

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		discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate.	
19622	The cursory estimate of financial assurance provides little detail about how the cost estimates were derived. Instead, specific discussions about the scale and appropriate instruments for financial assurance have been postponed until the permitting phase of this Project. This approach fundamentally contradicts federal and state environmental policy and the SDEIS must be revised, with significant additional study, to appropriately evaluate closure, mitigation, reclamation, and perpetual treatment cost estimates.	FEIS Section 3.2.2.4 provides available details regarding financial assurance, including for reclamation of all disturbed areas and ongoing long-term monitoring and maintenance, as required under NEPA/MEPA. Additional details on the cost estimates, time frames, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate. *Minnesota Rules*, part 6132.1200, subpart 4 states that the Commissioner shall evaluate all financial assurance cost estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs. Neither NEPA nor MEPA rules require that all financial assurance mechanisms be in place before the EIS is finalized.	FIN 13
19623	Long-term treatment of contaminated water; consistency with maintenance-free closure goals: The SDEIS lists the sulfur concentrations of Project waste rock ranging between 0.01 - 5.0% with an average mass-weighted concentration of 0.15%. The Virginia Formation has the highest concentrations of sulfur at 0.4 - 5.0%, and the Duluth Complex 0.13 – 0.6% sulfur. These concentrations are at least equal to, or in some instances significantly higher than the Zortman-landusky mine waste rock (0.2% sulfur) that requires perpetual wastewater treatment. Just as Zortman-landusky predicted for their mine project, PolyMet has suggested that "most (70%) of the NorthMet waste rock would be the low-sulfur, non-acid-generating" and will never cause acid	The GoldSim model used probabilistic modeling to avoid improbable predictions that can occur when a deterministic simulation is done with a suite of "worst case" inputs. The probabilistic modeling approach used in GoldSim provides cumulative probability distributions for predicted concentrations that are far more useful for impacts assessment and project evaluation. Computing a "highest predicted concentration" is not useful if the probability of its occurrence is exceedingly small. Concentration caps are established at the highest expected concentrations of solutes in the various types of mine waste. Concentration caps incorporated into the GoldSim model are based upon the widely observed finding that the concentration of many solutes released by oxidation of sulfide metals in mine wastes can be limited by the precipitation of secondary minerals or adsorption to mineral surfaces. Because concentration caps vary with aqueous chemical conditions (i.e., most metals in mine waste pore waters have higher concentration caps in acidic conditions than neutral conditions), the GoldSim model applied different caps to water from acid-	PD 03 WR 056

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	mine drainage. Yet the SDEIS speaks to the need for at least centuries of wastewater treatment at both the Mine Site and Plant Site: "Once the West Pit is full (approximately year 40), discharge of treated water from the WWTF to the West Pit would be terminated. The WWTF would be upgraded to RO and include evaporator/crystalizers to convert the RO reject concentrate to residual solids, which would be disposed of at appropriate off-site facilities."…Based on current GoldSim P90 model predictions, treatment activities could be required for a minimum of 200 years at the Mine Site"...Mechanical water treatment is part of the modeled NorthMet Project Proposed Action for the duration of the simulations (200 years at the Mine Site, and 500 years at the Plant Site). The duration of the simulations was determined based on capturing the highest predicted concentrations of the modeled NorthMet Project Proposed Action. It is uncertain how long the NorthMet Project Proposed Action would require water treatment, but it is expected to be long term; actual treatment requirements would be based on measured, rather than modeled, NorthMet Project water quality performance, as determined through monitoring requirements." The tribal cooperating agencies have provided substantial evidence that the modeling for the NorthMet Project Proposed Action potentially underestimates those "highest predicted concentrations." This will affect both volumes of water requiring treatment and duration of the need for mechanical treatment.	generating waste and non-acid generating waste. The selection of specific values for concentration caps was considered by the Co-lead Agencies (see Table 1 of MDNR, et. al. 2011, as cited in the FEIS); the specific ranges for concentration caps were estimated from mineral solubilities (for those solutes commonly found as secondary minerals in mine wastes) or observed in effluent from field-scale mine wastes (see Tables 1-15 and 1-30 through 1-33 in Barr 2012d, as cited in the FEIS). Concentration caps were based on field studies rather than laboratory studies so that the rock to water ratios would be similar to conditions expected at the NorthMet Project Site, and thus would avoid the higher water to rock ratios in humidity cell tests that could under-estimate caps. The use of concentration caps is described in FEIS Section 5.2.2.2.3.	
19624	After refill, the West Pit water level would be controlled by pumping to the WWTF to prevent surface water overflow from the pit lake. However, release of pit lake water to the West Pit Surficial	Section 5.2.2 of the FEIS says water quality modeling performed in support of the FEIS indicates that water treatment systems would be needed indefinitely at the Mine Site and Plant Site. If and when non-mechanical water treatment is implemented at the Plant Site, Unnamed Creek, Trimble	WR 035 WR 036

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	Flowpath would continue. The WWTF would also receive low flow rates from the Category 1 Stockpile groundwater containment system. The WWTF effluent would be discharged into a tributary channel that flows into the Partridge River at the location shown on Figure 5.2.2-15. Mine site: The WWTF would continue to operate during long-term closure, treating excess water from the West Pit and discharging the effluent to the small Partridge River tributary. The typical discharge rate from the WWTF is predicted to be 285 gpm. The water balance model predicts periodic temporary higher treatment/discharge rates to account for conditions when the freeboard in the pit becomes too small. By pumping pit lake water to the WWTF, the pit water level would be managed to always provide sufficient freeboard to absorb extreme precipitation events without overflowing. The estimated discharge for this condition is 570 gpm. In the water balance model, the occasional switch to the "high" treatment flow pushes the long-term average discharge rate to 290 gpm. Plant Site: During long-term closure, the WWTP would continue to treat water collected by the Tailings Basin containment systems. Some of the treated effluent would be used for flow augmentation to Unnamed Creek, Mud Lake Creek, Trimble Creek, and Second Creek. It is predicted that Colby Lake water would no longer be needed for augmentation (Barr 2013a). Tailings seepage bypassing the containment system (approximately 19.4 gpm) would continue to enter the North, Northwest, and West Surficial flowpaths, and migrate slowly toward the Embarrass River. By year 200 in closure, which reflects when effects would have peaked and would be decreasing, the WWTF would be discharging and all groundwater contaminant loads would have reached the Partridge River (except	Creek and Mud Lake Creek stream augmentation would no longer be necessary.	

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	negligible contributions from the bedrock flowpaths). Whatever the long-term goals to transition to non-mechanical treatment, this acknowledges a minimum of 200 years of operation of the WWTF. It is clear that the NorthMet Project Proposed Action would require long term treatment of water at both the Plant and Mine Sites. The minimum duration of this treatment is on the order of centuries, but the SDEIS does not provide an estimate of when mechanical treatment would no longer be needed to meet MN WQS. Therefore, as provided in multiple comments on the preliminary SDEIS, Fond du Lac conservatively assumes that water treatment for the proposed PolyMet mine is perpetual and the SDEIS should be clear on this issue.		
19625	However, instead of clarifying this factor, it appears that the co-lead agencies are attempting to minimize the significance of the necessity for long term/perpetual treatment by using vague and confusing language in the SDEIS. The specific language describing long term water treatment has changed during the development of the document, even though the model results have not. The co-lead agencies use creative wording to obscure the results of the modeling; this is misdirection at best and highly inappropriate for the co-lead agencies to present to the public.	Water quality modeling performed in support of the FEIS indicates that water treatment systems in some form and at some scale would be needed at the Mine Site and Plant Site indefinitely. The water models constructed to assess the potential effects from the NorthMet Project Proposed Action were not designed to predict the duration of treatment nor do they capture all the factors that influence the duration of treatment, for example potential future regulatory and technological changes. Therefore, the models cannot be used to predict a year treatment would end. Actual treatment requirements would be assessed on a reoccurring basis throughout operations and closure based on results of ongoing discharges, performance and water resource monitoring ensuring continuous protection of ground and surface water quality and compliance with applicable water quality standards. This reassessment process would rely on measured monitoring results (evaluated through modeling) rather than the results of the predictive modeling included in the FEIS. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there are measures available to address impacts to natural resources.	NEPA 09 WR 035
19626	In addition to water treatment, there will also need to be a substantial investment in long-term or perpetual operation, maintenance and replacement of other environmental controls for the Project,	It is acknowledged that operation, maintenance and periodic replacement of environmental controls would be required during closure. Financial Assurance would be required under the State's Permit to Mine to perform these activities on a continuous and/or periodic basis for as long as these	PER 03 WR 035 WR 037

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	including seepage capture and pumping at multiple locations at both the mine site and plant site, repair and replacement of liners, managing appropriate stream augmentation and Tailings Basin pond elevation, and pumping, treating, and disposal of seepage from the HRF: The Tailings Basin pond would primarily receive solute loadings from the tailings, treated Mine Site process water (primarily during years 1 to 11, and possibly through year 20, depending on the NorthMet Project Proposed Action water budget), and captured seepage from the groundwater containment system. The Tailings Basin pond, in turn, would become a primary source of contaminants as its water seeps into the tailings. Therefore, the composition of the Tailings Basin pond, which would be a permanent feature of the Tailings Basin, would be an important component in the quality of water that would be discharged from the Tailings Basin. Thus, PolyMet proposes to use the WWTP to treat the pond water during reclamation, and as necessary during closure, to maintain the design water level and prevent overflow. The presence of the pond in closure would provide benefits as it would create a saturated layer that would permanently reduce the oxygen flux and associated solute release in the underlying tailings. The groundwater containment system would continue to operate during reclamation and closure, although in those phases, the seepage could not be reused as process water, but would be treated at the WWTP and used to accelerate filling of the West Pit (during reclamation) and for streamflow augmentation (during closure). Although it is designed to capture all of the Tailings Basin seepage, the groundwater containment system is assumed to capture 90 percent of the groundwater flow that approaches the system (PolyMet 2013g). During reclamation, all WWTP effluent would be used to help flood	activities are needed. The FEIS Project description indicates that no Colby Lake water would be used for direct surface water augmentation. All water used for stream augmentation would be treated prior to being added to hydrologically affected waters. See the response to theme WR 035.	

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	the West Pit; therefore, during this phase, all augmentation water would come from Colby Lake (approximately 1,600 gpm). In closure, it is expected that effluent from the WWTP alone (estimated at approximately 2,000 gpm) would be sufficient to meet the minimum flow augmentation requirements of the tributaries without requiring additional water from Colby Lake.		
19627	The Tailings Basin pond would primarily receive solute loadings from the tailings, treated Mine Site process water (primarily during years 1 to 11, and possibly through year 20, depending on the NorthMet Project Proposed Action water budget), and captured seepage from the groundwater containment system. The Tailings Basin pond, in turn, would become a primary source of contaminants as its water seeps into the tailings. Therefore, the composition of the Tailings Basin pond, which would be a permanent feature of the Tailings Basin, would be an important component in the quality of water that would be discharged from the Tailings Basin. Thus, PolyMet proposes to use the WWTP to treat the pond water during reclamation, and as necessary during closure, to maintain the design water level and prevent overflow. The presence of the pond in closure would provide benefits as it would create a saturated layer that would permanently reduce the oxygen flux and associated solute release in the underlying tailings. The groundwater containment system would continue to operate during reclamation and closure, although in those phases, the seepage could not be reused as process water, but would be treated at the WWTP and used to accelerate filling of the West Pit (during reclamation) and for streamflow augmentation (during closure). Although it is designed to capture all of the Tailings Basin seepage, the groundwater containment system is assumed to capture 90	It is acknowledged that operation, maintenance and periodic replacement of environmental controls would be required during closure. Financial Assurance would be required under the State's Permit to Mine to perform these activities on a continuous and/or periodic basis for as long as these activities are needed. The NorthMet Project Proposed Action has been modified since the SDEIS to address the issue of using Colby Lake water for augmentation. The FEIS Project description indicates that no Colby Lake water would be used for direct surface water augmentation. All water used for stream augmentation would be treated prior to being added to hydrologically affected waters. See the response to theme WR 035. Section 5.2.2 of the FEIS says water quality modeling performed in support of the FEIS indicates that water treatment systems would be needed indefinitely at the Mine Site and Plant Site. If and when non-mechanical water treatment is implemented at the Plant Site, Unnamed Creek, Trimble Creek and Mud Lake Creek stream augmentation would no longer be necessary.	WR 035 WR 037 WR 124

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	percent of the groundwater flow that approaches the system (PolyMet 2013g). During reclamation, all WWTP effluent would be used to help flood the West Pit; therefore, during this phase, all augmentation water would come from Colby Lake (approximately 1,600 gpm). In closure, it is expected that effluent from the WWTP alone (estimated at approximately 2,000 gpm) would be sufficient to meet the minimum flow augmentation requirements of the tributaries without requiring additional water from Colby Lake. These statements indicate the need for perpetual WWTP operation, if for no other reason than needing clean water for stream augmentation, which will be required in perpetuity to compensate for the hydrologic impacts of the Tailings Basin.		
19628	The rate of drainage would decrease over time as the pore water within the hydrometallurgical residue is collected and removed. Once the entire facility is closed, the volume of water from the drainage collection systems would decline. In the long term, the volume of water requiring treatment would decline to the point that the remaining reclamation activity may consist of periodic pumping of remaining drainage into tank trucks for transportation, treatment, and disposal, as appropriate, and of inspection of the closed cells to verify integrity of the reclamation systems...The water quality of both mine pits, however, is predicted to improve over time as the pits become flooded, thereby effectively eliminating oxidation of the pit walls, the primary source of solutes, except for the upper few feet where water levels may fluctuate. Figures 5.2.2-37, 5.2.2-38, and 5.2.2-39 show how the water quality in the West Pit is predicted to improve over time for three representative solutes: cobalt, nickel, and sulfate. It is expected that eventually the solute concentrations in the pits would stabilize to more	The NorthMet Project Proposed Action relies on mechanical treatment for as long as necessary. FEIS Chapter 3 states that PolyMet has committed to conducting pilot and other feasibility studies on the use of non-mechanical treatment as an adaptive management measure if proven effective and cost efficient. The possible future use of non-mechanical treatment is stated as a long-term goal, but the details of how such systems would operate would be determined once operations begin and site specific data could be used for pilot/feasibility studies, and if eventually proposed would be addressed in future permitting.	PD 06 WR 137

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	or less steady-state values, although the timeframe for this would likely be greater than 200 years as indicated by Figures 5.2.2-37 to 5.2.2-39, which show solute concentrations continuing to decrease at year 200, although still above water quality standards. These predicted improvements in water quality suggest that the WWTF may not need to operate permanently, but that at some point, non-mechanical treatment systems may be sufficient to meet water quality standards. The SDEIS frequently states the long-term goal is to transition to non-mechanical treatment, but there is little evidence to suggest that current treatment technologies can consistently treat large volumes of water to meet WQS.		
19629	Furthermore, constructed wetlands would require substantial acreage to handle the volume of wastewater that will perpetually be collected, and do not function well in our cold climate for at least half of the year (when vegetation is not actively growing). They are not likely to be able to treat wastewater sufficiently to consistently meet water quality standards, including the wild rice sulfate criterion. But perhaps most the most significant factor to consider for the likelihood of successfully transitioning is that non-mechanical treatment, at least at the Mine Site, necessitates the seasonal application of the wild rice sulfate criterion: "…However, the non-mechanical system will be designed to discharge only during a portion of the year, to comply with the seasonal discharge criterion for wild rice downstream of the Mine Site. The design of the West Pit Overflow Non-Mechanical Treatment System is based on a discharge period of two months, September and October."	The NorthMet Project Proposed Action relies on mechanical treatment for as long as necessary. FEIS Chapter 3 states that PolyMet has committed to conducting pilot and other feasibility studies on the use of non-mechanical treatment as an adaptive management measure if proven effective and cost efficient. The possible future use of non-mechanical treatment is stated as a long-term goal, but the details of how such systems would operate would be determined once operations begin and site specific data could be used for pilot/feasibility studies, and if eventually proposed would be addresses in future permitting. Reference to a seasonal application of the wild rice standard has been removed from the description of these potential future non-mechanical treatment systems for the FEIS.	WR 137 WR 153
19630	"However, the non-mechanical system will be designed to discharge only during a portion of the	The NorthMet Project Proposed Action relies on mechanical treatment for as long as necessary. FEIS Chapter 3 states that PolyMet has committed to	WR 137

Comment ID	Comment	Response	Theme(s)
	year, to comply with the seasonal discharge criterion for wild rice downstream of the Mine Site. The design of the West Pit Overflow Non-Mechanical Treatment System is based on a discharge period of two months, September and October." As described in the AWMP, this type of non-mechanical treatment system cannot meet the 10mg/l sulfate criterion. At this time, the continued implementation of the seasonal application of that criterion is highly questionable as recent research conducted by the University of Minnesota on behalf of the MPCA indicates excess sulfate loading is detrimental to wild rice regardless of the time of year.	conducting pilot and other feasibility studies on the use of non-mechanical treatment as an adaptive management measure if proven effective and cost efficient. The possible future use of non-mechanical treatment is stated as a long-term goal, but the details of how such systems would operate would be determined once operations begin and site specific data could be used for pilot/feasibility studies, and if eventually proposed would be addresses in future permitting. Reference to a seasonal application of the wild rice standard has been removed from the description of these potential future non-mechanical treatment systems for the FEIS.	WR 153
19631	The SDEIS requires substantially more public transparency and less equivocation on what is arguably one of the most fundamental issues at stake for this project: how long will the company be required to flawlessly operate and maintain expensive mechanical treatment to comply with MN WQS? Clearly there are other engineering controls and management actions that will absolutely have to flawlessly operate and require maintenance in perpetuity (seepage collection, liners, pumps, waste rock stockpile cover systems, waste disposal, stream augmentation, Tailings Basin pond elevation management). This singular issue has significant repercussions for the public interest determinations and the scale of required financial assurance.	Water quality modeling performed in support of the FEIS indicates that water treatment systems in some form and at some scale would be needed at the Mine Site and Plant Site indefinitely. The water models constructed to assess the potential effects from the NorthMet Project Proposed Action were not designed to predict the duration of treatment nor do they capture all the factors that influence the duration of treatment, for example potential future regulatory and technological changes. Therefore, the models cannot be used to predict a year treatment would end. Actual treatment requirements would be assessed on a reoccurring basis throughout operations and closure based on results of ongoing discharges, performance and water resource monitoring ensuring continuous protection of ground and surface water quality and compliance with applicable water quality standards. This reassessment process would rely on measured monitoring results (evaluated through modeling) rather than the results of the predictive modeling included in the FEIS. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there are measures available to address impacts to natural resources. Engineered systems can operate successfully over long periods of time if they are property monitored and maintained. The FEIS provides a comprehensive description of proposed water treatment and seep collection systems including surface water and groundwater containment and synthetic liners and covers. This includes the types of monitoring used to assess performance. Detailed designs are provided in supporting documents, which are fully referenced in the FEIS. The FEIS also discusses	PD 03 WR 036

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		long-term operation, maintenance, and periodic replacement of engineered systems. It is acknowledged that certain components of the engineered systems would need to be replaced when monitoring indicates that performance is marginal and not readily compensated for by adaptive mitigation measures. The financial assurance process would fully consider long-term monitoring and periodic replacement of equipment including, but not limited to, water treatment hardware and synthetic liners and covers. The Financial Assurance package for the NorthMet Project Proposed Action would insure that future funding would be available if and when adaptive mitigation measures or component replacements are needed to achieve performance specifications. FEIS Section 3.2.2.4 includes available details regarding financial assurance. Additional details on the cost estimates and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, as well as for monitoring and mitigation costs. FEIS Section 3.2.2.4.1 discusses the activities that would be considered in cost estimates, and states that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate.	
19632	The SDEIS identifies 29 Areas of Concern (AOCs) that are now PolyMet's legal responsibility, but still does not provide the necessary clarity about the status of remedial investigations and/or actions necessary to clean up the contamination that occurred over decades of taconite mining and processing.	FEIS Table 4.2.1-2: NorthMet Project Proposed Action Area of Concern Summary List for Voluntary Investigation and Cleanup Program, has been updated in the FEIS to show the current status and additional information where available. Costs for assessment, investigation, and cleanup are not feasible to provide (MPCA, Pers. Comm., October 27 & 29, 2014). The April 6, 2010, Consent Decree is a court registered agreement between Cliffs Erie LLC and the MPCA to resolve alleged violations of Cliffs Erie's NPDES/SDS permits for its Hoyt Lakes and Dunka mining area facilities (State of Minnesota v. Cliffs Erie, LLC. 2010, as cited in the FEIS). Of particular relevance to the NorthMet project, the Consent Decree addresses issues at the current Cliffs Erie tailings basin (including outfall SD026) and discharges from the Cliffs Erie Area 5 mining area (SD033). The Tailings Basin is part of the NorthMet Project Proposed Action, whereas Area 5 is not; however, PolyMet has entered into an agreement with Cliffs Erie where both areas would be transferred to PolyMet upon issuance of project	HAZ 05

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		permits. Until that time, Cliffs Erie retains responsibilities for permit-related activities at the tailings basin and Area 5. While certain Consent Decree-related activities have been in progress or have been completed for these areas since the SDEIS, there has been no change in ownership or responsible parties since that time (MPCA, Pers. Comm., October 27 & 29, 2014).	
19633	The SDEIS does not provide sufficient information for the public to understand whether the NorthMet Project Proposed Action will be required to remediate these and other AOCs before commencing project operations, or be allowed to defer remediation until closure. It is not clear in the SDEIS how the Voluntary Investigation and Cleanup ("VIC") program requirements will be applied to PolyMet	FEIS Table 4.2.1-2: NorthMet Project Proposed Action Area of Concern Summary List for Voluntary Investigation and Cleanup (VIC) Program, has been updated in the FEIS to show the current status and additional information where available. Costs for assessment, investigation, and cleanup are not available. It is anticipated that PolyMet would assume and continue Cliffs Erie's participation in the MPCA's VIC program for the AOCs in the areas that would be transferred to PolyMet ownership. Specific schedules for addressing each AOC will continue to be developed as part of the VIC process. Current remedial actions relating to the AOCs pertaining to lands proposed for use as part of the NorthMet Project would be taken into consideration for the MDNR Permit to Mine and other permits.	HAZ 05
19634	Cliffs Erie (now Cliffs Natural Resources) was party to a Consent Decree and approved work plan(s) with MPCA regarding their remedial responsibilities, but there is little information in the SDEIS for the public to be assured regarding the need for PolyMet to enter into a legally binding agreement and develop approvable work plans to address their responsibilities.	The FEIS discusses in section 3.2.3.2 how the Consent Decree under the NorthMet Project No Action Alternative would require Cliffs Erie to complete closure and reclamation activities at the Plant Site. This would include completing activities for the localized affected areas under the Minnesota VIC Program, removal of the former Plant Site building, and management of seepage at the Tailings Basin embankment. The FEIS identifies in Table 3.2-1 that under the NorthMet Project No Action Alternative, there would be no mining activities, and that existing management and land use of the federal lands would continue. The NorthMet Project No Action Alternative is also analyzed under each resource area in the FEIS Chapter 5, and summarized in the FEIS Table 7.2.4-1. FEIS Section 5.2.3.4 identifies that under the NorthMet Project No Action Alternative there would be no direct or indirect effects on wetlands. If the project progresses through permitting, MPCA and MDNR would determine the responsible parties for cleanup of legacy and other project related impacts managed under permit. See also response to 19636.	ALT 14
19635	It seems reasonable to expect PolyMet to clean up	These comments provide information on the legacy contamination sites at	HAZ 05

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	all legacy contamination as quickly as possible; in fact, remedial actions should be integrated with the 'refurbishing' actions they plan to do to re-tool the taconite processing facilities to accommodate their processing needs.	the NorthMet Mining project. No changes were made to the EIS as a result of these comments.	
19636	the public may not realize that the actual cleanup of LTV's legacy contamination may be deferred until reclamation and closure of the NorthMet Project. This timeline is not acceptable, and the SDEIS should not be vague about the pace of fulfilling remedial requirements.	FEIS Table 4.2.1-2 includes the updated NorthMet Areas of Concern (AOCs) Summary List from the MPCA Voluntary Investigation and Clean-up Program. PolyMet has entered into an agreement with Cliffs Erie where the AOCs on the Mine Site would be transferred to PolyMet upon issuance of project permits. Until that time, Cliffs Erie retains responsibilities for permit-related activities at the AOCs. While certain Consent Decree related activities have been in progress or completed for these areas since the SDEIS, there has been no change in ownership or responsible parties since that time. Costs for assessment, investigation, and cleanup, are not feasible to provide.	HAZ 05

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19637	Inadequate hydrologic and geochemical characterizations using all existing data; insufficient new data to support modeling and assumptions. Many of the deficiencies in site characterization and water modeling from the 2009 DEIS persist in the 2013 SDEIS despite some new data collection (not all of which was used) and new modeling (using unrealistic or unsupported assumptions and neglecting to consider critical features). As detailed in extensive comments submitted by tribal cooperating agencies to the co-lead agencies over the past seven years, water quality analyses for the Partridge and Embarrass Rivers are inadequate. Water modeling results, whether deterministic (DEIS) or in the form of probability distributions (SDEIS) are based on flawed understanding of hydrology at both the mine site and plant site. One example of this flawed understanding is the error in baseflow calculations, which is carried forward in the MODFLOW hydrologic modeling. At the mine site, MODFLOW under-predicts the amount of water that would flow into the mine pits and thus under-predicts the amount of water treatment needed for both short and long term closure. At the plant site, the MODFLOW model is constructed in a way that is not representative of the site's physical conditions and therefore yields results that are not logical.	In the FEIS Mine Site GoldSim model, bedrock flowpaths have been reconfigured with a bulk hydraulic conductivity that is approximately one order-of-magnitude higher than what was used in the SDEIS. In addition, the flowpaths are remodeled to be 15 meters thick to account for new information indicating that upper bedrock tends to have higher hydraulic conductivity, and this zone tends to control the overall groundwater flow within the bedrock. The model does consider the Virginia Formation as a separate hydrostratigraphic unit and assigns a higher hydraulic conductivity to this unit compared to the Duluth Complex. The presence of higher hydraulic conductivity Virginia Formation explains the higher pit inflows predicted for the East Pit, which is partially excavated into this bedrock unit. Note that Virginia Formation is not relevant to bedrock flowpaths in the Mine Site GoldSim model because the flowpaths only exist in Duluth Complex rock. The FEIS Plant Site MODFLOW model was modified and recalibrated for the FEIS as follows: 1) updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain or river cells along the East Embankment to allow surface seepage of tailings water, 4) incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available site data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use of river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin. As a result of these changes, the FEIS Plant Site MODFLOW model no longer has no-flow boundary condition at the toe of the East Embankment, and river and/or drain cells in surficial deposits are in place to allow the potential for surface seepage ("upwelling") were added. The model was calibrated to insure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	WR 011 WR 058 WR 060 WR 071 WR 093 WR 103 WR 176 WR 179

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19638	"Hard rock mining affects fresh water through heavy use of water in processing ore, and through water pollution from discharged mine effluent and seepage from tailings and waste rock impoundments." Acid mine drainage ("AMD") is one of the greatest environmental liabilities associated with mining, especially in pristine, water-rich environments like the Project mine site, that have economically and ecologically valuable natural resources. There are no hard rock surface mines that exist today that can demonstrate that AMD can be stopped once it occurs on a large scale. Inaccurate pre-mining characterization and interpretation often results in a failure to recognize or predict impacts to water quality and aquatic life. Evidence from literature and field observations suggests that permitting large scale surface mining in sulfide-hosted rock with the expectation that no degradation of surface water will result due to acid generation imparts a substantial and unquantifiable risk to water quality and fisheries. In a report comparing predicted and actual water quality at hard rock mines, two types of characterization failures were identified that led to differences between the predicted water quality in EIS documents and the actual water quality either during or after mining began. These included: (1) insufficient or inaccurate characterization of the hydrology. The authors reported primary causes of hydrologic characterization failures as overestimations of dilution, lack of hydrological characterization, overestimations of discharge volumes, and underestimations of storm size. (2) insufficient or inaccurate geochemical characterization of the proposed mine. The primary causes of geochemical characterization failures were identified as lack of adequate geochemical characterization, in terms of sample representativeness and sample adequacy. The	The Co-lead Agencies have requested additional hydrologic and geochemical data and the incorporation of those data into EIS analyses periodically throughout the environmental review process by the Co-lead Agencies. The criteria the Co-lead Agencies used to determine what data is included in the FEIS are as follows. Is the updated data: • Significantly different than the data already used in the model? • An integral component of a calibrated variable? • Linked to other data such that updating one necessitates updating the other? • Considered background information important to assessing the project's impacts? • Part of a greater dataset such that updating all of the dataset is necessary for consistency? • A type of input variable where GoldSim is sensitive? • Necessary for permitting-level analyses? Data collection and use in the FEIS are summarized in various data sufficiency documents. Nevertheless, a degree uncertainty in the predictions of environmental effects remains, as it would for any study of this type. The Co-lead Agencies have addressed this uncertainty is several ways. Water quality modeling results (concentrations) are presented in terms of a probability, which communicates the likelihood actual concentrations could be higher or lower than what was modeled. Sensitivity analyses were performed on temperature and precipitation inputs, baseflows in the Partridge River and other inputs. The FEIS identifies monitoring and reliable mitigation measures that have been incorporated in the NorthMet Project Proposed Action, possible improvements to these measures and additional mitigation that could be implemented if effects to water quality are worse than predicted. Additionally, on-going monitoring would be used in modeling to help predict any issues before they occur. A detailed financial assurance analysis would be part of the permitting phase. The financial assurance process would fully consider long-term monitoring and periodic replacement of equipment including, but not limited to, water treatment hardware and synthetic liners/covers. The Financial Assurance package for the NorthMet Project Proposed Action would insure that future funding would be available if and when adaptive	PD 01 WR 128

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	primary causes of mitigation failures were that mitigation measures were not identified, were inadequate, or were not implemented; waste rock mixing and segregation was not effective; liners leaked; tailings were spilled; or embankments failed, and land application discharge was not effective. The NorthMet Project Proposed Action, as defined in the SDEIS includes all of these characterization failures.	mitigation measures or component replacements are needed to achieve performance specifications. Taking the data, modeling, proposed monitoring, mitigation, adaptive management and financial assurance together, the NorthMet EIS sufficiently discloses and accurately predicts to the degree possible potential effects to water quality.	
19639	The Project overestimates dilution of polluted water by underestimating baseflow in the bedrock surficial aquifer at both the mine and plant sites.	Groundwater baseflows used in the SDEIS are best-estimate values and should be retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88 stream gaging in the Partridge River at SW-006 that occurred when there were no discharges from Northshore; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTV tailings basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The water quality predictions generated by the Mine and Plant Site GoldSim models reasonably consider the groundwater baseflow contributions in projecting potential contaminant levels within the Partridge River and Embarrass River during project operations, reclamation, and closure. A Partridge River high groundwater baseflow scenario (sensitivity analysis) was also completed for the FEIS. Increased groundwater baseflows affect concentrations; however the predicted concentrations relative to FEIS evaluation criteria are not a concern.	WR 165
19640	A fundamental lack of hydrologic characterization enables PolyMet to reach a fictitious conclusion that there will be no water pollution resulting from the Project. No bedrock monitoring wells were installed near the tailings basin. The number of groundwater samples used to model the Mine Site included three or more samples from each of 23 monitoring wells in the surficial aquifer (a 24th	The SDEIS was based on data generally collected through October 2012. The FEIS relied on new data collected through the end of 2013, which included 12 new monitoring wells at the Mine Site. In addition, the FEIS made use of new geotechnical data collected in 2014 along the north, northwest, and west perimeter of the Tailings Basin; included geologic logs, ten new surficial aquifer piezometers, slug tests in the piezometers, and ten bedrock packer tests performed in five boreholes advanced into upper bedrock. Hydrogeologic site characterization was sufficient for	WR 071 WR 095

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	well was dry after the first sampling, so it only provided a single sample). Of these, 12 were new monitoring wells installed in the surficial aquifer in 2012, yet data collected from them was not used to model and predict potential impacts to water surrounding the Project. Storage coefficients used to model the entire Plant site area are not consistent with any peer reviewed scientific literature.	purposes of environmental review. All publically available and relevant studies were considered in developing the SDEIS and FEIS. These include technical reports prepared by the Proposer, reports from State and Federal agencies, technical papers in peer reviewed journals, and technical reports associated with other mine sites. The SDEIS and FEIS preparers drew on these information sources to the degree that they were reliable and relevant to the assessment of potential NorthMet Project Proposed Action impacts. The FEIS provided a description of data used to assess impacts. An explanation was provided regarding any data used and not used in finalizing the FEIS MODFLOW and GoldSim models. It is well known that unexplained sampling/laboratory issues can cause occasional chemical results to be incorrect and unusable for site characterization. This happens to some extent on all large projects where sampling is conducted at many locations and for long periods of time. When an occasional data value is clearly anomalous and does not fit in any reasonable way with the bulk of the related data, it is an acceptable practice to not use the anomalous value for characterization to develop a more accurate site characterization. During winter 2013-2014, an investigation of bedrock was conducted along the north, northwest, and west perimeter of the tailings basin. The investigation included five boreholes advanced into upper bedrock and 10 packer tests conducted in these holes. The investigation provided rock core, Rock Quality Designation data, and hydraulic conductivity of discrete intervals within the upper bedrock. The results of this investigation are reported in Barr 2014b, as cited in the FEIS, and in FEIS Section 4.2.2.3.1. It is correct there are currently no bedrock monitoring wells at the Plant Site. Installation of bedrock monitoring wells would be specified as part of the permitting process, with the results used to assess project performance on an ongoing basis. The MODFLOW and GoldSim models for the Mine and Plant Sites were modified and recalibrated using groundwater level and sampling data collected through the end of 2013. At the Mine Site, this included all 24 monitoring wells, including data from 12 newer wells that was not used in the SDEIS. Stream gaging data used in the SDEIS and FEIS is adequate to characterize groundwater baseflow, seasonal flow, and storm runoff in the Partridge and	

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		Embarrass Rivers. See the responses to themes WR 011 and WR 012 for additional discussions of fracture flow and hydrology. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	
19641	The hydrology model that was applied used outdated data collected at a significant distance from the site. The Project XP-SWMM model is based on a stream gauging station for the Partridge River that is seventeen miles from the mine site and the data from that station are twenty years old; and stream gauging data for the Embarrass River that is based in data that is more than fifty years old from eleven miles downstream. Therefore, the results are highly unlikely to be representative of current conditions at the mine or plant site. This baseline hydrologic data deficiency has been carried forward from the 2009 DEIS, despite ample time and opportunity to collect sufficient new hydrologic data. The tribal cooperating agencies have long urged the co-lead agencies to require a more rigorous modeling effort before any confidence can be placed in predictions of Project impacts. From the March 2, 2012 Coleman memo to the co-lead agencies: "The calibration of the Modflow model to a Partridge River baseflow of 0.76 cfs predicted by XP-SWMM results in a model that moves very little water through the groundwater system. This can result in low predicted rates of inflow to the mine pit and slow movement of contaminants from sources (stockpiles or reflooded pits) to points of evaluation. More generally, an incorrect baseflow calibration target results in excessively low estimates of recharge and likely incorrect estimates of horizontal and vertical conductivity. These hydrologic parameters are interrelated and getting	Groundwater baseflows used in the SDEIS are best-estimate values and should be retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88 stream gaging in the Partridge River at SW006 that occurred when there were no discharges from Northshore; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTVSMC tailings basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The only other available gaging data is from a station installed during 2011 at SW003 on the Partridge River. Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore PMP pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-87 USGS data for the FEIS is reliable (PolyMet 2015m, as cited in the FEIS). To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted Project impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. It also reflected consideration of the flow data	WR 003 WR 071 WR 086 WR 091 WR 175

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	one wrong, as appears to be the case with baseflow, will almost certainly result in the other parameters being incorrectly estimated…Our long standing concern that the mine site hydrologic models incorporate incorrect assumptions about recharge are supported by Fred Marinelli's comment on line 39 and elsewhere of: "Agency Responses MS and PS WP and Waste Characterization Data package V7 2-7-12.xls". His comment states that "A net infiltration (recharge) range of 0.3 to 1.5 in/yr represents 1.1 to 5.4 percent of mean annual precipitation (MAP). This range for local net infiltration is unrealistically low for this area of the US." These low recharge values and the low vertical K values are related to calibration of the Modflow model to low baseflow. Until Modflow, and by extension the other related models XP-SWIMM and GoldSim, are calibrated to data from the site (e.g. observed baseflow and an adequate number of observed heads) and incorporate reasonable recharge rates, the results from the models are unlikely to accurately simulate current or future conditions…The Modflow model, in particular, needs to be calibrated with targets based on observed baseflow and observed well water heads. Calibration to projections by XP-SWMM, that appear to be incorrect, means that the fundamental characterization of the site hydrology is likely to be faulty…. The focus on water quality parameters to the near exclusion of hydrologic flow parameters is reflected in the Groundwater IAP summary memo of June 2011. Groundwater flow modeling underpins contaminant transport modeling and is interrelated to surface flow models. Without adequate vetting of flow model parameters and predictions, it is impossible to have confidence in predictions of contaminant movement and water quality."	collected at SW003 in requiring groundwater baseflows at all locations on the Partridge River be increased by a factor of 4 (e.g., 0.5 to 2.0 cfs at SW-003). The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2. The purpose of the groundwater baseflow analysis was to: 1) evaluate natural characteristics of the surficial aquifer such as recharge and hydraulic conductivity, and 2) estimate natural groundwater discharges into the rivers during low-flow conditions. Note that non-natural discharges into the rivers were estimated separately in the site models. Use of older data for evaluating natural hydrologic conditions was justified because it was not affected by artificial (non-natural) discharges into the stream channels by Northshore and LTVSMC operations.	

Comment ID	Comment	Response	Theme(s)
19642	Underestimation of storm size and frequency is a serious problem for capture and treatment of polluted water from the Category 1 waste rock stockpile and tailings basin, tailings basin stability, and stormwater run-off from the Overburden Storage and Layout Area (OSLA). Project estimates were based on one-hundred-year storm events. Before recognition of climate change impacts, this would have been a reasonable assumption. Now, storm severity and frequency suggest that what was previously considered a one-hundred-year storm event may occur once every ten years.	Estimates of monthly and annual rainfall amounts inputted into the water models were based on best available data obtained from weather stations near the NorthMet Project Proposed Action site. Rainfall inputs were based at a minimum on the 30-year climatic normal data. In the GoldSim models, these parameters were treated as uncertain inputs and assigned probability distributions to capture the range of possible future conditions. While climate change may occur in the future, it cannot be stated at this time if in the long-term there would be more or less rainfall. Thus, the probabilistic approach to rainfall used in GoldSim represents a technically defensible method for dealing with this issue. Individual storm events and frequency are not incorporated into the GoldSim models. The effects of individual storms are considered by designing facilities to handle a 100 year - 24 hour storm event based on current data. If over time, climate change causes a gradual increase in annual rainfall, the 100 year storm event would be redefined to a larger precipitation value and mine facilities would be upgraded to handle a larger storm. For the Mine Site, a GoldSim sensitivity analysis was conducted to assess the possible effects of future climate change on groundwater and surface water impacts. It was concluded that reasonably foreseeable climate change would have little effect on pit inflows, pit lake water quality, groundwater chemical concentrations, and surface water chemical concentrations. These results are reported in the Sensitivity Analysis of the NorthMet Water Quality Models, Version 2 (Barr2015d, as cited in the FEIS). By analogy, the Plant Site is also expected to be minimally affected by possible future climate change. See the responses to themes WR 077 and WR 180.	WR 077 WR 180
19643	Many mitigation measures were not identified or evaluated using the required NEPA “hard look”. Those mitigation measures that have been identified and carried forward as the Proposed Project are inadequate, especially the tailings basin seepage capture system. The tailings basin is unlined, and the seepage capture system has not been designed to collect any seepage from the east side of the tailings basin. This flow path for project pollutants to reach surface and ground water has not been addressed at all. The waste rock mixing	The FEIS Plant Site MODFLOW model was modified from the SDEIS to include: 1) the presence of surficial deposits below the East Embankment, 2) boundary conditions (drain and/or river cells) along the embankment toe to allow the potential for surface seepage, and 3) hydrologic inputs to account for the presence of the proposed drainage swale. Similar to other locations along the perimeter of the Tailings Basin, the project was modified to include installation of a containment system along the East Embankment where it is underlain by surficial deposits. Given the hydrogeology of the area east of the Tailings Basin and the proposed swale to be constructed there, this containment system would have higher hydraulic head on the east side compared to the west (tailings) side where a	NEPA 14 WR 054 WR 126

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	and segregation has not been demonstrated to be effective at other similar projects. Liner leakage rates are very optimistically estimated using solid waste landfill average leakage rates (lined solid waste landfills are much smaller).	pumped trench would depress the groundwater level. This would create hydraulic gradients in the slurry wall and in shallow bedrock that would drive (low) flows from east to west across the containment system. This set of hydraulics would result in complete capture of all tailings water approaching the containment system from the Tailings Basin. Because the system would achieve complete capture of tailings water, an east side chemical transport flowpath is not needed in the Plant Site GoldSim model. There is no hydrologic reason to expect that impacted water from the Tailings Basin would migrate east of the containment system. There is a long history of rock segregation on the Iron Range and regulatory agencies annually review the placement of rock. Technology like GPS has improved segregation practices. See the responses to theme WR 134 for more information on waste rock segregation. The assumed liner leakage rates are based on a combination of literature values, experience at mine sites, experience at other types of industrial facilities, manufacturer documentation, and information provided in standard engineering guidance documents (Section 5.2.2.3 in the Mine Site Water Modeling Data Package [PolyMet 2015m, as cited in the FEIS]). Liner leakage rates were estimated using the USEPA-approved HELP model, where simulations combined NorthMet Project Proposed Action design values for slopes and subgrade design with the published values for average liner defects per acre. See response to theme WR 126 for more information.	
19644	There are no predictions or contingency plans addressing the potential for tailings piped from the processing plant to the tailings basin could be spilled, or that tailings embankments may fail. The Hydrometallurgical Residue Facility (HRF) is proposed to be constructed in an area that is currently under water, and has a prominent historic drainage channel that has not been accounted for in project design or water modeling.	FEIS Section 5.2.14.2.2 (geotechnical stability of the Tailings Basin) and Section 3.2.2.3.5 (tailings management under the NorthMet Project Proposed Action) indicates that the Tailings Basin design would meet appropriate Factors of Safety and that Tailings Basin embankments would be monitored and inspected on a routine basis and repaired or strengthened on an as-needed basis (Geotechnical Data Package Volume 1(PolyMet 2015l, as cited in the FEIS). The Hydrometallurgical Residue Facility would be constructed over the LTVSMC emergency basin. The design of the Hydrometallurgical Residue Facility acknowledges the presence of this seep by including a collection drain that would collect water from the seep below the proposed constructed embankment and liner systems to transmit the collected seep to the exterior of the facility. FEIS Section 5.2.2.3.3, and Section 5.2.14.2.3 discusses the design and construction of the Hydrometallurgical Residue Facility, and Geotechnical Data Package Volume 2 (PolyMet 2014c, as	WR 066 WR 131 WR 132 GT 01 GT 11

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		cited in the FEIS) indicates the design would meet all factors of safety as required. Management of hazardous materials (including piping and other means of transport) is addressed in section 5.2.13. Monitoring would allow potential failures to be recognized and corrected if and before there would be release of impacted water to the environment. Financial assurance would be adequate to: 1) monitor and inspect the engineered systems, 2) repair or replace components as necessary, and 3) apply adaptive mitigation measures that are shown to be cost-effective which would also be required under the Permit to Mine. Financial assurance is described in FEIS Section 3.2.2.4.	
19645	Project baseline data used for both the Mine Site and the Tailings Basin are still insufficient, even though this deficiency was highly criticized by many commenters on the 2009 DEIS. A comparison of hydrologic data that was collected for two other projects in the region demonstrates that the PolyMet project is data-poor in the area of basic hydrology, much less mitigation. Given the availability of the many existing studies of area hydrology, it is mystifying that the SDEIS preparers have continually neglected to use them, even as tribal cooperating agencies have repeatedly requested and recommended that they be used. A few examples of publicly available studies include: the Minnamax Project; the LTVSMC Dunka Pit, historic DNR fisheries documents; and data collected under the Cliffs Consent Decree.	Co-lead agencies rely upon the expertise and experience of their staff and consultants who bring to bear their knowledge of various studies and analyses performed on mine sites in Minnesota and elsewhere. This knowledge is applied in the review of documents prepared to evaluate the NorthMet Project Proposed Action potential effects. It should be noted that the NorthMet Project Proposed Action is different from other mining projects in this part of Minnesota in the following ways: different ore type, designs for groundwater containment systems, and use of long-term mechanical treatment. While experiences gained on other projects are informative, they do not necessarily apply to the NorthMet Project Proposed Action. This is particularly true for groundwater containment systems because the NorthMet Project Proposed Action uses a design that differs from those at other Iron Range mine sites. The mitigation designs of the NorthMet Project Proposed Action are unlike measures discussed in the Regional Copper-Nickel Study (MEQB 1979, as cited in the FEIS). The NorthMet Project Proposed Action measures include: long-term mechanical water treatment, uniquely designed groundwater containment systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the NorthMet Project Proposed Action site would necessarily entail the same types of failures that have occurred at some historical Iron Range mines. In fact, the unique designs and high-quality construction measures proposed are a response to past events.	WR 023 WR 071

Comment ID	Comment	Response	Theme(s)
		The detailed and sophisticated modeling work performed to support the FEIS exceed those conducted for some existing mines in Minnesota. The models used for the NorthMet Project Proposed Action represent years of development, with input from the Proposer, Co-lead Agencies and Cooperating Agencies. Based on comments received on the SDEIS, modifications were made to the models to improve FEIS impact evaluations. It is the Co-lead Agencies' position that incomplete or inaccurate predictions made in the past at historical mining operations do not provide a basis for judging the quality of modeling to be used in the NorthMet FEIS. The EIS reflects consideration of information pertaining to the Dunka Pit that was directly relevant to the NorthMet Project Proposed Action. It is noteworthy that many aspects of operations at the Dunka Pit are dissimilar to the NorthMet Project Proposed Action in terms of hydrogeology and mine design. See the response to theme WR 071.	
19646	there is no explanation for the failure to use pre-mining flow and sulfate data available through DNR fisheries reports to determine potential water quality and quantity impacts, or cumulative effects to flow and water quality in the Embarrass, Partridge, or St. Louis Rivers. In fact, decades-old flow data (1942 – 1964) was used instead of recently collected data in the Embarrass River watershed even though that historic flow data precedes any mining. Surface water and groundwater quality and quantity data collected for the Minnamax Project, LTVSMC Dunka Pit, and the VIC program were listed in SDEIS, but largely ignored in water quality and quantity predictions.	The Co-lead Agencies have requested additional hydrologic and geochemical data and the incorporation of those data into EIS analyses periodically throughout the environmental review process by the Co-lead Agencies. The criteria the Co-lead Agencies used to determine what data is included in the FEIS are as follows. Is the updated data: • Significantly different than the data already used in the model? • An integral component of a calibrated variable? • Linked to other data such that updating one necessitates updating the other? • Considered background information important to assessing the project's impacts? • Part of a greater dataset such that updating all of the dataset is necessary for consistency? • A type of input variable where GoldSim is sensitive? • Necessary for permitting-level analyses? Data collection and use in the FEIS are summarized in various data sufficiency documents. To assess the incremental effects of the NorthMet Project Proposed Action on water resources in the Embarrass River and Partridge River, the best information representative of existing conditions was used as the baseline.	WR 003 WR 023 WR 071 WR 175

Comment ID	Comment	Response	Theme(s)
		This method allows the proper assessment of the project on the environment. The assessment of cumulative effects does not require the tracing of water quality throughout time, but the aggregation of effects considering a proposed action. Water quality models were calibrated to existing conditions in and around the Plant Site and Mine Site. This allowed for the highest degree of model accuracy.	
19647	The cumulative body of data and public information regarding clear risks to area hydrology from mining at the PolyMet site cannot be ignored, with only new, favorable data be inserted into the SDEIS instead. Extensive experience from other hard rock mines and their faulty predictions of water quality impacts should compel the co-lead agencies to recognize the need for significant improvements to the modeling evaluations.	The detail and sophistication modeling work performed to support the FEIS far surpasses any analyses that have ever been performed at mines in Minnesota. The models used for the Proposed Action represent years of development, with input from the PolyMet, Co-lead Agencies and Cooperating Agencies. Based on comments received on the SDEIS, modification were made to the models to improve FEIS impact evaluations. Inaccurate predictions made in the past at historical mining operations do not provide a basis for judging the quality of modeling to be used in this FEIS. In addition, the mitigation designs of the Proposed Action differ from the many other hard rock mines. The Proposed Action measures include: long-term mechanical water treatment, uniquely designed groundwater capture systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the Proposed Action site would necessarily entail the same types of failures that have occurred at some historical Iron Range mines. Some of the unique designs and high-quality construction measures proposed are in response to past mine site events. Also see the response to theme WR 071.	PD 26 WR 023 WR 071 WR 189
19648	Inadequate water quality impacts analysis. From SDEIS 5.2.2, Water Resources: with the proposed design modifications and engineering controls, the water quality model predicts that the NorthMet Project Proposed Action would not cause or increase the magnitude of an exceedance of the groundwater and surface water quality evaluation criteria at the P90 level for any of 28 solutes at 29 groundwater or surface water evaluation locations	The FEIS discusses lead concentrations in the Embarrass River in Section 5.2.2.3.3, providing better discussion of results to avoid misinterpretation. According to the 2004 - 2012 surface water monitoring results, average lead concentrations on the Embarrass River do not exceed the water quality standard (3.2 µg/L) at 100 mg/L hardness. Under certain circumstances, water quality model results predict an exceedance of the lead surface water evaluation criterion in Unnamed Creek, north of the Tailings Basin. These exceedances would not be a	WR 003 WR 056 WR 071 WR 072 WR 082 WR 128 WR 129

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	within the Partridge River and Embarrass River watersheds, with two exceptions: Aluminum...Lead…Evidently, the public is expected to uncritically accept the project proponent's assertion that a 700-ft deep open pit sulfide mine, a 526-acre permanent reactive waste rock stockpile, a pit lake requiring water treatment in perpetuity, a tailings basin that has already contaminated ground and surface water that now will host reactive sulfide tailings, and a permanent hazardous waste facility constructed within a wetland, will collectively result in only two exceedances of water quality standards – and they are not even directly attributable to the Project Proposed Action! This stunning conclusion is a result of flawed modeling assumptions (baseflow, hydraulic connectivity, etc.), dubious decisions on data usage (omitting 'outliers', concentration caps, etc.), fuzzy compliance thresholds, and inordinate reliance on engineering controls that must perform flawlessly, most of them in perpetuity.	direct effect but a side effect of the NorthMet Project Proposed Action and would be the result of the capture and removal of dissolved solids by the Plant Site WWTP and the associated decrease in the hardness-based lead evaluation criterion. The WWTP effluent would meet the water quality evaluation criteria, but exceedances could infrequently occur when non-project, noncontact surface runoff mixes with the WWTP effluent and lowers hardness more than it dilutes lead concentrations. Evaluation criteria can be found in Section 5.2.2. The FEIS discusses current aluminum concentrations in the Embarrass River in Section 5.2.2.3.3, providing better discussion of results to avoid misinterpretation. According to the 2004 - 2012 historic surface water monitoring results, average aluminum concentrations on the Embarrass River do not exceed the water quality standard (125 µg/L). This is considered a NorthMet Project Proposed Action side effect. The NorthMet Project Proposed Action would not directly cause an exceedance of the groundwater and surface water quality evaluation criteria of aluminum. Additionally, the FEIS Project Description indicates that Colby Lake water, with higher aluminum concentrations, would not be used for direct surface water augmentation. However, the capture of Tailings Basin seepage with low aluminum concentrations (5 to 20 µg/L) by the groundwater containment system could result in exceedances of the aluminum evaluation criteria in tributary streams north of Tailings Basin. Capture of the seepage would result in less dilution, increasing the proportion of non-project, non-contact surface water runoff with higher natural aluminum concentrations (70 to 160 µg/L) reaching the streams. Elevated aluminum levels under the NorthMet Project Proposed Action modeling scenario are considered a side effect of the project.	
19649	The NorthMet Project Proposed Action is also not predicted to result in any significant changes to groundwater and surface water flows when compared to existing conditions. Again, a remarkable conclusion grounded in the assumption that all seepage capture systems will operate at unrealistic performance rates in perpetuity, and dismissing the significant error in the baseflow value used to model project impacts. Surface water quality remains insufficiently characterized or left uncharacterized, and the defects in analysis are	The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the revised NorthMet Project Water Management Plan - Plant (PolyMet 2015i, as cited in the FEIS). These new models consider the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed capture system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall groundwater capture efficiencies of the proposed Tailings Basin surface	WR 003 WR 017 WR 018 WR 021 WR 115

Comment ID	Comment	Response	Theme(s)
	profound in this area.	and groundwater seepage containment system would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater groundwater capture efficiency is justified. Based on a MODFLOW groundwater model specifically developed to assess capture efficiency of the Category 1 system, it was concluded that the system would achieve an overall efficiency between 90 percent and 94 percent for groundwater flowing in surficial deposits and bedrock. This analysis supports the conclusion that the proposed Category 1 surface and groundwater seepage containment system has a high probability of meeting its performance specifications; thus, there was no need to consider a range of capture efficiency inputs in modeling. Groundwater baseflows used in the SDEIS are best-estimate values and were retained in the FEIS. The Co-lead Agencies have requested additional hydrologic and geochemical data and the incorporation of those data into EIS analyses periodically throughout the environmental review process by the Co-lead Agencies. The criteria the Co-lead Agencies used to determine what data is included in the FEIS are as follows. Is the updated data: • Significantly different than the data already used in the model? • An integral component of a calibrated variable? • Linked to other data such that updating one necessitates updating the other? • Considered background information important to assessing the project's impacts? • Part of a greater dataset such that updating all of the dataset is necessary for consistency? • A type of input variable where GoldSim is sensitive? • Necessary for permitting-level analyses? Data collection and use in the FEIS are summarized in various data sufficiency documents.	
19650	Contaminant transport modeling suggests that the Project will cause manganese, aluminum, and sulfate to exceed Minnesota Water Quality Standards ("MN WQS"). Mercury, sulfate, and specific conductance already exceed surface water	The evaluation and decision of whether or not the NorthMet Project Proposed Action may or may not discharge into surface waters where water quality standards are exceeded is a permit decision. The FEIS identifies potential impacts to water resources and measures available to anticipate and control these same impacts.	WR 064 WR 075 WR 109 WR 197

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	criteria in surface water samples collected near the tailings basin at nearby Area Pit 5, and mercury and aluminum exceed surface water criteria in the Partridge River downstream of Colby Lake. Aluminum, iron, manganese, and mercury all exceed MN WQS in Colby Lake. Contaminants from the Project will likely contribute additional loading to these existing exceedances of MN WQS in the Embarrass River, Colby Lake, and the Partridge River. There have not been any water samples collected from lakes in proximity to the tailings basin (Hiekkilla, Mud, Kaunonen, or Hay Lakes) to determine if the pollutants found in the surface and groundwater at the existing tailings basin have caused contamination of those waterbodies.	Water resources are considered not to be significantly impacted if evaluation criteria are met at evaluation locations. Evaluation criteria can be found in Section 5.2.2. If water quality evaluation criteria are not met under the CEC modeling scenario, the FEIS evaluates whether the NorthMet Project Proposed Action causes or increases concentrations. Surface water quality evaluation criteria apply instream after the groundwater discharge has mixed with ambient surface water (independent of proximity to the project property boundary). Evaluation criteria are based on a combination of health-based water quality standards for drinking water sources (such as groundwater and Colby Lake) and mercury in surface water (fish consumption) and on aquatic life-based standards for surface waters. Evaluation criteria can be found in Section 5.2.2. Groundwater evaluation criteria apply to groundwater at the project property boundary and the GoldSim models predicts that these criteria would be met. For the different flowpaths, groundwater travel times to groundwater evaluation locations and surface water discharge points are presented in the FEIS, including the times for initial change in chemical concentrations and the times to reach peak concentrations. Once chemicals are released from groundwater to surface water, it is assumed that migration is instantaneous to surface water evaluation locations. Sampling of the listed lakes would not have added substantially to the overall Plant Site characterization for the purpose of impacts assessment. It should be noted that Spring Mine Lake is located upstream of the east side of the Tailings Basin and has been sampled for water quality.	
19651	Groundwater contamination from previous mining activities persists near the LTVSMC tailings basin, more than twelve years after operations ceased. Over the decades of operations at the LTVSMC tailings basin, thousands of gallons per minute of tailings basin water were discharged through the bottom of the basin into groundwater. This plume of contaminated water has been slowly moving down gradient into surrounding wetlands and the Embarrass River. The monitoring wells that do exist near the tailings basin have concentrations of pollutants including iron, sulfate, manganese, aluminum, and fluoride that exceeded drinking water standards. But because of the limited	Section 4.2.2.3.1 has been revised to more clearly communicate groundwater quality at the existing LTVSMC Tailings Basin. The FEIS uses information from 27 domestic wells, Northeast Minnesota Baseline study and Regional Copper Nickel Study to characterize existing surficial groundwater quality. It is acknowledged that bedrock groundwater at the Plant Site has not been sampled for the FEIS. Effects to bedrock groundwater at the Plant Site are not anticipated. The characteristic hydraulic conductivity of upper bedrock is taken to be 4×10^{-2} m/day, which is two orders-of-magnitude lower than the hydraulic conductivity used in the GoldSim model for the overlying surficial deposits. Given this difference in hydraulic conductivities, the Co-lead Agencies conclude that the GoldSim water quality model does not need to be revised to specifically include groundwater flow and transport in bedrock. The cross-section modeling indicates that in the presence of more	HU 03 WR 008 WR 064

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	distribution of monitoring wells, the extent of the existing contaminant plume is not known. No bedrock monitoring wells have been drilled in the vicinity of the tailings basin. However, domestic wells near the northern property line show substantial contamination of the groundwater aquifer.	permeable upper bedrock, the groundwater capture systems would still achieve substantially higher capture efficiencies than what was assumed in the SDEIS GoldSim model.	
19652	Regardless, modeling of PolyMet contaminants at the tailings basin did not take existing pollutant concentrations into account, and pretends that existing contamination is an acceptable "baseline" from which only new contamination should be measured.	The FEIS does not consider the magnitude of change to water quality due to the NorthMet Project Proposed Action from a theoretical, "unimpacted" or "natural" background condition. Instead, the FEIS defines baseline for purposes of modeling as the CEC, be they impacted or unimpacted. The baseline water quality and predicted water quality with project are plotted against evaluation criteria for each water quality parameter so conclusions may be drawn about the baseline and project relative to the evaluation criteria and to one another. This approach was used because it discloses the actual changes expected to the environment from the Proposed Action. Evaluation criteria can be found in Section 5.2.2.	WR 082 WR 109
19653	The assumption that 93% of the seepage from the tailings basin can be captured is unrealistic. Tribes requested the co-lead agencies or their contractor to provide any references for the 90% or greater capture efficiency rate they were confident could be achieved; they were not able to provide a single example from anywhere in the world. The co-lead agencies provided a single citation from a USEPA guidance document (generally intended to inform solid waste sites) that revealed: • most barriers in the study have been in place for fewer than 10 years; therefore, long-term performance can only be extrapolated… • All sites included in the study were existing sites that had vertical barriers and, in many cases, caps. • None of the sites has an engineered bottom barrier. Therefore, the effect of leakage through aquitards was not evaluated in this study.	The Co-lead Agencies acknowledge that there are existing water containment systems at other mine sites that do not operate with a high degree of capture, but these are different designs and cannot be directly compared to the system proposed for the NorthMet Project Proposed Action. The proposed containment system uses pumping on the tailings side and reinjection on the downgradient side to reverse hydraulic gradients across the slurry wall and in underlying bedrock. Relatively few containment systems have been built with this degree of pumping and reinjection to ensure effective capture. The conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete capture. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed containment system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation data, and depth to top of bedrock. This information was used to develop revised MODFLOW cross-section models to evaluate containment system efficiencies on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the revised Plant Site Water Modeling Data Package (PolyMet 2015j, as cited in the FEIS).	WR 018

Comment ID	Comment	Response	Theme(s)
		These revised cross-sections and MODFLOW models considered the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. It is the Co-lead Agencies' position that the assumption in the Plant Site GoldSim model of 90 percent or greater capture efficiency is justified by the analyses performed.	
19654	Regardless of this study's applicability (or lack thereof) to seepage capture systems proposed for the PolyMet project, the EPA found that • 10% of the reviewed containment systems failed to meet the desired performance objectives and required corrective action. • An additional 19% of the evaluated facilities did not have sufficient data to conclude weather the containment system was operating successfully or not. • There is no information on the effectiveness of any of these facilities at timeframes remotely comparable to what will be required for PolyMet… A search for examples similar to the Project Proposed Action identified the Zortman-Landusky mine in Montana…the Molycorp, Inc., mine site in New Mexico…Examples of similar seepage capture systems installed and operating in northeastern Minnesota are at the US Steel-MINNTAC tailings basin, and the former LTV tailings basin seep SD0026 (the same tailings basin PolyMet proposes to re-use), and demonstrate capture rates of less than 60%...The primary purpose of the seepage capture at the	The Co-lead Agencies acknowledge that there are existing water containment systems at other mine sites that do not operate with a high degree of capture, but these are different designs and cannot be directly compared to the system proposed for the NorthMet Project Proposed Action. The proposed containment system uses pumping on the tailings side and reinjection on the downgradient side to reverse hydraulic gradients across the slurry wall and in underlying bedrock. Relatively few containment systems have been built with this degree of pumping and reinjection to ensure effective capture. The conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete capture. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed containment system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation data, and depth to top of bedrock. This information was used to develop revised MODFLOW cross-section models to evaluate containment system efficiencies on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the revised Plant Site Water Modeling Data Package (PolyMet 2015j, as cited in the FEIS). These revised cross-sections and MODFLOW models considered the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results	WR 018 WR 020

Comment ID	Comment	Response	Theme(s)
	Proposed Project is to achieve compliance with MN WQS, but it is not likely to be successful, based upon limited but relevant regional experience.	predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. It is the Co-lead Agencies' position that the assumption in the Plant Site GoldSim model of 90 percent or greater capture efficiency is justified by the analyses performed.	
19655	The SDEIS acknowledges that seepage from the existing LTV tailings basin continues to drain south to Second Creek long after LTV operations have ceased (SDEIS p. 4-99). Because that seepage will need to continue to be pumped back under the PolyMet Proposed Action, it "is not considered further in this discussion" (SDEIS p. 5-89). On pages 5-121 and 5-158, the SDEIS maintains that the seepage collection system installed at the south side of the existing tailings basin has "essentially eliminated the flow of Tailings Basin seepage into Second Creek". This statement is clearly not supported by the facts. PolyMet and the state regulatory agencies are fully aware that that this seepage pumpback system is not nearly as effective as claimed in the SDEIS. According to MPCA staff, the pumpback system has not resulted in the water quality improvements required under the Consent Decree, so there are two modifications currently proposed by Cliffs Natural Resources: 1) dewater the pond that is an additional source of water contributing to water quality concerns (pending a US EPA wetlands determination); or 2) create an additional barrier (dam) for seepage collection and pumpback between the existing dam and monitoring station SD026.	It is acknowledged that there is currently incomplete capture of impacted water at SD-026. Text within the FEIS has been changed to recognize that fact. Cliffs Erie is currently addressing this issue by upgrading the performance of the existing capture system and, if necessary, constructing new systems to enhance capture. If 100 percent capture is not attained by the Cliffs Erie upgrades, the PolyMet has committed to installing additional systems in Second Creek to achieve this level of performance regardless of the types of measures required.	WR 101 WR 117
19656	There is simply no evidence to support the rosy scenario that PolyMet will be able to capture 97% of the shallow seepage and 90% of the deep seepage from an unlined, purposefully 'leaky' tailings basin, despite the co-lead agencies' assurances. The SDEIS must be revised to	The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the north, northwest, and west sides of the Tailings Basin, which are documented in the revised Water Management Plan - Plant Site (PolyMet 2015i, as cited in the FEIS). These new models consider the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests	PD 08 WR 018 WR 117 WR 118 WR 133

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	accurately describe the ineffectiveness of the current seepage collection system, and the need for a redesigned system or additional mitigation must be clearly stated. The SDEIS must evaluate the impacts of polluted tailings basin seepage to Second Creek and the Partridge River.	conducted in five boreholes along the proposed capture system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin capture systems would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed capture system on the north, northwest, and west sides of the Tailings Basin in Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, rock RQD, and depth to top of bedrock. This information was used to develop MODFLOW cross-section models at three locations on the alignment to assess capture efficiency. The models included bedrock below the slurry wall. The water quality modeling has been updated for the FEIS to include the potential for water to seep from the east side of the Tailings Basin. FEIS Section 3.2.2.3.10 describes that a containment system would be constructed around a portion of the east side of the Tailings Basin for seepage collection. Key design considerations for the containment systems include but are not limited to the local geologic and hydrogeologic characteristics of the site, the depth to bedrock or other confining unit from the ground surface, the presence and prevalence of cobbles and boulders in the glacial till, the ground surface topography along and adjacent to the containment system alignment, the soil types to be encountered along the alignment, and the constituents in the groundwater to be contained. The proposed containment system technology is not new nor unique; the slurry cutoff wall and collection trench approach has been used for many decades, beginning initially as a means to facilitate construction of deep foundations in locations of shallow groundwater and difficult soil conditions, and subsequently expanding to other uses such as the containment of contaminated groundwater emanating from unlined waste disposal facilities (e.g., landfills, stockpiles, etc.). There are many papers written about the use of groundwater containment systems and a number of contractors well-experienced and proficient in containment system construction. The groundwater collection component of the system and the hydraulic barrier (cutoff wall) work in tandem to control the direction of groundwater flow and the amount of groundwater collected. Maintenance of a lower hydraulic	

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		head on the upgradient side of the cutoff wall than on the downgradient side of the cutoff effectively captures any seepage that would otherwise leave the site, while limiting the effect that the system has on groundwater conditions downgradient from (away from) the system. This barrier to flow thereby minimizes the potential for water quality effects on the downgradient side of the containment system. PolyMet has committed to collecting all of the south seepage from the Tailings Basin that makes its way to Second Creek by implementing additional improvements to the existing seepage management system if necessary. Potential measures that could bring the capture efficiency of the system to 100 percent include improvements to the existing dam such as lining the upstream dam face with bentonite and injecting grout into the dam. If seepage is observed to bypass the existing dam, a second dam could be constructed approximately 500 feet downstream of the existing system, in an area where the Second Creek headwaters valley is more constricted and any remaining subsurface seepage will have to come to the surface. This potential second dam could be constructed as an earthen dam with a clay or concrete cutoff wall (extending to bedrock if necessary) in order to achieve 100 percent capture of the surface seepage. See FEIS Section 5.2.2.3.2.	
19658	The unsupported prediction of 90% or better seepage capture efficiency is unfortunately carried forward into other critical analyses. The SDEIS claims that construction of a groundwater containment system along the north, northwest and west sides of its unlined tailings basin "would capture virtually all of the Tailings Basin seepage presently flowing in those directions to restore water quality" (SDEIS p. 5-174). Without even a single bedrock monitoring well installed to confirm or deny this assumption, the SDEIS maintains that this is prediction is "conservative", because the modeling done by PolyMet assumes that bedrock hydraulic conductivity is "negligible" (SDEIS, pp. 5-68 - 5-69). Disturbingly, the tailings basin model uses storage coefficients that are not found anywhere in peer reviewed scientific literature.	It is acknowledged that the Plant Site MODFLOW model does not include bedrock below surficial deposits and thus does not consider flow towards the Embarrass River in bedrock. This is because the bulk hydraulic conductivity of upper bedrock is estimated to be about two orders-of-magnitude lower than the hydraulic conductivity of the surficial aquifer, and it is interpreted that deeper bedrock has substantially lower hydraulic conductivity. Based on these assumptions, calculations show that chemical mass migration downgradient of Tailings Basin is dominated by flow in the surficial aquifer and for this reason only surficial flowpaths were modeled in MODFLOW and GoldSim; see FEIS Section 5.2.2.2.1 for greater detail. MODFLOW cross-section models of the Tailings Basin containment systems showed that groundwater capture substantially greater than 90 percent was achieved in both surficial deposits and the underlying zone of more "permeable" bedrock that was assumed to be 15 m thick. So even if there was chemical migration in upper bedrock, it would be effectively captured by the Tailings Basin containment systems. Absent predicted impacts there was no need for modeling of the underlying bedrock in MODFLOW or GoldSim to support the water resources impact assessment.	PD 08 WR 008 WR 018 WR 071 WR 095 WR 099

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		See WR62 for additional information. The water quality modeling has been updated for the FEIS to include the potential for water to seep from the east side of the Tailings Basin. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials. FEIS Section 3.2.2.3.10 states that a containment system would be constructed around a portion of the east side of the Tailings Basin for seepage collection. The proposed containment system technology is not new nor unique; the slurry cutoff wall and collection trench approach has been used for many decades, beginning initially as a means to facilitate construction of deep foundations in locations of shallow groundwater and difficult soil conditions, and subsequently expanding to other uses such as the containment of contaminated groundwater emanating from unlined waste disposal facilities (e.g., landfills, stockpiles, etc.). There are many papers written about the use of groundwater containment systems and a number of contractors well-experienced and proficient in containment system construction. Installation of paired monitoring wells on either side of the Tailings Basin containment systems would likely be identified during the permitting phase. Monitoring devices at these points would measure the head pressure differential, which would indicate the direction of groundwater flow through the containment system. The groundwater collection component of the system and the hydraulic barrier (cutoff wall) work in tandem to control the direction of groundwater flow and the amount of groundwater collected. Maintenance of a lower hydraulic head on the upgradient side of the cutoff wall than on the downgradient side of the cutoff effectively captures any seepage that would otherwise leave the site, while limiting the effect that the system has on groundwater conditions downgradient from (away from) the system. This barrier to flow thereby minimizes the potential for water quality effects on the downgradient side of the containment system.	
19659	These parameters are highly critical for establishing a reliable model, because the volume of groundwater that a geologic formation can contain (storativity or storage coefficient) and the rate of flow (hydraulic conductivity) are functions of the amount of open pore spaces or fractures/faults in rock, the quantity of water that	In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	WR 095

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	infiltrates from the surface, and the groundwater gradient. The storage coefficient incorporated in the plant site model (including the tailings basin) for bedrock is 0.20, and for the surficial deposits 0.0002 (SDEIS p.5-41), suggesting that the bedrock contains several orders of magnitude more water than the surficial deposits.		
19660	When questioned about these extraordinary storage coefficients, the co-lead agencies' explanation was that the model was "calibrated to match predicted and measured groundwater levels," Essentially, this model is simulates a bedrock 'storage tank' where large volumes of water go in but virtually nothing comes out. Since this is not conceptually accurate, the modeled hydraulic conductivity and/or modeled storage coefficients cannot be relied upon to estimate the amount of seepage that will bypass the seepage capture system, or the amount of time before seepage upwells to surface waters in adjacent wetlands and the Embarrass River, where MN WQS must be met.	The FEIS relies on revised cross-section models to evaluate containment systems on the north, northwest, and west sides of the Tailings Basin, which are documented in the revised Water Management Plan – Plant (PolyMet 2015i, as cited in the FEIS). These new models considered the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The new models explicitly consider groundwater flow in bedrock below the slurry wall and at the contact between the slurry wall and bedrock. The model results predicted that the overall capture efficiencies of the proposed Tailings Basin containment systems (with bedrock flow) would be substantially greater than 90 percent. FEIS Figure 3.2-28 has been revised to show that the slurry wall is keyed into bedrock. It is the Co-lead Agencies' opinion that engineered systems can operate successfully over long periods of time is they are property monitored and maintained. The FEIS provides a comprehensive description of proposed water treatment and seep collection systems including groundwater containment and synthetic liners and covers in Section 5.2.2. This includes conceptual designs and discussions of the types of monitoring used to assess performance. Detailed designs are provided in supporting documents, which are referenced in the FEIS. The FEIS also discusses long-term operation, maintenance, and periodic replacement of engineered systems. It is acknowledged that certain components of the engineered systems would need to be replaced when monitoring indicates that performance is marginal and not readily compensated for by adaptive mitigation measures. A detailed financial assurance analysis would be part of the permitting phase and is not a required component of the FEIS. The financial assurance	WR 019 WR 128

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		process would fully consider long-term monitoring and periodic replacement of equipment including, but not limited to, water treatment hardware and synthetic liners/covers. The Financial Assurance package for the Project would ensure that future funding would be available if and when adaptive mitigation measures or component replacements are needed to achieve performance specifications.	
19661	Another major deficiency in the plant site model is that seepage capture at the flotation tailings basin, as modeled with MODFLOW and GoldSim, does not account for any seepage out of the east side of the basin. SDEIS Figure 3.2-27, that indicates continuous bedrock on the east side of the tailings basin, is incorrect and must be corrected.	The FEIS Plant Site MODFLOW model was modified from the SDEIS to include: 1) the presence of surficial deposits below the East Embankment, 2) boundary conditions (drain and/or river cells) along the embankment toe to allow the potential for surface seepage, and 3) hydrologic inputs to account for the presence of the proposed drainage swale. See FEIS Section 5.2.2.2.1. Similar to other locations along the perimeter of the Tailings Basin, the project was modified to include installation of a containment system along the East Embankment where it is underlain by surficial deposits. Given the hydrogeology of the area east of the Tailings Basin and the proposed swale to be constructed there, this containment system would have higher hydraulic head on the east side compared to the west (tailings) side where a pumped trench would depress the groundwater level. This would create hydraulic gradients in the slurry wall and in shallow bedrock that would drive (low) flows from east to west across the containment system. This set of hydraulics would result in complete capture of all tailings water approaching the containment system from the Tailings Basin. Because the system would achieve complete capture of tailings water, an east side chemical transport flowpath is not needed in the Plant Site GoldSim model. There is no hydrologic reason to expect that impacted water from the Tailings Basin would migrate east of the containment system.	WR 054
19662	Baseline groundwater elevations, depths to bedrock, and surface water drainage locations have been used to identify four flowpaths (West, Northwest, North, and South) that represent the most direct paths between Tailings Basin facilities and evaluation locations (i.e., property boundaries and surface waters of the state) (MDNR 2011L [as cited in the submission]). The modeling approach used by PolyMet has placed an artificial and unrealistic no-flow boundary on the east side of the tailings basin, when a critical evaluation of	The Plant Site MODFLOW model was modified for the FEIS to better represent natural and Project-related conditions. These include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many of the improvements pertained to the East Embankment area of the Tailings Basin, where it is acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately. These changes in response to the Theme improve	WR 054 WR 102

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	hydraulic head clearly shows the potential for substantial groundwater movement to east. Because of this this flawed assumption, there has been no contaminant transport modeling or water quality impacts analysis for seepage leaving the east side of the tailings basin.	the SDEIS MODFLOW model that limited tailings seepage on the east side of the Tailings Basin.	
19663	Also, according to the plant site surficial geology and depth to bedrock figures, the thickest layer of glacial till for the entire Proposed Project occurs around the tailings basin, representing, essentially, the biggest "pipe" for conducting contaminated tailings basin seepage to downgradient wetlands and eventually the Embarrass River. Tribal agency re-analysis using MODFLOW for the east side of the tailings basin reveals that this is likely the most significant discharge area for the entire tailings basin.	The Plant Site MODFLOW model was modified for the FEIS to better represent natural and project-related conditions. These include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many of the improvements pertained to the East Embankment area of the Tailings Basin, where it is acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately. These changes correct deficiencies in the SDEIS MODFLOW model that limited tailings seepage on the east side of the Tailings Basin. With the modifications described above, the FEIS Plant Site MODFLOW model has provided reliable flow directions in this area.	WR 093
19664	The SDEIS maintains that mine pit dewatering impacts will be very limited or non-existent based on an assumption carried forward from the DEIS that there is little or no connection between the bedrock and surficial aquifers. This assumption is based solely on an unsupported "professional opinion," when in fact there is ample evidence that there may be substantial connection between the bedrock and surficial aquifers. Such a connection indicates that dewatering the mine pits could cause significant drawdown of the water table in the surficial aquifer, potentially dewatering wetlands and ephemeral streams.	Impact assessment modeling relies on site characterization data that indicate the bulk hydraulic conductivity of upper bedrock is two to three orders-of-magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at both the Mine Site and Plant Site are dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting water. However, it is acknowledge that there could be some negligible hydraulic connections between bedrock and the surficial aquifer. Therefore, the approach in the FEIS was to not consider this possible connection in the NorthMet Project Proposed Action water quality models, but to recommend extensive monitoring during operations and closure to assess if interactions occur and if they would raise concerns for permitting agencies. If monitoring data indicate trends toward permit non-compliance, adaptive mitigation measures would be implemented to prevent or eliminate what is expected to be a small transport-related bedrock impact relative to surficial flows. See FEIS Section 5.2.2.3.5 for information on adaptive mitigation measures and Section 5.2.2.3.6 for information on monitoring. The FEIS further evaluated the possibility of fractures and faults at the	WR 010 WR 012 WR 013

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		Mine Site and Plant Site to determine what (if any) changes need to be made to model assumptions to accurately predict potential environmental effects for purposes of environmental review. Although no change was made to the Plant Site GoldSim model, the FEIS Mine Site GoldSim model was modified to include a flow/transport zone 15 meters thick from that present in the SDEIS. The results of the analysis are included in FEIS Section 5.2.2.3.2. The response to theme WR169 also contains additional information.	
19665	Tritium and unionized ammonia nitrogen were found in water samples collected from two deep boreholes in the area where the Project mine pits will be located. Both tritium and unionized ammonia are classic indicators for a strong connection with surface water. Tritium indicates water found in the deep boreholes was surface water that originated post-1952, during or after nuclear testing. The boreholes are approximately one mile southwest of the Peter Mitchell Pit, which is the closest and most likely source of this pollution. Production at the Northshore mine started in 1955. Review of the Peter Mitchell Pit discharge monitoring data for SD001 from 2006 and 2008 shows the average concentration of unionized ammonia exceeded their 0.04 mg/l NPDES permit limit. Unionized ammonia and tritium in the deep boreholes suggest that travel time of contaminants through bedrock fractures will be on the order of decades, not the hundreds or thousands of years that are assumed in the SDEIS. Impacts to surface waters, groundwater, and wetlands for a project of this size and complexity demand a scientific, data-driven approach rather than one based on opinion and scant, selectively used data.	Tritium and non-ionized ammonia can be indicators of relatively young water. However, when these constituents are identified in water extracted from a borehole, the overriding question is whether or not foreign (young) water was introduced during the drilling process. There are many documented cases where tritium in borehole water could be traced to makeup water introduced during the drilling process to help maintain circulation. Experience indicates that conclusions about the age of groundwater based on tritium and non-ionized ammonia are unreliable unless it can be absolutely verified that no foreign (makeup) water was introduced during the drilling process. Given the isolated occurrences additional verification is not warranted for the EIS. It is acknowledged that there could be some hydraulic connections between bedrock and the surficial aquifer where transport is expected to be negligible. Given these factors, the approach was to not consider this possible connection in the NorthMet Project Proposed Action water quality models, but to recommend extensive monitoring during operations and closure to assess if interactions occur and if they would raise concerns for permitting agencies. If monitoring data indicate trends toward permit non-compliance, adaptive mitigation measures would be implemented to prevent or eliminate what is expected to be a small transport-related bedrock impact relative to surficial flows. See FEIS Section 5.2.2.3.5 for information on adaptive mitigation measures and Section 5.2.2.3.6 for information on monitoring. The Co-lead Agencies believe that the EIS contains adequate information and analyses consistent with the NEPA and MEPA guidance and best practices. Also refer to the response to theme NEPA 09 for more detail.	NEPA 09 WR 010 WR 013
19667	The lack of fracture and fault analysis is a major deficiency of this SDEIS. The map provided by GLIFWC in their SDEIS comments, Geologic Faults at the PolyMet Mine and Plant Site ,	Regarding tritium and non-ionized ammonia, these can be indicators of relatively young water. However, when these constituents are identified in water extracted from a borehole, the overriding question is whether or not foreign (young) water was introduced during the drilling process. There are	WR 007 WR 008 WR 012

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	indicates: 1. There are several faults extending from Northshore pits to the PolyMet mine site. This may explain why there is ammonia and tritium in the deep borehole samples. 2. There is an inferred fault running right through the area of the Hydrometallurgic Residue Facility. (Not only is the HRF proposed to be constructed within wetland, with a buried stream and springs, but it will also be receiving seepage from the tailings basin and it could be geologically predisposed to facilitate groundwater movement. 3. There is a fault system right where water would exit the tailings basin on the east side. Notice that the inferred fault may connect to other fault systems running east-west to the south of the facility.	many documented cases where tritium in borehole water could be traced to makeup water introduced during the drilling process to help maintain circulation. Experience indicates that conclusions about the age of groundwater based on tritium and non-ionized ammonia are unreliable unless it can be absolutely verified that no foreign (makeup) water was introduced during the drilling process. Given the isolated occurrences additional verification is not warranted for the EIS. Geologic mapping suggests bedrock faults could exist in areas at the Hydrometallurgical Residue Facility and Tailings Basin. However, on published geologic maps, the faults in these areas are dashed and identified as conjectural with inferred (not exact) locations. Regional geologic maps of the Iron Range do show the existence of fault lines, but hydrogeologic studies have not provided evidence that any faults that may be present behave as conduits for groundwater flow. In addition, case histories at similar Iron Range mine sites indicate that groundwater movement is dominated by flow in surficial materials (where present) and not bedrock, regardless of the presence of fractures and faults. At the Plant Site, there is no field evidence to suggest that bedrock faults or fracture zones provide enhanced groundwater flow to the Partridge and Embarrass Rivers. It is possible that structural features with enhanced groundwater flow exist, but the Co-lead Agencies believe they are improbable given the body of evidence for the Project Site and other mines sites in the Iron Range with similar geology. Further, if such features do exist, it is highly unlikely that they could be intercepted and characterized by any reasonable field program of exploratory boreholes. The management approach is to require robust groundwater monitoring during operations and closure to identify if structurally controlled groundwater flow actually occurs at the site, and if this proves to be the case, require the implementation of adaptive management measures. Monitoring would include observations from paired piezometers to be installed on opposite sides of the containment systems to verify reversal of hydraulic gradients and thus, essentially complete capture of affected groundwater. If reversed gradients are not indicated, adaptive mitigation measures would be implemented to modify the groundwater hydraulics so that essentially complete capture is established.	WR 013
19668	The potential for water quality impacts from prospecting and mining operations that have contacted the Duluth Complex have long been	The Co-lead Agencies rely upon the expertise and experience of their staff and consultants who bring to bear their knowledge of various studies and analyses performed on mine sites in Minnesota and elsewhere. This	WR 023 WR 203

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	known to the MNDNR and MPCA. The State of Minnesota spent $4.3 million over three years in the late 1970s to produce the Regional Copper-Nickel Study, a 5-volume compilation of technical information regarding the potential impacts of copper-nickel mining in the Duluth Complex. Nevertheless, predicted water quality impacts and ineffective mitigation methods referenced in the Study were ignored when the technical documents and SDEIS were drafted for PolyMet.	knowledge is applied in the review of documents prepared to evaluate the NorthMet Project Proposed Action potential effects. It should be noted that the NorthMet Project Proposed Action is different from other mining projects in this part of Minnesota in the following ways: different ore type, designs for groundwater containment systems, and use of long-term mechanical treatment. While experiences gained on other projects are informative, they do not necessarily apply to the NorthMet Project Proposed Action. This is particularly true for groundwater containment systems because the NorthMet Project Proposed Action uses a design that differs from those at other Iron Range mine sites. The mitigation designs of the NorthMet Project Proposed Action are unlike measures discussed in the Regional Copper-Nickel Study (MEQB 1976, as cited in the FEIS). The NorthMet Project Proposed Action measures include: long-term mechanical water treatment, uniquely designed groundwater containment systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the NorthMet Project Proposed Action site would necessarily entail the same types of failures that have occurred at some historical Iron Range mines. In fact, the unique designs and high-quality construction measures proposed are a response to past events. The detailed and sophisticated modeling work performed to support the FEIS exceed those conducted for some existing mines in Minnesota. The models used for the NorthMet Project Proposed Action represent years of development, with input from the Proposer, Co-lead Agencies and Cooperating Agencies. Based on comments received on the SDEIS, modifications were made to the models to improve FEIS impact evaluations. It is the Co-lead Agencies' position that incomplete or inaccurate predictions made in the past at historical mining operations do not provide a basis for judging the quality of modeling to be used in the NorthMet FEIS. The EIS reflects consideration of information pertaining to the Dunka Pit that was directly relevant to the NorthMet Project Proposed Action. It is noteworthy that many aspects of operations at the Dunka Pit are dissimilar to the NorthMet Project Proposed Action in terms of hydrogeology and	

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		mine design.	
19669	The SDEIS also diminishes the lessons learned from the Dunka Pit, located on the former LTVSMC site approximately five miles north and east of the PolyMet Project mine site. Within the Dunka Pit, LTVSMC contacted the Duluth Complex and the Virginia Formation while mining for taconite in the Biwabik Iron Formation. By 1991, LTVSMC had removed about 50 million tons of Duluth Complex material from the Dunka pit and placed it in "gabbro" stockpiles. Monitoring of the drainage from these stockpiles beginning in 1976 revealed a decrease in pH and an increase in trace metals. Copper and nickel concentrations as high as 1.7 and 40 mg/l respectively were observed in seepage/run-off from the Duluth Complex waste rock stockpiles and pH was observed as low as 5.0 at seep 1 between 1976 and 1980. Most of the seepage from waste rock piles at the Dunka site was discharged to Bob's Bay in Birch Lake via Unnamed Creek. A 1976-1977 study of trace metals in Bob's Bay found that concentrations of copper, nickel, cobalt, and zinc in the water of the Bay were higher than regional average concentrations and decreased with distance from the mouth of Unnamed Creek. Additionally, it was determined that Unnamed Creek contributed more than 90% of the trace metals load to Bob's Bay. The NPDES permit for this discharge expired in 2005 and another variance request is expected. A WWTF located at the site has been inactive because Cliffs Erie, LLC, the owner who acquired the property from LTVSMC, declared bankruptcy and claims it is simply too expensive to continue running. Unfortunately, the passive wetland treatment system did not function well enough to remove nickel and copper in waters still discharging from the mine pit and stockpiles to a concentration that	The Co-lead Agencies rely upon the expertise and experience of their staff and consultants who bring to bear their knowledge of various studies and analyses performed on mine sites in Minnesota and elsewhere. This knowledge is applied in the review of documents prepared to evaluate the NorthMet Project Proposed Action potential effects. It should be noted that the NorthMet Project Proposed Action is different from other mining projects in this part of Minnesota in the following ways: different ore type, designs for groundwater containment systems, and use of long-term mechanical treatment. While experiences gained on other projects are informative, they do not necessarily apply to the Proposed Action. This is particularly true for groundwater containment systems because the NorthMet Project Proposed Action uses a design that differs from those at other Iron Range mine sites. The mitigation designs of the Proposed Action are unlike measures discussed in the Regional Copper-Nickel Study (MEQB 1979, as cited in the FEIS). The Proposed Action measures include: long-term mechanical water treatment, uniquely designed groundwater containment systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the NorthMet Project Proposed Action Site would necessarily entail the same types of failures that have occurred at some historical Iron Range mines. In fact, the unique designs and high-quality construction measures proposed are a response to past events. The detailed and sophisticated modeling work performed to support the FEIS exceed those conducted for some existing mines in Minnesota. The models used for the NorthMet Project Proposed Action represent years of development, with input from PolyMet, Co-lead Agencies and Cooperating Agencies. Based on comments received on the SDEIS, modifications were made to the models to improve FEIS impact evaluations. It is the Co-lead Agencies 'position that incomplete or inaccurate predictions made in the past at historical mining operations do not provide a basis for judging the quality of modeling to be used in the NorthMet FEIS. The FEIS reflects consideration of information pertaining to the Dunka Pit that was directly relevant to the NorthMet Project Proposed Action. It is	WR 023

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	complies with MN WQS.	noteworthy that many aspects of operations at the Dunka Pit are dissimilar to the NorthMet Project Proposed Action in terms of hydrogeology and mine design.	
19670	The Mining Simulation Project (funded in part by a Minnesota Legislative appropriation of $185,000 to the MNDNR and MPCA) was a cooperative study to identify and resolve environmental issues associated with non-ferrous mining and to anticipate industry and government data needs to address those issues before commercial development occurred in Minnesota. The study clearly identified those state ground and surface water quality regulations that would apply to copper-nickel mining operations in Minnesota, including applying the 10 mg/l sulfate criterion to effluent discharges where wild rice is present; it prioritized nondegradation of both surface and groundwater and protection of groundwater as a drinking water source; and it rejected using natural wetlands for mine effluent treatment ("as a toxic metals dumping ground"). The tribal cooperating agencies have also consistently elevated our concerns for the Proposed Project's potential to adversely impact groundwater quality and quantity. "Groundwater maintains stream flows and wetlands during dry periods, supporting significant ecosystem functions. Groundwater is an important source of drinking water in the Great Lakes Basin, where 8.2 million people, or 82% of the rural population, rely on groundwater for their drinking water." In Minnesota, all groundwater is protected for drinking water supplies, "constituting the highest priority use, and as such, to provide maximum protection to all underground waters." When considering water allocations, drinking water is supposed to be considered the highest priority by the MN DNR. According to MPCA's groundwater profile for Northeastern MN including the Project area: "Glacial aquifers are	Evaluation criteria are based on applicable water quality standards. Where a water body is classified as Domestic Consumption (1B) or for groundwater, USEPA primary drinking water standards apply. The USEPA primary drinking water standards set mandatory maximum contaminant levels for drinking water to protect the public from consuming water that presents a risk to human health. Evaluation criteria can be found in Section 5.2.2. The MPCA has previously provided draft staff recommendations as to what waters in the Embarrass and Partridge rivers are waters used for production of wild rice to which the current 10 mg/L wild rice sulfate standard applies. The MPCA reviewed all available relevant information in making their recommendation. Water treatment using natural wetlands is not included in the Project Description. The NorthMet Project Proposed Action would rely upon mechanical treatment for as long as necessary. During operations and closure, the use wetland treatment may be considered as an adaptive management measure if pilot and other studies indicate that this method has potential utility and is cost-effective. Groundwater and surface water flow model predict that the NorthMet Project Proposed Action would have a minimal effect on drinking water standard-based evaluation criteria in the groundwater at the project boundaries or in Colby Lake (the locations at which drinking water standards apply. Based on this, It is therefore expected that the NorthMet Project Proposed Action would not have any significant impacts on water quality downstream of the Project area or significantly contribute to any cumulative effects on drinking water resources.	WR 041 WR 042 WR 110 WR 154

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	commonly thin and limited in their extent and yield. Bedrock aquifers have limited yield, generally from fractures; groundwater movement is difficult to define. There are no large-scale regional aquifers. The Biwabik Iron Formation is the only source of groundwater for many Iron Range cities." The SDEIS has not adequately evaluated the potential for impacting drinking water sources, and it is clear from the state regulatory agencies' uncertainties about the frequency, volume, and water quality of other mine discharges (i.e., the Peter Mitchell Pit) even while regulated under permits, that this issue remains a significant deficiency in the SDEIS analysis.		
19671	The tribal cooperating agencies have consistently raised concerns about reactive dust and ore fines along the Transportation and Utility Corridor, and potential for water quality impacts to the three streams and wetlands that are crossed within the corridor. Yet these concerns have been repeatedly kicked back and forth between the Air IAP and Water Quality IAP work groups, with neither group ultimately resolving the information and risk analysis gap. The end result of this 'oversight' in the SDEIS is that no consideration, discussion, or proposed management of this potential water and wetland quality impact is provided for the public to review.	The Project Description in the FEIS includes routine inspections of the Transportation and Utility Corridor to identify accumulations of dust or ore spillage. Regarding dust, given the majority of the dust that could leave the NorthMet Project area could be characterized as low sulfide/low metal, potential impacts would be controlled by: 1) the commitment to treat all runoff from disturbed areas as process wastewater, and 2) the facilities would be subject to an air quality Fugitive Emissions Plan. Significant impact on water resources or historic properties is not expected. All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6, and 4.3.9, in PolyMet 2015a, as cited in the FEIS). Regarding potential spillage, any significant accumulations would be removed by a combination of machines and hand work. Ore transport would be by special railcars that minimize dust and spillage, where, since the SDEIS, the Proposer has committed to retrofit the railcars to better control spillage and develop an ore management/transport plan for monitoring site conditions. It is unlikely that there would be sufficient spillage to affect the quality of surface water or groundwater (See FEIS Section 5.2.2.3.2). See FEIS Section 3.2.2.4 for more information on the	WET 11 WR 151

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		railcars, and Sections 5.2.3 and 5.2.7 for impacts of railcar spillage and dust on wetlands and air quality, respectively. The effect of dust falling on the disturbed portions of the Mine Site would be controlled by the perimeter dike and ditch system, which would route runoff to the WWTF (Section 4.1.5.3 and Large Figures 19 through 21 of PolyMet 2015a, as cited in the FEIS). Please refer to the responses to themes WET 11 and WR 151.	
19672	The only potential solute sources along the Transportation and Utility Corridor or at the processing plant (both within the Partridge River Watershed) would be from spills, as there would be no surface stockpiles of waste rock, ore, or other potential solute sources in these areas. There is the potential, however, for ore spillage from rail cars in transport from the Mine Site to the processing plant during operations. Based on observations at other mining operations using similar side-dump rail cars, it is assumed that spillage could occur along the first 1,000 meters of rail from the Rail Transfer Hopper (PolyMet 2013l). It is estimated that 55.7 kg ore per m2 track could spill from rail cars within the first 1,000 meters of the Transportation and Utility Corridor over the 20-year life of the NorthMet Project Proposed Action. This is equivalent to 1.25 inches of spilled material over a 2,000-m2 area. Rainfall contacting the spilled ore material has the potential to release solutes, but with the small volume of ore and dilution from other sources, water quality is expected to meet the evaluation criteria (PolyMet 2013l). This is not a trifling mass of ore, nor is it an insignificant quantity of reactive dust and fines, deposited directly into the watershed. It is unacceptable to dismiss the likely water quality impacts of twenty years of ore spillage and dust/fine deposition with a casual statement and zero analysis. It is especially disheartening to the tribal cooperating agencies that have attempted to elevate this issue for so	The FEIS Project Description includes routine inspections of the Transportation and Utility Corridor to identify accumulations of dust or ore spillage. Regarding dust, given the majority of the dust that could leave the NorthMet Project area could be characterized as low sulfide/low metal, potential impacts would be controlled by: 1) the commitment to treat all runoff from disturbed areas as process wastewater, and 2) the facilities would be subject to an air quality Fugitive Emissions Plan. Significant impact on water resources or historic properties is not expected. All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6, and 4.3.9, in PolyMet 2015a, as cited in the FEIS). Regarding potential spillage, any significant accumulations would be removed by a combination of machines and hand work. Ore transport would be by special railcars that minimize dust and spillage, where, since the SDEIS, the Proposer has committed to retrofit the railcars to better control spillage and develop an ore management/transport plan for monitoring site conditions. It is unlikely that there would be sufficient spillage to affect the quality of surface water or groundwater. See FEIS Section 5.2.2.3.2. See FEIS Section 3.2.2.4 for more information on the railcars, and Sections 5.2.3 and 5.2.7 for impacts of railcar spillage and dust on wetlands and air quality, respectively. The effect of dust falling on the disturbed portions of the Mine Site would be controlled by the perimeter dike and ditch system, which would route runoff to the WWTF (Section 4.1.5.3 and Large Figures 19 through 21 of PolyMet 2015a, as cited in the FEIS).	WET 11 WR 023 WR 151

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	many years, that the co-leads have been completely unwilling to consider giving it the analysis it requires, or to even provide examples from other sulfide mines where this has not proven to be a concern.		
19673	Regardless of the 'footprint' of the equalization basins, the liner leakage estimate of 5 gallons per acre per day (gpad) is not consistent with what we have found in the literature for the maximum allowable, or "Action Leak Rate", above which a leak must be found and repaired.	The assumed liner leakage rates are based on a combination of literature values, experience at mine sites and other types of industrial facilities, manufacturer documentation, and information provided in standard engineering guidance documents (Section 5.2.2.3 in PolyMet 2015m, as cited in the FEIS). Liner leakage rates were estimated using the USEPA-approved HELP model, where simulations combined NorthMet Project design values for slopes and subgrade design with the published values for average liner defects per acre. It is acknowledged that there have been historical instances where poor-quality liner installations have failed or leaked at relatively high rates. However, for the high-quality liner installations to be used for the NorthMet Project Proposed Action, the assumed liner leakage rates are reasonable and consistent with industry standards. While solid waste landfills may typically be smaller than the NorthMet facilities, the liner leakage rates are expressed on a unit area basis, so the results can be scaled to larger facilities. Further, the waste rock stockpiles where liners would be used are only temporary and monitoring would give early warning if they are not functioning properly.	WR 126
19674	The Band has consistently raised concerns for the NorthMet Project potential to increase mercury concentrations in fish within the St. Louis River watershed, where we exercise water quality jurisdiction, and within the 1854 Ceded Territory where Band members can exercise treaty fishing rights.	The change in mercury concentration in fish is thought to be ultimately proportional to the percent increase in mercury load (MPCA 2006a, as cited in the FEIS). The current MPCA-estimated mercury deposition rate is 12.5 µg/m2/yr for northeast Minnesota (MPCA 2007, as cited in the FEIS), which translates into about 250 pounds per year of mercury currently being deposited onto the St. Louis River Watershed (3,600 square miles) due to background deposition. The potential total annual deposition in the watershed from the NorthMet Project Proposed Action is estimated to be about 0.17 pounds per year (Barr 2012b, as cited in the FEIS), which is less than 0.1 percent of the background deposition levels described above. Discharges from the WWTF and WWTP are expected to meet the 1.3 ng/L standard for mercury, and overall the NorthMet Project Proposed Action is predicted to result in a net decrease in mercury loading. Additionally MPCA's MMREM analysis showed a 0.5 to 1.8 percent and 0.3 to 0.5 percent potential increase in fish mercury concentrations above	AQ 05

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		background. However, the increase would not be expected to have any appreciable effect on loading estimates from permitted discharges to the Embarrass River, Partridge River, or the lower St. Louis River. Therefore, mercury concentrations are not likely to result in an appreciable change in the mercury concentration in fish in waterbodies of the St. Louis River watershed or in the St. Louis River itself (Barr 2015f, as cited in the FEIS). Per FEIS Section 6.2.6, the NorthMet Project Proposed Action would not have any direct effects on aquatic habitat in the St. Louis River, and would not have any appreciable indirect effects on fish or aquatic invertebrates as a result in changes in flow or water quality.	
19675	There has not been significant "ground-truthing" of mercury deposition rates that were used in the modeling assessment. Tribal cooperating agencies note that no studies have been conducted within this region of active mining to determine why fish tissue mercury concentrations are so high if the local sources mainly emit 'non-locally polluting' forms of mercury.	The assessment of potential local mercury deposition and resulting changes in fish mercury conducted for the NorthMet Project Proposed Action are consistent with the assessments conducted for other recent mining projects requiring environmental review. Such information in reference to mercury deposition has been summarized in Barr 2006g, as cited in the FEIS.	AQ 28
19676	The Band concurs with the letter recently signed by 19 Duluth health care professionals expressing concerns that the SDEIS fails to define the human health effects of increased mercury emissions, exposure to asbestos-like mineral fibers, and arsenic.	The AERA contains toxicological information for various emissions, including mercury and airborne fibers, as well as an analysis of the potential health effects of those chemicals. The toxicological information was included in the AERA summary in FEIS Section 7.3.4. The AERA includes an evaluation of the most sensitive health endpoint for each chemical (e.g., neurological morbidity from manganese, reproductive toxicity of methyl mercury, and the carcinogenic potential of diesel, nickel, and arsenic). Arsenic releases to groundwater and surface water were evaluated in FEIS Section 5.2.2.3.2, and modelled concentrations were compared to drinking water standards. Drinking water standards would not be exceeded for arsenic. FEIS Section 5.2.7.5 contains a discussion of various types of fibers, as well as the health effects found in the scientific literature, including a summary of toxicity information from a scientific literature review conducted in 2009. FEIS Section 5.2.7.5 concludes with a finding of "an uncertain level of potential public health risk" being present due to airborne fibers in the area, and provides a summary of the dust suppression practices that would be used to minimize fiber generation. This information is referenced in the human health section of Chapter 7 (FEIS Section 7.3.4).	HU 01 HU 02 HU 07

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19677	The SDEIS states that the current fish tissue concentrations in the five local lakes that were studied result in Hazard Quotients (HQs) that exceed 1 (page 6-63), but gives no further information. The Cumulative Impacts Analysis, Local Mercury Deposition and Bioaccumulation in Fish (July 2012) (Barr report) showed modeled contributions from both the Mesabi Nugget LDSP and PolyMet; this information should be included in the SDEIS for public review. The Barr report provides the actual HQs, rather than just saying "they exceed 1". The SDEIS should state clearly that in one case, the existing HQ equals 46.2, which is 46 times as high as the number where action is recommended. This is an unacceptable situation.	'Information pertaining to the specific Hazard Quotients summarized in Barr 2012b, as cited in the FEIS, have been included in FEIS Section 6.2.6, summarizing the cumulative effects assessment for mercury deposition.	AQ 03
19678	The SDEIS does not provide any rationale for more mercury to be added to a system that is already so high in mercury, but rather only suggests that the TMDL should take care of this.	This comment was originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. MPCA's goal is to protect high-quality waters and improve the quality of impaired waters, so water quality standards are met and beneficial uses are maintained and restored, where these uses are attainable. As summarized in FEIS Section 5.2.7.2.5, widespread contamination of fish from atmospheric pollution is why Minnesota established a statewide mercury TMDL. The TMDL seeks to reduce atmospheric deposition everywhere in the state, in order to make the state's lakes and streams fishable, as required by federal regulations, and is intended to provide the long-term framework to reduce mercury in fish. The MPCA published Guidelines for New and Modified Mercury Air Emission Sources, and revised those guidelines in 2012 (MPCA 2012h, as cited in the FEIS). The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions of 789 lbs/year by 2025. The MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions, and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS). The MPCA has provided guidance to the Co-lead Agencies that a discharge to a water body impaired for fish tissue mercury is not prohibited, provided that the discharge can meet the applicable water quality standard without	MERC 22

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		benefit of mixing or dilution (i.e., does not cause or contribute to the impairment). The FEIS has evaluated mercury concentrations from the Plant Site WWTP and Mine Site WWTF, and has concluded that effluent from both facilities can meet the applicable mercury water quality standard of 1.3 ng/L. Overall the NorthMet Project Proposed Action is predicted to result in a net decrease of mercury-loading.	
19679	The background site-specific analyses and data presented in the SDEIS for total mercury and methylmercury in surface and groundwater is not sufficient to adequately describe existing conditions or evaluate the potential for impact due to changes in hydrology and water quality as a result of the NorthMet Proposed Project.	The comments in this theme correctly recognize that impact assessment requires collection of background information to establish baseline conditions. For assessing mercury impacts, the SDEIS relied on monitoring data for total mercury and methylmercury collected through August 2012 at both the Mine Site and Plant Site. Because collection of baseline data is ongoing, data used for the impact assessment was expanded for the FEIS by using data collected through December 2013. Selected surface waters where water quality samples have been taken include, but are not limited to, the LTVSMC Tailings Basin, Unnamed Creek, Trimble Creek, Spring Mine Creek, Second Creek, Embarrass River, Sabin Lake, Wynne Lake, Esquagama Lake, Embarrass Lake, Heikkila Lake, Partridge River, Colby Lake, and the St. Louis River. FEIS Table 4.2.2-4 summarizes total mercury concentrations in the Partridge River and Embarrass River watersheds in the NorthMet Project area. Groundwater monitoring has also been conducted at the Mine Site and Plant Site. For surficial groundwater resources, 24 wells collected data at the Mine Site, while 8 wells were used at the Plant Site. Bedrock monitoring for the Mine Site includes 4 deep monitoring wells and 5 shallower bedrock wells. FEIS Table 4.2.2-6 summarizes total mercury concentrations sampled from these wells at the Mine Site. No bedrock water quality sampling has been required at the Plant Site. All of these data were subject to statistical analysis to estimate baseline mercury concentrations for surface water and groundwater resources at the Mine Site and Plant Site. This baseline estimate was subsequently used as input into the respective GoldSim water quality models, with the results reported in the FEIS. See FEIS Section 4.2.2. This data collection and subsequent analyses are documented in (all as cited in the FEIS): PolyMet 2015j, PolyMet 2015m, PolyMet 2015q, and Barr 2015f. Additional relevant documentation includes (all as cited in the FEIS): Barr 2010c, Barr 2012b, and Barr 2015g, as well as PolyMet 2011 (not cited in the FEIS). These analyses are considered adequate for FEIS	MERC 02

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		impact evaluations.	
19680	There is very little methylmercury data included in the analysis for any waterbodies, and there is no sediment mercury or methylmercury data used to evaluate and understanding existing conditions. For the data that is presented, there are numerous inconsistencies in reporting limits and method detection limits, casting doubt on data quality and its utility for critical analysis of project impacts.	Additional baseline monitoring was performed in 2009 and additional data was included in the SDEIS to evaluate the Embarrass River and tributary streams and assess relationships between sulfate and methylmercury. This data are summarized in FEIS Section 4.2.2.3.1 and 4.2.2.3.2. Data presented in the FEIS were gathered from various sources thereby leading to inconsistencies in the way the results are reported. The data presented in tables in the FEIS have been reviewed for consistency and updated as necessary. The quality assurance process is documented in the FEIS.	MERC 04
19681	The SDEIS also fails to evaluate other scientifically documented factors that affect mercury methylation and bioaccumulation. The SDEIS approach to evaluating mercury impacts of the Proposed Project avoids addressing complex but well-studied environmental processes by modeling, and instead relies upon an incomplete mercury mass balance to predict future conditions. It superficially references some of the large body of literature related to sulfate, pH, dissolved organic carbon, iron, and microbial activity, but in some cases erroneously interprets it.	The FEIS assesses NorthMet Project Proposed Action-related mercury contributions using a mass-balance methodology. This approach was identified as the appropriate analytic tool for predicting mercury concentrations during scoping of this EIS, and is a common and reliable analytical tool used by agencies to assess mercury impacts in impact assessments. This estimation method is preferred over a detailed mechanistic model because it incorporates the important input and removal processes for mercury, it is transparent with regard to data inputs, it typically provides conservative estimates of aqueous mercury concentrations, and it allows for easy assessment of the effect of changing parameter values on mercury concentrations. Further, the NorthMet Project Proposed Action is not anticipated to be a major discharger of mercury into the environment. The RO treatment is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site, including water used for flow augmentation. Mercury at the Mine Site is projected to decrease due to the NorthMet Project Proposed Action and the combined contributions from the Embarrass River and Partridge River are unchanged when modeled at the St. Louis River at the Fond du Lac reservation boundary. Therefore, the potential effects are expected to be less than significant, and the mass balance approach is appropriate to provide a reasonable estimate of potential contributions for purposes of environmental review given these circumstances. Regarding mercury concentrations in fish, the scientific community's understanding of the relationship between total mercury, sulfate, methylmercury, etc., is evolving, and the science is complex. That said, changes in mercury concentration in fish is thought to be ultimately proportional to the percent increase in mercury load (MPCA 2006a, as cited	MERC 13

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		in the FEIS); therefore, sophisticated modeling of methylation and bioaccumulation may not lead to more accurate results, but instead could lead to erroneous conclusions.	
19682	The SDEIS assumes that existing tailings in the LTV Tailings Basin will indefinitely adsorb mercury. However, Table 4.2.2-34 Summary of Surface Water Quality Monitoring Data for the Tailings Basin Surface Seeps clearly demonstrates that existing seepage exceed the GLI standard, and are higher than many of the data shown for most of the tributary streams. Given the lack of confidence in predicted seepage capture rates, Tailings Basin seepage is another source that has been greatly underestimated in the SDEIS analysis.	The MDNR has found that taconite tailings appear to be a sink for mercury in full-scale actual tailings basins in northern Minnesota, at least similar to other media like soils, as evidenced by lower mercury concentrations in waters seeping from tailings basins (specifically at U.S. Steel's Minntac Mine and Northshore Mining's Northshore Mine) than in either precipitation input or pond water in the tailings basin. The loss of mercury through adsorption to solids in the tailings basin and subsequent burial in the sediments results in an overall permanent retention of mercury within the basin and decreases the mercury load released to receiving waters. MDNR research demonstrates that mercury released to surface waters during taconite processing is insignificant with respect to mercury concentrations found in local precipitation and existing background surface waters. The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the north, northwest, and west sides of the Tailings Basin, which are documented in PolyMet 2015i, as cited in the FEIS. These new models consider the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified. Water captured by the containment system would be treated by the WWTP thereby lowering mercury levels once again before water is discharged to the environment. The target mercury WWTP effluent concentration is 1.3 ng/L which would meet the GLI standard.	PD 08 WR 018 WR 021
19683	The SDEIS evaluation of mercury impacts is deficient, and the conclusion of no mercury impacts downstream in the St. Louis River watershed is not supported by the information presented. This issue remains a significant impact	As summarized in FEIS Section 6.2.3.3.4, the NorthMet Project Proposed Action is predicted to result in a net overall decrease of mercury loadings of approximately 1.0 grams per year (i.e., a net decrease of 1.2 grams per year in the Partridge River and a net increase of 0.2 grams per year in the Embarrass River), which is indistinguishable from natural background	MERC 19

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	to reservation and treaty resources.	variability. Therefore, the NorthMet Project Proposed Action would not contribute to cumulative effects on mercury loading to the St. Louis River. Supporting information is provided in FEIS Section 6.2.3.3.4.	
19684	Project's effect on wild rice waters sulfate loadings, compliance points, seasonal discharge. The Band has consistently challenged the conclusion that the NorthMet Project will not result in damage to wild rice waters in the Partridge and Embarrass Rivers and their watersheds. Our skepticism arises from growing knowledge of the extent to which state and federal regulatory agencies have consistently failed to enforce standards and regulations on the mining industry that are intended to protect wild rice. We have exhaustively commented on the specific threats of this project from the very beginning of our involvement as a cooperating agency, and our previous concerns are carried forward to the SDEIS, despite new engineering controls and water treatment. It is commendable that PolyMet has committed to constructing wastewater treatment plants that include reverse osmosis, which has the potential to meet the low sulfate effluent limit if designed and operated properly, including at the Mine Site at year 1. But the damage to wild rice will be just as real and just as permanent if it results from inadequate regulatory controls, as if it results from inadequate engineering controls. In order to effectively apply the standard, the period when wild rice may be susceptible to high sulfate needed to be determined. MPCA produced draft staff recommendations (MPCA 2012b; MPCA 2012a) that included reviews of supporting research findings and related information. The MPCA's recommendations were that the 10 mg/L sulfate standard is applicable for portions of the Partridge River and Embarrass River used for the production of wild rice and that in the portions of the	Neither seasonal application of the wild rice standard nor non-mechanical treatment systems are part of the NorthMet Project Proposed Action, which relies solely on mechanical treatment and year-round application of the sulfate standard. Non-mechanical treatment may be considered during operations and closure if pilot studies demonstrate their utility and cost-effectiveness for water treatment and water disposal. For purposes of the EIS, the MPCA has previously provided draft staff recommendations as to what waters in the Embarrass and Partridge rivers are waters used for production of wild rice to which the current 10 mg/L wild rice sulfate standard applies. The MPCA reviewed all available relevant information in making their recommendation; however.	WR 153 WR 154

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	Partridge River, the 10 mg/L sulfate standard is applicable from April 1 through August 31. As stated in earlier comments, recent research does not support seasonal-only restrictions on sulfate loading. There is no time of year when high sulfate discharges do not result in the generation of highly toxic sulfide in the sediments, and consequently, no time of year when wild rice is not susceptible to high sulfate.		
19685	The results over the 4 years of surveys indicate some variability in the location and density of observed wild rice and in associated water column sulfate concentrations between survey years. The 2012 survey showed generally fewer and less dense stands of wild rice than were observed in the 2009 to 2011 surveys...No wild rice was observed in Spring Mine Creek, Trimble Creek, or Unnamed Creek near the Plant Site and they are not recommended as waters used for production of wild rice (Barr 2009b; Barr 2011a; Barr 2012a; MPCA 2012b). Section 4.2.2 provides a discussion on wild rice survey results and water quality standards (see Figure 4.2.2-3)….The co-lead and cooperating agencies are all well aware of the historic flood event this region experienced in June 2012; tribal and state rice harvesters reported widespread resource losses (thousands of acres) across many of the region's wild rice lakes and flowages. It is not surprising that the 2012 surveys of wild rice waters impacted by mine discharges showed fewer, less dense stands of wild rice than in previous years…Minnesota tribes have engaged in consultation with the MPCA on this culturally vital issue and provided recommendations for better protection of the wild rice that remains across a much-diminished range. The tribal cooperating agencies have engaged in consultation with the federal co-lead agencies under Section 106 of the National Historic Preservation Act,	For purposes of the FEIS, the MPCA has previously provided draft staff recommendations as to what waters in the Embarrass and Partridge rivers are waters used for production of wild rice to which the current 10 mg/L wild rice sulfate standard applies. The MPCA reviewed all available relevant information in making their recommendation; however.	WR 154

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	continually elevating the need for protection of all remaining wild rice in the 1854 Ceded Territory. During consultation the Bands have provided information about tribal wild rice harvest in the Embarrass River far upstream of where the MPCA has recommended as "waters used for the production of wild rice." The wild rice sulfate standard must apply throughout the Embarrass River watershed.		
19686	The scant remaining stands[of wild rice] in the upper reaches [of the Embarrass River] have already been severely impacted by previous mining disturbances and continued releases of high-sulfate water, and are in need of restoration.	In 1973, Minnesota adopted a water quality standard of 10 mg/L applicable to "water used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels." Water quality and quantity modeling predictions for SW-005 and PM-13 indicate that the project would not result in adverse impacts to wild rice. These locations are the nearest downstream locations in the Partridge and Embarrass Rivers respectively and were previously recommended by MPCA staff to be considered as waters used for production of wild rice. Impacts on wild rice further downstream in these waters, or on wild rice resources regionally throughout the treaty areas, would not be expected.	PER 10 WR 154 WR 157
19687	In MPCA-recommended wild rice waters along the Partridge and Embarrass rivers, the sulfate concentration already exceeds 10 mg/L, so it must be demonstrated that the NorthMet Project Proposed Action would have an acceptably high probability of not increasing sulfate concentrations in these areas. This contorted interpretation of compliance under the Clean Water Act is not defensible. The NorthMet Project Proposed Action must meet MN WQS, including the sulfate criterion to protect wild rice.	Federal Regulations 40 CFR 122.4(i) and 40 CFR 122.44(d)1 have the primary purpose of ensuring that impaired waters are not further degraded before a TMDL is complete. Enacted in the early 1980s, these regulations fulfill the Clean Water Act objective to restore and maintain the chemical, physical, and biological integrity of the nation's waters. 40 CFR. § 122.4(i) prohibits the net increase of any pollutant that will cause or contribute to a numeric or narrative water quality standard violation. 40 CFR. § 122.44(d) requires effluent limits in permits to ensure discharges do not cause, have a reasonable potential to cause, or contribute to the violation of a numeric or narrative water quality standard.	PER 10 WR 153 WR 154
19688	As stated previously, our concerns for protecting wild rice within this region of the 1854 Ceded Territory is based as much upon inadequate implementation of MN WQS protections, as upon the high likelihood that surface and groundwater discharges from the project will exceed MN WQS. We consider the high probability of continued	Water quality and quantity modeling predictions for SW-005 and PM-13 indicate that the project would not result in adverse impacts to wild rice. These locations are the nearest downstream locations in the Partridge and Embarrass Rivers respectively and were previously recommended by MPCA staff to be considered as waters used for production of wild rice. Impacts on wild rice further downstream in these waters, or on wild rice resources regionally throughout the treaty areas, would not be expected.	PER 10 WR 156 WR 157

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	degradation of remaining wild rice stands in the Partridge and Embarrass River watersheds as a result of the NorthMet Project to be an unacceptable environmental impact.		
19689	The SDEIS does not adequately discuss impacts to traditional uses such as hunting and trapping, nor does it adequately discuss impacts to traditional game and furbearer populations. This is a major discrepancy in these documents as healthy wildlife populations, particularly game and furbearer species, and access to them is critical for the exercise of treaty rights for tribal members.	Potential effects from the NorthMet Project Proposed Action on game species are discussed in FEIS Section 5.2.5. The potential cultural effects on the Bands from the NorthMet Project Proposed Action on game species are discussed in FEIS Section 5.2.9.2.2.	CR 01
19690	Fond du Lac's comments on the DEIS regarding the existing wildlife corridors are still applicable: they are fundamentally inadequate to maintain habitat connectivity across the heavily disturbed Mesabi Iron Range. As evidenced from aerial photographs, they're narrow and often heavily intruded upon by roads, utility corridors, mine pits and urban development. These features serve as barriers to many kinds of wildlife. While the existing corridors may function well enough for large, mobile species like deer or wolves, they are inadequate for smaller, less mobile species	The FEIS wildlife sections include an analysis of the wildlife corridors, including their use by various species. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process.	WI 02 WI 03
19691	The SDEIS concedes that increasing development of urban areas alongside the corridors will render some of the existing corridors less suitable for wildlife in the future. Increased urban development and associated transportation and utility infrastructure should be expected if the project provides the economic benefits stated in the SDEIS. Yet there is no mitigation proposed or even evaluated in the SDEIS for this environmental impact.	The FEIS wildlife sections include an analysis of the wildlife corridors, including their use by various species. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process.	WI 02 WI 03
19692	The Band specifically requests that state and federal regulatory agencies work with the tribal agencies to establish dedicated and protected	The FEIS wildlife sections include an analysis of the wildlife corridors, including their use by various species. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed	WI 03 CR 01

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	wildlife corridors and enhance reclamation of existing mine lands to mitigate wildlife impacts within the 1854 Ceded Territory.	once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process. The Cultural Resources section of the Final EIS Chapters 4 and 5 addresses the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of Chapters 4, 5, and 6, also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the NorthMet project review.	
19693	from the Band's perspective, perhaps the most significant deficiency in the SDEIS analysis of wildlife impacts is its failure to critically analyze potential impacts to moose.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement.	WI 01
19694	The tribal cooperating agencies have consistently raised impacts to moose as an issue of critical importance throughout the DEIS, SDEIS, Section 106 consultation, and 'sieve list' meeting processes. It is not acceptable to defer full consideration of this culturally significant species until the FEIS. We have valid concerns about the project's impact on moose habitat at a time when their population is crashing, and they should be addressed immediately.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state ETSC status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement.	CR 03
19695	the Band's concern for project impacts to moose is not simply potential effects to hunting zones and seasons; we are gravely concerned about protecting sustainable moose populations for future generations	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose, including habitat and displacement.	WI 03
19696	This discussion [in the SDEIS] contains	FEIS Section 4.2.6.1.4 has been edited to state that lake sturgeon have been	AQ 02

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	substantially outdated information regarding sturgeon reintroduction, both in the St. Louis River estuary and upstream of the Minnesota Power dams on the Fond du Lac Reservation.	documented near Floodwood, MN, per 2012 - 2014 FDL sturgeon data.	
19697	Uncontrolled contaminant loading from existing mine facilities, along with elevated constituents from the Proposed Project, have the potential to affect the successful establishment of a sustainable lake sturgeon fishery throughout the St. Louis River. This potential impact should be fully evaluated in the SDEIS.	Existing data review indicates recruitment and a viable population of lake sturgeon do exist in the St. Louis River Watershed. The NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River Watershed. As a result, no affects to lake sturgeon population within the St. Louis River Watershed system would occur.	AQ 02
19698	The SDEIS states that the property boundaries at both the Plant Site and Mine Site are used to define the maximum extent of NorthMet air impacts that would have the potential to affect historic properties, because the project is predicted to meet ambient air quality standards at those boundaries. The Band asserts that these property boundaries cannot arbitrarily be used for acid dust and metal deposition boundaries because there are no ambient air quality standards for these pollutants. While secondary ambient air quality standards do exist for vegetation, these are not to be used for deposition. It doesn't make sense to use or reference an ambient air quality standard for purposes of studying deposition because "ambient air quality" is a concentration of a pollutant found in a unit of air. "Deposition" is a concentration of a pollutant that settles out of the air onto a surface. Therefore, compliance with traditional ambient air quality modeling and the range where such compliance occurs cannot be used with regard to the deposition of these pollutants on the ground, water surfaces, and vegetation.	The NorthMet project would have fugitive dust emissions. To evaluate the impact of those fugitive dust emissions, air quality modeling was conducted to assess impacts from those emissions. The modeled results determined impacts to be below applicable air quality standards. The FEIS used the evaluation criteria available to determine impacts. Secondary ambient air quality standards are used to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Significant impact on environmental resources or historic properties from dust is not expected because areas with the potential to generate dust would be controlled by a Fugitive Dust Control Plan and any dust leaving the site would most likely come from sources that would be characterized as having low sulfide/low metal content, All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project Proposed Action area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6 and 4.3.9 of PolyMet 2015a, as cited in the FEIS). FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 includes a discussion on the potential indirect deposition effects on wetlands from particulate emissions from the Mine Site, Transportation and Utility Corridor, and the Plant Site. The FEIS has been revised to clarify the assessment results. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those	AIR 05 AIR 08 WR 151

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		areas that had deposition rates greater than 100 percent of background deposition. These specific wetlands areas would be identified for consideration in any future monitoring to be conducted for the NorthMet Project Proposed Action. Please refer to theme WET 11 for more information.	
19700	The SDEIS also states that "Within the property boundary, modeling shows where fugitive dust from the Plant Site, Tailings Basin, and Mine Site stockpiles is predicted to settle. Outside of these areas, modeling does not indicate potential effects on historic properties from dust deposition." Again, it is inappropriate to use areas that show compliance with ambient air quality standards to show "no effects from dust and metal deposition", because ambient air quality and impacts caused by deposition are two separate concepts.	The NorthMet project would have fugitive dust emissions. To evaluate the impact of those fugitive dust emissions, air quality modeling was conducted to assess impacts from those emissions. The modeled results determined impacts to be below applicable air quality standards. The FEIS used the evaluation criteria available to determine impacts. Secondary ambient air quality standards are used to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Significant impact on environmental resources or historic properties from dust is not expected because areas with the potential to generate dust would be controlled by a Fugitive Dust Control Plan and any dust leaving the site would most likely come from sources that would be characterized as having low sulfide/low metal content, All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project Proposed Action area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6 and 4.3.9 of PolyMet 2015a, as cited in the FEIS). FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 includes a discussion on the potential indirect deposition effects on wetlands from particulate emissions from the Mine Site, Transportation and Utility Corridor, and the Plant Site. The FEIS has been revised to clarify the assessment results. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those areas that had deposition rates greater than 100 percent of background deposition. These specific wetlands areas would be identified for consideration in any future monitoring to be conducted for the NorthMet Project Proposed Action. Please refer to theme WET 11 for more information.	AIR 05 WR 151
19701	Second, and more importantly, it is simply not true that "modeling does not indicate potential effects	Significant dust related impact on environmental resources or historic properties located out of the project boundary is not expected because	AIR 05

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	on historic properties from dust deposition". Figure 4.2.9-4 shows areas where the Fugitive Dust Area of Potential Effect extends outside both the Plant and Mine Sites.	project areas with the potential to generate dust would be controlled by a Fugitive Dust Control Plan and any dust leaving the site would most likely come from sources that would be characterized as having low sulfide/low metal content, All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project Proposed Action area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6 and 4.3.9 of PolyMet 2015a, as cited in the FEIS).	WR 151
19702	The SDEIS states that modeled annual dust deposition rates were compared to an "annual effects-level deposition rate" (background) of 365 g/m2/yr. This same "annual effects-level deposition rate" was given in the PSDEIS in May of 2013, but without providing a reference for how this number was derived.	The assessment approach for deposition of dust, metals, and sulfur to wetlands presented in FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 was a summary from the *NorthMet Project Wetlands Data Package* (PolyMet 2015b, as cited in the FEIS) which includes a citation of the 365 g/m2/yr.	AIR 05 WR 151 WET 11
19703	direct physical effects of mineral dusts on vegetation can be seen at a surface load of 7 g/m2 and chemical effects of reactive materials can be seen at 2 g/m2 . These levels indicate that the proposed "impact" level of 365 g/m2/yr may be too high.	Minnesota's acid deposition standard recognized that aquatic systems were more sensitive to sulfur inputs and that a wet sulfate deposition standard of 11 kilogram/hectare/year (kg/ha/yr) (3.6 kg/ha/yr wet sulfur) was considered protective of chemistry and biota (MPCA 1985). Others identified that a wet sulfate deposition standard of 15 kg/ha/yr (approximately 5 kg/ha/yr wet sulfur) would be protective of the aquatic systems (MPCA 1985). Sulfate dosing of wetlands in the Marcell Experimental Forest near Grand Rapids that was more than four times background (approximately 28 kg/ha/yr wet sulfate; approximately 9 kg/ha/yr as wet sulfur) did not identify any vegetation-related affects due to the additional sulfur (Jeremiason et al. 2006, as cited in the FEIS). At 100 percent of background, the "total" potential sulfur deposition (wet plus dry) estimated for the NorthMet Project Proposed Action would be approximately 3.2 kg/ha/yr (background plus NorthMet Project Proposed Action). Given that higher doses of sulfur are considered protective of aquatic chemistry and biota, and/or did not show any toxic effects to wetland vegetation, the potential particle-bound sulfur that may be contributed to wetlands by the NorthMet Project Proposed Action would	AIR 04 WET 11

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		not be expected to result in any adverse effects to vegetation. The fugitive dust would not be reasonably expected to be toxic to the touch and would not be reasonably expected to be directly toxic to vegetation, as it is typically part of road construction materials and/or tailings. The wetland dust deposition analysis identified that metals are expected to be particle-bound, within the mineral matrix of the rock particle. Therefore, the mineral particle must undergo physical or chemical weathering to release the metals. This is typically a slow release over time, measured in years. Metals deposited or applied to mineral and wetland soils have been shown to be sequestered in the upper soil layers and not be available to vegetation. Because of the potential small amounts of metals from fugitive dust that may be available in surface soils for uptake by plants, and the sequestering of most of the metals in soil should they be weathered out of the dust over time, the potential for the metals to be toxic to vegetation is very low. Monitoring of the areas estimated to have metal deposition greater than 100 percent of background would occur as part of the wetland monitoring program which would assess if potential indirect effects occur as a result of the NorthMet Project Proposed Action.	
19704	Further, as the Band commented on the PSDEIS, the modeled deposition rates do not include the effects of contamination from other sources, such as pit leaks and seepage, nor are cumulative impacts from all of these sources included in Chapter 6.	The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or conclusions.	CU 12
19705	The SDEIS statement that "all of the receptor nodes with the highest model-estimated deposition rates were located within the ambient air boundary" is incorrect, especially given that the following paragraph contradicts this statement by saying "of the 234 acres of wetlands, (that could be potentially indirectly affected) 228 acres would be located within the Mine Site ambient air boundary". While only 3% of the affected acres are outside of the boundary, these two statements should be reconciled. This same comment was made by the Band previously while reviewing the PSDEIS. The inaccuracy serves to diminish	FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 includes a discussion on the potential indirect deposition effects on wetlands from particulate emissions from the Mine Site, Transportation and Utility Corridor, and the Plant Site. The FEIS has been revised to clarify the assessment results. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those areas that had deposition rates greater than 100 percent of background deposition. These specific wetlands areas would be identified for consideration in any future monitoring to be conducted for the NorthMet Project Proposed Action.	WET 11

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	consideration of any impacts.		
19706	SDEIS Figure 5.2.3-22 depicts receptors outside the plant site that are predicted to receive dust deposition rates higher than 50% of background. Since the SDEIS asserts that only those areas receiving deposition greater than 100% of background will be affected, it is unclear why Figure 5.2.3-22 shows areas receiving more than 50% of this value.	The FEIS indicates that dust deposition was highest in three locations: southwest corner, northwest of the Plant Site; southeast corner; and the northeast corner, towards Area 5. The FEIS also states that all receptors have model-estimated dust deposition of 50 percent or less of the effects-level background. FEIS Figure 5.2.3-22 depicts those three locations that would receive dust deposition of 50 percent or less and is not intended to depict areas receiving deposition greater than 100 percent of background.	WET 11
19707	SDEIS Figure 5.2.3-23 depicts receptors outside the plant site that are predicted to receive metal deposition rates higher than 100% of background, but there is no discussion regarding monitoring or management actions to quantify or mitigate affects. Other SDEIS text is confusing or contradictory; from SDEIS 5-302: "all receptors have model-estimated dust deposition of 50% or less of the effects-level background of 365 g/m2/yr", but the very next sentence states "At the Plant Site, there would be two locations showing model-estimated deposition rates greater than 100% of background deposition". Later in the same paragraph "…the modeling only indicated those areas that had deposition rates greater than 100% of background deposition". It appears as though one statement may address dust deposition and the other metals deposition, but this is unclear.	FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 includes a discussion on the potential indirect deposition effects on wetlands from particulate emissions from the Mine Site, Transportation and Utility Corridor, and the Plant Site. The FEIS has been revised to clarify the assessment results. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those areas that had deposition rates greater than 100 percent of background deposition. These specific wetlands areas would be identified for consideration in any future monitoring to be conducted for the NorthMet Project Proposed Action. Please refer to theme WET 11 for more information on deposition.	WET 11
19708	The SDEIS discussion on fugitive dust is quite often confusing. There should be clarification between when the text is referring to sulfide dust and when it is talking about metallic dust. The text apparently switches between the two without explanation. Also, the text is not clear which air emissions sources were modeled with regard to fugitive dust.	FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 includes a discussion on the potential indirect deposition effects on wetlands from particulate emissions from the Mine Site, Transportation and Utility Corridor, and the Plant Site. The discussions is divided into a discussion on: 1) fugitive dust, and 2) metals and sulfide dust emissions. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those areas that had deposition rates greater than 100 percent of background deposition. These specific wetlands areas would be identified for consideration in any future monitoring to be conducted for the NorthMet Project Proposed Action.	WET 11

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		Please refer to theme WET 11 for more information on deposition.	
19709	From the SDEIS, "90% of the receptor nodes with the highest model-estimated deposition rates are located within the ambient air quality boundary". As the Band has commented before, this is impossible to verify, as no map of the location of the receptor nodes has been included. Also, 90% of the area predicted to be impacted does not lie within the ambient air quality boundary; it appears to be only about 60% contained to the ambient air quality boundary (SDEIS Figure 5.2.3-22).	FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 show the deposition impacts on wetlands from particulate emissions from the Mine Site, Transportation and Utility Corridor, and the Plant Site. The receptor nodes are depicted on Large Figure 15 and 16 of the *NorthMet Project Wetlands Data Package* (PolyMet 2015b, as cited in the FEIS).	WET 11
19710	the co-lead's only 'mitigation' for fugitive sulfide dust is recommending future wetlands monitoring.	The indirect effects analyses performed for the FEIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects. FEIS Section 5.2.3.3 (wetland mitigation and monitoring), has been revised to include additional details on the proposed monitoring and wetland adaptive plan. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process. Monitoring is proposed within all wetlands containing a potential indirect wetland impact factor rating of 3 to 5 and a sampling of those wetlands with factor ratings of 1 or 2 as described in FEIS Section 5.2.3.3 (see Figures 5.2.3-31 and 5.2.3-32).	WET 11
19711	the Proposed Project suggests water spraying for areas of fugitive dust release during dry periods as mitigation. In the case of dust that may have high acidic content, this would be a poor choice for management action, as the addition of water to the dust would likely create or accelerate toxic run-off.	All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan (FDCP) approved by the MPCA, which would discuss dust mitigation beyond water spray as a control technique for mitigating impacts from dust with acidic content. Reducing vehicle travel speeds, limiting blasting on days with low wind speed, and including chemical dust suppressants would also be in the FDCP. The FDCP would be part of the air quality permit public notice documents. (see Sections 4.1.6, and 4.3.9, in PolyMet 2015a, as cited in the FEIS). Fugitive dust from the project could generally be characterized as low sulfide/low metal. Using water spray on unvegetated surfaces would be appropriate because this would reduce the potential for dust generation and	WET 11 WR 151

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		transport off site where it would not be managed. Water that contacts dust falling on disturbed areas within the Project Site would be treated before discharged. The effect of dust falling on the disturbed portions of the Mine Site would be controlled by the perimeter dike and ditch system, which would route runoff to the WWTF (Section 4.1.5.3 and Large Figures 19 through 21 of PolyMet 2015a, as cited in the FEIS). Please refer to theme WET 11 for more information.	
19712	The Band does not agree with the statement that "no significant reactive airborne fugitive dust from the rail transport is expected". The SDEIS minimizes the potential adverse impacts from constant rail corridor spillage during the life of the mine project by claiming "Any spillage of the ore fines is expected to be within 2 meters of the rail line, along the path". The Band is concerned with the effect of any spillage on water run-off, as has been seen with other mines in the US: "The Fugitive Dust Risk Management Plan (FDRMP) for Red Dog Operations, Alaska (August 2008, draft) states: "Elevated metal concentrations have been identified in tundra in areas surrounding the DMTS, primarily as a result of deposition of fugitive dust originating from the DMTS corridor, which is used to transport zinc and lead ore concentrates from the Red Dog Mine, operated by Teck Cominco Alaska Incorporated (Teck Cominco)."	The NorthMet Project Proposed Action description in the FEIS includes routine inspections of the Transportation and Utility Corridor to identify accumulations of dust or ore spillage. Regarding dust, given the majority of the dust that could leave the NorthMet Project area could be characterized as low sulfide/low metal, potential impacts would be controlled by: 1) the commitment to treat all runoff from disturbed areas as process wastewater, and 2) the facilities would be subject to an air quality Fugitive Emissions Plan. Significant impact on water resources or historic properties is not expected. All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6, and 4.3.9, in PolyMet 2015a, as cited in the FEIS). Regarding potential spillage, any significant accumulations would be removed by a combination of machines and hand work. Ore transport would be by special railcars that minimize dust and spillage, where, since the SDEIS, PolyMet has committed to retrofit the railcars to better control spillage and develop an ore management/transport plan for monitoring site conditions. It is unlikely that there would be sufficient spillage to affect the quality of surface water or groundwater (See FEIS Section 5.2.2.3.2). See FEIS Section 3.2.2.4 for more information on the railcars, and Sections 5.2.3 and 5.2.7 for impacts of railcar spillage and dust on wetlands and air quality, respectively. The effect of dust falling on the disturbed portions of the Mine Site would be controlled by the perimeter dike and ditch system, which would route runoff to the WWTF (Section 4.1.5.3 and Large Figures 19 through 21 of PolyMet 2015a, as cited in the FEIS).	WR 151
19713	There are other invalid and/or inconsistent	In FEIS Section 5.2.7.1.1, the statement, "The NorthMet Project area has	AIR 12

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	statements throughout the SDEIS related to air quality. The SDEIS states "The NorthMet Project area has been designated by the USEPA as attainment for all air quality pollutants". To be clear, attainment designations for the new short-term standards for NOx and SO2 have not yet been completed for the State of Minnesota. Also, 90% control efficiency is assumed for haul roads at the Mine Site, but only 80% control is assumed for unpaved roads at the Plant Site.	been designated by the USEPA as attainment for all air quality pollutants" has been revised to read, "The NorthMet Project area has been designated by the USEPA as attainment or unclassified for all air quality pollutants." The proposed project can have multiple control efficiencies for the various road segments located at the site. The MPCA approved Fugitive Dust Control Plan (FDCP) would have the control efficiencies and the required dust suppression details outlined within the document. The FDCP would be part of the air quality permit public notice documents.	
19714	The Band has continually questioned the Page 5-411 states that "The modeling results for the Mine Site receptors…indicate that the highest modeled 24-hour H2H PM-10 concentration was 27 ug/m3 for the year 8 operating scenario and 29 ug/m3 for the year 13 operating scenario". Yet the 29 ug/m3 result not shown in Table 5.2.7-11, even though this value is nearly the PM-10 24-hour increment limit (30 ug/m3).	The highest second-high PM_{10} concentration of 29 $\mu g/m^3$ for the year 13 operating scenario was added in FEIS Table 5.2.7-11.	AIR 12
19716	From Table 6.2-22, cumulative inhalation risks for cancer are four times greater than the guideline of 1E-05. Although much of this risk comes from existing facilities, this number indicates that the area cannot sustain pollution that adds to what is already there without compromising health.	Please also see Response to Comment ID 2879. The commenter is correct that the estimated inhalation cancer risk from the combination of background air data and modeled facility data are above the facility risk guideline for cancer risk. This is consistent with estimates for air data across the state of Minnesota, with levels generally higher in urban areas and lower in rural areas. The estimation of cancer risk from air concentrations is a mathematical exercise and is not equal to actual increases in cancer. Also, these estimates based on environmental hazards must be considered against the background cancer risk in Minnesota from all causes (genetics, tobacco, nutrition, etc.). For example, the background incidence in males is about 1 in a population of 2 (MDH 2001).	HU 05
19717	The Band has also continued to raise concerns for amphibole fibers, and what we perceive as insufficient analysis in the SDEIS. According to the SDEIS, the BACT-like fine particulate controls will control the release of more than "99.9% of amphibole fibers that are emitted from controlled sources", not "99.9% of fibers in the ore". The	FEIS Section 5.2.7.1 has been revised to incorporate additional information about limiting fugitive dust as a surrogate to limit potential fiber emissions. All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see	AIR 03

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	second statement is incorrect, because some sources of fibers from the ore are uncontrolled, like blasting operations, or are unable to be controlled up to 99.9%, like haul roads, tailings, crushing and screening, and stockpiles.	Sections 4.1.6, and 4.3.9, in PolyMet 2015a, as cited in the FEIS). Compliance with the requirements for blasting, found in *Minnesota Rules*, Chapter 6132, will minimize fugitive dust from blasting operations.	
19718	The SDEIS states that the Biwabik Iron Formation (which has been found to contain amphibole fibers) slopes under the Duluth Complex at the Mine Site, coming within 100 feet of the area that is planned to be mined. The Band's previous comments regarding unexamined hydrological connections between geologic layers or formations are also applicable in this instance. With fractured bedrock present, that could establish a hydrological connection, and 100 feet would be an insufficient barrier. Additionally, these types of formations are characteristically not homogeneously distributed, meaning that pockets of fibers could be found unexpectedly. While it is true that some information on the occurrence of amphibole fibers has been gathered from the site, the drill locations were chosen with regard to studying minerals of economic interest, and did not specifically target locations where fibers may be expected to occur.	The NorthMet Project Proposed Action would mine ore from the Duluth Complex, which has been shown to contain amphibole mineral fibers, though to a lesser extent than found in the Biwabik iron formation. The Duluth complex may contain geologic heterogeneities near the proposed project site, which could result in variability in both the concentrations of and type of fiber contained within the oar. The results of the analysis for quantification and identification of fibers collected from samples taken from PolyMet's various floatation tests (SGS 2004, as cited in the FEIS; Barr 2007l, as cited in the FEIS) were used only to confirm the presence of amphibole minerals in the ore and should not be used as a predictor of potential facility emissions. It is not possible to quantify the amount of fibers that may be emitted from the facility with any predictive accuracy. Any decisions as to the stringency of ambient air quality monitoring for fibers would be made during the air permitting process, during which there will be an opportunity for public participation.	WR 012
19719	The SDEIS maintains that the Minnesota Department of Health has reported that males within the area of the taconite mining and milling industry had more than two times the mesothelioma rate than the rest of the state. Actually, the report from the epidemiologic study of Minnesota iron mine workers states that it is three times the rate found in the rest of the state.	Both the MDH's study of cancer incidence rates in Northeastern Minnesota and the U of M's Taconite Miners Health Study found an increased risk of certain respiratory cancers in iron range mine workers when compared to incidence experienced in Minnesota as a whole. However, neither study was able to definitively link the exposure to occupational amphibole mineral fibers with this observed increase in risk. The design limitations of these epidemiologic studies did not allow for the development of data that could address the potential toxicity that amphibole mineral fibers may present to either those that work directly with mining operations or who live within the surrounding communities.	HU 05
19720	Page 5-443 The SDEIS assures that ambient air monitoring for amphibole fibers would be conducted following facility start-up. While no	Decisions on ambient air quality monitoring for fibers would be made during air permitting and there would be an opportunity for public	AIR 03

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	schedule of frequency or duration for amphibole fibers monitoring has been proposed in the SDEIS, the Band continues to assert, as we have throughout the environmental review process, that monitoring will need to continue over the life of the mine, as no one can predict when fibers might be contacted and released.	participation via that process.	
19722	The tribal cooperating agencies were not permitted to participate in the Geotechnical Stability IAP workgroup, so we are at a disadvantage for understanding how some of the profound geotechnical stability risks identified for the PolyMet project as defined in the 2009 DEIS were resolved for the 2013 SDEIS.	The proposed design and management of the proposed waste management facilities has evolved throughout the EIS. These modifications have resulted in improved expected stability as well as enhanced environmental outcomes (such as water impacts). Notable enhancements to the design of the proposed waste management facilities since the DEIS include: - improving stability at the Tailings Basin by adding rock buttressing along the northern edge, and adding cement deep soil mixing in the fines and slimes layers along the northern sections of the LTVSMC tailings basin; - moving the Hydrometallurgical Residue Facility from on top of the LTVSMC tailings basin, to a site adjacent to the LTVSMC tailings basin, and designing the Hydrometallurgical Residue Facility as a double-lined facility constructed using the downstream construction method; - designing the Category 1 Stockpile as a permanent feature with a containment system for groundwater runoff and seepage, and geomembrane cover for closure; and - designing the Category 2/3 and 4 waste stockpile as temporary features, with liners, and to reclaim (progressive reclamation) the stockpiles by placing the waste rock as backfill in the East and Central pits. FEIS Sections 2.3, 2.4 and 3.2.3 provide an overview of the evolution of the NorthMet Project Proposed Action. Details of the current NorthMet Project Proposed Action are provided in Section 3.2. Section 5.2.14 provides details of the design factors, management, and modeling results pertaining to geotechnical stability of the waste material storage facilities.	GT 14
19723	we do not share PolyMet's confidence in being able to virtually eliminate leakage to groundwater from any type of containment system. Some leakage must always be assumed, and given the site-specific conditions for the proposed location of the HRF, the risk for highly contaminated seepage to exit the HRF and flow to wetlands in	The Hydrometallurgical Residue Facility would be double-lined to minimize release of water that has contacted the hydrometallurgical residue. The double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a leakage collection system. This would substantially remove all hydraulic head from the lower liner and thereby virtually eliminate leakage from the Hydrometallurgical Residue	WET 12

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	the Embarrass River watershed.	Facility. It is expected that no water would be released directly from the Hydrometallurgical Residue Facility, so, appropriately, leakage from the Hydrometallurgical Residue Facility is not included in modeling. PolyMet initiated laboratory testing to consider the chemical compatibility of the potential geosynthetic liner to be used with leakage from residue (PolyMet 2014r, as cited in the FEIS). Results indicated that a polymer-treated geosynthetic liner should be used that is manufactured specifically in anticipation of the chemical characteristics of the liquid and the pore water that would be contained within the facility. The hydraulic conductivity of the soil leakage collection system is not expected to degrade over time. Typical liner performance assumes a 500-year service life of the geomembrane; therefore, hydraulic conductivity of the liner is not expected to degrade over that time. Specific attributes would be determined during the geosynthetic clay layer development to achieve the desired performance before final installation. Findings of studies on geosynthetic liners indicate that performance is minimally affected by freeze-thaw cycles (PolyMet 2014c, as cited in the FEIS). At the Hydrometallurgical Residue Facility, the majority of the geosynthetic liner system would be below the water elevation, and therefore not exposed to freeze-thaw cycles.	
19724	[A] 'natural low point in the topography' is an open water wetland (as prominently displayed in the left photograph on the cover of the SDEIS) with distinct natural drainage channels .	This comment has been received and acknowledged by the Co-lead Agencies. The Co-lead Agencies believe the identification of wetlands at the NorthMet Project area are accurately and adequately depicted in Section 4.2.3 for the purpose of the EIS.	WET 17
19725	A 0.03-acre area of sedge/wet meadow within the Tailings Basin and a 28.6 acre area of shallow marsh within the Hydrometallurgical Residue Facility are exempt from state and federal wetland regulations as they are both located within the Cliffs Erie Permit to Mine Ultimate Tailings Basin Limit Boundary. The significance of the site topography and natural drainage features is more relevant to our concerns than the regulatory status of the wetlands. The SDEIS simply does not address the potential lack of integrity or risk of failure when constructing a hazardous waste facility within a wetland. Assumptions about hydraulic head being removed from the lower liner	The Hydrometallurgical Residue Facility would be constructed over the LTVSMC emergency basin. This site is known to have suitable subsurface conditions, and would minimize impacts to ecosystems and water resources as compared to a new site, since it is already disturbed. The two liner layers on the Hydrometallurgical Residue Facility would be separated by a leakage collection system, which is designed to collect any potential leakage from the bottom of the cell. Each liner layer would consist of a geomembrane layer above a geosynthetic clay layer. A drainage collection system would also be installed during reclamation to collect drainage above the upper liner. The cap would consist of a geotextile fabric, overlain by a clay barrier layer, and a 40-mil low-density polyethylene layer. This would be covered with additional LTVSMC coarse tailings or common borrow and cover soils to sustain a vegetated cover. During reclamation and long-term closure, leakage would be routed and cycled through the Plant Site	PD 18 WR 126

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	are not reassuring when the lower liner (geosynthetic clay) has been installed within a wetland and natural drainage ravine.	WWTP. The FEIS includes details from the updated Residue Management Plan. The liner system components have been selected specifically to perform well given the characteristics of the residue, which consists primarily of gypsum. The liner system components selected for the Hydrometallurgical Residue Facility are routinely used for similar facilities in other industries and have demonstrated the expected levels of performance. The design produces a liner system with virtually no leakage due to the system's ability to maintain a very low hydraulic head on the composite liner portion of the overall liner system. In order to install liners, the existing ground would be cleared and either dewatered or built up with fill material. It is not possible to install liners on saturated ground or in standing water. If needed to address foundation conditions, wick drains, including a granular drainage layer and geogrid reinforcement as needed, will be incorporated during construction. If after installation and placement of waste material, there is some head buildup below the liner (unlikely), the direction of leakage would be upward through the liner and into the facility collection system, not downward into groundwater. The Residue Management Plan presents the planned Hydrometallurgical Residue Facility monitoring and maintenance plan. Additional monitoring and maintenance requirements would be outlined by the responsible regulatory agency as part of facility permitting. A submittal containing two documents, *Information Provided by PolyMet Regarding 2009 Hydrometallurgical Residue Testing* and *Information Provided by Polymet Regarding Hydrometallurgical Residue Testing for RCRA Thresholds,* was provided to the Co-lead Agencies on August 5, 2014 (see PolyMet 2014a). The documentation summarized the results of two rounds of testing conducted in 2005 and 2009 respectively on the residue that is to be discharged to the Hydrometallurgical Residue Facility. It also reviewed the testing results against the regulations under the federal Resource Conservation and Recovery Act (RCRA). Mining wastes associated with extraction, beneficiation, and processing of ores and minerals are typically excluded from the RCRA definition of hazardous waste (40 CFR 261.4(b)(7)). PolyMet has conducted environmental testing to compare the properties of the hydrometallurgical residue with the RCRA hazardous waste thresholds. Comparison of the results from this testing with the RCRA hazardous waste thresholds shows that the	

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		hydrometallurgical residue does not have any toxicity characteristics of a hazardous waste. The MPCA concurs with this assessment.	
19726	The potential for substantial volumes of seepage flowing from the Tailings Basin to the HRF has not been addressed in the SDEIS; this represents a potential structural hazard.	Seeps have been observed along the southern edge of the LTVSMC Tailings Basin Cell 2W. These seeps have diminished since the termination of the LTVSMC operations and are expected to remain minimal as Cell 2W is not proposed for use as part of the NorthMet Project Proposed Action. The design of the Hydrometallurgical Residue Facility acknowledges the presence of this seep by including a collection drain that would collect water from the seep below the proposed constructed embankment and liner systems to transmit the collected seep to the exterior of the facility. This seepage collection system would include a layer of free-draining soil which would reduce the potential for phreatic build-up below the liner. Details on this design consideration are provided in Section 5.1 of the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS). Geotechnical stability of the Hydrometallurgical Residue Facility is summarized in FEIS Section 5.2.14.2.3. Details are provided in the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS). Design, construction, monitoring, maintenance, and adaptive management are addressed in the Residue Management Plan (PolyMet 2014r, as cited in the FEIS).	GT 11 WR 066
19727	But we have no assurance that the HRF is designed to structurally withstand thousands of gallons per day of Tailings Basin seepage along the dikes that do not have seepage capture features installed.	The current Hydrometallurgical Residue Facility design acknowledges the presence of an active seep in the proposed area of construction. As such, a collection drain has been designed to collect water from the active seep below the proposed constructed embankment and liner systems, and to transmit the collected seep to the exterior of the facility. This seepage collection system would include a layer of free-draining soil which would reduce the potential for phreatic build-up below the liner. Details on this design consideration are provided in Section 5.1 of the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS). FEIS Section 4.2.14.3 describes the details of the existing conditions at the location of the proposed Hydrometallurgical Residue Facility, including the fact that it is proposed to be constructed at the location of the LTVSMC Emergency Basin. FEIS Section FEIS 3.2.2.3.7 broadly describes the Hydrometallurgical Residue Facility, while Section 5.2.14.2.3 provides details on the construction, operation, monitoring, and maintenance for geotechnical stability, including potential liquefaction. Additional technical details on design and construction, factors of safety analysis, operation and management, and reclamation and closure are found in the Geotechnical	GT 11

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		Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS) the Residue Management Plan (PolyMet 2014r, as cited in the FEIS).	
19728	the co-lead agencies' approach to predicting indirect impacts to wetlands and their resulting conclusions, [is] an overly simplistic method based upon a flawed concept of hydrology at the mine site.	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring	WET 08

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		wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
19729	The purpose of an EIS is to be "forward looking" by predicting potential impacts and adequate mitigation for those impacts; this SDEIS is deficient in that respect. The USACE has not yet developed a monitoring plan to assess after-the-fact Project impacts to wetlands, but maintains that will be the way to best determine and mitigate indirect wetland impacts. The Band is not aware of any previous instance for which the USACE St. Paul District Office has required reasonably foreseeable indirect wetland impacts to be later mitigated as direct effects based upon monitoring.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects.	COE 02 WET 02
19730	Given the persistent major differences of opinion between the co-lead agencies and the tribal cooperating agencies, the Band specifically requests that financial assurance for potential indirect wetland effects and monitoring be secured.	FEIS Section 3.2.2.4 states that compensatory wetland mitigation for the NorthMet Project Proposed Action is expected to be approved and constructed in advance of any authorized direct wetland impacts and would therefore not require financial assurance. If issued, USACE permits would require mitigation for indirect wetland effects. Guidance for USACE permits that are conditioned to include any type of financial assurance to ensure that required compensatory mitigation is completed can be found in FEIS Section 5.2.3.3.2, or at: • 33 CFR Parts 325 and 332, Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, dated April 10, 2008. Financial assurances are specifically discussed at 33 CFR 332.3(n). • Regulatory Guidance Letter No. 05-1 Date: 14 February 2005 titled: Guidance on the Use of Financial Assurances, and Suggested language for Special Conditions for Department of the Army [i.e., USACE] Permits Requiring Performance Bonds, provides additional guidance on the use of financial assurances (USACE 2005).	FIN 03
19731	Nearly 2,000 acres of coniferous bog wetlands will be directly impacted by mine pit(s) and stockpiles, or indirectly impacted due to drawdown and/or pollution. This is particularly significant to the	The Co-lead Agencies/ obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and that the Bands' usufructuary rights to collect	WET 13

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	Band because many tribally harvested resources are only available in coniferous bogs, and restoration of coniferous bogs is a very difficult and long process that has extremely low success rates.	resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effect posed to usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the GLIFWC and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing and gathering, cultural or religious resources, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 Ceded Territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 ceded territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process.	
19732	The proposed mitigation plan is inadequate; it allows for the vast majority of mitigation and/or restoration credits to come from outside the Partridge, Embarrass, and St. Louis River watersheds. There is no justifiable reason to permit out-of-watershed mitigation when in-watershed opportunities still exist…	FEIS Section 5.2.3.3.2 includes a discussion on the wetland mitigation study limits and the site selection process. The compensatory wetland mitigation site selection for the NorthMet Project Proposed Action began in 2005 and has gone through a rigorous site selection evaluation. Prior to the 2008 Federal Mitigation Rule, the Aitkin and Hinckley sites were selected, initial approvals by the USACE were received, and substantial investments were made by PolyMet to develop both sites for compensatory mitigation. The USACE guidance prior to the implementation of the 2008 Federal Mitigation Rule was to look for mitigation sites that could provide the following: restoration of historical wetlands, high probability of success, achieve at least partial in-kind mitigation and sites that had ditched and/or tiled peatlands to provide for restoration. When the 2008 Federal Mitigation	WET 03

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		Rule went into effect, the USACE informed PolyMet of the priority for siting any future compensatory mitigation within the St. Louis River/ Great Lakes Basin. The Zim Site was subsequently proposed as a third site. Please refer to the response to theme WET 03.	
19733	The Band objects to the approval of any further out-of-watershed mitigation credits or restoration for impacts to irreplaceable high quality aquatic resources of national importance, which include all remaining unimpacted wetlands within the St. Louis River watershed/Lake Superior Basin.	FEIS Section 5.2.3.3.2 includes a discussion on the wetland mitigation study limits and the site selection process. The compensatory wetland mitigation site selection for the NorthMet Project Proposed Action began in 2005 and has gone through a rigorous site selection evaluation. Prior to the 2008 Federal Mitigation Rule, the Aitkin and Hinckley sites were selected, initial approvals by the USACE were received, and substantial investments were made by PolyMet to develop both sites for compensatory mitigation. The USACE guidance prior to the implementation of the 2008 Federal Mitigation Rule was to look for mitigation sites that could provide the following: restoration of historical wetlands, high probability of success, achieve at least partial in-kind mitigation and sites that had ditched and/or tiled peatlands to provide for restoration. When the 2008 Federal Mitigation Rule went into effect, the USACE informed PolyMet of the priority for siting any future compensatory mitigation within the St. Louis River/ Great Lakes Basin. The Zim Site was subsequently proposed as a third site. Please refer to the response to theme WET 03.	WET 03
19734	Tribal cooperating agencies believe the CEA for land use should encompass the 1854 Ceded Territory, as the signatory Bands have lost access to substantial portions of the 1854 CT and the resources within.	The cumulative effects section in the FEIS (Section 6.1.1.1) describes the rationale how the cumulative effects assessment areas (CEAAs) were identified. The CEAAs for individual resource areas vary based on the potential for cumulative effects and not on a single overall assessment area. Table 6.1.1-2 of the FEIS summarizes the spatial areas utilized for each resource area. Please also refer to the response to themes CR 02 and CR 03. The federal Co-lead Agencies considered an expanded area for analysis of cumulative effects on cultural resources and natural resources of significance to the Bands including use of a portion of the 1854 Ceded Territory as the CEAA. By evaluating the effects of the NorthMet Project Proposed Action along with other past, present, and reasonably foreseeable future projects in the context of a much larger area with a much larger number of resources similar to those affected by the NorthMet Project Proposed Action, the effect of the NorthMet Project Proposed Action on those resources is diminished. The cumulative effects analysis focuses on the specific resources, or types of resources, affected by the NorthMet Project Proposed Action within an area that is geographically meaningful considering the project under review. The Cultural Resources section of	CU 01 CR 01 CR 03

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		FEIS Chapter 6 addresses the Co-lead Agencies' determination of the NorthMet Project Proposed Action's cumulative areas of potential effect.	
19735	The tribal cooperating agencies believe the water quality and hydrologic cumulative effects analysis should incorporate the entire St. Louis River watershed. This watershed has experienced substantial historic, current and proposed expanded mining activities, as well as other industrial, agricultural and urban development. In addition to the direct surface water and wetland impacts (loss and/or degradation) from these activities, nearly half of the watershed has experienced hydrologic alteration from extensive ditching.	The cumulative effects section in the FEIS (Section 6.1.1.1) describes the rationale how the cumulative effects assessment areas (CEAAs) were identified. The CEAAs for individual resource areas vary based on the potential for cumulative effects and not on a single overall assessment area. Table 6.1.1-2 of FEIS summarizes the spatial areas utilized for each resource area. Please also refer to Section 8.3, MDO 12 for the Co-lead Agencies' rationale for the CEAA identified for water resources.	CU 01
19736	Tribal cooperating agencies consider a 216,300 acre area bounded by the St Louis River, Lake Superior, Lake Vermilion and the Beaver Bay to Vermilion Trail to be a Tribal Historic District, and the pertinent area for consideration of cumulative effects to cultural resources.	The historic district proposed by the Grand Portage Band in a June 27, 2013 letter was addressed (Grand Portage 2013, as cited in the FEIS). The federal Co-lead Agencies have considered an expanded area for analysis of cumulative effects on cultural resources and natural resources of significance to the Bands, including use of the 1854 Ceded Territory as the CEAA. Use of the 1854 Ceded Territory as the CEAA for cultural resources would actually diminish the significance of any cumulative effects. By evaluating the effects of the NorthMet Project Proposed Action along with other past, present, and reasonably foreseeable future projects in the context of a much larger area with a much larger number of resources similar to those affected by the NorthMet Project Proposed Action, the effect of the NorthMet Project Proposed Action on those resources is diminished. The cumulative effects analysis focuses on the specific resources, or types of resources, affected by the NorthMet Project Proposed Action within an area that is geographically meaningful considering the project under review. Cumulative effects are discussed and addressed differently based on the affected resource. Discussions related to socioeconomics, for instance, use an expanded analysis area compared to other resources. Such expanded analysis areas are used as appropriate. The Cultural Resources sections in FEIS Chapters 4, 5, and 6 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's direct, indirect, and cumulative areas of potential effect.	CR 03 CR 04

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19737	Inadequate cumulative effects analysis, across all resource categories. Cumulative effects result in a relentless, unmitigated diminishment of treaty resources and access to those resources. Yet across virtually all resource categories, the SDEIS predicts that there will be no adverse impacts as a result of the NorthMet Project Proposed Action; this conclusion then enables the co-leads to determine 'no cumulative effects' from the project and the land exchange. But those initial no-impact predictions are contingent upon assumptions that all best management practices, engineering controls and mitigation measures discussed throughout the SDEIS will be successfully and flawlessly implemented, and that the NorthMet Project will comply with all applicable federal state and local regulations and permit requirements, particularly water quality standards. The tribal cooperating agencies have provided extensive comments and analyses over the course of the DEIS and SDEIS processes that support our misgivings for this circular logic. We presented a substantial alternative analysis of cumulative effects from the NorthMet Project Proposed Action as part of our commenting during the preliminary SDEIS review. Key concepts from our tribal CEA include: The tribal cooperating agencies' review of the water modeling data packages for the NorthMet Project Proposed Action led to our conclusion that GoldSim did not accurately predict existing conditions, and cannot be relied upon to accurately predict future project conditions.	The FEIS does not conclude there would be no adverse impacts or there would be no cumulative effects from the NorthMet Project Proposed Action or Land Exchange. The rationale for the geographic and temporal scope of the cumulative effects analysis is well documented in Chapter 6. FEIS Table 6.2.2-1 (formerly Table 6.2-1 in the SDEIS) has been updated to include additional projects that have been identified since publication of the SDEIS. In addition, FEIS Section 6.1.1.2.1 has expanded descriptions regarding the actions included the cumulative effects assessment. FEIS Section 6.2.9 describes specific cumulative effects for cultural resources, including effects to treaty-protected resources and access to those resources. The FEIS's estimates of predicted water quality impacts represent years of study and deliberation and are expected to be reasonable estimates of actual impacts in the event the project is constructed. The NorthMet Project Proposed Action has undergone substantial changes throughout this time to improve predicted water quality, most notably the addition on reverse osmosis treatment plants and water capture systems, liners and covers. The FEIS discloses the probability of water quality impacts and identifies mitigation measures that can be implemented in the event they are needed. The FEIS Mine Site GoldSim model was recalibrated to provide a better correspondence between predicted and observed water chemistry data in the Partridge River for existing conditions. This calibration considered new surface water chemistry data collected through the end of 2013. For Colby Lake, a new chemical source term was added to the Mine Site GoldSim model and calibrated to measured concentrations in the lake to ensure there was an adequate basis for assessing Proposed Action potential impacts.	WR 044 WR 045 WR 049
19738	While any individual mine may not have significant impacts on plants, wildlife or the landscape, the cumulative impacts of thousands of acres of habitat loss and degradation correspond to a legitimate, significant concern for treaty-	FEIS Table 6.2.2-1 (formerly Table 6.2-1 in the SDEIS) has been updated to include additional projects that have been identified since publication of the SDEIS. In addition, FEIS Section 6.1.1.2.1 has expanded descriptions regarding the actions included the cumulative effects assessment. FEIS Section 6.2.9 describes specific cumulative effects for cultural	CU 11

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	protected resources and access to them.	resources, including effects to treaty-protected resources. Please also refer to the responses to themes CR 02, VEG 08, and WI 09.	
19739	General reluctance to share information with non-Band members is often prevalent [at NorthMet Project meetings] as well as cultural restrictions on who (inside and outside the Band) can legitimately and safely be trusted with sensitive information.	Refer to FEIS section 1.2 for roles and responsibilities of the agencies, and Chapter 2 for an overview of the EIS process undertaken. The federal Co-lead Agencies have made a reasonable and good-faith effort to identify cultural resources potentially affected by the NorthMet Project Proposed Action. The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting on the NorthMet Project Proposed Action. Historic properties affected by the NorthMet Project Proposed Action have been identified and the impacts to those properties have been assessed through the traditional Section 106 methods/process. This also includes an assessment of actual use of those historic properties, as well as other resources in the APE, by tribal members. In addition to traditional methods, elder interviews were conducted in 2010 and 2011 with members of the Bois Forte, Fond du Lac, and Grand Portage. Elders recalled that some Band members had utilized the general NorthMet Project area for hunting, fishing, and plant gathering of wild rice, maple-sugar, berries, and birch bark; however, they could not provide specific locations or uses within the NorthMet Project area. The federal Co-lead Agencies also conducted reconnaissance of trail corridors with participation from the Bands. The purpose of the traditional research and survey was to provide historic documentation and context for and to identify places important to the Bands. The elder interviews were to be used to further identify and understand tribal use areas and places of importance. The field investigation component was informed by the results of those efforts.	NEPA 14
19740	The Area of Potential Effect (APE) for cultural resources divided the project into two separate sections surrounding the proposed mine site and the proposed plant site should be revised. “Figure 4.2.9-1, Cultural Resource Analysis-Area of Potential Effect” needs only to have the two areas joined to compose an APE that reflects an undertaking as defined in Section 106 of the National Historic Preservation Act of 1966...]).” An APE that encompasses the Mine and Plant sites and surrounding area affected by operations would better describe the undertaking for cultural	The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange, and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been modified to encompass the proposed Mine Site and Plant Site, the Dunka Road corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline.	CR 02

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	resource investigations.		
19741	The Beaver Bay to Lake Vermilion Trail requires further clarification...There has been no rigorous attempt to research the BBLVT by the Bands or Lead Agencies, although the Superior National Forest Heritage Program reviewed the GLO plats and conducted field investigations on SNF land. Additional fieldwork should be conducted in the spring or fall when ephemeral features such as foot trails are less easily concealed by vegetation and more easily discerned.	The federal Co-lead Agencies believe that the work to justify consideration of the BBLV Trail Segment as an historic property is complete. There has been sufficient background research and fieldwork completed to date as discussed in FEIS Section 4.2.9.2.3. Additional research and fieldwork may be part of any resolution of adverse effect.	CR 04
19742	The proximity of the plant site to the Sugarbush and the cumulative effects of dust on leaves, trees and understory flora have not been examined in detail and their long term effects may well be detrimental to vegetation, other than maples, that comprise the Sugarbush."	As discussed in FEIS Section 5.2.9.2.1 , the federal Co-lead Agencies have determined that the NorthMet Project Proposed Action would adversely affect the Spring Mine Lake Sugarbush. As part of an MOA, the federal Co-lead Agencies would ensure the avoidance, minimization, and/or mitigation of impacts to cultural resources that may be encountered, such as unauthorized collection, during construction or operation of the NorthMet Project Proposed Action. The federal Co-lead Agencies, in consultation with the Bands, SHPO, and PolyMet, are currently working to resolve adverse effects on this property.	CR 02 CR 03 CR 05
19743	The SDEIS must be revised to fully evaluate reasonable alternatives in the SDEIS, including identifying the federal agency preferred alternative and the LEDPA.	Neither Minnesota Rules nor CEQ regulations require the Co-lead Agencies to identify a preferred alternative in the SDEIS (40 CFR 1502.14(e)). The FEIS includes available details regarding the identification of an Agency Preferred Alternative. The FEIS contains sufficient information to identify and substantiate the Least Environmentally Damaging Preferred Alternative (LEDPA). The LEDPA is the only alternative that is permittable pursuant to the Clean Water Act (CWA) Section 404(b)(1) Guidelines. The applicant must clearly demonstrate that the preferred alternative in the FEIS is the LEDPA, in that there is not a practicable alternative that would have less adverse impact on the aquatic ecosystem and no other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics. The USACE is not required to identify a LEDPA in the FEIS; the final determination on the LEDPA would be made in the ROD for the USACE which serves as the USACE's decision document and the basis for the Department of the Army permit decision. FEIS Section 7.5 includes additional information about the Area of Potential Effect (APE) and	ALT 20 COE 04

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		LEDPA. The USFS would utilize the FEIS to show the factors relating to how the public interest would be served by the Land Exchange, and the ROD for the USFS would incorporate the findings of those factors and identify the preferred alternative. The MDNR is not required to identify a preferred alternative under MEPA. The FEIS Sections 3.2 and 3.3 further detail this process. The agency preferred alternative and LEDPA process are described in FEIS Sections 7.4 and 7.5. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of an FEIS. Any comments received during the 30 day period may be considered in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of the Project.	
19744	No mitigation has been identified in the SDEIS for this permanent loss of lands and resources (natural and cultural) to the 1854 Ceded Territory. The public interest determination must include a specific finding that "The intended use of the conveyed Federal land will not substantially conflict with established management objectives on adjacent Federal lands, including Indian Trust lands" (36 C.F.R. 254.3(b)(2)(ii)). This threshold has not been met, and the Fond du Lac Band objects to the implementation of the Land Exchange Proposed Action.	The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6, also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the NorthMet project review The federal Co-lead Agencies' obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Cultural Resources sections of FEIS Chapters 4 and 5 address these federal tribal trust responsibilities under the 1854 Treaty. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife	CR 01 LAN 05

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		Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands. Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process. The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in Section 5.2.9 of the FEIS. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory. The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands. No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would	

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		not adversely affect the heritage resource, but would provide greater preservation protection under federal law. The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited. Please refer to the response to theme LAN 01 for more information on the public interest determination.	
19745	Summary: Based upon our extensive evaluation of the SDEIS and supporting technical documents, we conclude that there will undoubtedly be significant and unmitigated impacts to natural and cultural resources that the tribal cooperating agencies have consistently elevated to the attention of the co-lead agencies. There will be significant and unmitigated tribal resource losses within the 1854 Ceded Territory and the Lake Superior basin, including the St. Louis River watershed. The NorthMet Project Proposed Action and Land Exchange Proposed Action would decrease the amount of land available for public access and use, and would decrease portions of the 1854 Ceded Territory available for use by the Bands. The SDEIS must be revised, with significant additional study, to appropriately evaluate closure, mitigation, reclamation, and perpetual treatment cost estimates. The SDEIS requires substantially more public transparency and less equivocation on what is arguably one of the most fundamental issues at stake for this project: perpetual treatment.	FEIS Section 4.2.9.2.3 provides a detailed discussion and analysis of the area in which cultural resources may be affected by the undertaking. The APE takes into account both direct and indirect effects using a geographically expansive area that accounts for direct effects as well as visual, audible, atmospheric, hydrological, and water quality effects. The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange, and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been revised slightly to include the Dunka Road corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline. It is acknowledged that operation, maintenance and periodic replacement of environmental controls would be required during closure. Financial Assurance would be required under the State's Permit to Mine to perform these activities on a continuous and/or periodic basis for as long as these activities are needed. The FEIS includes available details regarding financial assurance (Section 3.2.2.4). Final details on the cost estimates, timeframes, contingency plan amounts, and calculations that would be required for the project would be addressed during permitting. In addition, see the response to theme WR 035.	FIN 06 PER 03 WR 035 WR 037 CR03

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19746	The SDEIS does not provide sufficient information for the public to understand whether the NorthMet Project Proposed Action will be required to remediate these and other AOCs before commencing project operations, or be allowed to defer remediation until closure.	FEIS Table 4.2.1-2: NorthMet Project Proposed Action Area of Concern Summary List for Voluntary Investigation and Cleanup Program, has been updated in the FEIS to show the current status and additional information where available. Costs for assessment, investigation, and cleanup are not available. The April 6, 2010, Consent Decree is a court registered agreement between Cliffs Erie LLC and the MPCA to resolve alleged violations of Cliffs Erie's NPDES/SDS permits for its Hoyt Lakes and Dunka mining area facilities. The Consent Decree addresses issues at the Tailings Basin (including outfall SD026) and discharges from the Cliffs Erie Area 5 mining area (SD033). While the latter area is not part of the NorthMet Project Proposed Action, PolyMet has entered into an agreement with Cliffs Erie, whereby it would be transferred to PolyMet upon issuance of permits for the NorthMet Project Proposed Action. Until that time, Cliffs Erie retains responsibilities for permit-related activities at both the Tailings Basin and Area 5. While certain Consent Decree-related activities have been in progress or have been completed for these areas since the SDEIS, there has been no change in ownership or responsible parties since that time.	HAZ 05
19747	Based upon our extensive evaluation of the SDEIS and supporting technical documents, we conclude that there will undoubtedly be significant and unmitigated impacts to natural and cultural resources that the tribal cooperating agencies have consistently elevated to the attention of the co-lead agencies. There will be significant and unmitigated tribal resource losses within the 1854 Ceded Territory and the Lake Superior basin, including the St. Louis River watershed. The NorthMet Project Proposed Action and Land Exchange Proposed Action would decrease the amount of land available for public access and use, and would decrease portions of the 1854 Ceded Territory available for use by the Bands…There is a demonstrated need for significant improvements to the modeling evaluations. The lack of fracture and fault analysis is also major deficiency of this SDEIS.	The Co-lead Agencies acknowledge that bedrock is variably fractured. The effects of fracturing are incorporated into the bulk hydraulic conductivity values used to characterize bedrock. This is common practice in large-scale evaluations of bedrock hydraulics. The Co-lead Agencies acknowledge that structural faults may exist between mine facilities and perennial streams that receive groundwater discharge. Because the landscape is covered with surficial deposits and there few bedrock outcrops, the existence of faults is conjectural and locations at best can only be inferred. It is unknown if faults (if and where they exist) behave as conduits or barriers to groundwater flow. Given these uncertainties, it is unlikely that any reasonable field program would be able to identify the existence, location, and hydraulic characteristics of faults that may or may not be present at the site. The Co-lead Agencies' approach is to set up a robust monitoring program during operations and closure to provide direct or indirect evidence on the existence of hydrologically significant faults. If significant faults are identified (that is, faults which could lead to violation of water quality standards), then adaptive measures would be employed to mitigate the fault-related effects.	WR 012
19748	Based upon our extensive evaluation of the SDEIS	Water quality modeling predictions for SW-005 and PM-13 indicate that	WR 115

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	and supporting technical documents, we conclude that there will undoubtedly be significant and unmitigated impacts to natural and cultural resources that the tribal cooperating agencies have consistently elevated to the attention of the co-lead agencies. There will be significant and unmitigated tribal resource losses within the 1854 Ceded Territory and the Lake Superior basin, including the St. Louis River watershed. The NorthMet Project Proposed Action and Land Exchange Proposed Action would decrease the amount of land available for public access and use, and would decrease portions of the 1854 Ceded Territory available for use by the Bands. We consider the high probability of continued degradation of remaining wild rice stands in the Partridge and Embarrass River watersheds as a result of the NorthMet Project to be an unacceptable environmental impact...The water quality analysis is fundamentally inadequate; it must be redone	the NorthMet Project Proposed Action would not result in significant adverse impacts to water quality. These evaluation locations are the nearest downstream locations from the NorthMet Project Proposed Action in the Partridge and Embarrass Rivers respectively and were previously recommended by MPCA staff to be considered as waters used for production of wild rice for purposes of the FEIS. Impacts on wild rice further downstream in these waters, or on wild rice resources regionally throughout the treaty areas, would not be expected.	WR 157
19749	The SDEIS evaluation of mercury impacts is deficient, and the conclusion of no mercury impacts downstream in the St. Louis River watershed is not supported by the information presented.	As summarized in FEIS Section 6.2.3.3.4, the NorthMet Project Proposed Action is predicted to result in a net overall decrease of mercury loadings of approximately 1.0 grams per year (i.e., a net decrease of 1.2 grams per year in the Partridge River and a net increase of 0.2 grams per year in the Embarrass River), which is indistinguishable from natural background variability. Therefore, the NorthMet Project Proposed Action would not contribute to cumulative effects on mercury loading to the St. Louis River. Supporting information is provided in FEIS Section 6.2.3.3.4.	MERC 19
19750	We consider the high probability of continued degradation of remaining wild rice stands in the Partridge and Embarrass River watersheds as a result of the NorthMet Project to be an unacceptable environmental impact.	This comment states that the continued degradation of wild rice stands in the Partridge and Embarrass Rivers will result from the NorthMet Mining project. Since no specific information was provided, no changes were made to the EIS. See also response to comment 19748.	PER 10 VEG 04
19751	The most significant deficiency in the SDEIS analysis of wildlife impacts is its failure to critically analyze potential impacts to moose.	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes. The FEIS includes a more robust analysis on effects to moose,	WI 01

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		including habitat and displacement.	
19752	Uncontrolled contaminant loading from existing mine facilities, along with elevated constituents from the Proposed Project, have the potential to affect the successful establishment of a sustainable lake sturgeon fishery throughout the St. Louis River. This potential impact should be fully evaluated in the SDEIS.	Existing data review indicates recruitment and a viable population of lake sturgeon do exist in the St. Louis River Watershed. The NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River Watershed. As a result, no affects to lake sturgeon population within the St. Louis River Watershed system would occur.	AQ 02
19753	A cumulative analysis of fibers expected from the site along with fibers currently being emitted from other sources should be performed. Human health risk assessments should be expanded to include scenarios of worker exposure to amphibole fibers. Fugitive dust impacts must be evaluated for human health and environmental impacts.	FEIS Section 5.2.7.5.3 contains information on amphibole mineral fibers resulting from mining activities. The exact human health risk of amphibole mineral fiber exposure is not known, and it is not possible to quantify amphibole mineral fiber emissions. Section 5.2.7.5.3 includes information on activities that can minimize fiber emissions, ongoing ambient monitoring to collect baseline mineral fiber data, and information on the commitment to continue fiber emission monitoring after start-up of the NorthMet Project Proposed Action for comparison to the baseline. Amphibole mineral fiber emissions would also be addressed during air permitting. Off-site worker exposure is discussed in the air section of FEIS Chapter 5, specifically in sections 5.2.7.5.2 and 5.2.7.5.3. On-site worker health and safety is regulated by other agencies such as the MSHA, NIOSH, and the OSHA.	AIR 03 HU 04
19754	The SDEIS simply does not address the potential lack of integrity or risk of failure when constructing a hazardous waste facility within a wetland.	Based on MPCA preliminary analysis of the material being placed in the Hydrometallurgical Residue Facility, it is not expected to be classified as a hazardous waste facility subject to RCRA. Samples would be collected routinely to confirm that physical and chemical characteristics of residue and materials disposed of in the Hydrometallurgical Residue Facility are not characteristically hazardous, subject to RCRA, and are in compliance with the Permit to Mine and NPDES/SDS permits. FEIS Section 4.2.14.3 describes the details of the existing conditions at the location of the proposed Hydrometallurgical Residue Facility, including the fact that it is proposed to be constructed at the location of the LTVSMC Emergency Basin. The LTVSMC emergency tailings would be consolidated and compacted prior to the construction of the proposed facility. New dams would be located beyond the extent of the emergency basin and founded on existing silty sand, gravel glacial till, and Giants Range granite. The Hydrometallurgical Residue Facility would be	GT 07 GT 15

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		constructed using the downstream method and stability modeling indicates that the Hydrometallurgical Residue Facility would meet the required factors of safety. Construction monitoring and mitigation plans would require further detail during permitting to evaluate consolidation of the LTVSMC tailings, settlement for the Hydrometallurgical Residue Facility, and performance of the wick drains. For more information, see the responses to themes GT 11 and GT 15. Geotechnical stability of the Hydrometallurgical Residue Facility is summarized in FEIS Section 5.2.14.2.3. Details are provided in the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS). Design, construction, monitoring, maintenance, and adaptive management are addressed in the Residue Management Plan (PolyMet 2014r, as cited in the FEIS).	
19756	The Band specifically requests that financial assurance for potential indirect wetland effects and monitoring be secured.	FEIS Section 3.2.2.4 states that compensatory wetland mitigation for the NorthMet Project Proposed Action is expected to be approved and constructed in advance of any authorized direct wetland impacts and would therefore not require financial assurance. If issued, USACE permits would require mitigation for indirect wetland effects. Guidance for USACE permits that are conditioned to include any type of financial assurance to ensure that required compensatory mitigation is completed can be found in FEIS Section 5.2.3.3.2, or at: - 33 CFR Parts 325 and 332, Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, dated April 19, 2008. Financial assurances are specifically discussed at 33 CFR 332.3(n). - Regulatory Guidance Letter No. 05-1 Date: 14 February 2005 titled: Guidance on the Use of Financial Assurances, and Suggested language for Special Conditions for Department of the Army [i.e., USACE] Permits Requiring Performance Bonds, provides additional guidance on the use of financial assurances (USACE 2005).	FIN 03
19757	The Band objects to the approval of any further out-of-watershed mitigation credits or restoration for impacts to irreplaceable high quality aquatic resources of national importance, which include all remaining unimpacted wetlands within the St. Louis River watershed/Lake Superior Basin.	FEIS Section 5.2.3.3.2 includes a discussion on the wetland mitigation study limits and the site selection process. The compensatory wetland mitigation site selection for the NorthMet Project Proposed Action began in 2005 and has gone through a rigorous site selection evaluation. Prior to the 2008 Federal Mitigation Rule, the Aitkin and Hinckley sites were selected, initial approvals by the USACE were received, and substantial investments were made by PolyMet to develop both sites for compensatory mitigation.	WET 03 WET 14

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		The USACE guidance prior to the implementation of the 2008 Federal Mitigation Rule was to look for mitigation sites that could provide the following: restoration of historical wetlands, high probability of success, achieve at least partial in-kind mitigation and sites that had ditched and/or tiled peatlands to provide for restoration. When the 2008 Federal Mitigation Rule went into effect, the USACE informed PolyMet of the priority for siting any future compensatory mitigation within the St. Louis River/ Great Lakes Basin. The Zim Site was subsequently proposed as a third site. Please refer to the response to theme WET 03.	
19758	Tribal cooperating agencies believe the CEAA for land use should encompass the 1854 Ceded Territory, as the signatory Bands have lost access to substantial portions of the 1854 CT and the resources within.	The cumulative effects section in the FEIS (Section 6.1.1.1) describes the rationale for the identification of CEAAs. The CEAAs for individual resource areas vary based on the potential for cumulative effects, and not on a single overall assessment area. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area. Please refer to the responses to themes CR 02 and CR 03.	CU 01
19759	The tribal cooperating agencies believe the water quality and hydrologic cumulative effects analysis should incorporate the entire St. Louis River watershed.	The cumulative effects section in the FEIS (Section 6.1.1.1) describes the rationale for the identification of CEAAs. The CEAAs for individual resource areas vary based on the potential for cumulative effects, and not on a single overall assessment area. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area. Please also refer to Section 8.3, MDO12 for the Co-lead Agencies' rationale for the CEAA identified for water resources.	CU 01
19760	Tribal cooperating agencies consider a 216,300 acre area bounded by the St Louis River, Lake Superior, Lake Vermilion and the Beaver Bay to Vermilion Trail to be a Tribal Historic District, and the pertinent area for consideration of cumulative effects to cultural resources.	The historic district proposed by the Grand Portage Band in a June 27, 2013 letter was addressed (Grand Portage 2013, as cited in the FEIS). The federal Co-lead Agencies do not believe that this area meets the definition of a district, nor does it have sufficient integrity as a district to qualify for inclusion in the NRHP. The federal Co-lead Agencies have considered an expanded area for analysis of cumulative effects on cultural resources and natural resources of significance to the Bands, including use of the 1854 Ceded Territory as the CEAA. Use of the 1854 Ceded Territory as the CEAA for cultural resources would actually diminish the significance of any cumulative effects. By evaluating the effects of the NorthMet Project Proposed Action along with other past, present, and reasonably foreseeable future projects in the context of a much larger area with a much larger number of resources similar to those affected by the NorthMet Project Proposed Action, the effect of the NorthMet Project Proposed Action on those resources is diminished. The cumulative effects analysis focuses on the specific resources, or types of resources, affected by the NorthMet	CR 03 CR 04

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		Project Proposed Action within an area that is geographically meaningful considering the project under review. Cumulative effects are discussed and addressed differently based on the affected resource. Discussions related to socioeconomics, for instance, use an expanded analysis area compared to other resources. Such expanded analysis areas are used as appropriate. The Cultural Resources sections in FEIS Chapters 4, 5, and 6 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's direct, indirect, and cumulative areas of potential effect.	

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Comments from GLIFWC (Submission ID 42952)			
2924	In the SDEIS or supporting documents, there is no discussion of tailings pond water exiting the basin into this topographically closed area. There is no accounting for contaminants moving eastward, and there is no description of their possible impact on receiving ground or surface waters.	The FEIS contains new text describing pond leakage and how the chemistry of this leakage would affect chemical concentrations at the Tailings Basin toes. In general, the chemistry of water at the Tailings Basin toes results from a combination of chemical-loading from pond leakage, meteoric infiltration, chemical release from currently existing LTVSMC tailings, and chemical release from future NorthMet Project Proposed Action-related tailings. See FEIS Section 5.2.2.2.1 for additional information. The 6.5-inches-per-year pond leakage flux is not computed, but is a stated engineering performance specification. The hydraulic conductivity that achieves this leakage flux is computed using a Darcy's law calculation. The GoldSim model contains algorithms that can allow the pond to overflow during periods of high rainfall, so the model does in fact evaluate pond overflow. The pond size and design are such that the GoldSim model predicts that the pond never overflows during the 200-year simulation period. The FEIS acknowledges that there would be future leakage from the tailings pond and the GoldSim model performs calculations to estimate this flow rate. The FEIS Plant Site MODFLOW model was modified from the SDEIS to include: 1) the presence of surficial deposits below the East Embankment, 2) boundary conditions (drain and/or river cells) along the embankment toe to allow the potential for surface seepage, and 3) hydrologic inputs to account for the presence of the proposed drainage swale. See FEIS Section 5.2.2.3.3 and PolyMet 2015j and PolyMet 2015i (both as cited in the FEIS) for more information.	WR 054 WR 057
2925	Because of the no-flow boundaries, the model output files (NorthMet Model Files DVD, BARR July 2012) show extremely unrealistic groundwater heads in the aquifer surrounding the east side of the FTB.	In response to these issues, the Plant Site MODFLOW model was modified and recalibrated as follows: 1) Updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain or river cells along the East Embankment to allow surface seepage of tailings water, 4) incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use of river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin. As a result of these changes, the FEIS Plant Site MODFLOW model no	WR 093 WR 097

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		longer has a no-flow boundary condition at the toe of the East Embankment, and river and/or drain cells in surficial deposits are in place to allow the potential for surface seepage along the embankment toes (See Attachment A, Plant Site Water Modeling Data Package [PolyMet 2015j, as cited in the FEIS]). The model was checked to ensure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	
2950	Staff continue to believe that the underground mine and west pit backfill alternatives have not been properly explored given the environmental benefits they could bring to the project. Our comments stand as detailed in Appendix C.	The Co-lead agencies considered the information provided by the Tribal Cooperating Agencies in SDEIS Appendix C, and considered both Underground Mining and Backfilling the West Pit as potential alternatives; however, they did not pass screening analysis and were therefore eliminated from detailed analysis in the EIS. The screening process and results for these potential alternatives is described in FEIS Section 3.2.3. See the response to theme ALT 01 for more details on the Underground Mining Alternative and ALT 03 for more details on the West Pit Backfill Alternative.	ALT 01 ALT 03
2951	In addition, there are a number of alternatives that the SDEIS fails to explore. These include paste backfill, immediate operation of the RO treatment facility at the mine site, etc. Additional details are found in the comments submitted by the Fond du Lac Band.	The Co-lead Agencies considered many potential alternatives and mitigation measures including several options for tailings and water management throughout the development of the EIS. As described in Chapter 2 of the FEIS, consideration of these alternatives and mitigation measures influenced the development of the NorthMet Project Proposed Action. Section 3.2.3 of the FEIS describes the alternatives considered and either adopted or eliminated (with reason) from detailed analysis in the EIS. See the response to themes ALT 06 and ALT 13 for more details on several other alternatives, including paste tailings, RO treatment, etc.	ALT 06 ALT 13
2952	Unfortunately the SDEIS has no serious analysis of a No Action Alternative. Section 5.2.2.4 is less than 1 page long and gives a very general and hypothetical discussion. It in no way represents a serious analysis of a No Action Alternative. The SDEIS needs to have modeling of a No Action Alternative	FEIS Section 3.2.3.2 discusses how the Consent Decree under the NorthMet Project No Action Alternative would require Cliffs Erie to complete closure and reclamation activities at the Plant Site. This would include completing activities for the localized affected areas under the Minnesota Voluntary Investigation and Cleanup (VIC) Program, removal of the former Plant Site building, and management of seepage at the Tailings Basin embankment. FEIS Table 3.2-1 shows that under the NorthMet Project No Action Alternative, there would be no mining activities, and that existing management and land use of the federal lands would continue. The NorthMet Project No Action Alternative is also	ALT 14

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		analyzed under each resource area in FEIS Chapter 5, and summarized in FEIS Table 7.2.4-1.	
2953	The concerns regarding the cumulative effects analysis have not been resolved. The information provided in Appendix C is still applicable to the SDEIS.	The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or conclusions.	CU 12
2959	The ACOE and Forest Service's position in the SDEIS is that these items can addressed at a later time by the Minnesota Department of Natural Resources in the review of future mining permits. This action is an ill-conceived attempt to abdicate their federal trust responsibility to protect the habitats that support treaty harvests. Despite their attempts, the ACOE and Forest Service cannot delegate their federal trust responsibility to protect habitats that sustain treaty harvests to state of Minnesota when it undertakes the process of permitting the mine.	The Cultural Resources sections in FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6, also address effects on and any proposed mitigation for cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations pertaining to the federal authorities for the NorthMet Project Proposed Action review. Effects on historic properties would be fully considered prior to the issuance of any permit or land exchange, pursuant to the NHPA and its implementing regulations. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.	CR 01
2961	The superficial estimate of financial assurance provides inadequate detail as to how any of the cost estimates were developed. The DEIS provided a discussion about the options for financial assurance instruments however any substantial discussion of costs and assumptions on the metrics were not provided and instead postponed until the permitting phase of this Project.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.	FIN 05 FIN 08
2963	The Executive Summary fails to provide: 1) an estimated cost for reclamation, 2) an estimated cost for post-closure maintenance and water treatment, 3) any realistic estimate as to the length	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting.	FIN 05 FIN 06 FIN 08

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	of time that post-closure maintenance and water treatment would be required, or 4) information as to how financial assurance instruments would be structured to ensure the costs of post-closure maintenance and water treatment are paid for an uncertain amount of time and for which models indicate would be longer than 200 years at the mine site and 500 years at the plant site.	Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate. FEIS Sections 3.2.2.1.10, 3.2.2.3.12, and 5.2.2.3.1 provide available information regarding long-term water treatment and maintenance. Temporal aspects of financial assurance are addressed in *Minnesota Rules*, part 6132.3200, subpart 2, item E, which states that financial assurance is required for all areas that require continued maintenance following closure, and that no release from the Permit to Mine would be granted for portions of mining areas that require post-closure maintenance until the maintenance activities are no longer necessary. Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.	
2964	The SDEIS Executive Summary failed to provide either an estimated cost of reclamation or an estimated cost for post-closure maintenance and water treatment.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine.	FIN 05
2965	The Executive Summary also failed to explain how financial assurance instruments can be established to cover the cost of reclamation and post-closure maintenance and water treatment costs if "it is uncertain how long the NorthMet Project Proposed Action would require water treatment4".	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine to account for the proceeding year's activities. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate. Section 3.2.2.4.2 discusses the types of financial assurance instruments that	FIN 08

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		could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting. At this time, PolyMet estimates that based on preliminary information that will need to be confirmed by pilot/feasibility studies, they can transition from mechanical to non-mechanical water treatment at the Tailings Basin upon mine closure, and at the Mine Site within 30 years after mine closure.	
2966	The SDEIS provides a listing of items for which costs must be included in the financial assurance instrument (i.e. demolition of all structures and remediation of sites [fencing the perimeters, sloping and seeding the overburden, constructing outlet structures, removing culverts, etc.]) yet fails to provide any estimated costs or the basis for these costs.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine.	FIN 05
2967	The SDEIS notes, PolyMet would ensure that the financial assurance amount is established as a function of at least three main variables: 1) extent of surface disturbance and potential releases from waste storage facilities, 2) reclamation and long-term care standards (including mechanical water treatment), and 3) reasonable assessment of the costs to execute the Contingency Reclamation Plan. The SDEIS provides no discussion as to how these variables are likely to impact overall costs of the financial assurance instrument and how large the variance of cost estimates are likely to be.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.	FIN 05 FIN 08
2968	The costs provided in Table 3.2-15 provide no basis for their estimation or other assumptions. The SDEIS failed to provide detailed costs for the physical closure and reclamation of the mine site that will need to be covered by Financial Assurance Instruments – a detailed discussion as to how much money will be needed from financial	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost	FIN 05 FIN 08

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	assurance instruments and when.	estimates, and that cost estimates would be updated annually under the Permit to Mine. Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.	
2969	Cost to be covered by Financial Assurance need to include detailed information and cover the following areas: 1) interim operations and maintenance for agencies when a company declares bankruptcy and leaves the site, 2) water management and treatment, 3) removal of hazardous wastes and substances, 4) demolition, removal and disposal of facilities and equipment, 5) earthwork (sloping, backfill, grading), 6) revegetation, 7) long-term operations and maintenance, 8) Monitoring costs, 9) detailed inflation estimates, 9) provide a cash flow analysis, and 10) detail assumptions in the determination of risk and uncertainty.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. As stated in *Minnesota Rules*, part 6132.1200, subpart 5, financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. *Minnesota Rules*, part 6132.1200, subpart 7 states that the Permit to Mine could be suspended or revoked if the proponent does not comply with financial assurance criteria. The Commissioner may also order imposition of a civil penalty in such a situation, under *Minnesota Rules*, part 6132.5100. Additional details on the legal framework for the financial assurance required for the project would be addressed during permitting. Also see the response to theme FIN 08, which addresses long-term financial assurance assumptions and instruments/investments. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate.	FIN 03 FIN 05
2970	In addition to providing detailed cost estimation, the final EIS needs to clearly identify and communicate assumptions regarding inflation rates, rates of return, contingencies, and labor rates. Closure and maintenance costs will need to be covered years into the future, so a net present value must be included in the final EIS.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the	FIN 05 FIN 08

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		Permit to Mine. Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.	
2971	The SDEIS provides a listing of contingencies that may have to be covered by financial instruments… Unfortunately the SDEIS provides no discussion as to any of the costs of the contingencies that are identified. The SDEIS also fails to discuss how financial instruments would be structured to meet those contingencies or the assumptions made by PolyMet to ensure an adequate stream of revenue is available to meet closure and maintenance costs	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.	FIN 05 FIN 08
2973	The SDEIS notes, PolyMet may cancel financial assurance only upon approval by the MDNR after it is replaced by an alternative mechanism or after being released (in whole or in part) from financial assurance. The SDEIS fails to discuss any federal oversight of this process and how the federal government will meet its trust responsibility in protecting habitats that support off-reservation treaty harvests.	Section 3.2.2.4 discusses financial assurance requirements of the Project, and the response to Theme FIN15 addresses federal requirements for financial assurance. The Cultural Resources sections in FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6, also address effects on and any proposed mitigation for cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations pertaining to the federal authorities for the NorthMet Project Proposed Action review.	CR 01
3049	Depending on the exact placement of the drain cells, the modified modeling [GLIFWC conducted] resulted in an estimate of 588 to 847 gpm of flow through the east berm of the basin. This flow is on a scale similar to the flow predicted for the south berm discharge at SD026	The Plant Site MODFLOW model was modified for the FEIS to better represent natural and NorthMet Project Proposed Action-related conditions. These include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage	WR 102

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	(570 gpm, RS13B Draft-01; or 540 gpm, PolyMet 2013j). That the predicted discharges at the south berm and at the east berm are similar is logical because both areas are underlain by bedrock valleys filled with high conductivity surficial deposits. In the context of the predicted total discharge from the FTB at year 20 (3340 gpm, RS13B; or 3230 gpm, PolyMet 2013j) the 588-847 gpm prediction suggests that approximately 1/5 of the FTB water would exit through the east berm.	coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many of the improvements pertained to the East Embankment area of the Tailings Basin, where it is acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately.	
3054	NorthMet water management plan version 2 states that the south side seepage capture facility is already operational. The SDEIS further states that the system is operating effectively and capturing all seepage out of the south end of the facility. This statement is factually incorrect.	FEIS text has been changed to acknowledge that the south side Tailings Basin containment system is not capturing all seepage from the southern end of the Tailings Basin. Cliffs Erie is currently addressing this issue by upgrading the performance of the existing capture system and, if necessary, constructing new systems to enhance capture. If 100 percent capture is not attained by the Cliffs Erie upgrades, PolyMet has committed to installing additional systems in Second Creek to achieve this level of performance regardless of the types of measures required.	WR 117
3055	The SDEIS discusses Cliffs Erie site, identifies 62 Areas of Concern (AOCs), and discusses PolyMets role in site remediation. The SDEIS failed to provide any information as to cost estimates for addressing the legal requirements for mitigating the AOCs as identified. This information is needed to ascertain if the proposed project would further contaminant AOCs and increase clean-up/remediation costs.	FEIS Table 4.2.1-2: NorthMet Project Proposed Action Area of Concern Summary List for Voluntary Investigation and Cleanup Program, has been updated in the FEIS to show the current status and additional information where available. Costs for assessment, investigation, and cleanup are not feasible to provide (MPCA, Pers. Comm., October 27 & 29, 2014. The April 6, 2010, Consent Decree is a court registered agreement between Cliffs Erie LLC and the MPCA to resolve alleged violations of Cliffs Erie's NPDES/SDS permits for its Hoyt Lakes and Dunka mining area facilities (State of Minnesota v. Cliffs Erie, LLC. 2010, as cited in the FEIS). Of particular relevance to the NorthMet project, the Consent Decree addresses issues at the current Cliffs Erie tailings basin (including outfall SD026) and discharges from the Cliffs Erie Area 5 mining area (SD033). The tailings basin is part of the NorthMet Project Proposed Action whereas Area 5 is not; however, PolyMet has entered into an agreement with Cliffs Erie where both areas would be transferred to PolyMet upon issuance of project permits. Until that time, Cliffs Erie retains responsibilities for permit-related activities at the tailings basin and Area 5. While certain Consent Decree-related activities have been in progress or have been completed for these areas since the SDEIS, there has been no change in ownership or responsible parties since that time (MPCA, Pers. Comm., October 27 & 29,	HAZ 05

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		2014).	
12501	The importance of baseflow in understanding site hydrogeology is hard to overstate. Unfortunately, the quality of flow data collected at the Polymet site is poor and fraught with uncertainty. Because there has not been a Polymet stream gage at the site and Northshore pit dewatering has occurred into the Partridge at varying and uncertain times, all flow data from the site is suspect. Simple upstream, at-site, and downstream flow measurement would have provided higher quality data but was never collected by the applicant nor required by the state.	Groundwater baseflows used in the SDEIS are best-estimate values and are retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88 stream gaging in the Partridge River at SW-006 that occurred when there were no discharges from Northshore; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTVSMC Tailings Basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The only other available gaging data is from a station installed during 2011 at SW-003 on the Partridge River. Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore Pit pumped discharges, seepage from the Northshore Western Pond, and complex storage and release mechanisms in the wetlands that receive these flows. More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-87 USGS data for the FEIS is reliable(PolyMet 2015m, as cited in the FEIS) . To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.	WR 003

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12502	The mine site water modeling data package very clearly states (SDEIS reference PolyMet 2013i, pg 123 & 133) that the 1 cfs added to Goldsim modeling was to account for constituents added to the Partridge by pit dewatering from Northshore; It is not relevant to baseflow calculations nor is it relevant to determination of aquifer conductivity or groundwater travel times.	The 1 cfs added to GoldSim modeling was to account for constituents added to the Partridge River by pit dewatering and other discharges from the Northshore Mine. It is not part of groundwater baseflow as defined in the Mine Site GoldSim model and is therefore not relevant to determination of aquifer hydraulic conductivity, areal recharge, or groundwater travel times. This variable was updated to be 2.6 cfs at a sulfate concentration of 28 mg/l in the FEIS Mine Site GoldSim model.	WR 005
12504	Polymet Modeling of Flow from the Basin: Polymet modeling with MODFLOW (RS13 Attachment A-6 2007; RS13B Attachment A-6 2008; Polymet 2013j Attachment A 2011), for the FTB has prevented any discharge of basin water to the east by erecting a no-flow boundary at the surface of the berm and at the ground surface. This no-flow boundary is an artificial construct that has no basis in reality. In reality, flow to the east will be controlled by the relative head pressures and the conductivity of the materials in the FTB, beneath the FTB and in the berms.	In response to these issues, the Plant Site MODFLOW model was modified and recalibrated as follows: 1) Updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain or river cells along the East Embankment to allow surface seepage of tailings water, 4) incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use of river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin. As a result of these changes, the FEIS Plant Site MODFLOW model no longer has a no-flow boundary condition at the toe of the East Embankment, and river and/or drain cells in surficial deposits are in place to allow the potential for surface seepage along the embankment toes (See Attachment A, Plant Site Water Modeling Data Package [PolyMet 2015j, as cited in the FEIS]). The model was checked to ensure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	WR 093
12510	Geology Beneath the East Berm: Examination of the geologic data for the site indicates that the east berm of the FTB sits on a bedrock valley filled with surficial material that is 25 to 50 feet deep. The bedrock valley under the east berm is the historical stream channel for Trimble Creek prior to the creation of the current tailings basins (Figure 1). The thickness of the	The Tailings Basin design and footprint used in the FEIS Plant Site MODFLOW model was updated from the version used in the SDEIS to address this comment.	WR 094

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	surficial material under the east berm is indicated as 25 to 50 feet in the depth to bedrock map of the SDEIS Figure 4.2.2.-12 (Figure 2) and in the depth to bedrock map MN Geological Survey M-126. The distribution of bedrock under the FTB has been represented in 2 ways during Polymet MODFLOW modeling. Technical document RS13 of Nov. 16, 2007 Attachment A-6 Fig. 4-2 showed bedrock in the 2007 MODFLOW model as extending under the eastern quarter of the tailings basin. In technical document RS13b of Sept. 8, 2008 Attachment A-6 Fig. 4-7h, bedrock in the 2008 model did not extend under the basin but rather showed the basin to be underlain with surficial material. The text of RS13b, section 4.6.1 of Attachment A-6 states: "The location of the bedrock hills that flank the Tailings Basin to the east and south were updated. The location of the bedrock hills is used in the model to define the extent of the low hydraulic conductivity zone that represents the bedrock. Because the footprint of the Tailings Basin – Mitigation Design is closer to these hills on the southeast side of the footprint than was the footprint for the proposed design, it was important to get the location of these hills as accurate as possible. The location of the bedrock hills was defined using information from the Minnesota Geological Survey's map M-164. The resulting zones of hydraulic conductivity can be seen on Figure 4-7." The extent of the tailings basin footprint represented in RS13b is the same extent as currently proposed in the SDEIS. However, evaluation of flow from the basin using MODFLOW and Goldsim appears to have fallen back to the 2007 representation of the basin footprint and of the underlying bedrock (see GLIFWC comment re: SDEIS modeling and		

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	mitigation basin design).		
12520	Conceptual Model of East Berm: A conceptual diagram of the east berm is provided below. The head difference between the top of the basin (~1720 ft), the head pressures expected in the surficial deposits below the center of the basin (1700 ft; RS13b, 2008), and the head pressure at the toe of the basin (1660 ft) will push water toward the toe of the east berm. The 25-50 feet of surficial deposits in the bedrock valley under the east berm will conduct water under the east berm and beyond. Revised MODFLOW Modeling of Discharge from East Berm: In order to investigate the approximate magnitude of discharge that would exit the east berm of the FTB, we conducted modified MODFLOW modeling of basin flows in year 20 of the project. To simulate the basin but without the no-flow boundary imposed in previous Polymet modeling, we used the 2008 Polymet MODFLOW model (RS13B Draft-01), with the sole modification being the placement of model drain cells at the east berm. The original 2008 model predicted flows of 3340 gpm from the basins, 570 of which was predicted to flow to the seepage barrier on the south side of the basins (SD026) but no flow to the east because of the no-flow boundary instituted in that model (RS13B Draft-01). Our placement of drain cells in the east berm area of the MODFLOW model enabled water to move east from the berm, rather than reverse flow to the north, west and south as was dictated by the no-flow boundary. The use of drain cells at the east berm to allow eastward movement of water is an identical approach as that implemented by Polymet for the south berm of the tailings basin where the discharge to SD026 is modeled by drain cells.	The Plant Site MODFLOW model was modified for the FEIS to better represent natural and NorthMet Project Proposed Action-related conditions. These include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many of the improvements pertained to the East Embankment area of the Tailings Basin, where it is acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately. These changes in response to the comment improve the SDEIS MODFLOW model that limited tailings seepage on the east side of the Tailings Basin.	WR 054 WR 056 WR 102 WR 105

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	Depending on the exact placement of the drain cells, the modified modeling resulted in an estimate of 588 to 847 gpm of flow through the east berm of the basin. This flow is on a scale similar to the flow predicted for the south berm discharge at SD026 (570 gpm, RS13B Draft-01; or 540 gpm, Polymet 2013j). That the predicted discharges at the south berm and at the east berm are similar is logical because both areas are underlain by bedrock valleys filled with high conductivity surficial deposits. In the context of the predicted total discharge from the FTB at year 20 (3340 gpm, RS13B; or 3230 gpm, Polymet 2013j) the 588-847 gpm prediction suggests that approximately 1/5 of the FTB water would exit through the east berm. Implication of Faulty Modeling of Discharge to the East: At least three problems arise from the current situation of SDEIS modeling of the FTB with a no-flow boundary on the east and inaccurate representation of bedrock: 1) There is no contaminant transport modeling or evaluation of the water leaving the east side of the basin. Without substantial engineering to remove the water, a lake toward the 1680 foot contour would form (Figure 4) until water spilled toward Spring Mine Lake. The Flotation Tailings Management Plan (Polymet 2013m, page16) discusses the need for a drainage swale to release stormwater from the topographically closed area to the east of cell 1E. In the SDEIS or supporting documents, there is no discussion of tailings pond water exiting the basin into this topographically closed area. There is no accounting for contaminants moving eastward, and there is no description of their possible impact on receiving ground or surface waters. 2) There are potential receiving surface waters near to the east berm; wetlands at the toe of		

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	the east berm, Spring Mine Lake & Spring Mine Creek to the east, and wetlands and an unnamed creek to the north of the proposed drainage swale. 3) The Polymet MODFLOW modeling was designed to prevent any water from leaving the east side of the basin by establishing no-flow boundaries on that side of the model. Because of the no flow boundaries, the model output files (NorthMet Model Files DVD, BARR July 2012) show extremely unrealistic groundwater heads in the aquifer surrounding the east side of the FTB. For example, the Polymet MODFLOW 2011 model predicts groundwater head to be over 1800 ft in elevation where the ground elevation is 1660 ft on the east side of the tailings basin. A model with such distorted groundwater head predictions is unlikely to produce accurate flow information, rendering the flowpaths to the north, west and south and flow quantities used by Goldsim in the SDEIS unreliable. Realistic flow modeling of the proposed FTB must be conducted to determine flow directions, flow quantities and travel rates for environmental impact prediction. Information on water flow direction and quantity is also needed so that water management plans can be formulated.		
12525	SDEIS MODFLOW Modeling Appears to be of Fatally Flawed and Discarded Tailings Basin Design. Modeling in the SDEIS appears to be of a Flotation Tailings Basin (FTB) design that was discarded several years ago and does not model the currently proposed basin design. The 2007 FTB design, that is modeled in Attachment A (2011) of Polymet 2013j, was deemed to be "fatally flawed" by the MNDNR (Mitigation Table, Arkley email of 2008/12/09) and was replaced by the "mitigation" design developed in 2008. GLIFWC staff have posed a series of questions to the lead agencies regarding the modeling for water quantity	The Tailings Basin design and footprint used in the FEIS Plant Site MODFLOW model was updated from the version used in the SDEIS to address this comment.	WR 094 WR 098

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	and flow direction at the FTB. ERM has provided a series of written responses to those questions. The 2014-03-10 Response 4 from ERM re: the Plant Site MODFLOW modeling identified Attachment A of the Water Modeling Data package of March 2013 (SDEIS reference Polymet 2013j) as the documentation of the tailings basin flow modeling for the SDEIS. Careful examination of the scant information in the above referenced Attachment A (2011) indicates that the modeling done in 2011 for that attachment was not of the FTB as currently proposed. The footprint modeled for attachment A is the footprint of an early FTB proposal from 2007 (Figure 5) that was supplanted by the FTB design developed during the "Mitigation Options" process of 2008. The 2008 mitigation FTB design (Figure 6) is the current design footprint assumed in the text of the SDEIS (SDEIS Fig. 3.2-23). In addition to using a discarded FTB design footprint, the modeling in Attachment A also used a crude representation of bedrock that was supplanted by a more refined bedrock representation during the modeling of the 2008 mitigation design (RS13B Draft-01, 2008). The diagrams and model files supporting Appendix A (2011) further demonstrate that the modeled footprint is of the 2007 fatally flawed FTB design (see footprints in layer 1 of 2007 (Figure 7) and 2011(Figure 8) models, attached), instead of the mitigation basin design (see footprint in layer 1 of 2008 model, (Figure 9)). The rejected basin design had a smaller footprint and did not extend as far to the south and south-east. Unlike the current design, the rejected design did not cover the ash disposal site in the south-east end of the FTB. It appears that the SDEIS Goldsim (water quality) modeling is based on MODFLOW (water quantity) modeling of an old FTB design that was deemed fatally flawed and is not		

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	modeling the currently proposed FTB design.		
12541	Perpetual Water Treatment The proposed Polymet project would require long term treatment of water at both the plant and mine sites. This treatment would be needed for centuries but the lead agencies have not required that the applicant provide an estimate of when treatment would no longer be needed. Therefore, as articulated in Chapter C, GLIFWC staff maintain that water treatment for the proposed Polymet mine is perpetual. GLIFWC staff are gravely concerned that the lead agencies are attempting to minimize the issue of perpetual/long term treatment by using vague and confusing language in the SDEIS. In addition, the language the lead agencies have used has changed during the development of the document even though the model results have not. The SDEIS states on page 5-7: "Mechanical water treatment is part of the modeled NorthMet Project Proposed Action for the duration of the simulations (200 years at the Mine Site, and 500 years at the Plant Site). The duration of the simulations was determined based on capturing the highest predicted concentrations of the modeled NorthMet Project Proposed Action. It is uncertain how long the NorthMet Project Proposed Action would require water treatment, but it is expected to be long term; actual treatment requirements would be based on measured, rather than modeled, NorthMet Project water quality performance, as determined through monitoring requirements." (Emphasis added) In response to comments on the PSDEIS (Comment GLIFWC1) the Co-Lead agency disposition states: "Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at	Although precise estimates cannot be developed, the FEIS modeling indicates that the East Pit, West Pit, and Category 1 Stockpile would be permanent features that would provide solute-loading for a minimum of 200 years at the Mine Site. Similarly, the Tailings Basin is a permanent feature that would provide solute loading for a minimum of 500 years at the Plant Site. It is acknowledged that operation, maintenance and periodic replacement of environmental controls would be required during closure. Financial Assurance would be required under Minnesota's Permit to Mine to perform these activities on a continuous and/or periodic basis for as long as these activities are needed. FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, time frames, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. FEIS Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate. The liner and cover systems selected for waste containment are selected on the basis of numerous factors discussed in the Rock and Overburden Management Plan and FEIS Sections 3.2.2.1.8 and 3.2.2.3.10. The WWTP and WWTF would undergo continued inspection and maintenance during operations, long-term treatment, and in closure. The WWTP and WWTF replacement costs would be included in long-term financial assurance estimates. The USEPA guidance on utilization of adaptive management defines it as a decision making process that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. *Minnesota Rules*, part 6132.1200, subparts 4 and 5 require the MDNR to evaluate financial assurance cost estimates, terms, and conditions using individuals with documented experience in the relevant field. Those individuals would consider all relevant information in making their evaluations.	FIN 05 WR 035 WR 036 WR 037

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	the Plant Site. While long-term, these time frames are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions are met" (Appendix C SDEIS) (Emphasis added) It is impossible to reconcile these 2 statements. We agree that the duration of simulations were based on capturing the highest predicted concentrations of the modeled action. However, those concentrations require water treatment to avoid violating water quality standards. This treatment is at minimum 200 years at the mine site and 500 years at the plant site. As the lead agencies indicate, these time estimates are only minimums and there is no information that points to a time when water treatment would not be needed. Finally, while the maximum contaminant plume is predicted to occur at the 200 and 500 year mark for the mine and plant sites respectively, this does not mean that contaminants immediately drop to zero. The reduction would be gradual and perhaps last for another few centuries. In addition the SDEIS states on page 5-56: "The attenuation effect resulting from sorption is significant enough that arsenic, copper, and nickel are not predicted to travel from source areas to any evaluation locations or the Partridge River within the 200 year model simulation period (Barr 2013f). Analytical calculations suggest that the travel times for these solutes would be in the order of thousands of years." This statement suggests that water treatment activities would be required far beyond the 200 year time frame at the mine site and would be on the order of thousands of years. Therefore, the only logical conclusion is that water treatment is perpetual at this project.	In addition, see the response to theme WR 035.	

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	It is also important to note that, in the response to GLIFWC comments on the PSDEIS, the lead agencies acknowledge monitoring and maintenance requirements during the same 200 (mine site) and 500 (plant site) year timeframe. The SDEIS requires substantially more transparency on one of the most fundamental issues at stake for this project. The fundamental question is: how long will the company be required to operate and maintain expensive mechanical treatment to meet water quality standards? This singular issue has significant repercussions for the public interest determination		
12544	Indirect Wetland Impacts. The methods used in the analysis of indirect wetland impacts in the SDEIS are essentially the same as the 2009 DEIS. GLIFWC staff reiterate the comments we have provided in the past that the method is overly simplistic, based on a flawed conceptual understanding of hydrology at the mine site and inadequate for the NEPA process of a large scale sulfide mine. The SDEIS has underestimated baseflow at the mine site. The entire conceptual model of perched wetlands with hydrology that is completely decoupled from groundwater was supported by the use of unrealistically low baseflow numbers. Now that the applicants XP-SWMM model has been discredited and that it is obvious that the movement of groundwater at the mine site is 3 times greater than the SDEIS indicates, the assumption that wetlands will not be impacted by groundwater drawdown should be abandoned. The higher baseflow numbers support the independent analysis of indirect wetland impacts provided by the tribal cooperating agencies in Appendix C. The lead agencies have also based their analysis on the Bog Memo prepared by the Army Corps of Engineers (Eggers, Steve (2011)	Groundwater baseflows used in the SDEIS are best-estimate values and should be retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88 stream gaging in the Partridge River at SW-006 that occurred when there were no discharges from the Northshore Mine; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTVSMC Tailings Basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The only other available gaging data is from a station installed during 2011 at SW-003 on the Partridge River. Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore Mine probable maximum precipitation pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-87 USGS data for the FEIS is reliable (PolyMet 2015m, as cited in the FEIS).	WET 08 WR 003 WR 175

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	MEMORANDUM SUBJECT: Distinguishing Between Bogs That Are Entirely Precipitation Driven Versus Those with Some Degree of Mineral Inputs from Groundwater and/or Surface Water Runoff). This memo uses plant community information to determine the degree of hydrologic connectivity between a wetland and groundwater. The conclusions in the memo are appropriate for a system that is not experiencing depressurization of the aquifer (drawdown). However, when mine induced drawdown occurs, new downward pressure gradients are created. Whittington and Price documented that these downward hydrologic gradients can in fact dewater wetlands that are entirely surface water dependent under normal conditions (Whittington, PN and JS Price, The effects of water table drawdown (as a surrogate for climate change) on the hydrology of a fen peatland, Canada.) HYDROLOGICAL PROCESSES, 20(17), 3589-3600. 2006). The bog memo is not an assessment of the hydrologic conditions of wetlands in a dewatered state but rather an assessment of surface hydrology under normal conditions. The indirect wetland impact analysis should be performed using realistic hydrologic assumptions and appropriate mitigation should be required.	To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. It also reflected consideration of the flow data collected at SW-003 in requiring groundwater baseflows at all locations on the Partridge River be increased by a factor of 4 (e.g., 0.5 to 2.0 cfs at SW-003). The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2. The Co-lead Agencies are responsible for determining the requirements and adequacy of data used for the EIS. Where field measurements were not available, model assumptions were reviewed and approved for use in impact analyses. The Co-lead Agencies believe that the FEIS contains the best available data and analyses consistent with NEPA and MEPA guidance and best practices. While the Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate, the FEIS has been updated with a more conservative approach to address concerns raised by the Bands. FEIS Section 5.2.3.2.2 has been updated to make a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-feet analog zone such that all bogs are reclassified from the "no effect" category to "low likelihood" category of wetland hydrology effects. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
12566	Seepage Capture Efficiency. As detailed in comments submitted to the lead agencies for the 2009 DEIS and for the current SDEIS, water	Although relatively few containment systems have been built with this degree of pumping, the conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete	WR 003 WR 009 WR 010

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	quality analyses for the Partridge and Embarrass Rivers are inadequate. The results, be they deterministic (DEIS) or in the form of probability distributions (SDEIS) are based on a flawed understanding of hydrology at both mine site and plant site. This flawed understanding, reflected most prominently in the errors in baseflow calculations, is carried forward to the MODFLOW hydrologic modeling. At the mine site MODFLOW under-predicts the amount of water that would flow into the mine pits and thus under-predicts the amount of water treatment needed for both short and long term closure. At the plant site, the MODFLOW model is constructed in a way that is not representative of reality and therefore yields results that are not logical. The lead agencies appear to disregard these problems because there is faith that the seepage capture and treatment systems will work at over 90% effectiveness for centuries. The SDEIS claims of long term compliance with applicable water quality standards depend entirely on this leap of faith. On conference calls scheduled to discuss these issues, the lead agency consultants have stated that the effectiveness of the capture systems have not been questioned and the lead agencies have not been able to provide any references that would support their position. We suggest that there are substantial reasons for skepticism regarding capture efficiency for the flotation tailings basin, hydrometallurgical tailings basin, and category 1 stockpile seepage capture systems. This skepticism is based on available literature and the performance of other facilities in the immediate vicinity. The EPA conducted an analysis of the effectiveness of seepage capture systems (Evaluation of Subsurface Engineered Barriers at Waster Sites, United States Environmental Protection Agency (EPA), 1998). This analysis	capture. The FEIS relies on revised cross-section models from the FEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in PolyMet 2015j, as cited in the FEIS. These new models consider the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. This analysis supports the conclusion that the assumption of 90 percent or greater capture efficiency is justified. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed containment system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 5.2.2.2.3. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation, and depth to top of bedrock. This information was used to develop MODFLOW cross-section models at three locations on the alignment to assess capture efficiency. The models included bedrock below the slurry wall. The FEIS has been changed to recognize that currently not all water is being pumped back to the Tailings Basin, and therefore it is being released into Second Creek. Impact assessment modeling relies on site 19649 data that indicate the bulk hydraulic conductivity of upper bedrock is two to three orders-of-magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at both the Mine Site and Plant Site are dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting NorthMet Project Proposed Action Site-derived chemicals to the Partridge River and Embarrass River. It is acknowledged that there could be some hydraulic connections between bedrock and the surficial aquifer where transport is expected to be negligible. Given these factors, the approach was to not consider this possible connection in the NorthMet Project Proposed Action water quality models, but to recommend extensive monitoring during operations and closure to assess if interactions occur and if they would raise concerns for permitting agencies. If monitoring data indicate trends toward permit non-	WR 013 WR 018 WR 019 WR 020 WR 099 WR 117 WR 123

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	looked at capture systems at 36 facilities and evaluated their effectiveness based on the performance requirements at each site. It is difficult to extrapolate the results of this analysis to the Polymet setting because a) the required effectiveness varied from facility to facility; b) the way in which effectiveness was measured was different (i.e. water quality improvements downstream versus change in hydrologic head pressure) and c) data collection varied between facilities. Despite these difficulties, the report indicates that 10% of the reviewed containment systems failed to meet the desired performance objectives and required corrective action. An additional 19% of the evaluated facilities did not have sufficient data to conclude whether the containment system was operating successfully or not. Furthermore, there is no information on the effectiveness of any of these facilities at timeframes remotely comparable to the needs at Polymet. In the EPA report, long term is considered 30 years whereas the water capture needs at Polymet are perpetual for the flotation tailings basin, category 1 stockpile and hydrometallurgical tailings basin. Finally, none of the facilities in the study are as large as the one proposed at Polymet. At the tailings basin, Polymet has proposed to install a seepage collection system around the north and west sides of the facility. The scale of this engineering control is extensive. It would be approximately 5 miles long and would have to be keyed to bedrock that is 25 to 50 feet below ground surface. The most likely pathway for leakage at this barrier will be in the vicinity of the key with bedrock (EPA 1998). This feature, and the similar containment system at the Category 1 waste rock stockpile are assumed to capture 93% of water leaving the facilities for an indeterminate period of time. As	compliance, adaptive mitigation measures would be implemented to prevent or eliminate what is expected to be a small transport-related bedrock impact relative to surficial flows. See FEIS Section 5.2.2.3.5 for more information on adaptive mitigation measures and FEIS Section 5.2.2.3.6 for more information on monitoring. The Hydrometallurgical Residue Facility would be double-lined to minimize release of water that has contacted the hydrometallurgical residue. The double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a leakage collection system. This would substantially remove all hydraulic head from the lower liner and thereby virtually eliminate leakage from the Hydrometallurgical Residue Facility. It is expected that no water would be released directly from the Hydrometallurgical Residue Facility. PolyMet initiated laboratory testing to consider the chemical compatibility of the potential geosynthetic liner to be used with leakage from residue (Residue Management Plan [PolyMet 2014r, as cited in the FEIS]). Results indicated that a polymer-treated geosynthetic liner should be used that is manufactured specifically in anticipation of the chemical characteristics of the liquid and the pore water that would be contained within the facility. The hydraulic conductivity of the soil leakage collection system is not expected to degrade over time. Typical liner performance assumes a 500-year service life of the geomembrane; therefore, hydraulic conductivity of the liner is not expected to degrade over that time. Specific attributes would be determined during the geosynthetic clay layer development to achieve the desired performance before final installation. Findings of studies on geosynthetic liners indicate that performance is minimally affected by freeze-thaw cycles (PolyMet 2014c, as cited in the FEIS). At the Hydrometallurgical Residue Facility, the majority of the geosynthetic liner system would be below the water elevation, and therefore not exposed to freeze-thaw cycles. Based on a MODFLOW groundwater model specifically developed to assess capture efficiency of the Category 1 system, it was concluded that the system would achieve an overall efficiency between 90 percent and 94 percent for groundwater flowing in surficial deposits and bedrock. The FEIS further evaluated the possibility of fractures and faults at the Mine Site and Plant Site to determine what (if any) changes need to be made to model assumptions to accurately predict potential environmental	

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	previously stated, there is no scientific justification for this number. The only examples we are able to identify at this time suggest capture rates that are lower. In t	effects for purposes of environmental review. Although no change was made to the Plant Site GoldSim model, the FEIS Mine Site GoldSim model was modified to include a flow/transport zone 15 meters thick from that present in the SDEIS. The results of the analysis are included in FEIS Section 5.2.2.3.2.	
12568	Summary for Seepage Capture Comments. The prediction of water quality standard compliance for this proposed project hinges on the perfect operation of the water capture systems. The reliance on this engineered containment system that uses overly optimistic capture rates and must function in perpetuity is not scientifically supported and therefore is not appropriate for the SDEIS. The water quality and quantity impacts at both plant site and mine site should be remodeled by using a range of capture efficiencies. We suggest 60%, 70%, 80% capture rates be modeled for the tailings basin and category 1 stockpile. Water quality values for each of these capture rates should be reported. This will allow the public and decision makes to have a realistic picture of the risk and uncertainty for this project. Seepage capture at the flotation tailings basin does not account for seepage out of the east side of the basin. The seepage capture system should be expanded to account for this expected discharge. A MODFLOW model was developed to assess the amount of seepage that would flow out of the basin. As detailed in GLIFWC comments, that model is designed in a way that does not conform to reality and therefore the results are unreliable.	The design of the tailings basin capture system includes: 1) a slurry wall keyed into bedrock, 2) a collection trench on the tailings side, 3) permanent pumping of the collection trench to depress the groundwater level on the tailings side, and 4) a discharge pipe on the opposite side to raise groundwater levels to near ground surface. As shown by the cross-section MODFLOW models, this design insures a reversal of hydraulic gradients across the slurry wall (complete capture in surficial deposits) and complete or very high capture efficiency in bedrock below the slurry wall. The examples cited in the comment for northeastern Minnesota are very different designs and cannot be compared to the proposed design for the Tailings Basin. Modeling performed for the NorthMet Project Proposed Action capture system indicates that the overall capture efficiency would be substantially greater than 90 percent. The proposed capture system for the Category 1 Stockpile is a unique design that uses a slurry wall keyed into bedrock and a pumped collection trench that maintains depressed groundwater levels on the inside (Category 1 Stockpile side) of the system. It is acknowledged that there are existing capture systems at other mine sites that do not operate with a high degree of capture, but these are different designs and cannot be directly compared to the system proposed for the Category 1 Stockpile. Based on a MODFLOW groundwater model specifically developed to assess capture efficiency of the Category 1 Stockpile system, it was concluded that the system would achieve an overall efficiency between 90 percent and 93 percent for groundwater flowing in surficial deposits and bedrock. This analysis supports the conclusion that the proposed Category 1 capture system has a high probability of meeting its performance specifications.	WR 017 WR 018 WR 022 WR 035 WR 093 WR 129 WR 133
12573	Ability of Goldsim to Accurately Predict Contaminant Concentrations:. We remain concerned about the inability of Goldsim to accurately predict current and future contaminant concentrations. This is particularly troubling in the lower Partridge River (e.g. SW005) and in Colby Lake where Goldsim	The Mine Site GoldSim model used for the SDEIS (Barr 2013f, as cited in the FEIS) was modified for the FEIS (Mine Site GoldSim model) (PolyMet 2014v, as cited in the FEIS) to include a new chemical loading source in Colby Lake and was calibrated to the measured chemical concentrations in Colby Lake. This calibration considered new surface water chemistry data collected through the end of 2013. The same chemical loading source was applied to both the Continuation of Existing Conditions model and	WR 049

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	predictions of current conditions appear to be inaccurate. In recent conversations with the lead agencies and ERM, there has been agreement that the modeling in the SDEIS does not accurately capture the environmental conditions at Colby Lake. Additional modeling of this waterbody is needed to assess impacts of the proposed project and to evaluate the suitability of Colby Lake water for use in augmenting the flow of other waterbodies. In addition, the discrepancies between modeled and observed data at SW005 should be addressed in detail.	NorthMet Project Proposed Action model (PolyMet 2014v, as cited in the FEIS). The chemical loading source was constant and did not exhibit seasonal or long-term variations for future conditions. Incorporation of the loading source addressed the issue by providing predicted chemical concentrations in Colby Lake for existing conditions that are similar to currently measured concentrations. The average arsenic concentration based on 33 samples in Colby Lake is 0.95 µg/L. The GoldSim Continuation of Existing Conditions (PolyMet 2014v, as cited in the FEIS) modeling scenario predicts an average concentration of 0.80 µg/L at P50 over the 200 year modeling period.	
12575	The SDEIS does not adequately address mercury concerns.	This comment has been received and acknowledged by the Co-lead Agencies. An index of information on mercury associated with the NorthMet Project Proposed Action can be found in FEIS Section 1.7.	MERC 01
12580	Wild Rice Standard. The concerns over the MPCA's interpretations and recommendations regarding the wild rice sulfate standard have not been resolved. The information provided in Appendix C is still applicable to the SDEIS. In addition, staff believe that water quality modeling underestimates the amount of sulfate at points of compliance. Even with this problem, contaminant modeling suggests that the sulfate standard will be violated in the Partridge River points of compliance approximately 10% of the time. While this may meet the lead agencies arbitrary evaluation criteria (standard met 90% of the time) it certainly is not enough to warrant the issuance of an NPDES permit. At the Embarrass River the standard is already exceeded at the point of compliance because of historic contamination from the tailings basin and the area 5 pits. It is not clear if the capture system around the tailings basin will function well enough to allow the standard to be met.	The GoldSim model results predict that for all situations where a potential impact could be attributed to the NorthMet Project Proposed Action, the expected increase in sulfate concentration at SW-005 (and SW-006) would be less than 1.0 percent when assessing if the NorthMet Project Proposed Action would cause or add to an exceedance. A practical consequence of this result is that the effects of the NorthMet Project Proposed Action would not be identifiable by even the most robust field monitoring program. The small modeled sulfate increases associated with the NorthMet Project Proposed Action are explained by the small amounts of impacted and untreated water leaving the Mine Site in the model, which only occurs as groundwater migration. For P50 best-estimate predictions of the model during all phases of the NorthMet Project Proposed Action, the maximum amount of impacted and untreated groundwater leaving the NorthMet Project Proposed Action Site is 0.031 cfs (14 gpm). The maximum impact to the Partridge River would occur when this affected groundwater is released to the Partridge River during low-flow conditions. At SW-005, the average annual 1-day low flow is estimated to be 6.9 cfs (3,100 gpm) when Northshore Mine is discharging (up to year 52) and 5.0 cfs (2,240 cfs) when only the wastewater treatment facility discharges to the Partridge River (after year 52). Given the difference between groundwater and river flows, it is apparent that the mass loading associated with groundwater flow from the Mine Site is far too small to impart a noticeable impact on sulfate	WR 152 WR 153 WR 154

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		concentrations in the Partridge River.	
12601	Impacts from Rail Car Spillage. The concerns regarding the hydrologic impacts of sulfide ore dust spillage along the rail corridor have not been resolved. The information provided in Appendix C is still applicable to the SDEIS.	The potential for rail car spillage and dust has been minimized since the SDEIS by PolyMet committing to (PolyMet 2015a): - additional rail car refurbishments as part of the NorthMet Project Proposed Action (FEIS Section 3.2.2.2.4 and PolyMet 2014a, as cited in the FEIS). - Developing and implementing monitoring and mitigation activities with the MDNR and MPCA in the permit process (including surface water quality sampling in the streams traversed by the rail line). The FEIS includes available information from the updated Project Description document. Routine inspections would be undertaken along the Transportation and Utility Corridor to identify accumulations of dust or ore spillage. Any significant accumulations would be removed by a combination of machines and hand work. It is unlikely that there would be sufficient spillage to affect the quality of surface water or groundwater. Facilities and activities with the potential to generate fugitive dust would be subject to an air quality Fugitive Dust Control Plan which would be (regulated by the MPCA) (see Section 4.1.6 and Section 4.3.9 of PolyMet 2015a, as cited in the FEIS). See FEIS Sections 5.2.2.3.2, 5.2.3, and 5.2.7 for impacts of railcar spillage and dust on wetlands and air quality, respectively. See also the response to comment 19698.	PD 07 WR 151 AIR 05
12602	Loss of High Biodiversity Significance Values Sites. The concerns regarding the loss of high biodiversity sites such as the 100 mile swamp, Lynx and Moose habitat and remaining wildlife corridors have not been resolved. The information provided in Appendix C is still applicable to the SDEIS.	The USGS National Atlas shows a single wetland complex (referred to as the One Hundred Mile Swamp) as straddling the major watershed divide separating the Superior Basin from the Rainy River Watershed, which suggests that this wetland complex creates a conduit for surface water or surficial groundwater originating from the Mine Site to reach the Dunka River, and ultimately, the BWCAW. Wetlands are delineated using many factors in addition to hydrology; the delineation of the One Hundred Mile Swamp as continuous across this boundary does not equate to a hydrologic connection. There are two hydrologic barriers between the Mine Site and the Rainy River Watershed, including: 1) High ground north of the	VEG 02 WI 02 WI 03 WR 080

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		Partridge River creates a watershed divide separating the Superior and Rainy River Basins, and prevents surface water from passing between the two. This major watershed divide is included in the National Atlas, as well as USGS and MDNR data sets(this divide is accurately presented in the FEIS); and 2) Yelp Creek and the Partridge River encircle the north, east, and south sides of the Mine Site. These streams create a hydrologic "sink" for sources of surface water and surficial groundwater originating at the Mine Site. Surface runoff and groundwater in surficial deposits leaving the Mine Site would follow a gradient into Yelp Creek or the Partridge River, as opposed to continuing uphill towards the watershed divide. Yelp Creek and the Partridge River extend further west (i.e., more fully encompassing the Mine Site) than is shown on the map in question. If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS sections 5.2.2.3.5 5.2.2.3.6 and 6.2.2.3.1. The FEIS wildlife sections include information about NorthMet Project Proposed Action impacts to wildlife habitat types and Minnesota Biological Survey (MBS) Sites of Biodiversity Significance. FEIS Sections 4.2.4 and 4.3.4 provide maps of the MBS Sites (Figures 4.2.4-1, 4.2.4-4, 4.3.4-1, 4.3.4-2). The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process.	
12604	The Supplemental Draft Environmental Impact Statement (SDEIS) NorthMet Mining Project and	FEIS Sections 3.2.2.1.10, 3.2.2.3.12, and 5.2.2.3.1 include available information regarding long-term water treatment and maintenance.	FIN 05

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	Land Exchange failed to adequately address closure and maintenance costs and length of time for post-closure treatment in the context of financial assurance requirements.	Temporal aspects of financial assurance can be managed through *Minnesota Rules*, part 6132.3200 subpart 2, item E, which states that financial assurance is required for all areas that require continued maintenance following closure, and that no release from the Permit to Mine would be granted for portions of mining areas that require post-closure maintenance until the maintenance activities are no longer necessary. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine.	
12605	Within the 54 pages of Executive Summary only a single paragraph addresses the issue of financial assurance as noted below:	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, time frames, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate. Neither NEPA nor MEPA rules require that all financial assurance mechanisms be in place before the EIS is finalized.	FIN 08
12607	The SDEIS failed to clearly state how the State of Minnesota will determine the maximum bond requirements,	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates and calculations that would be required for the project would be addressed during permitting. Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. Financial assurance is required upfront and would be updated throughout the project under the Permit to Mine, which would be required prior to the start of mining. *Minnesota Rules*, part 6132.1200, subpart 4 also dictates that the Commissioner shall evaluate all financial assurance cost	FIN 05

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		estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs.	
15020	In determination of baseflow, all GLIFWC's calculations have excluded Northshore pumping from the calculation. The Dec. 17th MNDNR memo (Attachment A) also picked a period when pumping for Northshore pit dewatering was not occurring so as to calculate true baseflow. The 1 cfs added to GoldSim modeling of the Partridge, mentioned in various DNR documents, is irrelevant to the calculation of baseflow and does not solve the modeling problems in XP-SWMM, MODFLOW and by extension GoldSim. Some of the implications of incorrect baseflow are highlighted on page 114 of the water modeling data package (March 2013), in our memo of 2012-03-02, and in GLIFWC's baseflow summary of 2014-02-13 (Attachments B, C, and D respectively).	The FEIS reflects Co-lead Agencies' reconsideration of the appropriate groundwater baseflow rate to employ in the water impact assessment modeling. Information considered included: 1) definition of groundwater baseflow, 2) potential Northshore Peter Mitchell Pit contributions to flow, 3) available data from SW-006 gage versus SW-003 gage, and 4) confounding factors. The Co-lead Agencies continued to rely on the USGS-collected data at SW-006 as the basis for determining groundwater baseflow for the water impact assessment in the EIS. To better understand how groundwater baseflow affected water quality projections, a detailed GoldSim sensitivity analysis was conducted using groundwater baseflows four times larger than the best-estimate values. As part of the sensitivity analysis, appropriate modifications were made to surficial aquifer hydraulic conductivities and aerial recharge based on a recalibration of the Mine Site MODFLOW model. In addition, a recalibration was performed for surface water runoff concentrations. Results of the high groundwater baseflow rate scenario were compared with the best-estimate scenario to evaluate the degree to which predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow and related inputs. The FEIS reports the results of the sensitivity analysis in FEIS Section 5.2.2.3.2. The Mine Site sensitivity analysis indicates that modeled groundwater and surface water concentrations are sensitive to changes in baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.	WR 052
15021	Because the implications of baseflow are substantial when it comes to a basic understanding of the mine site hydrogeology, all modeling of flow and by extension contaminant transport must be re-calibrated to the higher baseflow numbers indicated by GLIFWC's analysis of 2013-07-02 (Attachment E) and DNR's 2013-12-17 analysis (Attachment A). Page 114 of the mine site Water Modeling Data Package makes it clear that re-calibration of the MODFLOW model generates	Groundwater baseflows used in the SDEIS are best-estimate values and should be retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88 stream gaging in the Partridge River at SW-006 that occurred when there were no discharges from Northshore Mine; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTV tailings basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that	WR 003

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	new conductivity values that are then fed into Goldsim. It states: "The revised model calibration resulted in different optimized values for the horizontal hydraulic conductivity of the surficial aquifer and bedrock, which are used to establish the distribution of values used for the probabilistic groundwater flow path modeling (Section 5.2.3.1)." It is also clear that higher hydraulic conductivities for the aquifers result in faster contaminant transport to points of evaluation.	streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The only other available gaging data is from a station installed during 2011 at SW-003 on the Partridge River. Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore Mine probable maximum precipitation pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-87 USGS data for the FEIS is reliable (PolyMet 2015m, as cited in the FEIS). To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.	
15022	Although baseflow assumptions have significant effects on Goldsim modeling, the implication of re-calibrating the MODFLOW model go beyond the conductivities used in the GoldSim modeling. Higher baseflows imply higher conductivities that imply faster and greater groundwater flow rates. This affects: 1) The amount of water expected to flow into the mine pit as it is excavated. 2) The amount of drawdown of Partridge River flow that can be expected due to pit dewatering.	Mine Site groundwater baseflows used in the SDEIS and FEIS are reliable. This is because the SDEIS and FEIS groundwater baseflow values were based on winter 1986-77 and winter 1987-88 stream gaging in the Partridge River that occurred when there were no discharges from the Northshore Mine. When expressed as a groundwater baseflow yield per unit area, the similar results for both the Partridge and Embarrass River watersheds (approximately 0.05 cfs per square mile) lends credibility to the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Interpretation of groundwater baseflow derived from new data collection at SW-003 is not reliable due to the complicating effects of Northshore Pit	WR 003 WR 086 WR 094 WR 098 WR 165 WR 166

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	3) The amount of wetland dewatering that can be expected due to pit dewatering. Given the uncertainty in baseflow numbers due to the poor quality flow data, it is reasonable to re-calibrate the MODFLOW model to a range of values that included the previously assumed baseflow and the newer, higher baseflow numbers.	pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. The Mine Site MODFLOW model was re-calibrated based on new groundwater level data collected through the end of 2013; however, calibrations performed for the FEIS used the same Partridge River baseflows as were used in SDEIS. Revised hydraulic conductivities and recharge values that come from MODFLOW recalibration informed the FEIS Mine Site GoldSim model. Groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms that groundwater baseflows used in the Mine Site GoldSim model are reliable and appropriate for FEIS impact evaluation. PolyMet performed a groundwater baseflow sensitivity analysis for the Mine Site to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis fully considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. See FEIS Section 5.2.2.3.2 regarding the results of the sensitivity analysis.	
15023	Discharge From East Berm of Flotation Tailings Basin: Significance: The contaminant transport analysis at the Flotation Tailings Basin (FTB) does not include any accounting for discharge through the east berm of the basin. There are 3 reasons why discharge through the east berm will be enough to cause environmental concern: 1) the flow distance between the final FTB pond in cell 1E and the exterior of the east berm is relatively short compared to flow distances from the pond to the north and west berms (SDEIS Figure 3.2-29). 2) the east berm is underlain with 25-50 feet of conductive surficial material (SDEIS Figure 4.2.2.-	It is acknowledged that there would likely be subsurface flow below the East Embankment from west to east and that surface seepage may occur at the toe. The FEIS Plant Site MODFLOW model was modified from the SDEIS to include: 1) the presence of surficial deposits below the East Embankment, 2) boundary conditions (drain and/or river cells) along the East Embankment toe to allow the potential for surface seepage, and 3) hydrologic inputs to account for the presence of the proposed drainage swale. See PolyMet 2015j, as cited in the FEIS, for more information. Similar to other locations along the perimeter of the Tailings Basin, the NorthMet Project Proposed Action was modified to include installation of a containment system along the East Embankment where it is underlain by surficial deposits. Given the hydrogeology of the area east of the Tailings Basin and the proposed swale to be constructed there, this containment system would have higher hydraulic head on the east side compared to the west (tailings) side where a pumped trench would depress the groundwater level. This would create hydraulic gradients in the slurry wall and in	WR 054

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	12 and Figure 2 below). 3) the basin pond level is 1720 ft, the land elevation east of the basin is 1660 ft (Lidar data: http://www.mngeo.state.mn.us/chouse/elevation/lidar.html). The elevation difference between the pond and the adjacent land surface is substantial; 1720 ft - 1660 ft = 60 ft.	shallow bedrock that would drive (low) flows from east to west across the containment system. This set of hydraulics would result in complete capture of all tailings water approaching the containment system from the Tailings Basin. Because the system would achieve complete capture of tailings water, an east side chemical transport flowpath is not needed in the Plant Site GoldSim model. There is no hydrologic reason to expect that impacted water from the Tailings Basin would migrate east of the containment system.	
15024	Discharge From East Berm of Flotation Tailings Basin: Significance: Because there has been no prediction of discharge from the east side of the FTB, there was no flow path established or contaminant transport analyzed in the easterly direction. The SDEIS is completely devoid of any mention or analysis of flow from the basin toward the east. Receiving waters for the contaminated discharge would be wetlands adjacent to the basin, Spring Mine Lake, Spring Mine Creek and wetlands to the north if a proposed storm water drainage swale is constructed.	The FEIS Plant Site MODFLOW model was modified from the SDEIS to include: 1) the presence of surficial deposits below the East Embankment, 2) boundary conditions (drain and/or river cells) along the embankment toe to allow the potential for surface seepage, and 3) hydrologic inputs to account for the presence of the proposed drainage swale. Similar to other locations along the perimeter of the Tailings Basin, the project was modified to include installation of a containment system along the East Embankment where it is underlain by surficial deposits. Given the hydrogeology of the area east of the Tailings Basin and the proposed swale to be constructed there, this containment system would have higher hydraulic head on the east side compared to the west (tailings) side where a pumped trench would depress the groundwater level. This would create hydraulic gradients in the slurry wall and in shallow bedrock that would drive (low) flows from east to west across the containment system. This set of hydraulics would result in complete capture of all tailings water approaching the containment system from the Tailings Basin. Because the system would achieve complete capture of tailings water, an east side chemical transport flowpath is not needed in the Plant Site GoldSim model. There is no hydrologic reason to expect that impacted water from the Tailings Basin would migrate east of the containment system.	WR 054

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Comments from the 1854 Treaty Authority (Submission ID 42968)			
3111	Under the proposed project, it appears that long term (perhaps perpetual) water treatment, site maintenance, and monitoring will be needed after closure to protect the environment and meet water quality standards. We don't believe that this meets the goal of a maintenance free closure, which is required under MN Rule 6132.3200…Regardless of how this issue is described or strategically worded in the document, it is our understanding that the project will require long term/perpetual monitoring, maintenance, and treatment. We would argue that a timeframe of potentially hundreds of years should be considered perpetual rather than long term. This will not constitute a site that is maintenance free at closure.	*Minnesota Rules*, part 6132.3200, Closure and Postclosure Maintenance, identifies several goals for non-ferrous mining areas, including sites be closed so that they are maintenance-free. If a maintenance-free site cannot be achieved, the permittee is required to implement post-closure maintenance techniques, identify who will manage the maintenance techniques, identify the performance level at which the techniques will be considered successful, and provide for financial assurance. A maintenance-free site is the goal of the MDNR for the NorthMet Project Proposed Action, as it is for every mining site. The NorthMet Project Proposed Action includes piloting of non-mechanical treatment system to move in the direction of achieving the goal. PolyMet would include funds in its reclamation cost estimate and financial assurance package to fund mechanical water treatment for as long as necessary. Any Permit to Mine would also require PolyMet to present a plan for eventual transition from mechanical water treatment to non-mechanical treatment. PolyMet cannot be released from its responsibilities, including financial assurance requirements, until there is no longer a need for closure/post-closure treatment/maintenance. Financial assurance is a component of any Permit to Mine, to ensure necessary maintenance can be provided for as long as it necessary.	PER 04
3113	Effectiveness of the proposed water treatment and seep collection methods are vital to the project meeting water quality standards. Analysis and design detail are lacking in the SDEIS as a whole. More detail is needed on water treatment and seep collection, including long-term operation and maintenance, since they are essential components of the project meeting environmental standards.	The FEIS relies on revised cross-section models to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in PolyMet 2015j, as cited in the FEIS. These new models considered the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The new models explicitly consider groundwater flow in bedrock below the slurry wall and at the contact between the slurry wall and bedrock. The model results predicted that the overall capture efficiencies of the proposed Tailings Basin containment systems (with bedrock flow) would be substantially greater than 90 percent. FEIS Figure 3.2-28 has been revised to show that the slurry wall is keyed into bedrock. Engineered systems can operate successfully over long periods of time if they are properly monitored and maintained. FEIS Section 5.2.2 provides a	PD 35 WR 019 WR 128 WR 143 WR 144 WR 148

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		comprehensive description of proposed water treatment and seep collection systems including groundwater containment and synthetic liners/covers. This includes conceptual designs and discussions of the types of monitoring used to assess performance. Detailed designs are provided in supporting documents, which are fully referenced in the FEIS. The FEIS also discusses long-term operation, maintenance, and periodic replacement of engineered systems. It is acknowledged that certain components of the engineered systems would need to be replaced when monitoring indicates that performance is marginal and not readily compensated for by adaptive mitigation measures. A detailed financial assurance analysis would be part of the permitting phase and is not a required component of the FEIS. The financial assurance process would fully consider long-term monitoring and periodic replacement of equipment including, but not limited to, water treatment hardware and synthetic liners and covers. The Financial Assurance package for the NorthMet Project Proposed Action would ensure that future funding would be available if and when adaptive mitigation measures or component replacements are needed to achieve performance specifications.	
3114	The seep collection system is modeled to have a capture efficiency of 90%. Description is needed on how this efficiency rate was determined. We question if such a high capture rate can be achieved, and it would be helpful to include examples and citations of other projects operating seep collections at that efficiency rate. Further, if such capture rates are not achieved, impacts to water quality and quantity should be described in the SDEIS.	The Co-lead Agencies acknowledge that there are existing water containment systems at other mine sites that do not operate with a high degree of capture, but these are different designs and cannot be directly compared to the system proposed for the NorthMet Project Proposed Action. The proposed containment system uses pumping on the tailings side and reinjection after treatment on the downgradient side to reverse hydraulic gradients across the slurry wall and in underlying bedrock. Relatively few containment systems have been built with this degree of pumping and reinjection to ensure effective capture. The conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete capture. The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed containment system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 4.2.2.3.1. This investigation provided field data on bedrock hydraulic conductivity, Rock Quality Designation, and depth to top of bedrock. This information was used to develop revised MODFLOW cross-section models to evaluate containment system efficiencies on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the revised Plant Site Water Modeling Data Package (PolyMet 2015j, as cited	WR 018 WR 020

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		in the FEIS). These revised cross section models considered the presence of an upper more permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed containment system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall capture efficiencies of the proposed Tailings Basin containment systems would be substantially greater than 90 percent. It is the position of the Co-lead Agencies that the assumption in the Plant Site GoldSim model of 90 percent or greater capture efficiency is justified by the analyses performed.	
3115	Concern also exists over the methods used to estimate Partridge River baseflow (Section 5.2.2.2.2). XP-SWMM model estimates of Partridge River baseflow presented in the SDEIS have been found to be three times lower than observed values. The XP-SWMM projections, which are based on data from 17 miles away collected from 1978 to 1987, do not align with the rating curve from recent Minnesota Department of Natural Resources (MDNR) winter monitoring data, or the results of the Great Lakes Indian Fish and Wildlife (GLIFWC) projections taken from two years of recent data from the Dunka Road gage in the XP-SWMM model. Co-Lead Agencies have been working with Cooperating Agencies on this issue, but it needs to be addressed in the SDEIS regarding how it may affect modeling results. The models may be under-predicting the amount of water and contaminant load that will need to be treated and contained at the Mine Site. Questions have also arisen on data use, including if new data is being utilized and how existing data was selected (or not selected) for use.	Groundwater baseflows used in the SDEIS are best-estimate values and should be retained in the FEIS. This is because the SDEIS groundwater baseflow values were based on: 1) winter 1986-87 and winter 1987-88 stream gaging in the Partridge River at SW-006 that occurred when there were no discharges from the Northshore Mine; and 2) 1942 to 1963 gaging data in the Embarrass River, which includes years prior to the LTV tailings basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) supports the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years. The only other available gaging data is from a station installed during 2011 at SW-003 on the Partridge River. Interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Northshore Mine pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-87 USGS data for the FEIS is reliable (PolyMet 2015m, as cited in the FEIS). To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted NorthMet Project	WR 003 WR 175

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		Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. It also reflected consideration of the flow data collected at SW-003 in requiring groundwater baseflows at all locations on the Partridge River be increased by a factor of 4 (e.g., 0.5 to 2 cfs at SW-003). The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.	
3116	Questions have also arisen on data use, including if new data is being utilized and how existing data was selected (or not selected) for use. Additional analyses should be performed and included in the SDEIS that investigate how the XP-SWMM model predictions may change with using the new baseflow measurements for the Partridge River to calibrate the model, and how that may affect the MODFLOW and GoldSIM model predictions.	Mine Site groundwater baseflows used in the SDEIS and FEIS are reliable. This is because the SDEIS and FEIS groundwater baseflow values were based on winter 1986-77 and winter 1987-88 stream gaging in the Partridge River that occurred when there were no discharges from the Northshore Mine. When expressed as a groundwater baseflow yield per unit area, the similar results for both the Partridge and Embarrass River watersheds (approximately 0.05 cfs per square mile) lends credibility to the approach used. The yield per unit area is similar to other watersheds in Northern Minnesota. Interpretation of groundwater baseflow derived from new data collection at SW003 is not reliable due to the complicating effects of Northshore Pit pumped discharges, seepage from the Northshore Western Pond, and complex storage/release mechanisms in the wetlands that receive these flows. The Mine Site MODFLOW model was re-calibrated based on new groundwater level data collected through the end of 2013; however, calibrations performed for the FEIS used the same Partridge River baseflows as were used in SDEIS. Revised hydraulic conductivities and recharge values that come from MODFLOW recalibration informed the FEIS Mine Site GoldSim model. Groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms that groundwater baseflows used in the Mine Site GoldSim model are reliable and appropriate for FEIS impact evaluation.	WR 003 WR 091 WR 165

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3118	It is our understanding that MODFLOW modeling does not account for any water to move east from the tailings basin. The head differential between the tailings basin and surrounding elevation may push water through the east side of the basin, potentially forming a lake. Significant uncertainties exist with groundwater flows and related contaminated water transport.	In response to these issues, the Plant Site MODFLOW model was modified and recalibrated as follows: 1) Updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain or river cells along the East Embankment to allow surface seepage of tailings water, 4) incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use of river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin. As a result of these changes, the FEIS Plant Site MODFLOW model no longer has a no-flow boundary condition at the toe of the East Embankment, and river and/or drain cells in surficial deposits are in place to allow the potential for surface seepage along the embankment toes (See Attachment A, Plant Site Water Modeling Data Package [PolyMet 2015j, as cited in the FEIS]). The model was checked to ensure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.	WR 093
3119	We disagree with the conclusion in the SDEIS that the PolyMet project will not have any impacts on surface or ground water hydrology in the Partridge and Embarrass Rivers (Section 5.2.2, page 5-8). Augmenting stream flow to tributaries with treated and Colby Lake water will impact surface water hydrology.	The FEIS assesses the potential for the NorthMet Project Proposed Action to affect surface and groundwater hydrology for the Partridge and Embarrass Rivers. The FEIS updates this analysis in FEIS Sections 5.2.2.3.2 and 5.2.2.3.3 respectively. The FEIS acknowledges that the NorthMet Project Proposed Action would alter stream flows relative to existing conditions. However, the flows would be similar to existing conditions. Where and when necessary, surface streams would receive treated augmentation water to maintain stream flow to within plus or minus 20 percent of existing flows. The augmentation water would generally consist of water obtained from the containment systems or mine pits, and treated at the WWTF or WWTP prior to discharge.	WR 107 WR 183
3121	We believe that the interaction of the project's impacts with natural variability in precipitation would be more adverse than reported in the SDEIS. This is because effects of climatic	Estimates of monthly and annual rainfall amounts were based on best available data obtained from weather stations near the NorthMet Project Proposed Action site. In the GoldSim models, these parameters were treated as uncertain inputs and assigned probability distributions to capture	WR 077 WR 180

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	variability are additive to the project-related change, which would be especially true for drier periods.	the range of possible future conditions. While climate change may occur in the future, it cannot be stated at this time if in the long-term there would be more or less rainfall. Thus, the probabilistic approach to rainfall used in GoldSim represents a technically defensible method for dealing with this issue. Individual storm events and frequency are not incorporated into the GoldSim models. Rainfall inputs are monthly and annual. The effects of individual storms are considered by designing facilities to handle a 100-year, 24-hour storm event based on current data. If over time, climate change causes a gradual increase in annual rainfall, the 100-year storm event would be redefined to a larger precipitation value and mine facilities would be upgraded to handle a larger storm.	
3123	It is also noted in section 5.2.3 (Wetlands) that indirect effects on wetlands are expected due to groundwater drawdown. Groundwater drawdown will impact groundwater hydrology and it's connectivity to the surficial aquifer, which will likely impact surface water hydrology.	Using an observational approach based on data from similar nearby mine sites (i.e., analog method), the Co-lead Agencies concluded that drawdowns in the surficial aquifer would not be expected to extend very far from the mine pits. This is explained by the following factors: 1) the surficial aquifer is thin and moderately permeable, 2) the surficial aquifer is subject to aerial recharge, and 3) the surficial aquifer is underlain by low-permeability bedrock that limits downward leakage from the surficial unit. These factors support the conclusion that wetland drawdown did not need to be included in the Mine Site GoldSim model. See FEIS Section 5.2.2.3.2 for more information on the analog method. It is acknowledged that there is some degree of hydraulic interaction between wetlands and the surficial aquifer at the Mine Site. However, attempts to quantitatively model the effects of these interactions on drawdown and water quality would be highly uncertain and potentially misleading. The FEIS approach was to not model hydraulic connections between wetlands and the surficial aquifer in the Mine Site GoldSim model, but rely on future monitoring and adaptive mitigation measures in the event that some wetlands are affected by the NorthMet Project Proposed Action. See FEIS Sections 5.2.2.3.6 and 5.2.2.3.5 for more information on closure monitoring and adaptive mitigation.	WET 15 WR 053 WR 086 WR 166
3124	Disagreement exists over application of the 10 mg/L wild rice sulfate standard (Section 5.2.2.1.2, page 5-21). Although some of these comments relate more to Minnesota Pollution Control Agency (MPCA) determinations and permitting issues, they are important considerations for the	The FEIS recognizes the MPCA is overseeing a variety of studies on wild rice beds. At applicable surface water locations, the FEIS evaluated impacts using an evaluation criterion based on the current 10 mg/L water quality standard for sulfate in waters used for production of wild rice. This impact assessment metric is keyed to the current regulation. It is recognized that the MPCA is currently evaluating the current wild rice	PER 10 WR 152 WR 154

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	project to meet water quality standards and should be clearly addressed in the SDEIS. It is arbitrary to define how much rice presence is required for an area to be defined as a water used for the production of wild rice, especially given the lack of long-term monitoring data in the receiving waters of this project. Application of this standard may be evolving/changing as research has been completed and the standard is currently being evaluated by the MPCA. Wild rice exists upstream in the Embarrass River from the draft MPCA staff recommended definitions of water used for production of wild rice (compliance points). In the Partridge River, the 2009 survey identified rice near SW-004b, also upstream of the proposed compliance point. Barr Engineering conducted the survey and has indicated a possible error in the 2009 survey, bringing into question the accuracy of these upstream wild rice locations in the Partridge River. Currently, the wild rice water quality standard is not being met in portions of the Embarrass and Partridge river systems. The SDEIS states that the wild rice sulfate standard would be met for the Embarrass River, assuming the containment and seepage collection system would capture seepage presently going to the Embarrass tributaries. However, the Partridge River will exceed the standard during low-flow conditions. We question how this will be handled in permitting.	sulfate water quality standard and, as part of that process, new information on potential contributing factors on the growth of wild rice beds has been generated. However, that information has not yet been holistically reviewed in the context of its possible influence on the wild rice standard. Future change to the wild rice sulfate standard, if any, is speculative and outside the scope of the FEIS; applying research findings outside the basis of the current rule is not appropriate. The FEIS includes descriptions of the Plant Site WWTP and Mine Site WWTF, both of which would be capable of discharging treated wastewater at concentrations at or below 10 mg/L as demonstrated by pilot-testing already conducted. More detailed information on these treatment systems would be available as part of the permitting process. However, should a more stringent standard be developed in the future, operation of the reverse osmosis treatment systems, or equivalently performing technologies, could be adjusted to meet a more stringent effluent limit. During permitting, the MPCA would evaluate the latest water quality modeling results to ensure that surface water uses are being protected. Appropriate mitigation and monitoring would be required if and when a permit is drafted.	
3125	Disagreement also exists over the current MPCA staff recommendation of seasonal application of the wild rice sulfate standard from April 1 through August 31 (page 5-25). Application of this standard may be evolving/changing as research has been completed and the standard is currently being evaluated. According to SDEIS, PolyMet is seeking seasonal application [April 1 through August 31] of the standard during non-mechanical	PolyMet is not seeking a seasonal application of the wild rice sulfate standard. Neither seasonal application of the wild rice standard nor non-mechanical treatment systems are part of the NorthMet Project Proposed Action, which relies solely on mechanical treatment and year-round application of the sulfate standard. Non-mechanical treatment may be considered during operations and closure if pilot studies demonstrate their utility and cost-effectiveness for water treatment and water disposal. The NorthMet Project Proposed Action, as proposed, relies on well-tested mitigation and mechanical treatment technologies. Non-mechanical	WR 153

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	water treatment after closure. If seep collection and water treatment do not work as planned (substantial assumptions without a lot of detail), the seasonal discharge may become a larger issue. The SDEIS states that this is beyond the scope of the document, but we believe that it is relevant to the project meeting water quality standards and is an issue to be addressed.	treatment effectiveness in decreasing the concentration of sulfate and other parameters would need to be proven through bench and pilot testing before it would be relied upon to meet water quality standards.	
3126	We do not believe the proposed project will result in a decrease in mercury loading to the Embarrass and Partridge River aquatic systems (Section 5.2.2.3.4). For the Embarrass River, we do not believe that: 1) the tailings basin will function as a mercury sink; and 2) mercury methylation would decrease due to projected reductions in sulfate contributions. Regarding flows of the Partridge River, Embarrass River, or their tributaries, we disagree that the project would not significantly impact flow and water level fluctuations, thus leading to increased mercury methylation and bioaccumulation, which taken together may be sufficient to impact habitat leading to alterations of species composition, food web structure, and ultimately mercury bioaccumulation.	The MPCA's Cumulative Mercury Risk Estimation Method analysis for the two scenarios showed a 0.5 to 1.8 percent and 0.3 to 0.5 percent potential increase in fish mercury concentration above background. The increase is not expected to have an appreciable effect on the loading estimates from permitted discharges to the Embarrass, Partridge, or lower St. Louis rivers. Discharges are expected to meet the 1.3 ng/L standard for mercury, with an overall net decrease in mercury loading predicted for the NorthMet Project Proposed Action. FEIS Section 5.2.2.3.4 provides supporting documentation and a rationale explaining that tailings are a sink for mercury. Berndt (2003, as cited in the FEIS) further explains that the reaction of mercury in full-scale actual tailings basins (i.e., mercury assumed to be lost through adsorption to solids and then burial in the sediments) results in an overall permanent retention of mercury within the basin and decreases in mercury released to receiving waters. The overall findings in Berndt (2003) demonstrated that the release of mercury to surface waters during taconite processing was insignificant with respect to the mercury concentrations found in local precipitation and existing background surface waters. The findings are supported by surface and groundwater monitoring around the existing LTVSMC Tailings Basin, which found mercury concentrations generally averaging less than 2.0 ng/L. Additional documentation supporting sequestering of mercury in the Tailings Basin are presented in FEIS Sections 5.2.2.3.4 and 6.2.2. It is difficult to quantify the extent to which predictions of elevated mercury concentrations in the Tailings Basin surficial seepage would influence mercury methylation north of the Tailings Basin and further downstream, although the FEIS notes that sulfate can contribute to mercury methylation. The FEIS notes that the NorthMet Project Proposed Action would reduce sulfate concentrations within the Embarrass River watershed, and that this may result in downstream reductions in mercury methylation. Effects on flows (and, by extension, water surface elevations) generated by	MERC 06 MERC 20 MERC 23

Comment ID	Comment	Response	Theme(s)
		the NorthMet Project Proposed Action are anticipated to be within the natural variation of flow within the St. Louis River (e.g., less than 1 percent reduction in average annual flow as measured at the confluence of the Embarrass River with the St. Louis River). Therefore, no potential indirect or cumulative wetland effects are identified for the wetlands within the St. Louis River below the ordinary high water mark, from its confluence with the Embarrass River to Lake Superior, and it is not expect that the NorthMet Project Proposed Action would contribute to water level fluctuations than can promote mercury methylation. Additional information regarding water level and flows to surrounding watersheds is included in FEIS Section 5.2.2.	
3128	Potential mercury contributions from peat stored at the Overburden Laydown and Storage Area have also not been addressed.	This comment was originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. Some of the temporarily stored organic material would decompose on site, which would release mercury into solution. Any dissolved mercury would be transported in solution with precipitation that falls on the Overburden Storage and Laydown Area (PolyMet 2015r, as cited in the FEIS). Any mercury released from the peat decomposition process is thought to be transported with precipitation that falls on the Overburden Storage and Laydown Area. The Overburden Storage and Laydown Area would be unlined; therefore, there would be some potential for seepage to enter the groundwater system from peat which has decomposed and releases as a pulse of mercury. Water contacting the Overburden Storage and Laydown Area is considered to be process water and would be routed to Pond PW-OSLA. In years 1 to 11, the water from Pond PW-OSLA would be routed to the Tailings Basin, and any mercury in the routed water would have the chance to be sequestered in the tailings. In years 12 to 20, some of the water from Pond PW-OSLA would be used to backfill the East Pit. Any mercury in the water routed to the East Pit would mix with waste rock and become sequestered at depth in the East Pit. In addition, any contributions of water in years 21 to 65 from the East Pit to the West Pit would reflect water from the East Pit and its associated watershed runoff, and would not reflect process water from Pond PW-OSLA. Because peat removal from the areas to be mined would be completed between years 5 and 11, any potential release of mercury from stored peat materials would have occurred, or be ending, by the time water is routed from Pond PW-OSLA to the East Pit beginning in	MERC 20

Comment ID	Comment	Response	Theme(s)
		year 12. All water that is discharged would be meet the GLI mercury standard of 1.3 ng/L.	
3134	Mercury-related concerns are present for created wetlands at the East Pit and mercury concentrations in water discharged from the West Pit.	This comment was originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. Water levels in the East Pit would generally be controlled by passive wetland overflow to the West Pit. West Pit water would be treated via RO (or equivalent performing technology) at the WWTF in closure before being discharged into West Pit Overflow Creek. Depending on seasonal weather conditions, there could be occasional pumped flows from the wetland to the WWTF or treated effluent from the WWTF could be pumped to the wetland to further control the water levels (PolyMet 2015d, as cited in the FEIS).	MERC 09
3135	Air-related mercury emissions do not account for sources from energy generation or vehicle use at the site.	This comment was originally presented as part of the Tribal Position Summary included in MDO #2, which was previously addressed in SDEIS Table 8-1. Further explanation is provided below. As summarized in Section 5.2.7 of the FEIS, procedures for air quality assessments vary depending upon the level of emissions from a proposed project. The NorthMet Project Proposed Action has been defined as a synthetic minor source according to the USEPA definitions of "major" vs. "minor" sources, since the NorthMet Project Proposed Action would limit its emissions through permit restrictions to less than the defined emission levels (see Section 5.2.7 of FEIS). At the Mine Site, emissions were estimated for material handling sources associated with excavation, portable crushing and screening operations, blast hole drilling, use of unpaved roads, and vehicle exhaust. At the Plant Site, point source emissions are predicted to occur from the crushing plant, flotation operation autoclaves and other hydrometallurgical processes, process consumables handling, and combustion. Fugitive emissions are also expected to occur from raw materials handling, Plant Site roads, the Tailings Basin, and from vehicle use of Dunka Road. Additional information has been summarized below and is included in FEIS Section 5.2.7. Mercury in the ore is the primary source of mercury and air emissions of mercury are primarily associated with the Hydrometallurgical Plant (4.1 pounds/year). A small amount of mercury emissions are estimated to potentially be emitted from natural gas combustion associated with a package boiler and a natural gas fired process heater and space heaters (0.4 pounds/year). In addition, a small amount of particle-bound mercury is	AIR 02

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		associated with mining, ore crushing, milling processes, flotation concentrate handling, and fugitive dust emissions from the Tailings Basin (less than 0.1 pounds/year). A relatively small amount of mercury is estimated to be associated with diesel fuel combustion in mine vehicles. Overall, total potential emissions of mercury from the NorthMet Project Proposed Action are estimated to be 4.6 pounds/year from the Plant Site, a maximum of 0.17 pounds per year from Tailings Basin construction vehicles (diesel fuel combustion emissions), and approximately 0.6 pounds/year from diesel fuel combustion at the Mine Site (Barr 2012a, as cited in the FEIS). In comparison, Minnesota's statewide mercury emissions were estimated to be 3,011 pounds in 2005 and about 2,835 pounds in 2011 (MPCA 2013). The TMDL target emissions are set at 789 pounds/year by 2025 (MPCA 2014). The NorthMet Project Proposed Action's air emissions are about 0.16 percent of 2011 estimated statewide emissions and about 0.6 percent of the TMDL statewide target emissions. As summarized in FEIS Section 5.2.7, the MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions and has determined that it would not impede the TMDL reduction goals.	
3136	For the Lake Superior watershed, any additional mercury releases to the environment are exacerbating already existing impairments including fish advisories set for recreational fishing. Increased fish mercury levels will also have direct impacts on both the cultural and recreational resources of the region.	Based on the evaluations conducted for air emissions and water discharges for the FEIS, the NorthMet Project Proposed Action is not considered to have an appreciable effect on: 1) surface water mercury concentrations, 2) fish mercury concentrations, 3) methylation of mercury, or 4) risk to people consuming fish from lakes near the NorthMet Project Proposed Action site. Two mercury air emission scenarios were evaluated. Scenario 1 is a conservative overestimation of oxidized mercury and Scenario 2 is considered to be a conservative but more likely mercury speciation for the air emissions associated with the NorthMet Project Proposed Action. The MPCA's Cumulative Mercury Risk Estimation Method (MMREM) analysis for the two scenarios showed a 0.5-1.8 percent and 0.3-0.5 percent potential increase in fish mercury concentration above background in the following five lakes: Heikkila Lake, Colby Lake, Sabin Lake, Wynne Lake, and Whitewater Lake. This potential change is considered to be small compared to background levels and is not expected to affect fish consumption advisories or effect consumers of locally caught fish. Further, discharges from the Proposed Action are expected to meet the 1.3 ng/L water quality standard for mercury, with an overall net decrease in mercury loading to the St. Louis River Watershed predicted for the NorthMet Project Proposed Action Alternative, as compared to the CEC Scenario.	AQ 11 MERC 02

Comment ID	Comment	Response	Theme(s)
		The Cultural Resources section of FEIS Chapters 4 and 5 addresses the Co-lead Agencies' federal tribal trust responsibilities as part of the 1854 Treaty. These sections, along with other relevant natural resources sections of Chapters 4, 5, and 6, also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources that do not qualify for listing on the NRHP.	
3137	Indirect impacts to wetlands from mine pit dewatering (866.9 acres with high likelihood of wetland hydrology effects (Zone 1)) may be underestimated as a result of using the analog method described in the SDEIS (Section 5.2.3.2.2). We do not feel the proposed analog method of assessing potential indirect impacts from mine site pit dewatering is adequate, and as such should not be the sole means of indirect impact assessment for the SDEIS.	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the	WET 08

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		open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
3138	We do not feel the impact zones and distances are well described, and do not agree with the automatic exclusion of ombrotrophic wetlands from potential drawdown effects. ...GLIFWC conducted an independent assessment using the same methods as the Co-lead Agencies, along with additional analog data from other mining-impacted sites. The assessment found an estimated total of 5719.75 acres of wetlands would be potentially susceptible to severe indirect impacts from mine pit drawdown (Zone 1).	When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the	WET 10

Comment ID	Comment	Response	Theme(s)
		potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2. The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.	
3140	We also disagree the Partridge River would act as a "natural barrier" to the cone of depression, which suggests that the riparian zone of the Partridge River will not be affected by groundwater drawdown (page 5-243).The upper Partridge River is located in Zone 2; GLIFWC's independent analysis estimated drawdowns of 3 to 5 feet under the river, which would severely reduce baseflow in the channel, indirectly impact riparian wetlands downstream, and affect other surface water features. GLIFWC's analysis should be considered in the SDEIS for estimating potential indirect effects on wetlands from mine pit dewatering. This would also have implications for the cumulative effects analysis presented in Chapter 6 (Section 6.2.3.4.4).	Using an observational approach based on data from similar nearby mine sites (i.e., analog method), the Co-lead Agencies concluded that drawdowns in the surficial aquifer would not be expected to extend very far from the mine pits. This is explained by the following factors: 1) the surficial aquifer is thin and moderately permeable, 2) the surficial aquifer is subject to aerial recharge, and 3) the surficial aquifer is underlain by low-permeability bedrock that limits downward leakage from the surficial unit. These factors support the conclusion that wetland drawdown did not need to be included in the Mine Site GoldSim model. See FEIS Section 5.2.3 for more information on the analog method. It is acknowledged that there is some degree of hydraulic interaction between wetlands and the surficial aquifer at the Mine Site. However, attempts to quantitatively model the effects of these interactions on drawdown and water quality would be highly uncertain and potentially misleading. The FEIS approach was to not model hydraulic connections between wetlands and the surficial aquifer in the Mine Site GoldSim model, but rely on future monitoring and adaptive mitigation measures in the event that some wetlands are indirectly affected by the Proposed Project. See FEIS Section 5.2.2.3.6 and 5.2.2.3.5 for more information on Closure monitoring and adaptive mitigation. Please refer to the responses to themes WR 086 and WR 171.	WET 10 WET 18
3141	Much of the proposed mitigation (Aitkin and Hinckley sites) for directly impacted wetlands is outside of the watershed and 1854 Ceded Territory. This is a permanent loss to these areas and should be discussed in the document.	FEIS Section 5.2.3.3.2 includes a discussion on the wetland mitigation study limits and the site selection process. The compensatory wetland mitigation site selection for the NorthMet Project Proposed Action began in 2005 and has gone through a rigorous site selection evaluation. Prior to the 2008 Federal Mitigation Rule, the Aitkin and Hinckley sites were selected,	WET 03

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	Mitigation options within the watershed and 1854 Ceded Territory should be re-visited.	initial approvals by the USACE were received, and substantial investments were made by PolyMet to develop both sites for compensatory mitigation. The USACE guidance prior to the implementation of the 2008 Federal Mitigation Rule was to look for mitigation sites that could provide the following: restoration of historical wetlands, high probability of success, achieve at least partial in-kind mitigation and sites that had ditched and/or tiled peatlands to provide for restoration. When the 2008 Federal Mitigation Rule went into effect, the USACE informed PolyMet of the priority for siting any future compensatory mitigation within the St. Louis River/Great Lakes Basin. The Zim Site was subsequently proposed as a third site. Initially, no practicable compensation sites were found in the St. Louis River Watershed, but subsequently, the Zim Site was found and incorporated as part of the compensatory mitigation plan. Although the 2008 Federal Mitigation Rule and 2009 USACE St. Paul District Policy (USACE 2009, as cited in the FEIS) do not require wetland mitigation sites to stay within the 1854 Ceded Territory, the Zim Site is located within the 1854 Ceded Territory. The permanent functional loss of wetlands within the St. Louis River Watershed/Great Lakes Basin would be considered by the USACE in its DA permit decision and has been accounted for in the proposed mitigation credits by PolyMet. Please refer to the response to theme WET 03.	
3143	Upfront mitigation for wetlands susceptible to severe indirect impacts is currently not proposed, and we believe that the USACE should require up front mitigation for all severely impacted wetlands. We also contend that additional up front mitigation should be considered for wetlands that are classified in the moderate to severe category, with robust monitoring being required for wetlands in the moderate category.	FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater mounding and seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated	WET 01 WET 02

Comment ID	Comment	Response	Theme(s)
		effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for factor 6 (change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations).The identification of specific mitigation for indirect effects and a monitoring plan is not a requirement for an EIS; however, the FEIS has been updated with additional information on the approach for determining mitigation if the monitoring shows indirect effects are occurring. The monitoring and mitigation for potential indirect effects would be determined during permitting. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for potential indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.	
3144	Section 5.2.9.2.2 (Wildlife) does not contain information on game species such as moose, deer, grouse, waterfowl, furbearers, etc. These species are important to the Bands for the exercise of treaty rights, and further analysis is needed.	The FEIS wildlife sections provide an analysis of wildlife species used for subsistence/harvest, as well as those culturally important to the Bands. FEIS Section 4.2.9.3.3 identifies species potentially harvested in the 1854 Ceded Territory, while FEIS Section 5.2.9.2.2 explains that a lack of data regarding use of such species in the NorthMet Project area likely indicates limited present day use in that area due to general inaccessibility. FEIS Section 5.2.5.2.5 discusses the types of potential effects to common and/or game species, which are similar to effects on ETSC species. The FEIS has been revised to include additional detail regarding moose, and this discussion has been moved to the state ETSC species discussion, due to its new state listing status. The response to theme CR 01 also discusses effects to resources important to the Bands.	CR 01 WI 09
3145	This section also contains language about "1854 Treaty Authority-regulated species". We suggest removing or altering this language. The Fond du Lac Band also exercises treaty rights in the 1854 Ceded Territory, and has their own regulations. Further, the 1854 Treaty Authority maintains seasons and limits on some species, but these are not the only species of importance.	Text has been added to clarify the definition of "1854 Treaty Authority-regulated species" in Section 5.2.9.2.2. As discussed in this section, Fond du Lac has its own regulations applicable to the 1854 Ceded Territory. The discussion of "1854 Treaty Authority-regulated" species or resources is not inclusive of all species important to the Bands. Instead, the lists serve as the most updated and best available data for the most common game species or tribally harvested resources on the 1854 Ceded Territory.	EDIT 01

Comment ID	Comment	Response	Theme(s)
3146	The project would result in one more piece of the 1854 Ceded Territory permanently altered and impacted. When taken in combination of all the mining operations across the Iron Range and other general development, the Ceded Territory and related exercise of treaty rights have been significantly impacted.	The Cultural Resources sections of FEIS Chapters 4 and 5 address the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of FEIS Chapters 4, 5, and 6 also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation/compensation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the review of the NorthMet Project Proposed Action.	CR 01
3147	The SDEIS states on page 4-340 that subsistence activity (including hunting, fishing, and plant gathering) accounted for approximately one meal per week among the survey respondents… Our interpretation and analysis of the results would likely show an increased consumption rate from what is reported in the SDEIS.	The NorthMet Project Proposed Action is within the 1854 Ceded Territory. FEIS Section 4.2.10.1.6, as well as Table 4.2.9-1 in FEIS Section 4.2.9 summarize available information about subsistence patterns and resources within the 1854 Ceded Territory. Construction of the NorthMet Project Proposed Action would make the Mine Site unavailable for subsistence use. The degree to which construction of the NorthMet Project Proposed Action would affect individual subsistence resources (i.e., fish, game, and plant species) outside of the Mine Site, Transportation and Utility Corridor, and Plant Site is discussed in FEIS Section 5.2.9 (Cultural Resources). FEIS Section 5.2.10.2.6 discusses consumption of fish. Increased mercury concentrations and associated increases in mercury bioaccumulation in fish tissue could constitute an EJ impact for Band members and other subsistence consumers of fish.	SO 09
3148	The SDEIS also states that harvest for all species (including big game and trapping) have generally declined since 1994. We believe that this statement is inaccurate and also seems to minimize the importance of the exercise of treaty rights.	The statement that harvest for all species (including big game and trapping) have generally declined since 1994 is based on the citation Edwards 2012, as cited in the FEIS. The 1854 Treaty as it relates to subsistence and the Project Area is described in Section FEIS 4.2.10.1.6.	SO 04
3149	In addition, this section focuses only on harvest activities regulated and reported by the 1854 Treaty Authority, and does not include the exercise of treaty rights by the Fond du Lac Band.	Text has been added to clarify the definition of "1854 Treaty Authority-regulated species" in FEIS Section 5.2.9.2.2. As discussed in this section, Fond du Lac has its own regulations applicable to the 1854 Ceded Territory. The discussion of "1854 Treaty Authority-regulated" species or resources is not inclusive of all species important to the Bands. Instead, the lists serve as the most updated and best available data for the most common game species or tribally harvested resources on the 1854 Ceded Territory.	CR 01
3150	The SDEIS essentially contains no analysis on	The FEIS includes an analysis about cumulative effects on special status	WI 01

Comment ID	Comment	Response	Theme(s)
	moose. This issue has been raised by the cooperating agencies a number of times throughout the EIS development process. Given this listing [on August 19, 2013], and the cultural importance to the Bands, the SDEIS should analyze project impacts to moose and also consider it from a cumulative impacts perspective.	wildlife species of cultural importance. The FEIS Section 5.2.9.2.2 explains that a lack of data regarding use of such species in the NorthMet Project area likely indicates limited present day use in that area due to general inaccessibility. The FEIS Section 6.2.3.10.4 discusses general impacts to culturally-important plants and animals. The FEIS wildlife sections (4.2.5, 4.3.5, 5.2.5, and 5.3.5) have been updated to include the new state ETSC status listings from August 19, 2013, as well as any new federal status listing changes. The FEIS includes a more robust analysis on direct and cumulative effects to the moose.	
3151	Stating the economic benefits of the project, while not stating economic costs to resources and related uses, does not allow for a fair comparison or overall view of the project. Environmental economic tools do exist to value resources and the services they provide, and perhaps some would be applicable and beneficial for the SDEIS.	Section 102 of NEPA (42 USC 4321 et seq.) requires all Federal agencies, to the fullest extent possible, to do the following: "identify and develop methods and procedures, in consultation with the CEQ...which would insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations." Neither NEPA nor MEPA require the costs and benefits of a proposed action to be quantified in dollars or any other common metric; moreover, it is not possible to quantify and assign a value to all benefits and costs associated with the NorthMet Project Proposed Action. The FEIS focuses on the benefits and costs of such magnitude or importance that their inclusion in the analysis can inform the decision-making process. The FEIS fulfills NEPA and MEPA requirements in adequately addressing benefits and costs.	SO 04
3152	The document states that there will be a net increase of up to 579.6 acres for the Superior National Forest. Any gains or losses in federal ownership will not be known until the values of all the proposed lands in the exchange have been determined. The proposed exchange loses one large tract of public land for several smaller tracts. The project also results in permanent impacts and changes to the resources regardless of ownership. These issues should be clearly identified in the SDEIS.	The Land Exchange Proposed Action must comply with FLPMA's requirement that the values of the lands exchanged are equal or, if they are not equal, that the values shall be equalized by the payment of money so long as the payment does not exceed 25 percent of the total value of the lands transferred out of federal ownership. Disclosure of appraisal information in the EIS is not required. Any decision, documented in the ROD, to move forward with a land exchange will be supported by a current appraisal, approved by the USFS, which verifies that the exchange meets the equal value requirements of applicable federal law and regulation. Requests for appraisal reports and appraisal review reports are processed under Freedom of Information Act procedures. Appraisals must conform to Uniform Appraisal Standards for Federal Land Acquisitions and the Uniform Standards of Professional Appraisal Practice of the Appraisal Foundation. The effects to resources are discussed in detailed in Section 5.0.	LAN 03

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3153	The SDEIS also puts too much emphasis on the current lack of access to the Forest Service lands (Section 3 .1.2.1, page 5-579). This is seemingly done to minimize the impact of losing it.	Access is discussed because it defines the degree to which the lands in question can actually be used—either by the public for recreational purposes, by forestry interests for economic purposes, or for research and conservation purposes.	NEPA 12
3154	Access to the specific public waters and wild rice associated with the land exchange (Pike River, Hay Lake, Little Rice Lake) is currently available. Adjacent land ownership is not a direct impact to this access because wild rice is in public waters that are currently accessible. The SDEIS does not paint an accurate picture to say that the land exchange will result in additional wild rice beds, that there is currently no opportunity to harvest wild rice directly on the federal lands, or that the public would have better opportunities for wild rice harvesting (Section 5.3.4.2.1, page 5-609).	Wild rice does not currently grow within the proposed federal land boundaries, and suitable habitat is limited. The Land Exchange Proposed Action would result in the public ownership of additional wild rice beds by the acquisition of Tract 1. Tract 1 contains Little Rice Lake, which supports a continuous population of wild rice. Wild rice also grows along the Pike River south of Little Rice Lake and in isolated populations on Hay Lake. The FEIS vegetation sections clarify the discussion of access to locations of wild rice beds on the non-federal lands. The Land Exchange would result in an increase in wild rice beds within the federal estate. FEIS Section 4.3.4.2.5 provides further discussion of wild rice beds on Tract 1. As a result, the public would have better opportunities for wild rice harvesting on Tract 1, where there is currently no opportunity to harvest wild rice directly on the federal lands (i.e., no known wild rice populations) despite the public water access onto the federal lands. A carry-down boat launching access is located on Tract 1, which may provide private access for wild rice harvesting on the Tract 1 lands. Access to wild rice beds on the federal lands would not be lost as a result of the Land Exchange Proposed Action, but access to wild rice beds on Tract 1 would be gained. Overall, there would be no increase in wild rice harvest opportunities for the public.	VEG 04 VEG 08 WR 155
3155	page 5-591 states that the proposed land exchange would result in a net increase of wild rice beds to the federal estate. Wild rice in these locations are found in public waters (and would not be on federal lands or under federal ownership/management) and are currently accessible through an access on the Pike River. Some resource protection advantages may exist to gaining adjacent federal ownership as it relates to land management.	Wild rice does not currently grow within the proposed federal land boundaries, and suitable habitat is limited. The Land Exchange Proposed Action would result in the public ownership of additional wild rice beds by the acquisition of Tract 1. Tract 1 contains Little Rice Lake, which supports a continuous population of wild rice. Wild rice also grows along the Pike River south of Little Rice Lake and in isolated populations on Hay Lake. The FEIS vegetation sections clarify the discussion of access to locations of wild rice beds on the non-federal lands. The Land Exchange would result in an increase in wild rice beds within the federal estate. FEIS Section 4.3.4.2.5 provides further discussion of wild rice beds on Tract 1. As a result, the public would have better opportunities for wild rice harvesting on Tract 1, where there is currently no opportunity to harvest wild rice directly on the federal lands (i.e., no known wild rice populations) despite the public water access onto the federal lands. A carry-down boat	VEG 08 WR 155

Comment ID	Comment	Response	Theme(s)
		launching access is located on Tract 1, which may provide private access for wild rice harvesting on the Tract 1 lands. Access to wild rice beds on the federal lands would not be lost as a result of the Land Exchange Proposed Action, but access to wild rice beds on Tract 1 would be gained. Overall, there would be no increase in wild rice harvest opportunities for the public.	
3157	We do not agree that the project and proposed land exchange would increase habitat availability because even the with land exchange, the overall result of the project is permanent impacts, loss, and changes to the resources of northeastern Minnesota and the 1854 Ceded Territory (Section 5.3.5, page 625).	FEIS Sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) include information about impacts of the NorthMet Project Proposed Action on wildlife habitat types and MBS Sites of Biodiversity Significance. FEIS Section 5.3.4 discusses that the increases in habitat under the Land Exchange Proposed Action would be to the federal estate. However, FEIS Section 5.2.4 discusses that with the Combined Proposed Actions, there would be a decrease in overall habitat. *Minnesota Rules*, part 6132.2700 does require that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation.	WI 02 WI 03
3158	Regarding habitat availability and impacts from the proposed land exchange, there is no mention of effects on game species such as moose, deer, grouse, waterfowl, furbearers and others in Section 5.3.5.2.5 nor in Section 6.2.3.6 from the cumulative effects analysis.	The FEIS wildlife sections provide an analysis of wildlife species used for subsistence/harvest, as well as those culturally important to the Bands. FEIS Section 4.2.9.3.3 identifies species potentially harvested in the 1854 Ceded Territory, while FEIS Section 5.2.9.2.2 explains that a lack of data regarding use of such species in the NorthMet Project area likely indicates limited present day use in that area due to general inaccessibility. FEIS Section 5.2.5.2.5 discusses the types of potential effects to common and/or game species, which are similar to effects on ETSC species. The FEIS has been revised to include additional detail regarding moose, and this discussion has been moved to the state ETSC species discussion, due to its new state listing status. The response to theme CR 01 also discusses effects to resources important to the Bands.	WI 10
3160	We would suggest that the proposed School Trust Lands Exchange also be a consideration. The project would entail exchange, purchase, or some combination of both for the Forest Service to acquire the school trust lands within the Boundary Waters Canoe Area Wilderness.	FEIS Section 6.1.2 includes an updated list of projects and actions that were considered in the cumulative effects assessment for the Land Exchange Proposed Action, which includes the School Trust Lands project.	CU 08

Comment ID	Comment	Response	Theme(s)
3161	We believe that limiting the cumulative effects analysis area (CEAA) for water resources (Section 6.2.3.3), wetlands (Section 6.2.3.4) and aquatic species (Sections 6.2.3.7) to the Partridge and Embarrass River watersheds is too small. These CEAA's should be expanded to include the St. Louis River watershed. Impacts associated with United Taconite's proposal for 1,200 acres of wetland destruction to build a new tailings basin within the St. Louis River watershed should be considered. The PolyMet project would add to the load of pollutants in the St. Louis River and would reduce tributary flows to the river. Impacts that may occur due to the project could be underestimated (due to modeling concerns), and would not stop before reaching the St. Louis River. Further, any added impact from the project to the St. Louis River watershed would in turn impact Lake Superior. We believe that this should be the appropriate scale to analyze cumulative effects for these resources.	The cumulative effects section in the FEIS (Section 6.1.1.1) describes the rationale for the identification of CEAAs, which for the water resources cumulative effects analysis excludes United Taconite, which lies within the St,. Louis River watersheds. FEIS Section 6.2.2.1.1 provides a rationale for not including the St. Louis River Basin in the cumulative effects analysis. The CEAAs for individual resource areas vary based on the potential for cumulative effects, and not on a single overall assessment area. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area and FEIS Table 6.1.1-1 lists the project considered in the cumulative effects assessment. Please also refer to Section 8.3, MDO 12 for the Co-lead Agencies' rationale for the CEAA identified for water resources.	CU 01
3162	We disagree with the conclusion that no cumulative effects to groundwater resources are expected (Section 6.2.3.3, page 6-16)…Cumulative effects at these locations should be assessed with the proposed project along with potential groundwater pollution from the Peter Mitchell Pit, Laskin Energy, Arcelor-Mittal, United Taconite, and US Steel Minntac.	Cumulative effects result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. The modeled groundwater flowpaths of the NorthMet Project Proposed Action do not interact with other groundwater flowpaths. There may be other plumes from other projects in the vicinity of the NorthMet Project Proposed Action, but the effects of these plumes would only interact with NorthMet Project Proposed Action impacts within surface waters. This has been evaluated. The only exception is the seepage effects from existing LTVSMC Tailings Basin that the NorthMet Project Proposed Action would supplant. This combined effect has been considered.	WR 024
3163	A future action that should be considered in the cumulative effects analysis is any potential future backfill of Virginia Formation waste rock for in-pit disposal at the Cliffs Peter Mitchell Pit. Potential dewatering-related interaction effects between the proposed PolyMet Project and the Peter Mitchell Pit should also be evaluated for	The Northshore Mining Company Progression of the Ultimate Pit Limit project which includes the in-pit stockpiling of Virginia Formation waste rock in the Northshore Mine Pit would have no impact on the Partridge River, as all operations discharges would be primarily to Langley Creek.	WR 024

Comment ID	Comment	Response	Theme(s)
	cumulative effects.		
3164	In Section 6.2.3.4.4 (Future Wetlands and Water Resources) wetlands that would be indirectly impacted from the PolyMet project (and other projects) should be considered for inclusion in the number of wetland acres lost.	It is difficult to predict potential indirect wetland effects within the CEAA, and difficult to know what the potential indirect wetland effects would be for the projects assessed other than the NorthMet Project Proposed Action. However, based on the amount of potential indirect wetland effects that could occur from the NorthMet Project Proposed Action, there could be 0.1 to 12.0 percent cumulatively lost, in addition to the direct wetland impacts assessed, within the Partridge and Embarrass River watersheds as a result of the NorthMet Project Proposed Action. FEIS Section 6.2.3 has been revised to include more information.	WET 18
3165	In Section 6.2.3.10.4 (page 6-95), it should be clarified that the project would result in permanent impacts, changes, and loss within the 1854 Ceded Territory… No matter how the proposed project is viewed, it would result in a permanent loss or change to treaty guaranteed resources and the exercise of treaty rights….Further consultation required by federal agencies is needed to better understand effects to cultural resources, and to properly plan for avoidance or mitigation.	The Cultural Resources section of the Final EIS Chapters 4 and 5 addresses the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of Chapters 4, 5, and 6, also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the NorthMet project review.	CR 01
3166	it is anticipated that Minnesota Biological Survey sites of High Biodiversity Significance would be decreased by 6056.4 acres on Superior National Forest lands.	The FEIS vegetation sections include information about the decrease of Minnesota Biological Survey (MBS) sites due to the Land Exchange Proposed Action in Sections 5.2.4 and 5.3.4. There would be a decrease of 6,142.7 acres of MBS Sites of High Biodiversity Significance within the Laurentian Uplands subsection, and an increase of 116.9 acres of MBS Sites of High Biodiversity Significance in the North Shore Highlands subsection. The Land Exchange Proposed Action would also result in an increase to the federal estate of 767.6 acres of MBS Sites of Moderate Biodiversity Significance in the Laurentian Uplands subsection. The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would	VEG 02

Comment ID	Comment	Response	Theme(s)
		address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.	
3167	The SDEIS states that financial assurance requirements for the project are not included in the document, but will instead be determined during the permitting phase. We are concerned about this approach given the potential for long-term/perpetual treatment, maintenance, and monitoring that may be needed from the proposed project.	It is acknowledged that operation, maintenance and periodic replacement of environmental controls would be required during closure. Financial Assurance would be required under the State's Permit to Mine to perform these activities on a continuous and/or periodic basis for as long as these activities are needed. FEIS Section 3.2.2.4 provides available details regarding financial assurance, including for reclamation of all disturbed areas and ongoing long-term monitoring and maintenance. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine. Additional details on the financial assurance required for the project effects, monitoring, and mitigation would be addressed during permitting. To the extent the reclamation plan includes maintenance and mitigation, those items would be covered by financial assurance. Neither NEPA nor MEPA rules require that all financial assurance mechanisms be in place before the EIS is finalized. In addition, see the response to theme WR 035.	FIN 12 WR 037
3168	The SDEIS states that contingency mitigation will not be included initially in the financial assurance package. Financial assurance must be monitored and updated as the project proceeds to properly cover site cleanup and closure.	FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, time frames, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine to account for the proceeding year's activities. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted, using current dollar value at the time of the estimate. This requires estimating the contingency funds required for closure and post-closure activities in the event of unplanned closure during the course of the year.	FIN 11

A.5 THEME STATEMENTS AND RESPONSES

A.5.1 Issue: Air Quality (AIR)

Theme AIR 01

Theme Statement

The project fails to adequately account for greenhouse gas emissions and their contribution to global climate change, as well as the effects of climate change on general air quality and local resources over the life of the project.

Thematic Response

The information contained in FEIS Tables 5.2.7-8 and 5.2.7-9 quantifies the direct and indirect emissions of greenhouse gases (GHGs) from the NorthMet Project Proposed Action. In addition, information in FEIS Section 5.2.7.2.4 addresses the potential for climate change impacts in the area, including the frequency and duration of severe weather events. GHG issues have been assessed in a manner consistent with USEPA and MPCA guidance, as well as CEQ's Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions, dated February 18, 2010 (CEQ 2010, as cited in the FEIS).

Theme AIR 02

Theme Statement

The project fails to adequately account for the impact of emissions from increased energy use/generation due to the project.

Thematic Response

The information contained FEIS Tables 5.2.7-8 and 5.2.7-9 quantifies the direct and indirect emissions of GHGs from the NorthMet Project Proposed Action. The FEIS does not quantify the emissions of non-GHG emissions from indirect sources. Electrical generating units (EGUs) are subject to their own permitting requirements and emission and capacity limitations. If additional electrical capacity is required, then any new EGUs would be subject to environmental permitting and regulation. FEIS Section 5.2.7.1.3 has been revised to address indirect emission of criteria pollutants.

Theme AIR 03

Theme Statement

The project fails to quantify the amount and assess the impact of amphibole mineral fibers resulting from mining activities.

Thematic Response

FEIS Section 5.2.7.5.3 contains information on amphibole mineral fibers resulting from mining activities. The exact human health risk of amphibole mineral fiber exposure is not known, and it

is not possible to quantify amphibole mineral fiber emissions. Section 5.2.7.5.3 includes information on activities that can minimize fiber emissions, ongoing ambient monitoring to collect baseline mineral fiber data, and the commitment to continue fiber emission monitoring after start-up of the NorthMet Project Proposed Action, for comparison to the baseline. Amphibole mineral fiber emissions would also be addressed during air permitting.

Theme AIR 04

Theme Statement

The project does not account for the impacts of planned air pollution control measures/equipment on other resources, such as plants and surface water, in the area around the plant.

Thematic Response

The modeling completed for the FEIS includes all facility emissions, taking into account air pollution control mechanisms, where appropriate.

Theme AIR 05

Theme Statement

The project does not accurately quantify or account for the impacts (e.g., reactivity) of fugitive dust emissions on human health and the environment, including plants and surface water, in the area around the plant.

Thematic Response

The NorthMet project would have fugitive dust emissions. To evaluate the impact of those fugitive dust emissions, air quality modeling was conducted to assess impacts from those emissions. The FEIS quantifies fugitive dust emissions. Language has been added to FEIS Section 5.2.7.1.1 that describes the purpose of the Secondary NAAQS, including as they relate to fugitive dust emissions. The modeled results determined impacts to be below applicable air quality standards. The FEIS used the evaluation criteria available to determine impacts. Secondary ambient air quality standards are used to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Significant impact on water resources or historic properties from dust is not expected because areas with the potential to generate dust would be controlled by a Fugitive Dust Control Plan and any dust leaving the site would most likely come from sources that would be characterized as having low sulfide/low metal content.

All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project Proposed Action area, rock dumping and loading locations on the Mine Site, and areas potentially subject to wind erosion on the Plant Site (see Sections 4.1.6 and 4.3.9 of PolyMet 2015a, as cited in the FEIS).

FEIS Sections 5.2.3.2.2 and 5.2.3.2.4 includes a discussion on the potential indirect deposition effects on wetlands from particulate emissions from the Mine Site, Transportation and Utility

Corridor, and the Plant Site. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those areas that had deposition rates greater than 100 percent of background deposition. These specific wetlands areas would be identified for consideration in any future monitoring to be conducted for the NorthMet Project Proposed Action. Please refer to theme WET 11 for more information.

Theme AIR 06

Theme Statement

The project does not adequately estimate mercury emissions from all sources, or the impacts of mercury on resources and human health.

Thematic Response

The FEIS estimates the mercury emissions from the NorthMet Project Proposed Action and other nearby sources, including their impact on mercury in fish tissue levels. The NorthMet Project Proposed Action does not jeopardize the State's mercury emission reduction goals, as discussed in FEIS Section 6.2.6.3. In addition, please see the responses to themes HU 02, HU 03, as well as the themes associated with Mercury (MERC 01 through 24).

Theme AIR 07

Theme Statement

The emission estimates for the project fail to adequately quantify or speciate the components of the emissions including those that cause odor.

Thematic Response

Emissions from the NorthMet Project Proposed Action are quantified and presented in FEIS Table 5.2.7-4. No odor-causing compounds are anticipated to result from the NorthMet Project Proposed Action. FEIS Section 5.2.7.1.3 has been revised to more clearly address comments associated with this theme.

Theme AIR 08

Theme Statement

The SDEIS does not adequately assess the air pollution caused by existing taconite ore processing facilities or further offsite processing of the project's final product.

Thematic Response

FEIS Table 6.2-7-4 (formerly Table 6.2-20 in the SDEIS) includes nearby source emissions, including existing (permitted allowed) and reasonable foreseeable sources. Ambient air modeling includes these sources, as well as background concentrations, which include regional emissions generated from vehicles, as well as both far-field and localized smaller sources. If further off-site processing is proposed in the future, it would be subject to all applicable permitting requirements. FEIS Section 6.2.7.3 has been revised to state that other sources and reasonable future activity are already included in the analysis.

Theme AIR 09

Theme Statement

The project fails to adequately assess the downwind interstate transport of mercury emissions.

Thematic Response

The introduction of FEIS Section 5.2.7.2.5 has been revised to clarification the discussion of mercury transport. FEIS Section 5.2.7.2.5 contains information on the mercury impacts of the NorthMet Project Proposed Action relative to the Minnesota statewide mercury TMDL.

Theme AIR 10

Theme Statement

The air dispersion modeling is not adequate for assessing the effects on plant life due to deposition.

Thematic Response

Title 42, Chapter 85, Subchapter I, Part A, Section 7408 (a)(2) of the Clean Air Act directs the USEPA to develop air quality criteria for air pollutants that have identifiable effects on public health or "welfare." The term "welfare" in the context of the CAA includes the protection of vegetation. As a result, the Secondary NAAQS are designed to be protective of plant life, including the effects of both concentration and deposition of material.

FEIS Section 5.2.7.1.1 has been revised to include the above language regarding plant life, the Secondary NAAQS, and the use of information gathered through the Integrated Science Assessment and Ecological Risk Assessment process. In addition, FEIS Section 5.2.7.1.4 includes the results of a deposition modeling assessment that assesses depositional impacts on nearby Class I areas.

Theme AIR 11

Theme Statement

The project does not adequately assess the contribution of the project to regional haze in Class I areas.

Thematic Response

FEIS Section 5.2.7.1.4 contains a Class I visibility impact analysis. The FEIS concludes that the NorthMet Project Proposed Action does not jeopardize the Minnesota's Regional Haze State Implementation Plan (MPCA 2009b, as cited in the FEIS). The full discussion of visibility impacts and Regional Haze is included in FEIS Section 6.2.7.6.

Theme AIR 12

Theme Statement

The SDEIS requires clarification of air quality terms, values, and concepts.

Thematic Response

The FEIS has been revised to better describe and provide updated values for air pollution control terms, values, and concepts, including:

- The Annual $PM_{2.5}$ Standard in FEIS Table 4.2.7-1 changed from 15 to 12 (footnote added to reflect December 2012 updated standard).
- The Sulfur Dioxide 3-hour Primary Standard value in FEIS Table 4.2.7-1 is aligned with "Primary" in the "Standard Type" column.
- The Sulfur Dioxide 1-hour Standard listed as 0.075 ppm identified as the state standard has been corrected to 0.5 ppm by volume. The federal standard remains 0.075 ppm.
- In FEIS Section 5.2.7.1.3, the last sentence of the third paragraph has been revised from "ambient air quality monitors" to "PM_{10} monitors."
- The column headings in FEIS Table 5.2.7-4 have been revised to include "controlled potential" parenthetically under the existing headings (which are acknowledged to be non-standard air permitting nomenclature).
- The title of FEIS Table 5.2.7-6 has been changed from "Annual Hazardous Air Pollutant Emissions for Prevention of Significant Deterioration-regulated Stationary Sources" to read "Annual Hazardous Air Pollutant Emissions."
- An explanation of the use of short tons has been added in FEIS Table 5.2.7-7 and metric tons in FEIS Table 5.2.7-8.
- A footnote has been added to FEIS Table 5.2.7-7, indicating that the emission estimates in the table are not proposed permit limitations.
- FEIS Section 5.2.7.1.4 has been revised to indicate that the North Shore Mine was determined to be permitted before the Prevention of Significant Deterioration (PSD) baseline date, and is not an increment-consuming source; therefore, it was not included in the increment modeling.
- The sentence reading "NO_x and SO_2 would be primarily emitted by mobile sources" was removed from FEIS Section 5.2.7.2.1.
- In FEIS Section 5.2.7.2.3, the sentence that reads, "The risk driver for acute inhalation was NO_2 from the natural gas combustion" has been revised to read, "The risk driver for acute inhalation was NO_2 from the diesel fuel combustion."
- The highest second-high PM_{10} concentration of 29 $\mu g/m^3$ for the year 13 operating scenario is shown in FEIS Table 5.2.7-11.

- In FEIS Section 5.2.7.5.1, the statement, "The State of Minnesota's definition of amphibole mineral fibers incorporates..." has been revised to read, "The State of Minnesota's definition of fibers incorporates..."
- In FEIS Section 5.2.7.1.1, the statement, "The NorthMet Project area has been designated by the USEPA as attainment for all air quality pollutants" has been revised to read, "The NorthMet Project area has been designated by the USEPA as attainment or unclassified for all air quality pollutants."
- As stated in the FEIS, all of the receptor nodes with the highest model-estimated deposition rates were located within the ambient air boundary.
- The distinction between metallic dust and sulfide dust has been clarified in the text.

Theme AIR 13

Theme Statement

Comments related to issues that will be determined in the air quality permitting process.

Thematic Response

Comments identified as permitting-related are outside of the scope of the FEIS, and would be resolved during air quality permitting. These are issues that would be negotiated by the applicant and MPCA; the public would be involved through the permit review process. The role of the air permitting process is described in FEIS Section 5.2.7. In addition, the permitting authority of the MPCA is described in FEIS Section 4.2.7. Issues identified by comments in this theme that would be part of the air permitting process include:

- Ambient air quality monitoring;
- Air emissions monitoring;
- Air emissions reporting;
- Emission limits and averaging times;
- Permit limit compliance demonstration;
- Additional air emission mitigation measures; and
- Permitting applicability.

Theme AIR 14

Theme Statement

General statements of support for the Project based on perceived compliance with air quality regulations.

Thematic Response

These comments have been received and acknowledged by the Co-lead agencies. No specific information related to the environmental effects of the NorthMet Project Proposed Action was provided. No changes were made to the FEIS in response to these comments.

A.5.2 Issue: Alternatives (ALT)

Theme ALT 01

Theme Statement

The FEIS should evaluate an underground mining alternative. Such an alternative would cost more, but would have environmental benefits, such as greatly reducing forest, rare habitat, and wetland losses. The company's economic analysis of the underground mining alternative lacks support, and the assumed costs for water treatment for that alternative should be updated, especially considering that perpetual water treatment might not be necessary. Economics alone should not eliminate an alternative from consideration in the FEIS. A cost/benefit analysis should be done for this alternative. Tribal Cooperating Agencies identified this deficiency in the DEIS, consistently brought it forward for discussions throughout the SDEIS process, and USEPA cited the lack of alternatives as a factor when issuing an EU-3 rating for the DEIS.

Thematic Response

The Underground Mine alternative was first considered but eliminated during the Final Scoping Decision Document (FSDD) process. FEIS Section 3.2.3.4.1 describes how it was re-considered during the DEIS process as alternative E7 in response to Cooperating Agency and stakeholder comments, but eliminated from further consideration. The economic feasibility of the Underground Mine alternative was re-considered during development of the SDEIS. In response to a request from the Co-lead Agencies, PolyMet's consultants prepared an updated economic assessment of underground mining, which the Co-lead Agencies independently evaluated (see FEIS Appendix B). The Co-lead Agencies concluded that an underground mine would not be economically feasible, regardless of the tonnage extracted. In addition, the lower rate of ore production would not meet the Purpose and Need of the project. Although the Underground Mine alternative would offer environmental benefits over the NorthMet Project Proposed Action, it would result in reduced socioeconomic benefits. A position paper (FEIS Appendix B) was prepared to document the Co-lead Agencies' rationale for eliminating the Underground Mine alternative from further consideration.

FEIS Section 5.2.10.1.4 states, "neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric. However, this EIS acknowledges that economic costs and loss of non-market value may result from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."

Theme ALT 02

Theme Statement

An underground mining alternative does not require a land exchange.

Thematic Response

FEIS Section 3.3.3.3.6 states that a land exchange would not be needed if underground mining was proposed for the NorthMet Deposit.

See the response to Theme ALT 01 which discusses why the Underground Mine alternative is not reasonable.

Theme ALT 03

Theme Statement

The FEIS should evaluate a West Pit backfill alternative. This alternative would cost more but would have greater environmental benefits, such as reduced wetlands and water quality effects. The company's economic analysis for the West Pit backfill alternative lacks support. Economics alone should not eliminate an alternative from consideration in the FEIS. A cost/benefit analysis should be done for this alternative.

Thematic Response

The West Pit Backfill alternative (E20) was considered but eliminated during the development of the DEIS. It was eliminated from further consideration because it was determined that it would not offer significant environmental or socioeconomic benefits compared to the NorthMet Project Proposed Action and because backfilling the West Pit would prevent recovery of additional mineral resources. These factors are sufficient to qualify the West Pit Backfill alternative as unreasonable under NEPA, and justify its exclusion under *Minnesota Rules*, part 4410.2300, subpart G. It was re-considered in the SDEIS in response to DEIS comments from the Cooperating Agencies. A Co-lead Agencies memorandum (MDNR et al. 2013b, as cited in the FEIS) was prepared to summarize the decision-making process, which is referenced in FEIS Section 3.2.3.4.2. The Co-lead Agencies screened the alternative against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. It is also important to note that the Virginia formation in the East Pit is more reactive than the pit walls in the West Pit, and that the East Pit can

accommodate all of the reactive Category 2/3 and 4 waste rock. The opportunity to reclaim wetlands and vegetation at the Category 1 Waste Rock Stockpile footprint area would be a measurable environmental benefit offered by backfilling the Category 1 Stockpile into the West Pit. However, some degree of these vegetation and wetland impacts would occur and would require mitigation regardless of future backfilling or not, because of the need to "temporarily" store these materials until mining operations cease.

FEIS Section 5.2.10.1.4 states, "neither NEPA nor CEQ requires the cost and benefits of a proposed action to be quantified in dollars or any other common metric; however, this EIS acknowledges that economic costs and loss of non-market value may result from environmental and social effects. Also acknowledged is that the agreement on the value (i.e., the "cost") of environmental effects is often difficult to achieve. Therefore, the approach of this EIS is to evaluate environmental and social impacts directly, in the appropriate resource-specific section." CEQ regulations for implementing NEPA (40 CFR 1502.23) state that, "for purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."

Theme ALT 04

Theme Statement

A perpetual pumping alternative for the West Pit could mitigate or prevent long-term environmental damage. It would prevent a pit lake from forming, thus protecting surface and groundwater.

Thematic Response

An interagency memorandum was prepared regarding the West Pit Water Elevation Alternative (MDNR et al. 2014, as cited in the FEIS). This alternative includes both the option to maintain a dry West Pit through perpetual pumping and maintaining pit water levels below the elevation of the Partridge River. The alternative was screened against criteria used for other alternatives, including Purpose and Need, Technical and Economic Feasibility, Availability, and Environmental or Socioeconomic Benefit. The screening level assessment concluded that the alternative would meet all criteria except for the environmental or socioeconomic benefit criterion. Continuous dewatering of the West Pit would keep the pit walls exposed instead of covered by a pit lake as in the NorthMet Project Proposed Action. This exposure would potentially result in increased solute loading to a smaller pit lake volume, and thus higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time. The Co-lead Agencies recommend that the Alternative be considered as an adaptive mitigation measure in the event that monitoring during operations and reclamation indicate that implementing this action is better able to meet future environmental objectives, compared to the NorthMet Project Proposed Action.

Theme ALT 05

Theme Statement

The SDEIS fails to evaluate an alternative that would allow the West Pit to refill naturally without pumping, thereby avoiding effects on Yelp Creek.

Thematic Response

Allowing the West Pit to refill naturally without pumping water into the pit would keep the pit walls exposed for a longer time period, which would potentially result in increased solute loading to a smaller pit lake volume and higher concentrations of pollutants than under the NorthMet Project Proposed Action. Consequently, treatment would be required for a longer period of time.

In addition, groundwater from the West Pit is projected to flow towards the Partridge River rather than Yelp Creek under the NorthMet Project Proposed Action. The NorthMet Project Proposed Action would not be anticipated to have any different impact on Yelp Creek than would be expected with natural flooding. Allowing the West Pit to refill naturally without pumping water into the pit does not offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

Theme ALT 06

Theme Statement

The FEIS should address other alternatives, such as mine design alternatives, a reduced scale of operations, paste tailings, more waste rock backfilling for wetland benefits, and limestone addition to reduce sulfate levels.

Thematic Response

An off-site disposal of waste rock alternative (E1) and off-site subaqueous in-pit disposal of waste rock in the LTVSMC Area 3 pit or other Dunka pits alternatives (E2, E6) were considered but eliminated in the DEIS. The Co-lead Agencies determined after independent review that off-site subaqueous disposal of waste rock would not have environmental benefits greater than on-site subaqueous disposal. In addition, the alternatives were eliminated because of the added potential impacts associated with transporting waste rock off site, or because off-site locations were insufficient in storage capacity or unavailable due to access rights.

The Co-lead Agencies considered several different reduced scales of operation (e.g., E21), but each was deemed unreasonable and eliminated because they were not economically feasible and/or they did not significantly reduce environmental impacts.

A thickened tailings (paste tailings) alternative (A1) was considered but eliminated in the DEIS and post-DEIS, as it was found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

FEIS Section 3.2.2.1.10 states that waste rock would be backfilled into the East Pit starting at year 11 and in the combined East Central Pit starting in year 16. After backfilling is complete, a wetland would be constructed over the combined East Central Pit.

FEIS Section 3.2.2.1.10 also discusses the possibility of adding lime to the East Pit during waste rock backfilling in order to maintain circumneutral pH in the pit pore water. The volume of lime required would be determined through monitoring during operations. During reclamation, water from the West Pit would be treated at the Wastewater Treatment Facility (WWTF), which would be upgraded to include a Reverse Osmosis (RO) treatment unit (or equivalent performing technology) to meet applicable water quality standards.

Theme ALT 07

Theme Statement

The SDEIS does not adequately analyze major design alternatives, such as the use of liners for the Overburden Storage and Laydown Area or Category 1 Stockpile.

Thematic Response

As described in the FEIS, liners would be installed for stockpiles or areas where there is a potential to generate acid and/or metal leachate from potentially reactive waste. Temporary stockpiles (Category 2/3 and Category 4) and the Ore Surge Pile would contain a liner. The Category 1 Stockpile would have a containment system to collect seepage, which would be pumped to the WWTF. The Overburden Storage and Laydown Area would hold peat soils and unsaturated overburden, which are not considered to be reactive.

The EIS scoping process, as documented in the FSDD, examined several modified design alternatives, as well as multiple mitigation and monitoring measures. The 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) also discussed a liner system as part of its consideration of a modified design or layout at the Mine Site. Key aspects of this alternative from the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) were incorporated into the NorthMet Project Proposed Action and assessed in the SDEIS.

Theme ALT 08

Theme Statement

The FEIS should consider an alternative that employs fly ash as a solution to potential acid mine drainage. For example, fly ash could be used as a mine cap and/or a neutralizing agent in the mine pit.

Thematic Response

The analysis in the FEIS shows that the treatment and mitigation measures employed as part of the NorthMet Project Proposed action would prevent acid mine drainage.

During operations, water from the mine pits would be treated at the WWTF. During reclamation, water from the West Pit would be treated at the WWTF, which would be upgraded to include a RO treatment unit (or equivalent performing technology). Treatment at this unit would result in an effluent that meets all applicable water quality standards.

FEIS Section 3.2.2.1.10 discusses the possibility of adding lime to the East Pit during waste rock backfilling in order to maintain circumneutral pH in the pit pore water. The necessity of this mitigation measure and the volume of lime required would be determined through monitoring.

Fly ash is regulated by the Minnesota Pollution Control Agency (MPCA) under their Industrial Solid Waste Rules and is proposed to be regulated by the U.S. Environmental Protection Agency (USEPA) under their draft amendment to the Resource Conservation and Recovery Act (RCRA) Subtitle D. In general, fly ash must be disposed of within a lined facility or be used in a manner approved by appropriate regulation. With the exception of beneficial use as a cement replacement, studies, permits, and approvals are required for both fly ash disposal and beneficial use. The potential use of fly ash could be assessed during the permitting process.

Theme ALT 09

Theme Statement

The FEIS should consider alternative means of storage, recycling, transport, and disposal of mining operation by-products, such as hydrometallurgical residue or reject concentrate.

Thematic Response

The FEIS discusses the storage, recycling, transport, and disposal of mining operation byproducts. For example, FEIS Section 3.2.2.3.7 describes the management of hydrometallurgical residue, which would be disposed of in the Hydrometallurgical Residue Facility. The facility would be located at the existing LTVSMC Emergency Basin. This facility would include a double-lined cell that could be expanded vertically and horizontally, as needed. The water ponded at the Hydrometallurgical Residue Facility would be returned/recycled to the Hydrometallurgical Plant as much as possible. Because solids from the Mine Site WWTF would be similar to hydrometallurgical residue, they would be recycled directly into the Hydrometallurgical Plant and disposed of in the Hydrometallurgical Residue Facility. Transporting these materials to an off-site location was found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

FEIS Section 3.2.2.3 also explains that reject concentrate from the Plant Site WWTP would be treated at the Mine Site WWTF. In the long term, reject concentrate from the WWTP and the WWTF would be evaporated, and the residual solids disposed of at appropriate off-site facilities (see FEIS Sections 3.2.2.1.10, 3.2.2.3.12).

Theme ALT 10

Theme Statement

The FEIS should evaluate different Tailings Basin design alternatives, such as a lined facility or a different location. Specifically, the FEIS should evaluate paste tailings placed on a lined and covered facility.

Thematic Response

FEIS Table 3.2-17 compares the previous alternatives that were screened for the SDEIS. An off-site subaqueous in-pit disposal of tailings alternative (E5) was considered but eliminated in the DEIS. The Co-lead Agencies determined after independent review that off-site subaqueous disposal of waste rock would not have environmental benefits greater than on-site subaqueous disposal. In addition, the alternatives were eliminated because of the added potential impacts

associated with transporting waste rock off-site or because off-site locations were insufficient in storage capacity or unavailable due to access rights.

A thickened tailings (paste tailings) alternative TB-1 was considered but eliminated in the DEIS, and post-DEIS it was reconsidered and determined not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

A co-disposal of waste rock and tailings on a lined tailings basin alternative (E14) was considered but eliminated in the DEIS because it was not technically feasible and its economic feasibility was uncertain. Several different Tailings Basin alternatives (TB2-TB6) were reconsidered but eliminated during the SDEIS process. These Tailings Basin alternatives did not afford significant environmental benefits when compared to the enhanced engineering controls (seepage collection and RO mechanical water treatment) built into the NorthMet Project Proposed Action. A dry cap alternative was considered; however, seepage was predicted to result in substantially higher constituent concentrations.

After the close of the comment period on the SDEIS, but prior to publication of the FEIS, an Independent Expert Engineering Investigation and Review panel issued a *Report on Mount Polley Tailings Storage Facility Breach* (IEEIRP 2015). This report was reviewed by geotechnical staff from the Co-lead Agencies as part of developing this response. The report contained general recommendations that can be considered to reduce the risk of tailings dam failures. Environmental review of the NorthMet Project considered design and siting features similar to the recommendations in the report. The specific use of dry stacking technology would increase tailings basin stability, but when other site specific and environmental factors are considered, this alternative technology does not have significant environmental benefit over the proposed Project. Other factors considered included:

- Industry standard for dry stacking includes the use of a basin liner. Construction of a basin liner on the existing LTVSMC tailings basin has been evaluated and determined not to be feasible.
- Use of dry stack technology would require a new tailings basin to be constructed in a different location as a lined dry stack basin. A separate dry stack tailings basin would increase footprint effects of the project.
- The proposed Project addresses legacy water quality issues of the LTVSMC tailings basin while making use of the brownfield site for tailings disposal. A separate dry stack tailings basin would not address LTVSMC tailings basin legacy issues.

Theme ALT 11

Theme Statement

The FEIS should address Tailings Basin emergency overflow channel alternatives.

Thematic Response

According to *Minnesota Rules*, part 6132.2500, Tailings Basin designs must ensure that probable maximum precipitation (PMP) rainfall events do not result in overtopping the basin. The emergency overflow channel is a design feature required to prevent Tailings Basin failure in such

a situation. The emergency overflow for the Tailings Basin is discussed in the FEIS Section 3.2.2.3.10.

FEIS Table 3.2-17 compares the previous alternatives that were screened for the SDEIS. Various modified designs of the Tailings Basin and tailings management technologies were considered as an alternative (A1) during the DEIS process, but were found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

Theme ALT 12

Theme Statement

Water from Colby Lake for ore processing may not always be available. The FEIS should evaluate alternative sources, such as spring snow-melt.

Thematic Response

FEIS Table 3.2-17 describes an alternative that was considered in the DEIS (E19) that would have used non-contact stormwater from the Mine Site detention pond as process water at the Plant Site, to reduce withdrawals from Colby Lake. The Co-lead Agencies eliminated this alternative because it was found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action, as it would reduce the flow in the Partridge River. The water needed for ore processing would primarily be from the Tailings Basin pond and collected seepage. Colby Lake make-up water would only be drawn on an as-needed basis. Water management of the NorthMet Project Proposed Action changed since the publication of the SDEIS. Predicted average annual demand for Colby Lake water decreased from 1,170 gpm to 760 gpm.

Theme ALT 13

Theme Statement

The FEIS should specifically consider (or consider in greater detail) alternative designs and operational approaches that reduce air emissions and water contamination, while mitigating effects on aquatic ecosystems, wetlands, or important habitat types. Examples include earlier use of the reverse osmosis (RO) system beginning in year one, a Category 1 Stockpile liner, and other efforts to reduce or foreshorten the reactivity of waste rock and tailings.

Thematic Response

The WWTP would include a RO unit or equivalent technology beginning year one throughout operations, while the WWTF would be upgraded to include a RO unit or equivalent technology during closure. The Category 1 Stockpile would have a containment system to collect seepage that would be pumped to the WWTF.

Alternatives to the NorthMet Project Proposed Action were identified in accordance with the requirements of NEPA and MEPA. Engineering controls and mitigation measures have been incorporated into the NorthMet Project Proposed Action to minimize effects, including air emissions and water contamination, to subsequently minimize potential effects to aquatic ecosystems, wetlands, or other important habitat types. Refer to FEIS Section 3.2.3.3 for more

information on the development of the NorthMet Project Proposed Action and alternatives. Refer to FEIS Table 3.2-16 for the engineering controls adopted into the NorthMet Project Proposed Action since the DEIS in order to reduce emissions and mitigate impacts. During operations, extensive monitoring would be required, and adaptive management would be used to ensure minimization of effects and compliance into the future.

FEIS Table 3.2-17 compares the previous alternatives that were screened for the SDEIS. Alternatives were considered in the SDEIS (E2, E6) that would transport the Category 2/3 and Category 4 waste rock and/or tailings to an off-site pit for subaqueous disposal. These alternatives were eliminated because the added impacts associated with transport were found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

Theme ALT 14

Theme Statement

The SDEIS does not provide an adequate analysis of the No Action Alternative. In particular, there is no detailed discussion of the No Action Alternative, and the analysis provided does not accurately characterize changes that would occur under the Cliffs Erie Consent Decree, in the absence of the Project. In particular, the SDEIS does not recognize the direct and indirect effects on wetlands from the No Action Alternative.

Thematic Response

FEIS Section 3.2.3.2 discusses how the Consent Decree under the NorthMet Project No Action Alternative would require Cliffs Erie to complete closure and reclamation activities at the Plant Site. This would include completing activities for the localized affected areas under the Minnesota Voluntary Investigation and Cleanup (VIC) Program, removal of the former Plant Site building, and management of seepage at the Tailings Basin embankment. FEIS Table 3.2-1 shows that under the NorthMet Project No Action Alternative, there would be no mining activities, and that existing management and land use of the federal lands would continue. The NorthMet Project No Action Alternative is also analyzed under each resource area in FEIS Chapter 5, and summarized in FEIS Table 7.2.4-1. FEIS Section 5.2.3.4 identifies that under the NorthMet Project No Action Alternative, there would be no direct or indirect effects on wetlands.

Theme ALT 15

Theme Statement

The FEIS should analyze an alternative that achieves no active treatment (zero discharge) at closure.

Thematic Response

The DEIS considered two potential options that could be considered as no active treatment, or zero discharge, scenarios. They involved pre-treatment of reactive runoff from the Mine Site and process water from the Plant Site Tailings Basin, and discharge this water to the Cities of Hoyt Lakes' or Babbitt's Publically Owned Treatment Works (POTWs). See FEIS Table 3.2-17 for

alternatives E16 and E17, respectively. These alternatives were eliminated because the nearby POTW facilities would not have enough capacity to handle the projected volume of water, and were found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action. FEIS Sections 3.1.1.7 and 3.2.1 indicate that a goal for long-term water treatment in the NorthMet Project Proposed Action is to provide mechanical or non-mechanical treatment for as long as necessary to meet regulatory standards at applicable groundwater and surface water compliance points.

Minnesota Rules, part 6132.3200, subpart 2.E.6 allow for closure and post-closure maintenance, and state that post-closure maintenance includes those techniques or activities that are required to meet closure objectives. PolyMet plans to do pilot-scale testing of non-mechanical water treatment technologies (e.g., Permeable Reactive Barriers [PRBs], Sulfate Reducing Bacteria [SRB] cubes, etc.) during mine operations and following closure until an acceptable treatment performance could be achieved for full scale implementation.

Theme ALT 16

Theme Statement

The FEIS should identify and analyze alternatives that use more modern, less environmentally damaging mineral extraction techniques, including underground mining.

Thematic Response

As discussed in the response to Theme ALT01, the Co-lead Agencies considered an Underground Mine alternative that could have offered environmental benefits when compared to the NorthMet Project Proposed Action. A position paper (FEIS Appendix B) documents the Co-lead Agencies' rationale to eliminate the Underground Mine alternative from further consideration, because it would not meet the Purpose and Need and would not be economically feasible.

FEIS Table 3.2-17 states that other hydrometallurgical technologies were considered in an alternative (E8), but eliminated in the FSDD. The Co-lead Agencies concluded that these hydrometallurgical technologies were found not to offer significant environmental benefits when compared to the NorthMet Project Proposed Action.

Theme ALT 17

Theme Statement

The FEIS should address other alternatives, such as solar hydrogen or fumarole biotics to reduce sulfate levels. Use of slowly biodegradable electron donor materials should be considered.

Thematic Response

The Co-lead Agencies considered a reasonable range of alternatives during screening. FEIS Sections 3.1.1.7 and 3.2.1 indicate that a goal for long-term water treatment in the NorthMet Project Proposed Action is to provide mechanical or non-mechanical treatment for as long as necessary to meet regulatory standards at applicable groundwater and surface water compliance points. The Permit to Mine may also include a requirement to perform pilot testing on non-

mechanical treatment methods during operations. After closure, water from the West Pit would be treated at the WWTF, which would be upgraded to include a RO treatment unit (or equivalent performing technology). Treatment at this unit would result in an effluent that meets all applicable water quality standards, eliminating the need for alternative technologies in the mine pits. Similarly, water that could not be stored in the Tailings Basin would be treated at the WWTP, which would include a RO treatment unit (or equivalent performing technology).

Theme ALT 18

Theme Statement

Adaptive management is itself an alternative that must be analyzed in the FEIS.

Thematic Response

CEQ regulations (40 CFR 1502.14(f)) do not require adaptive management to be analyzed as its own alternative. Further, USEPA guidance on utilization of adaptive management defines it as a decision making process that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood - not as a separate alternative for NEPA purposes. The FEIS discusses adaptive management in Section 5.2.2.3.5.

Theme ALT 19

Theme Statement

The FEIS should evaluate alternatives to open-pit mining such as hydrometallurgy, where a leach liquor solution is used to extract the precious metal.

Thematic Response

The Co-lead Agencies considered a reasonable range of alternatives during screening. As discussed in response to ALT 16, other hydrometallurgical technologies were considered in an alternative (E8) but eliminated in the FSDD (see FEIS Table 3.2-17). The Co-lead Agencies concluded that these hydrometallurgical technologies would have no significant environmental benefit when compared to the NorthMet Project Proposed Action.

Theme ALT 20

Theme Statement

The SDEIS fails to identify an Agency Preferred Alternative and/or a Least Environmentally Damaging Practicable Alternative (LEDPA).

Thematic Response

CEQ regulations (40 CFR 1502.14) states that based on the information and analysis presented in the affected environment and environmental consequences sections of an EIS, the EIS should present the environmental impacts of the proposal and the alternatives in comparative form to provide a clear basis for choice among the alternative options by the decision makers and the public. The regulations further state under 1502.14(e) that federal agencies shall identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and

identify such alternative in the final statement unless another law prohibits the expression of such a preference; however, the regulations do not require a rationale for the choice. No similar requirement to identify a preferred alternative exists for the MDNR under state law.

For the USFS, the Agency-Preferred Alternative is the Land Exchange Proposed Action described in Section 3.3.2. Potential effects specifically relating to the Land Exchange Proposed Action are identified in Sections 5.3 and 6.3. Table 7.3.5-1 summarizes potential effects relating to public interest factors considered for the Land Exchange Proposed Action and its alternatives. The FEIS Sections 3.2.3.4, 7.4, and 7.5 further detail this process.

Theme ALT 21

Theme Statement

Alternatives screening in Section 3.2.3 was flawed because it either eliminated alternatives or incorporated them into the project, rather than subjecting them to detailed review in the body of the SDEIS. This is not consistent with the purpose of an EIS, and is therefore a violation of the National Environmental Policy Act (NEPA).

Thematic Response

FEIS Section 3.2.3 describes how the alternatives were developed from initial project scoping through the SDEIS. Minnesota Rules and CEQ rules (40 CFR 1502.14) require a comparison of the effects of the proposed action and alternatives. The FEIS compares the effects of the NorthMet Project Proposed Action, NorthMet Project No Action Alternative, Land Exchange Proposed Action, Land Exchange Alternative B, and Land Exchange No Action Alternative.

The original project proposal and alternatives were developed during project scoping in 2005. The project was refined at various points in response to public and agency input. As a result, the NorthMet Project Proposed Action studied in the SDEIS incorporates additional engineering controls that were not part of the proposed action in the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The alternatives to the NorthMet Project Proposed Action that were eliminated during the scoping and DEIS phases of the project were re-assessed during development of the SDEIS.

Alternatives were eliminated from detailed evaluation if they did not offer substantial environmental or socioeconomic benefits, were not reasonable (were not technically or economically feasible), were not available, or would not meet the Purpose and Need. This review—beginning during the scoping process and concluding with the FEIS—is consistent with the alternatives review required by NEPA and MEPA, and with the CEQ rules for analyzing alternatives.

Theme ALT 22

Theme Statement

Section 3.2.3 of the SDEIS would be improved if it better reflected the thoroughness of the Co-lead Agencies' alternatives review, including review that occurred during scoping and the 2009 DEIS.

Thematic Response

Additional clarifying information has been included in the FEIS. The FEIS incorporates available and relevant details about the Co-lead Agencies' alternatives review, specifically in section 3.2.3. This section describes how the alternatives were developed from initial project scoping through the SDEIS. FEIS Table 3.2-17 identifies alternatives that were screened for the SDEIS.

Theme ALT 23

Theme Statement

The SDEIS analyzes an insufficient range of Land Exchange alternatives.

Thematic Response

Following the publication of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS), several land exchange alternatives were identified, screened, and made a part of the SDEIS scoping process. Some of the land exchange alternatives were ultimately eliminated from detailed analysis. The FEIS separately compares the Land Exchange Proposed Action, Land Exchange Alternative B, and Land Exchange No Action Alternative. FEIS Section 3.3.3 discusses the process by which land exchange alternatives were analyzed.

Theme ALT 24

Theme Statement

The SDEIS and associated documents provide sufficient alternatives analysis. However, additional detail is available and should be included in the FEIS.

Thematic Response

Additional clarifying information has been included in the FEIS. The FEIS incorporates available and relevant details about the Co-lead Agencies' alternatives review, specifically in Section 3.2.3. FEIS Table 3.2-17 identifies alternatives that were screened for the SDEIS, and FEIS Section 3.2.3 describes how alternatives were developed through a process from initial project scoping through the SDEIS (which includes the FSDD, DEIS, SDEIS, and FEIS—along with supporting attachments, appendices, and addenda).

A.5.3 Issue: Aquatic Species (AQ)

Theme AQ 01

Theme Statement

The SDEIS does not include adequate information and data on fisheries and aquatic organisms (e.g., microbiota; mollusks). The FEIS should include additional baseline data on the aquatic biota as well as habitat identification and monitoring, particularly of aquatic indicator species, in order to determine potential effects from the NorthMet Project. In addition, the assessment area defined by the Co-lead Agencies for effects on aquatic species from the Project is overly limited.

Thematic Response

Additional relevant aquatic species baseline data has been added to FEIS Tables 4.2.6-4, 4.2.6-5, and 4.2.6-6 in Section 4.2.6.1.3. Aquatic Monitoring would be finalized during permitting; however, overviews of water monitoring plans at the Mine Site and Plant Site are presented in FEIS Section 5.2.2.3.6. The NorthMet Project Proposed Action is not considered to have the potential for effects on hydrology and water quality in the St. Louis River Watershed. As a result, the assessment area for aquatic species is defined by the Partridge River and Embarrass River watersheds.

Theme AQ 02

Theme Statement

The SDEIS contains outdated information regarding tribal lake sturgeon (*Acipenser fulvescens*) reintroduction efforts. Uncontrolled contaminant loading from existing mine facilities, along with elevated constituents from the Proposed Project, have the potential to affect the successful establishment of a sustainable lake sturgeon fishery throughout the St. Louis River Watershed. Updated data on these efforts along with additional baseline data on the existing aquatic ecology is needed in order to determine potential effects on lake sturgeon from the Proposed Project.

Thematic Response

Existing data review from the Minnesota Department of Natural Resources (MDNR) and Fond du Lac Band of Lake Superior Chippewa (FDL) since publication of the SDEIS indicates recruitment and a viable population of lake sturgeon do exist in the St. Louis River Watershed (see FEIS Section 4.2.6). The NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River Watershed (see FEIS Section 5.2.6). As a result, no effects to lake sturgeon population within the St. Louis Watershed would occur.

Theme AQ 03

Theme Statement

The SDEIS states that the current fish tissue concentration in five local lakes results in Hazard Quotients that exceed 1, but gives no further information. The actual values of the Hazard Quotients and their meaning should be included in the FEIS.

Thematic Response

Information pertaining to the specific Hazard Quotients summarized in the report *Cumulative Impacts Analysis, Local Deposition and Bioaccumulation in Fish* (Table 5 of Barr 2012b, as cited in the FEIS) and their significance have been included in the FEIS Section 6.2.6.3.3, which summarizes the cumulative effects assessment for mercury deposition.

Theme AQ 04

Theme Statement

The Index of Biotic Integrity scores in the SDEIS (Table 4.2.6-4) do not indicate good fish assemblage conditions.

Thematic Response

Index of Biological Integrity (IBI) scores were derived from two MPCA fish surveys conducted at sites MCA_97LS077 and MCA_09LS105. The scores of 61 and 87, respectively, represent average to good habitat quality. FEIS Table 4.2.6-4 has been edited to include data for 09LS105 and USFS_SBPR (see revised FEIS Figure 4.2.6-1). The IBI was not available for many of the Partridge River sites closest to the NorthMet Project area; however, the presence of one or more intolerant or intermediate species in each of these monitoring locations is one indication that quality habitat is present at these sites, and that chemical and physical stream deterioration is likely negligible.

Theme AQ 05

Theme Statement

Sulfates and toxic metals such as mercury, arsenic, copper, and nickel from the Project that are not captured for treatment would affect aquatic organisms—including their population size, community composition, and habitats. This may impact fish, mollusk, and wild rice resources and in turn affect people, birds, and wildlife that depend on fish and other aquatic organisms for food.

Thematic Response

The NorthMet Project Proposed Action is designed to capture sulfates and metals with engineering controls and adaptive management. FEIS Section 4.2 describes existing conditions that may be directly or indirectly affected by the NorthMet Project Proposed Action. Potential impacts to water resources and aquatic species from the NorthMet Project Proposed Action are discussed in detail in FEIS Section 5.2.2 and Section 5.2.6, respectively. The discussion in FEIS Section 5.2.6 now provides additional information on potential impacts to aquatic species from metals, specifically aluminum and lead. Water monitoring would ensure that water quality standards would be met with engineering controls. In addition, spill prevention plans would be implemented. These measures would minimize any potential impacts to aquatic species. See also the responses to themes AQ 06 and AQ 22.

Theme AQ 06

Theme Statement

The SDEIS does not address aquatic toxicity or effects on aquatic life from chemicals or other constituents in the Tailings Basin leachate or water leaving the Mine Site. Toxicity testing of mine waste, Tailings Basin and Hydrometallurgical Residue Facility leachates prior to issuing the FEIS would identify risks to aquatic life from inorganic ions as well as from metals solutes.

The FEIS should be revised to evaluate the significance of the potential effects on aquatic life from increased metal solutes under the NorthMet Project Proposed Action, including solutes not predicted to exceed water quality standards.

Thematic Response

Potential impacts to aquatic species from the NorthMet Project Proposed Action are discussed in detail in FEIS Section 5.2.6. The discussion in FEIS Section 5.2.6 now provides additional information on potential impacts to aquatic species from metals, specifically aluminum and lead. Toxicity testing of mine waste, Tailings Basin and Hydrometallurgical Residue Facility leachates themselves is not planned and are not necessary, because these are within the engineering controls; however, water monitoring, including Whole Effluent Toxicity (WET) testing, as appropriate, would ensure that water quality standards would be met with engineering controls. Specific monitoring details would be addressed in permitting. In addition, spill prevention plans would be implemented. See also the responses to themes AQ 05 and AQ 22.

Theme AQ 07

Theme Statement

To comply with NEPA and MEPA, the FEIS should provide substantially more information on the likely effects of aluminum and lead exceedances on the aquatic community.

Thematic Response

The discussion in FEIS Section 5.2.6 now provides additional information on potential impacts to aquatic species from metals, specifically aluminum and lead. An exceedance of aluminum could potentially affect aquatic species by causing pulmonary problems, developmental issues, and osmoregulatory disturbances (Soucek 2006, as cited in the FEIS). However, given the similarity between the Continuation of Existing Condition Scenario and the NorthMet Project Proposed Action, aluminum values at Embarrass River and Partridge River evaluation locations, impacts from aluminum to aquatic species due to the NorthMet Project Proposed Action are not anticipated. Lead does not bioaccumulate, and tends to decrease with increasing trophic levels in freshwater habitats. Exposure to high levels of lead could result in muscular and neurological degeneration and destruction, growth inhibition, reproductive problems, paralysis, and mortality in fish. It could also negatively affect invertebrate reproduction as well as reduce growth, photosynthesis, mitosis, and water absorption in aquatic plants (Eisler 1988b, as cited in the FEIS). The NorthMet Project Proposed Action is designed to capture metals with engineering controls and adaptive management. Water monitoring would ensure that water quality standards would be met with engineering controls. In addition, spill prevention plans would be implemented. These measures would minimize any potential impacts to aquatic species.

Theme AQ 08

Theme Statement

Acid mine drainage would pollute surrounding water and lower the pH of the water. Sulfuric acid runoff can kill many important fish species and can indirectly alter the food chain by reducing food availability for birds and other mammals. These consequences could impact the fishing industry and the health of those who consume fish (i.e., humans, birds, other wildlife) from areas exposed to acid mine drainage.

Thematic Response

The FEIS considers the release of acidity from proposed NorthMet facilities in that leachate from all acid-generating material (Waste Rock and pit wall rock composed of Category 2/3 and Category 4 material) would be captured and treated prior to discharge. The permanent surficial waste facilities (Category 1 Stockpile and Tailings Basin) would contain material that is not expected to produce acidic leachate. The non-acid generating waste was identified using multi-year kinetic tests (humidity cells) on NorthMet rock samples. Waste rock with 0.12 percent sulfide S or less is the threshold for selecting non-acid generation mine waste and, is supported by long-term humidity cell tests on NorthMet waste (i.e., 38 samples of Category 1 waste rock, with tests now run between 187 and 337 weeks; and 33 humidity cell tests run on NorthMet Tailings between 84 and 304 weeks [Attachments C and F, of PolyMet 2015q, as cited in the FEIS]). These tests demonstrate that tailings and Category 1 waste rock materials do not generate acidic leachate, and acid generation rates decreases over time as sulfide S minerals are depleted. The NorthMet Project Proposed Action design thus prevents the introduction of acidic leachate to surface water that could affect fisheries.

Theme AQ 09

Theme Statement

The SDEIS ignores the broad effects of underwater disposal on metal and other constituent concentrations. As the pits fill, the high concentrations of these parameters will seep or flow out of the pits, and will impact the adjacent wetlands and the Partridge River Watershed, as well as the aquatic life in them.

Thematic Response

The rate of oxidation and associated release of acidity and metals from waste rock and wall rock after it is submerged under water was considered by the Impact Assessment Process (see Table 1 of MPCA 2011d, as cited in the FEIS). Analysis found that after the rock was submerged by a layer of oxygenated water, the rate of oxidation in the rock would decrease by at least a factor of approximately 800 relative to the oxidation rate when it was exposed to atmospheric oxygen (Day 2008, as cited in the FEIS). Based on this analysis, which is consistent with general results of studies on subaqueous disposal of sulfide-bearing mine waste, the GoldSim model assumed that oxidation in submerged wall rock and waste rock was negligible. Therefore, modeling has indicated that the NorthMet Project Proposed Action would not impact the adjacent wetlands and the Partridge River Watershed, as well as the aquatic life in them. FEIS Section 5.2.5.2.3

discusses potential impacts to wildlife from incidental contact with the tailings basin pond and pit lakes. FEIS Section 5.2.2.3.6 discusses on-site monitoring.

Theme AQ 10

Theme Statement

Many Trust Resources will continue to have direct access to open water sources at the Mine Site (mainly migratory birds and northern long-eared bat). The FEIS should clearly state the anticipated water quality of the West Pit and East-Central Pit lakes and the potential for bioaccumulation of methylmercury from aquatic invertebrates and other food chain pathways, and should propose measures to minimize or mitigate for any effects on Trust Resources throughout the life of the mine and into reclamation phase.

Thematic Response

The Cultural Resources section of the FEIS Chapters 4 and 5 addresses the federal Co-lead Agencies' federal tribal trust responsibilities as part of the 1854 Treaty. These sections, along with other relevant natural resources sections of Chapters 4, 5, and 6, also address effects, and any proposed mitigation for effects, on cultural resources and culturally significant natural resources that do not qualify for listing on the National Register of Historic Places (NRHP).

Based on the results of water quality modeling, the water quality of the West Pit Lake, East Pit wetland and Tailings Basin pond is predicted to be at concentrations not injurious to wildlife. On-site monitoring of water bodies within facility boundaries would likely be a part of a monitoring program. Monitoring details would be finalized in the permitting process. FEIS Section 5.2.5.2.3 discusses potential impacts to wildlife from incidental contact with the tailings basin pond and pit lakes. FEIS Section 7.3.4 discusses potential human health impacts. FEIS Section 5.2.2.3.6 discusses on-site monitoring. FEIS Section 5.2.2.3.4 discusses bioaccumulation of methylmercury.

Theme AQ 11

Theme Statement

Several waterbodies within the Project area are impaired (as defined by the Clean Water Act) for Fishes Bioassessments, Mercury in Fish Tissue, and Aquatic Macroinvertebrates Bioassessments. Any additional releases of constituents, including metals such as mercury and copper, to the environment will exacerbate these already existing impairments.

Thematic Response

FEIS Section 4.2.2.1.2 and Table 4.2.2-2 identify the existing impairments of waters downstream of the NorthMet Project area. In particular, the Embarrass River is listed on the final 2012 "TMDL List" as impaired for Fishes Bioassessments, and the St. Louis River and several lakes in the Embarrass Chain of Lakes are listed as impaired for Mercury in Fish Tissue.

With respect to the Fishes Bioassessment impairment in the Embarrass River, the specific stressor (or pollutant) causing the impairment has not yet been identified – stressor identification studies are currently in progress by the MPCA to identify the cause of the impairment. Without

that identification, it is speculative to attempt to describe potential impacts on the impairment as a result of the proposed project. However, that said, the discharge from the Plant Site Wastewater Treatment Plant (WWTP) to the tributaries of the Embarrass River would be required to meet all applicable Water Quality Based Effluent Limits.

For the Mercury in Fish Tissue impairments, atmospheric deposition of mercury has been identified as the dominant source of mercury for these waters – this is summarized in FEIS Section 5.2.7.2.5. MPCA has conducted a review of potential mercury emissions from the proposed project and has determined that they would not impede the state's reduction goals (MPCA 2013l, as cited in the FEIS). Furthermore, discharges to surface water from the Plant Site WWTP and from the Mine Site Wastewater Treatment Facility (WWTF) are both expected to meet the 1.3 ng/L water quality standard for mercury at the point of discharge. Overall, the NorthMet Project Proposed Action is predicted to result in no increase in mercury loading and a net decrease in sulfate loading to downstream impaired waters (mercury and sulfate being contributory to methylation of mercury and accumulation of mercury in fish tissue) as compared to the Continuation of Existing Conditions Scenario. Potential impacts to water resources and aquatic species from the NorthMet Project Proposed Action are discussed in detail in FEIS Section 5.2.2 and FEIS Section 5.2.6, respectively. Water monitoring would ensure that water quality standards would be met with engineering controls. In addition, spill prevention plans would be implemented. These measures would minimize any potential impacts to aquatic species and ensure already existing impairments are not exacerbated.

Theme AQ 12

Theme Statement

The SDEIS completely ignores the potential for effects on aquatic fauna due to the reduction of sulfate to sulfide within the wetland environment. Considering that several streams within the Plant Site are on the impaired waters list for Fishes Bioassessments, PolyMet and the Co-lead Agencies need to investigate the role of sulfate in the degradation of aquatic wildlife before permitting any additional releases.

Thematic Response

Sulfur is one of six macronutrients essential for plant growth, and low levels of available sulfur have the potential to limit plant primary production (Marschner 1995, Leustek and Saito 1999). Sulfide is commonly found in the sufficiently saturated soils of wetland environments, and reduced sulfur compounds (i.e., sulfides) are known to be potent inhibitors of plant growth, as well as particular microbial processes (Wiessner et al. 2005). The reduction of sulfate can form insoluble sulfide precipitates, most commonly with iron in environments not contaminated with metals such as cadmium, copper, lead, or zinc; however, if the wetland dries as a result of flooding drought or other changes in hydrology, and aerobic conditions occur, the reaction would reverse and sulfates (along with their reactive metal counterparts) would once again become available (Schrauf and Smith 2005). The apex of the reduction of sulfate typically appears after aerobic conditions have been eliminated (i.e., flooding, sufficient saturation, etc.) and bacteria respire sulfate rather than oxygen. Following the depletion of oxygen, microbial respiration favors nitrate (NO_3), manganese (Mn), iron (Fe), and finally sulfate (SO_4) (Inglett et al. 2005). Sulfate is the last compound to be reduced in a wetland environment, resulting in the production

of hydrogen sulfide (H_2S), carbon dioxide (CO_2), and water (H_20). Free (not precipitated with metals) hydrogen sulfide can be highly toxic to plants and animals. However, toxic levels of sulfide can only accumulate in anaerobic conditions. If oxidation of the wetland soil occurs, the concentrations of sulfide would decrease, as would toxic accumulations. The difficulty in quantifying sulfide toxicity centers on other changes in the biochemical characteristics of the ecosystem, which often occur concurrently with the accumulation of sulfide, such as changes in salinity, substrate organic matter or composition, and the availability of oxygen and other macronutrients. Because there are many factors that control the net conversion of sulfate to sulfide, the degree to which the NorthMet Project Proposed Action might result in an increase in free hydrogen sulfide and result in a negative impact on wetlands, watercourses, or aquatic fauna is not well understood and cannot be confidently predicted at this time.

Theme AQ 13

Theme Statement

Project-related sulfate reduction would impact all types of aquatic flora in addition to wild rice.

Thematic Response

The reduction of sulfate results in the production of sulfide, including insoluble metal sulfides, if metals are available; however, in some instances, increased rates of sulfate inputs into a wetland system may result in the formation of free sulfide, which can function as a potent phytotoxin (Wiessner et al. 2005). The accumulation of toxic levels of sulfides is dependent on the maintenance of an anaerobic environment without oxidation of the substrate. The toxicity of sulfides varies greatly among species of plants and animals (Lamers et al. 2013). Research has shown that early successional plants typically have a lower tolerance of increased sulfide, as compared to that of late successional plants, such as shrubs and trees (Lamers et al. 2013).

Increased levels of sulfate in an aquatic ecosystem may or may not result in negative impacts to aquatic flora. Potential impacts resultant from increased sulfate inputs into an aquatic system are dependent on multiple variables including: the amount of existing organic material, temperature, amount of additional sulfate introduced, the species of organisms present within the ecosystem, and the availability of reactive metals. Therefore, the degree to which sulfate reduction may or may not impact all types of aquatic flora is not well understood and cannot be confidently predicted at this time.

Theme AQ 14

Theme Statement

The SDEIS fails to analyze specific conductivity and total dissolved solids, elements that are both governed by Minnesota water quality standards and are known to be stressors for aquatic life. Even though existing Tailings Basin seeps have exceeded standards for specific conductivity, the SDEIS neither reports existing conditions nor models effects of the Proposed Action on specific conductivity. To evaluate effects of the Proposed Action on aquatic life, the FEIS should analyze both specific conductance in the affected environment and predicted levels of this pollutant resulting from the Proposed Action.

Thematic Response

The SDEIS discussed Total Dissolved Solids (TDS) in Section 4.2.2 and Section 5.2.2. Minnesota does not have specific toxicity standards for TDS or specific conductivity and the water quality evaluation criteria used for TDS at the Tailings Basin are irrigation standards and not applicable to aquatic life. However, under the NorthMet Project Proposed Action, TDS concentrations were predicted to be below the current applicable 4A standards.

Baseline data for TDS and specific conductivity have been added to FEIS Section 4.2.2 and 4.2.6, respectively. Although neither of these parameters is included in the water model, the potential concentrations of TDS under the NorthMet Project Proposed Action and the CEC Scenario are calculated in Section 5.2.2.

Studies on the relationship between specific conductivity and aquatic life are ongoing; therefore, the degree to which the NorthMet Project Proposed Action could potentially affect aquatic species due to changes in specific conductivity cannot be conclusively determined. Adverse effects from the NorthMet Project Proposed Action are not anticipated because project-related conductivity and TDS releases are estimated to be lower than existing conditions. Water monitoring, including for TDS and specific conductivity, would ensure that water quality standards would be met with engineering controls and adaptive management. Specific monitoring details would be addressed in permitting. In addition, spill prevention plans would be implemented.

Theme AQ 15

Theme Statement

The FEIS should examine how aquatic and wetland species and communities in the Project area and downstream of the Project may be impacted by changes in water temperature, especially in relation to other parameters, due to the Project. The FEIS should determine whether warmed augmentation water from Colby Lake will kill off colder-water fish.

Thematic Response

The NorthMet Project Description has changed since the SDEIS. The FEIS Project Description indicates that no Colby Lake water would be used for direct surface water augmentation. All water used for stream augmentation would be treated prior to being added to hydrologically affected waters. Wyman Creek is the only designated trout stream in the NorthMet Project area; since no water is expected to be discharged there, temperature impacts to aquatic species are not anticipated. All other streams in the NorthMet Project area are classified as warm water streams; however, some Project area streams could exhibit cooler temperatures due to shading from riparian vegetation cover and the regional setting. Water temperatures for any treated water discharged to these streams would be regulated via the National Pollutant Discharge Elimination System (NPDES) process.

Theme AQ 16

Theme Statement

The FEIS should take into account not just the anticipated effects on aquatic species under the current climate, but the likely effects on aquatic species in the future under probable future climate scenarios.

Thematic Response

Effects of climate change on aquatic species was not identified as a concern during scoping and is beyond the scope of the FEIS analysis, because the effects to aquatic species under future climate scenarios is speculative. A preliminary qualitative assessment of water resources impacts due to climate change is provided in Attachment W of the NorthMet Project Air Data Package, Version 5. January 15, 2015 (PolyMet 2015e, as cited in the FEIS).

Theme AQ 17

Theme Statement

Increased calcium loads from mining discharges would enhance the zebra mussel's ability to colonize the watershed. The FEIS should analyze the consequences of increasing the amount of calcium in waters that could be invaded by zebra mussels.

Thematic Response

The water modeling results, which are discussed in FEIS Section 5.2.2, predict that calcium concentrations in surface water at the Plant Site would be lower under the NorthMet Project Proposed Action (max P90 concentrations in the tributaries range from 26.0 to 36.6 mg/L and in Embarrass River range from 23.4 to 41.5 mg/L) than under the CEC Scenario (tributaries range from 41.4 to 112 mg/L and Embarrass River range from 23.4 to 49.3 mg/L) due to project capture of Tailings Basin seepage. Calcium concentrations in surface water at the Mine Site are predicted to be similar under the NorthMet Project Proposed Action (range from 36.7 to 38.0 mg/L) and the CEC Scenario (range from 36.7 to 38.0 mg/L). Therefore, calcium concentrations in discharges from the NorthMet Project Proposed Action would not enhance the zebra mussel's ability to colonize either watershed as compared to the CEC Scenario.

Theme AQ 18

Theme Statement

The FEIS should address how listed and sensitive aquatic indicator species--including the mussel (*Ligumia recta*), Zigzag Darner dragonfly (*Aeshna sitchensis*), and the Lake Emerald dragonfly (*Somatochlora cingulata*)--will be impacted by the NorthMet Project. Two poorly chosen sampling sites missed an important indicator species—the mussel. Mussels are sensitive to sulfate, copper sulfate, and calcium arsenate levels and could be threatened by the Project or the alternative.

Thematic Response

There should be no direct effects to creek heelsplitter and black sandshell mussels from the NorthMet Project Proposed Action, because they have not been reported within the NorthMet Project area. Mussels were sampled in the NorthMet Project area at the Partridge River, Embarrass River, and Trimble Creek in 2004, and at two locations of the Partridge River in 2009 (Heath 2011, as cited in the FEIS; see FEIS Section 4.2.6.1.3 and FEIS Figure 4.2.6-3). Because the NorthMet Project Proposed Action would not result in any significant changes in habitat quality, flow regimes, or water quality (i.e., no project-caused exceedances of Class 2B water quality standards) in the NorthMet Project area, no effects to the habitat for these species are expected within the Partridge River or Embarrass River watersheds. FEIS Section 5.2.2 and FEIS Section 5.2.6 provide additional information on anticipated changes to flow regimes.

Theme AQ 19

Theme Statement

Amphibians are experiencing high rates of species extinction and seem to be very sensitive to environmental pollution. The FEIS should address how amphibians will be impacted by the NorthMet Project.

Thematic Response

The FEIS Section 5.2.5 (Wildlife) includes an analysis of hydrologic changes and impacts to amphibians or other sensitive species by cross-referencing Section 5.2.2 (Water Resources). The Wetland Data Package (PolyMet 2015b, as cited in the FEIS) XP-SWMM model estimates that changes in the average annual flow of the Partridge River and Embarrass River would be within naturally occurring annual variation; thus, there would be limited hydrologic changes. As a result, effects to amphibians and other sensitive wildlife species due to hydrologic changes would be limited. The NorthMet Project Reclamation Plan (PolyMet 2015g, as cited in the FEIS) explains that when roads or railroads are abandoned, culverts would be removed to prevent damming and access impediments for aquatic life. These locations would also be graded and vegetated to provide a stable stream bank. The Reclamation Plan states that during reclamation monitoring and maintenance, areas that have been damaged by erosion, animal activity (e.g., beaver dams), or that have lost vegetation would be identified and repaired.

Theme AQ 20

Theme Statement

The Embarrass River and Partridge River watersheds have some of the highest condition and watershed integrity scores in the St. Louis Watershed. Biological monitoring of the NorthMet Project site indicates the waters are capable of supporting many important fish and macrobiotic species. Specialists should be used to move/relocate aquatic species, including micro and macroinvertebrates in base sediments that would be harmed by Project activities. Failure to do so will result in loss of wildlife and destruction of food chains.

Thematic Response

Both the Embarrass River and Partridge River watersheds are listed for "Mercury in fish tissue" and "Fishes Bioassessments" impairments. Portions of the Embarrass River are also listed for "Macroinvertebrate Bioassessments" impairment. These impairments are discussed in FEIS Section 4.2.2.1.2.

Water monitoring (see FEIS Section 5.2.2.3.6) would ensure that water quality standards would be met with engineering controls. In addition, spill prevention plans would be implemented. These measures would minimize potential impacts to aquatic species. The need for biological monitoring would be determined in permitting.

Aquatic species would not be moved or relocated, because there is high mortality associated with relocation of wildlife. Relocation is often not successful, because it is stressful to the organisms, which makes them more vulnerable to disease and predation. Relocation also forces the relocated organisms to compete with established species for food and shelter, and increases the risk of the spread of diseases to new areas.

Theme AQ 21

Theme Statement

Because waterbodies in northern Minnesota are oligotrophic and often have long water residency times, the influences of mining contaminants can be long lasting. Decomposition and growth is slow in these systems, which can equate to more accumulation of toxins in sediments and increased bioaccumulation of toxins in the tissues of animals such as fish.

Thematic Response

Potential impacts to water quality from the NorthMet Project Proposed Action are discussed in FEIS Section 5.2.2. Most Minnesota Class 2 water quality standards (upon which project evaluation criteria were based) apply to all waters of the state in the NorthMet Project area, regardless of the trophic status of the water. Lakes downstream of the NorthMet Project area (Colby and Whitewater Lakes in the Partridge River Watershed and Wynne, Sabin, and the Embarrass chain of lakes in the Embarrass River Watershed) are riverine lakes, and do not have particularly long residence times. Water monitoring would ensure that water quality standards would be met with engineering controls. In addition, spill prevention plans would be implemented. These measures would minimize potential impacts to aquatic species. Moreover, water flow alterations would not cause measurable changes in ecosystem function if maintained under twenty percent of baseline flows.

Theme AQ 22

Theme Statement

The FEIS should address the probability, impact potential, and aquatic toxicity potential of an accidental release of chemicals and untreated water at the Mine Site and Plant Site.

Thematic Response

Stability modeling and the rationale for the design are discussed in FEIS Section 5.2.14. Final design is subject to permitting under the requirements of the MDNR Dam Safety Permit and Permit to Mine. The potential effects of hypothetical failure scenarios have not been assessed in this FEIS, as the risk of failure is mitigated through application of design and safety requirements including adaptive management procedures.

Potential impacts to aquatic species from the NorthMet Project Proposed Action are discussed in detail in FEIS Section 5.2.6. Testing for aquatic toxicity of the seepage or leachate from the various mine wastes (i.e., waste rock, tailings or Hydrometallurgical Residue Facility residues) prior to their treatment at the WWTF and/or WWTP is not expected, since these are internal waste streams that are not discharged untreated to the environment. Toxicity testing (Whole Effluent Testing or WET testing) of the treated discharges from the WWTP and WWTF to the environment, is anticipated to be included as a requirement of the water quality permit. Specific monitoring details would be addressed in permitting. In addition, spill prevention plans would be implemented. See also the responses to themes AQ 05 and AQ 06.

Theme AQ 23

Theme Statement

The SDEIS did not evaluate impacts to aquatic ecosystems from the volume as well as chemical composition of Wastewater Treatment Facility (WWTF) effluent that would be discharged to the Partridge River.

Thematic Response

By comparing modeled project water quality against evaluation criteria based, in part, on Class 2B water quality standards (protection of aquatic life and recreation), the SDEIS did indirectly evaluate impacts to aquatic ecosystems. Evaluation criteria can be found in Section 5.2.2. Water quality monitoring to be conducted pursuant to NPDES/State Disposal System (SDS) permitting would ensure that water quality standards would be met with engineering controls. In addition, spill prevention plans would be implemented. These measures would minimize potential impacts to aquatic species. Water flow alterations would not cause measurable changes in ecosystem function if maintained under twenty percent of baseline flows.

Varying degrees of hydrologic alteration can be tied to ecological condition using the Limits of Hydrologic Alteration (LOHA) Method, which is intended to provide a better articulation of the aspects of flow rate and timing thought to be most important to ecological condition, and provide more elaboration on the ecological changes that are associated with increasing degrees of hydrologic alteration. Research in review lists 10 percent, 20 percent, and greater than 20 percent flow alteration as setting the ecological condition of “natural,” “minimally altered,” and

"moderately altered," respectively. A review of case studies (Richter et al. 2011, as cited in the FEIS) found that recommendations for flow protection are quite consistent, typically resulting in a range of allowable cumulative depletion of 6 percent to 20 percent of normal to low flows, but with occasional allowance for greater depletion in seasons or flow levels during which aquatic species are thought to be less sensitive.

Based on the professional application of accumulated science, the MDNR has determined that monitoring should be conducted at a minimum of 3 sites for each impacted stream whenever there is a 20 percent change in watershed area or an extraction or addition of flow that exceeds 20 percent of the mean annual flow (MAF). Monitoring sites should be located:

1) within 2000 feet of the (each) outflow;

2) at the endpoint of impact; and,

3) midway between the two.

The only surface water discharge from the Mine Site to the Partridge River is the discharge of treated Category 1 Stockpile drainage and West Pit water via the WWTF in long-term closure. This discharge is included in the GoldSim model at location SW004a. The XP-SWMM model estimates an average annual flow of 1.2 cfs at the approximate location of the WWTF discharge under existing conditions. The estimated average annual flow at this location in long-term closure is increased to 1.4 cfs (due to changes in upstream watershed areas and the addition of the WWTF discharge). However, as a whole, the NorthMet Project Proposed Action would reduce flow within the Partridge River by a maximum of eight percent, respectively. Therefore, flow changes due to the NorthMet Project Proposed Action are anticipated to be within the natural ecological condition and have minimal impacts to ecosystem function.

Theme AQ 24

Theme Statement

Aquatic organisms that live in the streams, rivers, and wetlands in the Project area would likely be adversely affected by changes in streamflow and loss of connectivity of the streams. The conclusion in the SDEIS that allowing up to a 20 percent change in streamflow volumes is protective of aquatic life is unsubstantiated. For example, the SDEIS lacks details on potential effects on aquatic ecosystems from hydrologic changes resulting from the NorthMet Project in the Partridge River Watershed, including Yelp, Wetlegs, Wyman, Longnose, and Unnamed creeks as well as the Partridge River.

Thematic Response

Flow within both the Embarrass River and Partridge River would be reduced by a maximum of two percent and eight percent, respectively. Varying degrees of hydrologic alteration can be tied to ecological conditions using the LOHA Method, which is intended to provide a better articulation of the aspects of flow rate and timing thought to be most important to ecological condition, and provide more elaboration on the ecological changes that are associated with increasing degrees of hydrologic alteration. Research in review lists 10 percent, 20 percent, and greater than 20 percent flow alteration as setting the ecological condition of 'natural', 'minimally altered', and 'moderately altered', respectively. A review of case studies (Richter et al. 2011, as cited in the FEIS) found that recommendations for flow protection are quite consistent, typically

resulting in a range of allowable cumulative depletion of 6 percent to 20 percent of normal to low flows, but with occasional allowance for greater depletion in seasons or flow levels during which aquatic species are thought to be less sensitive.

Based on the professional application of accumulated science, the MDNR has determined that monitoring should be conducted at a minimum of 3 sites for each impacted stream whenever there is a 20 percent change in watershed area or an extraction or addition of flow that exceeds 20 percent of the mean annual flow (MAF). Monitoring sites should be located:

1) within 2000 feet of the (each) outflow;

2) at the endpoint of impact; and,

3) midway between the two.

Flow reductions due to the NorthMet Project Proposed Action are anticipated to be within the natural ecological condition and have minimal impacts to ecosystem function. Moreover, geomorphic surveys of the Partridge River and the unnamed creek south of Dunka Road indicate that the upper reaches of these systems are near 100 percent vegetated, and that the influence of riparian vegetation is very high. Moderate changes to flow within these systems are expected to be protected by the riparian vegetation, and these reaches are expected to be stable under moderate changes to stream flow and sediment supply (Barr 2013a, as cited in the FEIS). This characteristic is evident within these reaches as hydrologic changes are often caused by the influence of beaver dams.

Theme AQ 25

Theme Statement

The FEIS should include quantitative modeling in addition to the existing qualitative discussion for effects on fish. Specific analysis should include: mercury, methylmercury, specific conductance, and discharge and hydrologic changes.

Thematic Response

Hydrologic changes to the Partridge River were modeled and are discussed in FEIS Section 5.2.2. In addition, PolyMet performed geomorphology studies on the channel downstream of the proposed West Pit/WWTF discharge (Rosgen Classification: Unnamed Creek South of Dunka Road, Barr 2013o, as cited in the FEIS). Modelling predicted the mean flow would change by 5 percent or less during operations and reclamation, and would return to within approximately 1 percent of existing flow conditions during closure and long-term maintenance (see Figure 5.2.2-29). Additionally, a Level I Geomorphic Survey of the Partridge River determined the river to be stable under existing conditions, with no evidence of erosion except in its headwaters, well-armored steep reaches and flatter reaches with well-vegetated shorelines. See also the response to theme AQ 24.

Studies on the relationship between specific conductivity and aquatic life are ongoing. Therefore, the degree to which the NorthMet Project Proposed Action could potentially affect aquatic species due to changes in specific conductivity cannot be determined. Water monitoring, including for specific conductivity, would ensure that water quality standards would be met with engineering controls and adaptive management. Specific monitoring details would be addressed

in permitting. In addition, spill prevention plans would be implemented. See also the response to theme AQ 14.

The FEIS assesses project-related mercury contributions using a mass-balance methodology. This approach was identified as the appropriate analytic tool for predicting mercury concentrations during scoping of this EIS and it is a common, reliable, analytical tool used by agencies to assess mercury impacts in EISs. This estimation method is preferred over a detailed mechanistic model, because it incorporates the important input and removal processes for mercury, it is very transparent with regard to data inputs, it typically provides conservative estimates of aqueous mercury concentrations, and it allows for easy assessment of the effect of changing parameter values on mercury concentrations. The Reverse Osmosis (RO) treatment is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site, including water used for flow augmentation. Mercury loadings from the Mine Site are projected to decrease due to the NorthMet Project Proposed Action, and the combined contributions from the Embarrass River and Partridge River are unchanged when modeled for the St. Louis River at the Fond du Lac reservation boundary. Therefore, the potential effects are expected to be less than significant, and the mass balance approach is appropriate to provide a reasonable estimate of potential contributions for purposes of environmental review given these circumstances.

In regards to mercury concentrations in fish, the scientific community's understanding of the relationship between total mercury, sulfate, methyl mercury, etc., is evolving, and the science is complex. That said, change in mercury concentration in fish is thought to be ultimately proportional to the percent increase in mercury load (MPCA 2006a, as cited in the FEIS). Therefore, sophisticated modeling of methylation and bioaccumulation is not likely to lead to more accurate results, but by failing to capture unknown or uncertain relationships and variables, could instead lead to erroneous conclusions.

Theme AQ 26

Theme Statement

The Cumulative Effects Assessment Area (CEAA) defined by the Co-lead Agencies for effects on aquatic species is overly limited. The appropriate spatial scale for considering cumulative effects on aquatic species is the entire St. Louis River Watershed and Lake Superior Basin. Some of the waters in the Project area and downstream of it are already impaired for aquatic life and aquatic consumption.

Thematic Response

The NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River Watershed. As a result, the Cumulative Effects Assessment Area (CEAA) for aquatic species is defined by the Partridge River and Embarrass River watersheds.

Theme AQ 27

Theme Statement

The aquatic species cumulative effects section of the FEIS should provide a discussion of the significance of the predicted adverse cumulative effects on aquatic resources, as well as the relationship between these effects and legal standards preventing degradation of water quality. This includes solutes not predicted to exceed numeric water quality standards.

Thematic Response

Water quality standards and evaluation criteria are discussed in FEIS Section 5.2.2. As discussed in FEIS Section 6.2.2, the impact assessment water quality modeling for the NorthMet Project Proposed Action already takes into consideration low flow conditions. Even during low flows, the NorthMet Project Proposed Action is not predicted to significantly affect water quality, although achieving this prediction would require long-term water treatment and WWTF/WWTP maintenance. Other reasonably foreseeable actions may also increase metal and other solute loadings downstream, but it is assumed that these other actions would also be required to meet federal and state water quality requirements, including nondegradation. Therefore, the potential for significant cumulative effects from the NorthMet Project Proposed Action and other reasonably foreseeable actions is considered unlikely.

Although not expected to result in any direct exceedances of water quality evaluation criteria, the NorthMet Project Proposed Action, in combination with other reasonably foreseeable actions, would increase metal and other solute loadings to the Partridge River and Embarrass River, and further downstream in the St. Louis River Watershed. These loadings would, however, be diluted as the solutes are transported downstream (i.e., average annual flow in the St. Louis River at the confluence with the Embarrass River is approximately four times more than in the Partridge and Embarrass rivers alone). Further, the MPCA would review the NorthMet Project Proposed Action for consistency with the State's non-degradation requirements prior to any permitting, as it would also do at the time of permitting for any other reasonably foreseeable actions. FEIS Section 6.2.6 states that potential cumulative impacts to aquatic species are anticipated to be minimal. FEIS Section 5.2.6 now provides additional information on potential impacts to aquatic species from metals.

FEIS Section 6.2.6 discusses the predicted adverse cumulative effects on aquatic resources. The methodology and evaluation criteria that were utilized for determining direct and indirect effects to aquatic species are discussed in FEIS Section 5.2.6.1, and the effects that could occur from the NorthMet Project Proposed Action are discussed in detail in FEIS Section 5.2.6.2. The direct, indirect, and cumulative assessments that were performed for the NorthMet Project Proposed Action were agreed upon during the Scoping Process.

Theme AQ 28

Theme Statement

The SDEIS does not adequately address how the NorthMet Project Proposed Action, combined with other mines, would affect levels of mercury in fish. Any additional mercury releases to the environment will exacerbate already existing impairments, including fish advisories set for recreational fishing. Increased fish mercury levels will have direct effects on both the cultural and recreational resources of the region. Mercury is also known to bioaccumulate in fish at a faster rate in warmer water. Sulfate discharges and water level fluctuations from the Proposed Project will also contribute to increased mercury levels in fish.

Thematic Response

Based on the evaluations conducted for air emissions and water discharges for the FEIS, the NorthMet Project Proposed Action is not considered to have an appreciable effect on: 1) surface water mercury concentrations, 2) fish mercury concentrations, 3) methylation of mercury, or 4) risk to people consuming fish from lakes near the NorthMet Project Proposed Action site.

Sulfur is inherent to the mineral matrix of the dust particles, it is therefore likely that less than 100 percent of the sulfur would be weathered from the particles and be available to go into solution if deposited to soils or water. This potential incremental change may warrant future monitoring, as small sulfate increases in sulfate-poor wetlands may be expected to increase the production of methylmercury in wetlands (Jeremiason et al. 2006, as cited in the FEIS). However methylmercury produced in wetlands is not necessarily incorporated into food chains and concentrated to levels of concern.

MPCA's Cumulative Mercury Risk Estimation Method (MMREM) analysis for the two scenarios showed a 0.5-1.8 percent and 0.3-0.5 percent potential increase (respectively) in fish mercury concentration above background. This potential change is considered to be small compared to background levels and is not expected to affect fish consumption advisories or effect consumers of locally caught fish. The increase would not be expected to have any appreciable effect on the loading estimates from permitted discharges to the Embarrass River, Partridge River, or the lower St. Louis River Watershed. Discharges are expected to meet the 1.3 ng/L standard for mercury, with an overall net decrease in mercury loading predicted for the NorthMet Project Proposed Action Alternative.

The goal of the MPCA is to protect high-quality waters and improve the quality of impaired waters so water quality standards are met and beneficial uses are maintained and restored, where these uses are attainable. As summarized in FEIS Section 5.2.7.2.5, widespread contamination of fish from atmospheric pollution is why Minnesota established a statewide mercury TMDL. The TMDL seeks to reduce atmospheric deposition everywhere in the state in order to make the state's lakes and streams fishable, as required by federal regulations, and is intended to provide the long-term framework to reduce mercury in fish. The MPCA published Guidelines for New and Modified Mercury Air Emission Sources, and revised those guidelines in 2012 (MPCA 2012g, as cited in the FEIS). The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions. MPCA has conducted a review of the NorthMet Project Proposed Action mercury

emissions and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS).

Further, the NorthMet Project Proposed Action is not anticipated to be a significant discharger of mercury to the environment. The RO treatment (or equivalent performing technology) is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site, including water used for flow augmentation. Mercury loadings from the Mine Site are projected to decrease due to the NorthMet Project Proposed Action, and the combined contributions from the Embarrass River and Partridge River are unchanged when modeled for the St. Louis River Watershed at the Fond du Lac reservation boundary. Therefore, further degradation of surface water quality, and by extension increased mercury in fish, is not expected.

The NorthMet Project Proposed Action is not anticipated to have any noticeable effect on water temperature, since only water from the Plant Site's WWTP would be used for stream augmentation. When discharged, the temperature of this water is expected to quickly equilibrate to ambient water temperatures such that temperature effects would not be expected in downstream rivers and lakes.

In general, in aquatic systems there is generally a positive correlation between warmer water temperatures and accumulation of heavy metals. However, studies on the relationship between temperature and bioaccumulation of mercury in aquatic life are ongoing. Therefore, the degree to which the NorthMet Project Proposed Action could potentially affect aquatic species due to changes in temperature cannot be determined. Water monitoring would ensure that water quality standards would be met with engineering controls and adaptive management. Specific monitoring details would be addressed in permitting. In addition, spill prevention plans would be implemented.

It is difficult to quantify the extent to which mercury concentrations in the Tailings Basin surficial seepage might affect mercury methylation north of the Tailings Basin and further downstream. The FEIS notes that sulfate can contribute to mercury methylation; however, the FEIS also notes that the NorthMet Project Proposed Action would reduce sulfate concentrations within the Embarrass River Watershed and that may result in downstream reductions in mercury methylation.

Effects on flows (and, by extension, water surface elevations) generated by the NorthMet Project Proposed Action are anticipated to be within the natural variation of flow within the St. Louis River Watershed (e.g., less than 1 percent reduction in average annual flow as measured at the confluence of the Embarrass River with the St. Louis River). Therefore, no potential indirect or cumulative wetland effects are identified for the wetlands within the St. Louis River Watershed below the ordinary high water mark, from its confluence with the Embarrass River to Lake Superior and it is not expected that the NorthMet Project Proposed Action would contribute to water level fluctuations than can promote mercury methylation. Additional information in regards to water level and flows to surrounding watersheds is included in FEIS Section 5.2.2.

Theme AQ 29

Theme Statement

The SDEIS underestimates the effects on aquatic species in the area affected by the Land Exchange, due to the decrease of first-order streams in the federal estate.

Thematic Response

Effects of the Land Exchange Proposed Action on headwater streams are discussed in detail in FEIS Sections 5.3.6.2.2 and 5.3.6.3.2. A paragraph in FEIS Section 5.3.6.2.2 has been revised to include: "...however, the net reduction to the Superior National Forest of 0.3 miles of first order streams may result in slightly less habitat available for headwater stream dependent species."

Theme AQ 30

Theme Statement

The FEIS should provide details on monitoring that would be conducted on site and elsewhere to ensure that nearby aquatic life is not affected.

Thematic Response

PolyMet, as the assigned permittee for the NorthMet Project Proposed Action, would be responsible of carrying out the proposed monitoring activities described in any legally enforceable permits. The permits, supported by state and federal laws, would include provisions that address failure to comply with the terms and conditions of the permit, including those related to conducting required monitoring.

Details on any aquatic monitoring would be finalized during permitting; however, overviews of water monitoring plans at the Mine Site and Plant Site are presented in FEIS Section 5.2.2.3.6. Monitoring would be used on a continual basis to document compliance with permit conditions, annually validate and update water models, and provide input to optimize operations of adaptive engineering controls. The FEIS provides information on objectives, monitoring summary and general location for monitoring of process water streams, stormwater, surface discharges, groundwater, wetlands, and surface water in the Partridge River and Embarrass River watersheds (as applicable). For groundwater monitoring, the general number of sampling locations and frequency are identified. For surface water, general sampling locations and timeline are identified. As mentioned in the FEIS, the water monitoring plans would be finalized in detail (including specific locations, frequencies, and parameters) during the NPDES/SDS water permitting, and water appropriations processes and updated as required during the Project's life.

A.5.4 Issue: US Army Corps of Engineers 404 Permit (COE)

Theme COE 01

Theme Statement

Compensatory mitigation for wetland effects should be located within the Lake Superior Basin, and should take into account wetland losses/replacements from a quality standpoint as well as the wetlands functions. Wetland mitigation efforts should focus on wetlands that have been completely or significantly drained, or significantly modified by agricultural practices. The replacement ratio for the mitigation of the loss of high quality wetlands and difficult to replace forested and bog wetland plant communities should be higher, such as 2:1. In addition, the Federal Mitigation Rule and the Guidelines require that compensatory mitigation be based on a watershed approach to the extent appropriate and practicable. Furthermore, the mitigation plan in the Section 404 Wetlands Permit should exclude mitigation credits for post-mining, on-site wetland mitigation. If the USACE determines that a greater percentage of the compensation for direct impacts should be accomplished within the St. Louis River Watershed/Great Lakes Basin, the public should be notified.

When mitigating outside of the watershed, consider other methods to replace wetland functions (i.e. water retention ponds, shore land buffers, and other "green" technology to collect and store runoff in these watersheds).

Thematic Response

Please refer to the response to theme WET 03 for a discussion of wetland mitigation, mitigation study limits and replacement of wetland functions. Please refer to response to theme WET 04 for a discussion on the mitigation plan and measure for direct compensatory mitigation. FEIS Section 5.2.3.3.2 includes a discussion on the wetland mitigation study limits, site selection process, and mitigation proposed for the NorthMet Project Proposed Action.

The post-closure establishment of the estimated 101.8 acres of on-site wetland is not included in the wetland mitigation credits. The generation of wetland credits in these areas has the potential to be used on a contingency basis, but compensatory credit would not be considered up front due to the post-closure timeframe. The summary of proposed wetland mitigation credits, presented in FEIS Table 5.2.3-17, does not include the on-site wetland restoration. The FEIS Executive Summary and Section 5.2.3.3.3 have also been updated note that the on-site wetland would not be considered in the wetland mitigation credits.

Theme COE 02

Theme Statement

The Section 404 Wetlands Permit application should include the following information:

- a quantitative assessment of all indirect wetland impacts;
- a description of the impact thresholds and how the fragmentation impact criteria were developed;
- an estimate of the change in functions and values at wetlands;
- a more detailed description of, and rationale for, how the impacts analysis would be used to ensure that indirect impacts are avoided, minimized, and mitigated—including more comprehensive monitoring and reporting for indirect impacts at the plant and mine sites as well as to vegetation and headwater streams surrounding the site;
- inclusion of hydroperiod in the quantitative assessment;
- design of Phase II monitoring prior to permit issuance, as well as a description of the threshold for determining the need for Phase II; and
- discussion of how the reference sites would be used to predict impacts.

Identified indirect impacts should be mitigated upfront; the SDEIS did not provide for such upfront mitigation. The ROD for the USACE and permit conditions should include advance commitment to mitigation for all indirect impacts, including identification of mitigation sites, compensation ratios, and notification to the public. If no mitigation for the foreseeable "indirect" wetland losses can be identified, the USACE should not issue a Section 404 permit. A robust monitoring design should require monitoring in all potential impact categories, not just in Highly and Moderately impacted zones. The Section 404 Wetlands Permit and the FEIS should contain more information on how the monitoring would be performed to determine if indirect impacts are occurring, including who would perform the monitoring. The SDEIS failed to describe what would be included in the adaptive management plan. The FEIS should include the criteria and process for determining when and what additional mitigation is needed.

Thematic Response

FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including

groundwater mounding and seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for factor 6 (change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations). The identification of specific mitigation for indirect effects and a monitoring plan is not a requirement for an EIS; however, the FEIS has been updated with additional information on the approach for determining mitigation if the monitoring shows indirect effects are occurring. The monitoring and mitigation for potential indirect effects would be determined during permitting. Section 5.2.3.3 of the FEIS has been revised to include more information on the monitoring and mitigation plan for the indirect wetland effects, including how the reference sites would help determine potential indirect effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting. Please refer to response to theme FIN 11 for more information on financial assurance.

Both the USACE and MDNR require functions to be replaced; however, both agencies use a set of defined ratio requirements to determine the number of acres required to replace functions lost, as there is currently no suitable quantitative functional assessment method in Minnesota. Based on the findings and where impacts occur (e.g., types of wetlands), the mitigation ratios and credits have been increased to take into account the functions lost due to the NorthMet Project Proposed Action. Please refer to response to theme WET 05 for more information on functions.

Section 5.2.3.1.2 of the FEIS provides information on the methodology and criteria for the indirect effects assessments for fragmented wetlands.

When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group, how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used as well as other suggested approaches have been carefully considered. The Co-lead Agencies ultimately decided the use of the analog method and the 20 percent metric described in Section 5.2.3 of the FEIS as factors considered in identifying potential indirect effects to wetlands is a credible and reasonable approach consistent with the requirements of NEPA.

Theme COE 03

Theme Statement

Residents of the state have clearly expressed their interest in water quality protection/enhancement. The mine runs counter to that public interest. The Section 404 Wetlands Permit should be denied because PolyMet's discharge would violate the Clean Water Act, violate water quality standards, affect our aquifers, groundwater, and water supplies (municipal and private wells), affect climate change due to the loss of peatlands, destroy animal and fish habitats, and threaten natural resources. In addition, the Permit should be denied due to an unaccepted amount of wetland loss.

Thematic Response

The USACE is the federal agency responsible for regulating the discharge of dredged or fill material into Waters of the United States, including wetlands under Section 404 of the Clean Water Act. PolyMet has applied for a Section 404 Individual Permit from the USACE for the proposed fill into the Waters of the United States. If a permit from the USACE is issued, it is not valid until the State has either certified under Section 401 of the CWA that the proposed discharges to aquatic resources comply with the State's water quality standards or waived the 401 certification requirements. When making a decision, the USACE takes into consideration numerous factors. Permit decisions are based on the probable expected effects associated with a proposed project including direct, indirect, and cumulative impacts. Public interest review factors include: conservation, economics, aesthetics, general environment, wetlands, cultural values, fish and wildlife, land use, flood hazards, property ownership, flood plain values, navigation, recreation, shore erosion and accretion, water supply and water quality, energy needs, safety, mineral needs, safety, food and fiber production, and the needs and welfare of the people. In determining whether the project is in the public interest, the USACE considers the project's impacts on these public interest factors. In addition, the project must comply with the 404(b)(1) guidelines to be considered in the public interest. Only those projects that the USACE determines to be in the public interest are authorized. The decision to grant or deny a permit by the USACE is explained and described in a ROD. If the permit is issued, a copy of the permit is sent to the project sponsor for their signature, which signifies that they accept the permit requirements. If the USACE decides to deny the permit or the project sponsor does not agree with the conditions contained in the permit, the project sponsor may request an administrative appeal of the permit decision. A decision by the USACE on whether to grant or deny a Section 404 Individual Permit has not yet been made.

Theme COE 04

Theme Statement

The SDEIS fails to identify alternatives to minimize and/or mitigate effects to wetlands as well as a Least Environmentally Damaging Practicable Alternative ("LEDPA"), which is required before approving a Section 404 Wetlands Permit. In addition, no agency-preferred alternative was identified in the SDEIS. Therefore, after an agency preferred alternative and the LEDPA are identified, the USACE should re-notice the 404 permit and MPCA should re-notice the 401 certification.

Thematic Response

Alternatives have been developed and evaluated in three stages during the Environmental Review Process; the scoping stage (2005), the DEIS stage (2009), and the SDEIS stage (2011). Section 3.2.3 of the FEIS includes a discussion of the process and alternatives that were considered for the NorthMet Project Proposed Action. The modifications that have occurred during the development of the EIS have resulted in avoidance and minimization of impacts to wetland resources. To date, these modifications have reduced the acreage of wetlands impacted from 1,257 to 913.8 acres, a 27 percent decrease. In addition to the NorthMet Project Proposed Action, a "No Action Alternative" is also being considered. Section 5.2.3.3.1 of the FEIS includes six considerations that were proposed in order to avoid unnecessary impacts to wetland resources and seven considerations that were proposed that would minimize impacts to wetland resources as part of the NorthMet Project Proposed Action. Section 5.2.3.3 of the FEIS also describes, in depth, the mitigation strategies for the NorthMet Project Proposed Action including how sites were selected, mitigation ratios, and other factors. Please refer to responses to themes WET 03, WET 05, and WET 06 for more information on siting and mitigation.

The agency preferred alternative and LEDPA process are discussed in Sections 7.4 and 7.5 of the FEIS.

The USACE is not anticipating the need to re-issue the Section 404 public notice for the NorthMet Project Proposed Action. However, MPCA would need to re-issue the Section 401 public notice for the Project. Under the provisions of the Clean Water Act, the MPCA has one year from the public notice (December 3, 2014) to act upon an application for 401 Certification. However, the MEPA (*Minnesota Statutes* division 116.04, subdivision 2b) and rules regarding environmental review (*Minnesota Rules*, part 4410.3100) prohibit final agency decisions, such as the Section 401 Certification, until all environmental review steps are completed. The environmental review process being undertaken by the Co-lead Agencies would not be completed within the one year time frame for issuance of the Section 401 Certification. Therefore, PolyMet has made a procedural decision to withdraw the Section 401 application before MPCA and resubmit it in the near future to allow for processing of the application.

Theme COE 05

Theme Statement

The Section 404 Wetlands Permit application should provide information on the accuracy of the wetland boundaries for the project areas, perform a reassessment of likely impacts to surrounding wetlands outside the project footprint, and should include an assessment of wetland functions in order to provide an assessment of lost wetland functions and a mitigation plan designed to replace those functions.

Thematic Response

As described in FEIS Section 4.2.3, wetland characterization, mapping, and surveys for the Mine Site, Transportation and Utility Corridor, Plant Site, Area 1, and Area 2 were conducted between 2004 and 2010 (Barr 2006d; Barr 2007c; Barr 2008k; Barr 2011d; PolyMet 2015b, as cited in the FEIS). Wetland acreages were determined using USGS topographic and USFWS National Wetlands Inventory (NWI) maps, aerial photographs, soil survey data, and field investigations. The Co-lead Agencies agreed to use the Eggers and Reed Classification system for the NorthMet

Project Proposed Action, and have reviewed the accuracy of the wetland characterization, mapping, and surveys. Wetland boundaries were identified using the routine wetland delineation procedures of the Corps of Engineers Wetlands Delineation Manual (USACE 1987, as cited in the FEIS), and were reviewed by the appropriate agencies. An abbreviated MnRAM functional assessment, which was agreed upon by the USACE, was utilized to assess wetland functions for the Mine Site, Transportation and Utility Corridor, and Plant Site. Please refer to the responses to themes WET 03 and WET 05 for more information on how the NorthMet Project Proposed Action considered wetland functions. FEIS Section 5.2.3 includes a detailed discussion of the direct impacts and potential indirect effects as a result of the mining activities.

The USACE is currently reviewing the Section 404 permit application. The ROD for the USACE would include the Section 404(b)(1) analysis and the public interest review, and would determine the LEDPA. Furthermore, the ROD for the USACE cannot be finalized until 30 days after release of FEIS; comments to the FEIS must also be addressed in the ROD for the USACE. The ROD for the USACE would recommend issuance, issuance with conditions, or denial of the Section 404 permit for NorthMet Project Proposed Action. Please refer to FEIS Sections 7.4 and 7.5 for more information on the USACE permit process.

Theme COE 06

Theme Statement

The Section 404 Wetlands Permit should require the following monitoring conditions:

- continued monitoring by the applicant at existing wells where they are outside the direct mine impact locations, because changes in wetland hydrology, if they occur, should be evident at these locations;
- wetland and stream monitoring sites for the east side of the tailings basin;
- baseline vegetation monitoring prior to permitted impacts, and increased post-construction monitoring frequency to every 2 years.

In addition, an independent agency, such as BWSR, should be given the task of monitoring and determining the mitigation required for the project.

Thematic Response

Mitigation and monitoring requirements would be determined during permitting. The USACE, MDNR, and MPCA have a suite of approaches for measuring effects for projects, based on an established set of procedures resulting in a better understanding of project effects. Monitoring requirements for each project that is permitted by the agencies is site-specific and tailored to the project.

FEIS Section 5.2.3.3 (wetland mitigation and monitoring) has been revised to include additional details on the proposed monitoring and wetland adaptive plan. Wetland mitigation and monitoring would be reviewed by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process. Monitoring is proposed within all wetlands containing a potential indirect wetland impact factor rating of 3 to 5, as well as a sampling of wetlands with factor ratings of 1 or 2, as described in FEIS Section 5.2.3.3 (see FEIS Figures 5.2.3-31 and 5.2.3-32).

Many suggestions were provided regarding how best to quantify indirect impacts. While changes to wetland plant communities would be monitored, changes in the vegetation community are typically slower to manifest and identify compared to changes in hydrology. The USACE believes that closely monitoring hydrology early and often during the NorthMet Project Proposed Action provides sufficient assurances of observing any indicators of anticipated changes to the wetland communities.

Theme COE 07

Theme Statement

The Section 404 Wetlands Permit application should include the most recent and comprehensive information on the cumulative effect assessment, including cumulative indirect effects to aquatic resources within the watersheds. The cumulative loss of different wetland types (e.g. as a result of indirect impacts such as changes in hydrology) should also be evaluated in the Section 404 Wetlands Permit application.

Thematic Response

FEIS Section 6.1.1 describes the rationale for how the cumulative effects assessment areas (CEAAs) were identified for NorthMet Project Proposed Action, and provides a list of projects and actions that were considered in the cumulative effects wetland analysis. The CEAAs for individual resource areas vary based on the potential for cumulative effects and not on a single overall assessment area. FEIS Section 6.2.3 describes the wetland resource CEAA. The spatial area for the wetland analysis for the DEIS was determined to be the Partridge and Embarrass River watersheds. It was determined during the Wetland IAP Working Group that the FEIS spatial area would not change from the DEIS. The wetland cumulative effects methodology and assessment approach was developed based on the Wetland IAP Working Group and is presented in the Wetland Analysis Work Plan (PolyMet 2011b, as cited in the FEIS). FEIS Section 6.2.3.1 provides a description of the wetland cumulative analysis.

It is difficult to predict potential indirect wetland effects within the CEAA, or to know what the potential indirect wetland effects would be for projects other than the NorthMet Project Proposed Action. Based on the amount of potential indirect wetland effects from the NorthMet Project Proposed Action, loss of wetlands could cumulatively be 0.1 to 12.0 percent of total wetland acres in the Partridge and Embarrass River watersheds. This would be in addition to the direct wetland impacts assessed in FEIS Section 6.2.3.

Theme COE 08

Theme Statement

Additional information on crediting, drainage, plant recommendations and sustainability, and permit requirements is needed for the Atkin wetland mitigation site.

Thematic Response

The Aitkin Mitigation Plan, updated in 2014, provides additional details related to crediting, drainage, plant recommendations and sustainability, and permit requirements. The updated Aitkin Mitigation Plan would be reviewed by the appropriate agencies and approved during the

permitting process. The USACE has concluded that the mitigation sites selected and the wetland credits generated at the three mitigation sites would be acceptable for use in compensating for direct wetland losses. The USACE has not made a final decision on the mitigation ratios that would be required to compensate for direct wetland impacts; if fully successful, it is likely these three mitigation sites would generate sufficient credits to compensate for the 940 acres of direct wetlands impacts, as well as wetland fragmentation associated with the NorthMet Project Proposed Action. In the event that not all of the credits generated by these sites are utilized to compensate for direct wetland impacts, any excess credits could be used to compensate for indirect losses (USACE 2015a, as cited in the FEIS).

Theme COE 09

Theme Statement

The Section 404 Wetlands Permit must be denied because the proposed action has substantial and unacceptable impacts on aquatic resources of national importance (ARNI).

Thematic Response

A Clean Water Act Section 404(q) Memorandum of an Agreement between the Environmental Protection Agency and the Department the Army was signed on 11 August 1992. Part IV of that MOA which is titled Elevation of Individual Permit Decisions, provides exclusive procedures for elevation of specific cases that involve aquatic resources of national importance (ARNI). Elevation of issues related to specific individual permit cases would be limited to those cases that involve aquatic resources of national importance. In such cases, the USEPA determines that issuance of the permit for a proposed project as proposed would result in unacceptable adverse effects to ARNI. Regarding the NorthMet Project Proposed Action, the USEPA raised ARNI as an initial concern in their February 18, 2010 comment letter on the USACE public notice. The SDEIS has addressed many of the USEPA's concerns regarding ARNIs, and the lead agencies continue to work with the USEPA to address their comments on the SDEIS. The USACE may also consult with the USEPA on issues of interest to them while writing the ROD.

The USEPA reviews and comments on Federal EISs pursuant to its authorities and responsibilities under NEPA, Section 309 of the CAA, and Section 404 of the CWA. Under Section 404(c) of the CWA, the USEPA has the authority to prohibit, restrict, or deny the discharge of dredged or fill material at defined sites in Waters of the United States (including wetlands) whenever it determines, after notice and opportunity for public hearing, that use of such sites for disposal would have an unacceptable adverse impact on one or more resources, including fisheries, wildlife, municipal water supplies, or recreational areas. The 404(q) Memorandum of Agreement between the USACE and USEPA provides a procedure for considering both agencies' views on projects, including procedures for elevating unresolved issues to regional and national levels. The 404(q) process is used by the USEPA when they wish to initiate consultation regarding concerns they may have about the impacts of a proposed project.

Theme COE 10

Theme Statement

The SDEIS and/or 404 Permit process should evaluate whether wetlands restoration mitigation project sites would require a Section 404 Wetlands Permit, and if so they must be included in the FEIS as connected actions. In addition, a wetland delineation and additional hydrologic monitoring information is needed for the wetland mitigation sites.

Thematic Response

Under Section 404 of the CWA, impacts to regulated aquatic resources considered to be Waters of the United States, including wetlands, must be mitigated to offset the impact to those resources. Compensatory mitigation is intended to compensate for the impacts associated with permitted activities and is intended to increase the acreage and/or function of other wetlands. Since compensatory mitigation is usually required in order receive a Section 404 permit, the USACE neither requires a separate permit for the proposed mitigation nor do they require that the beneficial impacts proposed by the mitigation be included in the final impact tally for a proposed project. Mitigation efforts that involve the discharge of dredged or fill material into Waters of the United States would require Department of the Army authorization. For project specific mitigation, the impacts are disclosed in the NEPA EIS document, evaluated in the ROD for the USACE, and required as a condition of the permit. Any required authorization would be conveyed by that permit condition.

A wetland delineation of the mitigation sites by PolyMet may be required, and would be submitted as part of the permitting process, if needed. Restoration activities at the mitigation sites have not commenced, and would not be initiated until appropriate approvals and permits have been obtained. Hydrology monitoring has begun at the mitigation sites; however, the state and federal agencies have not yet made a determination on the drainage status of the mitigation sites (i.e., drained, partially drained, etc.). This determination, including credit ratios, would be made during permitting. FEIS Section 5.2.3.3.2 discusses the wetland mitigation for the NorthMet Project Proposed Action, while Section 5.2.3.3.4 discusses the monitoring as part of the proposed mitigation.

Theme COE 11

Theme Statement

The USACE does not have jurisdiction on this project.

Thematic Response

FEIS Section 4.2.3 includes a discussion on the regulatory jurisdiction regarding the wetland resources on the NorthMet Project Proposed Action. As discussed in that section, wetlands in Minnesota are protected under both federal and state laws. The USACE regulates the discharge of dredged or fill material into Waters of the United States, including wetlands, under Section 404 of the CWA. Any project that proposes to impact federally-regulated wetlands must apply for a permit from the USACE to do so. In addition, if a permit from the USACE is issued, it is not valid until the State of Minnesota has either certified (under Section 401 of the CWA) that

the proposed discharges to aquatic resources comply with the State of Minnesota's water quality standards or waived the Section 401 certification requirements.

As discussed in the FEIS, the different federal and state programs that regulate aquatic resources differ in respect to the specific types of resources that are under the jurisdiction of the respective regulatory agencies. While each agency has the authority to regulate most wetlands in Minnesota, neither agency has jurisdiction over all wetlands in the state. For example, "incidental" wetlands are not regulated by the State of Minnesota, may be jurisdictional under Section 404 of the CWA; and in some circumstances wetlands not be subject to regulation under Section 404 of the CWA (see 33 CFR 328.3 for a definition of waters of the U.S.) may be regulated by the state of Minnesota. The wetlands within the NorthMet Project Proposed Action area are either regulated by the USACE under Section 404 of the CWA, under the various state regulatory programs previously discussed, or both, with the exception of two wetland areas that would not be regulated by either program, as a result of being located within an actively permitted waste storage facility. These two wetland areas are discussed in FEIS Section 4.2.3.2.

Theme COE 12

Theme Statement

The mitigation ratios proposed in the USACE (404) Memorandum are reasonable.

Thematic Response

These comments provide general information regarding the USACE Section 404 permit application review. No changes to the FEIS were made as a result of these comments.

Theme COE 13

Theme Statement

Once implemented, the Northeast Minnesota Wetland Mitigation Strategy should be used to identify additional wetland mitigation sites within the St. Louis River and Lake Superior Watersheds to compensate for indirect wetland effects at the PolyMet Site. Until then, mitigation options for indirect effects must be discussed in the 404 permit application.

Thematic Response

These comments provide general information regarding mitigation that should be considered for wetland mitigation in the future. No changes were made to the FEIS as a result of these comments.

A.5.5 Issue: Cultural Resources (CR)

Theme CR 01

Theme Statement

The SDEIS does not adequately discuss the federal government's trust responsibility as part of the 1854 Treaty, nor does it adequately address potential impacts to, and proposed mitigation/compensation for loss of access to, resources important to the Bands.

Thematic Response

The Cultural Resources section of the Final EIS Chapters 4 and 5 addresses the federal Co-lead Agencies' federal tribal trust responsibilities under the 1854 Treaty. These sections, along with other relevant natural resources sections of Chapters 4, 5, and 6, also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources. Mitigation for effects on cultural resources and culturally significant natural resources is considered to the extent possible within the parameters of the statutes and regulations providing the federal authorities for the NorthMet project review.

Theme CR 02

Theme Statement

The Area of Potential Effect (APE) discussed in the SDEIS does not encompass the true APE within which the proposed project could affect cultural resources.

Thematic Response

FEIS Section 4.2.9.2.3 provides a detailed discussion and analysis of the area in which cultural resources may be affected by the undertaking. The APE takes into account both direct and indirect effects using a geographically expansive area that accounts for direct effects as well as visual, audible, atmospheric, hydrological, and water quality effects. The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange, and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been revised slightly to include the Dunka Road corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline.

Theme CR 03

Theme Statement

The SDEIS does not adequately discuss and address cumulative effects to cultural and 1854 Treaty resources.

Thematic Response

FEIS Section 4.2.9.2.3 provides a detailed discussion and analysis of the area in which cultural resources may be affected by the undertaking. The APE takes into account both direct and

indirect effects using a geographically expansive area that accounts for direct effects as well as visual, audible, atmospheric, hydrological, and water quality effects. The APE is based on extensive modeling and other analysis completed for the NorthMet Mining Project and Land Exchange, and includes an area much broader than the Plant Site and Mine Site. Since the SDEIS, the APE has been revised slightly to include the Dunka Road corridor, several federal parcels included in the Land Exchange Proposed Action, and the Colby Lake Pumphouse and pipeline.

Theme CR 04

Theme Statement

Tribal cooperating agencies consider a 216,300-acre area bounded by the St Louis River, Lake Superior, Lake Vermilion and the Beaver Bay to Vermilion Trail to be a Tribal Historic District. The cumulative effects analysis for cultural resources should include this Tribal Historic District.

Thematic Response

The historic district proposed by the Grand Portage Band in a June 27, 2013 letter was addressed (Grand Portage 2013, as cited in the FEIS). The federal Co-lead Agencies do not believe that this area meets the definition of a district, nor does it have sufficient integrity as a district to qualify for inclusion in the NRHP. The federal Co-lead Agencies have considered an expanded area for analysis of cumulative effects on cultural resources and natural resources of significance to the Bands, including use of the 1854 Ceded Territory as the CEAA. Use of the 1854 Ceded Territory as the CEAA for cultural resources would actually diminish the significance of any cumulative effects. By evaluating the effects of the NorthMet Project Proposed Action along with other past, present, and reasonably foreseeable future projects in the context of a much larger area with a much larger number of resources similar to those affected by the NorthMet Project Proposed Action, the effect of the NorthMet Project Proposed Action on those resources is diminished. The cumulative effects analysis focuses on the specific resources, or types of resources, affected by the NorthMet Project Proposed Action within an area that is geographically meaningful considering the project under review.

Cumulative effects are discussed and addressed differently based on the affected resource. Discussions related to socioeconomics, for instance, use an expanded analysis area compared to other resources. Such expanded analysis areas are used as appropriate. The Cultural Resources sections in FEIS Chapters 4, 5, and 6 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's direct, indirect, and cumulative areas of potential effect.

Theme CR 05

Theme Statement

The Section 106 survey and SDEIS did not adequately identify, address impacts to, and provide mitigation measures for cultural resources.

Thematic Response

The federal Co-lead Agencies have made a reasonable and good-faith effort to identify cultural resources potentially affected by the NorthMet Project Proposed Action, and to determine which

resources qualify for inclusion in the NRHP as historic properties. Impacts to historic properties have been appropriately assessed, and the federal Co-lead Agencies are actively consulting with the federally recognized Bands, the Minnesota SHPO, and other consulting parties to develop appropriate mitigation measures. Effects on resources significant to the Bands that do not qualify as historic properties, as well as general effects on natural resources, are considered within the parameters of the statutes that shape this review. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.

Theme CR 06

Theme Statement

The Section 106 consultation and survey, and government to government consultation should be complete prior to the Final EIS, to address the presence of and impacts to cultural resources and use of resources by tribal members.

Thematic Response

The federal Co-lead Agencies have actively consulted with the federally recognized Bands that have expressed an interest in consulting on the NorthMet Project Proposed Action. Historic properties affected by the NorthMet Project Proposed Action have been identified and the impacts to those properties have been assessed. This also includes an assessment of actual use of those historic properties, as well as other resources in the APE, by tribal members. Effects on historic properties would be fully considered prior to the issuance of any permit or land exchange, pursuant to the NHPA and its implementing regulations. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.

Theme CR 07

Theme Statement

The proposed avoidance and mitigation measures identified in the SDEIS are adequate to allow for the proposed Project to have a minimal effect on Cultural Resources.

Thematic Response

The federal Co-lead Agencies are actively consulting to avoid, minimize, and mitigate effects on historic properties to the extent practicable and within the parameters of the underlying statutes. Effects on cultural resources and culturally significant natural resources are addressed in the Cultural Resources sections in FEIS Chapters 4, 5, and 6.

Theme CR 08

Theme Statement

The FEIS should use the USEPA's 2011 NEPA review guidance titled "Applying Cumulative Impact Analysis Tools to Tribes and Tribal Lands."

Thematic Response

The 2011 USEPA guidance document on cumulative effects has been reviewed and discussed with the USEPA. The FEIS complies with CEQ guidance for the cumulative effects analysis.

A.5.6 Issue: Cumulative Effects (CU)

Theme CU 01

Theme Statement

The cumulative effects assessment areas (CEAAs) were incorrectly defined, and should include the BWCAW, Voyageurs National Park, Lake Superior (including Isle Royale and Apostle Island National Parks), the St. Louis River Watershed, and the 1854 Ceded Territory. The FEIS should also consider cumulative impacts within a larger region beyond just the Mesabi Iron Range, such as the Duluth Complex south and east of the range.

Thematic Response

The cumulative effects section in the FEIS (Sections 6.1.1.1 and 6.1.2.1) describes the rationale for the identification of cumulative effects assessment areas (CEAAs). The CEAAs for individual resource areas vary based on the potential for cumulative effects, and not on a single overall assessment area. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area.

Theme CU 02

Theme Statement

The SDEIS did not consider the correct projects in the cumulative effects assessment. The FEIS should not exclude speculative projects just because they are not yet at the permitting stage. Instead, the cumulative effects analysis should include all potential projects, including those for mineral exploration and possible future expansion of the NorthMet Mine itself. Eventual Northshore Mine closure should also be considered.

Thematic Response

FEIS Sections 6.1.1.2 and 6.1.2.1 includes an updated list of projects and actions that were considered in the cumulative effects assessment. The Northshore Mine closure has been included in the list of actions as a reasonably foreseeable action. Any potential future expansion of the NorthMet Mine would be considered a speculative project.

The FEIS considered for the cumulative effects assessment "reasonably foreseeable" actions, which are defined as those actions that are included in approved planning documents and have approved funding, are permitted, or have a currently active federal or state permit or site plan application under review. The Co-lead agencies have followed cumulative effects guidance from CEQ and sources, as they relate to reasonably foreseeable projects, including other mining projects.

Theme CU 03

Theme Statement

The SDEIS did not use the correct methodology to consider cumulative effects. The FEIS should apply USEPA's approach for the Pebble Mine (Bristol Bay, Alaska) assessment. It should also reference USEPA guidance for considering cumulative effects and the "Cumulative Impact Analysis Tools to Tribes and Tribal Lands" guide. The FEIS should also include information from other sources, such as the Regional Copper-Nickel Study, in order to estimate the amount of mining potential in northern Minnesota.

Thematic Response

The Co-lead agencies consulted a wide range of sources to conduct the cumulative effects assessment of the NorthMet Project Proposed Action and Land Exchange Proposed Action. In addition, the Co-lead agencies followed USEPA (USEPA 1999b, as cited in the FEIS) and CEQ (CEQ 1997, as cited in the FEIS, and Connaughton 2005, as cited in the FEIS) guidance on how to conduct the cumulative effects analysis. FEIS Section 6.1.1.1 describes the cumulative effects analysis approach. The cumulative effects analysis meets the requirements of MEPA/NEPA.

Theme CU 04

Theme Statement

The FEIS cumulative effects analysis should describe how permitting the Proposed NorthMet Mining Project would facilitate the eventual permitting of additional similar mines in northern Minnesota, thus establishing a sulfide mining district. The FEIS should also discuss the possibility that excess capacity at the proposed NorthMet processing plant would also facilitate additional mining in the region.

Thematic Response

The FEIS considered for the cumulative effects assessment "reasonably foreseeable" actions, which are defined as those actions that are included in approved planning documents and have approved funding, are permitted, or have a currently active federal or state permit or site plan application under review. The degree to which the NorthMet Project Proposed Action and Land Exchange Proposed Action could facilitate future permitting of additional mines is outside the scope of the FEIS, and is thus not included in the analysis. The Co-lead agencies followed USEPA (USEPA 1999b, as cited in the FEIS), CEQ (CEQ 1997, as cited in the FEIS, and Connaughton 2005, as cited in the FEIS), and other cumulative effects guidance relating to reasonably foreseeable projects, such as other mining projects. The use of the NorthMet Processing Plant by other potential speculative mining projects is outside the scope of the FEIS.

Theme CU 05

Theme Statement

The cumulative effects analysis of the FEIS should be revised to better describe how the spatial and temporal boundaries were established. The FEIS should also make clear that the findings of the cumulative effects analysis rely on complete and successful implementation of mitigation measures.

Thematic Response

FEIS Sections 6.2 and 6.3 describe how each resource's cumulative effects assessment area was determined, including spatial and temporal areas. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area.

Theme CU 06

Theme Statement

The zone of impact for PolyMet extends beyond the State of Minnesota to other states and foreign countries within the Lake Superior basin.

Thematic Response

The FEIS describes the cumulative effects of the NorthMet Mining Project. Refer to FEIS Chapter 6 under the individual resource topics for further information. The rationale for each resource CEAA have been defined as noted in the response to theme CU 01 and in FEIS Section 6.2. FEIS Table 6.1.1-2 summarizes the spatial areas used for each resource area.

Theme CU 07

Theme Statement

The FEIS should consider all other "actions" and not just "projects." The assessment is therefore unreasonably limited to reasonably foreseeable projects only.

Thematic Response

Section 6.1.1.2 describes all past, present, and reasonably foreseeable projects/actions that were considered in the NorthMet Project Proposed Action cumulative effects assessment. Section 6.1.2.2 describes the cumulative forest service land actions that were considered in the Land Exchange Proposed Action cumulative effects assessment.

Theme CU 08

Theme Statement

The FEIS cumulative effects analysis should include various land exchanges that are being considered, and should specifically evaluate how these exchanges could affect the potential environmental impacts related to the Proposed Action. This includes the Proposed School Trust Lands/Boundary Waters Land Exchange.

Thematic Response

FEIS Section 6.1.2 includes an updated list of projects and actions that were considered in the cumulative effects assessment for the Land Exchange Proposed Action, which includes the School Trust Lands project.

Theme CU 09

Theme Statement

The FEIS cumulative effects analysis should include numerous vegetation management projects conducted by the U.S. Forest Service (USFS). Some of these include: the Kabetogama Project, the Mixed Use Motorized Use Project, the Pearl Project, the Glacier Project, the Skibo Project, the Tracks Project, the Birch Project, the Echo Trail Project, the Travel Management Plan of 2009, the Pelican Project, the Tracks Project, the Virginia Project, and the Big Grass Project. Simply listing "forestry practices" as part of the analysis is not sufficient.

Thematic Response

The FEIS includes a qualitative cumulative effects assessment of USFS's ongoing management activities on the Superior National Forest in conjunction with the NorthMet Mining Project and Land Exchange. The vegetation management projects listed in theme CU 09 address Superior National Forest Landscape Ecosystems objectives stated in the Forest Plan. These projects' effects on the Forest Plan Landscape Ecosystems are cumulatively incorporated into the Superior National Forest databases. The cumulative effects analysis for the NorthMet Mining Project and Land Exchange used the Superior National Forest Landscape Ecosystems data in estimating potential effects, as shown in FEIS Section 6.3.4.3.2 and Table 6.3.4-2. Motorized Use and Travel Management projects are outside the scope of the effects of, and therefore would not be affected by the NorthMet Project Proposed Action.

Theme CU 10

Theme Statement

The SDEIS does not adequately address cumulative effects on National Forest lands from other mining projects that may require National Forest lands for tailings, ore processing, stockpiles, and other infrastructure.

Thematic Response

Sections 6.1.1 and 6.1.2 describes all past, present, and reasonably foreseeable projects/actions that were considered in the cumulative effects assessment.

Theme CU 11

Theme Statement

The Proposed NorthMet Mine would cause irreversible cumulative effects in the region, including impacts on treaty rights and subsistence practices.

Thematic Response

The FEIS describes the cumulative effects of the NorthMet Project Proposed Action and Land Exchange Proposed Action. FEIS Sections 6.2 and 6.3 have been updated with additional information that has become available since publication of the SDEIS. FEIS Section 6.2.9 describes cumulative effects for cultural resources.

Theme CU 12

Theme Statement

The cumulative effects analysis conducted by the Tribal Cooperating Agencies must be considered by the lead agencies.

Thematic Response

The Co-lead Agencies considered the information included in the Tribal Cooperating Agencies' cumulative effects assessment and found no compelling information or analysis to change the original approach or conclusions.

Theme CU 13

Theme Statement

The cumulative effects analysis must include a conceptual analysis of the impact of multiple copper/nickel mines operating in these headwaters. These projects are occurring because the State of Minnesota is permitting mine development anywhere in the Duluth Complex but restricting processing to the St. Louis River drainage only.

Thematic Response

The FEIS analyzed the direct, indirect and cumulative effects of the NorthMet Project Proposed Action and Land Exchange Proposed Action to include past, present, and reasonably foreseeable projects as defined in USEPA (USEPA 1999b, as cited in the FEIS) and CEQ (CEQ 1997, as cited in the FEIS, and Connaughton 2005, as cited in the FEIS) guidance. Speculative projects are considered outside the scope of the analysis. There are currently no copper/nickel mining projects permitted in the State of Minnesota. The NorthMet Project is the only proposed copper/nickel mining project currently under Environmental Review (EIS process). The State of Minnesota does not have any restrictions limiting mine processing to the St. Louis River Watershed.

Theme CU 14

Theme Statement

Cumulative effects analysis requires quantified or detailed information. Absent specific justification, general statements about possible effects and some risk do not constitute the NEPA-required "hard look."

Thematic Response

The FEIS includes both quantitative and qualitative analysis of the cumulative effects of the NorthMet Project Proposed Action and Land Exchange Proposed Action. Where quantification of conditions could not be ascertained, a qualitative analysis of the potential cumulative effects was used. The Co-lead Agencies considered these qualitative effects carefully where data did not exist or could not be collected using reasonable methods consistent with the CEQ regulations (40 CFR 1502.22).

Theme CU 15

Theme Statement

The FEIS should reveal the cumulative effects from all sources together on impacted resources, acknowledging that the Proposed Action would be one of many sources that cause the impacts.

Thematic Response

The FEIS describes the cumulative effects of the NorthMet Project Proposed Action and Land Exchange Proposed Action in conjunction with other projects on individual resources from a variety of sources. For example, water impacts to the Partridge River take into account the effect that the Northshore Mine has on flows, including projecting the conditions at future closure of the Northshore Mine. In addition, impacts to wildlife take into account the effects from noise, direct mortality (e.g., traffic), habitat fragmentation to wildlife corridors, and loss of 1854 Treaty resources due to other reasonably foreseeable projects.

Theme CU 16

Theme Statement

Post-closure impacts should be included in the cumulative effects analysis because some mine features would become permanent features on the landscape.

Thematic Response

The FEIS describes the cumulative effects of the NorthMet Project Proposed Action, including those expected during closure and post-closure. The FEIS discloses post-closure effects in Section 6.2.

Theme CU 17

Theme Statement

The SDEIS underestimated the cumulative effects on native habitats in this region. Native habitat has been destroyed from Grand Rapids to the BWCAW by mining, urbanization, and settlement, among other factors.

Thematic Response

FEIS Section 6.1.1.2 states that past effects on all resources are described as the current environmental conditions in FEIS Chapter 4. The FEIS discloses how native habitats have been modified in the past by human activity. Using the descriptions in FEIS Chapter 4 as a baseline, the FEIS describes how the NorthMet Project Proposed Action and Land Exchange Proposed Action, in addition to reasonably foreseeable projects and actions, would cause cumulative effects in the future.

Theme CU 18

Theme Statement

The state should conduct a regional or programmatic cumulative effects study of all sulfide mining in the Lake Superior Basin, including previous and potential future mining activities, before approving the NorthMet Mine.

Thematic Response

The preparation of a regional or programmatic analysis of past and potential mining activities is outside the scope of the FEIS. The cumulative effects analysis meets the requirements of MEPA/NEPA.

Theme CU 19

Theme Statement

A generic or programmatic EIS for sulfide mining would be the appropriate way to evaluate multiple mining projects currently being planned. Such an EIS should be used to determine whether sulfide mining in the Duluth Complex will be beneficial to the long-term interests of the State.

Thematic Response

The preparation of a regional or programmatic analysis of past and potential mining activities is outside the scope of the FEIS. The cumulative effects analysis meets the requirements of MEPA/NEPA.

Theme CU 20

Theme Statement

The SDEIS correctly identified the cumulative effects study areas, cumulative projects, and analysis approach.

Thematic Response

These comments provide general information regarding the cumulative effects assessment. Because no specific information was provided, no changes to the EIS were made.

A.5.7 Issue: Financial Assurance (FIN)

Theme FIN 01

Theme Statement

The SDEIS does not clearly state who will be financially responsible, how those parties will be held responsible for the Proposed Action, or who will monitor this process. Such considerations are crucial, given the mining industry's history and the 200-500 year or possible perpetual (even through bankruptcy) timeframe of the Project. The FEIS should also identify the parties that would monitor this process over such a long timeframe. Restrictions should be placed on PolyMet (with respect to financial assurance obligations) for any transfers of ownership or organizational restructuring once the project permits are granted.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. The project proponent (PolyMet) would be responsible for financial assurance costs. As stated in *Minnesota Rules*, part 6132.1200, subpart 5, financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. *Minnesota Rules*, part 6132.1200, subpart 7 states that the Permit to Mine could be suspended or revoked if the proponent does not comply with financial assurance criteria. The Commissioner may also order imposition of a civil penalty in such a situation, under *Minnesota Rules*, part 6132.5100. *Minnesota Rules*, part 6132.1200 subpart 4 also states that the Commissioner shall evaluate all financial assurance cost estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs. Costs incurred by the Commissioner in hiring third parties to perform the evaluation must be paid by the applicant. *Minnesota Rules*, part 6132.1200, subpart 4, item F states that any new permittee would be responsible for complying with the Permit to Mine and any outstanding obligations before the former permittee could be released from the requirements. Additional details on the financial assurance required for the project would be addressed during permitting.

Theme FIN 02

Theme Statement

Since PolyMet (Minnesota) has no assets, PolyMet's parent company (PolyMet, Canada) and major shareholder (Glencore Xstrata), must be included as responsible parties for financial assurance.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. PolyMet, the project proponent and not its shareholders, would be responsible for financial assurance. As stated in *Minnesota Rules*, part 6132.1200, subpart 5, financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. *Minnesota Rules*, part 6132.1200, subpart 4, item F states that any new permittee would be responsible for complying with the Permit to Mine and any outstanding obligations before the former permittee could be released from the requirements. Additional details on the financial assurance required for the project, including responsible parties, would be addressed during permitting.

Theme FIN 03

Theme Statement

The FEIS should describe the legal framework for financial assurance that would result in bankruptcy-proof and perpetual financial assurance investments/instruments, as well as the repercussions if PolyMet fails to meet its obligations.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. As stated in *Minnesota Rules*, part 6132.1200, subpart 5, financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. *Minnesota Rules*, part 6132.1200, subpart 7 states that the Permit to Mine could be suspended or revoked if the proponent does not comply with financial assurance criteria. The Commissioner may also order imposition of a civil penalty in such a situation, under *Minnesota Rules*, part, part 6132.5100. Additional details on the legal framework for the financial assurance required for the project would be addressed during permitting. Also see the response to theme FIN 08, which addresses long-term financial assurance instruments/investments.

Theme FIN 04

Theme Statement

The State of Minnesota should not let a foreign corporation (PolyMet, Canada and Glencore Xstrata) make profits off of U.S. land and/or send minerals to China, especially without financial assurances that address long-term cleanup of the site. The FEIS should provide a discussion of the feasibility and methods of enforcing U.S. laws regarding foreign companies.

Thematic Response

Financial assurance is required up front, and would be updated throughout the project under the Permit to Mine, which would be required prior to the start of mining. The purpose of financial assurance, as stated in *Minnesota Rules*, part 6132.1200, subpart 1, is to ensure that MDNR has a "source of funds" to perform reclamation activities if the permittee fails to do so. As stated in *Minnesota Rules*, part 6132.1200, subpart 5, financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. The NorthMet Project's financial assurance requirements are independent of PolyMet's parent company and its shareholders. FEIS Section 3.2.2.4 provides available details regarding financial assurance and applicable regulations. Additional details on the financial assurance required for the project would be addressed during permitting.

Theme FIN 05

Theme Statement

Relative to cost estimates, the SDEIS does not contain information regarding:

- Adequate reclamation and closure cost estimate information to ensure a sufficient amount is available when needed to meet evolving long-term care standards;
- How often the cost estimates for water treatment will be updated;
- How long the covers, liners, treatment equipment, Wastewater Treatment Plant (WWTP) and Wastewater Treatment Facility (WWTF) will last, and how they would be replaced;
- How cost estimates would be determined for contingency plans/unforeseen challenges (natural events and man-made accidents);
- Adaptive management as a mechanism to address uncertainties;
- How the economic value of water and human health is considered; and
- How alternative estimates (e.g., from the Grand Portage Band of Lake Superior Chippewa) are considered and reconciled with PolyMet's estimate.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the cost estimates, timeframes, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. FEIS Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated at least annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. The liner and cover systems for waste containment are selected on the basis of numerous factors discussed in the Rock and Overburden Management Plan and FEIS Sections 3.2.2.1.8 and 3.2.2.3.10. The WWTP and WWTF would undergo continued inspection and maintenance during operations, long-term treatment, and in closure. The WWTP

and WWTF replacement costs would be included in long-term financial assurance estimates. USEPA guidance on utilization of adaptive management defines it as a decision making process that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. *Minnesota Rules*, part 6132.1200, subparts 4 and 5 require the MDNR to evaluate financial assurance cost estimates, terms, and conditions using individuals with documented experience in the relevant field. Those individuals would consider all relevant information in making their evaluations.

Theme FIN 06

Theme Statement

The FEIS should provide reasonable estimates on how long closure/post-closure treatment and maintenance will be required to assess project effects and risks in the context of financial assurance requirements.

Thematic Response

FEIS Sections 3.2.2.1.10, 3.2.2.3.12, and 5.2.2.3.1 provide available information regarding long-term water treatment and maintenance. Temporal aspects of financial assurance are addressed in *Minnesota Rules*, part 6132.3200, subpart 2, item E, which states that financial assurance is required for all areas that require continued maintenance following closure, and that no release from the Permit to Mine would be granted for portions of mining areas that require post-closure maintenance until the maintenance activities are no longer necessary. Refer to FEIS Section 3.2.2.4 for more information on financial assurance.

Theme FIN 07

Theme Statement

The State of Minnesota should set a value for financial assurance obligations and should require PolyMet to pay that amount as a condition of issuance of the Permit to Mine.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. Financial assurance is required up front, and would be updated throughout the project under the Permit to Mine, which would be required prior to the start of mining. *Minnesota Rules*, part 6132.1200, subpart 4 also dictates that the Commissioner shall evaluate all financial assurance cost estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs. Additional details on the cost estimates that would be required for the project would be addressed during permitting.

Theme FIN 08

Theme Statement

The SDEIS provides detailed project modeling, analysis, and discussion concluding the need for long term (perpetual) treatment, yet the financial assurance section presents very minimal, general information on how this long term treatment will be financed. It is unclear what methods (assumptions on discount rates, inflation, and rate of return on investments) or instruments (e.g., cash up front within the custody and control of the State, reliance on a reputable third-party insurer such as Lloyd's of London) will be used to do so, how to assure the investments are risk-free and account for market fluctuations, and determination of how the funds would be dedicated to this project. Annual adjustment of financial assurance is a "reactive" approach that does not seem adequate for project with such large potential risks and effects.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. FEIS Table 3.2-15 provides financial assurance cost estimates for various years of closure, long term annual monitoring and maintenance cost estimates. FEIS Section 3.2.2.4.1 discusses what activities would be considered in cost estimates, and that cost estimates would be updated annually under the Permit to Mine to account for the proceeding year's activities. *Minnesota Rules*, part 6132.1200, subpart 3 states that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. FEIS Section 3.2.2.4.2 discusses the types of financial assurance instruments that could be used in combination to assure the project. Additional details on the cost estimates, methods, and instruments that would be required for the project, and how the instruments would be updated and dedicated to the project would be addressed during permitting.

Theme FIN 09

Theme Statement

The State of Minnesota does not have the staff expertise necessary to protect tax payers when assessing the types and adequacy of financial assurance and financial instruments necessary for this project.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance. *Minnesota Rules*, part 6132.1200, subpart 4 states that the Commissioner shall evaluate all financial assurance cost estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs. Costs incurred by the Commissioner in hiring third parties to perform the evaluation must be paid by the applicant. Additional details on the financial assurance required for the project would be addressed during permitting.

Theme FIN 10

Theme Statement

The potential benefits from a limited number of jobs are outweighed by potential effects of open-pit sulfide mining on thousands of acres for hundreds of years. These costs cannot really be measured, and they are likely to fall on the shoulders of current and future generations of Minnesota taxpayers.

Thematic Response

The FEIS discusses the number of jobs potentially created by (and other socioeconomic impacts of) the NorthMet Project Proposed Action in Section 5.2.10. Other effects of the project, such as environmental effects, are discussed throughout FEIS Chapter 5. Long-term environmental monitoring and maintenance cost estimates are part of financial assurance, as discussed in FEIS Section 3.2.2.4. As stated in *Minnesota Rules*, part 6132.1200, subpart 5, financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. Additional details on the financial assurance cost estimates and commitment required for the project would be addressed during permitting.

Theme FIN 11

Theme Statement

The proposed extent of Financial Assurance is inadequate and should also be required for potential effects (indirect and unforeseen) to resources such as wetlands, waters, and wild rice. Financial Assurance should also address monitoring and maintenance costs, mitigation costs, and legacy contamination.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance, including for reclamation of all disturbed areas and ongoing long-term monitoring and maintenance. Additional details on the financial assurance required for the project effects, monitoring, mitigation, and legacy contamination would be addressed during permitting. The FEIS analyzes the reasonably foreseeable effects of the NorthMet Project, and includes monitoring systems (i.e., environmental/compliance samples or measurements) to confirm modeled predictions. MDNR has the authority to require remedial action for unforeseen effects, and to adjust financial assurance on at least an annual basis when changes are necessary to the reclamation plan. To the extent that the reclamation plan includes maintenance, mitigation, and cleanup of legacy contamination, those items would be covered by financial assurance.

Guidance for USACE permits that are conditioned to include any type of financial assurance to ensure that required compensatory mitigation is completed can be found in FEIS Section 5.2.3.3.2, or at:

- 33 CFR Parts 325 and 332, Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, dated April 10, 2008. Financial assurances are specifically discussed at 33 CFR 332.3(n).

- Regulatory Guidance Letter No. 05-1 Date: 14 February 2005 titled: Guidance on the Use of Financial Assurances, and Suggested Language for Special Conditions for Department of the Army [i.e., USACE] Permits Requiring Performance Bonds, provides additional guidance on the use of financial assurances (USACE 2005).

Theme FIN 12

Theme Statement

The FEIS should include a Failure Analysis, and should account for risks (e.g., mine pit wall failures or operation failures) associated with unprecedented duration of monitoring and treatment. This was the approach taken in USEPA's assessment of the Pebble Mine.

Thematic Response

The referenced document (USEPA's "Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska") does not address any specific mining proposal, and thus cannot appropriately be applied to the NorthMet Project Proposed Action. FEIS Section 3.2.2.4 provides available details regarding financial assurance. Additional details on the financial assurance would be addressed during permitting. The FEIS analyzes the reasonably foreseeable effects of the NorthMet Project Proposed Action, and includes monitoring systems (i.e., environmental/compliance samples or measurements) to confirm modeled predictions. MDNR has the authority to require remedial action for unforeseen effects or events, and to adjust financial assurance on at least an annual basis when changes are necessary to the reclamation plan.

Theme FIN 13

Theme Statement

Detailed financial assurance information must be included up front, as part of the Environmental Review process, as required by NEPA/MEPA. Without sufficient information on Financial Assurance in the SDEIS, the public's opportunity to comment on it during the public comment period was reduced, as was with the opportunity to understand key elements of the proposed financial assurance. The Project's Financial Assurance discussion should include a robust public debate involving financial and legal experts.

Thematic Response

FEIS Section 3.2.2.4 provides available details regarding financial assurance as required under NEPA/MEPA. *Minnesota Rules*, part 6132.1200, subpart 4 states that the Commissioner shall evaluate all financial assurance cost estimates and adjustments to cost estimates using individuals with documented experience in material handling and construction and mining costs. Additional details on the financial assurance that would be required for the project would be addressed during permitting. The Permit to Mine, which would include financial assurance information, includes an opportunity for public input. Neither NEPA nor MEPA rules require that all financial assurance mechanisms be in place before the EIS is finalized.

Theme FIN 14

Theme Statement

State statutes and rules (such as *Minnesota Rules*, part 6132.3200) prohibit projects requiring perpetual maintenance after closure. Financial Assurance laws are also inadequate for this project.

Thematic Response

The FEIS describes the state statutes and rules (specifically *Minnesota Rules*, part 6132.3200) as they relate to long-term maintenance. *Minnesota Rules*, part 6132.3200, subpart 2, item E states that financial assurance is required for all areas that require continued maintenance following closure, and that no release from the Permit to Mine would be granted for portions of mining areas that require post-closure maintenance until the maintenance activities are no longer necessary.

Theme FIN 15

Theme Statement

The SDEIS does not discuss federal requirements for Financial Assurance.

Thematic Response

FEIS Section 3.2.2.4 describes how financial assurance would be incorporated into the state Permit to Mine. If issued, USACE permits would require mitigation for indirect wetland effects. Guidance for USACE permits that are conditioned to include any type of financial assurance to ensure that required compensatory mitigation is completed can be found in FEIS Section 5.2.3.3.2, or at:

- 33 CFR Parts 325 and 332, Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, dated April 10, 2008. Financial assurances are specifically discussed at 33 CFR 332.3(n).
- Regulatory Guidance Letter No. 05-1 Date: 14 February 2005 titled: Guidance on the Use of Financial Assurances, and Suggested Language for Special Conditions for Department of the Army [i.e., USACE] Permits Requiring Performance Bonds, provides additional guidance on the use of financial assurances (USACE 2005).

Theme FIN 16

Theme Statement

PolyMet has the ability to financially assure the project.

Thematic Response

These comments include general information supporting PolyMet's ability to provide sufficient financial resources for the NorthMet Mining project. No changes were made to the EIS as a result of these comments.

Theme FIN 17

Theme Statement

The Project should be permitted because Financial Assurance will protect against any future problems, and Financial Assurance laws and regulations are sufficient for this purpose.

Thematic Response

These comments include general support for the NorthMet Mining project because the company would provide sufficient funds to financially assure the project. Because no specific information was provided, no changes were made to the EIS as a result of these comments.

A.5.8 Issue: General Opinion (GEN)

Theme GEN 01

Theme Statement

General opposition to the project due to broad environmental concerns, such as "pollution" or "environmental damage."

Thematic Response

These comments include general opposition to the NorthMet Mining project. Because no specific information was provided, no changes were made to the EIS as a result of these comments.

Theme GEN 02

Theme Statement

General support for the project.

Thematic Response

These comments include general support for the NorthMet Mining project. Because no specific information was provided, no changes were made to the EIS as a result of these comments.

Theme GEN 03

Theme Statement

General opposition to the project due to multiple environmental and/or social concerns.

Thematic Response

These comments include general opposition to the NorthMet Mining project. Because no specific information was provided, no changes were made to the EIS as a result of these comments.

A.5.9 Issue: Geotechnical Stability (GT)

Theme GT 01

Theme Statement

The SDEIS does not properly address the stability risks of using the existing tailings basin, including using the existing LTV tailings basin as a base, and the presence of erosion, peat, and LTV slimes, faults and streams.

Thematic Response

The FEIS summarizes the design of the proposed Tailings Basin in Section 5.2.14.2.2, and includes information on the analyses pertaining to its stability. Existing conditions are accounted for in the design through data gathered from surveys, material testing, and site exploration. Peat represents some of the weaker material within the existing LTVSMC Tailings Basin. The NorthMet Project Proposed Action includes adding a rock buttress within the existing dams to reinforce those areas where peat and fine tailings and slimes layers occur. Peat would be removed from locations where rock buttress would be added to allow the rock to key into the more competent glacial till. Peat, fines, and slimes layers within the existing tailings basin would also be strengthened through cement deep soil mixing prior to use in the Tailings Basin for NorthMet. The proposed water containment system would capture and remove water that seeps from the Tailings Basin. Results of a probabilistic seismic hazard analysis indicated that a severe earthquake is highly unlikely in Minnesota, and that any seismically induced forces would not likely affect the stability of the Tailings Basin. Geotechnical stability modeling undertaken for the FEIS takes into account the above proposed design measures, as well as the location where peat would remain after construction of the on-site facilities. Modeling indicates that the Factors of Safety would be met. Monitoring and adaptive management would be implemented throughout construction, operation, and maintenance of the Tailings Basin to account for measured stability characteristics to manage the risk of failure. Refer to FEIS Section 5.2.2 for more information about water management at the Tailings Basin. The Geotechnical Data Package, Volume 1 (Tailings Basin) (PolyMet 2015l, as cited in the FEIS) contains specific detail on the design and stability modeling. Stability would be monitored throughout construction and operation in accordance with permit requirements, and adaptive management could be implemented as necessary based on monitoring results (see FEIS Section 5.2.14.2.2). The Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS) contains details of monitoring and management for the Tailings Basin. The details of the design, as well as monitoring and management requirements would be further refined for permitting under the MDNR Dam Safety Permit and the Permit to Mine.

After the close of the comment period on the SDEIS, but prior to publication of the FEIS, an Independent Expert Engineering Investigation and Review panel issued a *Report on Mount Polley Tailings Storage Facility Breach* (IEEIRP 2015). This report was reviewed by geotechnical staff from the Co-lead Agencies as part of developing this response. Site specific information and design features are essential to understanding geotechnical stability of any tailings basin. The Co-lead Agencies are confident in the site specific data that has been collected for the NorthMet Project and that was used to model geotechnical stability. The design of the NorthMet Project tailings basin is sufficiently different (i.e., shallower slopes, use of buttressing,

incorporation of cement deep soil mixing technology) from the Mount Polley Tailings Storage Facility that a direct comparison cannot be made.

Theme GT 02

Theme Statement

The SDEIS does not properly address the stability risks of the tailings basin related to the design standards, including the risk of the liquefaction factor of safety 1.1 being too low. Design criteria are vague and shouldn't be based on existing tailings basins in Minnesota.

Thematic Response

The Co-lead Agencies believe that the design criteria and minimum Factors of Safety required for the NorthMet Project are adequate and are in-line with the state of the industry. These criteria are consistent with world-wide industry standards and not limited or restricted by local Minnesota regulations. The Geotechnical Data Package, Volume 1 (Tailings Basin) (PolyMet 2015l, as cited in the FEIS) contains specific detail on the design and stability modeling. Stability would be monitored throughout construction and operation in accordance with permit requirements, and adaptive management could be implemented as necessary based on monitoring results. Details of monitoring and management for the Tailings Basin are provided in the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS). The details of the design, as well as monitoring and management requirements would be further refined for permitting under the MDNR Dam Safety Permit and the Permit to Mine. FEIS Section 5.2.14.2.2 summarizes the design, stability modeling results, monitoring and adaptive management measures for the proposed Tailings Basin.

Theme GT 03

Theme Statement

The SDEIS does not properly address the stability risks of the tailings basin related to components of the design proposal, including the suitability of the rock buttresses (including construction on top of peat) and the hydrostatic pressure resulting from the water containment system.

Thematic Response

The FEIS summarizes the design of the proposed Tailings Basin in Section 5.2.14.2.2 and includes information on the analyses pertaining to its stability, including the proposed rock buttress. Peat would be removed prior to the construction of the buttress so that the buttress could key into the stronger underlying glacial till. Since the SDEIS, PolyMet has included cement deep soil mixing in the proposed design to further stabilize the fines and slimes layers in the existing LTVSMC tailings before placing NorthMet tailings in the Tailings Basin. See FEIS Sections 3.2.2.3.3 and 3.5.2.14.2.2 for more information on cement deep soil mixing. The proposed water containment system would capture and remove water that seeps from the Tailings Basin. Hydrostatic pressure from this system was considered in the design and stability modeling. The Geotechnical Data Package, Volume 1 (Tailings Basin) (PolyMet 2015l, as cited in the FEIS) contains specific detail on the design and stability modeling. Stability would be

monitored throughout construction and operation in accordance with permit requirements, and adaptive management could be implemented as necessary based on monitoring results (see FEIS Section 5.2.14.2.2). The Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS) contains details of monitoring and management for the Tailings Basin. The details of the design, as well as monitoring and management requirements would be further refined for permitting under the MDNR Dam Safety Permit and the Permit to Mine.

Theme GT 04

Theme Statement

The FEIS should clarify the design of the waste rock stockpiles with respect to geotechnical stability, including:

- angle of repose;
- recommended minimum cover slope of least 2 %;
- site-specific and material specific tests prior to construction, and rigorous construction quality assurance;
- the required factors of safety; and
- design details.

Thematic Response

The design of the stockpiles would need to conform with Minnesota Rule 6132.2400. FEIS Section 5.2.14.2.1 provides a summary of the design requirements for the stockpiles including angles of repose, configured stockpile slopes, factors of safety, as well as the material tests that have occurred to date and that would be required prior to permitting. Geotechnical Data Package Volume 3 (Stockpiles) (PolyMet 2014p, as cited in the FEIS) and the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS) contain further information on the design and management of the stockpiles. Additional geotechnical investigations to address site conditions, materials and design would be required prior to stockpile construction approval under the Permit to Mine.

Theme GT 05

Theme Statement

The SDEIS does not properly address the stability risks of the tailings basin related to unusual but possible events, including:

- seismic events (e.g. using probabilistic method for determining maximum credible seismic event);
- dynamic modeling (as recommended by Chambers and Levit report); and
- extreme weather events (what was the probable maximum precipitation event modeled).

Thematic Response

Geotechnical analysis conducted for the FEIS included consideration for potential seismic liquefaction and extreme weather events. Details are provided in the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS) and the Geotechnical Data Package Volume 1 (PolyMet 2015l, as cited in the FEIS). The results are summarized in FEIS Section 5.2.14.2.2. The details of the design, as well as monitoring, maintenance, and adaptive management requirements would be further refined for permitting under the MDNR Dam Safety Permit and the Permit to Mine.

A seismic liquefaction analysis was undertaken for the Tailings Basin. Results indicated that a significant earthquake is unlikely in Minnesota, and a seismic design event (2,475-year return period) is not likely to trigger liquefaction in the Tailings Basin materials. Seismic deformation was also considered, and the effect of settlement resulting from a design earthquake event would not affect the stability or pond containment of the Tailings Basin.

Extreme weather events are accounted for in the design of the Tailings Basin, whereby the freeboard requirements have been determined to accommodate pond bounce from the Probable Maximum Precipitation (PMP) event. The PMP derived for the NorthMet site is a catastrophic event consisting of 38-inch storm event within a 72-hour period. The design of the Tailings Basin also includes an emergency overflow spillway to help limit pond storage if an event occurs where the freeboard is not sufficient to contain all stormwater. Tailings Basin stability modeling was undertaken to assess the effect of a PMP event pond bounce. Results indicated that the required Factor of Safety would be met.

Modeling showed that liquefaction was unlikely to occur; therefore, dynamic modeling was neither required nor performed for the design of the facility. Instead, a fully liquefied condition was analyzed to represent the critical condition.

Theme GT 06

Theme Statement

Would peat beneath the dikes present stability problems?

Thematic Response

Peat represents some of the weaker material within the existing LTVSMC tailings basin. It occurs in some areas under the existing LTVSMC dams, and beyond the toe of the dams. The NorthMet Project Proposed Action includes adding a rock buttress within the existing dams to reinforce those areas where peat and fine tailings and slimes layers occur. Virgin peat at the toe of the dams would be removed from the location of rock buttresses to allow the rock to key into the more competent glacial till. Peat, fines, and slimes layers within the existing tailings basin would also be strengthened through cement deep soil mixing prior to use of the Tailings Basin for NorthMet. See FEIS Sections 3.2.2.3.3 and 3.5.2.14.2.2 for more information on cement deep soil mixing. Geotechnical stability modeling undertaken for the FEIS takes into account the above proposed design measures, as well as the location where peat would remain after construction of the on-site facilities. Modeling indicates that the Factors of Safety would be met. Monitoring and adaptive management would be implemented throughout construction, operation and maintenance of the Tailings Basin to account for measured stability characteristics to

manage the risk of failure. FEIS Section 5.2.14.2.2 provides information on the design criteria, stability modeling methodology and results, and monitoring, maintenance and adaptive management relating to stability of the proposed Tailings Basin. Additional detail is provided in Geotechnical Data Package, Volume 1 (Tailings Basin) (PolyMet 2015l, as cited in the FEIS) as well as the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS).

Theme GT 07

Theme Statement

More information should be provided on operations and monitoring, potential contingency actions (e.g. physical modifications), and response to unplanned and catastrophic events (e.g. extreme weather events, equipment failure, human error) at the Tailings Basin, Hydrometallurgical Residue facility, and stockpiles.

Thematic Response

FEIS Section 5.2.14 includes subsections addressing the waste rock Stockpiles, Tailings Basin, and Hydrometallurgical Residue Facility respectively that describe operations, monitoring and contingency management actions. These sections have been revised since the SDEIS to provide additional information and clarity. The Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS), the Residue Management Plan (PolyMet 2014r, as cited in the FEIS), and the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS) provide detailed information on the monitoring and mitigation of these features. Details on operation and monitoring would be further refined during permitting.

Theme GT 08

Theme Statement

The FEIS should include additional detail regarding the borrow, tailings, and bentonite materials considered for construction of the waste facilities.

Thematic Response

FEIS Sections 3.2 and 5.2.14 provide a summary of the material to be used and disposed of in the proposed stockpiles, Tailings Basin, and Hydrometallurgical Reside Facility. FEIS Section 5.2.14 addresses the stability of the waste facilities (proposed stockpiles, Tailings Basin, and Hydrometallurgical Reside Facility), while the remainder of Chapter 5 addresses other potential environmental consequences relating to those materials (e.g., water impacts are addressed in FEIS Section 5.2.2). Additional information pertaining to tailings and construction materials is provided in the corresponding Geotechnical Data Packages for the Tailings Basin (PolyMet 2015l, as cited in the FEIS), Hydrometallurgical Residue Facility (PolyMet 2014c, as cited in the FEIS), and stockpiles (PolyMet 2014p, as cited in the FEIS), as well as the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS), Residue Management Plan (PolyMet 2014r, as cited in the FEIS), and the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS). Additional detail on construction materials would be included in the MDNR Dam Safety Permit and Permit to Mine.

Theme GT 09

Theme Statement

The FEIS should clarify closure concepts, including plans to address existing over-steepened embankments on Tailings Basin Cell 2W, as well as long term monitoring and maintenance (e.g. bentonite, erosion and vegetation cover) for the waste facilities.

Thematic Response

The NorthMet Project Proposed Action does not include actions to redesign the existing Cell 2W apart from utilizing coarse LTVSMC tailings as borrow for the construction of the new NorthMet Project Proposed Action lifts. Removing some of those coarse LTVSMC tailings could reduce the slope of the Cell 2W embankments. The conditions and stability of the entire basin is monitored and maintained under the existing permit requirements, and would be monitored under the NorthMet Project Proposed Action permit requirements, should the project be permitted. Closure of the NorthMet Project Proposed Action facilities is described in the respective parts of FEIS Section 3.2. FEIS Section 5.2.14 has been revised in the FEIS to improve clarity on closure requirements, including monitoring and maintenance for the waste facilities as it relates to stability. Additional detail can be found in the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS), Residue Management Plan (PolyMet 2014r, as cited in the FEIS), and the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS).

Theme GT 10

Theme Statement

The FEIS should provide additional details on the proposed stockpile liner and geomembrane systems including:

- Ground preparations, installation, and use;
- Short- and long-term performance (conductivity). The same conductivity (10-6) should be prescribed for both the Category 2/3 and Category 4 stockpiles;
- The potential for long-term deterioration due to acid, extreme weather, or other factors, and the impact of this deterioration on factors of safety;
- The potential for spreading and separation of the panel overlaps due to settling;
- Additional citations for expected liner performance;
- Site-specific and material-specific tests prior to construction and rigorous construction quality assurance; and
- Long term monitoring and maintenance.

Thematic Response

FEIS Sections 3.2.2.1.7 and Section 5.2.14.2.1 summarize the design of the proposed stockpiles and liners; these sections have been supplemented since the SDEIS. FEIS Section 3.2.2.1.10 provides a summary of the design of the Category 1 Stockpile geomembrane cover system. The

Geotechnical Data Package, Volume 3 (Stockpiles) (PolyMet 2014p, as cited in the FEIS) and the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS) provide technical and design information for the stockpiles and liners (including liner leakage analysis and foundation settling).

The permanent Category 1 Stockpile would not be lined, but would instead be surrounded by a containment system to that would capture groundwater and surface runoff and direct it to a WWTF for treatment. The Category 1 Stockpile would be progressively reclaimed and at closure would be covered with a geomembrane system that would be vegetated to meet the requirements of *Minnesota Rules*, part 6132.2200, subpart 2, item B. The design of the Category 1 Stockpile cover system was derived from landfill requirements in *Minnesota Rules*, part 7035.2815, subpart 6, item D. Long-term maintenance of the Category 1 Stockpile would include repair of erosional damage and removal of woody species and trees from the stockpile cover system. The factors of safety estimated during slope stability are not anticipated to change due to long-term performance variation in the geomembrane.

Liners would be used at the temporary Category 2/3 and Category 4 stockpiles. Additional detail on the foundation materials and design would be required for permitting; however, local soils appear suitable (or could be treated) for foundation material in order to meet permeability design criteria. The Category 4 Stockpile liner has a lower permeability design criteria than the Category 2/3 Stockpile liner because the Category 4 waste rock would be more reactive. These stockpiles would be removed and reclaimed prior to the end of mining (i.e., prior to year 20). The liners for these stockpiles would perform to expectations throughout the duration of their need.

The Co-lead Agencies believe the level of analysis and information provided in the FEIS is sufficient for an environmental impact statement as required under NEPA and MEPA. Additional geotechnical analysis and design details would be required for permitting, including more detail on the foundation material characteristics, design details to ensure foundation and liner integrity, and details on the installation, operation, monitoring, and maintenance of the liners, covers, and stockpiles.

Theme GT 11

Theme Statement

The SDEIS does not properly address the stability risks of the Hydrometallurgical Residue Facility, including:

- Potential liquefaction scenarios;
- How seepage from the Tailings Basin may affect the Hydrometallurgical Residue Facility;
- The presence of emergency LTVSMC tailings at the base of the Hydrometallurgical Residue Facility—this material should be removed;
- Consequences of unsuccessful wick drain installation;
- Dynamic modeling, as recommended by the Chambers and Levit report;

- Insufficient consolidation tests and assumption of homogeneity in the settling analysis of LTVSMC tailings and slimes; and
- The presence of faults.

Thematic Response

FEIS Section 5.2.14.2.3 summarizes the geotechnical stability of the Hydrometallurgical Residue Facility. Details are provided in the Geotechnical Data Package, Volume 2 (PolyMet 2014c, as cited in the FEIS) and design, construction, monitoring, maintenance, and adaptive management is addressed in the Residue Management Plan (PolyMet 2014r, as cited in the FEIS).

The Hydrometallurgical Residue Facility would be constructed using the downstream methods at the existing LTVSMC Emergency Tailings basin. The LTVSMC emergency tailings would be consolidated and compacted prior to the construction of the proposed facility. New dams would be located beyond the extent of the emergency basin and founded on existing silty sand, gravel glacial till, and Giants Range granite.

Materials placed in thin, well-compacted lifts such as that proposed for the Hydrometallurgical Residue Facility embankment fill are understood to be sufficiently dense of critical state that liquefaction is not anticipated under the various loading conditions considered for the design of the Hydrometallurgical Residue Facility. Although liquefaction of the hydrometallurgical residue (within the basin) may occur, the facility is designed such that containment is not reliant upon the strength of the residue. Therefore, the integrity of the facility would not be impacted by a loss of strength associated with potential residue liquefaction.

Seeps have been observed along the southern edge of the LTVSMC Tailings Basin Cell 2W. These seeps have diminished since the termination of LTVSMC operations and are expected to remain minimal, because Cell 2W is not proposed for use as part of the NorthMet Project Proposed Action. The current design of the Hydrometallurgical Residue Facility acknowledges the presence of this seep by including a collection drain that would collect water from the seep below the proposed constructed embankment and liner systems to transmit the collected seep to the exterior of the facility. This seepage collection system would consist of a layer of free draining soil that would reduce the potential for phreatic build-up below the liner.

Construction monitoring and mitigation plans would require further detail for permitting to evaluate consolidation of the LTVSMC tailings, settlement for the Hydrometallurgical Residue Facility and performance of the wick drains.

One Minnesota Geological Survey figure indicates an inferred (but not confirmed) fault underlying the proposed Hydrometallurgical Residue Facility; however, the area has also been mapped without an inferred fault (PolyMet 2014c, as cited in the FEIS). The potential presence of faults within the footprint of the Hydrometallurgical Residue Facility is not anticipated to have a negative impact on the storage of residue within the double-lined facility. Results of a probabilistic seismic hazard analysis for the Hydrometallurgical Residue Facility indicated that a severe earthquake is highly unlikely in Minnesota, and that seismically induced forces would not likely affect the stability of the Hydrometallurgical Residue Facility.

A fully dynamic model was not developed for the Hydrometallurgical Residue Facility. Because the facility would be constructed of compacted borrow material in the downstream method, the

effects of the relatively small earthquake event are not believed to be significant relative to the performance of the Hydrometallurgical Residue Facility.

Theme GT 12

Theme Statement

The FEIS should provide additional geotechnical details on the proposed Hydrometallurgical Residue Facility liner and cover systems, including:

- Ground preparations, installation, and use;
- Short- and long-term performance (conductivity);
- The potential for long-term deterioration due to acid, extreme weather, or other factors, and the impact of this deterioration on factors of safety;
- The potential for spreading and separation of the liner panel overlaps due to settlement;
- Additional citations for expected liner performance;
- Site-specific and material-specific tests prior to construction and rigorous construction quality assurance; and
- Long term monitoring and maintenance.

Thematic Response

FEIS Section 3.2.2.3.7 summarizes the Hydrometallurgical Reside Facility design and construction, Section 3.2.2.3.10 summarizes water management at the Hydrometallurgical Reside Facility, and Section 3.2.2.3.12 summarizes reclamation of the Hydrometallurgical Reside Facility. FEIS Section 5.2.14.2.3 provides details pertaining to geotechnical stability, including ground preparations, construction, monitoring, and maintenance of the Hydrometallurgical Reside Facility. This section has been supplemented since the SDEIS to include additional detail and clarity.

The Hydrometallurgical Reside Facility design includes a double liner system using geosynthetic materials. Stress on the liner system resulting from settling of the foundation material would be mitigated by consolidation of the existing LTVSMC emergency tailings prior to construction of the facility. A collection drain would also be installed to collect water from below the proposed constructed embankment and liner systems and transmit it to the exterior of the facility to reduce the potential for phreatic build-up below the liner. A stress deformation analysis found that strain on the liner system would be within acceptable limits of most geosynthetics. Results would not be noticeably affected by a large precipitation event.

PolyMet initiated laboratory testing to consider the chemical compatibility of the potential geosynthetic liner to be used with leakage from residue (PolyMet 2014r, as cited in the FEIS). Results indicated that the best liner material would be a polymer-treated geosynthetic liner that is manufactured specifically in anticipation of the chemical characteristics of the liquid and the pore water that would be contained within the facility. The hydraulic conductivity of the soil leakage collection system is not expected to degrade over time. Typical liner performance assumes a 500-year service life of the geomembrane; therefore, hydraulic conductivity of the

liner is not expected to degrade over that time. Specific attributes would be determined during the geosynthetic clay layer development to achieve the desired performance before final installation.

Findings of studies on geosynthetic liners indicate that performance is minimally affected by freeze-thaw cycles (PolyMet 2014c, as cited in the FEIS). At the Hydrometallurgical Residue Facility, the majority of the geosynthetic liner system would be below the water elevation, and therefore not exposed to freeze-thaw cycles.

Reclamation of the Hydrometallurgical Residue Facility would include removal of ponded water, removal of pore water from the residue, construction of the cover system, and establishment of vegetation and surface water runoff controls. Maintenance activities that would continue throughout reclamation and post-reclamation include dam slope erosion repair, and woody species and tree removal.

The Co-lead Agencies believe the level of analysis and information provided in the FEIS are sufficient for an EIS, pursuant to NEPA and MEPA. Additional geotechnical analysis and design details would be required for permitting, including more detail on the foundation material characteristics, design details to ensure foundation and liner integrity, and details on the installation, operation, monitoring and maintenance of the liners, covers, and the stability of the Hydrometallurgical Residue Facility.

Theme GT 13

Theme Statement

Tailings Basin stability model inputs are inadequately explained (e.g. terms of methodology for selection validity and reliability). There seems to be missing values of compression index (Cc) and swell index (Cs) for the LTVSMC tailings, peat, and residue.

Thematic Response

FEIS Section 4.2.14.2 summarizes the existing conditions and material inputs for the proposed Tailings Basin geotechnical modeling. FEIS Section 5.2.14.2.2 summarizes the design, modeling methodology and results, as well as the monitoring, maintenance and adaptive management for the proposed Tailings Basin. These sections have been revised since the SDEIS to improve clarity and to incorporate updated modeling information. Details on geotechnical modeling for the Tailings Basin are provided in Geotechnical Data Package, Volume 1 (Tailings Basin) (PolyMet 2015l, as cited in the FEIS), and proposed monitoring and management of the Tailings Basin is described in the Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS).

Theme GT 14

Theme Statement

The project enhancements for geotechnical stability from the DEIS to the SDEIS were not clearly stated.

Thematic Response

The proposed design and management of the proposed waste management facilities has evolved throughout the EIS. These modifications have resulted in improved expected stability as well as enhanced environmental outcomes (such as water impacts). Notable enhancements to the design of the proposed waste management facilities since the DEIS include:

- improving stability at the Tailings Basin by adding rock buttressing along the northern edge, and adding cement deep soil mixing in the fines and slimes layers along the northern sections of the LTVSMC tailings basin;
- moving the Hydrometallurgical Residue Facility from on top of the LTVSMC tailings basin, to a site adjacent to the LTVSMC tailings basin, and designing the Hydrometallurgical Residue Facility as a double-lined facility constructed using the downstream construction method;
- designing the Category 1 Stockpile as a permanent feature with a containment system for groundwater runoff and seepage, and geomembrane cover for closure (progressively reclaimed); and
- designing the Category 2/3 and 4 waste stockpile as temporary features, with liners, and to use reclaim the stockpiles but using the waste rock as backfill in the East and Central pits.

FEIS Sections 2.3, 2.4 and 3.2.3 provide an overview of the evolution of the NorthMet Project Proposed Action. Details of the current NorthMet Project Proposed Action are provided in Section 3.2. FEIS Section 5.2.14 provides details of the design factors, management, and modeling results pertaining to geotechnical stability of the waste material storage facilities.

Theme GT 15

Theme Statement

The SDEIS does not properly address the potential environmental consequences of a geotechnical failure due to unplanned and catastrophic events (e.g. extreme weather events, equipment failure, human error) at the Tailings Basin, Hydrometallurgical Residue facility, stockpiles, or pit.

Thematic Response

If incorrectly designed, constructed, and/or managed, or from other unforeseen circumstances, waste material storage facilities would have the potential to result in increased hydrologic and/or water quality effects and could potentially lead to slope or dam failure. Because the risk of failure is mitigated through application of design and safety requirements, including adaptive management procedures, the potential effects of hypothetical failure scenarios are not assessed in

the FEIS. Design and safety requirements are summarized in FEIS Section 5.2.14, and detailed in the Geotechnical Data Packages (PolyMet 2015l, PolyMet 2014c, PolyMet 2014p [all as cited in the FEIS]) and management plans (PolyMet 2015n, PolyMet 2014r, and PolyMet 2015h [all as cited in the FEIS]).

The design of the NorthMet Project Proposed Action geotechnical features has been developed using an iterative approach, whereby the design has been amended until modeling results meet the required design criteria, including Factors of Safety and other requirements for permitting. Stability modeling undertaken to inform these design requirements included extreme scenarios such as maximum precipitation events and earthquakes. This process resulted in additional engineering design features to strengthen the waste disposal facilities that now form part of the NorthMet Project Proposed Action. These include moving the Hydrometallurgical Reside Facility to a location adjacent to, but off of the existing tailings basin, and proposing construction of that facility using the downstream construction method. The design of the proposed Tailings Basin was also enhanced through the addition of the rock buttress and cement deep soil mixing. Designs would be further refined during the permitting process and optimized during construction, operation and closure, based on monitoring and adaptive management that required under permits.

The large-scale waste material storage facilities proposed for the NorthMet Project Proposed Action require compliance with MDNR nonferrous mining and dam safety rules, as well as the MPCA NPDES/SDS Permit. The Dam Safety permit requires that design and safety criteria be met to reduce the risk of potential failure. Under Minnesota Rule 6115.0490, Class 1 dams require contingency plans that inform emergency responders in the unlikely event of dam failure. As such, a dam break analysis may be required for the Tailings Basin and considered for safety management purposes under the Dam Safety Permit. A preliminary dam break analysis is included as an appendix in the Tailings Management Plan (PolyMet 2015n, as cited in the FEIS).

A.5.10 Issue: Hazardous Materials (HAZ)

Theme HAZ 01

Theme Statement

The EIS does not adequately describe how hazardous materials would be managed within the project area, or the potential impacts of hazardous materials spills or other incidents. Materials of concern include gasoline, diesel, oil, chemicals, explosives, and reject concentrate. Impacts of concern include human health, groundwater, surface water, vegetation, or other natural resources.

Thematic Response

FEIS Section 5.2.13 provides descriptions and references or citations regarding hazardous materials management; hazardous material management plan requirements (transportation, storage, use and disposal); emergency planning and community right-to-know recordkeeping and reporting requirements; and hazardous material spill response management and mitigation measure requirements.

A hazardous substance is defined by 40 CFR 302.3 as any substance designated pursuant to 40 CFR Part 302.

Hazardous waste as defined by *Minnesota Statutes* 116.06, subdivision 11:

> means any refuse, sludge, or other waste material or combinations of refuse, sludge or other waste materials in solid, semisolid, liquid, or contained gaseous form which because of its quantity, concentration, or chemical, physical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Categories of hazardous waste materials include, but are not limited to: explosives, flammables, oxidizers, poisons, irritants, and corrosives. Hazardous waste does not include source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended.

Hazardous waste may simply be defined as a waste that is a listed hazardous waste, or waste that exhibits ignitability, corrosivity, reactivity, toxicity, lethality, or is an oxidizer as described in *Minnesota Rules*, part 7045.0131, *Characteristics of Hazardous Waste*.

Potential impacts of hazardous materials to human health, groundwater, surface water, vegetation, and other natural resources may be found within the resource topic areas of FEIS Section 5.2.

The EIS process is not intended to replace good compliance planning, nor is it meant to provide explicit detail of spill response plans, hazardous material reduction plans, hazardous material or waste management plans, and contingency plans. Hazardous materials would be managed according to applicable Minnesota and Federal regulations.

Theme HAZ 02

Theme Statement

Materials deposited in the HRF should be assessed/characterized to determine whether HRF wastes or any part of them are hazardous wastes under Minnesota Law. Contaminants include nickel, arsenic, and mercury. The HRF should be considered a hazardous waste landfill and be regulated as such. Leakage will occur.

Thematic Response

Hazardous waste as defined by *Minnesota Statutes* 116.06, subdivision 11, "means any refuse, sludge, or other waste material or combinations of refuse, sludge or other waste materials in solid, semisolid, liquid, or contained gaseous form which because of its quantity, concentration, or chemical, physical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Categories of hazardous waste materials include, but are not limited to: explosives, flammables, oxidizers, poisons, irritants, and corrosives. Hazardous waste does not include source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended."

Minnesota Rules, part 7045.0120, subpart 1.I provides exemption to waste from extraction, beneficiation, and processing of ores and minerals in regard to storage, labeling, transportation, treatment, processing and disposal. Waste, hazardous only due to zinc, copper, nickel, and some other less common metals are not regulated as RCRA hazardous wastes. The MPCA anticipates that PolyMet would be licensed as a hazardous waste generator and not as a treatment, storage, and disposal facility.

The Hydrometallurgical Residue Facility would be constructed with the following layers from lower to higher: liner subgrade, geosynthetic clay liner, 60 millimeter low density polyethylene geomembrane, geocomposite leachate collection layer, 80 millimeter low density polyethylene geomembrane, geocomposite leachate drainage collection layer, and LTVSMC coarse tailings. Hydrometallurgical residue would be placed above the LTVSMC coarse tailings layer. The Residue would settle out within the Hydrometallurgical Residue Facility and remaining process water would be pumped from the Hydrometallurgical Residue Facility back to the Hydrometallurgical Plant. Water would be lost from this closed loop system to evaporation from the cell surface, and entrapment within the Residue's pore space. The double liner system would limit leachate leakage from the bottom of the cell. Precipitation falling within the Hydrometallurgical Residue Facility would be retained. During operations, leachate collected in the system would be recycled back into the Hydrometallurgical Residue Facility pond. During reclamation and long-term closure, leachate would be routed and cycled through the WWTP (PolyMet 2014r, as cited in the FEIS).

Material from the existing coal ash landfill is anticipated to be placed into the Hydrometallurgical Residue Facility during operations (PolyMet 2014b, as cited in the FEIS). Chemical and physical characteristics of materials placed in the Hydrometallurgical Residue Facility would be approved by the MPCA, within permit requirements, and would be placed in a manner as to not compromise the integrity of the liner system (PolyMet, Pers. Comm., November 4, 2014).

PolyMet reports ("Information Provided By PolyMet Regarding Hydrometallurgical Residue Testing for RCRA Thresholds," SRK 2014) indicate that 17 residue samples from 2005 pilot-plant testing and one residue sample from 2009 pilot-plant testing were analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) (EPA Method 1311). The method is typically used to assess solid waste to determine if the waste has toxicity characteristics exceeding RCRA hazardous waste thresholds. All 18 analytical tests resulted in TCLP analytical results less than the RCRA hazardous waste thresholds, indicating that for the metal parameters analyzed, the hydrometallurgical residue is not characteristically hazardous. All of the residues that were produced during the pilot plant testing in 2005 and 2009 represent residues that would be deposited into the Hydrometallurgical Residue Facility. Once Phase 2 is operational and as part of initial operational optimization, individual and combined residue samples would be analyzed weekly for physical characteristics, total metals, and TCLP. Once operations are optimized, individual and combined residue samples would be analyzed monthly for the same parameters. Hydrometallurgical Residue Facility pond and Hydrometallurgical Residue Facility leachate samples are expected to be sampled and analyzed for metals on a quarterly basis. These samples would continually be collected to confirm that physical and chemical characteristics of the hydrometallurgical residue are not characteristically hazardous, subject to RCRA, and are in compliance with the Permit to Mine and NPDES/SDS permits (PolyMet, Pers. Comm., September 12, 2014).

The MPCA reviewed residue pilot-testing and analysis data provided by PolyMet and has established the following statements (MPCA, Pers. Comm., October 24, 2014 [as cited in the FEIS]): 1) TCLP testing results of pilot test residues in 2005 and 2009 did not meet the thresholds to be regulated as a RCRA hazardous waste; 2) Elimination of the bulk hydrometallurgical mode from the project would not materially affect the chemical composition of residue stored in the Hydrometallurgical Residue Facility, and 2005 and 2009 testing results would be representative of the residue stored in the Hydrometallurgical Residue Facility if the current project is approved; and 3) New residue resulting from future hydrometallurgical pilot-testing and/or Phase 2 of the project should be tested to verify that the residue remains under RCRA hazardous waste thresholds.

Theme HAZ 03

Theme Statement

The EIS does not adequately define the toxicity of mining-related wastes. Mining-related waste could possibly release sulfuric acid and metals to the environment. Radioactive minerals could also be released.

Thematic Response

Mining-related waste and waste in general that has not been excluded from regulation as hazardous waste under *Minnesota Rules*, part 7045.0120, is a hazardous waste if the waste exhibits ignitability, corrosivity, reactivity, toxicity, lethality, or is an oxidizer as described in *Minnesota Rules*, part 7045.0131, *Characteristics of Hazardous Waste*.

Toxicity in the context of mining-related waste refers to the hazardous toxic characteristic of a solid waste. Toxicity of the waste is determined through laboratory analysis using the TCLP method (see response to theme HAZ 02). If the extract from a representative sample of the waste contains any of the contaminants at concentrations equal to or greater than the concentration values listed in *Minnesota Rules*, part 7045.0131, subpart 8, *Maximum Concentration of Contaminants for the Toxicity Characteristic*, the waste exhibits toxicity characteristics and is considered toxic hazardous waste, unless that waste has been excluded from hazardous waste regulation under *Minnesota Rules*, part 7045.0120.

Generally, a waste has the characteristic of corrosivity if the waste is aqueous, and either: 1) has a pH less than or equal to 2.0 or greater than or equal to 12.5, or 2) corrodes steel at a rate greater than 6.35 mm per year.

Analytical testing of nine hydrometallurgical residue samples from 2005 pilot-testing produced pH values ranging from 4.74 to 9.8. Analytical testing of one sample of autoclave leach residue from bulk concentrate from 2005 pilot-testing produced a pH value of 4.94. Analytical testing of one sample of autoclave leach residue from nickel rich concentrate from 2009 pilot-testing produced a pH value of 4.93 (SRK 2014).

Radiation or radionuclides, if detected, would be regulated through applicable *Minnesota Rules*, chapter 4731, *Radiation Safety*, by the Minnesota Department of Health and/or the USEPA through the Clean Water Act and Clean Air Act.

FEIS Section 4.2 describes existing conditions that may be affected directly or indirectly by the NorthMet Project Proposed Action.

Theme HAZ 04

Theme Statement

The EIS does not adequately describe the toxicity, fate, and transport to the environment of chemicals used in the flotation processes.

Thematic Response

FEIS Sections 3.2.2 and 3.2.3 describe large-quantity chemicals to be used at the Mine Site and the Plant Site, as well as transport through the processes and the consumption/fate of these chemicals. Toxicity of each individual chemical or consumable product/compound would be described on specific Material Safety Data Sheets (MSDSs) for each substance. MSDSs would be retained as part of Hazardous Material Management planning/compliance, and EPCRA documentation and reporting requirements.

Theme HAZ 05

Theme Statement

The EIS should provide additional information on Areas of Concern (AOCs), especially the current status and costs of clean-up, PolyMet's responsibilities, and requirements for mitigation.

Thematic Response

Table 4.2.1-2: NorthMet Project Proposed Action Area of Concern Summary List for Voluntary Investigation and Cleanup Program, has been updated in the FEIS to show the current status and additional information where available. Costs for assessment, investigation, and cleanup are not available or reasonably calculable at this time.

The April 6, 2010, Consent Decree is a court registered agreement between Cliffs Erie LLC and the MPCA to resolve alleged violations of Cliffs Erie's NPDES/SDS permits for its Hoyt Lakes and Dunka mining area facilities. Of particular relevance to the NorthMet project, the Consent Decree addresses issues at the current Cliffs Erie tailings basin (including outfall SD026) and discharges from the Cliffs Erie Area 5 mining area (SD033). The tailings basin is part of the NorthMet Project Proposed Action, whereas Area 5 is not; however, PolyMet has entered into an agreement with Cliffs Erie whereby both areas would be transferred to PolyMet upon issuance of project permits. Until that time, Cliffs Erie retains responsibilities for permit-related activities at the tailings basin and Area 5. While certain Consent Decree-related activities have been in progress or have been completed for these areas since preparation of the SDEIS, there has been no change in ownership or responsible parties since that time.

Theme HAZ 06

Theme Statement

The EIS does not adequately describe how accidents resulting from transportation of hazardous materials to and from the project site will be handled. Materials being shipped by rail and/or truck include copper concentrate, mixed nickel/copper hydroxide, PGE precipitate, and potassium amyl xanthate. Would local communities and emergency first responders be prepared

to handle emergency releases of these products, and what would be the environmental impacts of such releases?

Thematic Response

FEIS Section 5.2.13.2.1 addresses transportation and incident response for hazardous materials.

Accidental spills or incidents resulting from rail or truck transportation of hazardous material or any materials would initially be assessed by the nearest first responders, including local community fire departments or other emergency personnel. Local communities and emergency responders are trained in hazardous material awareness and operations, and are familiar with (or have access to) the 2012 Emergency Response Guidebook (PHMSA 2012c, as cited in the FEIS). The guidebook describes safety precautions, material identification and associated hazards, response steps to take based on the specific material, and notification requirements and request for additional technical information or assistance.

In the event of releases, first responders typically request additional resources through the State Duty Officer and/or the National Response Center, based on the assessed severity of the event. Where appropriate, the State Duty Officer or National Response Center may notify the State's Homeland Security and Emergency Management Division (part of the Minnesota Department of Public Safety), along with other appropriate state agencies, the USEPA, and the carrier company, among others. In the event of an incident or accident involving the release of a hazardous material, 49 CFR also requires that the carrier notify local emergency response personnel, the National Response Center, and the State Duty Officer. Additional emergency resources are available from the City of Duluth's HazMat team. HazMat team members are trained as hazardous materials Technicians and Specialists (those capable of full understanding of hazardous material characteristics, assessment, and mitigation of "hot-spot" zones). The team is also capable of initial or intermediate cleanup, dependent upon the nature and characteristics of the material, the severity, and the media affected as a result of the accident.

Should an incident or accident require additional soil, surface water, or groundwater investigation or cleanup, the MPCA, MDH or MDA would be the responsible agency to administer or provide oversight to an environmental engineering contractor, if hired by the transportation carrier. Under certain situations, state agency contractors might conduct the investigation or cleanup. St. Louis County maintains a Hazard Mitigation Plan, and an Emergency Operations Plan (St. Louis County 2013, as cited in the FEIS) for reference or general response guidance for a wide variety of hazards. The Western Lake Superior Area Maritime Security Committee and the Western Lake Superior Port Area Committee also maintain plans for recovery of hazardous materials. The Bois Forte Band of Chippewa maintains a Hazard Mitigation Plan.

Hazardous materials, hazardous waste management, and spill response training is stipulated by the administrative rules, statues, and regulations described in FEIS Section 5.2.13.2.

A.5.11 Issue: Human Health (HU)

Theme HU 01

Theme Statement

A Human Health Impact Assessment (HIA) should be prepared to address the human health risks of the NorthMet project. Specifically, the HIA should characterize the potential health impacts from the Project's effects on air water quality, and food (including drinking water). Societal costs from mining-related pollution should be identified. The HIA would integrate human health into the EIS from its current piecemeal fashion.

Thematic Response

The SDEIS analyzed risks to human health, specifically how the NorthMet Project Proposed Action could affect air quality, surface water quality, and ground water quality, including effects to drinking water and food sources. However, this information was presented in various media-specific chapters of the SDEIS, rather than in a consolidated section on the assessment of human health risks.

The MDNR and the Minnesota Department of Health (MDH) met after the close of the public comment period for the SDEIS to discuss the MDH comments, including the suggestion that a Health Impact Assessment (HIA) be completed for the NorthMet project. The agencies agreed that an HIA is not required for an EIS, but that it is a tool that can help inform the public about potential health impacts from a proposed project. Although additional HIA information can be developed as part of an EIS, the Co-lead Agencies in this instance took a more customary approach and addressed public health impacts based on water and air quality evaluation criteria and regulatory standards that are protective of human health. Public health impacts were addressed in document sections related to water quality, air quality and toxics, including potential effects to drinking water and food sources as required by MEPA and NEPA. The Co-lead Agencies carefully considered the additional information that could be obtained by completing an HIA, as well as the time and effort to obtain that information and how relevant that information would be to regulatory decisions. In evaluating these considerations, the Co-lead Agencies concluded that:

- Completing an HIA between the SDEIS and FEIS would require significant time and effort, and would represent a considerable delay to the FEIS;
- The SDEIS did include extensive public health information relative to air and water quality; and
- The additional information from an HIA would not significantly inform regulatory permits required for the project.

Based on these conclusions, the Co-lead Agencies have determined that an HIA would not be prepared as part of the EIS. However, the Co-lead Agencies agreed the human health information in the EIS could be more clearly articulated and better organized. The FEIS, therefore, includes a new section (7.3.4) that concisely summarizes all human health-related information and impact assessments included in the document. This section also directs readers to specific sections in the FEIS where human health risks are addressed in detail.

As presented in FEIS section 5.2.10, the FEIS found that predicted levels of environmental impacts from the NorthMet Project Proposed Action are not expected to cause substantial changes in local socioeconomic conditions, and therefore would not result in adverse societal costs.

Theme HU 02

Theme Statement

The FEIS should assess the human health risks in terms of: neurologic morbidity from manganese and lead release; carcinogenic effects of air emissions of diesel, nickel, and other particulates; arsenic releases to water; metals as endocrine disruptors; cumulative mercury and methylmercury exposure; and reproductive pathology.

Thematic Response

The AERA contains toxicological information for arsenic, diesel, nickel, manganese, mercury, and methyl mercury (plus additional chemicals), as well as an analysis of the potential health effects of those chemicals. While the toxicological information was not included in the AERA summary in FEIS Section 5.2.7.2.3, this information is included in FEIS Section 7.3.4, the summary of human health findings. The AERA includes an evaluation of the most sensitive health endpoint for each chemical (e.g., neurological morbidity from manganese, reproductive toxicity of methyl mercury, and the carcinogenic potential of diesel, nickel, and arsenic). Arsenic released to groundwater and surface water was extensively evaluated in FEIS Section 5.2.2.3.2, and modelled concentrations were compared to drinking water standards. Drinking water standards would not be exceeded for arsenic.

Theme HU 03

Theme Statement

The NorthMet Project could have significant adverse impacts on human health as a result of pollutants released to the air, surface water, and drinking water (including residential wells), such as mercury, arsenic, manganese, cadmium, lead, asbestos, diesel, and thallium.

Thematic Response

These chemicals and their releases to air and drinking water are extensively studied in the FEIS, and the potential concentrations are compared to health-based air and water standards. These chemicals are assessed according to current regulatory methodology. No adverse health risks have been identified. For discussion of these chemicals and their releases to surface water and drinking water, see FEIS Sections 5.2.2.1.1, 5.2.2.1.2, and 5.2.2.3.4. For a discussion of these chemicals and their releases to air, see FEIS Sections 5.2.7.1.1, 5.2.7.1.3, 5.2.7.2.3, 5.2.7.2.5, and 5.2.7.5.

Theme HU 04

Theme Statement

The discussion of human health risks and impacts should be expanded to include on-site worker exposure to pollution and worker safety.

Thematic Response

Off-site worker exposure is discussed in the air section of FEIS Chapter 5, specifically in sections 5.2.7.5.2 and 5.2.7.5.3. On-site worker health and safety is regulated by other agencies such as the MSHA, NIOSH, and the OSHA.

Theme HU 05

Theme Statement

The Arrowhead region already reaches the Minnesota Department of Health (MDH) additional lifetime cancer risk guidance level, and the NorthMet Project would increase this cancer risk. This includes increased risk of cancer due to increased exposure to amphibole mineral fibers and arsenic releases to drinking water supplies. Other risk drivers are also present.

Thematic Response

These calculations are based on an increased risk of contracting cancer using very conservative assumptions. The increased risk of contracting cancer due to the Project's emissions is extremely small. For further discussions, see FEIS Sections 5.2.7.2.3 and 7.3.4.3.

Theme HU 06

Theme Statement

The SDEIS should assess cumulative cancer and non-cancer risks using a 70-year lifetime.

Thematic Response

The AERA is a multi-step process, comparing a pollutant-specific exposure estimate and a toxicity value, and then summing these through pollutants and exposure pathways. All toxicity values used for comparison are: 1) based on a lifetime of exposure; and 2) are values where, if exposure occurs over a lifetime, health effects are unlikely. The exposure estimates for inhalation risks are not adjusted for exposure time (e.g., time spent outdoors, away from home, or operation time of the mine); therefore, they reflect the 70 year lifetime recommended in the theme. The ingestion risks assume 30 years of exposure for the resident scenario and 40 years of exposure for the farmer scenario from air pollutant deposition and subsequent uptake into the food chain. The AERA assumes that 100 percent of the pollutants at the exposure levels are absorbed into the human body. The total multi-pathway risks are then the sum of ingestion and inhalation. The AERA process follows USEPA guidance, and is considered a human health protective methodology.

Theme HU 07

Theme Statement

Information cited in SDEIS does not correlate with--and the SDEIS itself improperly characterizes the findings of--the University of Minnesota Taconite Workers Health Study.

Thematic Response

FEIS Section 5.2.7.5 contains an extensive discussion of various types of fibers, as well as the health effects found in the scientific literature, including a summary of toxicity information from an extensive scientific literature review conducted in 2009. FEIS Section 5.2.7.5 concludes with a finding of "an uncertain level of potential public health risk" being present due to airborne fibers in the area, and provides a summary of the dust suppression practices that would be used to minimize fiber generation. This information is referenced in the human health section of Chapter 7 (FEIS Section 7.3.4).

Theme HU 08

Theme Statement

The Taconite Workers Health Study contains several findings that support the conclusion in the SDEIS that amphibole mineral fiber emissions pose no threat to the health and safety of mine workers or the general public.

Thematic Response

The Taconite Workers Health study did not identify any areas of concern for community health. However, the study does not rule out amphibole mineral fibers as a potential source of health risk or from playing some role in the incidence of disease among taconite workers. The MPCA would consider this issue during the air permitting process.

Theme HU 09

Theme Statement

The Barr Engineering studies on mineral fibers rely on outdated information, the wrong aspect ratio, and the faulty assumption that low levels of fibers suggests no health harm is likely. A MDNR literature review showed short fibers contributed to health effects.

Thematic Response

The literature cited in Section 5.2.7.5 supports a connection between longer fibers and adverse health effects; the information on the health impacts of shorter fibers is still under investigation. The 2007 Mineral Fibers Report (Barr 2007l, as cited in the FEIS) assessed the shorter fibers by comparing toxicity to Fine particulates ($PM_{2.5}$). There is an extensive body of literature on $PM_{2.5}$ health effects. The FEIS concludes "public health risk of uncertain magnitude", and this conclusion is supported by the scientific literature. Additionally, the Barr report referenced in the comment was used solely to support the conclusion that the Project has the potential to release amphibole mineral fibers. For this reason, the FEIS focuses on how to avoid, minimize, and mitigate and potential fiber releases. See the responses to themes HU 07 and HU 08.

Theme HU 10

Theme Statement

The mineral fibers testing was tainted by additional grinding of samples.

Thematic Response

The additional grinding is discussed in FEIS Section 5.2.7.5.1. According to the laboratory conducting the analysis, this only affects fiber counts, not the identification of asbestiform fibers, since asbestiform fibers have high tensile strength and flexibility (Barr 2007l, as cited in the FEIS). Additionally, the Barr report was used solely to support the conclusion that the Project has the potential to release amphibole mineral fibers.

Theme HU 11

Theme Statement

The SDEIS should assess the cumulative health risks from air emissions resulting from coal combustion to supply the project's energy needs.

Thematic Response

Air quality cumulative effects are addressed in FEIS Section 6.2.3.8. A cumulative analysis that considers the cumulative health risks from air emissions resulting from coal combustion to supply the Project's energy needs is outside the scope of the FEIS. The studies described in FEIS Chapter 6 meet the requirements of MEPA/NEPA.

Theme HU 12

Theme Statement

Metals concentrations in the tailings basin are high.

Thematic Response

The tailings basin would be isolated from surface and groundwater so metals from the Tailings Basin would not adversely impact water quality. See FEIS Section 3.2.2.3.10 for a discussion of the Tailings Basin seepage containment system.

Theme HU 13

Theme Statement

How were the results of the tests on residential wells treated?

Thematic Response

This information was used as a baseline for groundwater quality downgradient from the existing LTVSMC Tailings Basin. The results of the water quality testing done on 15 residential wells is summarized in FEIS Table 4.2.2-24 and is discussed in Section 4.2.2.3.1.

Theme HU 14

Theme Statement

The FEIS should use 300 µg/L for the copper groundwater evaluation criterion instead of 1,000 µg/L, as was done in the SDEIS.

Thematic Response

This change does not affect any human health analysis. The MCL for copper is 1,300 µg/L; therefore, adverse human health effects would not be expected at copper concentrations below 1,000 µg/L. See the response to theme WR 177.

A.5.12 Issue: US Forest Service Land Exchange (LAN)

Theme LAN 01

Theme Statement

The FEIS should clearly and concisely summarize the analysis of the Proposed Land Exchange under 36 CFR 254.3(b), including a clear explanation of the rationale and criteria for selecting the preferred Land Exchange alternative, and should demonstrate that the public interest has been well served.

Thematic Response

CEQ regulations (40 CFR 1502.14) state that an EIS should present the environmental impacts of a proposal and its alternatives in comparative form to provide a clear basis for choice among the alternative options by the decision makers and the public. The regulations further state (40 CFR 1502.14(e)) that agencies shall identify their preferred alternative (or alternatives, if one or more exists) in the DEIS as well as the FEIS, unless another law prohibits the expression of such a preference; however, the regulations do not require a rationale for the choice. The ROD from the USFS would contain the rationale for the selected alternative, as well as a discussion of how the public interest is served under 36 CFR 254.3(b).

The FEIS includes the factors relating to how the public interest would be served by the Land Exchange Proposed Action, Land Exchange Alternative B, and the Land Exchange No Action Alternative. The ROD would incorporate these findings in its determination. As stated in FEIS Section 1.4.3, factors that must be considered include:

- the opportunity to achieve better management of federal lands and resources;
- to meet the needs of state and local residents and their economies; and
- to secure important objectives, including but not limited to: protection of fish and wildlife habitats, cultural resources, watersheds, and wilderness and aesthetic values; enhancement of recreation opportunities and public access; consolidation of lands and/or interests in lands, such as mineral and timber interests, for more logical and efficient management and development; consolidation of split estates; expansion of communities; accommodation of existing or planned land use authorizations; promotion of multiple-use values; implementations of applicable Forest Land and Resource Management Plans; and fulfillment of public needs. See 36 CFR 254.3(b) and 254.4(c)(4).

Table 7.3.5-1 presents a comparison of how the alternatives address these factors.

To determine that a land exchange serves the public interest, the authorized officer must find that:

1. the resource values and the public objectives served by the non-federal lands or interests to be acquired must equal or exceed the resource values and the public objectives served by the federal lands to be conveyed; and
2. the intended use of the conveyed federal land will not substantially conflict with established management objectives on adjacent federal lands, including Indian Trust lands (36 CFR 254.3(b)(2)).

The findings and supporting rationale for the public interest determination would be documented and made part of the administrative record pursuant to 36 CFR 254.3(b)(3).

Theme LAN 02

Theme Statement

The Proposed Land Exchange violates the Weeks Act of March 1, 1911; Federal Land Policy and Management Act of 1976; Federal Land Exchange Facilitation Act of 1988; the Minnesota Environmental Rights Act; NEPA; and MEPA. The Proposed Land Exchange would remove the protections intended under these laws. The FEIS should clarify whether the lands exchanged would have equal surface protections compared to the lands currently protected by the Weeks Act.

Thematic Response

The Co-lead agencies are following the applicable state and federal laws and regulations to the best of their knowledge, and with the guidance of agencies' legal counsel. The USFS manages the Superior National Forest in conformance with many laws, regulations, executive orders, and policies. In all cases, the Forest Plan is consistent with national law, policy, and direction (USFS 2004c, as cited in the EIS). As discussed in the FEIS, the USFS' position is that the mineral rights that were reserved do not include the right to surface mine as proposed by PolyMet. In order to resolve this conflict, a proposed land exchange has been presented as part of the NorthMet Mining Project. The Weeks Act authorizes land exchanges so long as "public interests would be benefitted thereby" (16 USC 516). Lands acquired by the United States pursuant to the Weeks Act, whether by purchase or exchange, are subject to all provisions of the Act (16 USC 516). Lands conveyed from federal ownership would no longer be under federal control, and therefore would not be managed under the Forest Plan and/or influenced by the authority (the Weeks Act) under which the United States acquired them. This is consistent with other land exchanges that have occurred in the Superior National Forest. The NEPA analysis would inform the USFS decision on the public interest determination, and the decision would be presented in the ROD. While the federal lands, if transferred to PolyMet, would still be located within the proclamation boundary of the Superior National Forest, they would be private lands and no longer managed by the Forest Service.

The proposed Land Exchange must comply with FLPMA's requirement that the values of the lands exchanged are equal or, if they are not equal, that the values shall be equalized by the payment of money so long as the payment does not exceed 25 percent of the total value of the

lands transferred out of federal ownership. Disclosure of appraisal information in the EIS is not required. Any decision, documented in the ROD, to move forward with a land exchange will be supported by a current appraisal, approved by the USFS, which verifies that the exchange meets the equal value requirements of applicable federal law and regulation. Requests for appraisal reports and appraisal review reports are processed under Freedom of Information Act procedures. Appraisals must conform to Uniform Appraisal Standards for Federal Land Acquisitions and the Uniform Standards of Professional Appraisal Practice of the Appraisal Foundation.

As part of the pending USFS decision, the Responsible Official must determine if the proposed exchange serves the public interest and supports the direction and guidance in the forest land management plan. The public interest determination must show that the resource values and the public objectives of the non-federal lands equal or exceed the resource values and the public objectives of the federal lands, and that the intended use of the conveyed federal land would not substantially conflict with established management objectives on adjacent federal lands, including Indian Trust lands (36 CFR 254.3(b)(2)). The findings and supporting rationale shall be made part of the decision (Forest Service Handbook 5409.13, section 34.1; 36 CFR 254.3(b) [USFS 2004d, as cited in the FEIS]). The ROD would contain the findings and supporting rationale for the selected alternative, would discuss how the public interest is served under 36 CFR 254.3(b), and would provide information for compliance with Forest Service requirements and Forest Plan. As part of the land exchange, several alternatives to the Land Exchange Proposed Action were identified and screened, including underground mining. The underground mining alternative is discussed in FEIS Section 3.2.3.4.1 and Appendix B, as well as the response to theme ALT 01.

Theme LAN 03

Theme Statement

The proposed lands involved for exchange are not a fair trade or of equal value and/or environmental quality, and the Land Exchange should not result in less acreage being acquired. In addition, the FEIS should include the real estate appraisals for the proposed exchanged lands.

Thematic Response

As described in FEIS Section 1.4.3, FLPMA requires that the values of the lands exchanged are equal or, if they are not equal, the values shall be equalized by the payment of money so long as the payment does not exceed 25 percent of the total value of the lands transferred out of federal ownership (36 CFR 254.12). The USFS relies on professional appraisals to determine market value. Such appraisals must conform to Uniform Appraisal Standards for Federal Land Acquisitions and the Uniform Standards of Professional Appraisal Practice of the Appraisal Foundation. Refer to the response to theme LAN 02 for more information.

The Land Exchange Proposed Action must also comply with two EOs related to wetlands and floodplains. EO 11990 (USEPA 1977) applies to land exchanges such that, as much as practicable, the exchange does not result in the loss of wetland resources. EO 11988 (USFS 2004d, as cited in the FEIS) applies to land exchanges such that, as much as practicable, the exchange does not result in an increase in the flood damage potential. USFS policy (Forest

Service Handbook 5409.13 § 33.43c) provides that any of three conditions satisfy the requirements of EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS):

1. the value of the wetlands or floodplains for properties received and conveyed is equal (balancing test) and the land exchange is in the public interest;
2. reservations or restrictions are retained on the unbalanced portion of the wetlands and floodplains on the federal lands when the land exchange is in the public interest but does not meet the balancing test; and
3. the federal property is removed from the exchange proposal when the conditions described in the preceding paragraphs 1 or 2 cannot be met.

The Land Exchange Proposed Action and the Land Exchange Alternative B meet the first condition (balancing test), which requires the value of the wetlands or floodplains is equal for properties received and conveyed. Therefore, as stated in FEIS Section 5.3.3, the Land Exchange Proposed Action would comply with EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS). All of the lands proposed for exchange are located throughout the 1854 Ceded Territory of northeastern Minnesota.

The Land Exchange Proposed Action equalization requirements are discussed in the response to theme LAN 02, as well as in FEIS Section 1.4.3. Furthermore, the FEIS discloses which non-federal tracts would be required for each land exchange alternative (see FEIS Section 5.3). Disclosure of appraisal information in the EIS is not required. Any decision, documented in the ROD, to move forward with a land exchange will be supported by a current appraisal, approved by the USFS, which verifies that the exchange meets the equal value requirements of applicable federal law and regulation. Requests for appraisal reports and appraisal review reports are processed under Freedom of Information Act procedures.

As part of the pending USFS decision, the Responsible Official must determine if the proposed exchange serves the public interest and supports the direction and guidance in the forest land management plan. The public interest determination must show that the resource values and the public objectives of the non-federal lands equal or exceed the resource values and the public objectives of the federal lands, and that the intended use of the conveyed federal land would not substantially conflict with established management objectives on adjacent federal lands, including Indian Trust lands (36 CFR 254.3(b)(2)). The findings and supporting rationale shall be made part of the decision (Forest Service Handbook 5409.13, section 34.1; 36 CFR 254.3(b)). The ROD would contain the findings and supporting rationale for the selected alternative and how the public interest is served under 36 CFR 254.3(b), and would provide information for compliance with Forest Service requirements and Forest Plan.

The lands to be exchanged are not required to be of a certain size, contiguous of each other, within the same watershed of the federal lands, within a reasonable distance to the federal lands to be exchanged, and/or within the 1854 Ceded Territory.

Theme LAN 04

Theme Statement

The Proposed Land Exchange does not comply with the USFS Superior National Forest Plan and other USFS policies. In particular, the Land Exchange would not consolidate the surface and mineral ownership of the lands. The FEIS needs to clarify title, mineral rights, and encumbrances on the lands involved.

Thematic Response

The Applicant's purpose and need states that the purpose of the Land Exchange Proposed Action is to "consolidate the surface and mineral ownership of the lands involved at the Mine Site." However, the USFS purpose of the Land Exchange Proposed Action is to resolve the conflict between USFS legal mandates for managing its lands (surface estate) and how PolyMet is proposing to exercise its mineral rights/leases. The conflict to be resolved does not result from the existence of the split estate alone, but rather from PolyMet's proposal to access the mineral estate by surface mining. As described in FEIS Section 1.3.2.2, the USFS purpose is to meet desired conditions in the Forest Plan, which includes: 1) ensuring the Land Exchange Proposed Action eliminates conflict, and 2) ensuring mineral resources are produced in an environmentally sound manner contributing to economic growth. To eliminate the conflict, a land exchange has been proposed, since the Mine Site is located on National Forest System lands but the mineral rights are privately held and under lease to PolyMet. It is the position of the United States that the mineral rights leased by PolyMet do not include the right to open pit mine the National Forest System land. PolyMet disagrees with the USFS position and argues that the mineral rights it seeks to utilize provide for access to the minerals by any mining method, including open pit or surface mining. The Land Exchange Proposed Action is being considered to resolve this fundamental conflict, rather than possible litigation that has no certain outcome. The desired conditions, D-LA-1 and D-MN-2, for the Land Exchange Proposed Action inform the USFS purpose for the project, while the Forest Plan standards and guidelines help to inform how the project would be designed. Although the desired condition for land adjustments, D-LA-1, identifies improving management effectiveness, the USFS is focusing on eliminating conflict in response to PolyMet's specific proposal to surface mine, as well as ensuring mineral resources are produced in an environmentally sound manner (D-MN-2). FEIS Section 3.3.1.1 discusses how the standards and guidelines help to inform how the Land Exchange Proposed Action would be designed.

The Weeks Act authorizes land exchanges so long as "public interests would be benefitted thereby" (16 USC 516). Lands acquired by the United States pursuant to the Weeks Act, whether by purchase or exchange, are subject to all provisions of the Act (16 USC 516). Lands conveyed from federal ownership would no longer be under federal control and therefore would not be managed under the Forest Plan and/or influenced by the authority (the Weeks Act) under which the United States acquired them. This is consistent with other land exchanges that have occurred in Superior National Forest. The NEPA analysis would inform the USFS decision on the public interest determination. This decision would be presented in the ROD.

Title, mineral rights, and encumbrances are evaluated as part of the USFS due diligence process prior to any land acquisition. If the mineral estate is severed from the land to be acquired, due

diligence includes evaluating mineral character. The Forest Supervisor relies on the mineral character determination, prepared by a geologist, to analyze the potential for future mineral development that would conflict with USFS surface management. If that conflict is likely, the USFS would decline to acquire the land. While most of the non-federal lands in the Land Exchange Proposed Action do not include mineral rights, the mineral character has been evaluated to determine there is a low potential for mineral development. Mineral development potential was considered as part of the Feasibility Analysis as well as in the FEIS (Section 5.3.1.2.5). Title commitments for the non-federal lands were reviewed and due diligence evaluations are presented in FEIS Section 5.3.1.2.5, along with the proper citations for the information. While it is preferable (but not required) to acquire lands from which minerals have not been severed, the lands are being acquired for multiple-use in accordance with the Forest Plan. Final title approval is not made at the Forest level. Any lands acquired by the USFS must meet the U.S. Department of Justice Title Standards 2001. The USDA, Office of the General Counsel determines whether title evidence meets the requirements of the Attorney General (see FSH 5409.13, 11.3).

The Land Exchange Proposed Action and the Land Exchange Alternative B would be designed to be consistent with the goals and objectives of the Forest Plan, including G-LA-2 and G-LA-3 (Forest Plan, pages 2-51 and 2-52; FEIS Section 3.3.1.1). The development of the FEIS under NEPA addresses Forest Plan desired conditions D-LA-1 and D-MN-2. The ROD would discuss whether and how the Land Exchange Proposed Action and the Land Exchange Alternative B meets these desired conditions. The non-federal lands for Land Exchange Proposed Action and the Land Exchange Alternative B would be incorporated within the adjacent federal ownership and managed in accordance with the Forest Plan direction for the particular management area.

In addition, the Land Exchange Proposed Action and Land Exchange Alternative B would be consistent with the goals of the Forest Plan for wetlands (page 2-15). The conveyance and acquisition of lands under either the Land Exchange Proposed Action or Land Exchange Alternative B would not result in wetland impacts. The mining activities of the NorthMet Proposed Action would result in wetland effects that cannot be avoided, although these losses would be minimized and/or compensated for. The Land Exchange Proposed Action and Land Exchange Alternative B would not result in a net loss of wetland acres to the federal estate and/or result in reduced water quality within a wetland, or upstream or downstream of a wetland. The NorthMet Project Proposed Action is subject to a number of regulatory permits, reviews, and approvals, including determination of whether the proposed mining activity would result in a change to water quality. The Forest Plan Standard S-WS-1 was established to manage the intensity of upland forest conversion on national forest land to young and open cover to manage the impacts of snowmelt on the morphology of streams at the HUC12 scale. The NorthMet Project Proposed Action was evaluated and it was determined that it is consistent with standard S-WS-1. Please see FEIS Section 5.2.2 for a detailed discussion on water resources and FEIS Section 5.2.3 for a discussion of wetland resources.

Theme LAN 05

Theme Statement

The Proposed Land Exchange would result in a loss of access to or use of public lands within the 1854 Ceded Territory, thereby affecting the ability to exercise Treaty rights. Additional information on the natural heritage and timber resources of the exchange lands should be provided. The federal agencies cannot approve permits that would have effects on 1854 Treaty resources without additional evaluation and mitigation. No mitigation has been identified in the SDEIS for this permanent loss of lands and resources. The USFS should consider exchanging for private lands only in order to maintain—or better yet, increase—the total public land acreage within the 1854 Ceded Territory.

Thematic Response

The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and to ensure that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effects on usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the GLIFWC and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands.

Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing, and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their Treaty rights in the 1854 ceded territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded Territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process.

The resource values and public objectives of the non-federal lands must equal or exceed the resource values and public objectives of the federal lands. See FEIS Section 1.4.3. Mitigation for cultural resources as a result of the NorthMet Project Proposed Action is discussed in FEIS Section 5.2.9. The NorthMet Project Proposed Action mining activities would result in a loss of bogs; however, as part of the NorthMet Proposed Action, the Applicant is required to provide compensatory mitigation for wetland impacts in accordance with state and federal permits. One

of the proposed mitigation sites for wetland impacts (Zim Site) would be a compensation site for the loss of bogs, and would be located within the 1854 Ceded Territory.

The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the SNF managed lands.

No heritage surveys were conducted on the non-federal lands. If any cultural resources are located on the non-federal lands, those cultural resources would be transferred to federal ownership. Such transfer would not adversely affect the heritage resource, but would provide greater preservation protection under federal law.

The non-federal lands that contain wild rice beds would not be affected as a result of the Land Exchange Proposed Action or Land Exchange Alternative B, because no activities are proposed on these lands and the proposed mining activities would not affect these lands. As noted in the FEIS, the Land Exchange Proposed Action and Land Exchange Alternative B would increase wild rice stands within the federal estate. FEIS Sections 5.3.2 and 5.3.4 clarify that, although the Land Exchange would result in an increase in wild rice stands within the federal estate boundaries, there would be no change to the existing public access to Tract 1 wild rice stands via the Pike River. Consequently, there would be no increase in wild rice harvest opportunities for the public. No wild rice stands are known to occur on the federal lands, and suitable habitat is limited.

Please refer to the response to theme LAN 01 for more information on the public interest determination.

Theme LAN 06

Theme Statement

The selection process and the locations of the non-federal lands to be exchanged needs to be clarified. It is not clear why the non-federal lands were selected. In particular, the FEIS should clarify why non-federal lands in these locations were selected, as opposed to non-federal lands located closer to the federal lands. The FEIS should also justify the failure to select larger non-federal parcels or parcels within the same watershed, as well as the failure to consider restoring impacted lands instead of getting rid of lands. The FEIS needs to include information about how the boundaries for the federal lands to be exchanged were drawn and why, as well as an explanation of the rationale for giving up the riparian lands along the Partridge River. The FEIS also needs to acknowledge that the additional federal buffer lands in the proposed exchange most likely will be used to facilitate and expedite future mining.

Thematic Response

An assembled land exchange means an "exchange of Federal land for a package of multiple ownership parcels of non-Federal land consolidated for purposes of one land exchange transaction" (36 CFR 254.2). The selection process for the non-federal lands is described in FEIS Section 3.3.1.1. A goal of the land exchange, but not the USFS purpose for the NorthMet Project Proposed Action, is to consolidate landownership, reduce the managed boundary, and reduce managed land fragmentation. The five tracts of non-federal lands are located within St. Louis, Lake, and Cook counties (see Figure 3.3-1 and Table 3.3-2) and lie within the Superior National

Forest proclamation boundary and within the 1854 Ceded Territory. Lands to be exchanged are not required to be of a certain size, contiguous of each other, within the same watershed of the federal lands, within a reasonable distance to the federal lands to be exchanged, and/or within the 1854 Ceded Territory. As previously stated, it is the position of the United States that the mineral rights leased by PolyMet do not include the right to open-pit mine the National Forest System land. Simply performing restoration of the mining lands would not meet the purpose and need for the USFS (see FEIS Section 1.3.2.2). A land exchange must conform to the standards and guidelines of the Forest Plan, as well as be of equal value and need to meet EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS). A description of the tracts to be exchanged is provided in FEIS Section 3.3.2.2, and the environments resources on each tract are described in Sections 4.3 and 5.3.

The recommendation for the boundaries of the federal lands was based on standards and guidelines in the Forest Plan, as described in FEIS Section 3.3.1.1. The lands in the Land Exchange Proposed Action were included to avoid intermingled and inefficient ownership patterns that would result by retaining isolated federal lands without legal access.

A land exchange is a change of ownership of land; once an exchange occurs, the federal land then becomes private land, allowing the private landowner to use the land in accordance with necessary local, state, and federal permits and approvals. Any future work on the exchanged lands, which could include mining on these lands, would require the necessary permits and/or approvals from state and federal agencies. Most mineral rights within the federal lands are privately held. The United States owns 181 acres of mineral rights on lands that are not part of the NorthMet Project Proposed Action mine pits (Figure 3.2-3). The USFS would reserve ownership of these mineral rights. These mineral rights are located near the eastern boundary of the federal lands north of Dunka Road, and near the southeast corner of the federal lands south of Dunka Road (Figure 3.2-3).

The lands involved in the Land Exchange Proposed Action or Land Exchange Alternative B are not intended to be the wetland mitigation sites that are required as part of permitting of the mining activities (i.e., under Section 404, Section 401, and WCA). The wetlands mitigation sites for the wetland effects of the mining activities are discussed in FEIS Section 5.2.3.

The Lake County lands were tax forfeit lands that were offered for sale by the County through a public auction. The Lake County lands would still be accessible to the Bands for their use if the exchange took place, because the lands would become part of the Superior National Forest managed lands.

Theme LAN 07

Theme Statement

The Proposed Land Exchange would not result in a reduced boundary length to be accessed and/or maintained by the USFS, would increase the fragmentation of forest lands, and would complicate USFS land management.

Thematic Response

As stated in the FEIS, Section 5.3.1.2.2, a reduced boundary length is more desirable for the USFS because it reduces the difficulty of accessing and managing the forest. The Land Exchange

Proposed Action would result in a 33.2-mile net reduction of the perimeter around the USFS-controlled portions of the Superior National Forest. In addition, the underlying assumption regarding land fragmentation of USFS-controlled portions of the Superior National Forest is that a lower ratio of boundary to area is more desirable, because it reduces the difficulty of accessing and managing the forest, in addition to increasing the forest's overall quality and function. All of the non-federal parcels are contiguous with existing National Forest System lands, thus decreasing the ratio of boundary to area. The Land Exchange Proposed Action would not measurably alter the existing ratio of fragmentation in the Superior National Forest of approximately 0.005 linear mile of boundary per acre of USFS-controlled Superior National Forest land (see Table 5.3.1-2). The Land Exchange Proposed Action would consolidate land ownership, which is an effect of the land exchange and is not part of the purpose and need of the NorthMet Project Proposed Action. Consolidation is one of the guidelines designed to achieve the Forest Plan's desired condition for land adjustment (see FEIS Section 3.3.1.1).

Theme LAN 08

Theme Statement

The FEIS should more clearly state that the Land Exchange Proposed Action can proceed regardless of what happens with the NorthMet Mining Project Proposed Action. In addition, the FEIS should clarify that the Land Exchange Proposed Action may occur independently of the NorthMet Mining Project Proposed Action.

Thematic Response

As noted in FEIS Section 1.0, the Land Exchange Proposed Action is considered a "connected action" to the NorthMet Project Proposed Action. The purpose of the Land Exchange Proposed Action is to consolidate the surface and mineral ownership of the lands involved at the Mine Site. PolyMet has a lease to mine the minerals on its NorthMet Deposit, which is surrounded by active and abandoned taconite mines near Hoyt Lakes. The surface of these lands is owned by the United States. The purpose for the USFS is to meet desired conditions in the Forest Plan, including ensuring that the Land Exchange Proposed Action eliminates existing conflict, and ensuring mineral resources are produced in an environmentally sound manner contributing to economic growth. The USFS would implement the NEPA per 36 CFR part 220, and would use the FEIS to support the ROD documenting its decision on the Land Exchange Proposed Action.

Theme LAN 09

Theme Statement

If Lake County has indeed entered into an agreement with PolyMet, this would be illegal. Minnesota law requires that state agencies (including county governments) not take final action on a project prior to the completion of environmental review. Lake County actions would be prejudicial to the final approval of the NorthMet Project. The USFS should address whether the Lake County Lands were acquired in violation of Minnesota law and, if so, remove them from consideration in the Proposed Land Exchange.

Thematic Response

The Lake County lands were purchased by PolyMet at a public auction at which other private buyers could have purchased these lands. Lake County had already decided to auction the lands before they were identified as potential non-federal lands for the Land Exchange Proposed Action.

Theme LAN 10

Theme Statement

The Proposed Land Exchange should not be accelerated. Furthermore, the Land Exchange should have its own environmental review.

Thematic Response

The Land Exchange Proposed Action is proceeding consistent with all legal and procedural requirements. Under state and federal regulations, multiple actions or projects that are connected actions must be considered in total in preparing an EIS. NEPA requires that federal agencies consider the potential environmental consequences of proposed actions in their decision-making process. For the NorthMet Mining Project and Land Exchange FEIS, because the Land Exchange Proposed Action is closely related to the NorthMet Project Proposed Action, it is considered a connected action and, as such, is included in the analysis of environmental effects. Therefore, the Land Exchange Proposed Action is considered a "connected action" to the NorthMet Project Proposed Action (40 CFR part 1508.25), meaning that it is part of the overall Project proposal, and therefore would be included in the analysis of environmental impacts.

Theme LAN 11

Theme Statement

The Land Exchange Proposed Action would be consistent with the management of the Superior National Forest, the Forest Plan, and applicable regulatory standards. In addition, the Land Exchange Proposed Action will enhance the overall resources of the Superior National Forest and enable the USFS to better meet its long term mission. Environmental degradation will not occur on these existing forest lands.

Thematic Response

These comments generally support the Land Exchange Proposed Action. Because no specific information was provided, no changes were made to the EIS.

A.5.13 Issue: Land Use (LU)

Theme LU 01

Theme Statement

The EIS should provide additional information on the existing condition of public access to the USFS lands proposed for exchange.

Thematic Response

As discussed in FEIS Section 5.3.1.2.1, the only public access to the federal lands is via the Partridge and Embarrass Rivers. The remainder of the federal lands is surrounded by private lands (or by other public lands that are themselves surrounded by private lands) (see FEIS Figure 4.3.1-1). While members of the public may obtain permission to cross these private lands and access the federal lands, there is no designated land-based access for the federal lands.

Theme LU 02

Theme Statement

The EIS should provide a clearer discussion of future land use after reclamation of the tailings basin including a timeframe for completion.

Thematic Response

FEIS Section 3.2.2.3.12 discusses reclamation of the tailings basin. This is also discussed in more detail in the Flotation Tailings Management Plan (PolyMet 2015q, as cited in the FEIS). To minimize water quality impacts, water would be managed at the Tailings Basin through application of bentonite on surface areas to minimize water flow into the tailings, and the containment system surrounding the Tailings Basin would be used to capture groundwater and surface water for treatment for as long as needed. Other reclamation objectives would include mulching and establishing vegetation on upland areas, controlling dust, controlling soil erosion, monitoring stability parameters, and minimizing the need for maintenance.

Theme LU 03

Theme Statement

The Cumulative Effects Analysis for Land Use should encompass the 1854 Ceded Territory.

Thematic Response

The methodology for determining the Cumulative Effects Analysis for Land Use is discussed in FEIS Section 6.2.1.2. The Cumulative Effects Assessment Area for land use includes effects associated with the NorthMet Project Proposed Action combined with other industrial (including mining) or public works projects located within the portion of the Mesabi Iron Range encompassed by St. Louis County.

Theme LU 04

Theme Statement

The NorthMet Project will adversely affect the region's aesthetic character.

Thematic Response

As discussed in FEIS Section 4.2.11.1.2, the Mine Site (including waste rock piles) would be visible from a limited number of viewpoints (such as Skibo Vista). Visibility, the Mine Site would be limited by topography and vegetation. The Plant Site would be visible from a greater number of locations, but would not look meaningfully different from existing conditions. FEIS Section 5.2.7 [Air Quality] discusses the degree to which dust and vehicle emissions would be visible.

Theme LU 05

Theme Statement

The Scenic Integrity Objective designation for the mine site and/or Land Exchange parcels is arbitrary.

Thematic Response

Scenic Integrity Objective designations were established by the US Forest Service as part of the Superior National Forest Plan; a process that is separate from the Supplemental EIS. Management direction for Scenic Resources (including SIO designations) on the Superior National Forest are located in the Forest Plan Chapter 2, pages 2-45 – 2-48.

Theme LU 06

Theme Statement

The NorthMet Project would adversely affect recreation opportunities in the region, such as hunting, fishing, berry picking, hiking, canoeing, birding, etc.)

Thematic Response

Excluding effects related to noise, fisheries, air quality, and other effects described elsewhere in FEIS Chapter 5, and given the proximity of active and past mining and industrial activity to high-quality recreational activity in the Arrowhead region (such as the BWCAW), there is no evidence that the presence of the NorthMet Project Proposed Action in and of itself would affect the public's ability to hunt, fish, and conduct other recreational activities, or affect the overall recreational experience (apart from specific activities) in the Arrowhead region as a whole. See FEIS Section 5.2.11.2.1 for further discussion of impacts to recreation opportunities.

Theme LU 07

Theme Statement

There will not be any negative impacts to land, recreation opportunities, or visual character as a result of the NorthMet Project.

Thematic Response

FEIS Sections 5.2.1 (Land Use) and 5.2.11 (Recreation and Visual Resources) discuss the impacts as a result of the NorthMet Project.

A.5.14 Issue: Mercury (MERC)

Theme MERC 01

Theme Statement

The Proposed Action would add mercury to the environment, and would cause or worsen violations of mercury water quality standards. The Proposed Action should not be permitted until compliance with these standards can be demonstrated. Applicable standards include those issued by the State of Minnesota, Great Lakes Initiative, and the Binational Program to Restore and Protect Lake Superior.

Thematic Response

Because the NorthMet Project area is located within the Lake Superior Basin, the NorthMet Project Proposed Action is subject to the Great Lakes Initiative mercury discharge standard of 1.3 ng/L. Mercury numeric standards are based on total (particulate plus dissolved) concentrations. For the Lake Superior Basin, the Class 2B (aquatic life and recreation) numeric chronic standard for mercury in the water column protective of wildlife (1.3 ng/L) is the most stringent applicable standard (with the exception of the downstream human health chronic standard of 0.77 ng/L at the Fond du Lac Reservation). Discharges from the Plant Site WWTP and Mine Site WWTF would be at or below the Great Lakes Initiative discharge standard of 1.3 ng/L, as the WWTP and WWTF would be designed to meet the mercury standard for the effluent. The WWTP and WWTF would use a greensand filtration process followed by RO technology, which is known to remove mercury, particularly when the influent to the RO system is pretreated. Therefore, the total mercury concentration in the WWTP and WWTF discharge are expected to meet the evaluation criteria of 1.3 ng/L.

The following adaptive management strategies have been proposed for mercury and are included in FEIS Section 5.2.2.3.5:

- Pretreatment modifications such as chemical scavenger addition to obtain additional metals;
- Use of tighter RO membranes for the primary RO system;
- Treatment of some portion of the VSEP permeate by the primary RO system to further remove some dissolved constituents; and
- Addition of polishing treatment units for removal of trace metals (e.g., ion exchange).

Overall, mercury loadings are predicted to increase slightly in the Embarrass River (0.1 percent), and decrease in the Partridge River (1.0 percent). Overall, the changes in total mercury concentrations associated with the NorthMet Project Proposed Action in closure and long-term maintenance at the respective Mine Site and Plant Site are estimated to be too small to distinguish from natural background variability in the Partridge River and the Embarrass River using available laboratory methods (Barr 2015g, as cited in the FEIS).

The state of Minnesota fish tissue standard for mercury of 0.2 mg/kg is lower than the USEPA criterion of 0.3 mg/kg (wet weight, per USEPA criteria) to adjust for the higher per capita consumption of wild-caught fish in Minnesota. Based on the results of scientific investigations, this standard assumes that all fish tissue mercury is in the methylmercury form. In-stream mercury concentrations in the St. Louis River, measured by the Fond du Lac Band, have been below the Great Lakes Initiative Chronic Wildlife Standard of 1.3 ng/L, but exceed the Fond du Lac Band's human health chronic standard of 0.77 ng/L. However research has found that mercury concentrations can be higher than 1.3 ng/L in the St. Louis River especially after a large storm. The majority of this mercury is from wetlands and riparian zones within the St. Louis River Watershed. Research suggests that total mercury concentrations in streams and methylmercury content in fish are roughly proportional within individual watersheds (USGS 2010, as cited in the FEIS), such that an increase in total mercury in water may be expected to result in increase in mercury content in fish within that watershed. It can reasonably be considered that that the predicted decrease in mercury loadings to the St. Louis River would result in no change in mercury loading to fish.

The goal of the Binational Program to Restore and Protect Lake Superior is to reduce the release of mercury to Lake Superior through prevention of further inputs of the chemical. The ultimate goal of the Zero Discharge Demonstration Program (ZDDP) is zero discharge (100 percent reduction) of nine designated pollutants (including mercury) by the year 2020. Most major reduction milestones were met by 2010, including an 80 percent reduction in mercury releases. The ultimate goal is to reach 100 percent reduction by 2020 (Lake Superior Binational Program 2012b, as cited in the FEIS). In September 2009, the MPCA published Guidelines for New and Modified Mercury Air Emission Sources. The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions of 789 lbs/year by 2025. The MPCA conducted a review of the NorthMet Project Proposed Action mercury emissions, and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS).

Theme MERC 02

Theme Statement

The FEIS should provide more evaluation and detail on the effects of the Proposed Action on already high mercury levels in the water, as well as mercury methylation and bioaccumulation in fish. Local and downstream waters, including the Embarrass River, are already impaired for fish tissue mercury levels.

Thematic Response

Based on the evaluations conducted for air emissions and water discharges for the FEIS, the NorthMet Project Proposed Action is not considered to have an appreciable effect on: 1) surface water mercury concentrations, 2) fish mercury concentrations, 3) methylation of mercury, or 4) risk to people consuming fish from lakes near the NorthMet Project area.

The MPCA's MMREM analysis for the two scenarios showed a 0.5 to 1.8 percent and 0.3 to 0.5 percent potential increase in fish mercury concentration above background. However, the change is not expected to be significant as compared to background. The increase would not be expected to have any appreciable effect on the loading estimates from permitted discharges to the Embarrass River, Partridge River, or the lower St. Louis River. Discharges are expected to meet the 1.3 ng/L standard for mercury, with an overall net decrease in mercury loading to the St. Louis River predicted for the NorthMet Project Proposed Action. Per FEIS Section 6.2.6, the NorthMet Project Proposed Action would not have any direct effects on aquatic habitat in the St. Louis River, and would not have any measureable indirect effects on fish or aquatic invertebrates as a result of changes in flow or water quality.

Theme MERC 03

Theme Statement

The FEIS should include a robust Health Impact Assessment (HIA) that evaluates the effects of the Proposed Action's mercury (methylmercury) releases. The HIA should specifically investigate risks related to fetal development from the consumption of mercury that has bioaccumulated in fish and/or wild rice.

Thematic Response

The AERA contains toxicological information for arsenic, diesel, nickel, manganese, mercury, and methylmercury (plus additional chemicals), and an analysis of the health effects of those chemicals. The AERA included an evaluation of the most sensitive health endpoint for each chemical (e.g., neurological morbidity from manganese, reproductive toxicity of methylmercury, and the carcinogenic potential of diesel, nickel, and arsenic). Therefore, these human health risks have already been assessed. While the toxicological information was not included in the AERA summary in FEIS Section 5.2.7.2.3, additional toxicological information has now been included in FEIS Chapter 7. Note that mercury impacts via air emissions and via deposition on land and water were also specifically assessed in FEIS Section 5.2.7.2.5, and were not found to be a health concern. The risk assessment assessed the health effects for recreational and tribal fishermen and their families consuming methylmercury in fish. Additional information pertaining to the effects of mercury and methylmercury on subsistence consumers has been included in FEIS Section 5.2.10.2.6, and risk assessment information is summarized in FEIS Section 7.3.4.4.3. In addition, see the response to theme HU 01.

Theme MERC 04

Theme Statement

The data used in the SDEIS to document and evaluate effects associated with mercury releases is inadequate and flawed. Data presented in the SDEIS have numerous inconsistencies related to reporting limits and method detection limits, casting doubt on overall data quality and the accuracy of impact analysis.

Thematic Response

The FEIS has been revised to include additional mercury data through the year of 2013, where available. These data are summarized in FEIS Section 4.2.2.3.1. Data presented in the FEIS were gathered from various sources, thereby leading to inconsistencies in the way the results were reported. Additionally, variability in the data and data reporting exists to some extent on large projects where sampling is conducted at many locations over long periods of time. Publicly available and relevant studies were considered in developing the SDEIS and FEIS. These include technical reports prepared by PolyMet reports from state and federal agencies, technical papers in peer-reviewed journals, and technical reports associated with other mine sites. The SDEIS and FEIS preparers drew on these information sources to the degree that they were reliable and relevant to the assessment of potential impacts from the NorthMet Project Proposed Action. Corresponding text, tables, and/or figures have been revised to include the addition of data. Furthermore, the data have been reviewed for inconsistencies, and necessary updates have been included in the FEIS.

Theme MERC 05

Theme Statement

The presentation of non-detect values as half the detection limit is an overly simplistic way of handling non-detect samples.

Thematic Response

Based on professional judgment, half of the detection limit was utilized in presenting data throughout the FEIS. Although contemporary science has refrained from utilizing half the detection limit, per the USEPA Region II Technical Guidance Document Chemical Concentration Data Near the Detection Limit (USEPA 1991) the method is valid. Additionally, the evaluation of the data provides a reasonable estimate of potential environmental effects for purposes of environmental review.

Theme MERC 06

Theme Statement

SDEIS does not provide the data to support the assumption that existing taconite within the Tailings Basin does, or that the PolyMet tailings would, remove mercury from discharged water.

Thematic Response

FEIS Section 5.2.2.3.4 provides supporting documentation and a rationale explaining tailings as a sink for mercury, including Berndt (2003, as cited in the FEIS). Berndt further explains that the reaction of mercury in the Tailings Basin (i.e., loss of mercury that is assumed to be through adsorption to solids and then burial in the sediments) results in an overall permanent retention of mercury within the basin and decreases the mercury released to receiving waters. The overall findings in Berndt demonstrated that the release of mercury to surface waters during taconite processing was insignificant with respect to the mercury concentrations found in local precipitation and existing background surface waters. The findings are supported by surface and groundwater monitoring around the existing LTVSMC Tailings Basin, which found mercury concentrations generally averaging less than 2.0 ng/L.

Furthermore, FEIS Section 5.2.2.3.4 summarizes a study conducted by Northeast Technical Services, Inc. (NTS) in 2006 (PolyMet 2015j, as cited in the FEIS) where a bench study was conducted using NorthMet tailings to determine the rate of mercury adsorption by the tailings. The study utilized large-volume shake flask tests to evaluate mercury adsorption of tailings over time. The concentration of dissolved mercury in a treatment flask containing process water and NorthMet tailings decreased from 3.3 ng/L (at time 0) to 0.9 ng/L (at 480 minutes). The study shows the ability of NorthMet tailings to adsorb mercury. In combination with the proven ability of the underlying taconite tailings to adsorb mercury, this is expected to result in an overall increase in the adsorption of mercury and subsequent lower concentrations of mercury at the Tailings Basin with the addition of the NorthMet tailings. The average concentration of mercury in samples collected from discharge locations SD026 and SD004 show seepage from the Tailings Basin with an estimated mercury concentration of 1.0 ng/L, which is lower than mercury concentrations in precipitation.

Theme MERC 07

Theme Statement

The mercury data provided in the Water Resources section of Chapter 4 of the SDEIS are inconsistent.

Thematic Response

FEIS Chapter 4 has been revised to address the comments in this theme. Such revisions included, but are not limited to:

- Inclusion of data on background methylmercury;
- Evaluation of inconsistencies in minimum detection limits for total mercury and methylmercury;
- Evaluation of a standard approach to calculating, interpreting, and presenting mercury results;
- Explanation and evaluation of unfiltered versus filtered mercury samples; and
- Reporting of mercury concentrations as presented in the text and figures of the SDEIS.

Theme MERC 08

Theme Statement

The FEIS should include an assessment of the effects of sulfur air emissions from both the Mine Site and Plant Site on mercury methylation and bioaccumulation. The FEIS should also provide an analysis of the aerial deposition of mercury into waterbodies and describe the linkage between sulfate and mercury reduction. The scientific literature indicates increased sulfate loading to freshwater systems increases methylmercury production, but the SDEIS understates these effects. There is a significant potential for increased methylmercury in downstream wetlands and surface waters.

Thematic Response

A supplemental assessment of the potential additional sulfur from stack and fugitive dust air emissions was conducted to evaluate the NorthMet Project Proposed Action's effects from sulfate as related to mercury methylation and fish concentrations. Sulfur-related emissions include SO_2, SAM, reduced sulfur compounds, and sulfur in particulate (e.g., sulfur in the mineral matrix of the ore). Because the estimated Plant Site and Mine Site emissions for each of these are below the PSD permitting thresholds and SER, no further consideration of these sources were required for environmental impact purposes (Barr 2015f, as cited in the FEIS). However, a summary of each is included in Section 4.0 of the document Mercury Overview a Summary of Potential Mercury Releases from the NorthMet Project and Potential Effects on the Environment (Barr 2015f, as cited in the FEIS). The evaluation estimates the potential sulfur deposition to the Partridge River (Colby Lake) and Embarrass River (Sabin Lake) watersheds. Based on the results of the additional assessment of sulfur deposition, the potential addition of sulfur from these emissions sources is small to negligible, and therefore would not be expected to have effects on mercury methylation or fish mercury concentrations. A summary of the evaluation is included in FEIS Section 5.2.7.2.6.

The supplemental assessment of potential additional sulfur from fugitive dust air emissions evaluated for the NorthMet Project Proposed Action's effects from potential sulfate additions to wetlands from the Plant Site and Mine Site fugitive dust emissions is summarized in FEIS Section 5.2.3. Using AERMOD to estimate estimated annual dust deposition, grams per square meter of dust containing sulfur was estimated to be deposited on the landscape. Based on a conservative assumption that all sulfur in fugitive dust converts to sulfate and mixes with surface water in wetlands, a potential incremental increase in sulfate was calculated as 4.2 mg/L. When mixed with annual precipitation, the sulfate value is 1.7 mg/L. Because the sulfur is inherent to the mineral matrix of the dust particles, it is likely that less than 100 percent of the sulfur would be weathered from the particles and be available to go into solution if deposited to soils or water. This potential incremental change may warrant future monitoring as small sulfate increases in sulfate-poor wetlands would be expected to increase the production of methylmercury in wetlands. However, methylmercury produced in wetlands is not necessarily incorporated into food chains and concentrated to levels of concern. The fugitive dust control plan for both the Mine Site and the Plant Site (including the Tailings Basin) should minimize such deposition, and the sulfur from any rock dust particles that are deposited may not be released or only released slowly through weathering. Using a conservative assumption that all sulfur in the deposited dust is both released and transformed to sulfate, no significant increase in methylmercury concentrations would be expected (Barr 2015f, as cited in the FEIS).

Because the potential additional deposition of sulfur from the NorthMet Project Proposed Action's air emissions is estimated to be small, including the potential release of sulfur from potential fugitive dust emissions, the findings and conclusions of the local mercury deposition analysis do not require changes or adjustments and no changes to current surface water methylmercury concentrations or fish mercury concentrations are reasonably expected. As currently stated in the FEIS, the NorthMet Project Proposed Action would reduce the sulfate loading to the small streams to the north of the Tailings Basin, the Embarrass River, and the downstream lakes. It is uncertain whether this reduction in sulfate discharge from the Tailings Basin would reduce methylmercury concentrations. However, the NorthMet Project Proposed Action is not expected to increase methylmercury concentrations in any of the receiving waters and would be in compliance with MPCA's guidance (MPCA 2006b, as cited in the FEIS) on the discharge of sulfate to sensitive ecosystems (Barr 2015f, as cited in the FEIS). Additional information in regards to mercury methylation is provided in FEIS Section 5.2.2.3.4. Discussion of mercury deposition and bioaccumulation in fish (Barr 2012b, as cited in the FEIS) and the assessment of the cumulative effects is provided in FEIS Section 6.2.6.

Theme MERC 09

Theme Statement

The SDEIS does not assess the effects of aerial deposition of mercury on wetlands. Groundwater-based mercury contributions to wetlands are also not assessed. The FEIS should assess these processes and their effects, including how such impacts will affect mercury bioaccumulation and compliance with existing water quality standards.

Thematic Response

The MPCA noted considerable uncertainty in modeling mercury transport and deposition (MPCA 2005, as cited in the FEIS). The results of modeling are conflicting with regards to local, regional, national, and global source contributions to a specific receptor. Ongoing efforts have been made to use computer models to estimate the amount of mercury deposition in the Midwest attributable to specific mercury emission sources. No generally accepted modeling technique has emerged, although the USEPA considers the Community Multiscale Air Quality (CMAQ) model the best available for evaluating mercury deposition (USEPA 2006, as cited in the FEIS). Overall, the models are helpful in linking deposition in an area to emissions from large regions or groups of sources, but are not accurate enough to predict the amount of mercury deposition to a site attributable to a specific remote source or group of emission sources. The assessment of potential local mercury deposition and resulting changes in fish mercury conducted for the NorthMet Project Proposed Action are consistent with the assessments conducted for other recent mining projects requiring environmental review. Such information in reference to mercury deposition has been summarized in Barr 2006g, as cited in the FEIS.

The Co-lead Agencies acknowledge that there could be water quality effects on wetlands and propose a comprehensive monitoring approach during operations, reclamation, and closure to identify such effects (if any). If effects are identified, adaptive mitigation measures would be invoked to remediate the situation and assure that water quality standards are met. A mercury deposition impact analysis is summarized in FEIS Section 5.2.7.2.5. In addition, PolyMet conducted a cumulative effects analysis on the local mercury deposition and bioaccumulation in

fish (Barr 2012b, as cited in the FEIS), and FEIS Section 6.2.6.3.3 presents an assessment of the cumulative effects of the NorthMet Project Proposed Action.

Theme MERC 10

Theme Statement

The SDEIS does not adequately assess the cumulative effects of mercury and sulfate release and methylmercury formation. The CEAA for mercury should include the entire St. Louis River Watershed.

Thematic Response

To assess cumulative effects, the potential impacts from the NorthMet Project Proposed Action were evaluated in combination with past, present, and reasonably foreseeable actions. The mercury concentrations in the St. Louis River from the NorthMet Project Proposed Action are not expected to increase. Therefore, cumulative effects are not expected. The potential increase in sulfate in the Partridge River near the Mine Site is estimated to a maximum of 0.1 mg/L. Thus, potential effects would not be noticeable in the Upper Partridge River, and even less so in the St. Louis River. As discussed in the FEIS, no cumulative impacts are expected for mercury and sulfate.

Theme MERC 11

Theme Statement

Assumptions regarding future mercury levels are questionable, due to the inaccurate water flow model in the SDEIS. Because the water model seriously underestimates the flow of groundwater through the mine and waste rock storage area into the Partridge River, it also underestimates mercury loading.

Thematic Response

The FEIS has been updated to reflect changes to water modeling. The GoldSim models are informed by a combination of groundwater flow models (MODFLOW), surface water runoff models (XP-SWMM), direct field measurements (groundwater levels, field borehole tests, groundwater and surface water sampling), and laboratory geochemical tests. For the FEIS, models (except XP-SWMM) were re-calibrated based on new field data obtained through the end of 2013. Where field data were not available, GoldSim inputs were based on a combination of literature values, experience at similar field sites, and best professional judgment. Changes in results based on the model outputs were evaluated and included in FEIS Chapters 4 and 5. The Co-lead Agencies reviewed and approved water model calibrations to existing conditions. Model calibrations, other model assumptions, and the resulting impact predictions provide a reasonable estimate of potential environmental effects for purposes of environmental review. The revised model results did not significantly change the initial and final parameter values for the mercury mass balance or the annual average load of mercury.

Theme MERC 12

Theme Statement

It appears that the waste rock (which will fill the East Pit) does leach mercury. Based on the humidity cell tests, a more appropriate value for East Pit porewater would be at least 6.5 ng/L.

Thematic Response

Information regarding the laboratory analysis of humidity cell leachates from waste rock in regards to mercury was summarized in FEIS Section 5.2.2.3.4. The NorthMet waste rock and ore contain trace amounts of mercury. Laboratory analysis of humidity cell leachates from waste rock samples found average total mercury concentrations between 5 and 7 ng/L, with concentrations unrelated to rock type or sulfur content (SRK 2007b, as cited in the FEIS). Separate 36-day batch tests using local rainfall (12 ng/L total mercury) found that contact with Duluth Complex rock actually decreased total mercury concentrations to between 1.9 and 3.2 ng/L as a result of adsorption (SRK 2007b, as cited in the FEIS). The control test only showed a decrease to 7 ng/L. The results indicate that the rock has the ability to remove mercury from solution. Therefore, the data suggest that mercury present in rainfall or released by sulfide oxidation is typically adsorbed by other minerals present in the mine waste rock. For these reasons, mercury released from waste rock and ore at the Mine Site is not expected to be a constituent of concern in groundwater seepage.

Theme MERC 13

Theme Statement

GoldSim did not evaluate elemental mercury in the water quality modeling. For the FEIS, mercury should be added to modeling and transport analysis for water quality effects.

Thematic Response

There will be no elemental mercury (Hg^0) discharge, but rather as ionic mercury (Hg^{2+}). Surface waters near the NorthMet Project area have a water quality standard for total mercury of 1.3 ng/L. Total mercury includes all species of mercury, including elemental mercury; however, elemental mercury is unlikely to exist in the water column. While mercury was not explicitly modeled in the GoldSim platform, mercury was modeled using a mass balance approach. The NorthMet Project Proposed Action would need to demonstrate during permitting that total mercury concentrations in anticipated permitted discharges would meet the effluent limit. The surface and groundwater containment system is expected to capture about 90 percent of groundwater and surface seepage from the Tailings Basin. Although mercury detected in rain water is at a concentration of ranging from 8 to 10 ng/L, mercury that now escapes the Tailings Basin is at a level of 2.0 ng/L (at the toe). Additionally, the NorthMet Project Proposed Action is expected to discharge mercury at or below the mercury standard of 1.3 ng/L, which includes treatment of water pumped from Colby Lake. Mercury concentrations at the Mine Site are projected to decrease, and effects are expected to be undetectable in the St. Louis River at the Fond du Lac reservation boundary. Therefore, the potential effects are expected to be less than significant, and the mass balance approach is appropriate to provide a reasonable estimate of potential contributions for purposes of environmental review.

The use of a mass balance approach to evaluate mercury was identified as the appropriate analytical tool for predicting mercury concentrations during scoping of this EIS, and is a common analytical tool utilized and relied upon by agencies to assess mercury impacts in Environmental Impact Statements and environmental assessments in general. Given the scientific community's current understanding of the relationship between total mercury, sulfate, methylmercury, etc., the mercury mass balance approach used in the FEIS is ideal for estimating mercury impacts from the NorthMet Project Proposed Action. For the Mine Site, a mass balance model approach using annual inputs and outputs was used to estimate total mercury concentration in the West Pit Lake. The estimation method is preferred over a detailed mechanistic model, because it incorporates the important input and removal processes for mercury, it is very transparent with regard to data inputs, and allows for easy assessment of the effect of changing parameter values on mercury concentrations (PolyMet 2015m, as cited in the FEIS). For the Plant Site, major mercury sources for the mining facility were included in the mass balance model, with the estimate of input and output values based on measurements taken at each stage of the ore processing as in the 2004 SGS Lakefield Pilot Study and 2005 Pilot Plant Study (PolyMet 2015j, as cited in the FEIS). Additional information supporting the evaluation of mercury by the mass balance approach is included in FEIS Section 5.2.2.3.4.

Theme MERC 14

Theme Statement

The Hydrometallurgical Residue Facility may contain 0.7 to 1.5 tons of mercury. Mercury leakage from the Hydrometallurgical Residue Facility should be modeled, and the FEIS should discuss the increased risk to groundwater due to mercury release from the aging Hydrometallurgical Residue Facility liners. The FEIS should also discuss mercury speciation versus changes in the Hydrometallurgical Residue Facility, should acid conditions develop.

Thematic Response

Approximately 85 percent of the mercury in the ore processed is expected to remain in the concentrate and hydrometallurgical residue. The concentrate would be shipped off site, leaving 164 lbs/yr to be deposited in the Hydrometallurgical Residue Facility (Barr 2007b; Barr 2007c). Resource Conservation and Recovery Act (RCRA) testing as recent as 2014 indicates that the concentration of mercury in the Hydrometallurgical Residue Facility would be below RCRA hazardous waste thresholds, therefore not considered as hazardous waste (PolyMet 2014c).

As summarized in FEIS Section 3.2.2.3, the Hydrometallurgical Residue Facility would be built at the existing LTVSMC Emergency Basin. A double-liner system would be installed, with each layer consisting of a geomembrane layer above a geosynthetic clay liner for leachate control (leachate collection system), and a geocomposite drainage system for leachate collection. According to FEIS Section 3.2.2.3, water captured by the liner system during operations would be returned to the Hydrometallurgical Residue Facility pond. The amount of water pumped from the leachate collection system would be monitored on a long-term basis, and repairs and mitigation measures would be implemented in the event of increased leakage. Therefore, it is assumed that the leakage from this facility into underlying groundwater or adjacent surface water would be negligible.

A polyethylene Geomembrane Chemical Resistance Chart was included in the Residue Management Plan (PolyMet 2014r, as cited in the FEIS) for the Hydrometallurgical Residue Facility. This chart lists specific chemicals, their concentration and resistance at specified temperatures (20 degrees Celsius and 60 degrees Celsius). Per the guidelines of the chart, mercury at a concentration of 100 percent and at temperatures of 20 and 60 degrees Celsius displays a satisfactory result, meaning the liner is resistant to the given reagent at the given concentration and temperature(s) and no mechanical or chemical degradation is observed.

Theme MERC 15

Theme Statement

The FEIS should disclose the influent and effluent mercury assumptions and targets for the Wastewater Treatment Facility (WWTF), and should explain mercury removal technologies.

Thematic Response

There would be no surface water discharges to the Partridge River or its tributaries from the Mine Site until approximately year 60, when the West Pit would be flooded and the overflow would be directed to the Mine Site WWTF for treatment and discharge. The Mine Site WWTF discharge would be subject to the Great Lakes Initiative standard for mercury (1.3 ng/L). Mercury concentrations in the West Pit were estimated two ways: using analog data from other natural lakes and mine pit lakes in northeastern Minnesota, and using a mass balance approach. Based on conservative assumptions, the mass balance analysis estimated the average mercury concentration of the West Pit during flooding (year 20 to about year 52) to be about 0.3 ng/L. At the time of overflow, the mercury concentration was estimated to be about 0.5 ng/L, which then reached an equilibrium concentration near 0.9 ng/L, which can be assumed for the influent to the WWTF. Because the Mine Site WWTF would discharge to the Tailings Basin pond during operations and to the West Pit during reclamation, it is anticipated that the Mine Site WWTF effluent would be considered an internal waste stream during these periods, and would not have discharge limits. However, treatment goals are expected to be part of an overall water management strategy.

Discharges from the Mine Site WWTF would be at or below the Great Lakes Initiative discharge standard of 1.3 ng/L, as the WWTF would be designed to meet the mercury standard for the effluent. Additional mercury reduction that may result from the Mine Site WWTF treatment is not accounted for in the calculations. FEIS Sections 3.2.2.1.8 and 3.2.2.1.9 summarize treatment methodologies for the Mine Site WWTF and water management. The Mine Site WWTF would be constructed to treat affected water at the Mine Site and also treat the reject concentrate from the Plant Site WWTP (see FEIS Section 3.2.2.3.10). Water treatment would include chemical precipitation and membrane filtration treatment methodologies. The design of the Mine Site WWTF is based on the predicted water loads and constituents modeling described in FEIS Section 5.2.2. The Mine Site WWTF could be expanded or treatment capabilities modified to meet water quality standards if monitoring indicates the need. As summarized in FEIS Section 3.2.2.1.10, an RO unit (or equivalent performing technology) would be added to the Mine Site WWTF during closure. At the Mine Site, because of the low concentrations of mercury in pit lakes and the RO process at the Mine Site WWTF, the permitted discharge from the Mine Site is expected to meet the Lake Superior Basin water quality standard of 1.3 ng/L for effluent.

The WWTP at the Plant Site and the WWTF at the Mine Site would use mercury-capturing greensand filtration for pretreatment prior to RO. Adaptive management would be based on monitoring for total mercury to determine whether the treated water could be discharged to surface waters, or whether some additional treatment is needed. PolyMet has identified the following adaptive management strategies:

- Pretreatment modifications such as chemical scavenger addition to obtain additional metals;
- Use of tighter RO membranes for the primary RO system;
- Treatment of some portion of the VSEP permeate by the primary RO system to further remove some dissolved constituents; and
- Addition of polishing treatment units for removal of trace metals (e.g., ion exchange).

Theme MERC 16

Theme Statement

The SDEIS fails to clearly state the expected amount of mercury that will be released into surrounding watersheds over time. Estimates for other metals are provided, but not for mercury.

Thematic Response

As summarized in FEIS Section 6.2.2.4.2, the NorthMet Project Proposed Action is predicted to result in an overall net decrease of mercury loadings of approximately 1.0 grams per year (i.e., a net decrease of 1.2 grams per year in the Partridge River and a net increase of 0.2 grams per year in the Embarrass River), which is indistinguishable from natural background variability. Furthermore, discharges are expected to meet the 1.3 ng/L standard for mercury.

Theme MERC 17

Theme Statement

The total amount of mercury generated from the mining processes should be listed in the FEIS. This includes bulk tailings, hydrometallurgical tailings, and autoclave scrubber waste and disposal. The FEIS should also provide a detailed mercury monitoring plan.

Thematic Response

A screening total facility mercury mass balance was conducted for the NorthMet Project Proposed Action to identify the potential releases to the environment. The original mass balance included two autoclaves associated with the hydrometallurgical process. The total facility mass balance followed the MPCA's requirements and was similar to mass balances conducted for other recent mining projects in Minnesota. Similar to other mining operations, about 95 percent of the mercury in the process is expected to stay with the solids. Also similar to other mining projects, air emissions would be a small component of the total mass of mercury associated with ore processing.

The majority of the mercury, about 95 percent, is expected to be routed to the Tailings Basin or the reactive residue cells, where available information indicates it should remain sequestered and not be released to air, surface waters, or groundwater. Mercury in the ore is the primary source of

mercury at the Plant Site, and air emissions of mercury are primarily associated with the Hydrometallurgical Plant (4.1 pounds/year). A small amount of mercury emissions are estimated to potentially be emitted from natural gas combustion associated with a package boiler and a natural gas fired process heater and space heaters (0.4 pounds/year). In addition, a small amount of particle-bound mercury is associated with mining, ore crushing, milling processes, flotation concentrate handling, and fugitive dust emissions from the Tailings Basin (less than 0.1 pounds/year). A relatively small amount of mercury is estimated to be associated with diesel fuel combustion in mine vehicles. Overall, total potential emissions of mercury from the NorthMet Project Proposed Action are estimated to be 4.6 pounds/year from the Plant Site, a maximum of 0.17 pounds per year from Tailings Basin construction vehicles (diesel fuel combustion emissions), and approximately 0.6 pounds/year from diesel fuel combustion at the Mine Site.

Adaptive management would be implemented as necessary based on monitoring for total mercury to determine whether the treated water could be discharged to surface waters, or whether some additional treatment would be needed. PolyMet has identified the following adaptive management strategies:

- Pretreatment modifications such as chemical scavenger addition to obtain additional metals;
- Use of tighter RO membranes for the primary RO system;
- Treatment of some portion of the VSEP permeate by the primary RO system to further remove some dissolved constituents; and
- Addition of polishing treatment units for removal of trace metals (e.g., ion exchange).

Theme MERC 18

Theme Statement

The SDEIS relies on impermissible mercury trade-offs between the Partridge, St. Louis, and Embarrass rivers.

Thematic Response

Discharges from the Mine Site would flow to the Upper Partridge River, and discharges from the Plant Site would flow to the Upper Embarrass River and to the lower Partridge River via Second Creek. Both the Partridge River and the Embarrass River are tributaries of the St. Louis River. The SDEIS and FEIS evaluate the Embarrass River, Partridge River, and St. Louis River individually, as summarized in Barr 2015g, as cited in the FEIS. The current mercury load from the watersheds containing the NorthMet Project Proposed Action area were evaluated and compared with projected future mercury loads from these same watersheds, including discharges from the NorthMet Project Proposed Action. The analysis assessed potential impacts during long-term closure. Long-term closure is the period with maximum sustained water discharges from both the Mine Site and the Plant Site, and is thus the time period of greatest potential to impact total mercury concentrations in the St. Louis River.

These assessments showed that the mercury load from the Mine Site would slightly decrease during long-term closure, because a portion of the flow that is currently watershed yield (total mercury concentration of 3.6 ng/L) would be captured in the West Pit lake and discharged via the Mine Site WWTF at a conservatively assumed total mercury concentration of 1.3 ng/L.

Flows from the Mine Site in long-term closure are not expected to change from existing conditions; therefore, the change in total mercury concentration from 3.6 to 1.3 ng/L for a portion of the flow from the Mine Site results in reduced loading to the Partridge River.

The mercury load from the Plant Site would increase slightly during long-term closure for two reasons. First, the seepage from the existing LTVSMC Tailings Basin is assumed to have a total mercury concentration of 1.0 ng/L, while the combined seepage collected by the groundwater containment system and excess Tailings Basin pond water that would be discharged via the Plant Site WWTP is conservatively assumed to have a total mercury concentration of 1.3 ng/L. Second, runoff from the vicinity of the East Dam that currently flows into the existing LTVSMC Tailings Basin and emerges as seepage (total mercury concentration of 1.0 ng/L) would become surface runoff to the Embarrass River watershed via Mud Lake Creek (total mercury concentration of 3.5 ng/L). The assumed small changes in mercury concentrations for seepage water and runoff from near the East Dam would result in a slight increase in mercury concentration and loading to the Embarrass River.

Overall, the changes in total mercury concentrations associated with the NorthMet Project Proposed Action in long-term closure at the Mine Site and Plant Site are estimated to be too small to distinguish from natural background variability in the Partridge River and the Embarrass River using available laboratory methods.

The NorthMet Project Proposed Action and NorthMet Project area watershed information used to assess the potential effects on average annual mercury loading and concentrations at the Plant Site and Mine Site (Upper Embarrass River and Upper Partridge River, respectively) were also used to assess the potential effects from the NorthMet Project Proposed Action on mercury loading in the St. Louis River. For the lower St. Louis River, estimated changes in average annual total mercury concentration from the NorthMet Project Proposed Action were smaller than the estimated changes in the Upper Embarrass River and the Upper Partridge River. When the potential mercury load from the NorthMet Project Proposed Action in long-term closure is added to the respective St. Louis River evaluation locations, there is a slight decrease in mercury loading (-1.0 g/yr) and no detectable change in the mercury concentration (change less than 0.05 ng/L), given the variability in environmental concentrations and the current laboratory detection limits. These results indicate that the potential mercury load from the NorthMet Project Proposed Action would not degrade or lower water quality with respect to average annual total mercury concentrations at the respective evaluation locations. Overall, the NorthMet Project Proposed Action is not expected to have a statistically discernible effect on mercury loading or concentrations at the St. Louis River evaluation locations.

Theme MERC 19

Theme Statement

The SDEIS does not estimate the amount of mercury likely to affect the St. Louis River and Lake Superior.

Thematic Response

As summarized in FEIS Section 6.2.2.4.2, the NorthMet Project Proposed Action is predicted to result in an overall net decrease of mercury-loadings of approximately 1.0 grams per year (i.e., a net decrease of 1.2 grams per year in the Partridge River and a net increase of 0.2 grams per year

in the Embarrass River), which is indistinguishable from natural background variability. Furthermore, discharges are expected to meet the 1.3 ng/L standard for mercury. The NorthMet Project Proposed Action would not contribute to cumulative effects on mercury loading to the St. Louis River. Supporting information is provided in FEIS Section 6.2.2.4.2.

Theme MERC 20

Theme Statement

The SDEIS does not address the transport and fate of mercury releases through seepage and leaching from waste rock stockpiles, mine pits, drying and re-wetting of peat overburden, tailings, or liner leaks, and thus does not adequately characterize potential mercury methylation, conversion, and bioaccumulation. The FEIS should be revised to disclose mercury and sulfate concentrations in seepage from all potential project sources, and should explain existing and proposed mitigation measures for mercury.

Thematic Response

The most reactive waste rock mined at the NorthMet site (Category 4) would be temporarily stored on liners, then placed in the East Pit and flooded with water before closure. FEIS Section 5.2.2 discusses temporary pollutant release by leakage through these liners. The less-reactive Category 1 Stockpile that remains permanently on the surface would be surrounded with a water containment trench to capture seepage during and after mining. Additionally, a proposed geosynthetic cover would decrease water infiltration, and water captured in the trench would be treated.

The recycle/reuse water management plan would result in very little wastewater discharged from the Plant Site during ore processing. Because of the demonstrated ability of both taconite tailings and copper nickel tailings to rapidly absorb mercury, seepage water from the Tailings Basin is expected to have a low concentration of mercury (i.e., less than 1.3 ng/L). The Tailings Basin seepage water would be collected and routed to the Plant Site WWTP along with other water from the Plant Site. The Plant Site WWTP would use greensand filtration followed by RO technology (or equivalent performing technology), which is expected to remove some additional mercury, although removal efficiency at low concentrations is not established. Because of the low concentrations of mercury in the Tailings Basin and LTVSMC tailings seepage, and greensand filtration followed by RO technology, the Plant Site WWTP would be expected to meet the numeric water quality standard of 1.3 ng/L.

Some of the temporarily stored organic material would decompose on site, which would release mercury into solution. Any dissolved mercury would be transported in solution with precipitation that falls on the Overburden Storage and Laydown Area (PolyMet 2015r, as cited in the FEIS). Any mercury released from the peat decomposition process is thought to be transported with precipitation that falls on the Overburden Storage and Laydown Area. However, water coming in contact with materials in the Overburden Storage and Laydown Area is considered to be process water, and would be routed to Pond PW-OSLA. In years 1 to 11, the water from Pond PW-OSLA would be routed to the Tailings Basin and any mercury in the routed water would have the chance to be sequestered in the tailings. In years 12 to 20, some of the water from Pond PW-OSLA would be used to backfill the East Pit. Any mercury in the water routed to the East Pit would have the chance to mix with waste rock and become sequestered at depth in the East Pit.

In addition, any contributions of water in years 21 to 65 from the East Pit to the West Pit would reflect water from the East Pit and its associated watershed runoff and would not reflect process water from Pond PW-OSLA. Because peat removal from the areas to be mined would be completed between years 5 and 11, any potential release of mercury from stored peat materials would have occurred, or be ending, by the time water is routed from Pond PW-OSLA to the East Pit beginning in year 12.

Section 3.0 of Barr 2015f, as cited in the FEIS, provides a summary of the NorthMet Project Proposed Action's potential releases of mercury and sulfur. Mercury and sulfate loadings are predicted to decrease overall as a result of the NorthMet Project Proposed Action. A summary of mercury and sulfur releases and methylation and deposition impact analyses are discussed in FEIS Sections 5.2.2.3.4, 5.2.7.2, 5.2.7.2.5, and 6.2.3.3.4. The following adaptive management strategies proposed for mercury are included in FEIS Section 5.2.2.3.5:

- Pretreatment modifications such as chemical scavenger addition to obtain additional metals;
- Use of tighter RO membranes for the primary RO system;
- Treatment of some portion of the VSEP permeate by the primary RO system to further remove some dissolved constituents; and
- Addition of polishing treatment units for removal of trace metals (e.g., ion exchange).

Theme MERC 21

Theme Statement

The FEIS should evaluate the use of unsaturated overburden and peat for construction and reclamation activities as a source of potential mercury release, in addition to other sources such as constructed wetlands, West Pit, and Overburden Storage and Laydown area.

Thematic Response

Unsaturated overburden and peat material would be used for construction, as approved by the MDNR. Peat (organic soils) and unsaturated overburden that could be used in immediate construction and reclamation would be stored in unlined overburden stockpiles at the Overburden Storage and Laydown Area. Unsaturated overburden (e.g., surficial mineral soil) and peat would be placed in the Overburden Storage and Laydown Area for temporary storage until the material is used for reclamation purposes. The removal of the material would occur prior to the initiation of mining. Also, the Overburden Storage and Laydown Area would be one of the first storage areas to be constructed in order to accommodate the materials associated with the start-up overburden removal. Some of the temporarily stored organic material would decompose on site, which would release mercury into solution. Any dissolved mercury would be transported in solution with precipitation that falls on the Overburden Storage and Laydown Area (PolyMet 2015r, as cited in the FEIS). Any mercury released from the peat decomposition process is thought to be transported with precipitation that falls on the Overburden Storage and Laydown Area. However, water coming in contact with materials in the Overburden Storage and Laydown Area is considered to be process water, and would be routed to the Overburden Storage and Laydown Area Pond (Pond PW-OSLA). Runoff water from the Overburden Storage and Laydown Area would be collected in Pond PW-OSLA as long as materials were stored there. In

years 1 to 11, the water from Pond PW-OSLA would be routed to the Tailings Basin and any mercury in the routed water would have the chance to be sequestered in the tailings. In year 12 to 20, some of the water from Pond PW-OSLA would be used to backfill the East Pit. Any mercury in the water routed to the East Pit would have the chance to mix with waste rock and become sequestered at depth in the East Pit. In addition, any contributions of water in years 21 to 65 from the East Pit to the West Pit would reflect water from the East Pit and its associated watershed runoff and would not reflect process water from Pond PW-OSLA. Because peat removal from the areas to be mined would be completed between years 5 and 11, any potential release of mercury from stored peat materials would have occurred, or be ending, by the time water is routed from Pond PW-OSLA to the East Pit beginning in year 12.

Theme MERC 22

Theme Statement

The SDEIS does not provide a rationale for allowing more mercury to be added to a water system that is already too high in mercury, especially since the existing mercury risk has not been addressed by a Total Maximum Daily Load (TMDL). A mercury TMDL for the St. Louis River should be completed before the FEIS is published and before Permits to Mine are authorized. The FEIS should state whether the company would have to buy mercury offsets, as defined by the State Mercury Implementation Plan, for any new mercury source.

Thematic Response

The comments in this theme were originally presented as part of the Tribal Position Summary included in MDO #2, and is currently addressed in Table 8-1 of the FEIS. Further explanation is provided below.

MPCA's goal is to protect high-quality waters and improve the quality of impaired waters, so water quality standards are met and beneficial uses are maintained and restored, where these uses are attainable. As summarized in FEIS Section 5.2.7.2.5, widespread contamination of fish from atmospheric pollution is why Minnesota established a statewide mercury TMDL. The TMDL seeks to reduce atmospheric deposition everywhere in the state, in order to make the state's lakes and streams fishable, as required by federal regulations, and is intended to provide the long-term framework to reduce mercury in fish. The MPCA published Guidelines for New and Modified Mercury Air Emission Sources, and revised those guidelines in 2012. The guidelines were developed to limit the mercury emissions from new and expanding sources in order to meet the TMDL goal of total statewide mercury emissions of 789 lbs/year by 2025. The MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions, and has determined that it would not impede the reduction goals (MPCA 2013l, as cited in the FEIS). Accordingly, no minimization and mitigation plan is required for the NorthMet Project Proposed Action. Based on the results of MPCA's review, the NorthMet Project Proposed Action should not be required to buy mercury offsets at this time. Should an evaluation of the NorthMet Project Proposed Action determine that an additional mercury source has been added, mercury offsets would be sought in accordance with the Implementation Plan for Minnesota's Statewide Mercury Total Maximum Daily Load (MPCA 2009d, as cited in the FEIS).

Further, the NorthMet Project Proposed Action is not anticipated to be a major source of mercury into the environment. The RO treatment is expected to discharge mercury at or below the

mercury standard of 1.3 ng/L, which includes all surface water that would be discharged at the Plant Site, including water used for flow augmentation. Mercury loadings from the Mine Site are projected to decrease due to the NorthMet Project Proposed Action. The combined contributions from the Embarrass River and Partridge River are unchanged when modeled for the St. Louis River at the Fond du Lac reservation boundary; therefore, further degradation of surface water quality, and by extension increased mercury in fish, is not expected.

Theme MERC 23

Theme Statement

The Proposed Action will result in an increase (and not a decrease, as claimed by the SDEIS) in mercury loading to the Embarrass and Partridge River aquatic systems and other waterways, and its effects on water quantity will cause increased mercury methylation and bioaccumulation. Such an increase would be illegal.

Thematic Response

Based on the evaluations conducted for air emissions and water discharges for the FEIS, the NorthMet Project Proposed Action is not considered to have an appreciable effect on: 1) surface water mercury concentrations, 2) fish mercury concentrations, 3) methylation of mercury, or 4) risk to people consuming fish from lakes near the NorthMet Project Proposed Action site.

The MMREM analysis for two scenarios showed a 0.5 to1.8 percent and 0.3 to 0.5 percent potential increase in fish mercury concentration above background. This potential change is considered to be small compared to background levels and is not expected to affect fish consumption advisories or effect consumers of locally caught fish. The increase is not expected to have an appreciable effect on the loading estimates from permitted discharges to the Embarrass, Partridge, or lower St. Louis rivers. Discharges are expected to meet the 1.3 ng/L standard for mercury, with an overall net decrease in mercury loading predicted for the NorthMet Project Proposed Action.

Theme MERC 24

Theme Statement

The Environmental Justice section of the FEIS should evaluate effects on Band members, subsistence consumers, and other Environmental Justice populations associated with increases in mercury and methylmercury bioaccumulation in fish tissue.

Thematic Response

The effects of mercury bioaccumulation on subsistence activity are discussed in FEIS Sections 5.2.7.2.5 and 5.2.10.2.6. Additionally, the potential cumulative effects of the NorthMet Project Proposed Action on the bioaccumulation of methylmercury in fish are discussed in FEIS Section 6.2.6. The Environmental Justice analysis included disproportionately affected populations, as well as residents of the NorthMet Project area, including Band members who use the area for subsistence regardless of where they live. Operations could affect individuals who consume fish from nearby waterbodies with increased mercury concentrations and associated increases in mercury bioaccumulation in fish tissue. Additional information pertaining to the effects of

mercury and methylmercury on subsistence consumers has been included in FEIS Section 5.2.10.2.6, and is also summarized with the human health considerations text in FEIS Section 7.3.4.4.3.

A.5.15 Issue: Noise and Vibration (N)

Theme N 01

Theme Statement

The NorthMet Project will result in long-term and permanent noise effects on nearby residents and visitors.

Thematic Response

Long-term noise impacts to nearby residents and visitors are addressed based on state noise standards (*Minnesota Rules*, chapter 7030) for different Noise Area Classifications (NACs), including residential and recreational land uses. Long-term noise impacts are discussed in FEIS Section 5.2.8.

Theme N 02

Theme Statement

The FEIS should assess mine noise effects on recreational sites, including residential and tourism sites near Birch Lake and within the BWCAW.

Thematic Response

Mine-related noise impacts on recreational sites such as those near Birch lake are addressed based on state noise standards (*Minnesota Rules*, chapter 7030) for different Noise Area Classifications (NACs), including residential and recreational land uses. Mine-related noise impacts on nearby recreational sites are discussed in FEIS Section 5.2.8. The FEIS also discloses that mine-related noise would not be audible within the BWCAW.

Theme N 03

Theme Statement

The FEIS should further analyze cumulative noise and vibration effects on nearby residents and recreational visitors. This analysis should include the provision of contour maps showing overlapping noise pollution from different projects and a cumulative mining vibration analysis.

Thematic Response

FEIS Section 6.2.8, under Cumulative Effects by Resource - Noise and Vibration, has been updated in the FEIS, and provides more analysis on the cumulative noise and vibration impacts on nearby residents and recreational visitors. The updated section concludes that adverse cumulative noise and vibration impacts are not expected on nearby sensitive receptors (residences/ dwelling places, recreational sites, cultural sites), due to the distance of the

NorthMet Project to the closest reasonably foreseeable action, Mesabi Nugget Phase II Mine Project, (approximately 2 miles west of the Plant Site and 10 miles west of the Mine Site).

Other reasonably foreseeable projects in the region are 25 to 55 miles away from the NorthMet Project and as such, would have no cumulative effect on the nearest receptors (see Figure 6.1.1-1 and Table 6.1.1-1). Other past and present actions, such as the North Shore Mine are already accounted for in the baseline/ambient noise levels. Actual noise and vibration source terms from future projects such as the Mesabi Nugget Phase II Mine Project were not publicly available and contour maps for such future projects were not provided. It should be noted that even if noise and vibration source terms for the Mesabi Project were available, such contour maps are not expected to overlap with the NorthMet Project noise and vibration contours due to the distance between both projects (i.e., considering the rapid decay of sound with increased distance [6 decibel decrease per doubling of distance] and attenuation from individual mine pit walls (i.e., as the pits become deeper) and dense foliage [Superior National Forest]).

Theme N 04

Theme Statement

The FEIS should further analyze noise and vibration effects on wildlife, including Canada Lynx and songbirds. The analysis should include cumulative effects from other nearby mining projects, as well as additional mitigation and a clearly defined area of impact to wildlife.

Thematic Response

FEIS section 5.2.5 (Wildlife Impacts) has been updated to include noise and vibration impacts to wildlife, including Canada lynx and songbirds at the local and regional level. Appropriate mitigation and impact areas have been clearly defined. For more details please see response to theme WI 05. In addition, please see the Biological Assessment (Appendix D of the FEIS) for further details on noise impacts to the Canada lynx, as well as the Biological Evaluation (also in Appendix D of the FEIS) for details on noise impacts to wildlife.

Theme N 05

Theme Statement

The FEIS should include a quantitative analysis of blasting noise and ground borne vibration effects.

Thematic Response

Quantitative analysis of blasting noise and ground-borne vibration impacts are addressed in accordance with *Minnesota Rules*, part 6132.2900, for ground-borne vibration and airblast overpressures (i.e., blasting noise). Quantitative analysis of ground-borne vibration and airblast overpressures from blasting are discussed in FEIS Section 5.2.8.2.2.

Theme N 06

Theme Statement

The FEIS should analyze noise in terms of its tonality, low frequency, fluctuations, and impulsiveness.

Thematic Response

FEIS sections 4.2.8.1 and 5.2.8.2.1 include noise analysis in terms of its tonality, low frequency, fluctuation (or intermittent noise), and impulsiveness. The sections have been modified to increase clarity and provide qualitative analysis. The analysis shows no significant impacts.

Theme N 07

Theme Statement

The FEIS should assess noise effects from increased transportation in and out of the NorthMet Project.

Thematic Response

Transportation of Project consumables and products could result in some noise from increased traffic on public roads and commercial railroads. Public roads could also experience minor increases in noise levels due to additional traffic from employees and service providers, particularly along State Highway 135 and County Road 666. Traffic noise from employee vehicles, service provider vehicles, and trucks transporting process consumables and products are not expected to be significant due to the small increase in daily traffic volumes (approximately 7 trucks per day and 149 employee and service provider vehicles per day along State Highway 135; and approximately 42 employee and service provider vehicles per day along County Road 666 [see the Biological Assessment in Appendix D of the FEIS]) in comparison to the existing annual average daily traffic (AADT) volumes of State Highway 135 and County Road 666. The NorthMet Project Proposed Action's offsite traffic volumes are approximately 2 to 18 percent and 5 to 30 percent of existing AADT at State Highway 135 (850 to 8300 vehicles per day) and County Road 666 (140 to 810 vehicles per day), respectively (Barr 2014a, as cited in the FEIS).

Similarly, railway noise from trains carrying process consumables and concentrates from the Plant Site to Virginia, Minnesota and vice versa (via Canadian National Railroad) are not expected to be significant due to the small increase in monthly railway traffic volumes: approximately one 100-car train once per month and one 30-car train 4 times per month, year round for product shipment; and approximately one 100-car train once per week, April through October, for process consumables (see the Biological Assessment in Appendix D of the FEIS). This accounts for approximately 3 to 4 percent of the existing monthly traffic volumes of the Canadian National Railroad on the Iron Junction to Allen Junction rail segment. (Barr, Pers. Comm., November 6, 2014 [as cited in the FEIS]).

Based on the off-site traffic information described above, noise effects on off-site transportation are not expected to be significant. In addition, all project-related off-site roadway and railway traffic would occur during daytime hours only. The off-site trucks would not exceed 40 miles per

hour, and would avoid densely populated areas to the extent practicable. Any noise sensitive receptor near the Canadian National Railway segments close to the Plant Site, State Highway 135, and County Road 666 would not be exposed to a new noise source since these infrastructures have been in operation for decades. FEIS Section 5.2.8.2.3 has been updated to include a qualitative assessment of noise effects on off-site transportation.

A.5.16 Issue: National Environmental Policy Act and Minnesota Environmental Policy Act Considerations

Theme NEPA 01

Theme Statement

The purpose and need statements should be broadened to allow consideration of other alternatives to the NorthMet Mining Project.

Thematic Response

The Co-lead Agencies' purpose and need statements are based on their respective mandates, other legal guidance, and the proposal before them for review. The Co-lead Agencies believe that the NorthMet Mining Project and Land Exchange EIS considered a reasonable range of alternatives based on the agencies' respective purpose and need statements, issues raised during scoping, and potential impacts identified during the analysis.

Theme NEPA 02

Theme Statement

The purpose and need statements need to be revised to clearly define the agencies' respective mandates and requirements. The agencies may be confused about their roles and responsibilities regarding the project. Comments in this theme questioned why the agencies' purpose and need statements matched the proponent's purpose for the project.

Thematic Response

The Co-lead Agencies' purpose and need statements are based on their respective mandates, other legal guidance, and the proposal before them for review. The Co-lead Agencies believe that their roles are accurately described and fulfill their respective responsibilities under state and federal law.

The Co-lead Agencies' purpose and need statements may be similar in some ways to the proposer's purpose for the Project; however, the agency purpose and need statements are based on state and federal laws and agency responsibilities to consider applications to mine and the Section 404 permit, as well as the Land Exchange Proposed Action.

Theme NEPA 03

Theme Statement

The agencies' purpose and need statements should define why the NorthMet Mining Project should be considered at this time and/or in this location.

Thematic Response

The MDNR and USACE are required by law to consider proposals to mine and the application for a Section 404 permit, respectively, at the time they are submitted and in the proposed location.

Theme NEPA 04

Theme Statement

The USFS purpose and need statement should more clearly define why the agency needs to consider the proposed land exchange and how it would be in the public interest. The purpose and need in the SDEIS serves a private interest, not a public interest.

Thematic Response

In addition to the USFS purpose and need statement in FEIS Section 1.3.2.2, FEIS Section 7.3 (including Table 7.3.5-1) identifies the factors that would be considered in the ROD to determine whether the Land Exchange Proposed Action serves the public interest.

Theme NEPA 05

Theme Statement

The project is needed because the metals proposed to be mined are of strategic and national importance. Copper, nickel, and PGEs are essential elements in the manufacture of products such as cell phones, wind turbines, electric car batteries, medical applications, computers, and many other items. Mining these resources in Minnesota ensures it is done in an environmentally controlled manner.

Thematic Response

These comments provide general information in support of the NorthMet Project Proposed Action because the minerals it would provide are of strategic and national importance. Because no specific information was provided, no changes to the EIS were made as a result of the comments.

Theme NEPA 06

Theme Statement

The project is not needed because the US need for copper is declining. Demand for metals like copper and nickel can be met by means other than a new mine, including recycling, metals resource recovery operations, and greater reliance on green energy. A more sustainable option should be first evaluated. The minerals aren't going anywhere. Hold off on mining until it can be done without endangering the watershed.

Thematic Response

During the development of the Draft EIS for the NorthMet Project (2009) and the SDEIS for the NorthMet Mining Project and Land Exchange (2013), the Co-lead Agencies screened potential alternatives based on a variety of screening criteria. These criteria included whether the possible alternative: 1) met the Co-lead Agencies and proposer's purpose and need for the Project; 2) was technically feasible; 3) was economically feasible; 4) was available (i.e., the mineral and surface rights and technologies were currently available); and 5) provided an environmental or socioeconomic benefit over the proposed Project. Of these, the alternative of using recycling, metals resource recovery, and greater reliance on green energy did not meet the Co-lead Agencies or proposer's purpose for the Project.

Although NEPA guidance (40 CFR 1502.14(c)) allows agencies to consider alternatives not within their legal jurisdiction, the suggested alternatives did not meet the overall purpose and need for the Project, as noted in criterion #1 above. The EIS discloses the potential impacts of the NorthMet Project Proposed Action, including watershed effects. To receive the necessary permits to construct and operate the mine, the proposer would need to demonstrate to permitting agencies that the NorthMet Project Proposed Action would not exceed applicable environmental quality standards.

Theme NEPA 07

Theme Statement

The SDEIS document is too complex, written in a confusing style, and too lengthy to enable the reader to understand and/or make an informed decision about the Proposed Action. SDEIS materials were also difficult to obtain and new information became available. At a minimum, the comment period is too short and should be extended to allow the public more time to consider the contents of the SDEIS.

Thematic Response

The FEIS contains a scientific analysis of the potential effects of the NorthMet Project and Land Exchange Proposed Actions necessary for such a complex project. This analysis was accompanied by plain language descriptions of the scientific analyses, notably in the introductions of each resource section and in the Executive Summary.

The Co-lead Agencies identified reference materials and included in the SDEIS relevant information believed to be necessary to understand its analysis and findings. Reference materials were made available upon request within reasonable timeframes, in accordance with the policies

of state and federal agencies. The SDEIS was circulated for public comment for 90 days, which is twice the amount of time required by the federal regulations, and three times the amount of time required by state regulations.

Theme NEPA 08

Theme Statement

The SDEIS is flawed because it did not follow the legal requirements of NEPA and/or MEPA, such as by failing to properly describe mitigation measures or management plans that affect the Project's potential impacts. How can it be that the same agencies that prepared the EIS issue the critical Record of Decision?

Thematic Response

The Co-lead Agencies believe that the analysis of the Project as presented in the EIS meets the procedural and analytical requirements of NEPA and MEPA.

As a disclosure document, the EIS describes the potential effects of the NorthMet Project and Land Exchange Proposed Actions, and identifies mitigation measures that could be required as part of permitting and as conditions become better understood through monitoring. This is consistent with NEPA and MEPA rules, which stress that EISs not become encyclopedic descriptions of every possible outcome, but instead focus on likely impacts. NEPA requires that federal agencies issue RODs based on the EISs they prepare (or adopt as consistent with CEQ regulations). Thus, the federal agencies are meant to issue the RODs.

Minnesota Rules, part 4410.2800, subpart 4 requires the RGU (the MDNR) to find the FEIS adequate if it: a) addresses the potentially significant issues and alternatives raised in scoping so that all significant issues for which information can reasonably be obtained have been analyzed in conformance with EQB Rules, 4410.2300, items G and H; b) provides responses to the substantive comments received during the draft EIS review concerning issues raised in scoping; and c) was prepared in compliance with the procedures of the MEPA and the Environmental Quality Board Review Program Rules, parts 4410.0200 to 4410.6500.

Theme NEPA 09

Theme Statement

The analysis in the SDEIS is inadequate and demonstrates unacceptable environmental impacts for a variety of reasons. It is based on flawed data and inaccurate information. The EIS should be rejected.

The analyses are based on a conceptual description of the proposed action and an extensive set of assumptions of the environment and the performance of the conceptual design. Much of the information provided is encyclopedic, describing ways in which the Project purports to fit within various regulatory regimes.

The EIS assumes that all mitigation measures perform perfectly, not merely for the 20-year life of the mine, but for hundreds of years afterwards. This is simply not a supportable assumption,

and the SDEIS fails to evaluate both the effectiveness of mitigation measures, and the impacts in the event that they fail.

Thematic Response

As an analysis and disclosure document and consistent with NEPA and MEPA, the NorthMet Mining Project and Land Exchange EIS does not determine which impacts are or are not acceptable. Decision-makers from the federal Co-lead Agencies would evaluate the effects identified in the FEIS to make that determination in their respective RODs. As the RGU, the MDNR would evaluate the adequacy of the EIS under *Minnesota Rules*, part 4410.2800, subpart 4, which considers whether the significant issues and alternatives have been analyzed, whether substantive comments have been responded to, and whether the procedures of MEPA and regulations thereunder have been complied with.

The Co-lead Agencies believe that the EIS contains the best available data and analyses consistent with the NEPA and MEPA guidance and best practices.

The Co-lead Agencies reviewed all applicable documentation submitted by the proposer to fully understand the NorthMet Project Proposed Action. These included detailed technical design documents, including the Project Description, Mine Plan and several resource-specific management plans, all of which are summarized in FEIS Chapter 3. The level of detail describing the NorthMet Mining Project provided in the EIS is consistent with the requirements of NEPA/MEPA for similar projects at this stage of environmental review. The Co-lead Agencies believe that the project description was sufficient to support a comprehensive scientific analysis of potential impacts to allow decision makers to make informed decisions on the NorthMet Project Proposed Action. The proposer would be required to provide more detailed information as the project is refined during the permit process, much of which would require additional public review.

NEPA (as well as MEPA) recognize that EISs are planning tools that focus agency analyses on significant environmental issues (40 CFR 1501.1(d)). As a tool, an EIS analyzes proposals at an appropriate level, given that the permitting process would require more finely tuned analyses based on further understanding of environmental conditions and project design. This means that the NEPA and MEPA phase of the environmental review process requires less specificity for proposed projects, and demands additional detail for the permitting phase.

Pursuant to NEPA and MEPA, mitigation measures and their effectiveness have been considered in the EIS. The actual effectiveness of any approved and implemented mitigation measures would be monitored as part of permit conditions, which may lead to additional mitigation measures being required of the permit holder.

Theme NEPA 10

Theme Statement

There should have been more than three public meetings held on the SDEIS, and they should not have been held in January when it was difficult some people to attend.

Thematic Response

The Co-lead Agencies believe that the number and timing of the public meetings more than satisfied the requirements of NEPA and MEPA for public involvement. Approximately 4,500 people attended the three public meetings held in Duluth, Hoyt Lakes, and St. Paul for the NorthMet Mining Project and Land Exchange SDEIS. Hundreds of individuals provided oral and written comments at these meetings, and dozens more people provided oral comments for transcription by stenographers. These comments are included in this volume of the FEIS, along with all other written comments received during the 90-day public comment period.

Theme NEPA 11

Theme Statement

The agencies do not explain how the comments received on the SDEIS will be used in their decision making processes. For instance, will the agencies place higher value on comments if there are more of them than other comments? The public meetings did not provide all participants with equal opportunity to express their views. The process could have been more fair between individuals that are pro-mining versus anti-mining.

Thematic Response

All comments and supporting documentation received on the SDEIS have been considered equally. Because over 58,000 submissions and over 17,000 unique comments were received on the SDEIS, the Co-lead Agencies have combined similar comments into common themes, which have been responded to in this volume of the FEIS.

The oral comment periods of the public meetings were designed to allow comments from the broadest spectrum of opinion. The Co-lead Agencies believe that the process was fair and did not favor one group's opinions over another's.

Theme NEPA 12

Theme Statement

The agencies should explain how they will resolve the Major Differences of Opinion with the Tribal Agencies. Agency responses are inadequate or not believable.

Thematic Response

During the development of the SDEIS, MDOs regarding the analysis presented in the document were identified. These MDOs are between the Co-lead Agencies and the Bands, GLIFWC, and the 1854 Treaty Authority, and represent comments from the Tribal Cooperating Agencies that

the Co-lead Agencies determined were adequately addressed in the existing analysis. The MDOs are discussed in FEIS Chapter 8 (and were discussed in SDEIS Chapter 8).

Comments submitted by the Bands on the SDEIS included comments reflecting the MDOs. In addressing and developing detailed responses to those comments, the Co-lead agencies also addressed many aspects of the MDOs. In developing the FEIS, the Co-lead Agencies engaged in ongoing interaction regarding MDOs with the Bands/Tribal Cooperating Agencies. The Co-lead Agencies shared with the Bands how they intended to respond to the Bands' comments, how the MDOs were addressed in the FEIS, and which MDOs had achieved some resolution. In FEIS Chapter 8, Table 8-1 notes where and how the MDOs are addressed in the FEIS.

Although it is beneficial to resolve differences of opinion on a project, MDOs often remain unresolved throughout the analysis process. In making decisions on proposed activities, responsible officials utilize information in the FEIS addressing differences of opinion to inform their decisions and to support rationale for those decisions.

Theme NEPA 13

Theme Statement

There should be a separate EIS prepared solely for the Land Exchange.

Thematic Response

The Co-lead Agencies determined that the Land Exchange Proposed Action is a connected action to the NorthMet Project Proposed Action, and therefore needs to be assessed in the same EIS as the mine. This is consistent with NEPA and MEPA guidance that require agencies to consider connected actions such as the Land Exchange Proposed Action, since it has been triggered by the NorthMet Mining Project proposal and application for a Section 404 permit.

Because the resources of the Proposed Actions for the NorthMet Project and Land Exchange differ, the impact assessment discussions for each are provided in separate sections of the EIS.

Theme NEPA 14

Theme Statement

The analysis in the SDEIS fails to meet NEPA's standards for providing a hard look at impacts, considering proper data or including proper regulatory or permitting information.

Thematic Response

The Co-lead Agencies believe that the EIS contains adequate information and analyses consistent with NEPA and MEPA guidance and best practices. Please refer to the response to theme NEPA 09 for more detail.

Theme NEPA 15

Theme Statement

Statements generally opposing the NorthMet project, or questioning the conceptual nature of the project, validity of the underlying data and/or analysis, and whether the agencies followed and balanced their respective laws and regulations in conducting the impact assessment, including independent data analysis. The co-lead agencies should choose the "No Action" Alternative.

Thematic Response

The Co-lead Agencies believe that the EIS meets the procedural and analytical requirements of NEPA and MEPA. Also, refer to the response to theme NEPA 08 for more detail.

Theme NEPA 16

Theme Statement

The SDEIS adequately addresses the impacts of the NorthMet Mining Project and Land Exchange, which should be approved, including issuance of the required permits. Comments in the theme generally support the proposed NorthMet Mining Project and Land Exchange because the minerals are needed and/or the jobs that the mine would create would be beneficial to the region. Impacts can be controlled through the project's design and permits.

Thematic Response

These comments express support for the NorthMet Project Proposed Action, including issuance of the necessary permits. Because they do not provide any specific information related to the environmental effects of the NorthMet Project Proposed Action, no changes were made to the EIS as a result of the comments.

Theme NEPA 17

Theme Statement

The public involvement process and meetings were informative and allowed for all sides to share their opinions.

Thematic Response

These comments generally support the public involvement process, including the public meetings held on the SDEIS. Because no specific information was provided, no changes were made to the EIS.

Theme NEPA 18

Theme Statement

The SDEIS is inadequate, because the Co-lead Agencies and/or their contractors had a conflict of interest: it was to their political or monetary benefit to prepare a document that generally allows the Proposed Action to proceed. The laws direct state and federal agencies to promote and regulate mining, which is an inherent conflict that restricts the agencies' objectivity.

Thematic Response

The Co-lead Agencies and their contractors acted objectively and independently to fulfill their respective roles and responsibilities under state and federal law. See FEIS Chapter 1 for more information.

A.5.17 Issue: Project Description (PD)

Theme PD 01

Theme Statement

The long-term environmental mitigation plan in the SDEIS is insufficient to provide a reasonable assurance that the Proposed Action can meet environmental regulations. In particular, the SDEIS does not provide sufficient information to adequately address wastewater containment, light pollution, and Superfund site remediation.

Thematic Response

The FEIS includes available details regarding long-term water treatment (see the response to theme PD 02 for additional information). The various resource sections of FEIS Chapter 5 discuss mitigation measures for the NorthMet Project. See the response to theme FIN 05 for more details regarding financial assurance. Additional details on the cost estimates, time frames, contingency plan amounts for unforeseen challenges, and calculations that would be required for the project would be addressed during permitting. FEIS Chapter 3 indicates that the Tailings Basin and the Category 1 Stockpile would have water containment systems, and that wastewater would be routed to the WWTP or WWTF, respectively, to be treated. FEIS Section 5.2.11.2.2 discusses the potential for some light pollution due to 24-hour mine operations, although lighting would be directed downward. PolyMet does not propose any further specific mitigation measures for light effects.

FEIS Section 5.2.13.2.3 indicates that if the NorthMet Project Proposed Action had a release of a CERCLA hazardous substance, it would be required to comply with the notification requirements of EPCRA and CERCLA, specifically 40 CFR 355.60, 40 CFR 302, and the Emergency Notification Procedures in Minnesota as required by Title III of the Superfund Amendments and Reauthorization Act (40 CFR 300-399).

Theme PD 02

Theme Statement

The SDEIS does not comply with Minnesota state rules regarding mine closure (i.e., *Minnesota Rules* 6132.3200, 6132.4800, 6132.1300, 6132.1200, and 6132.1100). Perpetual mechanical water treatment is not allowed; passive treatment should be well defined and proven before approved. Waste rock stockpiles should have liners.

Thematic Response

There is a crucial distinction in the state's Non-Ferrous Rules between goals (*Minnesota Rules*, part 6132.3200, subpart 1) and requirements (*Minnesota Rules*, part 6132.3200, subpart 2). Subpart 1 describes the "Goal" of closure and post-closure maintenance. The goals in the Non-Ferrous Rules (specifically *Minnesota Rules*, parts 6132.2000–6132.3200, subpart 1) are aspirational targets for reclamation, and are not specific requirements that obligate permittees (see *Minnesota Rules*, part 6132.0100, subpart 8).

Minnesota Rules, part 6132.3200, subpart 2 contains the legal "requirements" with which mine permit holders must comply. The Non-Ferrous Rules address the issue of reclamation by creating "reclamation standards" for thirteen different aspects of any mining project, including siting, buffers, storage pile design, management of reactive mine waste, and closure and post-closure maintenance. The Non-Ferrous Rules (subpart 2) do not contain a specific requirement that mines must show how they would be maintenance-free before receiving a mine permit.

The Non-Ferrous Rules explicitly allow maintenance after closure, which is known as post-closure maintenance (*Minnesota Rules*, part 6132.3200, subpart 2.E.6). While closure is defined in the Rules to mean the process of terminating and completing final steps in reclaiming any specific portion of a mining operation, post-closure maintenance includes those activities that are required to sustain reclamation after closure (*Minnesota Rules*, part 6132.0100).

In addition to setting out the requirements for mining and reclamation, the Non-Ferrous Rules mandate that the permittee provide financial assurance sufficient to perform reclamation activities, including closure and post-closure maintenance, should the permittee be unable to do so (*Minnesota Rules*, part 6132.1200, subpart1). Financial assurance may also be required where corrective action is needed during the life of the mine.

Because mine closure is part of every reclamation plan, financial assurance must be provided to cover the anticipated costs of the cessation of use and stabilizing the site. The nature of post-closure maintenance activities and the associated costs are likely to change over the course of active mining. Thus, the financial assurance package would be adjusted during the annual updates of the reclamation plan (*Minnesota Rules*, part 6132.1300).

The FEIS includes available details regarding long-term water treatment and Minnesota state rules. Liners would be installed for stockpiles or areas where there is a potential to generate acid and metal leachate. The Category 1 Stockpile and Tailings Basin would have containment systems to collect seepage, which would be pumped to the WWTF and WWTP, respectively. The two liner layers on the Hydrometallurgical Residue Facility would be separated by a leakage collection system, which is designed to collect any potential leakage. Each liner layer would consist of a geomembrane layer above a geosynthetic clay layer. A drainage collection system

would also be installed during reclamation to collect drainage above the upper liner. The cap would consist of a geotextile fabric, overlain by a clay barrier layer, and a 40-mil low-density polyethylene layer. This would be covered with additional LTVSMC coarse tailings or common borrow and cover soils to sustain a vegetated cover. The FEIS includes available details from the updated Residue Management Plan.

Theme PD 03

Theme Statement

The SDEIS relies on inadequate detail and unrealistic assumptions about how water resources would be managed for the NorthMet Project. In particular, there is very little detail on the reverse osmosis (RO) process, and the SDEIS makes the unrealistic assumption that the proposed wastewater treatment systems will be effective for centuries after the mine closes. Due to this deficiency, the project should not proceed. The FEIS should provide more detail regarding the RO process and confidence in being able to treat water from this project to suitable levels.

Thematic Response

FEIS Section 5.2.2 explains that during reclamation, water from the West Pit and Category 1 Stockpile would be treated at the WWTF, which would be upgraded to include an RO treatment unit (or equivalent performing technology). Treatment at the RO unit would result in an effluent that meets all applicable water quality standards. The WWTP would also include an RO unit that would achieve a sulfate concentration of 10 mg/L in effluent. The WWTP RO system would treat captured Tailings Basin seepage during operations and closure, and tailings pond water during closure. PolyMet has conducted pilot scale testing of RO treatment technology, and the results from this testing showed that this technology would treat water to meet all required water quality standards (see FEIS Section 3.2.2.1.10). Both WWTF and WWTP systems would continue operating until monitoring and pilot-testing results indicate that a transition could be made to approved non-mechanical systems. Provisions of the financial assurance package, which is part of the Permit to Mine, would require that funds be available if the company is unable to meet its obligations for the ongoing maintenance of all equipment, as well as replacement of all equipment as often as necessary.

Theme PD 04

Theme Statement

The FEIS should provide sufficient detail to fully describe how water runoff will be contained and managed on site, including details on:

- The effectiveness of the covers;
- The west equalization basin; and
- Stormwater control.

Thematic Response

FEIS Sections 3.2.2.3.10 and 3.2.2.3.11 describes that direct precipitation, stormwater run-on, and water collected by the Tailings Basin seepage capture systems would be directed to the Tailings Basin. The Tailings Basin would have a water containment system around the northern, eastern, and western dams to intercept seepage and pump it back to the Tailings Basin. Excess Tailings Basin pond water would be pumped to the WWTP for treatment. FEIS Sections 3.2.2.1.7 and 3.2.2.1.8 state that the Category 1 Stockpile would have a cover system in closure and water containment system surrounding it to collect drainage that would be pumped to the WWTF for treatment. In closure, surface runoff (non-contact stormwater) would be directed off-site. FEIS Section 3.2.2.1.8 also discusses stormwater controls at the Mine Site, which would include a system of dikes and ditches to manage and control non-contact stormwater from flowing off-site. Stormwater would be directed to sedimentation ponds. Contact stormwater from the Category 2/3 or 4 stockpiles or the Ore Surge Pile would be stored in the West Equalization Basin at the WWTF for treatment.

FEIS Section 3.1.1.3 states, "Water control systems would be constructed to capture water that has contacted surfaces disturbed by mining operations, as well as water collected on stockpile liners (i.e., process water). Process water would be treated at a treatment facility located at the Mine Site and either pumped via a Central Pumping Station to the Plant Site for discharge to the Tailings Basin, or used to supplement flooding of the East Pit after year 11."

The effectiveness of the containment systems are taken into account in the water quality modeling that has been accomplished for the NorthMet Project. The results of the water quality modeling are addressed in FEIS Section 5.2.2.

Theme PD 05

Theme Statement

The description of the Proposed Action in the SDEIS does not identify all of the necessary elements of a water monitoring system.

Thematic Response

FEIS Sections 3.2.2.1.10 and 5.2.2.3.1 state that surface water and groundwater would be monitored as required by relevant permits. The water monitoring program is required under NPDES/SDS regulations, and would be detailed and finalized in the NPDES/SDS permitting process. FEIS Section 5.2.2.3.6 provides an overview of the proposed water monitoring program.

Theme PD 06

Theme Statement

The FEIS should provide more information about future non-mechanical treatment systems, and should demonstrate that non-mechanical treatments are effective in treating wastewater after closure of the mine.

Thematic Response

The NorthMet Project Proposed Action relies on mechanical treatment for as long as necessary. FEIS Chapter 3 states that PolyMet has committed to conducting pilot and other feasibility studies on the use of non-mechanical treatment as an adaptive management measure if proven effective and cost efficient. The possible future use of non-mechanical treatment is stated as a long-term goal, but the details of how such systems would operate would be determined once operations begin and site specific data could be used for pilot/feasibility studies, and if eventually proposed would be addresses in future permitting.

The WWTF would continue to treat water until water quality monitoring demonstrates that effluent would achieve water quality standards under non-mechanical treatment. Similarly, the WWTP would continue to treat Tailings Basin seepage until non-mechanical treatment would be demonstrably appropriate. FEIS Section 5.2.2.3.5 lists some non-mechanical systems that may be used, including constructed wetlands, PRBs, PSBs, and/or other technologies to still be identified. The Adaptive Water Management Plan (PolyMet 2015d, as cited in the FEIS) describes in more detail various non-mechanical treatment systems that could be utilized with details about each design and the degree of use of each design in industry.

Theme PD 07

Theme Statement

The Proposed Action calls for Tailings Basin water containment technologies, such as the slurry walls, berms, and trenches, which are not proven to work for the type of mining proposed in the SDEIS. The FEIS should describe how these water containment technologies, as described in documents such as the USACE EM 1110-2-1901 standard, will decrease water pollution rates.

Thematic Response

USACE EM 1110-2-1901 is an Engineer Manual from 1986 titled “Seepage Analysis and Control for Dams.” Design criteria for the Tailings Basin are based on well-established geotechnical design standards with significant precedent in Minnesota, in the greater United States, and worldwide. The effects of the containment system on Tailings Basin stability have also previously been analyzed, and the analysis results are on file with MDNR. The water containment system is designed to avoid hydrostatic pressure, which would transfer back into the Tailings Basin dams, potentially increasing the phreatic surface elevation within the dams. Rather, the system as preliminarily designed would the capability to lower the hydrostatic pressure on the upstream (Tailings Basin) side of the containment system cutoff wall, thereby potentially lowering rather than raising the hydrostatic pressure at the Tailings Basin dams.

The type of mining proposed does not directly affect the design, construction, and operation of proposed groundwater containment systems for the NorthMet Project. Rather, key design considerations for the containment systems include but are not limited to the local geologic and hydrogeologic characteristics of the site, the depth to bedrock or other confining unit from the ground surface, the presence and prevalence of cobbles and boulders in the glacial till, the ground surface topography along and adjacent to the containment system alignment, the soil types to be encountered along the alignment, and the constituents in the groundwater to be contained. The proposed containment system technology is not new nor unique; the slurry cutoff wall and collection trench approach has been used for many decades, beginning initially as a

means to facilitate construction of deep foundations in locations of shallow groundwater and difficult soil conditions, and subsequently expanding to other uses such as the containment of contaminated groundwater emanating from unlined waste disposal facilities (e.g., landfills, stockpiles, etc.).

Numerous scholarly papers have been written about the use of groundwater containment systems, and a number of contractors are well-experienced and proficient in containment system construction. The groundwater collection component of the system and the hydraulic barrier (cutoff wall) work in tandem to control the direction of groundwater flow and the amount of groundwater collected. Maintenance of a lower hydraulic head on the upgradient side of the cutoff wall than on the downgradient side of the cutoff effectively captures any seepage that would otherwise leave the site, while limiting the effect that the system has on groundwater conditions downgradient from (away from) the system. This barrier to flow thereby minimizes the potential for water quality effects on the downgradient side of the containment system.

Theme PD 08

Theme Statement

The SDEIS makes unsupported assumptions about the ability of the Tailings Basin to contain contaminants seeping into the surrounding watershed for centuries to come. The assumptions are based on faulty modeling inputs and overly optimistic environmental analyses that lead to faulty basin design considerations.

Thematic Response

The environmental review process is an objective review by regulatory agencies of the potential impacts to all resources. See the response to theme PD 07, which addresses the Tailings Basin containment technologies and how the cutoff wall and containment system would capture seepage. The north, west, and east seepage containment systems would capture 100 percent of surface seepage under expected conditions, and 90 percent, 90 percent, and 100 percent, respectively, of groundwater seepage. The Tailings Basin South Seepage Management System would capture 100 percent of surface water (Barr 2015e, as cited in the FEIS).

Theme PD 09

Theme Statement

The SDEIS should include a full Reclamation Plan for the Tailings Basin that provides details about goals, methods, financial assurance, reclamation techniques that have been successfully demonstrated, and the timing of activities. The Reclamation Plan must address over-steepening of the Tailings Basin banks and associated seepage.

Thematic Response

A detailed Reclamation Plan is required under the Permit to Mine. The FEIS includes details from the Reclamation Plan (PolyMet 2015g, as cited in the FEIS), which has been updated since the SDEIS. FEIS Section 3.2.2.3.12 describes how the NorthMet Project Plant Site facilities would be operated to allow for progressive or concurrent reclamation during operations, where possible. PolyMet would also submit an annual contingency reclamation plan per *Minnesota*

Rules, part 6132.1300, subpart 4, to identify activities that would be implemented if operations were to cease in that upcoming year. After mining ceases, PolyMet would finish reclamation activities under the Reclamation Plan, which would be part of the Permit to Mine. Reclaimed areas would be monitored and maintained as needed in the spring and fall or as required by the Permit to Mine. Areas damaged by erosion or that lost vegetation would be identified, and plans to repair or reseed would be developed and implemented. The goals and methods for reclamation on various Plant Site facilities and areas are listed in FEIS Section 3.2.2.3.12. In addition, FEIS Section 3.2.2.4 describes that financial assurance, covering the costs of reclamation should the mine close for any reason, would be required before a Permit to Mine would be issued.

Theme PD 10

Theme Statement

The SDEIS does not provide enough information on the existing condition of the former LTVSMC Tailings Basin, which would be reused in the Proposed Action. If the existing basin is already leaking, how will PolyMet control seepage from the basin?

Thematic Response

FEIS Section 3.2.2 cites the Reclamation Plan's (PolyMet 2015g, as cited in the FEIS) discussion the remediation of AOCs and ongoing mitigation of water quality at the Tailings Basin. Several Tailings Basin surface seeps and discharges are currently being mitigated via a Consent Decree. The Reclamation Plan states that Cliffs Erie is currently executing the MDNR-approved Closure Plan for legacy components. Under the NorthMet Project Proposed Action, PolyMet would install a water containment system around the northern, western, and eastern Tailings Basin dams to intercept seepage emerging near the toe, which is where several legacy seeps exist as well. PolyMet would monitor, maintain, and improve, if necessary, the legacy components that remain, such as the Tailings Basin South Surface Seepage Management System along the south Tailings Basin dam. PolyMet would be required to address legacy contamination within the NorthMet Project footprint and would provide financial assurance for the legacy components under a Permit to Mine application, consistent with *Minnesota Rules*, part 6132.1200.

Theme PD 11

Theme Statement

The Proposed Action's designs do not address overflow concerns at the Tailings Basin due to heavy rain events or other catastrophic events. The SDEIS does not provide contingency plans, failure analyses, and costs to protect the land and watershed from contaminated water.

Thematic Response

FEIS Section 3.2.2.3.10 discusses the emergency overflow channel at the Tailings Basin, which would be designed as a backup means to control the pond elevation during a PMP event. The Tailings Basin pond is designed to hold the PMP event, which is a catastrophic event consisting of 38-inch storm event within a 72-hour period.

The Flotation Tailings Management Plan (PolyMet 2015n, as cited in the FEIS) and Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS) include draft Contingency Action Plans. The purpose of these plans is to anticipate or envision the failures that could occur at these facilities, and to identify early warning signs of potential future failures and appropriate response actions. These plans would be further developed as project development continued, with updated Contingency Action Plans included in future regulatory agency submittals in support of environmental review and permitting.

In addition to setting out the requirements for mining and reclamation, the Minnesota Non-Ferrous Rules mandate that the permittee provide financial assurance sufficient to perform reclamation activities should the permittee be unable to do so. *Minnesota Rules*, part 6132.1200, subpart 1 requires financial assurance so that funds are available if the company is unable to meet its obligations for potential corrective actions.

Theme PD 12

Theme Statement

The SDEIS wrongfully assumes the east side of the Tailings Basin would not have groundwater seepage due to bedrock. This assumption forms the basis for the inaccurate models used to predict zero water flow from the basin.

Thematic Response

The water quality modeling in the FEIS has been updated to include the potential for water to seep from the east side of the Tailings Basin. FEIS Section 3.2.2.3.10 states that a containment system would be constructed around a portion of the east side of the Tailings Basin for seepage collection.

Theme PD 13

Theme Statement

The SDEIS does not provide enough information concerning the hydrology of the south water containment system of the Tailings Basin. Specifically, the SDEIS does not:

- Describe the placement of berms and trenches to cut off water seeping from the basin;
- Provide water seepage monitoring data for the area; and
- Describe the hydrogeological features of the area which can affect water containment.

Thematic Response

The Water Management Plan-Plant Site (PolyMet 2015i, as cited in the FEIS) includes the detailed design drawings of the South Surface Seepage Management System, which was installed as part of Cliffs Erie's Consent Decree to capture seepage along the south side of the Tailings Basin. This system is being monitored and evaluated for effectiveness under the Consent Decree. The collected monitoring data is being submitted to the MPCA. FEIS Section 3.2.2.3.10 discusses surface seepage out of the south side of the Tailings Basin, and PolyMet's

commitment to upgrade the south side capture efficiency to 100 percent in the event the Cliffs Erie improvements do not attain 100 percent capture.

Theme PD 14

Theme Statement

The SDEIS does not provide an accurate measure of how much raw water will be needed to operate the Tailings Basin.

Thematic Response

FEIS Section 3.2.2.3.4 describes the water needs of the NorthMet Project Proposed Action. Project water needs are for the milling and flotation circuits, which would be supplied from return water from the Tailings Basin. Water in the Tailings Basin would come from precipitation, the Mine Site, and the Seepage Capture Systems. Additional raw water needs would come from Colby Lake as necessary, and the anticipated pumping rate from Colby Lake would vary between 260 and 1,760 gallons per minute, with an average of 760 gallons per minute (FEIS Section 3.2.2.3.4).

Theme PD 15

Theme Statement

The FEIS should provide additional detail and clarity regarding waste rock management including:

- Descriptions of waste rock by type (e.g., why separate Category 2 and 3 waste rock material if it would be combined anyway);
- Consistent characterization of the acid-generating potential of the rock stockpiles;
- Separate management of the overburden types based on their use;
- Clarification on how long the temporary stockpiles would be in place; and
- Containment of water from the stockpiles and mine pits.

Thematic Response

FEIS Section 3.2.2.1.7 includes available details regarding waste rock management and characterization, overburden management, and temporary stockpile timeframes. FEIS Section 3.2.2.1.8 discusses water containment for the stockpiles and mine pits. The FEIS also references documents such as the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS) and the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS), which contain additional details regarding waste rock and overburden management. Responses to themes GT10, GT12, and WR127 also provide additional information on the use of liners.

Theme PD 16

Theme Statement

The FEIS should provide additional detail and clarity regarding management of the closure cover for the Category 1 Stockpile, including vegetation control and effectiveness of the cutoff wall.

Thematic Response

FEIS Section 3.2.2.1.8 includes available details regarding the cutoff wall effectiveness, based on PolyMet's updated Project Description document (PolyMet 2014b, as cited in the FEIS) and Reclamation Plan (PolyMet 2015g, as cited in the FEIS). FEIS Section 3.2.2.1.10 states that the reclaimed Category 1 Stockpile would be monitored and maintained as needed in the spring and fall or as required by the Permit to Mine. Any areas damaged by erosion or that lost vegetation would be identified, and plans to repair or reseed would be developed and implemented. Long-term maintenance of the Category 1 Stockpile would also include removal of woody species and trees from the cover system. The Reclamation Plan, required as part of the Permit to Mine, contains additional details on the Category 1 Stockpile cover system.

Theme PD 17

Theme Statement

The FEIS should be revised to provide a reasonable range of probabilities for containment failures at the Hydrometallurgical Residue Facility. Performance (leakage) and life expectancy of the liners and drainage systems and cap are concerns that need more detail. In addition, the Hydrometallurgical Residue Facility should be classified as a hazardous waste landfill.

Thematic Response

The Hydrometallurgical Residue Facility would be constructed over the LTVSMC emergency basin. The two liner layers on the Hydrometallurgical Residue Facility would be separated by a leakage collection system, which is designed to collect any potential leakage from the bottom of the cell. Each liner layer would consist of a geomembrane layer above a geosynthetic clay liner. A drainage collection system would also be installed during reclamation to collect drainage above the upper liner. The cap would consist of a geotextile fabric, overlain by a clay barrier layer, and a 40-mil low-density polyethylene layer. This would be covered with additional LTVSMC coarse tailings or common borrow and cover soils to sustain a vegetated cover. During reclamation and long-term closure, leakage would be routed and cycled through the Plant Site WWTP. The FEIS includes available details from the updated Residue Management Plan (PolyMet 2014r, as cited in the FEIS).

The liner system components have been selected specifically to perform well, given the characteristics of the residue, which consists primarily of gypsum. The liner system components selected for the Hydrometallurgical Residue Facility are routinely used for similar facilities in other industries and have demonstrated the expected levels of performance. The design produces a liner system with virtually no leakage due to the system's ability to maintain a very low hydraulic head on the composite liner portion of the overall liner system.

The Residue Management Plan presents the planned Hydrometallurgical Residue Facility monitoring and maintenance plan. Additional monitoring and maintenance requirements would be outlined by the responsible regulatory agency as part of facility permitting.

A submittal containing two documents, *Information Provided by PolyMet Regarding 2009 Hydrometallurgical Residue Testing* and *Information Provided by Polymet Regarding Hydrometallurgical Residue Testing for RCRA Thresholds,* was provided to the Co-lead Agencies on August 5, 2014 (see PolyMet 2014a). The documentation summarized the results of two rounds of testing, conducted in 2005 and 2009, on the residue that is to be discharged to the Hydrometallurgical Residue Facility. It also reviewed the testing results against the regulations under RCRA. Mining wastes associated with extraction, beneficiation, and processing of ores and minerals are typically excluded from the RCRA definition of hazardous waste (40 CFR 261.4(b)(7)). PolyMet has conducted environmental testing to compare the properties of the hydrometallurgical residue with the RCRA hazardous waste thresholds. Comparison of the results from this testing with the RCRA hazardous waste thresholds shows that the hydrometallurgical residue does not have any toxicity characteristics of a hazardous waste. The MPCA concurs with this assessment.

Theme PD 18

Theme Statement

The FEIS should disclose more details about the operation of the Hydrometallurgical Residue Facility, including:

- The extraction methods used to recover metal concentrates at the facility;
- The chemical composition and pH of the materials that would be disposed of in the facility; and
- Monitoring for leakage.

Thematic Response

FEIS Sections 3.2.2.3.6 and 3.2.2.3.7 discuss the operation of the Hydrometallurgical Residue Facility, including the autoclave leaching and solution purification steps to extract and isolate platinum group, precious metals, and base metals. Calcium in the form of either limestone or lime would be added to neutralize solutions from the upstream process. FEIS Section 3.2.2.3.10 states that the Hydrometallurgical Residue Facility would be double-lined to minimize release of residue leachate, and any collected leakage would be pumped back to the Hydrometallurgical Residue Facility pond. The Residue Management Plan (PolyMet 2014r, as cited in the FEIS) presents the planned Hydrometallurgical Residue Facility monitoring and maintenance plan. Additional monitoring and maintenance requirements would be outlined by the responsible regulatory agency as part of facility permitting.

Theme PD 19

Theme Statement

The SDEIS lacks sufficient detail regarding construction quality assurance, as well as the suitability of the proposed location of the Hydrometallurgical Residue Facility (as it relates to effects on critical ecosystems and water resources).

Thematic Response

FEIS Section 5.2.14.2.3 discusses the design and construction of the Hydrometallurgical Residue Facility, and the Geotechnical Data Package (PolyMet 2014c, as cited in the FEIS) indicates the design would meet all factors of safety as required. The Hydrometallurgical Residue Facility would be constructed over the LTVSMC emergency basin. This site is known to have suitable subsurface conditions and would minimize impacts to ecosystems and water resources as compared to a new site, since the existing site is already disturbed. During operations, the double liner system for the Hydrometallurgical Residue Facility would minimize release of residue leachate, and any collected leakage would be pumped back to the Hydrometallurgical Residue Facility pond. During reclamation and long-term closure, leakage would be routed and cycled through the WWTP. The FEIS includes available details from the updated Hydrometallurgical Residue Management Plan (PolyMet 2014r, as cited in the FEIS).

Rigorous construction quality assurance procedures for lined facilities are standard in Minnesota, and PolyMet would propose and be required via facility permitting to implement a rigorous liner system construction quality assurance/quality control program.

Site-specific and material-specific testing as deemed necessary by the facility designer and the responsible regulatory agency would be performed as part of final design and/or construction and as part of the construction quality assurance/quality control program for the Hydrometallurgical Residue Facility.

Theme PD 20

Theme Statement

The FEIS should disclose more details about the closure of the Hydrometallurgical Residue Facility, including:

- The dewatering process at closure (how would it work and where would the water be taken?); and
- Long term closure monitoring and maintenance requirements, including vegetation control and inspection for plugged inlet structures and piping systems (would this be perpetual?).

Thematic Response

FEIS Section 3.2.2.3.12 includes available details regarding the closure of the Hydrometallurgical Residue Facility, based on the updated Project Description (PolyMet 2014b, as cited in the FEIS) and Reclamation Plan (PolyMet 2015g, as cited in the FEIS) documents. At closure, the ponded water would be pumped to the WWTP for treatment. The area would then be graded, equipped with a cover system, and re-vegetated. The final cover would be inspected and

maintained by mowing once per year or as needed, and repairs to the cover would be made as necessary. Woody species or trees would be removed from the cover system during mowing. A rip-rapped drainage channel or plug-resistant inlet and piping system for surface water runoff control would be installed, and inspections would occur annually or as needed.

Theme PD 21

Theme Statement

The SDEIS lacks details on the hydrometallurgical processing of metal ores at the Plant Site. Specifically, it does not adequately provide details for how the copper/gold/PGE recovery will produce sulfide precipitates from the hydrometallurgical processes.

Thematic Response

FEIS Sections 3.2.2.3.6 and 3.2.2.3.7 discuss the operation of the Hydrometallurgical Residue Facility, including the autoclave leaching and solution purification steps to extract and isolate PGE and precious metal sulfide precipitates, and base metals.

Theme PD 22

Theme Statement

The SDEIS fails to provide impact analysis and contingency plans that address climate change, extreme precipitation, other weather events, or other failures and mishaps that typically occur in mining operations and closure. The FEIS should disclose the effects suggested by failure analyses, contingency plans, and adaptive management plans.

Thematic Response

The FEIS includes available details regarding contingency plans for unforeseen challenges or failures. Stormwater ponds are designed for the 100-year, 24-hour storm event plus one foot of freeboard. All process water ponds, with the exception of the OSLA pond, were designed for the 100-year, 24-hour storm event plus three feet of freeboard. The OSLA pond was designed for the 25-year, 24-hour storm event plus three feet of freeboard. Additionally, all process water systems with the exception of the Rail Transfer Hopper pond, would be able to manage runoff from these storm events without their pumps running, in the event of a power outage or at full capacity at the WWTF. Due to the design of the Tailings Basin for the PMP event, the potential for overflows is very low. The PMP is defined as “the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area for a certain time of the year,” (Schreiner and Riedel 1978). Most if not all tailings basins on the Iron Range are designed for some level of PMP event. The Tailings Basin has been designed to hold the 72-hour PMP event, which is approximately 38 inches, without overtopping. The PMP does not have an assigned return period, but it is usually assumed by hydrologists to be on the order of thousands of years.

The Adaptive Water Management Plan (PolyMet 2015d, as cited in the FEIS) is currently a publicly available document, and would be referenced and available as part of the FEIS and Permit to Mine. See CEQ, Appropriate Use of Mitigation and Monitoring and Clarifying the

Appropriate Use of Mitigated Findings of No Significant Impact (Jan. 14, 2011) for more information about the use of adaptive management.

Contingency mitigation is part of the company's management plans. If monitoring or the refined model estimates show that with adaptive engineering controls water quantity or quality at compliance points would not meet compliance parameters, contingency mitigations would be available (and listed in the various management plans for the Project) to address specific situations.

Theme PD 23

Theme Statement

PolyMet has no mining experience, and aspects of the Proposed Action are untested or have otherwise failed elsewhere. What qualifications does PolyMet have to design, model, and manage the Proposed Action as outlined in the SDEIS?

Thematic Response

Regulatory agencies conduct the environmental review process to ensure impacts to the environment are minimized. Following environmental review, regulatory agencies review design plans, and draft permits that contain conditions that ensure compliance with all applicable state and federal regulations that protect the environment. The preliminary design work has been completed by experienced and licensed professionals. Detailed plans and specifications would be prepared by licensed professionals and reviewed by permitting agencies as part of the permitting process.

Theme PD 24

Theme Statement

The SDEIS does not indicate which parties will be responsible for implementing and monitoring the proposed mitigation measures and plans, nor the extent of public review of the final design during permitting.

Thematic Response

PolyMet is responsible for implementing and monitoring the proposed mitigation plans. The regulatory agencies would review monitoring results and annual reports to ensure compliance. The FEIS includes available details regarding mitigation measures in each resource section of Chapter 5. Final decisions on the mitigation measures would be made during permitting. Public review opportunities are outlined as part of each permit's existing process.

Theme PD 25

Theme Statement

The long-term financial assurance details in the SDEIS are insufficient for the Proposed Action. Also, the financial plans do not account for capital replacement costs for the mine. The SDEIS

also does not address how the financial and economic benefits of the mining project will be distributed.

Thematic Response

FEIS Section 3.2.2.4 includes available details regarding financial assurance. Additional details on the cost estimates and calculations that would be required for the project would be addressed during permitting. Specific infrastructure timelines and life expectancies of equipment would be accounted for during permitting as well. Table 3.2-15 provides financial assurance cost estimates for various years of closure, as well as for monitoring and mitigation costs. FEIS Section 3.2.2.4.1 discusses the activities that would be considered in cost estimates, and states that cost estimates would be updated annually under the Permit to Mine. *Minnesota Rules*, part 6132.1200, subpart 3, stated that cost estimates shall be annually adjusted using current dollar value at the time of the estimate. The liner and cover systems selected for waste containment are selected on the basis of numerous factors discussed in the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS) and FEIS Sections 3.2.2.1.8 and 3.2.2.3.10. The WWTP and WWTF replacement costs would be included in long-term financial assurance estimates. The FEIS discusses economic benefits to local communities in FEIS Section 5.2.10.

Theme PD 26

Theme Statement

Historically, mining in sulfide-bearing rock has always led to water contamination. This is particularly concerning in the water-rich environment of northeastern Minnesota. The FEIS should describe how the Proposed Action differs from previous mines with sulfide-bearing rock (e.g., Ladysmith Mine in Wisconsin, Eagle Mine in Michigan, Talvivaara Mine in Finland) and how those differences would avoid water contamination.

Thematic Response

NEPA/MEPA regulations do not require discussion or comparisons to other Copper/PGE mine projects, as it is outside the scope of the project (see *Minnesota Statutes* 116D.04 and 40 CFR 1500). FEIS Section 5.2.2 discusses how the NorthMet Project would address water contamination and/or comply with water standards.

Theme PD 27

Theme Statement

The SDEIS incorrectly makes the comparison between taconite mining and sulfide mining. Sulfide mining would have a substantially greater impact on the environment than taconite mining historically has.

Thematic Response

These comments generally faulted the SDEIS because it erroneously compared taconite mining and sulfide mining, which would be more environmentally damaging than the historical mining in the region. Because no specific information was provided, no changes were made to the EIS.

Theme PD 28

Theme Statement

The SDEIS shows that the Proposed Action has been designed in a way that is environmentally responsible and will minimally impact the environment. The Proposed Action would accomplish these goals by reusing a former mining facility and controlling its existing pollution. It would be managed appropriately by regulators.

Thematic Response

These comments generally supported the NorthMet Mining Proposed Action. Because no specific information was provided, no changes were made to the EIS.

Theme PD 29

Theme Statement

The SDEIS relies on a number of improper and unsupported assumptions in the project design, as well as environmental models that minimize the threats of the Proposed Action on human health and the environment. The FEIS should disclose, with objective data, accurate environmental effects, especially with regards to water.

Thematic Response

FEIS Chapter 5 discusses effects that are known or predicted to occur, using several different types of models. The environmental review process is an objective review by regulatory agencies of the potential impacts.

Theme PD 30

Theme Statement

The SDEIS is misleading because it does not disclose the full extent of the project. The FEIS should provide additional detail about:

- The Proposed Mine's full operating capacities and opportunity to expand (e.g., the full size of the ore body and the capacity of the Plant Site);
- The definition of ore and the volume and sulfur content of waste rock;
- The geology of the mine pits;
- The volume of material that would be mined, processed, and sold;
- Siting, construction, and operation of the mine pits (e.g., how open pit mining works) and related facilities; and
- The full environmental footprint.

Thematic Response

The FEIS analyzes the NorthMet Project as planned and proposed by PolyMet. If, in the future, there is a proposed expansion of the Project's footprint or processing rate, or a substantive change in operations, the requisite additional environmental review would be performed. No such changes are reasonably foreseeable. FEIS Section 3.2.2.1 discusses the geology of the NorthMet Deposit and mine pits, the total volume of ore and waste rock that would be excavated, the sulfur content of the various categories of waste rock, and the process of siting, construction, and operation at the mine pits (e.g., Figure 3.2-10, Tables 3.2-4 and 3.2-8). FEIS Section 3.2.2.3 discusses the siting, construction, operation, and capacity of the Plant Site.

Theme PD 31

Theme Statement

The FEIS should provide additional detail and clarity regarding the description of the geologic formations (e.g., where is the Virginia Formation and the Duluth Complex located?). The assumption that unsaturated overburden would not be reactive is misleading.

Thematic Response

The FEIS references documents such as the Rock and Overburden Management Plan (PolyMet 2015h, as cited in the FEIS) and the Mine Plan (PolyMet 2014q, as cited in the FEIS), which contain more details regarding site geology and overburden characteristics. FEIS Section 3.2.2.1 discusses the geology of the Duluth Complex, Virginia Formation, and mine pits (see Figure 3.2-10). This section also discusses the unsaturated overburden and explains that it has been above the natural water table and exposed to air long enough for chemical reactions to have already taken place.

Theme PD 32

Theme Statement

Technologies proposed for the NorthMet Project are devised by the mining industry and will not solve the issue of hazardous wastes and air pollution generated by activities associated with the Proposed Action. The mine should be put on hold until proven technology is available.

Thematic Response

FEIS Section 5.2.13 provides applicable hazardous materials management regulation references/citations; hazardous material management plan requirements (transportation, storage, use, and disposal); emergency planning and community right-to-know recordkeeping and reporting requirements; and hazardous material spill response management and mitigation measures. The EIS is not meant to replace compliance planning, nor is it meant to provide explicit detail of spill response plans, hazardous material reduction plans, hazardous material or waste management plans and contingency plans. PolyMet would be required to dispose of all waste in accordance with all applicable state and federal laws and regulations.

Theme PD 33

Theme Statement

The FEIS should consider the environmental effects of metal smelting and downstream use of the metal concentrates.

Thematic Response

The NorthMet Project Proposed Action would utilize a beneficiation and hydrometallurgical processing technology rather than smelting. Copper smelting at a specific location is not a reasonably foreseeable effect of the NorthMet Project Proposed Action. Accordingly, these effects are not included in the FEIS. In addition, any downstream smelting processes would be the subject of a separate environmental review process, and would be subject to compliance with applicable water quality and air quality standards.

Theme PD 34

Theme Statement

The addition of limestone to sulfur bearing rock should be considered as a management strategy. The SDEIS should consider the potential benefits and ecological effects of using limestone.

Thematic Response

FEIS Section 3.2.2.1.10 discusses that lime could be added to the East Pit during waste rock backfilling in order to maintain circumneutral pH in the pit pore water. The determination of whether to add lime, and the details of such addition would be determined during permitting.

Theme PD 35

Theme Statement

The FEIS should include a full Reclamation Plan for the waste rock pits that provides details about goals, methods, financial assurance, reclamation techniques that have been successfully demonstrated, and timing of activities. The FEIS should also include:

- A characterization of waste disposed of in the East Pit;
- An evaluation of abandoned pipelines;
- A tracking system for hazardous materials to ensure appropriate disposal and compliance with laws; and
- A description of the water balance desired for the pits post-closure.

Thematic Response

FEIS Section 3.2.2.1.10 and the Reclamation Plan referenced in the FEIS describe how the NorthMet Project Mine Site facilities would be operated to allow for progressive or concurrent reclamation during operations. Further details would be added to the Reclamation Plan during the permitting process. After mining ceases, PolyMet would finish reclamation activities under the Reclamation Plan, part of the Permit to Mine. After mining in each mine pit ceases, the walls

and overburden portions would be sloped and graded in accordance with *Minnesota Rules*, part 6132.2300, and then vegetated to conform to *Minnesota Rules*, part 6132.2700. Category 2/3 and 4 waste rock would be placed into the East Pit beginning in year 11, and the combined East Central Pit would be completely backfilled after year 20. FEIS Table 3.2-8 defines the waste rock characterization properties.

Pipelines and various other dewatering systems not used in reclamation would be removed, and the areas graded and vegetated.

See the response to theme PD 32 for more information about hazardous materials.

During backfilling, the pit would be flooded concurrently to limit the oxidation potential of waste rock. A wetland would be constructed over the backfilled combined East Central Pit, and water depth would be maintained by a gravity overflow structure to the West Pit. The West Pit would be sloped as well, and then allowed to fill naturally, and supplemented with treated water.

See the response to theme WR 181 for more information about the water balance and mechanisms of consumptive use.

Theme PD 36

Theme Statement

The SDEIS does not adequately address the design or the social and environmental effects of transportation and end use of materials, including:

- Dust and spillage of ore and other materials along the Transportation Corridor;
- Construction and reclamation plans for all roads;
- Pipeline construction materials used to move sulfate water between the Mine Site and Plant Site;
- The presence of project features within and out of the Transportation and Utility Corridor; and
- Probabilities and consequences of spills and accidents during transportation.

Thematic Response

The Project Description document states that monitoring and mitigation activities (including surface water quality sampling in the streams traversed by the rail line) would be developed in the permitting process. FEIS Section 3.2.2.1.10 states that roads not used during reclamation would be demolished, the asphalt from paced surfaces removed, and disturbed areas reclaimed and vegetated according to *Minnesota Rules*, part 6132.2700. Any roads, including mine pit access roads (*Minnesota Rules*, part 6132.3200), that may develop into unofficial off-road vehicle trails would require a variance from MDNR reclamation rules to allow a 15-ft-wide unpaved, unvegetated track down the centerline of the road. FEIS Section 5.2.13 discusses the probabilities and consequences of spills or accidents during transportation. The FEIS includes available information from the updated Project Description document. The downstream use of the metal concentrates is outside the scope of the FEIS.

Theme PD 37

Theme Statement

The FEIS should address the potential effects of transporting copper and nickel concentrates to the metal smelters. The FEIS should also consider alternative methods for the transportation of copper and nickel concentrates leaving the site.

Thematic Response

FEIS Section 3.2.2.3.9 describes the transport of concentrate products using sealed bulk bags, sealed containers, or covered solid-bottom rail cars. The off-site transport and use of the metal concentrates is outside the scope of the FEIS. Any downstream smelting processes would be the subject of a separate environmental review process, and would be subject to compliance with applicable water quality and air quality standards.

Theme PD 38

Theme Statement

The maps in the SDEIS are incorrect, including the map for the One Hundred Mile Swamp. The errors mislead the public into thinking that the Proposed Project will not affect surrounding water resources, including the BWCAW.

Thematic Response

A National Atlas shows a single wetland complex (referred to as 100-mile swamp) as straddling the major watershed divide separating the Superior Basin from the Rainy River Watershed. This appears to indicate that this wetland complex creates a conduit for surface water and surficial groundwater originating from the Mine Site to reach the Dunka River, and ultimately, the BWCAW. However, wetlands are delineated using many factors in addition to hydrology; the delineation of 100-mile swamp as continuous across this boundary does not equate to a hydrologic connection. There are two hydrologic barriers between the Mine Site and the Rainy River Watershed, including:

- High ground north of the Partridge River creates a watershed divide separating the Superior Basin and Rainy River Watershed, and prevents surface water from passing between the two. This major watershed divide is included in the National Atlas, as well as USGS and MDNR data sets. This divide is accurately presented in the FEIS Figure 4.2.2-1.
- Yelp Creek and the Partridge River encircle the north, east, and south sides of the Mine Site. These streams create a hydrologic "sink" for surface water and groundwater originating at the Mine Site. Surface runoff or surficial groundwater seepage leaving the Mine Site would follow a gradient into Yelp Creek or the Partridge River, as opposed to continuing uphill towards the watershed divide (see FEIS Figure 5.2.2-7). Yelp Creek and the Partridge River extend further west (i.e., more fully encompassing the Mine Site) than is shown on the map in question.

If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS Sections 5.2.2.3.5, 5.2.2.3.6 and 6.2.2.3.1.

Theme PD 39

Theme Statement

The FEIS should identify Project energy requirements, and should consider implementing solutions to reduce energy consumption during the life of the mining project. Energy efficient solutions such as making use of renewable energy sources instead of using coal and implementing energy efficient construction standards would demonstrate a commitment to the environment.

Thematic Response

The FEIS considers effects from the Land Exchange and the NorthMet Project Proposed Action, which is a proposed mining and mineral processing project. The NorthMet Project would consume electricity. In Minnesota, designated electric utilities are the default service providers. The primary policy mechanism to encourage renewable energy in Minnesota is through the renewable energy standard and the solar-specific standard for electric utilities in *Minnesota Statutes* 216B.1691.

The FEIS Tables 5.2.7-8 and 5.2.7-9 list indirect GHG emissions due to (offsite) electricity generation required for the project. FEIS Section 5.2.7.4.1 also describes that a hydrometallurgical process reduces energy demand by 50 percent over a pyrometallurgical process, and that the select processing motors would be premium efficiency motors, which would also help minimize electricity use. Since the SDEIS, PolyMet modified the NorthMet Project Proposed Action to include a SAG mill, which would be much more efficient and use less energy than the existing rod mill and ball mill circuit originally proposed.

A.5.18 Issue: Permitting and Regulatory Considerations (PER)

Theme PER 01

Theme Statement

The permit process should allow for public access to information, review, and input (e.g., hearings, and/or a vote), and should have an objective third party consultant to evaluate applications and process, including the Permit to Mine and AWMP.

Thematic Response

Under the State of Minnesota Data Practices Act, all public government data collected, created, received, maintained, or disseminated during the permit process is accessible to the public, including, but not limited to, permit applications and draft permits. The public review and input process varies depending upon the permit and is controlled by state statute and/or rule.

The Freedom of Information Act (FOIA) gives the public the right to access information from the federal government. Under the FOIA, federal agencies must disclose any information that is requested, unless that information is protected from public disclosure. Not all records can be released under the FOIA, and there are nine categories of exemptions. For example, Exemption 5 covers information that concerns communications within or between agencies which are protected by legal privileges that include, but are not limited to: attorney-work product privilege,

attorney-client privilege, deliberative process privilege, and presidential communications privilege.

Theme PER 02

Theme Statement

PolyMet is an untested company with no experience in mine development, mine operations, or financial assurance. The MDNR should not allow a company to undertake such a huge mining operation without a record showing that they are a qualified company to safely operate the proposed NorthMet mine. The parent company of PolyMet (PolyMet, Canada) and major investor (Glencore Xstrata) should be held responsible for and be part of the Permit to Mine and Financial Assurance. Even so, Glencore Xstrata is not from the United States and does not have a trustworthy environmental record.

Thematic Response

FEIS Section 3.2.2.4 includes available details regarding financial assurance. PolyMet, the project proponent, and not its shareholders, would be responsible for the Permit to Mine and financial assurance. *Minnesota Rules*, part 6132.1200, subpart 5 states that financial assurance criteria require that funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. Final details on the financial assurance requirements for the NorthMet Project Proposed Action, as well as who would be responsible for it would be addressed during permitting.

Theme PER 03

Theme Statement

The NorthMet Project is a high risk project and has inherently high costs associated with planned and unplanned environmental mitigation needs, such as long-term, post-closure water treatment. Permits for the project should include financial assurance adequate to cover unplanned events, reclamation, monitoring, contingency mitigation, and long-term closure activities to protect the state from financial cost. PolyMet should also be held to harsh financial and legal penalties for failure to comply.

Thematic Response

FEIS Section 3.2.2.4 includes available details regarding financial assurance. *Minnesota Rules*, part 6132.1200 outlines financial assurance requirements, and subpart 5 specifically states that financial assurance funds must not be dischargeable through bankruptcy and are fully binding and enforceable under state and federal law. Final details on the financial assurance requirements for the NorthMet Project Proposed Action, as well as who would be responsible for it would be addressed during permitting. Refer to the response to comment theme NEPA 09 for a description of the requirements under NEPA and MEPA including a description of how the Co-lead Agencies reviewed the proposer's documentation and how additional documentation would be required during permitting, much of which would require additional public review.

Theme PER 04

Theme Statement

The NorthMet Project would not meet the Permit to Mine requirement for the mine to be maintenance free at closure (*Minnesota Rules* 6132.3200), especially because the 200 and 500 year timeframes for potential water effects are tantamount to "perpetual" water treatment. In addition, other long-term monitoring and maintenance requirements included as part of the Proposed Action are unrealistic and not practicable.

Thematic Response

Minnesota Rules, part 6132.3200, *Closure and Postclosure Maintenance*, identifies several goals for non-ferrous mining areas, including the goal that sites be closed so that they are maintenance-free. A maintenance-free site is the goal of the Minnesota Department of Natural Resources (MDNR) for the NorthMet Project Proposed Action, as it is for every mining site. The NorthMet Project Proposed Action includes piloting a non-mechanical treatment system to achieve this goal. PolyMet would include funds in its reclamation cost estimate and financial assurance package to fund mechanical water treatment for as long as necessary, but the Permit to Mine would require PolyMet to present a plan for eventual transition from mechanical water treatment to non-mechanical treatment. PolyMet cannot be released from its responsibilities, including financial assurance requirements, until there is no longer a need for closure/post-closure treatment/maintenance. Financial assurance is a component of any Permit to Mine, to ensure that necessary maintenance can be provided for as long as it necessary.

Theme PER 05

Theme Statement

If contaminants traveling through groundwater contribute to the pollution of surface water, USEPA and the federal courts require an NPDES permit for the discharge.

Thematic Response

The EIS considers that permitting for the NorthMet Project Proposed Action, if approved, would require monitoring that would likely include water levels and water quality in groundwater and potentially affected waters of the U.S., including wetlands and tributaries. The goal of this monitoring is to anticipate or predict the potential for an NPDES discharge so that the NPDES discharge can either be eliminated, or alternatively permitted with NPDES permit coverage prior to its occurrence. See FEIS Section 5.2.2.3.6 for more information on groundwater and wetland monitoring and possible future mitigations.

The FEIS states that an NPDES permit would be required for any point source water discharge that adds pollutants to waters of the U.S. The Final EIS correctly identifies the waters of the US.

Theme PER 06

Theme Statement

The permitting agencies have a poor track record for enforcement and holding mining companies accountable for compliance with permit conditions. Known AMD sites in Minnesota (Dunka Mine and LTV) have legacy pollution. The FEIS and permits should include assurances that PolyMet would be able to meet, and would be strictly held to conditions (if approved) with harsh penalties for violation. Permitting agencies should retain the right to update the permit conditions, including monitoring, to reflect best practice and/or more stringent environmental standards, should conditions or standards change (e.g. for mercury). Facility shutdown should be an option. Variances should not be granted.

Thematic Response

If state permits are issued, the MDNR and MPCA would retain the right to re-open and amend the permit as necessary to ensure compliance with state and federal rules. In addition, MPCA's water quality permits are issued for five year terms, and must go through a formal (and public) reissuance process thereafter. If a permit is reissued or re-opened, contemporary standards would be incorporated into the revised permit. The MPCA and MDNR retain any and all enforcement powers allowed under state law. State and federal rules allow for a permittee, under certain circumstances, to apply for a water quality variance, and the MPCA cannot unilaterally terminate that right. The application for a variance would be evaluated against the criteria in state and federal rules to determine whether the variance can be granted.

Theme PER 07

Theme Statement

Permitting of the NorthMet mine would create a precedent for other sulfide mines in the vicinity of the BWCAW that would have significant cumulative consequences.

Thematic Response

An Environmental Impact Statement (EIS) would be required for any proposed new mine in the vicinity of the BWCAW, and a cumulative effects analysis would be part of such an EIS. In addition, each new project or facility would be subject to its own separate and independent permitting process.

Theme PER 08

Theme Statement

The NorthMet project and Land Exchange are inconsistent with fiduciary obligations owed by the United States government under treaties with Indian tribes. Treaty usufructuary rights to hunt and gather unpolluted fish, wildlife, medicinal plants and wild rice should be honored.

Thematic Response

The Agency's obligation is to ensure that Band members have ample opportunity to exercise their treaty-reserved usufructuary rights; that federal lands are managed to maintain both the diversity and abundance of natural resources; and that the Bands' usufructuary rights to 1854 Treaty resources are not impaired. The Land Exchange Proposed Action was analyzed to understand the potential effect posed to usufructuary rights. The Co-lead Agencies have consulted, and continue to consult with the Bois Forte Band of Chippewa, the Grand Portage Band of Lake Superior Chippewa, and the Fond du Lac Band of Lake Superior Chippewa, the three principle Bands that retain usufructuary rights in the proposed project area. In addition, the Co-lead Agencies have consulted with the Great Lakes Indian Fish and Wildlife Commission and the 1854 Treaty Authority, the principal natural resource agencies representing the aforementioned Bands Through consultation, the Co-lead Agencies understand that the Bands' principle interest with regards to the Land Exchange Proposed Action are the following: to retain or increase the amount of public land within the 1854 Treaty Ceded Territory, shoreline wetlands, culturally important natural resources used in exercising treaty rights of hunting, fishing and gathering, cultural or religious properties, and access to culturally important natural resources and cultural or religious properties. The Co-lead Agencies have a fiduciary obligation to understand and consider the effects that the Land Exchange Proposed Action would have on Band members exercising their treaty rights in the 1854 Ceded Territory. While the Land Exchange Proposed Action would remove certain lands from federal ownership, this loss is potentially offset by incoming private lands that would become part of the federal estate within the 1854 Ceded territory. Outside of the Land Exchange Proposed Action, the Co-lead Agencies have also analyzed the potential effects posed by the Proposed Connected Actions. The potential affects posed to natural resources and cultural resources of importance to the Bands have been disclosed and would be considered during the Co-lead Agencies' decision process.

Theme PER 09

Theme Statement

The SDEIS did not include sufficient information to inform related water permits. For example:

- The SDEIS is not clear where compliance points would be—property boundaries are not sufficient;
- The FEIS must disclose the predicted quality of groundwater below each of the mine features and Tailings Basin, as well as other seepage locations;
- Baseline water quality along the Transportation and Utility Corridor should be monitored for permitting. It is not clear if there will be mixing zones, or how groundwater entering surface water would be held in compliance; and
- The FEIS should include the narrative state standards, which are more difficult and complex than simple numeric goals, and should address issues related to nondegradation and/or antidegradation.

Thematic Response

The MPCA worked closely with the MDNR during the preparation of the FEIS to ensure that this document fully informs the subsequent water quality permitting process. The impact analysis performed as part of the FEIS to estimate potential impacts to water resources would be used to inform any future permitting process with respect to the location of surface and groundwater compliance points, monitoring requirements, and compliance limits consistent with state and federal requirements. All applicable state water quality standards and permitting requirements, including nondegradation, would be addressed as part of any water quality permitting process.

Theme PER 10

Theme Statement

The FEIS should include more detail on how the project would comply with the wild rice standard, given the existing high levels of sulfate in Embarrass and Partridge Rivers. How would PolyMet meet a (potential future) revised standard? How would PolyMet comply with non-mechanical treatment in the long term?

Thematic Response

The FEIS includes descriptions of the Wastewater Treatment Plant (WWTP) at the Plant Site and the Wastewater Treatment Facility (WWTF) at the Mine Site, both of which would be capable of discharging treated wastewater at concentrations at or below 10 mg/L (the wild rice sulfate water quality standard), as demonstrated by pilot-testing already conducted. More detailed information on these treatment systems would be available as part of any future permitting process. Future changes to the wild rice sulfate standard, if any, are speculative and outside the scope of the FEIS. However, should a more stringent standard be developed in the future, operation of the reverse osmosis (RO) treatment systems, or equivalently performing technologies, can be adjusted to meet a more stringent effluent limit. Non-mechanical treatment effectiveness in decreasing the concentration of sulfate and other parameters to required levels would need to be proven through bench- and pilot-testing before it could be permitted to replace the currently proposed mechanical systems.

Theme PER 11

Theme Statement

Increased mercury cannot be allowed in the Embarrass River, regardless of a projected mercury decrease in the Partridge River. Quantification of methylmercury, bioaccumulation and compliance with the downstream Fond du Lac Band of Lake Superior Chippewa's water quality standard for mercury should be considered as part of the EIS before permitting proceeds.

Thematic Response

The FEIS has evaluated mercury concentrations from the Plant Site WWTP and Mine Site WWTF, and has concluded that effluent from both facilities can meet the applicable mercury water quality standard of 1.3 ng/L. The MPCA has provided guidance to the Co-lead Agencies that a discharge to a water body impaired for fish tissue mercury is not prohibited, provided that the discharge can meet the applicable water quality standard without benefit of mixing or

dilution (i.e., does not cause or contribute to the impairment). In preparing the FEIS, the Co-lead Agencies concluded that a quantification of methylmercury and its subsequent bioaccumulation cannot be made, given the limitations of today's scientific understanding of the complex processes contributing to methylation of mercury in the environment and introduction into fish tissue. The analysis in the FEIS acknowledges this scientific uncertainty. The FEIS has evaluated potential changes in mercury concentrations in the St. Louis River near the Fond du Lac Band's northern reservation boundary and concluded that mercury concentrations in the St. Louis River at the reservation boundary are not predicted to change from current levels as a result of the NorthMet Project Proposed Action.

Theme PER 12

Theme Statement

The Hydrometallurgical Residue Facility should be classified as a hazardous waste facility, and as such should meet the respective rules for hazardous waste facilities (i.e., the current location is not suitable).

Thematic Response

Minnesota Rules, part 7045.0120, subpart 1.l provides exemption to waste from extraction, beneficiation, and processing of ores and minerals in regard to storage, labeling, transportation, treatment, processing and disposal. Even if that were not the case, actual testing of hydrometallurgical residues obtained from pilot-testing indicates that these residues do not exceed RCRA hazardous waste thresholds. For more details, see the response to theme HAZ 02.

Theme PER 13

Theme Statement

Under what conditions and when would PolyMet be able to request release from the Permit to Mine?

Thematic Response

PolyMet would need to complete all requirements of the Permit to Mine to the satisfaction of the MDNR, which would include all financial assurance and closure requirements. *Minnesota Rules*, part 6132.4800, *Request for Release From Permit*, outlines requirements/conditions for a permittee requesting release from a Permit to Mine.

Theme PER 14

Theme Statement

Has the USEPA reviewed the contents and potential effects of this SDEIS under the Clean Water Act?

Thematic Response

The USEPA, as a Cooperating Agency, reviewed and provided written comments on the SDEIS. The USEPA comment letter is included as part of the FEIS in Appendix A.

Theme PER 15

Theme Statement

Proposed wetland fill at the Plant Site is likely to result in water quality standard violations.

Thematic Response

Water levels in wetlands adjacent to proposed facilities could go up or down as a result of proposed wetland fill, but the proposed wetland fill would unlikely have an effect on the water quality of wetlands. At the Plant Site, the seepage collection system would intercept approximately 90 percent of groundwater and 100 percent of surface water. That intercepted water would be replaced by treated water from the WWTP, which would be discharged outside the containment structure into wetlands to maintain their hydrology. It is expected that water quality permits would require monitoring of potentially affected surface waters near the Tailings Basin.

Theme PER 16

Theme Statement

There should be no change to existing allowable limits for water quality.

Thematic Response

The MPCA would apply all applicable water quality standards as they appear in state and federal rules at the time of permitting. The incorporation of any changes to water quality standards is a separate public process, and is not part of the evaluation in this FEIS.

Theme PER 17

Theme Statement

The agencies should require detailed monitoring of the water levels in the shallow aquifers.

Thematic Response

The MPCA, MDNR, USACE would assess the need to require ongoing monitoring of water levels in the shallow aquifer during their respective permitting processes.

Theme PER 18

Theme Statement

What level of runoff into adjacent rivers and lakes will be deemed acceptable, and what impact will that runoff have on fish, birds, and wildlife in the region?

Thematic Response

All runoff that contacts mine waste or mining disturbed areas is proposed to be captured and treated to meet applicable effluent limitations before it is discharged into the environment. Non-contact stormwater would be managed through best management practices as determined through the stormwater pollution prevention plan required by the MPCA's water quality permit.

Theme PER 19

Theme Statement

Who would be responsible for non-mechanical treatment pilot testing?

Thematic Response

The permittee would be responsible for pilot-testing of non-mechanical treatment systems. The permittee would need to demonstrate to the satisfaction of the permitting agencies (MPCA and MDNR) that the non-mechanical treatment systems would be able to meet required performance levels before they can be permitted to replace either of the mechanical systems (i.e., the WWTP or WWTF) that are part of the NorthMet Project Proposed Action.

Theme PER 20

Theme Statement

The process has taken too long. The decision to grant the permits (or not) should be made in a timely manner.

Thematic Response

These comments discuss the timing of the environmental review and permitting processes. Since no specific information was provided, no changes were made to the EIS.

Theme PER 21

Theme Statement

Tailings dam safety reports should be completed more frequently than every five years.

Thematic Response

Tailings Basin dams would be monitored and managed in accordance with the Dam Safety Permit. Examples of the monitoring and management measures that may be required under the permit are provided in FEIS Section 3.2.14.2. Exact requirements, including the frequency of reporting, would be established during permitting.

Theme PER 22

Theme Statement

Does the sulfate standard drive the whole seepage treatment plan? What dilution factor is valid for the St Louis River between the Embarrass River and the Partridge River?

Thematic Response

The sulfate standard of 10 mg/L, applicable to waters used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels, is an important standard that informed PolyMet's treatment plan; however, it was not the only water quality parameter important to the design and selection of engineering controls. Efficient removal of metals and "salty" parameters were also important considerations. The modeling performed for

the FEIS considered effluent concentrations, watershed runoff, and contributions from stream flow and groundwater in estimating sulfate concentrations in surface water. The FEIS would inform permit decisions. If a permit is issued, the permit would be protective of all applicable beneficial uses.

Theme PER 23

Theme Statement

The SDEIS fails to study the project in the context of other sulfide copper/nickel mines, their history of impacts and regulatory compliance, including companies who are PolyMet investors. If permits are issued, will there be a constant battle to enforce regulations, will variances be sought?

Thematic Response

As required, the FEIS evaluates the potential environmental effects associated with the NorthMet Project Proposed Action. The original scoping of the EIS was informed by the available general body of knowledge related to non-ferrous mining. State and federal rules allow for a permittee, under certain circumstances, to apply for a water quality variance; however, variances are considered rarely and on only a case-by-case basis. Enforcement of regulations is an important component of any permit program, and available state tools have been shown to be effective in resolving non-compliance.

Theme PER 24

Theme Statement

PolyMet should fund an independent group to monitor the project on a full time basis in perpetuity. This entity should have the power to curtail or shut down operations and direct punitive measures as necessary.

Thematic Response

State and federal government agencies are the independent entities that have monitoring responsibility and authority. These responsibilities and authorities are embodied in law and policy, which are a reflection of the public interest.

Theme PER 25

Theme Statement

The State should institute a permanent or temporary moratorium on hard rock sulfide mining. If temporary, then a moratorium on the project should be in place until the reverse osmosis water treatment technology has been successfully installed at another comparable mine.

Thematic Response

To date, the Minnesota state legislature has enacted no moratoria on hard rock sulfide mining or wastewater treatment technologies. Such actions would require legislative approval, and would be enacted through a public process.

Theme PER 26

Theme Statement

The project violates the Weeks Act, Clean Water Act, Clean Air Act and/or National Land Management Policy.

Thematic Response

If permitted, the NorthMet Project Proposed Action would be required to comply with all applicable state and federal regulations and policies.

Theme PER 27

Theme Statement

The proposed project threatens Lake Superior, which is protected by international agreements, such as the International Boundary Waters Treaty of 1909, the Great Lakes Charter of 1985, the Great Lakes Charter Annex of 2001, the Great Lakes Compact of 2005, and the Lakewide Management Plan.

Thematic Response

If permitted, the NorthMet Project Proposed Action would be required to comply with all applicable state and federal regulations and policies.

Theme PER 28

Theme Statement

MDNR should require that sulfide in backfilled waste rock never oxidizes.

Thematic Response

The NorthMet Project Proposed Action is designed so that waste rock backfilled into the East Pit would remain permanently submerged under water. The rate at which sulfide minerals could oxidize in submerged waste rock (and pit wall rock) was considered explicitly in the Impact Assessment Planning (IAP) process undertaken by the Co-lead Agencies for the NorthMet Project Proposed Action. Specifically, the IAP geochemistry group considered the question of whether "Flooded wall rock and backfilled waste rock may still encounter some oxygen that is dissolved in the water, which would release some metals and sulfate" (MDNR et al. 2011, as cited in the FEIS). The IAP geochemistry group concluded that "The effect is too small to warrant incorporation into the pit lake water quality model." Justification for this conclusion is supported by an analysis presented in a 2008 memo by SRK Consulting, which estimated that, even in the top meter of waste rock, the rate of sulfide oxidation would be less than 1/800th as fast underwater relative to rock exposed to the air (Day 2008).

Theme PER 29

Theme Statement

The Minnesota Department of Health (MDH) recommends groundwater evaluation criteria be used for specific contaminants.

Thematic Response

Minnesota's water quality permitting agency, the MPCA, would use the water quality evaluations in the FEIS to inform permitting. For any water quality permit drafted for the NorthMet Project Proposed Action discharges, the specific permit requirements, including compliance limits for groundwater, would be determined through well-established water quality permitting practices reflecting state and federal water quality regulations and associated guidance.

Theme PER 30

Theme Statement

Does Minnesota's regulatory process include water quality monitoring for mining to prevent water pollution from exceeding standards or reduce pollution that exceeds standards?

Thematic Response

PolyMet would be required to comply with all terms and conditions of any water quality permit issued for the Project. These terms and conditions are based on established state and federal water quality regulations, including applicable water quality standards. The permit would include required performance, effluent, and other compliance monitoring to ensure compliance with permit conditions.

Theme PER 31

Theme Statement

The permitting agencies should use previous negative experiences to improve permits for the NorthMet mine to make sure that mistakes are not repeated.

Thematic Response

Permitting agencies would rely upon information presented in the FEIS, any additional information included in permit applications, and their own experience and knowledge in their respective permitting programs in preparing permits that are consistent with applicable state and federal permitting regulations.

Theme PER 32

Theme Statement

How would the Air Quality permit for the NorthMet project comply with the State's established greenhouse gas reduction goals?

Thematic Response

The issues raised by this comment would be part of any future air permit review and approval process. The permitting process would result in permit requirements that are consistent with Minnesota's greenhouse gas reduction goals.

Theme PER 33

Theme Statement

Minnesota law prohibits degrading water quality below the original level, even if the original level exceeds the standard for modified or polluted waters.

Thematic Response

These comments provide general information regarding the degradation of water quality. No changes were made to the EIS as a result of these comments.

Theme PER 34

Theme Statement

The SDEIS has shown that the project will have state and federal regulatory oversight. The SDEIS also has shown that PolyMet can comply with Minnesota's tough environmental management requirements, and should thus be able to proceed through permitting and approvals.

Thematic Response

These comments generally supported the NorthMet Mining project. Because no specific information was provided, no changes to the EIS were made.

Theme PER 35

Theme Statement

The SDEIS does not show that the NorthMet Project would be compliant with federal, state, and provincial environmental laws, including MERA. Economic considerations alone cannot drive environmental decisions. Because the mining companies have poor track records, environmental risks (including reactive mine waste) and potential consequences (including to Lake Superior) are too great, the NorthMet Project should not be permitted. The Minnesota Department of Natural Resources, the U.S. Army Corps of Engineers and the U.S. Forest Service should choose the No Action Alternative and deny the requested permits and Land Exchange.

Thematic Response

These comments stated that the Co-lead Agencies should choose the No Action Alternative and deny the requested permits and Land Exchange. Because no specific information was provided, no changes to the EIS were made.

Theme PER 36

Theme Statement

Were the USFWS, MPCA, and Minnesota Department of Health (MDH) included in EIS process?

Thematic Response

Although not acting as Co-lead agencies, MPCA and MDH have been involved in this EIS process. As discussed in FEIS Section 1.2.3, while not Co-lead or Cooperating Agencies, other federal and state agencies have important roles on the project. The MPCA and MDH are assisting the MDNR pursuant to *Minnesota Rules*, part 4410.2200. The USFWS has reviewed the Biological Assessment (Appendix D of the FEIS) and would provide a Biological Opinion.

Theme PER 37

Theme Statement

Is the P90 threshold a permitting loophole?

Thematic Response

The P90 evaluation criterion was a tool developed for EIS purposes to help interpret the probabilistic distribution of water quality predictions generated by the GoldSim water quality model. Minnesota's water quality permitting agency, the MPCA, would use the water quality evaluations in the FEIS to inform the permitting process. If a water quality permit is drafted for the NorthMet Project Proposed Action discharges, specific effluent limits and other compliance requirements would be determined through well-established water quality permitting practices reflecting state and federal water quality regulations and associated guidance.

Theme PER 38

Theme Statement

Why and how has the permitting process already started (parallel with the EIS process)?

Thematic Response

Pre-application permit discussions have occurred in parallel with the development of the NorthMet EIS so that the NorthMet Project Proposed Action can be modified during the EIS process as necessary to meet anticipated permitting regulatory requirements. The goal of these discussions was to prevent major project modifications during any potential permit drafting process. Establishing a complete NorthMet Project Proposed Action description during the EIS process that anticipates potential permit requirements allowed the public to perform a more

meaningful review of the NorthMet Project Proposed Action and gain a clearer understanding of the its potential effects. The extent of the permitting discussions that occurred during the EIS process was permit- and agency-specific; however, these discussions were typically limited to additional information and analyses needed for the permitting processes, permit application content, and the sequence and timing of permitting process steps. Outcomes of these discussions important to the EIS were shared with the Co-lead Agencies. While permit applications may be submitted and permits drafted prior to the end of the EIS process, no permit decisions may be made until the EIS process is complete.

Theme PER 39

Theme Statement

Both state and federal policy support the development of mining projects such as the NorthMet project within the Superior National Forest.

Thematic Response

These comments suggest that state and federal policy support development such as mining projects within the Superior National Forest. Because no specific information was provided, no changes to the EIS were made.

Theme PER 40

Theme Statement

The PolyMet proposal meets none of the MDNR's mission statement "to conserve and manage the state's natural resources, provide recreation opportunities and…provide commercial uses…in a way that creates a sustainable quality of life" and to "manage…and sustain waterways and groundwater resources."

Thematic Response

These comments indicate that PolyMet's proposal would meet no aspect of the MDNR's mission statement. Because no specific information was provided, no changes were made to the EIS.

Theme PER 41

Theme Statement

Preserving wetlands must be considered crucial to the goal of Minnesota's 25-year effort to "enhance, protect and restore water quality."

Thematic Response

If permitted, the NorthMet Project Proposed Action would be required to comply with all applicable state and federal wetland regulations and policies.

Theme PER 42

Theme Statement

The MDNR has two contradictory mandates that must be fixed—both protect the environment and be required to make the most money from the same land.

Thematic Response

These comments discuss MDNR's contradictory mandates and that they must be fixed. Since these comments are considered to be outside the scope of the EIS, no changes were made to the EIS.

Theme PER 43

Theme Statement

The MDNR does not have the expertise to properly evaluate the mine's impacts on the resources of Minnesota.

Thematic Response

The Environmental Review process for the NorthMet Project Proposed Action has included both experienced state and federal technical staff and experienced consultants/technical experts.

Theme PER 44

Theme Statement

Minnesota has an excellent reputation and laws to protect the environment, and should not be compared to other countries and areas, or to policies in effect years ago.

Thematic Response

These comments have generally supported Minnesota's good reputation and laws that protect the environment. Because no specific information was provided, no changes were made to the EIS.

Theme PER 45

Theme Statement

By rule, the MDNR is the designated RGU for the NorthMet project. It has never made sense that the MDNR should have final decision over property that is currently owned and managed by the USFS for the benefit of all citizens.

Thematic Response

Under MEPA rules, the MDNR is specifically designated as the Responsible Governmental Unit (RGU) for any new mining project. The Proposed Connected Actions include a land exchange of federal lands administered by the United States Forest Service (USFS); therefore, the USFS has been involved with the Proposed Connected Actions as a Co-lead Agency since 2010.

A.5.19 Issue: Socioeconomics (SO)

Theme SO 01

Theme Statement

The proposed economic and employment benefits of the NorthMet Project are small in comparison to the economic cost and the high probability of damage to the environment. The short-term gains (i.e., 20 years of profits and jobs) as a result of the NorthMet Project are not worth the long-term environmental damage and associated costs, which could last 200-500 years.

Thematic Response

FEIS Section 5.2.10.2.2 provides a discussion of the economic effects of the NorthMet Project Proposed Action. Construction, operations, and closure would provide new jobs, substantial new earnings, and indirect contributions to public finances. Environmental impacts would be managed through engineering controls, monitoring, mitigation and adaptive mitigation under permits, and the proposed would be responsible for associated costs as well as financial assurance. See FEIS Section 5.2.2 for detailed discussion on water impacts that would require long-term management. Impacts on air quality are addressed in FEIS Section 5.2.7 and other environmental impacts are disclosed throughout FEIS Chapter 5 and 6. Financial assurance is discussed in FEIS Section 3.2.2.4; however, specific details and costs would be determined during permitting.

Theme SO 02

Theme Statement

Northern Minnesota relies on pristine wilderness to support its economy—especially its tourism economy—which the NorthMet Project would put at risk.

Thematic Response

The NorthMet Project Proposed Action would take place in an area that has experienced mining previously; for more discussion on this see FEIS Section ES-10. As discussed in FEIS Section 5.2.11.2.1, the presence of the NorthMet Project Proposed Action would not substantially affect regional recreation or visual resources, nor would it substantially affect air or water quality or increase noise levels in popular regional recreation lands such as the BWCAW (see FEIS Section 5.2.12). Consequently, there is insufficient evidence to demonstrate that the presence of the NorthMet Project Proposed Action would affect the tourism industry as a whole; see FEIS Section 5.2.10.2.2 for further discussion.

Theme SO 03

Theme Statement

The Proposed NorthMet Project would have negative effects on the real estate market in northeastern Minnesota, with related secondary effects on the local economy. These effects could include reduction of real estate values and/or impedance of the already slow market recovery.

Thematic Response

The NorthMet Project Proposed Action's effects on the Study Area's housing values are anticipated to be minimal. The most likely result of the operation of the NorthMet Project Proposed Action is a minor increase in housing demand and prices in study area communities, with moderate effects in individual communities closest to the NorthMet Project area. Increased housing prices may or may not be a negative effect; average housing values in the communities closest to the NorthMet Project area are relatively low compared to other Study Area communities. Minor to moderate increases in housing value would likely be seen as a benefit to homeowners, and the opportunity to add newer housing stock (either through rehabilitation of existing units or the construction of new units) to the Study Area would generally improve property values, thus improving local property tax revenues in those communities. For further discussion, see FEIS Section 5.2.10.2.4.

Theme SO 04

Theme Statement

The discussion of potential socioeconomic effects in the SDEIS is inadequate. The FEIS should include further analysis, including a detailed analysis of displaced economic activity, ceded territory effects, and how fluctuating workforce numbers impact infrastructure and services.

Thematic Response

The socioeconomic analysis provided in the FEIS satisfies NEPA and MEPA requirements. Regarding displaced economic activity, FEIS Section 4.2.10.1.2 shows the distribution of employment by industry type in the Study Area, and demonstrates that mining is one of many important industries in the region. FEIS Section 5.2.10.2.2 discusses the relationship of mining to the tourism industry. While the NorthMet Project Proposed Action would have substantial economic impacts on the Study Area, it would only add approximately 1,000 jobs (1 percent of the existing workforce). There is no evidence that the Project would prevent the diversification of, or cause displacement of other economic activities from, the Study Area. The FEIS acknowledges the concern about fluctuating workforce numbers (see FEIS Section 5.2.10.1.4 for further discussion). FEIS Section 5.2.10.1.5 provides further discussion of impacts to infrastructure and other services, while FEIS Section 5.2.10.2.6 and the response to theme SO 09 discuss potential impacts to the ceded territory.

Theme SO 05

Theme Statement

The SDEIS evaluation of the economic effects related to taxes is inadequate. The FEIS should be revised to include the following considerations:

- The State of Minnesota policy of rebating taxes to the mining industry;
- Why the estimates of federal, state, and local taxes differ between the DEIS and SDEIS; and
- More detail on the calculation of estimated taxes paid, given that the copper-nickel mining industry has its own unique tax structure.

Thematic Response

1. Discussion of the State of Minnesota's policy of rebating taxes to the mining industry is not required under NEPA or MEPA.

2. The difference in tax estimates between the DEIS and SDEIS is due to different assumptions in IMPLAN modeling about projected operations. In the original IMPLAN report (2005), the total projected output for a typical year of operations (assumed at the time to be 2009) was half that of the projected output in the 2011 IMPLAN report. The change in output assumptions reflects changes in the NorthMet Project Proposed Action between the DEIS and SDEIS. The IMPLAN model uses the proportion of total tax collection attributed to direct, indirect, and induced output to estimate tax revenue; therefore, when the total projected output increases, so does tax revenue.

3. FEIS Section 4.2.10.1.3 discusses all taxes applicable to mining, and Table 5.2.10-3 lists the estimated annual NorthMet Project taxes paid.

Theme SO 06

Theme Statement

The FEIS should provide additional detail about the economic effects of the Proposed Action, including whether jobs would be held by Minnesota workers, how many will be long term vs. short term, and the degree to which profits would stay in northern Minnesota.

Thematic Response

FEIS Section 5.2.10.2.1 discusses the number of direct and indirect jobs created during construction, operations, and closure of the NorthMet Project Proposed Action. Accurate prediction of the degree to which jobs associated with the NorthMet Project Proposed Action (let alone indirect and induced jobs) would be filled by Minnesota workers is not feasible, given the complexity of the labor market. FEIS Section 5.2.10.2.2 discusses employment, income, the number of long-term versus short-term jobs, as well as the degree to which profits would stay in Minnesota. FEIS Section 5.2.10.2.3 discusses the impacts of the NorthMet Project Proposed Action on public finance.

Theme SO 07

Theme Statement

The SDEIS lacks a cost-benefit analysis. The FEIS should include such an analysis to determine if the benefits of sulfide mining outweigh the risks and known effects from this type of mining. An FEIS cost-benefit analysis should specifically evaluate concerns about financial assurance—i.e., whether the public would eventually need to pay for cleanup and how such costs would affect the cost-benefit equation.

Thematic Response

A cost/benefit analysis is not required under NEPA or MEPA.

Section 102 of NEPA (42 USC 4321 et seq.) requires all Federal agencies, to the fullest extent possible, to do the following: "identify and develop methods and procedures, in consultation with the CEQ...which would insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations."

Neither NEPA nor MEPA require the costs and benefits of a proposed action to be quantified in dollars or any other common metric; moreover, it is not possible to quantify and assign a value to all benefits and costs associated with the NorthMet Project Proposed Action. The FEIS focuses on the benefits and costs of such magnitude or importance that their inclusion in the analysis can inform the decision-making process.

The FEIS fulfills NEPA and MEPA requirements in adequately addressing benefits and costs. Financial assurance is discussed in FEIS Section 3.2.2.4.

Theme SO 08

Theme Statement

The IMPLAN modeling is inadequate. An economic model that includes both inputs and outputs must be a part of the discussion. The IMPLAN model was limited in scope and accounts for the benefits but does not consider the total costs of this project relative to the benefits of jobs and taxes.

Thematic Response

IMPLAN modeling is an accepted means to assess socioeconomic impacts of a project. IMPLAN uses an input-output approach to model the economic effects of changes in baseline conditions. IMPLAN reports direct, indirect, and induced effects (as defined in FEIS Section 5.2.10.1.3) in terms of employment, output (the value of production), and value added (wages, rents, taxes, etc.). FEIS Section 5.2.10.1.3 provides further discussion of IMPLAN model methodology, while FEIS Section 5.2.10.2 presents findings of the IMPLAN model. The response to theme SO 07 addresses cost/benefit analysis.

Theme SO 09

Theme Statement

The SDEIS fails to recognize environmental justice effects of pollutants, such as methylmercury and arsenic that may be found in fish, game, wild rice, and water. These pollutants may cause particular harm to tribal members or low-income families who rely on fish, game, and wild rice for subsistence. Cumulative effects of the project on environmental justice should be analyzed.

Thematic Response

The NorthMet Project Proposed Action are within the 1854 Ceded Territory. FEIS Section 4.2.10.1.6, as well as Table 4.2.9-1 in FEIS Section 4.2.9 summarize available information about subsistence patterns and resources within the 1854 Ceded Territory. Construction of the NorthMet Project Proposed Action would make the Mine Site unavailable for subsistence use. The degree to which construction of the NorthMet Project Proposed Action would affect individual subsistence resources (i.e., fish, game, and plant species) outside of the Mine Site, Transportation and Utility Corridor, and Plant Site is discussed in FEIS Section 5.2.9 (Cultural Resources).

FEIS Section 5.2.10.2.6 discusses consumption of fish. Increased mercury concentrations and associated increases in mercury bioaccumulation in fish tissue could constitute an EJ impact for Band members and other subsistence consumers of fish.

Theme SO 10

Theme Statement

PolyMet should be allowed to move forward with the NorthMet Project. The project will create jobs that will support families and provide economic vitality to the region, as well as produce metals that the world needs. Mining can coexist with a natural resources-based tourism industry.

Thematic Response

These comments generally supported the NorthMet Mining project for its economic benefits. Because no specific information was provided, no changes were made to the EIS.

A.5.20 Issue: Vegetation (VEG)

Theme VEG 01

Theme Statement

The FEIS should provide additional species-level analysis of direct, indirect, and cumulative effects on Endangered, Threatened, and Special Concern (ETSC) species, Regional Forester Sensitive Species (RFSS), Species of Greatest Conservation Need (SGCN), and common vegetation species. The FEIS should incorporate the August 19, 2013, Minnesota ETSC species status list, along with any federal status changes. The FEIS should also include acceptable mitigation measures, such as sensitive species being moved to suitable adjacent habitats. Other measures that address the area, biodiversity, and procedures should be proposed and evaluated.

Species of concern include the floating marsh marigold, neat spike-rush, and bog rush. Disrupting one of the 12 currently existing floating marsh marigold populations in Minnesota will increase the pressure on the remaining populations; the floating marsh marigold should be examined for genetic uniqueness and protected.

Thematic Response

The FEIS vegetation sections were updated to include the new state ETSC status listings from August 19, 2013, as well as any new federal status listing changes. FEIS Section 5.2.4.2 includes a listing of MDNR-acceptable potential mitigation measures. These mitigation measures would be decided upon at the time of permitting. The MDNR generally does not consider transplantation of sensitive species to be an acceptable mitigation measure for several reasons: transplantation moves the species into an artificial habitat, transplantation may have unanticipated effects on other organisms at the new site, and it would be necessary to establish the species and monitor it for several years to determine if it could persist. Additional discussion was added to the FEIS regarding floating marsh marigold; specifically, FEIS Section 5.2.4 clarifies the impact on the statewide population, using updated statewide NHIS data. Additional populations have been added to the NHIS database since the SDEIS. There are 15 known populations, several of which have hundreds to thousands of individuals. Of the 13 colonies within the Mine Site, three would be directly affected by the NorthMet Project Proposed Action, as stated in FEIS Table 5.2.4-3. These affected colonies represent a small percentage of total individuals within the state (using available data, approximately less than 1 percent).

Theme VEG 02

Theme Statement

The NorthMet Project and Land Exchange would result in a large decrease of or impact to Minnesota Biological Survey Sites of Biodiversity Significance and imperiled or vulnerable native plant communities. These effects should be mapped in the FEIS and more thoroughly evaluated in terms of biodiversity rankings and biodiversity areas. The SDEIS contains insufficient information on mitigation measures for these areas. Areas of concern that should be further analyzed include the Rich Black Spruce Swamp, the One Hundred Mile Swamp, Superior National Forest, the St. Louis River Watershed, wetlands classified by the USEPA as a likely Aquatic Resource of National Importance, the Laurentian Uplands subsection, the MDNR Headwaters Site, the Sand Lake Peatlands Scientific and Natural Area, and the USFS Big Lake candidate Research Natural Area. Communities of concern include the black spruce and jack pine woodland.

Thematic Response

FEIS Sections 4.2.4 and 4.3.4 discuss and provide maps of MBS Sites (Figures 4.2.4-1, 4.2.4-2, 4.2.4-5, 4.3.4-1, and 4.3.4-2) to provide clarity on the location and extent. FEIS Sections 5.2.4 and 5.3.4 include information about the impacts to MBS sites and native plant communities. The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3).

Minnesota Rules, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. FEIS Sections 3.2.2 and 5.2.4 describe mine reclamation activities that would be completed as part of the NorthMet Project Proposed Action, some of

which may allow such MBS sites to re-establish. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.

There are no SNAs or RNAs located on the Mine Site, Transportation and Utility Corridor, or Plant Site.

Theme VEG 03

Theme Statement

A large expanse of high-quality mature forest, peatland, floodplain, wetland, and other habitat would be removed, impacted, or fragmented and its biodiversity role could never be successfully restored on site or elsewhere. These effects will be exacerbated by climate change, especially for vulnerable species. The FEIS should assess costs of replacing these lost functions. Potential effects of the removal of this forest—especially in the context of the Forest Plan—should be assessed in more detail, including effects on timber management/harvest.

Thematic Response

The FEIS vegetation sections include discussion of the NorthMet Project Proposed Action's effects on habitat types. In addition, FEIS Sections 5.2.4 and 5.3.4 also discuss the Forest Plan as it relates to timber management. As described in FEIS Section 4.2.4.2.1 timber-harvesting activities have occurred across the upland forest areas of the Mine Site for the last 20-60 years. The oldest forest areas at the Mine Site include 40 to 80-year-old trees.

The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). *Minnesota Rules*, part 6132.2700 does require that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.

FEIS Section 5.2.3 discusses the wetland types that would be restored on- and off-site as mitigation for effects from the NorthMet Project Proposed Action. These types include forested and shrub swamps, coniferous bogs, etc. The responses to themes WET 05 and WET 14 also discuss effects to wetlands/peatlands, loss of wetland functions, and mitigation for wetland effects.

Theme VEG 04

Theme Statement

The FEIS should more accurately describe wild rice waters. The FEIS should also evaluate effects on wild rice stands (especially from water pollution due to sulfides, sulfates, acid mine drainage, asbestos, arsenic, mercury, iron, copper sulfate, sulfur, sulfuric acid, and hydrogen sulfide as converted by bacteria) downstream of the Project, along with techniques to benefit wild rice. Considering the traditional importance of wild rice and its use for food, adopting a sediment porewater sulfide standard to replace, complement, or work in conjunction with a sulfate standard should be considered. Areas of concern include the One Hundred Mile Swamp and the Embarrass, Partridge, and St. Louis rivers. The FEIS should also clarify access to rice beds on the federal and non-federal lands.

Thematic Response

FEIS Sections 5.2.2 and 5.2.4 includes a description of the NorthMet Project Proposed Action's effects on wild rice beds. The response to themes WR 152, WR 156, and WR 157 discuss wild rice beds and the sulfate standard for wild rice beds. Evaluation of a sediment porewater sulfide standard is outside the scope of this analysis. FEIS Section 5.2.2 states that for MPCA-previously recommended water used for production of wild rice, the proposed engineering controls would prevent an increase in sulfate concentrations in the Partridge River and would decrease sulfate concentrations in the Embarrass River. The area known as the One Hundred Mile Swamp is not known to support wild rice, and it is not identified as a draft MPCA staff-recommended water used for production of wild rice. Locations of and access to wild rice beds on the federal and non-federal lands are discussed in the FEIS vegetation sections. The Land Exchange would result in an increase in wild rice beds within the federal estate, the FEIS contains additional details about existing public access to Tract 1 wild rice beds via the Pike River. Overall, there would be no increase in wild rice harvest opportunities for the public.

Theme VEG 05

Theme Statement

The reclamation plan should:

- Outline clear re-vegetation goals and timelines;
- Describe woody species control on reclaimed stockpiles;
- Not allow the planting of non-native or invasive plant species;
- Include a noxious weed prevention program;
- Describe soil requirements (pH, fertility, microbial biota, ratios of sand/silt/clay, and nutrient cycles, such as for nitrogen and organic matter); and
- Discuss topsoil management based on soil characterization.

Thematic Response

The FEIS vegetation sections include new details from the updated Reclamation Plan. In particular, invasive species would not be permitted in the seed mix. Some non-native species (e.g., oats, winter wheat) that are commonly used in the state seed mixes to temporarily stabilize soils in order to reduce erosion or dust potential could be planted. The species to be used for reclamation would be finalized during permitting. FEIS Section 3.2.2.1.10 describes how the NorthMet Project area facilities would be operated to allow for progressive reclamation during operations.

After mining ceases, PolyMet would finish reclamation activities under the Reclamation Plan, which is a required portion of the Permit to Mine. *Minnesota Rules*, part 6132.2700 states that the establishment of vegetation shall begin during the first normal planting period after site features are determined by the Permit to Mine to be no longer scheduled to be disturbed. Reclaimed areas would be monitored and maintained as needed in the Spring and Fall or as required under the Permit to Mine. Areas damaged by erosion or that lost vegetation would be identified, and plans to repair or reseed would be developed and implemented. Long-term maintenance of the only remaining stockpile during closure (i.e., Category 1 Stockpile) would also include removal of deep-rooted woody species and trees from the cover system, according to the Adaptive Water Management Plan (PolyMet 2015d, as cited in the FEIS). Soil testing to evaluate appropriate fertilizer needs would be completed as available. FEIS Section 3.2.2.1.7 explains that topsoil or overburden would be separated into three types, including unsaturated overburden, saturated overburden, and peat, which is also described in the Rock and Overburden Management Plan. FEIS Section 3.2.2.1.10 further explains that on-site unsaturated overburden and peat would be used as topsoil for the Category 1 Stockpile cover system, while saturated overburden would be used for specific on-site construction applications as approved by MDNR or placed in the combined East Central Pit.

Theme VEG 06

Theme Statement

The FEIS should evaluate and more thoroughly model:

- Pollution (in the form of harmful substances, toxins, leachates, acid mine drainage, heavy metals, manganese, copper, aluminum, aluminum oxide, lead, asbestos, arsenic, dust, sulfates, sulfides, sulfuric acid, mercury, etc.);
- Poor water quality (including from reverse osmosis [RO] effects or due to pH levels) that will impact vegetation in the Project area; and
- Areas of concern including the Arrowhead Region, Lake Superior, the BWCAW, and the St. Louis, Embarrass, and Partridge rivers. The FEIS should provide a more detailed rationale for why effects on these areas are not considered significant, and should more thoroughly discuss the potential effects from bioaccumulation of pollutants within the food web.

Thematic Response

FEIS Sections 5.2.2 and 5.2.7 evaluate water and air modeling results (respectively), and these evaluations inform the analysis of potential effects from harmful pollutants or poor water quality on vegetation species and areas of concern. FEIS Section 5.2.2 states that the NorthMet Project Proposed Action has the potential to affect surface or groundwater hydrology and quality within the Partridge River and Embarrass River watersheds. These watersheds are part of the St. Louis River and Lake Superior watersheds, but are not part of the Hudson Bay basin, and would not affect the BWCAW. As described in FEIS Section 5.2.6, the NorthMet Project Proposed Action is estimated to result in a net decrease in mercury loadings to the Partridge River, but a net increase to the Embarrass River. The responses to theme AIR 04 and AIR 09 discuss the assessment of potentially reactive dust, and the Secondary National Ambient Air Quality Standards that would be protective of vegetation. The response to theme MERC 02 provides additional more information about how mercury bioaccumulation was estimated.

Theme VEG 07

Theme Statement

The analysis of indirect effects to plant species should be expanded (to include dust and other air pollutants such as sulfur dioxide, nitrogen oxide, and greenhouse gases; hydrologic changes; habitat fragmentation; microclimate; loss of fungal associates; erosion; and exotic species). The analysis should vary by each species and location.

Thematic Response

FEIS Section 5.2.4.2 includes an analysis of potential indirect effects to plant species, using available and updated air, water, and wetland modeling results. Potential foreseeable indirect effects analyzed include dust, hydrology effects, and exotic species. PolyMet proposes to implement various dust-control measures such as stabilizing disturbed soils by temporarily establishing vegetation and water spraying during dry periods (consistent with *Minnesota Rules*, part 6132.2800). As FEIS Section 5.2.7 further describes, fugitive dust control measures would result in 90 percent control at the Mine Site. FEIS Section 5.2.3 explains that vegetation located within zones with a high likelihood of hydrology effects would be more likely to have community changes than those with no or low likelihood of effect. FEIS Section 5.2.4.2.1 describes reclamation objectives, including rapidly establishing a self-sustaining plant community, controlling air emissions, controlling soil erosion, providing wildlife habitat, and minimizing the need for maintenance. The reclamation seeding mix would be determined during permitting, and MDNR would not allow the planting of invasive species.

Theme VEG 08

Theme Statement

The cumulative effects analysis for vegetation:

- Uses an unclear assessment area, data, and approach (past, present, and future);
- Should be expanded to discuss effects to treaty-protected (and state-listed) vegetation resources and access to them;

- Should evaluate the statewide status of each species and how effects on one population would cumulatively affect other populations;
- Should discuss the cumulative effects on resources (wetlands, wildlife, vegetation) and include Sites of Biodiversity Significance, native plant communities, threatened and endangered plant species, and invasive species; and
- Should clarify lack of effects or lack of data.

Thematic Response

The FEIS vegetation sections include an analysis of cumulative effects to vegetation species, treaty-protected resources, MBS sites, and native plant communities. The FEIS uses MDNR Natural Heritage Information System (NHIS) data to analyze the statewide status of each species. FEIS Table 6.2.4-3 (formerly Table 6.2-15 in the SDEIS) summarizes the percentage of statewide populations affected. The NHIS data also clarifies whether there is a lack of data in the cumulative project footprints or an absence of species in surveys conducted on-site. The FEIS has been updated to include the new state ETSC status listings from August 19, 2013, as well as any new federal status listing changes to assess effects to species in the cumulative analysis.

Theme VEG 09

Theme Statement

The FEIS should further describe, define, and explain baseline data on vegetation community types, invasive species, biodiversity, and relative abundance, including monitoring plans. The FEIS should also provide a correlation between Management Indicator Habitat types and Regional Foresters Sensitive Species (RFSS) abundance, along with overall justification for the data used in this analysis.

Thematic Response

FEIS Sections 4.2.4 and 4.3.4 include a discussion of baseline data on vegetation community types, invasive species, biodiversity, and relative abundance. PolyMet and agency documents have also been reviewed for new information. Detailed surveys for Regional Forester Sensitive Species (RFSS) have not been conducted; thus, FEIS Table 4.2.4-5 uses a correlation between RFSS preferred habitat types (Management Indicator Habitat [MIH]) and species abundance.

Theme VEG 10

Theme Statement

The risks to biodiversity and vegetation, and the loss of pristine ecosystems are too great to proceed with the Project as proposed.

Thematic Response

This comment has been received and acknowledged by the Co-lead agencies.

A.5.21 Issue: Wetlands (WET)

Theme WET 01

Theme Statement

The plan for indirect mitigation is inadequate. The SDEIS did not provide upfront mitigation for indirect impacts which should be mitigated upfront. The language on indirect impacts is too vague and does not provide enough assurance that mitigation for indirect impacts would actually occur.

Thematic Response

FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects for the six factors. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for factor 6 (change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations). The identification of specific mitigation for indirect effects and a monitoring plan is not a requirement for an EIS; however, the FEIS has been updated with additional information on the approach for determining mitigation if the monitoring shows indirect effects are occurring. The monitoring and mitigation for potential indirect effects would be determined during permitting. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting. Please refer to the response to theme FIN 11 for more information on financial assurance.

Theme WET 02

Theme Statement

The USACE has not yet developed a monitoring plan to assess after-the-fact Project indirect impacts to wetlands, but maintains that will be the way to best determine and mitigate indirect wetland impacts. The monitoring plan for indirect impacts should include the following and should be addressed in the FEIS:

- monitoring in all potential indirect impact categories;
- how would the monitoring be performed, including who would perform the monitoring and what is the criteria;
- decision framework as well as the criteria and process for determining when and what additional mitigation would be needed;
- specify the type, location, and compensation ratios that would be required if monitoring determines indirect impacts are occurring; and
- what the adaptive management practices entail.

Thematic Response

FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. FEIS Section 5.2.3 provides these quantitative values of potential indirect wetland effects for the six factors. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1) wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for factor 6 (change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations). The identification of specific mitigation for indirect effects and a monitoring plan is not a requirement for an EIS; however, the FEIS has been updated with additional information on the approach for determining mitigation if the monitoring shows indirect effects are occurring. The monitoring and mitigation for potential indirect effects would be determined during permitting. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation, and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore,

this information could change during permitting. Please refer to the response to theme FIN 11 for more information on financial assurance.

Theme WET 03

Theme Statement

The mitigation for direct impacts is inappropriately sited and would not replace functions within the impacted watershed. In addition, the mitigation sites are too far from the area impacted. The proposed mitigation:

- is outside of the watershed and therefore the type and function of the wetlands will not help water quantity and quality within this watershed;
- is outside of the Ceded Territory;
- is not based on a watershed approach;
- should establish a better plan for replacing wetlands on-site; and
- should consider a larger number of smaller wetlands in the direct area, and should not be dismissed solely on whether the company deems it economically feasible to do so if those mitigations make more sense environmentally.

Thematic Response

FEIS Section 5.2.3.3.2 includes a discussion on the wetland mitigation study limits and the site selection process. The NorthMet Project Proposed Action would be located within the St. Louis River Watershed (#3) (8-digit HUC) within the Great Lakes Basin (4-digit HUC). The Zim Site is located within the same watershed as the NorthMet Project Proposed Action; however, the Aitkin and Hinckley sites are located within the Mississippi River Basin (4-digit HUC) and 8-digit HUC watersheds of Elk-Nokasippi #10 and Snake River #36, respectively. In accordance with the 2008 Federal Mitigation Rule, USACE policy, and overall requirements of the CWA, the primary focus of compensatory mitigation is to replace lost wetland functions within the same watershed as the impact site—in this case, the St. Louis River Watershed/Great Lakes Basin. The compensatory wetland mitigation site selection for the NorthMet Project Proposed Action began in 2005 and has gone through a rigorous site selection evaluation. Prior to the 2008 Federal Mitigation Rule, the Aitkin and Hinckley sites were selected, initial approvals by the USACE were received, and substantial investments were made by PolyMet to develop both sites for compensatory mitigation. The USACE guidance prior to the implementation of the 2008 Federal Mitigation Rule was to look for mitigation sites that could provide the following: restoration of historical wetlands, high probability of success, achievement of at least partial in-kind mitigation, and sites that had ditched and/or tiled peatlands to provide for restoration. When the 2008 Federal Mitigation Rule went into effect, the USACE informed PolyMet of the priority for siting any future compensatory mitigation within the St. Louis River/ Great Lakes Basin. The Zim Site was subsequently proposed as a third site. The Proponent, along with, in some cases, state and federal agencies, have conducted and are continuing to conduct extensive efforts to find additional suitable sites within in the Great Lakes Basin for wetland mitigation.

The 2008 Federal Mitigation Rule and 2009 USACE St. Paul District Policy (USACE 2009, as cited in the FEIS) specifies a preferential sequence for compensatory mitigation (i.e., use of

mitigation banking credits, use of project-specific compensation that is based on a watershed approach, use of project-specific compensation that is on-site and in-kind, and use of project-specific compensation that is off-site and/or out-of-kind), and aims to select mitigation sites as close as possible to the watershed of impact; however, sometimes this cannot be accomplished. The 2009 USACE St. Paul District Policy (USACE 2009, as cited in the FEIS) accepts out-of-watershed mitigation; however, the USACE's preference is for the mitigation to be within the same watershed as a proposed project. The term "watershed approach" is defined in 33 CFR § 332.2 as "an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a waters. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs…"

Additionally, as described in FEIS Section 5.2.3.3.2, the wetland mitigation planning process relied on the WCA wetland replacement siting rules (*Minnesota Rules*, part 8420.0522), state compensatory mitigation requirements under state water quality standards (*Minnesota Rules*, part 7050.0186), and the federal requirements which are discussed above. Additionally, the NorthMet project considered *Minnesota Rules*, part 7050.0186, which requires compensatory mitigation to be sufficient to ensure replacement of the diminished or lost designated uses of the wetland system that was impacted. In addition, to the extent practicable, the same types of wetlands affected are to be replaced in the same watershed, before or concurrent with the actual alteration of the wetland. The WCA rule also states that wetlands in counties where 80 percent or more of pre-settlement wetlands currently exist (which includes wetlands in St. Louis County), the minimum replacement ratio requirements are as determined by the mitigation location and type ranging from 1:1 to 2.5:1. Moreover, *Minnesota Rules*, part 8420.0522 indicates the replacement standards for wetlands as regulated under the WCA.

The compensatory mitigation approach by PolyMet followed the St. Paul District Policy in effect at the time the proposed compensation sites were selected, as well as WCA siting rules. Further, the Zim Site was developed in accordance with a watershed approach. In combination, the proposed compensatory mitigation is appropriate for the siting and scale of the effects that would result from the NorthMet Project Proposed Action. As noted above for the project-specific compensation, the following compensatory mitigation siting sequence is required: on-site, in the same 10-digit HUC watershed, in same 8-digit HUC watershed, in same modified 6-digit watershed, in same 4-digit HUC watershed, then statewide.

Initially, no practicable compensation sites were found in the St. Louis River Watershed, but subsequently, the Zim Site was found and incorporated as part of the compensatory mitigation plan. The 2008 Federal Mitigation Rule and 2009 USACE St. Paul District Policy (USACE 2009, as cited in the FEIS) are watershed based, they do not require wetland mitigation sites to stay within the 1854 Ceded Territory; however, the Zim Site is located within the St. Louis Watershed and the 1854 Ceded Territory. The permanent functional loss of wetlands within the St. Louis River Watershed/Great Lakes Basin would be considered by the USACE in its DA permit decision and has been accounted for in the proposed mitigation credits by PolyMet.

The proposed wetland restoration and enhancement performance criteria place a strong emphasis on ensuring that the proposed mitigation strategy provides for the adequate replacement of lost functions. For purposes of compensatory mitigation, the focus is on functions. The 2008 Federal Mitigation Rule specifically eliminated use of the term "values." An abbreviated MnRAM functional assessment, which was agreed upon by the USACE, was utilized to assess wetland

functions for the Mine Site, Transportation and Utility Corridor, and Plant Site. Both the USACE and MDNR require functions to be replaced; however, both agencies use a set of defined ratio requirements to determine the number of acres required to replace functions lost, as there is currently no suitable quantitative functional assessment method in Minnesota. Based on the findings and where impacts occur (e.g., types of wetlands), the mitigation ratios and credits have been increased to take into account the functions lost due to the NorthMet Project Proposed Action. For example, additional compensatory mitigation (i.e., a higher replacement ratio) is proposed to offset loss of bog wetlands, a difficult-to-replace wetland type. All of the wetland mitigation proposed would be restoration with a minimal component of wetland preservation; no creation of wetlands would be part of the off-site mitigation. Furthermore, as previously noted, the mitigation sites would need to meet performance standards in order to be considered successful.

While on-site replacement of wetlands is listed first in the sequencing, on-site conditions may not be the most suitable for successful wetland mitigation. In fact, 33 CFR § 332.3(b) states that compensatory mitigation should be located where it is most likely to successfully replace lost functions and services within the watershed, not specifically on-site. Moreover, the preferred mitigation methodology stated under the 2008 Federal Mitigation Rule begins with the utilization of mitigation banks and in-lieu fee programs within appropriate service areas prior to permittee-responsible mitigation (33 CFR § 332.3(b)(2)-(3)). Following the use of mitigation banks and in-lieu fee programs, the 2008 Federal Mitigation Rule clearly states that permittee-responsible mitigation following a watershed approach (i.e., providing for mitigation in the best suitable location within the proposed impact watershed) should be used (33 CFR § 332.3(b)(4)). Only after mitigation banks, in-lieu fee programs, and permittee-responsible mitigation under a watershed approach have been exhausted or are infeasible should permittee-responsible mitigation through on-site and in-kind mitigation be considered (33 CFR § 332.3(b)(5). Prior to considering permittee-responsible mitigation, PolyMet investigated the potential to purchase wetland mitigation bank credits and/or use an in-lieu fee program; however, as stated in FEIS Section 5.2.3.3.2 of FEIS, there were insufficient credits available to satisfy the mitigation requirements of the NorthMet Project Proposed Action and no in-lieu fee programs are available in Minnesota.

PolyMet considered on-site mitigation first and there is the potential to provide 101.8 acres of wetland restoration on-site during reclamation. The post-closure establishment of the estimated 101.8 acres of on-site wetland is not included in the wetland mitigation credits. The generation of wetland credits from these areas has the potential to be used on a contingency basis, but compensatory credit would not be considered up front due to the post-closure timeframe. The summary of proposed wetland mitigation credits, presented in FEIS Table 5.2.3-17, does not include the on-site wetland restoration.

FEIS Section 5.2.3.3.2 under the off-site mitigation discussion states that mitigation sites were considered for areas meeting all of the required mitigation criteria with at least 100 contiguous acres. That analysis was limited to sites with more than 100 acres of wetland mitigation potential due to anticipated difficulties in planning numerous, small wetland mitigation projects, and the desire to identify opportunities that were feasible. In addition, the NorthMet Project Proposed Action represented an opportunity to restore large wetland systems and provide greater public and ecological benefits than typically available with smaller projects. In addition, smaller mitigation wetlands have a higher likelihood of failure whereas wetlands that are larger in size

are more likely to succeed and become self-sustaining. Financial assurance is a key component to compensatory mitigation. Please refer to the response to theme FIN 11 for more information on financial assurance. In addition, when considering potential mitigation location and methodologies, cost is an important factor, although it should not be given greater weight than other factors. However, if in order to establish a successful wetland mitigation area at a site is financially exorbitant as opposed to other similar areas which are more economically feasible, the more economically feasible location is acceptable if all other considerations are equal (e.g., habitat, potential future land uses, environmental suitability, etc.).

Proposed mitigation sites were selected based on availability and the high likelihood of meeting performance criteria. Locations for wetland mitigation projects were evaluated based on a four-tiered priority and are described in detail in FEIS Section 5.2.3.3.2:

- On-site;
- Off-site in the in St. Louis River Watershed (same 8-digit HUC);
- Off-site in the Great Lakes Basin (same 4-digit HUC); and
- Off-site in an adjacent 4-digit HUC, selecting an 8-digit HUC as close as possible to the impacted site.

In summary, on-site establishment of wetlands was considered first. There is the potential to provide 101.8 acres of restoration on-site during reclamation. An initial mitigation study investigation of off-site compensatory mitigation opportunities focused on available areas containing greater than 80 percent of their historic wetland resources as defined by the WCA. That area was selected as the initial study area to comprehensively cover the priority mitigation areas. Available mitigation banking credits that were available for purchase by PolyMet were evaluated in portions of bank service areas and found to be insufficient to satisfy the compensatory mitigation requirements. Subsequently, a GIS analysis was performed to identify potential wetland mitigation sites within the defined study area. PolyMet's primary goal of the analysis was to identify large, potentially drained wetlands located primarily on private or tax-forfeit land within the study area to provide preliminary data for more detailed ground investigations to proceed. To achieve the goal of the mitigation plan, which is to replace lost wetland functions using compensatory wetland types in-kind to the degree practicable, areas where drained wetlands could be restored were preferable over areas where wetlands could be created. The analysis was limited to sites with more than 100 acres of wetland mitigation potential due to the anticipated difficulties in planning numerous, small wetland mitigation projects, and the desire to identify opportunities that were feasible. In addition, the NorthMet Project Proposed Action represented an opportunity to restore large wetland systems and provide greater public and ecological benefit than typically available with smaller projects. The wetland mitigation investigation identified three off-site areas that would provide a total of 1,602.7 acres of wetland compensation and 197.1 acres of upland buffer. Please refer to FEIS Section 5.2.3.3.2 for more information on the mitigation site selection.

For those sites that were feasible, PolyMet has obtained rights to the land and mitigation plans were developed. While the two of the three mitigation sites are located outside the watershed (see FEIS Figure 5.2.3-30), PolyMet has sought out sites that would restore high functioning wetlands. PolyMet has plans, or obtained the rights, to develop three mitigation sites which would provide approximately 1,513.3 wetland mitigation credits off-site.

Theme WET 04

Theme Statement

The mitigation plan and measures are inadequate and the ratios for direct compensatory mitigation should be higher. The FEIS should provide a status update on the development of the final wetland mitigation credits (including type, location, acreages). The FEIS should discuss:

- use of a mitigation ratio of more than 2:1;
- mitigation ratio of a minimum of 2:1 and not reduced below this for the loss of high quality wetlands and difficult to replace forested and bog wetland plant communities;
- since no wetland bank is being developed by PolyMet, no excess wetland mitigation credits would be available. Permittee responsible mitigation sites do not generate credits;
- SDEIS suggests that PolyMet will have to replace only 27 acres that suffer this loss;
- wetlands destroyed will not be replaced in-kind;
- mitigation projects assume that permitting agencies will allow restoration and preservation credit for restoring and protecting coniferous bog and swamp that are already functioning as wetland communities;
- how the new wetlands are established;
- if there is a contingency plan if mitigation fails; and
- restoration should have already occurred.

Thematic Response

The FEIS includes the proposed direct compensatory mitigation credits and ratios for the NorthMet Project Proposed Action (see Tables 5.2.3-17, 5.2.3-18, and 5.2.3-19) which are based on the federal guidance policies and state replacement ratio rules. Currently, neither the USACE St. Paul District, nor the State of Minnesota has made a final determination of the compensation ratios required to offset the direct impacts of the NorthMet Project Proposed Action. The final decision on compensatory mitigation ratios for direct wetland impacts would be determined during permitting.

FEIS Section 5.2.3.3.2 discusses how the 2009 USACE St. Paul District Policy (USACE 2009, as cited in the FEIS) and the state policy for base compensation ratios could be applied for the NorthMet Project Proposed Action. As noted, the base compensation ratio for high-quality, difficult-to-replace bog and forested wetlands would be increased from 1.5:1 to 2:1 while the base compensation ratio for low- to moderate-quality wetlands would be set at 1.5:1 (USACE 2013, as cited in the FEIS). The 2009 USACE St. Paul District Policy (USACE 2009, as cited in the FEIS) allows for in-kind, in-place, and in-advance incentives to reduce the recommended base ratios and these would be considered at the time of permitting. The final decision on compensatory mitigation ratios will be determined at the time of the CWA Section 404 permit decision based on current District guidance.

Minnesota Rules, part 7050.0186 requires compensatory mitigation to be sufficient to ensure replacement of the diminished or lost designated uses of the wetland that was physically altered. Based on the WCA wetland replacement standards (*Minnesota Rules*, part 8420.0522, subpart 4),

the required replacement ratio would be either 1:1 or 1.5:1. For those wetlands that are replaced in the watershed with the same wetland type, a majority of which are in-kind, the base replacement ratio that would likely be required is 1:1 and for those wetlands that are replaced outside of the watershed, the ratio would be increased to 1.5:1. The final decision on replacement ratios will be determined at the time of the permit decision.

The NorthMet Project Proposed Action is estimated to directly impact 913.8 acres. Depending on the location, type, and timing of compensatory mitigation, the minimum required amount of replacement wetlands for direct impacts, based upon USEPA recommendations, could potentially range from 913.8 acres up to 1,827.6 acres (i.e., 1:1 up to 2:1 compensation ratios). The USACE has concluded that the mitigation sites selected and the wetland credits generated at the three mitigation sites would be acceptable for use in compensating for direct wetland losses. The USACE has not made a final decision on the mitigation ratios that would be required to compensate for direct wetland impacts; if fully successful, it is likely these three mitigation sites would generate sufficient credits to compensate for the 940 acres of direct and fragmented wetland impacts. In the event that not all of the credits generated by these sites are utilized to compensate for direct wetland impacts, any excess credits could be used to compensate for indirect losses (USACE 2015a, as cited in the FEIS). The current proposed mitigation presented in the FEIS shows that PolyMet could have an excess of mitigation credits from the three mitigation sites if the mitigation sites are successful and meet the performance standards. However, it is understood that mitigation sites sometimes are not fully successful and contingency plans (discussed below) would be developed for the NorthMet Project Proposed Action and approved during permitting. If the wetland monitoring identifies indirect effects and compensatory mitigation is required, the excess mitigation may be allowed to be used for the indirect effects. In the event that additional wetland mitigation is required for direct impacts, it would be consistent with current USACE guidelines which include a watershed approach. The USACE encourages the development of mitigation for foreseeable indirect effects. PolyMet is exploring mitigation options for indirect effects. The FEIS has been updated to note that the excess credits could be used for indirect effects if the monitoring shows mitigation is required. The three mitigation sites are not being developed under the federal banking process.

The majority of the credits proposed by PolyMet would be in-kind mitigation and nearly one-third of the credits would be from within the NorthMet Project area watershed (see Tables 5.2.3-17, 5.2.3-18, 5.2.3-19). Based on PolyMet's current mitigation proposal and assuming the mitigation efforts are fully successful and target communities are established, 83 percent of the impacts to coniferous bogs would be mitigated by in-kind and in-place credits, or 439.9 coniferous bog credits; the remaining 17 percent would be replaced out-of-kind. Out-of-kind credits would be used to mitigate for impacts on wet meadow, shallow marsh, deep marsh, open bog, and coniferous bog communities; these would not be replaced in-kind because of hydrological and ecological constraints at the proposed mitigation sites. Forty seven percent of the wetland impacts are proposed to be replaced in-kind, in-place, and before the impacts occur on-site. An additional 29 percent of the proposed impacts are proposed to be replaced in-kind and before the impacts occur. Most of the additional mitigation credits that are proposed outside of the watershed would fulfill mitigation requirements above the minimum 1:1 ratio. The proposed wetland impact, avoidance, minimization, mitigation, and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.

With restoration, some functions are replaced quickly such as flood storage, water quality benefits, vegetation filter, water flow, pollutants binding with the soil, vegetation absorbing contaminants in the water column, etc. While wildlife habitat replacement would be a long-term benefit from restoration, some short-term benefits for certain species such as mallards, etc. would be provision of cover and nesting areas. Performance standards have been developed and incorporated into the mitigation plan for the three sites to guide the restoration activities and to monitor whether the vegetation and hydrology are meeting the design goals. Restoration activities at the mitigation sites have not commenced yet and would not be initiated until appropriate approvals and permits have been obtained. The state and federal agencies have not yet made a determination on the drainage status of the mitigation sites (i.e., drained, partially drained, etc.); this determination, including credit ratios, would be made during permitting. PolyMet plans to complete initial phases of restoration on all of the proposed off-site wetland mitigation at least one full growing season prior to the occurrence of the wetland impacts for which the mitigation would compensate.

FEIS Section 5.2.3.3.3 has been updated with additional information on the monitoring plan for the mitigation sites and the contingencies for unsuccessful mitigation. In addition, the FEIS Sections 5.2.3.3.2 and 5.2.3.3.4 have been updated with additional details on how the mitigation sites would be developed and monitored.

Theme WET 05

Theme Statement

Compensatory mitigation sites should replace lost wetland functions including:

- replace wetlands of the same caliber (quality, functions and values) and support the same complexity and biodiversity of species;
- address the loss of peat lands and that the formation takes decades;
- address that restoration of coniferous bogs is very difficult and a long process, and has a low success rate;
- should not displace other sensitive habitat;
- provide for in-kind for coniferous bogs; and
- address the loss of carbon and methane storage capacity.

Thematic Response

As described in FEIS Section 5.2.3.3.2, the planning process utilized the wetland replacement standards of the Minnesota Wetlands Conservation Act (*Minnesota Rules*, part 8420.0522), the compensatory mitigation requirements under the state water quality standards (*Minnesota Rules*, part 7050.0186), and the 2009 USACE Saint Paul District Policy. When developing the proposed compensatory mitigation strategy, the primary goal was to restore high-quality wetland communities with the same habitat type, quality, and functions as those areas likely to be impacted by the NorthMet Project Proposed Action. The proposed wetland restoration and enhancement performance criteria place a strong emphasis on ensuring that the proposed mitigation strategy provides for the adequate replacement of lost functions. In addition, it is

standard procedure to complete a baseline study of reference wetland habitats which is then often used to aid in the development of mitigation wetlands to restore native habitats. In order to enhance and preserve the integrity of the habitats created as part of the proposed compensatory mitigation, during the design phase of the wetland mitigation, a planting plan and vegetation performance criteria would be developed which would ensure vegetative species richness and diversity based on the results of a baseline study of reference wetland habitats. Mitigation plans for the three sites have been developed and submitted to the appropriate agencies for review and approval as part of the permitting process.

Wetland functions are defined as what the wetland actually does (e.g., detain floodwaters, provide habitat, and assimilate nutrients) and these functions can be measured (e.g., acre-feet of floodwater storage, plant species richness, rate of sediment deposition, uptake of phosphorus in pounds/acre/year).Values are human perceptions, which vary from individual to individual. For purposes of compensatory mitigation, the focus is on functions and the 2008 Federal Mitigation Rule specifically eliminated use of the term "values." An abbreviated MnRAM functional assessment, which was agreed upon by the USACE, was utilized to assess wetland functions for the Mine Site, Transportation and Utility Corridor, and Plant Site. Both the USACE and MDNR require functions to be replaced; however, both agencies use a set of defined ratio requirements to determine the number of acres required to replace functions lost, as there is currently no suitable quantitative functional assessment method in Minnesota. Based on the findings and where impacts occur (e.g., types of wetlands), the mitigation ratios and credits have been increased to take into account the functions lost due to the NorthMet Project Proposed Action. For example, additional compensatory mitigation (i.e., a higher replacement ratio) is proposed to offset loss of bog wetlands, a difficult-to-replace wetland type. All of the wetland mitigation proposed would be restoration with a minimal component of wetland preservation; no creation of wetlands would be part of the off-site mitigation.

The NorthMet Project Proposed Action would impact approximately 537.6 acres of bog habitat (approximately 530.0 acres of coniferous bog and approximately 7.6 acres of open bog). However, based on PolyMet's proposal, the proposed compensatory mitigation would restore approximately 439.9 acres of coniferous bog communities in-kind. Loss of coniferous bog and open bog communities would be offset at a mitigation ratio of 1.58:1 and 2:1, respectively (i.e., 1.58 credits and 2.0 credits to offset each acre lost) resulting in 840.0 credits to offset the loss of coniferous bog and 15.3 credits to offset the loss of open bog. The proposed mitigation proposes to restore previously impacted bog habitat as opposed to other methods of compensatory mitigation, namely creation. As such, the probability of the restored bog to become self-sustainable and successful is greatly increased. Bogs are difficult ecosystems to restore given their special biochemical and geophysical requirements combined with their long development periods to maturity. However, major advances in restoration methodologies have increased the success rate of restoring these habitats. Performance standards have been proposed by PolyMet and the necessary performance standards would be approved during permitting for the mitigation sites to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals.

Eilling and Knighton (1984) noted that one of the major factors inhibiting the successful restoration of bogs was the inability of previously impacted bogs to support recolonization by bog plants. Schouwenaars (1988a, 1988b, and 1993) has documented that insufficient hydrology is typically the one of the main reasons why bog restorations fail. Lastly, the successful

reintroduction of sphagnum moss (*Sphagnum* spp.) has been shown to be critical to long-term sustainability and viability for restorations of bog habitats (Clymo 1984, Trettin et al. 1996, and Schouwenaars 1988a). As such, during the design phase, methodologies to restore the bog habitats focus on ensuring that the site has suitable organic soils; restoration of sufficient groundwater hydrologic inputs and retention of available surface water; and re-establishment of sufficient *Sphagnum* spp. cover densities. More specifically, Schouwenaars (1993) was able to show that deep drainage systems (e.g., tile drains, ditching, and similar methodologies) may have increased the downward seepage. As such, blocking relic drainage structures is the first step to rewetting bogs and further interventions may be required to ensure bog plant diaspores are provided optimal growing conditions (Trettin et al. 1996).

For the Zim Site, which includes bog restoration, the interior ditches would be filled, raised berms would be leveled and drain tiles would be disabled to restore wetland hydrology. Native, harvested bog material would be spread throughout the site to facilitate the re-introduction of sphagnum mosses and other bog species that cannot be easily re-introduced by seed. Damming and/or filling the drainage ditches and breaching the tile drains is likely to contribute a considerable amount of groundwater within the 15-inch critical saturation zone for *Sphagnum* spp. regeneration (Schouwenaars 1988a). Additionally, the combination of inward and external water control measures would be considered in order to increase the available water storage capacity near the surface to limit fluctuations in water level (i.e., inward controls) and to decrease downward hydrologic losses to maintain a higher water table (i.e., external).

The successful reintroduction of *Sphagnum* spp. to the restored bogs has been included in the design criteria. Clymo (1984) observed that the reintroduction of *Sphagnum* spp. was critical since those species were responsible for specific conditions found in bogs. As such, the design of the restored bogs would include methodologies which have been shown to successfully reintroduce *Sphagnum* spp. such as those presented by Trettin et al. (1996) which include the collection of live *Sphagnum* spp. specimens from reference habitats to seed the restoration site by spreading the live specimens on sufficiently prepared substrates combined with suitable designed microtopography and the application of natural ground cover (e.g., weed-free straw). The use of live specimens to seed restored bogs resulted in no observed negative impacts to the collection habitat and resulted in the reestablishment of *Sphagnum* spp. populations within a few months (Trettin et al. 1996). Moreover, the application of phosphorus-rich nutrients, including fertilizers, has been shown to benefit bog mosses and improve the success of bog restorations (Sottocornola et al. 2007). As described in FEIS Section 5.2.3.3.2, vegetation and hydrology would be managed and monitored to ensure the performance standards of the restored bogs are successfully met.

The proposed compensatory mitigation sites include three off-site locations that are active sod farms and/or under agricultural production, and have been previously impacted via drainage structures, land manipulation, and other common anthropogenic sources typically associated with agricultural production. Therefore, there is little concern that sensitive habitats would be displaced as a result of the proposed mitigation sites. However, in order to ensure that other sensitive ecological receptors, such as threatened or endangered species and rare habitat communities, are not unintentionally adversely affected as a result of the proposed compensatory wetland mitigation, the proposed mitigation sites have been evaluated for the potential presence of and impact to existing sensitive habitats. A Biological Assessment (Appendix D of the FEIS)

has been prepared for the NorthMet Project Proposed Action which includes the three mitigation sites.

The majority of the credits proposed by PolyMet would be in-kind mitigation and nearly one-third of the credits would be from within the NorthMet Project area watershed (see Tables 5.23-17, 5.2.3-18, 5.2.3-19). Eighty-three percent of the impacts to coniferous bogs would be mitigated by in-kind and in-place credits, or 439.9 coniferous bog credits; the remaining 17 percent would be replaced out-of-kind. Out-of-kind credits would be used to mitigate for impacts on wet meadow, shallow marsh, deep marsh, open bog, and coniferous bog communities; these would not be replaced in-kind because of hydrological and ecological constraints at the proposed mitigation sites. Forty seven percent of the wetland impacts are proposed to be replaced in-kind, in-place, and before the impacts occur on-site. An additional 29 percent of the proposed impacts are proposed to be replaced in-kind and before the impacts occur on-site. Most of the additional mitigation credits that are proposed outside of the watershed would fulfill mitigation requirements above the minimum 1:1 ratio.

The NorthMet Project Proposed Action would result in a loss of carbon and methane storage capacity as a result of impacts to wetland resources. Established and functioning wetlands often serve as a carbon "sink" wherein carbon dioxide (CO_2) is sequestered as a result of natural biogeochemical processes. However, as a product of CO_2 sequestration, methane (CH_4) is produced and released into the atmosphere. Both CO_2 and CH_4 are greenhouse gases; however, they function differently. CO_2 remains active in the atmosphere longer while CH_4 absorbs more atmospheric infrared radiation (Whiting and Chanton 2001). Whiting and Chanton (1992) demonstrated that carbon fixation in flooded wetland habitats was intimately related to CH_4 production and emission into the atmosphere. In fact, Matthews and Fung (1987) found that northern latitude wetlands emitted relatively more CH_4 than southern wetlands, likely as a result of the long winters and resultant shorter growing season. As such, the directive to address the loss of both carbon and methane storage as a result of the NorthMet Project Proposed Action is impracticable. Barr (2012l, as cited in the FEIS) assessed the carbon cycle effects due to direct and indirect impacts proposed by the NorthMet Project Proposed Action. That assessment determined that approximately 12,535 metric tons per year of greenhouse gas emissions (in CO_2-equivalents) would be released as a one-time event (i.e., not recurring over the life of the project). The assessment also noted that the aboveground forest carbon stock loss due to NorthMet Project Proposed Action impacts is a theoretical maximum of the amount of CO_2 stored in the impacted forest vegetation and that the estimate should not be interpreted that all carbon would necessarily be emitted over a short timescale as CO_2. The NorthMet Project Proposed Action would result in the loss of approximately 940.7 acres of direct and fragmented wetland impacts; however, the proposed compensatory mitigation includes the restoration and preservation of approximately 1,602.7 acres of wetland habitat, an approximately 1.6:1 mitigation ratio per USACE Policy and WCA rule crediting. Therefore, the loss of potential carbon sequestration provided by existing wetlands would be sufficiently mitigated via the restoration of nearly twice the acreage of wetlands proposed to be impacted. The mitigation sites are peat soils that have been drained; however, if the hydrology to the peatlands is restored, the release of carbon would be stopped and the sites would again function as carbon storage.

Theme WET 06

Theme Statement

The FEIS should describe the site selection process used to designate the location of the mitigation sites as it is unclear where the compensatory wetlands would be found. In addition:

- restoration work should not occur at the Sax-Zim Bog;
- Zim Site is already wet and serves the functions of a wetland;
- data must be provided documenting the biodiversity of these lands;
- mitigation sites are currently being developed and have not yet been permitted by the USACE; and
- none of the sites should be qualified as mitigation.

Thematic Response

Please refer to the response to theme WET 03 regarding the discussion of the considerations for site selection process.

The Zim Site is not the same as the Sax-Zim Bog site (which is a current banking proposal in this area, unrelated to the NorthMet Project). Please refer to FEIS Figure 5.2.3-30 which shows the mitigation site locations. The state and federal agencies have not yet made a determination on the drainage status of the mitigation sites (i.e., drained, partially drained, etc.); this determination, including credit ratios, would be made during permitting. The USACE has concluded that the mitigation sites selected and the wetland credits generated at the three mitigation sites would be acceptable for use in compensating for direct wetland losses. The USACE has not made a final decision on the mitigation ratios that would be required to compensate for direct wetland impacts; if the mitigation is fully successful, it is likely these three mitigation sites would generate sufficient credits to compensate for the 940 acres of direct and fragmented wetland impacts. In the event that not all of the credits generated by these sites are utilized to compensate for direct wetland impacts, any excess credits could be used to compensate for indirect losses (USACE 2015a, as cited in the FEIS). Currently, neither the USACE St. Paul District, nor the State of Minnesota has made a final determination of the compensation ratios required to offset the direct impacts of the NorthMet Project Proposed Action. The final decision on compensatory mitigation ratios for direct wetland impacts would be determined during permitting.

The role of biodiversity, including floristic diversity, is included as part of the wetland habitat functions that are addressed during mitigation site selection. The goal of the selected mitigation sites is to provide robust and diverse plant communities. The proposed mitigation plan captures the importance of biodiversity; replacing in-kind to the extent practical, lost functions of the impacted wetlands including those specific to the proposed impacted coniferous bogs of the proposed project. The mitigation ratios would also be adjusted accordingly to account for uncertainties in quantifying the degree functions provided. As such, the mitigation ratios have been increased in order to account for that uncertainty. Please refer to the response to theme WET 03 for more information on functions.

Theme WET 07

Theme Statement

The FEIS should more fully and clearly disclose the environmental impacts of the direct and indirect losses of wetlands, and should assess the significance of those impacts. FEIS should consider/describe:

- was a standard definition of "wetland" used?;
- limiting direct impacts on less than 57 percent of existing wetlands;
- how the footprint of 912.5 acres was calculated and does this include wetland and buffer zones and was a standard definition of wetland used;
- total acres of wetlands in the Partridge River and Embarrass River watersheds where adverse impacts are reasonably foreseeable, whether as a result of fragmentation, mine drawdown, hydrologic changes, seepages, leaks, spills or deposition of contaminants;
- underestimation of the number of wetland acres to be permanently disturbed, as well as their biological quality;
- providing the number and/or range of estimates of indirect wetlands impacts and fragmentation of directly and indirectly affected wetlands;
- whether or not the analysis took into account climate change in the 200+ year project life; and
- why was only one wetland surveyed south of the Transportation and Utility Corridor.

Thematic Response

The NorthMet Project Proposed Action would directly impact 913.8 acres of wetlands; however, actions have been taken to avoid, minimize, and mitigate wetland impacts as discussed in FEIS Section 5.2.3.3. The modifications that have occurred during the development of the EIS have resulted in avoidance and minimization of impacts to wetland resources. To date, these modifications have reduced the acreage of wetlands impacted from 1,257 to 913.8 acres, a 27 percent decrease. The NorthMet Project Proposed Action would provide compensatory mitigation for the 913.8 acres of direct impacts as well as for the 26.9 acres of fragmented wetlands at three off-site mitigation sites. FEIS Section 5.2.3.2 provides a detailed discussion of the direct impacts and potential indirect effects as a result of the NorthMet Project Proposed Action. In addition, the proposed wetland mitigation and wetland monitoring plans are discussed in FEIS Section 5.2.3.3.2.

Wetland boundaries were identified using the routine wetland delineation procedures of the Corps of Engineers Wetlands Delineation Manual (USACE 1987, as cited in the FEIS) (the "Manual") and were reviewed by the appropriate agencies. The Manual contains a standard definition of "wetland" and methodology to apply that definition in the field; both USACE and MDNR use this Manual. The methodology and evaluation criteria that were utilized for determining direct impacts and indirect effects to wetlands resources is discussed in FEIS Section 5.2.3.1.1 and the impacts that could occur from the NorthMet Project Proposed Action are discussed in detail in FEIS Section 5.2.3.2.

FEIS Section 4.2.3.1.3 provides a discussion of the wetland functional assessment that was performed for the wetlands at the Mine Site and along the Transportation and Utility Corridor; this discussion notes that the MnRAM was used to assess wetland functions on the Mine Site and along the Transportation and Utility Corridor. During the field wetland surveys for the Project areas, data was collected related to the functions of each wetland within the proposed Project areas (i.e., Mine Site, Transportation and Utility Corridor, Plant Site) under an abbreviated MnRAM approach. The vegetative diversity/integrity within each wetland was rated using the guidelines in the Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.0 (MNRAM 3.0). A total of 87 wetlands were evaluated at the Mine Site for vegetative diversity/integrity and overall functional quality rating and is summarized in FEIS Table 4.2.3-4. Wetland data forms with the MnRAM information collected in the field was presented in Wetland Delineation and Wetland Functional Assessment Report (Barr 2006d, as cited in the FEIS). Approximately 92 percent of the wetland resources in the Mine Site are of high overall wetland quality and 8 percent are of moderate overall wetland quality. Furthermore, the wetlands along the Transportation and Utility Corridor were also assessed using the same approach, and all 21 wetlands have been rated as high quality. The four wetland resources along the Railroad Connection Corridor are moderately affected and have a high vegetative diversity/integrity. FEIS Section 4.2.3.2.3 describes the findings of the MnRAM assessment for the Plant Site. The majority (92 percent) of the wetlands within the Plant Site are currently rated as low-quality with low vegetative diversity/integrity and the eight percent are rated as moderate quality. The wetlands within the Hydrometallurgical Residue Facility are currently rated as low-quality and the wetlands within the Colby Lake Water Pipeline Corridor are rated as low quality (93 percent) and moderate quality (7 percent). The field work that was completed for the federal lands that are beyond the Mine Site boundary included a MnRAM evaluation for representative wetland locations. At these representative locations, 63 questions given in MnRAM 3.2 were addressed, and all factors were evaluated for each wetland surveyed (see FEIS Section 4.3.3). This approach differed from the Project areas where mining activities would occur and was agreed to by the USACE. Therefore, the wetland assessment sites that are identified on the figures in the FEIS are associated with the federal lands evaluations. However, as indicated above, all wetlands within the NorthMet Project areas associated with the mining activities had an abbreviated MnRAM performed.

FEIS Section 5.2.3 discusses the percentage of high, medium, and low quality wetlands to be impacted by the mining features. The wetland assessment sites that were shown on SDEIS Figure 4.2.3-2 are wetland assessment sites, using MnRAM, that were collected for the federal lands and are now shown on FEIS Figure 4.3.3-1. FEIS Section 4.3.3 includes a discussion on these findings.

A qualitative assessment of the potential impacts of climate change on wetlands is included in FEIS Section 5.2.7.2.4. The Greenhouse Gas and Climate Change Evaluation (Barr 2012l, as cited in the FEIS) addressed the 20 year project life plus the 60 year post-closure period.

The direct, indirect, and cumulative assessments that were performed for the NorthMet Project Proposed Action were agreed upon during the Wetland Impact Assessment Planning Group and per the Wetland Analysis Work Plan (PolyMet 2011b, as cited in the FEIS).

Theme WET 08

Theme Statement

The discussion of indirect wetlands impacts in the PolyMet SDEIS is inadequate and potentially misleading. The methodology and criteria used for assessing indirect impacts should be properly described. In particular,

- the proposed analog method of assessing potential indirect impacts from mine site pit dewatering is not adequate and is unverified and based on anecdotal and limited observations, and as such should not be the sole means of indirect impact assessment for the SDEIS (e.g. GLIFWC provided an analysis, etc.);
- Tribal Cooperating Agency objections to use an analogue method include: 1) mine pit will be hundreds of feet deeper than any of the analogue mine pits; 2) mine pit walls will be crystalline and sedimentary bedrock versus the analogue mine pits in sedimentary bedrock only; 3) data collected from the site would be relatively inexpensive and should be used to inform impact assessment; and 4) relying on only a partial set of available analogue data as the source of information to estimate dewatering impacts is selective and not scientifically robust;
- GLIFWC's method of analogue assessment used all available drawdown data for the Mesabi Iron Range, and did not automatically exclude wetlands classified as ombrotrophic from being considered impacted by drawdown;
- a hydrological study, pump test, and/or laser test must be done;
- the FEIS should also not use the natural range of variation in stream levels to determine indirect wetland effects;
- explain how the 20% threshold was determined and should also recognize that the term fragmentation may define indirect impacts other than changes in watershed size;
- the indirect wetland effects need to be assessed for evaporation resulting from loss of vegetation cover, which should include ombrotrophic wetlands;
- explain why were the wetlands in the Northshore Mine and areas directly north of that mine excluded; and
- describe in more detail the criteria used to determine fragmentation losses.

Thematic Response

FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the indirect wetland effects. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. The Co-lead Agencies agree that multiple factors can affect whether a wetland would experience indirect effects due to a project. FEIS Section 5.2.3 provides these quantitative values of all potential indirect wetland effects. Potential indirect wetland effects from the NorthMet Project Proposed Action were assessed as a result from one of the following six factors: 1)

wetland fragmentation; 2) change in wetland hydrology from changes in watershed area; 3) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; 4) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater seepage containment; 5) changes in stream flow near the Mine Site and Plant Site and associated effects on wetlands abutting the streams; and 6) change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The assessments provided wetland type and acreage for all six factors; however, only wetland acreages were provided for change in wetland water quality related to atmospheric deposition of dust and rail car spillage associated with Mine Site and Plant Site operations. The methodology and criteria used for assessing potential indirect wetland effects are described in FEIS Section 5.2.3.1.2.

The Co-lead Agencies believe that the analog method used in the SDEIS to assess potential indirect effects from mine dewatering is adequate. Further, the FEIS has been revised to address concerns raised by the Bands regarding the assertion that ombrotrophic bogs would not be impacted by mine dewatering. FEIS Section 5.2.3.2.2 applies a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000-ft analog zone. Specifically, ombrotrophic bogs were reclassified from the "no effect" category to the "low likelihood" category, the same status as that assigned to minerotrophic bogs. The complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site impede the ability to reasonably model (e.g., using MODFLOW) and accurately assess the potential effect of pit dewatering on wetlands. In light of this modeling limitation, wetlands were divided into zones based on distance from the open pit. The closer a wetland was to the pit during dewatering, the greater the water table drawdown would be and the greater potential there would be for hydrologic effects on overlying wetlands. These impact assessment methodologies are presented in FEIS Sections 5.2.2.3.2 and 5.2.3.1.2.

The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.

Fragmentation and a change in watershed area (20 percent or greater) are two of the six factors, as noted above, being considered in the identification of potential indirect wetland effects that would be actively monitored due to the NorthMet Project Proposed Action, if the project were to be permitted. PolyMet proposes that if a wetland would potentially experience three or more of these factors, a monitoring well and a vegetation plot would be installed at that wetland for use in monitoring for indirect effects. A rating system (0-6) was developed for the wetlands based on the number of factors that may potentially affect it. Wetlands that were not determined to be potentially indirectly affected would be rated as zero, and wetlands that were determined to be potentially indirectly affected by all six factors would be rated as a 6; however, no wetlands were rated as a 6 (see Figures 5.2.3-24 through 5.2.3-29). Monitoring is proposed within all wetlands with a factor rating of 3 to 5 and also for a subset of those wetlands with factor ratings of 1 or 2 as described in FEIS Section 5.2.3.3 (see Figures 5.2.3-31 and 5.2.3-32).

The 20 percent change in watershed area is a metric used to assist in identifying wetlands to be monitored for indirect effects. It comes from a scientific paper (Richter et. al 2011) and its use in the EIS indirect effects wetland assessment is based on the assessment of potential water-related

impacts (including to aquatics) in the EIS. With regard to daily flow alterations (i.e., in streams or rivers), the paper states that, "Alterations greater than 20 percent will likely result in moderate to major changes in natural structure and ecosystem functions,…"

Though the 20 percent metric discussed in this paper is applied to streams and rivers, the Co-lead Agencies believe that a 20 percent change is a reasonable metric to apply when identifying wetlands for monitoring, in particular with respect to potential ecological changes that may be triggered with a change in watershed contribution (water yield) of this magnitude or greater. As stated above, the 20 percent change in watershed is just one of six factors used to identify which wetlands would be proposed to be actively monitored for indirect effects.

FEIS Section 5.2.3.1.2 has been updated to provide more information on the methodology and criteria for determining potential indirect fragmented wetland effects. Fragmentation is another of the six factors described above. The wetland fragments that are not expected to maintain their functions, approximately 26.9 acres, have been identified in FEIS Section 5.2.3 and on Figure 5.2.3-1. PolyMet's proposed mitigation for the NorthMet Project Proposed Action would be providing upfront compensatory mitigation for the 26.9 acres of wetland fragmentation (see Tables 5.23-17, 5.2.3-18, 5.2.3-19). The monitoring and mitigation requirements for indirect effects, including fragmentation, would be determined during permitting. The wetland fragments that have not been accounted for in the upfront mitigation would be included in the wetland hydrology and vegetation monitoring plan that would be developed and implemented for the NorthMet Project Proposed Action. FEIS Section 5.2.3.3 includes a detailed discussion on the monitoring and mitigation plan for the indirect wetland effects. The proposed wetland impact, avoidance, minimization, mitigation and monitoring plan presented in the FEIS would be reviewed, modified as required, and approved during permitting; therefore, this information could change during permitting.

When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, NEPA directs the agency to make it clear that such information is lacking, discuss the relevance of the lacking information, and discuss any information relevant to evaluation of the future impacts. In these cases, NEPA also directs the agency to evaluate these impacts based upon theoretical approaches or research methods generally accepted in the scientific community provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

The Co-lead Agencies believe this is the case for evaluating indirect wetland effects. The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland Impact Assessment Planning Work Group how to assess potential indirect wetland effects. As a result, strengths and weaknesses of the approach used, as well as other suggested approaches, have been carefully considered. The Co-lead Agencies ultimately decided the use of the analog method and the 20 percent metric described in FEIS Section 5.2.3 as factors considered in identifying potential indirect effects to wetlands is a credible and reasonable approach consistent with the requirements of NEPA.

Please refer to the response to theme WET 09 for more information on ombrotrophic wetlands and the evaluation that was done. A hydrological study, pump test, and/or laser test was not

performed as the Co-lead Agencies utilized the analog approach for assessing potential groundwater drawdown.

Areas that would have a loss of vegetative cover were identified as directly impacted wetland resource areas. These de-vegetated areas would be located under infrastructure footprint such as stockpiles, haul roads, etc. The areas outside of the directly impacted areas would be monitored for changes in vegetation and hydrology as described in FEIS Section 5.2.3.3.

As stated in FEIS Section 5.2.3.1.2, wetland acreage by wetland type was calculated using GIS analysis with 500-ft radius increments beginning at the mine pits and continuing out to a total radius of 10,000 ft (for a total of 20 increments); and 500-ft radius increments beginning at the Plant Site and continuing out to the Embarrass River. The area of analysis for the indirect effects extended beyond the NorthMet Project area component boundaries and included Area 1 and Area 2, as identified in FEIS Section 4.2.3. Wetlands in the Northshore Mine and areas directly north of the Northshore Mine have been excluded from the evaluation as agreed upon during the Wetland IAP Group discussions and by the Co-lead Agencies. The wetlands located on the Northshore Mine site were excluded as they are associated with that active project, the Northshore (Peter Mitchell) pit would be the predominant influence to the adjacent wetlands, and it would be the responsibility of Northshore to determine wetland effects in that area. Furthermore, the fact that a portion of the Northshore Mine is located in a different watershed and there is a watershed divide was considered in that decision. The cumulative effects discussion included that portion of the Northshore Project that is located in the Partridge River Watershed.

Theme WET 09

Theme Statement

The identification of ombrotrophic and minerotrophic bogs should be reevaluated; limited data were collected, and these features may have been misclassified. The FEIS should also acknowledge (and if necessary, revise its analysis to reflect) that the memorandum used to identify bogs was not an assessment of the hydrologic conditions of wetlands in a dewatered state but rather an assessment of surface hydrology under normal conditions. The assessment should consider:

- appearance of fen indicator species (e.g. northern white cedar, bog birch, balsam fir, alder, and willow) in the coniferous bog type at the NorthMet site clearly indicates that these peatlands are minerotrophic fens and not ombrotrophic bogs;
- ombrotrophic bogs have the following features: 1) are mounded (i.e. raised) 2) contain no fen indicators 3) have surface waters with a pH less than 4.2 and Ca less than 2 mg/l.
- relying on a two-day site visit of the bog wetlands and on the data collected to support wetland delineation will not provide the detail needed to track changes in site-specific wetland plant communities and hydrology;
- use of the MDNR Field Guide to the Native Plant Communities of Northeastern Minnesota which separates bogs from fens by the absence of fen indicator species;

- recommend some data on peat depths (which can be quickly compiled with a probe). The periodic re-sampling of these plots would provide the best and most cost-efficient indicator for major impacts of mining operations on the wetlands in the NorthMet site; and
- unless the bogs were in fact perched (which is probable but not supported by data included within this memorandum) they would still be connected to underlying groundwater flow systems and could be affected by drawdown.

Thematic Response

Summary

Eggers (2015, as cited in the FEIS) emphasized that it is imperative to understand that the distinction between the types of bog vegetative communities (ombrotrophic vs. somewhat minerotrophic) was used to estimate potential indirect effects for discussion purposes in the SDEIS and to recognize that those estimates would not be used to determine compensatory mitigation requirements should the NorthMet Project Proposed Action be authorized by the regulatory agencies.

An assumption made in the SDEIS was that ombrotrophic bogs would not be impacted by the proposed mine dewatering compared to affects to the somewhat minerotrophic bogs. However, public comments submitted on the SDEIS prompted a more conservative approach (i.e., projecting greater wetland impacts) for the FEIS. That approach assigns all bog communities the same likelihood of hydrology effects due to mine dewatering. The wetland analysis presented in FEIS Section 5.2.3.2.2, incorporates this more conservative assumption of the potential indirect effects to bogs and reassigned all bog communities within the 0-1,000 ft analog zone the "low likelihood" category of wetland hydrology effects (Eggers 2015, as cited in the FEIS). This resulted in moving the ombrotrophic bog community from the "no effect" to the more conservative "low likelihood" category. The 0-1,000 ft analog zone was described by Adams and Liljegren (ERM and MDNR 2011, as cited in the FEIS) wherein significant surficial groundwater drawdown was most likely to occur and is most likely to be measurable. As such, Eggers (2015, as cited in the FEIS) concluded that it would be reasonable to expect that groundwater drawdown would likely result in some level of hydrology effect experienced by all wetland types within this zone.

For the 1,000-2,000 ft. analog zone, Eggers (2015, as cited in the FEIS) noted that Adams and Liljegren (ERM and MDNR 2011, as cited in the FEIS) stated that drawdown of the surficial groundwater may occur but would likely be much less than the 0-1,000 ft zone and may not be discernible from natural variation. The FEIS includes both ombrotrophic bogs and somewhat minerotrophic bogs in the "no effect" category for this zone.

Thus, for purposes, the differentiation of ombrotrophic versus somewhat minerotrophic bog communities is no longer an important factor for estimating potential indirect effects due to mine dewatering.

If the NorthMet Project Proposed Action receives all of the necessary regulatory authorizations, any compensatory mitigation requirements to offset indirect wetland effects would be based on quantitative field data (e.g., hydrology and vegetation) collected during monitoring that would confirm or refute assumptions made regarding indirect effects.

Presence of Any Minerotrophic Species Precludes Ombrotrophic Bog Status

It is inaccurate to assert that the presence of one or more plant species not listed by Appendix D – List of Bog Species in the "Field Guide to the Native Plant Communities of Minnesota – The Laurentian Mixed Forest Province" (MDNR 2003b, as cited in the FEIS) precludes a determination that the community is an ombrotrophic bog (Eggers 2015, as cited in the FEIS). The Acid Peatland System (MDNR 2003b, as cited in the FEIS) explains that single individuals and single clones of minerotrophic species can occur within ombrotrophic bogs. More specifically, the description of the Northern Spruce Bog (i.e., APn80) community clearly states that, "minerotrophic species are absent or present only as single individuals or single clones…" (MDNR 2003b, as cited in the FEIS). Similarly, the Northern Open Bog (i.e., APn90) community definition states that, "Minerotrophic indicators are absent or extremely rare; vegetation is composed mostly of bog species." (MDNR 2003b, as cited in the FEIS).

Fieldwork was Insufficient to Accurately Differentiate Ombrotrophic vs. Minerotrophic Bogs

The Wetlands IAP Group site visit in September 2010 focused on field-checking the wetland plant community mapping and wetland delineation work. All plant species within each plant community were recorded as part of the field work. Eggers (2015, as cited in the FEIS) noted that some of the non-dominant species recorded were only single individuals or small patches with less than one percent areal cover. However, that level of detail was not recorded in the field since it was not necessary in order to properly apply the Eggers and Reed classification system. It was also noted that the field investigation frequently included the upland (i.e., mineral soil)/wetland (i.e., peatland) boundary in an effort to validate the accuracy of the wetland delineation (Eggers 2015, as cited in the FEIS). As a result, it is likely that minerotrophic species were included in the species observations when in actuality those species did not occur in substantive quantities within the broader wetland community but were only present within the narrow ecotone between the upland/wetland interfaces (relates to discussion in Item 2 above). Eggers (2015, as cited in the FEIS) noted that the work completed during the 2010 field investigations was not optimal for distinguishing between ombrotrophic vs. somewhat minerotrophic bog communities. Following the 2010 field investigations, discussions occurred concerning whether more expansive and intensive field work utilizing relieves, precise measurements of pH and mineral concentrations, and other factors should be accomplished; however, this effort was not implemented because of a determination that more detailed information would not result in a definitive answer regarding potential indirect effects to bog communities (Eggers 2015, as cited in the FEIS). Major uncertainties would remain including:

- Because ombrotrophic bogs are precipitation-driven systems, to what degree, if any, would these communities by impacted by groundwater drawdown due to the mine dewatering; and
- Are flowpath connections with groundwater present within some or all of the ombrotrophic bog communities within the project site?

Instead, Eggers (2015, as cited in the FEIS) proposed an alternative approach to apply more conservative assumptions of potential indirect effects to all bog communities as discussed above.

Technical Criteria to Differentiate Bog Community Types

Dr. Paul H. Glaser, an expert on peatlands who has conducted extensive research on the peatlands of northern Minnesota, provided detailed comments regarding criteria for ombrotrophic bogs which are also noted by MDNR (2003b, as cited in the FEIS):

- The landform type is a raised bog that is always higher than the peatland margin;
- There is an absence of minerotrophic (i.e., fen) indicator species;
- The surface water chemistry has a pH of less than 4.2 and calcium concentrations of less than 2 mg/l; and
- The hydrology and source of minerals is entirely sourced from precipitation.

There was across-the-board agreement by the Co-lead Agencies, Wetlands IAP Group, and public comments on the SDEIS, that MDNR (2003b, as cited in the FEIS) was the appropriate standard to differentiate ombrotrophic vs. somewhat minerotrophic bog communities.

Measure Peat Depths as part of Monitoring for Indirect Impacts

Bogs are well known to have a long-term imbalance between litter production and the decomposition of organic matter resultant from high water tables (Strakova et al. 2012) which results in the accumulation of peat material within peatlands. The depth of peat material as well as the composition of the vegetative communities of peat bogs can change over time resultant from indirect effects to the habitat from decreased hydrology resulting in a reduced thickness of peat as well as a change in the vegetative community (Laine et al. 1995, Weltzin et al. 2000, Robroek et al. 2007, Breeuwer et al. 2009, and Strakova et al. 2012). Numerous studies have demonstrated that the overall quantity (i.e., thickness), quality, and location of peat that is produced in bogs is affected only after experiencing a reduction in the water table depth (Laiho et al. 2003; Murphy et al. 2009; and Strakova et al. 2010, 2012).

As such, the dewatering of peatlands resulting in the subsequent oxidation of peat soils often leads to subsidence over an extended period of time and can be measured; however, changes in the elevation of the water table would become evident much more quickly than subsidence of the peat material. Therefore, hydrology data generated by the proposed monitoring plan utilizing shallow wells and water level data loggers would exhibit indicators of indirect effects to bogs at the earliest stage. Subsequently, the vegetation would begin to exhibit changes. Measureable subsidence of peat soils would be less responsive (i.e., slower to occur). Consequently, the suggestion that data on the depth of peat within the bogs be gathered is not an efficient methodology to determine the occurrence of indirect impacts. In summary, the proposed monitoring efforts offer sufficient early detection of potential indirect effects to bogs.

Groundwater Flowpaths and Ombrotrophic Bogs

Ombrotrophic bog communities can have flowpath connections with groundwater; therefore, those communities could potentially be sensitive to effects resultant from groundwater drawdown unless they support perched water table mounds (Eggers 2015, as cited in the FEIS). Although perched recharge mounds may exist within the NorthMet Project area, Eggers (2015, as cited in the FEIS) noted that in order to confirm this hypothesis, an extensive study utilizing piezometer nests installed to depths both above and below the confining layer to demonstrate the presence/absence of a perched water table mound would be required. The comments submitted combined with cited literature (e.g., Siegel and Glaser 1987) present sufficient evidence to support the conclusion that ombrotrophic bogs can have flowpath connections with groundwater (Eggers 2015, as cited in the FEIS).

The effort to determine if the NorthMet Project area ombrotrophic bogs are in fact perched or if they exhibit flowpaths to groundwater would be exorbitantly cost prohibitive and would not

result in any sufficient information that would drastically alter the conclusions of whether ombrotrophic bogs would experience any potential indirect effects. FEIS Section 5.2.3.2.2 has been updated to make a more conservative assumption of the potential indirect effects for all bog communities within the 0-1,000 ft analog zone by reclassifying ombrotrophic bogs from the "no effect" category to "low likelihood" category for potential wetland hydrology effects.

Theme WET 10

Theme Statement

The FEIS should provide a more complete evaluation of indirect wetland impacts resulting from change in hydrology due to groundwater drawdown, and impacts to river baseflows and riparian wetlands. In particular, the FEIS should provide a single estimate or range of acres and wetland types that would be affected by groundwater drawdown and if needed provide the worst case analysis. The analysis is inaccurate, because:

- impact zones and distances are not well described and do not agree with the automatic exclusion of ombrotrophic wetlands from potential drawdown effects;
- the water table would be drawn down for an unknown distance around the mine resulting in significant impacts and higher than reported acreage impacts, as well as drawdown of Partridge River and its riparian wetlands, and would be expected to have a greater effect on smaller wetlands as opposed to larger ones;
- groundwater drawdown is likely to result in impacts on ombrotrophic bogs, and these impacts must be included in the SDEIS as the new head pressure could lead to impacts of water seeping out of the ombrotrophic wetlands where there is a hydrologic connection to the saturated layer;
- in the absence of adequate rationale for the assumption that groundwater flowing from the mine features would not enter [minerotrophic] wetlands, it must be assumed that contamination would impact all wetlands that are hydrologically connected to groundwater in each flow path; and
- use of the Canisteo Pit as an analog must be adjusted to account for the difference in depth of the NorthMet pit, and this assessment must use relevant information from other mine pits.

The SDEIS should be revised to remove assertions that coniferous and open bogs would be unaffected by groundwater disturbances, as this is unsupported by scientific literature and field data and FEIS should use hydrologic data to characterize the wetlands and identify groundwater connections with the wetlands. In addition, hydraulic testing needs to be conducted at the Tailings Basin.

GLIFWC conducted an independent assessment using the same methods as the Co-lead Agencies, along with additional analog data from other mining-impacted sites, and the assessment found an estimated total of 5719.75 acres of wetlands would be potentially susceptible to severe indirect impacts from mine pit drawdown (Zone 1). The finding that the Partridge River would act as a natural barrier to the cone of depression suggests that the riparian zone of the Partridge River will not be affected by groundwater drawdown. GLIFWC independent analysis estimated drawdowns of 3 to 5 feet under the river, which would severely

reduce baseflow in the channel, indirectly impact riparian wetlands downstream, and affect other surface water features.

Thematic Response

The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. As a result of these analyses performed to determine where monitoring should occur, quantification of wetland types and acres of potential indirect wetland effects were also generated. The FEIS quantitatively assessed potential indirect wetland effects as a result from: 1) changes in wetland hydrology from groundwater drawdown resulting from open pit mine dewatering; and 2) changes in wetland hydrology from groundwater drawdown resulting from operation of the Plant Site, including groundwater seepage containment.

The wetland mitigation and monitoring plan would be reviewed and approved by the appropriate agencies during permitting. Monitoring is proposed within all wetlands containing a potential indirect wetland impact factor rating of 3 to 5 and a sampling of those wetlands with factor ratings of 1 or 2 as described in FEIS Section 5.2.3.3 (see Figures 5.2.3-31 and 5.2.3-32).

Please refer to the response to theme WET 08 for more information on the analog method and the response to theme WET 09 for more information on ombrotrophic bog wetlands.

Please refer to the responses to themes WR 10, WR 112, and WR 120 for more information on groundwater flow from the mine features. Please refer to the response to theme WR 86 for information on the how the Partridge River would act as a natural barrier to the cone of depression.

Theme WET 11

Theme Statement

The FEIS should more thoroughly examine, and should provide quantitative predictions for the potential for indirect wetland effects and their tributaries resulting from water quality changes due to fugitive dust and ore spillage along the Transportation and Utility Corridor. Examples should be provided from other sulfide mines where this has not proven to be a concern. The FEIS should provide an assessment of the potential for indirect wetland effects from water quality changes due to air deposition from dust, metals, and sulfur.

The FEIS should provide:

- rationale for using 100% of background level as a cutoff for impacts;
- an explanation of the impacts on water quality at this level of deposition;
- a discussion of why areas with less deposition will not be affected or contribute to impacts downstream;
- an assessment of impacts on water quality resulting from deposition greater than 100% of background levels; and
- information on the amount of sulfur or metals that will be deposited within the greater than 100% of background levels line;

The FEIS should also:

- Clarify whether indirect wetland effects from fugitive dust or air deposition would occur on Second Creek or Spring Mine Creek;
- Examine the potential impacts from fugitive dust on wetlands including evaluating how blasting activities might cause indirect wetlands impacts;
- Provide an analysis of the potential toxic effects of sulfur and heavy metals upon wetland vegetation from fugitive dust and precipitation;
- Reassess mitigation measures for fugitive sulfide dust;
- Reevaluate claims that the discharge of sulfates and metals will not impact wetlands and will not exceed water quality standards;
- Consider the impact of fugitive dust and plant emissions on mercury levels in the wetlands and address whether dust deposition will result in increased mercury methylation, and what will be done to control such affects, should they occur; and
- Evaluation of the transport of solutes during the spring snowmelt flush.

Thematic Response

The rail haul of ore is not unique, but it is not common either. In northern Minnesota, rail haulage used to be very common. LTVSMC hauled ore to their crusher at the NorthMet Plant Site during their operation. U.S. Steel's Minntac mine historically hauled their ore by rail for many years before changing to all truck haulage. Northshore hauls crushed ore by rail to Silver Bay. Canadian National Railroad hauls crushed limestone by rail to U.S. Steel's Minntac facility in similar side dump cars that PolyMet would be utilizing. Northshore Mining hauls tailings in similar side dump cars as U.S. Steel's Minntac facility. Carmeuse's lime quarry in Michigan hauls limestone by rail to their plant. Quebec Cartier Mining (QCM) hauls iron ore from their mine to their plant. However, PolyMet would be refurbishing the ore cars to minimize gaps along the hinges and joint areas, which would reduce the potential for ore spillage from rail cars.

Dust, ore spillage, and stockpile leakage is not a regulated discharge to wetlands under the Section 404 of the CWA; however, USACE would consider these types of potential effects in their determination of the LEDPA under the Section 404(b)(1) permit alternative analysis. The potential effects of dust, ore spillage, and stockpile leakage would be evaluated by MPCA under the Section 401 Water Quality Certification and NPDES permitting.

The analysis for potential indirect wetland effects resulting from water quality changes was a qualitative assessment of the types of effects that may affect each wetland. Wetlands that could be potentially affected through multiple pathways were identified as having a higher likelihood of indirect effects. The proposed wetland monitoring program has been designed with specific attention to these higher likelihood wetlands that are more likely to be affected. Quantitative analysis of these impacts has not been performed as agreed upon during the Wetland IAP Group and per the Wetland Analysis Work Plan (PolyMet 2011b, as cited in the FEIS).

As discussed in FEIS Section 5.2.3.2.2, subsection Water Quality Changes,, the deposition of dust, sulfate, and metals was modeled and compared to National Atmospheric Deposition Program or literature-based background deposition values. The screening analysis for depositional effects conducted to estimate potential annual deposition of dust, metals, and sulfur

to wetlands within and adjacent to the Mine Site was performed using AERMOD. The estimated deposition from fugitive dust emissions was used to identify wetlands that have the potential for water quality changes. The estimated deposition from fugitive dust emissions was used to identify a threshold for a negative effect on vegetation. The maximum area for potential indirect effects based on the modeling was identified to occur relatively close to the respective operating boundary of the Mine Site and Plant Site. The deposition modeling results for dust, metals, and sulfur would likely not have an adverse effect on wetlands; however, the modeling only indicated those areas that had deposition rates greater than 100 percent of background deposition. This screening analysis was intended to identify wetlands for potential inclusion in the future wetland monitoring program for the NorthMet Project Proposed Action.

Given the conservatism in air dispersion modeling in general and modeling fugitive dust specifically, an incremental potential change in dust-related deposition of 100 percent of background was selected because its represents a sufficiently large enough incremental increase that monitoring would have a higher probability of detecting a change if actual deposition due to the NorthMet Project Proposed Action were to increase to the modeled level. The reasons that the modeling used in the SDEIS is conservative include:

- The method for estimating fugitive dust emissions from the Tailings Basin and the Mine Site that are in the coarse size fraction, 10 microns in aerodynamic diameter or larger (PM_{10} up to about PM_{30});
- Modeling fugitive dust emissions with AERMOD over-predicts potential air concentrations and deposition (potential over-prediction by a factor of 4; Cowherd 2012); and
- This initial assessment assumes sulfur and metals are 100 percent soluble, but sulfur and metals (including Hg) associated with fugitive dust are within the mineral matrix of the particles and are not water soluble or bioavailable upon deposition.

It should be noted that some physical/chemical process is needed to release the sulfur and metals from the mineral matrix. Chemical weathering is the most likely release mechanism for sulfate and metals inherent to the mineral matrix of the deposited dust particles but this was not incorporated into the results presented in the Wetlands Data Package. Chemical weathering is affected by temperature (Brady 1974) and is likely to be slower within a wetland where the near-surface water table creates a generally cool microclimate. It is also important to recognize that wetlands are known to retain metals and serve as a net sink for nutrients and metals (O'Sullivan et al. 1999; Asapo and Coles 2012; Ness et al. 2014). As discussed by Ness et al. (2014), sequestration of metals by wetlands occurs naturally and has been ongoing for centuries through many processes including plant uptake, adsorption (binding to soil or organic matter), and precipitation (formation of solid compounds) (Wright and Reddy 2012). Any metal released into solution from deposited dust particles has a high probability to be adsorbed to organic matter and sequestered within the wetland (Urban et al. 2011; Ness et al. 2014). Any sulfate contributed by fugitive dust has a high probability to be sequestered (Urban et al. 1989). The potential amounts of sulfate and metals that may be released from fugitive dust to wetlands are estimated to be small and within the variability of background concentrations. Because wetlands are a net sink for metals and sulfate, wetland areas that may receive NorthMet Project Proposed Action's fugitive dust deposition and the small amount of sulfate and metals that may be released from the fugitive dust are not expected to be affected or contribute significantly to downstream areas.

In a preliminary conservative assessment, when accounting for weathering of the dust particles, the potential additional sulfate that could be added to a wetland ranges from 0.07 to 0.13 milligrams per liter (mg/L) at the location of maximum modeled deposition at the Mine Site and from 0.19 to 0.26 mg/L at the location of maximum modeled deposition at the Plant Site (Barr 2014c, as cited in the FEIS). Background concentrations of sulfate in streams draining wetlands in northeast Minnesota range from about 1 to 8 mg/L (Berndt and Bavin 2009; Barr 2010c, as cited in the FEIS, Barr 2014c, as cited in the FEIS; Rolfhus et al. 2015). The estimated potential incremental increase in sulfate from the deposition of the NorthMet Project Proposed Action's fugitive dust emissions is within the variability of background concentrations and is not expected to have a measurable effect on water quality. When accounting for weathering of dust particles, the potential additional concentrations of metals that could be added to a wetland are expected to be small compared to background concentrations of metals in streams draining wetlands. If metal concentrations would be higher than expected, as noted by Wright and Reddy (2012), "...elevated concentrations of metals do not necessarily result in problem releases to water or excessive plant uptake." Since natural wetlands are known to retain metals (such as sulfide minerals, organic complexes, etc.) (Wright and Reddy 2012; Dean et al. 2013; Ness et al. 2014), it is unlikely that metals from fugitive dust would have a significant effect on water quality or any downstream environments.

The amount of sulfur and metals potentially deposited would depend on a number of factors including the actual amount of dust deposited during operations and the metals inherent to the mineral matrix.

In general, this fugitive dust contains minor amounts of arsenic, cadmium, chromium, copper, lead, manganese, nickel, sulfur, selenium, vanadium, and zinc (PolyMet 2015b, as cited in the FEIS). But the fact that these metals are "deposited" within the mineral matrix of fugitive dust does not mean that they are "available." Availability depends on potential weathering of the fugitive dust and potential release of each parameter from the mineral matrix of the particle and this weathering is known to be relatively slow (PolyMet 2015q, as cited in the FEIS). Potential sulfate associated with the release of sulfur from fugitive dust is estimated to be small and well below background values. Metals that may be potentially released from fugitive dust have a high probability to be sequestered by organic matter. Overall, because the modeling of fugitive dust emissions is considered to provide a conservative overestimate of potential deposition it is unlikely that the sulfur and metals inherent to the mineral matrix of the fugitive dust particles would have any significant effect on nearby wetlands. Researchers have identified the overestimation of emissions from fugitive dust sources (Fitz et al. 2002) and the conservatism in the modeling of fugitive dust (Cowherd 2012) and deposition (Etyemezian et al. 2002). Because of the known conservatism (i.e., overestimation) in modeling fugitive dust emissions, the estimates of potential deposition are overestimates. As discussed in FEIS Sections 5.2.3.2.2 and 5.2.3.2.4, the localized area of potentially high deposition at the Mine Site is just south of the ore loading pocket and just east of the Category 2/3 Stockpile and for the Plant Site is adjacent to the Tailings Basin. These areas would be considered in any future monitoring to be conducted for the Project, if approved.

The FEIS indicates that there would be no potential indirect wetland effects from fugitive dust to Second Creek. In addition, there would be no indirect effect to Spring Mine Creek as the area is forested and dust would settle on the organic soil and be sequestered.

Dust emissions from blasting in the open pits were not included in the air quality modeling because the air dispersion models employed are not suitable for this type of potential emission source. PolyMet has developed a Fugitive Emission Control Plan for the NorthMet Project Proposed Action. Proper blast design and other procedures in the Fugitive Emission Control Plan would minimize dust generation and transport beyond the mine pits. PolyMet would be required to report exceptions from the Fugitive Emission Control Plan to MPCA. In addition, PolyMet would be required under the Permit to Mine to have a blast monitoring plan that would follow *Minnesota Rules*, chapter 6132, which outlines blast monitoring and auditing requirements. Also, drilling and blasting activities would be conducted in accordance with the Mine Safety and Health Administration (MSHA) Rules and Regulations. The blasting plan would require provisions to limit dispersion of dust, including monitoring of the weather and wind direction at the time of each blast. The monitoring results of the blast would be analyzed and any violations of the Permit to Mine would be immediately reported to the commissioner and the facility would implement immediate corrective action, or the facility would work with the commissioner and develop and implement contingency actions as required until the blast monitoring results are in compliance (*Minnesota Rules*, part 6132.3100).

The fugitive dust would not be reasonably expected to be toxic to the touch and would not be reasonably expected to be directly toxic to vegetation, as it is typically part of road construction materials and/or tailings. The wetland dust deposition analysis identified that metals are expected to be particle-bound, within the mineral matrix of the rock particle. Therefore, the mineral particle must undergo physical or chemical weathering to release the metals. This is typically a slow release over time, measured in years. Metals deposited or applied to mineral and wetland soils have been shown to be sequestered in the upper soil layers and not be available to vegetation. Because of the potential small amounts of metals from fugitive dust that may be available in surface soils for uptake by plants, and the sequestering of most of the metals in soil should they be weathered out of the dust over time, the potential for the metals to be toxic to vegetation is very low. Monitoring of the areas estimated to have metal deposition greater than 100 percent of background would occur as part of the wetland monitoring program which would assess if potential indirect effects occur as a result of the NorthMet Project Proposed Action.

The reevaluation indicates the estimated potential incremental increase in sulfate and metals from the deposition of the Project's fugitive dust emissions is expected to be within the variability of background concentrations and is not expected to have a measurable or significant effect on water quality.

The highest estimated deposition of mercury from the NorthMet Project Proposed Action stack emissions to a terrestrial watershed was 0.21 $\mu g/m^2/yr$ (air emissions scenario 1, 50 percent oxidized mercury; Heikkila Lake watershed; Barr 2013j, as cited in the FEIS). The potential release of mercury from fugitive dust particles (mercury that is inherent to the mineral matrix) is expected to be slow and is considered negligible compared to the potential input of mercury from the NorthMet Project Proposed Action's air emissions.

The potential small incremental addition of mercury to wetlands from the NorthMet Project Proposed Action is within the variability of background deposition estimates and is not expected to have any measurable effect on the mercury methylation process in wetlands in the NorthMet Project Proposed Action area. Sulfate addition to sensitive environments has been a concern for some time (MPCA 2006a, as cited in the FEIS). The NorthMet Project Proposed Action's potential deposition of sulfur to wetlands from fugitive dust and air emissions was evaluated in

the Mercury Overview document (Barr 2014c, as cited in the FEIS). At the location of maximum modeled deposition, the potential incremental increase in sulfate surface water concentrations from fugitive dust, when accounting for weathering, ranges from 0.07 to 0.13 mg/L at the Mine Site and 0.19 to 0.26 mg/L at the Plant Site, respectively. Sulfate from potential deposition of sulfur from stack air emissions (SO_2, sulfuric acid mist (SAM), particulate S) is much smaller than that estimated for fugitive dust. The potential incremental increases in sulfate surface water concentrations from deposition of fugitive dust and stack emissions were summed: Mine Site sum equals 0.13 mg/L (only dust deposition, no contribution from Plant Site air emissions); Plant Site sum equals 0.03 plus 0.005 plus 0.04 plus 0.26 equals 0.34 mg/L. Background sulfate concentrations in streams draining wetlands range from about 1 to 7 mg/L. The potential incremental increase in sulfate concentration that may be related to deposition of fugitive dust to wetlands and stack emissions is within background variability.

Fugitive dust deposition during the snow-free months of approximately mid-April through October is related to the coarse size fraction (10 microns and larger). Once deposited, these particles are expected to settle and mix with the existing materials at the ground/water surface. Under most conditions in the Hoyt Lakes area in a forested/vegetated watershed, the snowmelt does not result in notable erosion of the upland/wetland system. Therefore, any particles deposited during the snow free months are expected to remain in place at the soil/water surface during the active snowmelt. Fugitive dust particles deposited during the winter season (approximately November through March) are expected to be retained within the snowpack (Conway et al. 1996; Doherty et al. 2013). There may be periodic melting during the winter months that would redistribute some of these particles downward in the snowpack, but most of these insoluble mineral dust particles would be expected to remain in the snowpack (Conway et al. 1996; Doherty et al. 2013). Warming of the snowpack during early April occurs first, then ripening of the snowpack (decreasing snow depth and increase in the water content of the smaller snowpack), followed by output (release of water). In this stage of the melt, relatively insoluble fugitive dust particles (coarse size fraction) would be expected to remain in the snowpack, settling downward with the melting snow (Conway et al. 1996; Doherty et al. 2013) and eventually settling out on the soil or ice surface (if melting occurs on the surface of a lake or wetland). Conway et al. (1996) identified that particles larger than about 5 microns in size were not affected by melt waters and remained in the snowpack. In addition, the relatively flat slope of wetlands enhances downward movement of water and coarse size particles rather than lateral flow. As the water table rises in the wetland, water moves to the edge of the wetland/mineral soil interface (the lagg area) and then continues downgradient to form streamflow. Water moving across the wetland would carry dissolved constituents such as metals attached to dissolved organic carbon, but the larger particles (coarse size fraction) are not expected to be carried in the meltwater because they are insoluble (Conway et al. 1996; Doherty et al. 2013) and because the slow movement of water across the wetland to the lagg area does not have the capacity to carry these larger particles. The potential additional sulfate and metals released to wetlands from the NorthMet Project Proposed Action's estimated fugitive dust emissions are expected to be small and within the variability of background concentrations. Because of the slow movement of water within the relatively flat wetland that promotes the settling out of larger particles and the expected small amount of metals and sulfur that may be released from deposited particles because of the cold temperatures in the snowpack and the snowmelt water that limit chemical weathering, the NorthMet Project Proposed Action is not expected to have any significant effect on sulfur or metal concentrations during snowmelt.

Theme WET 12

Theme Statement

The FEIS should fully describe the basis that the project would not 1) result in indirect effects on wetlands abutting the rivers and creeks (e.g. Partridge River, Spring Mine Creek, Second Creek, etc.) near the mine and plant site and 2) that leakage and seepage from the proposed Project would not affect nearby wetland water quality and their tributaries or result in a lack of water flowing to the wetlands and tributaries. The FEIS should:

- Address the efficiency of the tailings basin seepage capture system as it is unlined and isn't designed to collect seepage from the east side. Seepage from the east side is likely to drain to Spring Mine Creek. There are no predictions regarding the possibility that tailings piped from the processing plant to the tailings basin could be spilled, what will happen if tailings embankments may fail, or that water standards would be exceeded;
- Provide adequate support for the assumption that seepage will not affect wetland water quality of Second Creek and its associated wetlands;
- Assume that some leakage would occur, and given the site-specific conditions for the proposed location of the HRF, the risk for highly contaminated seepage to exit the HRF and flow to wetlands in the Embarrass River Watershed;
- Address if, as a result of construction of the FTB containment system, there will be a lack of water to tributaries, it seems there would also be a lack of water flowing to adjacent wetlands. Although some wetlands will be monitored for hydrological and vegetation changes, it seems as if the extent of monitoring is not sufficient to ensure there are no secondary wetland impacts; and
- Clarify the conclusion, no indirect effects would occur on the Partridge River and four other creeks because augmented flows from the project would be within average flow (and stage) without the project, are based on potential added drying out of adjacent wetlands and rewetting since using averages can mask such events.

Thematic Response

Please refer to the responses to themes PD 08, PD 10, PD 12, PD 17, PD 18, WR 18, WR 54, WR 67, WR 69, WR 90, WR 102, WR 112, WR 117, WR 119, WR 120, WR 131, WR 132, WR 166, WR 185, and WR 202 for more information on potential indirect effects to wetlands abutting the rivers and creeks, leakage and seepage from the NorthMet Project Proposed Action, and stream flows.

Theme WET 13

Theme Statement

The Proposed Action would cause the release of carbon and methane stored in the peatland/bog wetlands that would be destroyed; the destruction of these systems would also reduce the regional capacity for future carbon sequestration and result in climate change concerns.

Thematic Response

As previously discussed in the response to theme WET 05, the NorthMet Project Proposed Action would not result in the release of methane (CH_4) from the proposed loss of wetland habitats. Wetlands act as carbon sinks that sequester carbon dioxide (CO_2). As a result of carbon cycling through the wetland system, a portion of sequestered carbon is mineralized to gaseous end products resulting in the production of CH_4, which is released to the atmosphere. As such, the assumption that the NorthMet Project Proposed Action would result in an increase of methane stored in the peat bogs is incorrect. The loss of wetland habitat at the NorthMet Project area would result in a one-time release of 12,535 metric tons per year of greenhouse gas emissions (i.e., CO_2-equivalents approximately stored carbon within those habitats (Barr 2012l, as cited in the FEIS). It is important to note that the loss of carbon sequestration capacity is fundamentally different from emission rates since it represents a loss of greenhouse gas absorptive capability (i.e., how effective the system is at absorbing carbon) and capacity (i.e., the amount of carbon able to be absorbed) as opposed to an actual contributing emission. However, Barr (2012l, as cited in the FEIS) also noted that the net effect of the loss of carbon sequestration capacity is essentially the same as emissions. The Barr report also noted that the projected calculated release of CO_2-equivalents is a one-time event; however, it should not be assumed that all aboveground forest carbon would necessarily be released over a short timescale and that net carbon cycle impacts are highly dependent on the end-use of the cleared vegetation. For example, timber harvested for boards manufactured into furniture or buildings which is typically maintained for an extended period of years or decades, would degrade and decompose (i.e., release their stored carbon) at a much slower pace than timber that is utilized for firewood or woodchips which would ultimately decompose at a much faster rate. Harvested timber is typically utilized for a multitude of purposes dependent on numerous variables including market value, stand quantity and quality, tree species, demand, among others. As such, predetermining the end-use of an entire stand of timber is unfeasible.

Additionally, the assumption that the NorthMet Project Proposed Action would result in the destruction of the carbon storage potential of the region is erroneous. That assumption discounts the contributions of the proposed compensatory wetland mitigation. The NorthMet Project Proposed Action would result in the loss of approximately 913.8 acres of directly impacted wetlands whereas the NorthMet Project Proposed Action would result in 1,799.7 acres of wetland mitigation (an impact to mitigation ratio of approximately 2:1).

Theme WET 14

Theme Statement

The proposed Land Exchange would be a significant net loss of wetlands both quality and function and would not be in compliance with Executive Orders 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS). The Land Exchange:

- should be based on wetland quality and type, and not merely on acreage;
- would not increase wetland acreage or mitigate in any way for the wetland losses at the Mine Site by transferring the non-federal lands to the Forest Service;

- would result in trading a far more contiguous and of higher overall quality wetland area for scattered areas across the non-federal parcels and of not equal or ecological value;
- would the USFS be compensated for loss of biodiversity that is not equally replaced;
- does not calculate indirect wetland loses in the land exchange;
- needs to address how the loss of acres of wetlands and loss of the one hundred mile swamp would be made up and acknowledge that it is a loss; and
- needs to address if new protected wetlands would be provided and/or would new wetlands be created on the exchanged lands.

Thematic Response

As described in FEIS Section 1.4.3, FLPMA requires that the values of the lands exchanged are equal or, if they are not equal, the values shall be equalized by the payment of money so long as the payment does not exceed 25 percent of the total value of the lands transferred out of federal ownership. (36 CFR 254.12). The USFS relies on professional appraisals to determine market value. Such appraisals must conform to Uniform Appraisal Standards for Federal Land Acquisitions and the Uniform Standards of Professional Appraisal Practice of the Appraisal Foundation. Refer to theme LAN02 for more information.

The Land Exchange Proposed Action and Land Exchange Alternative B must also comply with two EOs that are related to wetlands and floodplains. EO 11990 (USEPA 1977) applies to land exchanges such that, as much as practicable, the exchange does not result in the loss of wetland resources. EO 11988 (USFS 2004d, as cited in the FEIS) applies to land exchanges such that, as much as practicable, the exchange does not result in an increase in the flood damage potential.

As noted in FEIS Section 5.3.3.1, the potential net change that the Land Exchange Proposed Action and alternatives would have on wetland resources was evaluated using two types of criteria: 1) criteria assessing conformity to EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS), which requires a wetland acre-for-acre analysis and a floodplain acre-for-acre analysis of the federal estate; and 2) criteria used in an analysis of wetlands and floodplain habitat, as well as other water resource indicators. As stated in the FEIS, to satisfy the requirements of EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS), the USFS policy is to use the following three conditions (FSH 5409.13 § 33.43c [USFS 2004d, as cited in the FEIS]): 1) the value of the wetlands or floodplains for properties received and conveyed is equal (balancing test) and the land exchange is in the public interest, 2) reservations or restrictions are retained on the unbalanced portion of the wetlands and floodplains on the federal lands when the land exchange is in the public interest but does not meet the balancing test, and 3) the federal property is removed from the exchange proposal when the conditions described in the preceding items 1 or 2 cannot be met. In addition to evaluating wetlands in accordance with the two EOs, analysis of the Land Exchange included information on wetland community types as well as ecological floodplains. The methodology and evaluation criteria utilized for the wetland resource evaluation for the Land Exchange is presented in FEIS Section 5.3.3.1.

The Land Exchange Proposed Action and the Land Exchange Alternative B meet the first condition (balancing test), which requires the value of the wetlands or floodplains is equal for properties received and conveyed. Therefore, as stated in FEIS Section 5.3.3, the Land Exchange

Proposed Action and Land Exchange Alternative B would comply with EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS), as there would not be a loss of wetland and floodplain resources to the federal estate. All of the lands proposed for exchange are located within the 1854 Ceded Territory of northeastern Minnesota. The Land Exchange Proposed Action equalization requirements are discussed in theme LAN02 as well as in FEIS Section 1.4.3.

Furthermore, the lands to be exchanged are not required to be of a certain size, contiguous of each other, within the same watershed of the federal lands, within a reasonable distance to the federal lands to be exchanged, and/or within the 1854 Ceded Territory. However, a land exchange must conform to the standards and guidelines of the Forest Plan as well as be of equal value and meet the EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS). The Land Exchange Proposed Action and Land Exchange Alternative B would conform to the Forest Plan and would not result in a loss of wetland and floodplain resources to the federal estate. Four of the five tracts involved with the land exchange have existing wetland resources located on them as described in FEIS Sections 4.3.3 and 5.3.3.

The lands involved in the Land Exchange Proposed Action or Land Exchange Alternative B are not intended to be the wetland mitigation sites that are required as part of permitting (Section 404, Section 401, and WCA) of the mining activities; the wetlands mitigation sites for the wetland impacts of the mining activities are discussed in FEIS Section 5.2.3. Compensatory mitigation that is required as a result of the impacts from the mining activities is described in FEIS Section 5.2.3.3. FEIS Section 5.2.3 includes information on functions that would be impacted and replaced by the proposed mitigation required as a result of the mining activities.

Please refer to the LAN01 for more information on the factors that are evaluated for the public interest review by the USFS, and the equalization requirements are discussed in LAN02 as well as in FEIS Section 1.4.3. Furthermore, the FEIS discloses which non-federal tracts would be required for each Land Exchange alternative (FEIS Section 5.3). Disclosure of appraisal information in the EIS is not required. Any decision, documented in the ROD, to move forward with a land exchange will be supported by a current appraisal, approved by the USFS, which verifies that the exchange meets the equal value requirements of applicable federal law and regulation. Requests for appraisal reports and appraisal review reports are processed under Freedom of Information Act procedures.

The Weeks Act authorizes land exchanges so long as "public interests would be benefitted thereby." (16 USC 516) Lands acquired by the United States pursuant to the Weeks Act, whether by purchase or exchange, are subject to all provisions of the Act. (16 USC 516). Lands conveyed from federal ownership would no longer be under federal control and therefore would not be managed under the Forest Plan and/or influenced by the authority (the Weeks Act) under which the United States acquired them. This is consistent with other land exchanges that have occurred in the Superior National Forest. The NEPA analysis would inform the USFS decision on the public interest determination and the decision would be presented in the ROD. While the federal lands, if transferred to PolyMet, would still be located within the proclamation boundary of the Superior National Forest, they would be private lands and no longer managed by the Forest Service.

As presented in the FEIS, there would be little to no likelihood of potential indirect effects based on the analog approach to wetlands located on federal lands that would border the area, if the

land exchange is approved. However, monitoring would be performed to determine if effects occur and any effects would be addressed per permit conditions, if approved. Please refer to the response to theme WET 01 for more information on mitigation and monitoring for potential indirect effects.

Theme WET 15

Theme Statement

The proposed Land Exchange would result in a net loss of wetlands and function values for the St. Louis River Watershed/Lake Superior Basin, and the mitigation (e.g. wetland mitigation sites, non-federal exchange lands) would be outside of the watershed.

Thematic Response

The NorthMet Project Proposed Action would result in a loss of wetland resource areas in the St. Louis River Watershed. However, one of the three mitigation sites is located within the same watershed as the NorthMet Project Proposed Action. Overall, the Land Exchange Proposed Action and Land Exchange Alternative B would result in an increase to the federal estate of wetland acreage, and thus would be in conformity with EO 11990 (USEPA 1977) (see FEIS Table 5.3.3-1). The non-federal lands proposed as part of the land exchange are not the mitigation sites that are proposed as compensatory mitigation for the mining activities impacts. The non-federal lands to be exchanged, if approved, are not required to be within the same watershed. These lands are all lands that are located within the proclamation boundary of the Superior National Forest and would consolidate land ownership management. Please refer to themes LAN 01, LAN 03, and LAN 06 for more information.

Theme WET 16

Theme Statement

The proposed Land Exchange does not meet the Superior National Forest Plan's goals and objectives for avoiding loss of wetlands, specifically:

It is possible to avoid wetland impacts since PolyMet's deed does not allow them to open-pit mine, and the Forest Service is not obligated to go forward with the land exchange as land exchanges are discretionary and voluntary real estate transactions between the Federal government and a non-Federal party.

The land exchange and the PolyMet open-pit mine would be inconsistent within Forest Plan, G-WS-13, p. 2-15 and G-WS-15, p. 2-15.

Thematic Response

The USFS manages the Superior National Forest in conformance with many laws, regulations, executive orders, and policies. In all cases, the Forest Plan is consistent with national law, policy, and direction (USFS 2004c, as cited in the EIS). As discussed in the FEIS, the USFS' position is that the mineral rights that were reserved do not include the right to surface mine as proposed by PolyMet. In order to resolve this conflict, a proposed land exchange has been presented as part of

the NorthMet Mining Project. Please refer to the response to theme WET 14 for more information on the Weeks Act.

Please refer to the responses to themes LAN 02 and LAN 04 for more information on the public interest determination for the USFS and how the Land Exchange Proposed Action would comply with the Forest Plan and other USFS policies.

In addition, the Land Exchange Proposed Action and the Land Exchange Alternative B would be consistent with the goals of the Forest Plan for wetlands (G-WS-13 and G-WS-15; page 2-15). The Land Exchange Proposed Action and the Land Exchange Alternative B, the conveyance and acquisition of lands, would not result in wetland impacts; however, the mining activities of the NorthMet Project Proposed Action would result in wetland impacts that cannot be avoided but have been minimized and/or compensated for the loss through the Section 404, Section 401, and the WCA permitting processes. The Land Exchange Proposed Action and the Land Exchange Alternative B would not result in a net loss of wetland acres to the federal estate and/or result in reduced water quality within a wetland, or upstream or downstream of a wetland. The non-federal lands for the Land Exchange Proposed Action and the Land Exchange Alternative B would be incorporated within the adjacent federal ownership and managed in accordance with the Forest Plan direction for the particular management area. Lands conveyed from federal ownership would no longer be subject to federal control and would therefore not be managed under the Forest Plan. The No Action Alternative would continue to apply to the federal lands managed by the USFS. The NorthMet Project Proposed Action is subject to a number of regulatory permits, reviews, and approvals which would include determining if the proposed mining activities would result in a change to water quality. Please see FEIS Section 5.2.2 for detailed discussion on water resources and FEIS Section 5.2.3 for a discussion of wetland resources.

Theme WET 17

Theme Statement

The wetland boundaries on the lands proposed for exchange are approximate and not all wetlands have been delineated. Therefore it should not be assumed that there has been an appropriate examination of the wetland functions and values and that there would be an equal exchange. In addition, land exchange analysis should include:

- an assessment of the functions that would be lost to the Partridge and St. Louis River watersheds accompanied by an assessment of the degree to which the loss of those functions would be replaced by the proposed mitigation for the project; and
- an assessment and/or percentage of the non-Federal lands that contain coniferous bogs as was done for the Federal lands.

Thematic Response

As stated in FEIS Section 4.3.3.2.1, wetland boundaries and community types for the non-federal lands were identified from aerial photographic interpretation and field studies. The boundaries of wetlands were determined based on aerial photograph interpretation and NWI mapping, with some refining of wetland boundaries during field studies. Wetland boundaries were determined in the field based on hydrologic and vegetative characteristics and were more accurate where

survey routes crossed or were near wetland boundaries. Approximate wetland boundaries and wetland types based on habitat mapping are shown on Figures 4.3.3-3 and 4.3.3-4. Surveys covered nearly all portions of the parcels, although not all wetlands were field surveyed (AECOM 2011b, as cited in the FEIS; AECOM 2011c, as cited in the FEIS).The analysis for the land exchange did not require wetland delineations to be performed as no impacts or activities would be occurring on these lands and these lands would be incorporated into Superior National Forest and the USFS's responsibility for managing the lands. If any future activities were to occur on the lands, wetland delineation would then be required.

As stated in FEIS Section 5.3.3.1, the analysis of the wetland resources for the Land Exchange Proposed Action and Alternatives was guided by evaluation criteria that were developed by the USFS and other Co-lead Agencies, which included a comparison of wetland resource acreages, wetland resources types, wetland functions, floodplain acreages, and other water resources acreages. GIS data and field observations were used and then compared over an area of analysis that included the federal and non-federal lands.

The wetland assessment data that was collected for the non-federal lands was performed in the Cowardin et al. (1979) system and the federal lands were collected in Eggers and Reed (1997, as cited in the FEIS) classification system. Since the wetland data was characterized differently, the information is not directly comparable. Therefore, some wetland types were grouped on the non-federal lands and cannot be presented in the same format as the federal lands. The tables presented in 5.3.3 include footnotes explaining that the coniferous bogs on the non-federal lands were grouped with coniferous swamps during field data collection.

Please refer to the response to theme WET 14 for more information on the Land Exchange Proposed Action and Land Exchange Alternative B, including how the land exchange would meet equalization requirements and address EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS).

Theme WET 18

Theme Statement

The SDEIS contains inadequate analysis of the cumulative effects of wetland loss. The analysis should include additional projects (e.g. Northshore Mine, U.S. Steel Minntac mine expansion, U.S. Steel Keetac expansion, United Taconite Tailings Basin, Cliffs Erie's mine pit expansion, mining and/or road improvement projects), additional watersheds beyond the two that would be directly affected such as St. Louis River Watershed, indirect impacts, effects on wetland values, and should differentiate by wetland type and value. The cumulative analysis for wetlands:

- strictly compares wetland acreage between pre-settlement (which is based on imprecise estimates), current, and proposed conditions. Use accurate numbers for wetland acres lost in the area over the past few decades instead of using an unknown pre-settlement number as the baseline;
- should not include the East Pit wetland or the West Pit in its calculations as they would not meet water quality standards. Also referring to the West Pit as deep water habitat, habitat for what?; and

- disregarded the cumulative effects of evaporation drawdown from defoliated ground, accelerated defoliation from drying, dusting, the toxic effects of toxic dust or watering, increase runoff from dry defoliated ground, and draw down from the mine pit on vegetation.

Thematic Response

FEIS Section 6.2.1 describes the rationale for how the cumulative effects assessment areas (CEAAs) were identified for NorthMet Project Proposed Action as well as provides a list of projects and actions that were considered in the cumulative effects wetland analysis. The CEAAs for individual resource areas vary based on the potential for cumulative effects and not on a single overall assessment area. FEIS Section 6.2.3 explains the specific wetland resource CEAA used. The spatial area for the wetland analysis was determined to be the Partridge and Embarrass River watersheds for the DEIS and was determined during the Wetland IAP Working Group that the watershed spatial area would not change from the DEIS. The wetland cumulative effects methodology and assessment approach was developed based on the Wetland IAP Working Group and is presented in the Wetland Analysis Work Plan (PolyMet 2011b, as cited in the FEIS). FEIS Section 6.2.3.1 provides a description of the approach that was used for the wetland cumulative analysis. The direct, indirect, and cumulative assessments that were performed for the NorthMet Project Proposed Action were agreed upon by the Wetland Impact Assessment Planning Group and per the Wetland Analysis Work Plan (PolyMet 2011b, as cited in the FEIS). Furthermore, the east pit is no longer included in the cumulative analysis; however, the West Pit is considered as a deepwater resource (a mine pit water body) in the future. Deepwater resources were estimated for the analysis by using a combination of the MDNR Mesabi Mining Features (2008); interpretation of 2003, 2008, 2009, and 2010 FSA aerial photographs; and NWI datasets. Lake resources (lacustrine water body) acreages were estimated using the USGS National Hydrograph Dataset and the NWI datasets.

The majority of the Northshore Mine is located outside of the CEAA for wetlands; however, that portion of the NorthMet Project Proposed Action that is located within the Partridge River Watershed was included in the analysis. The following projects were not considered in the wetland resources cumulative analysis as they are outside the Partridge and Embarrass River watersheds: U.S. Steel Minntac mine expansion, U.S. Steel Keetac expansion, United Taconite Tailings Basin, and Cliffs Erie's mine pit expansion. Those projects that were considered reasonably foreseeable and within the Partridge and Embarrass River watersheds were considered in the wetland cumulative analysis. Please refer to response to theme CU 02 for more information.

It is difficult to predict potential indirect wetland effects within the CEAA, and difficult to know what the potential indirect wetland effects would be for the projects assessed other than the NorthMet Project Proposed Action. However, based on the amount of potential indirect wetland effects that could occur from the NorthMet Project Proposed Action, there could be 0.1 to 12.0 percent cumulatively lost, in addition to the direct wetland impacts assessed, within the Partridge and Embarrass River watersheds as a result of the NorthMet Project Proposed Action.

Please refer to the response to theme WET 08 for more information on evaporation.

Theme WET 19

Theme Statement

Wetlands that would be impacted by the Proposed Action, including the One Hundred Mile Swamp, have been named an Area of High Biodiversity Significance by the Minnesota Biological Survey, and the U.S. EPA has stated that it is likely an Aquatic Resource of National Importance due to its high biodiversity. In addition, the EIS does not accurately portray the ecological significance, drainage, watershed, or borders of the One Hundred Mile Swamp. Specific concerns include:

- The loss of ecological significant habitat that provides critical habitat to plants and animals;
- the mapping misrepresents the boundary implying that the drainage of the swamp is in one direction only and away from the boundary waters and the area should be reevaluated and mapped;
- delineated boundaries for the One Hundred Mile Swamp do exist and are available at http://www.nationalatlas.gov/streamer;
- 10.4 mile long depression straddling the Laurentian Divide that drains to both the Partridge River which is a tributary to the St. Louis River and Langley Creek which is a tributary to the Rainy Lake (BWCAW) Watershed and therefore the mine cannot possibly be isolated geographically from the BWCAW;
- estimate the proportion of mine waste that flows to the two watersheds by requiring lateral hydraulic conductivity testing in the One Hundred Mile Swamp; and
- disrupting such a large contiguous wetland such as the One Hundred Mile Swamp with its calcareous fens violates Minnesota Statutes 103G.223 of the Minnesota Wetlands Conservation Act, and Minnesota Statutes 84.0895 because of Minnesota's endangered species law.

Thematic Response

FEIS Sections 4.2.4 and 4.3.4 discuss and provide maps of MBS Sites (see Figures 4.2.4-1, 4.2.4-4, 4.3.4-1, and 4.3.4-2) to clarify location and extent of these communities. FEIS Sections 5.2.4 and 5.3.4 include information about the impacts to MBS sites and native plant communities. The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3). FEIS Sections 3.2.2 and 5.2.4 describe mine reclamation activities that would be completed as part of the NorthMet Project Proposed Action, some of which may allow such MBS sites to re-establish. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.

FEIS Section 5.2.3, Table 5.2.3-1, indicates that there would be a total of 758.2 acres of direct wetland impacts at the Mine Site. A portion of the approximate boundary for the One Hundred Mile Swamp would be located within the Mine Site boundary. PolyMet would ultimately need to satisfy both the federal and state mitigation requirements for providing compensatory mitigation for impacts to wetlands. The number of mitigation credits to be earned by replacement wetlands would be determined during permitting by the appropriate agencies reviewing the wetland mitigation plan.

The USEPA reviews and comments on Federal Environmental Impact Statements pursuant to their authorities and responsibilities under the National Environmental Policy Act, Section 309 of the Clean Air Act, and Section 404 of the Clean Water Act. The USEPA has additional authorities under Section 404 of the CWA. Under Section 404(c) of the CWA, the USEPA has the authority to prohibit, restrict, or deny the discharge of dredged or fill material at defined sites in waters of the United States (including wetlands) whenever it determines, after notice and opportunity for public hearing, that use of such sites for disposal would have an unacceptable adverse impact on one or more resources, including fisheries, wildlife, municipal water supplies, or recreational areas. The 404(q) Memorandum of Agreement between the USACE and USEPA provides a procedure considering both agencies' views on projects including procedures for elevating unresolved issues to regional and national levels. The 404(q) process is used by the USEPA when they wish to initiate consultation regarding concerns they may have about the impacts of a proposed project. Elevation of issues related to specific individual permit cases would be limited to those cases that involve aquatic resources of national importance. Procedures for elevation of such specific cases are provided in Part IV - Elevation of Individual Permit Decisions. In these cases the USEPA determines that issuance of the permit would result in unacceptable adverse effects to Aquatic Resources of National Importance. The USEPA raised this as an initial concern in their February 18, 2010 comment letter on the USACE public notice. The SDEIS has addressed many of the USEPA's concerns, and the lead agencies continue to work with the USEPA to address their comments on the SDEIS. The USACE may also consult with the USEPA on issues of interest to them while writing the ROD.

There are no calcareous fens located within the NorthMet Project Proposed Action as confirmed through wetland mapping and field work. WCA requirements would be addressed under the MDNR Permit to Mine.

A National Atlas shows a single wetland complex (referred to as One Hundred Mile Swamp) as straddling the major watershed divide separating the Superior Basin from the Rainy River Watershed. This appears to indicate that this wetland complex creates a conduit for surface water and surficial groundwater originating from the Mine Site to reach the Dunka River, and ultimately, the BWCAW. This single wetland complex shown on the National Atlas is not a delineated wetland; it does not meet the definition in accordance with the Manual (USACE 1987, as cited in the FEIS). The One Hundred Mile Swamp has not been delineated. The FEIS shows the approximate boundary of this complex. Wetlands are delineated using many factors in addition to hydrology; the boundary, as shown on the National Atlas, of the One Hundred Mile Swamp as continuous across this boundary does not equate to a hydrologic connection. There are two hydrologic barriers between the Mine Site and the Rainy River Basin, including:

High ground north of the Partridge River creates a watershed divide separating the Superior Basin and Rainy River Watershed, and prevents surface water from passing between the two.

This major watershed divide is included in the National Atlas, as well as USGS and MDNR data sets. This divide is accurately presented in Figure 4.2.2-1.

Yelp Creek and the Partridge River encircle the north, east, and south sides of the Mine Site. These streams create a hydrologic "sink" for surface water and groundwater originating at the Mine Site. Surface runoff or groundwater seepage leaving the Mine Site would follow a gradient into Yelp Creek or the Partridge River, as opposed to continuing uphill towards the watershed divide (see FEIS Figure 5.2.2-7). Yelp Creek and the Partridge River extend further west (i.e., more fully encompassing the Mine Site) than is shown on the map in question.

If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS sections 5.2.2.3.5, 5.2.2.3.6, and 6.2.2.3.1.

Theme WET 20

Theme Statement

Alternatives for avoiding, minimizing, and/or mitigating impacts to wetlands were not considered. The FEIS should include a thorough sequencing plan that demonstrates adherence to the mitigation hierarchy of avoid, minimize, and mitigate impacts as required by state and federal law and evaluate meaningful alternatives for avoiding and minimizing wetland impacts such as underground mining which was taken out of consideration largely for economic justifications. Furthermore, alternatives for avoiding impacts to wetlands that are difficult to replace should be considered, given how difficult these features are to recreate.

Thematic Response

FEIS Section 5.2.3.3 discusses multiple measures that were assessed to avoid, minimize, and mitigate any potential impacts to regulated wetlands as a result of the proposed project. In addition, several project alternatives were considered including those alternative's potential impacts on wetland resources. As described in 3.2.3.1.2, alternatives to the NorthMet Project Proposed Action were identified in accordance with the requirements of NEPA, CEQ regulations, Forest Service NEPA regulations, and MEQB rules for MEPA.

Alternatives have been developed and evaluated in three stages during the Environmental Review Process; the scoping stage (2005), the DEIS stage (2009), and the SDEIS stage (2011). FEIS Section 3.2.3 includes a discussion of the process and alternatives that were considered for the NorthMet Project Proposed Action. The modifications that have occurred during the development of the EIS have resulted in avoidance and minimization of impacts to wetland resources. To date, these modifications have reduced the acreage of wetlands impacted from 1,257 to 913.8 acres, a 27 percent decrease. In addition to the NorthMet Project Proposed Action, a "No Action Alternative" is also being considered. PolyMet proposes to avoid and minimize wetland impacts through a number of measures that are incorporated into the NorthMet Project Proposed Action. Direct wetland impacts at the Mine Site have been reduced during the development of the NorthMet Project Proposed Action. FEIS Section 5.2.3.3.1 includes six considerations that were proposed in order to avoid unnecessary impacts to wetland resources and seven considerations that were proposed that would minimize impacts to wetland resources as part of the NorthMet Project Proposed Action.

FEIS Section 5.2.3.3 also describes, in depth, the mitigation strategies for the NorthMet Project Proposed Action including how sites were selected, mitigation ratios, and other factors. Please refer to the responses to themes WET 03, WET 05, and WET 06 for more information on siting and mitigation.

The screening of alternatives are described in FEIS Section 3.2.3.1.2 and were evaluated against the purpose and need for the proposed project, the technical feasibility of the alternative, the economic feasibility, the availability of necessary resources to implement the alternative, and the environmental or socioeconomic benefits of the alternative. Alternatives that did not meet the screening criteria were discarded from further consideration. Alternatives that were removed from further consideration are summarized in FEIS Table 3.2-17. Consideration of the Underground Mining Alternative was described in FEIS Section 3.2.3.4.1.

Theme WET 21

Theme Statement

To adequately evaluate wetland composition, structure and function, affected wetlands should be classified using a different classification system, such as the MDNR Native Plant Community (NPC) or the one used by County Biological Survey. In addition, the FEIS should clearly state the criteria used for the baseline wetland evaluation. The FEIS should include:

- description of what is the Eggers and Reed classification System and whether or not other classification system(s) could have been used;
- did the 2010 re-evaluation of wetlands use a lower standard;
- describe in more detail the wetland assessment protocol and the assessment sites used, including the methods used at those locations, why these locations were chosen, and how will they be used (e.g., for monitoring future wetland conditions);
- peer reviewed indicators of ombrotrophic bogs in classifying wetland plant communities and what are ombrotrophic wetlands;
- different types of wetlands are not well defined; and
- who performed the SDEIS classification of wetlands.

Thematic Response

The classification system utilized to characterize wetlands for the NorthMet Project Proposed Action, Wetland Plants and Plant Communities of Minnesota and Wisconsin (Eggers and Reed 1997, as cited in the FEIS, now expanded and updated in Version 3.1 (Eggers and Reed 2014, as cited in the FEIS)), is the same system adopted by the USACE-St. Paul District and Minnesota Board of Water and Soil Resources to track wetland impacts and compensatory mitigation for their respective wetland regulatory programs. This classification system was designed to be rapidly utilized to classify wetland plant communities without extensive vegetative analyses. Eggers and Reed (1997, 2014, as cited in the FEIS) provides a dichotomous key with a progressive series of either/or descriptions of plant community characteristics whereby an investigator is able to quickly and sufficiently classify the plant community being evaluated. Each plant community is described – including composition, structure, hydrology and soils –

along with descriptions, photographs and ink drawings of representative plant species. All wetland classification systems have some limitations; however, the Eggers and Reed (1997, 2014, as cited in the FEIS) methodology sufficiently characterizes and describes the 15 major wetland plant communities that occur in Minnesota. Utilization of a methodology the employs a more complex system of classification would be inefficient, time-consuming and not warranted for most regulatory applications. The purpose of classifying the wetland plant communities within the NorthMet Project area was to characterize wetlands as part of the evaluation of wetland functions, potential adverse impacts, compensatory mitigation requirements, alternative designs/locations for project features, etc. As such, utilization of the classifications described by Eggers and Reed (1997, 2014, as cited in the FEIS) are sufficient for the purposes of an EIS. Furthermore, the Co-lead Agencies agreed to use the Eggers and Reed Classification system for the NorthMet Project Proposed Action as well as have reviewed the accuracy of the wetland characterization, mapping, and surveys.

The 2010 re-evaluation completed by Barr (2011d, as cited in the FEIS) used the same classification standard, Eggers and Reed (1997, 2014, as cited in the FEIS) as did the previous evaluations. As described in FEIS Section 4.2.3, wetland characterization, mapping, and surveys for the NorthMet Project areas were conducted between 2004 and 2010 by PolyMet's contractors. Information for the evaluations conducted for the NorthMet Project Proposed Action utilized multiple data sources, as described in FEIS Section 4.2.3, including: USGS topographic and USFWS NWI maps, aerial photographs, soil survey data, and field investigations. Wetland types are described in FEIS Table 4.2.3-1.

An abbreviated MnRAM functional assessment, which was agreed upon by the USACE, was utilized to assess wetland functions for the Mine Site, Transportation and Utility Corridor, and Plant Site. Please refer to the responses to themes WET 03, WET 05, and WET 07 for more information on how the NorthMet Project Proposed Action considered wetland functions. Please refer to response to theme WET 01 for more information on monitoring.

As described in FEIS Section 4.2.3.1.2, wetlands that are primarily dependent on precipitation for their hydrology are classified as ombrotrophic. Although the hydrology of ombrotrophic wetlands is primarily driven by precipitation, they can have groundwater flowpaths. As such, they may be susceptible to effects from groundwater drawdown associated with mining operations; however, that susceptibility is estimated to be low (Eggers 2015, as cited in the FEIS). Please refer to the response to theme WET 09 for more information on ombrotrophic bogs. Also please refer to FEIS Table 4.2.3-1 for more information on wetland types.

Theme WET 22

Theme Statement

The monitoring plan is of insufficient detail and should include:

- additional reference wells for pre-project monitoring;
- biological monitoring, including annual vegetation surveys, done in conjunction with hydrologic monitoring locations, and hydrologic monitoring using continuous recorders (and collecting data at daily, weekly and monthly intervals) at all sampling sites, with all data collected made available to the Co-lead Agencies and to the public;

- shallow monitoring wells or piezometers and deeper wells at the same locations to provide better evidence of the impacts of groundwater drawdown and might determine whether there is a layer separating the surface from the aquifers;
- weather stations at one or more sites to help distinguish true drawdown impacts from the effects of weather and climate;
- multi-parameter biological monitoring is also recommended, not just of plants with focus on edges of the wetlands and other locations that provide early indicators of hydrologic impacts;
- annual and growing season hydroperiods and hydropatterns are biologically important for determining wetland function and should be reported in consultation with agency staff;
- monitoring parameters at reference wetlands should be the same as impacted wetlands in terms of frequencies, type and locations. Reference locations should be free of all direct and indirect effects from the NorthMet project or other disturbance, including existing or future mining projects, yet close enough in proximity, setting and type that weather and other regional factors are reasonably similar to that of the impacted wetlands;
- monitor all wetlands, including ombrotrophic bogs, for changes in hydrology and wetland plant diversity, assemblage and peat depth which should be done using a scientifically accepted and easily repeatable method such as relevé plots or randomized grid of sample points;
- vegetation plot observations every other growing season by a botanist with experience in identifying peatland plants with reporting to regulatory agency within four months of the observed change, to allow for timely mitigative actions;
- all wetland mitigation should occur within 1 growing season of the observed change;
- monitoring should continue for the life of the mine at all locations, even if indirect effects have been mitigated to ensure that the completed mitigation projects offset the eventual loss of wetland function and area; and
- all species within the plot need to be identified and assigned a semi-quantitative or quantitative measure of abundance and dispersion. In each plot, water samples should be collected from the peat surface (if there is standing water) or shallow pits. Recommended that pH measurements be made at the time of sampling or the end of each sampling day. The water samples should then be filtered and acidified for analysis of cations (but not anions). In addition to the metals and anions most likely to be contaminants from mining operations these measurements also need to include Ca.

Thematic Response

The USACE, MDNR, and MPCA have a suite of approaches for measuring effects for projects and are based on an established set of procedures resulting in a better understanding of project effects. Each project that is permitted by the agencies is tailored to the project and is site-specific. The mitigation and monitoring requirements would be determined during permitting.

The wetland mitigation and monitoring section, FEIS Section 5.2.3.3, has been revised to include additional details on the proposed monitoring and wetland adaptive plan. The wetland mitigation and monitoring would be reviewed and approved by the appropriate regulatory agencies responsible for authorizing the permit application during the permitting process. Monitoring is

proposed within all wetlands containing a potential indirect wetland impact factor rating of 3 to 5 and a sampling of those wetlands with factor ratings of 1 or 2 as described in FEIS Section 5.2.3.3 (see Figures 5.2.3-31 and 5.2.3-32).

Many suggestions were provided regarding how best to quantify indirect impacts. While potential changes to wetland plant communities would be monitored, change in the vegetation community are typically slower to manifest and identify compared to changes in hydrology. The USACE believes that closely monitoring hydrology early and often during the NorthMet Project Proposed Action provides sufficient assurances of observing any indicators of anticipated changes to the wetland communities.

Theme WET 23

Theme Statement

The FEIS should acknowledge, and its impact assessment discussion should reflect the fact that the proposed Project would result in the largest permitted loss of wetlands in the history of the state of Minnesota.

Thematic Response

These comments generally stated that the FEIS should acknowledge the extent of loss of wetlands from the NorthMet Mining Proposed Action. The FEIS does describe the amount of wetlands that would be impacted by the NorthMet Project Proposed Action and how this impact would be mitigated through the USACE and State of Minnesota permitting process after issuance. The USACE's ROD would reference information in the FEIS and present any additional information required by the USACE to support its permit decision. The final evaluation and determination in the ROD would be made pursuant to the USACE's statutory authority and regulatory responsibilities under NEPA, the CWA, the 404(b)(1) Guidelines, the USACE's Public Interest Review, and other applicable laws and regulatory requirements. No changes were made to the FEIS as a result of these comments Furthermore, WCA requirements would be addressed under the MDNR Permit to Mine.

Theme WET 24

Theme Statement

General opposition to the Project due to impacts on wetlands

Thematic Response

These comments generally opposed the NorthMet Project Proposed Action on the grounds of its impact on wetlands. Because no specific information was provided, no changes were made to the FEIS.

Theme WET 25

Theme Statement

General support for the Project due minimization of impacts on wetlands and the reclamation and mitigation plans that would replace the wetlands lost due to mining.

Thematic Response

These comments generally supported the NorthMet Project Proposed Action because it would have minimal impact on wetlands. Because no specific information was provided, no changes were made to the FEIS.

A.5.22 Issue: Terrestrial Wildlife Species (WI)

Theme WI 01

Theme Statement

The FEIS should provide additional analysis of direct, indirect, and cumulative effects (including those from the changing climate) on ETSC, RFSS, SGCN, migratory species, and common wildlife species, and should incorporate the August 19, 2013, Minnesota ETSC species status list, along with any federal status changes. Sensitive species should be moved to suitable adjacent habitats, and alternative mitigation should be considered (e.g., accelerated revegetation of the Mine Site after closure). Local knowledge could be used to assess current wildlife habits (e.g., for nesting eagles). Species of concern include moose, Canada lynx, gray wolf, long-eared bat, migratory bird species, bald and golden eagles, black bear, belted kingfishers, hooded mergansers, common terns, common loons, black-backed woodpecker, boreal owl, spruce grouse, Northern goshawk, wood turtle, and the monarch butterfly.

Thematic Response

FEIS sections 4.2.5, 4.3.5, 5.2.5, and 5.3.5 (Wildlife) have been updated to include the new state endangered, threatened, and special concern (ETSC) status listings from August 19, 2013, as well as new federal status listing changes (northern long-eared bat and gray wolf). FEIS Section 5.2.4.2 provides a listing of MDNR-acceptable potential mitigation measures for impacts on habitat. These mitigation measures would be decided upon at the time of permitting. Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process. MDNR generally does not consider relocation of sensitive species to be an acceptable mitigation measure because may have unanticipated effects on other organisms at the new site. Additional discussion has been added to the FEIS regarding wildlife species, especially those species whose status was changed (Canada lynx, northern long-eared bat, gray wolf, moose, little brown myotis, eastern pipistrelle, boreal owl, northern goshawk, Laurentian tiger beetle, Freija's grizzled skipper, taiga alpine, Nabokov's blue, and bald eagle).

Theme WI 02

Theme Statement

The NorthMet Proposed Project and Land Exchange would lead to a net loss and fragmentation of wildlife habitat, wetlands, and biodiversity sites. These effects will be exacerbated by climate change, especially for sensitive species. The Land Exchange guidelines should be reconsidered, and similar habitats should be restored on site and elsewhere. A thorough evaluation is essential, given the risks and potential effects to natural resources. An assessment of all habitats, including local and regional ecology, could be used as a basis for a more thorough recovery plan. Areas of concern include the MDNR Headwaters Site, the Sand Lake Peatlands Scientific and Natural Area, the USFS Big Lake candidate Research Natural Area, Superior National Forest, designated Important Bird Areas, Areas of High Biodiversity Significance, and wetlands as Critical Canada lynx habitat and important moose, fish, and invertebrate habitat.

Thematic Response

The FEIS wildlife sections include information about NorthMet Project Proposed Action impacts to wildlife habitat types and Minnesota Biological Survey (MBS) Sites of Biodiversity Significance. FEIS Sections 4.2.4 and 4.3.4 provide maps of the MBS Sites (Figures 4.2.4-1, 4.2.4-4, 4.3.4-1, 4.3.4-2). The WCA rules (including those parts applicable to mining projects under *Minnesota Rules*, part 8420.0930) include a special consideration for wetlands that are rare natural communities (*Minnesota Rules*, part 8420.0515, subpart 3).

Minnesota Rules, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. The Permit to Mine would address special consideration of wetlands that include rare natural communities. Additional information on rare natural communities would be included in the wetland permit application as part of the Permit to Mine process for further refinement of site-specific conditions.

FEIS Sections 4.2.5.1.1 and 5.2.5.2.2 discuss the additive effect of climate change on moose. As described in the response to theme AIR 01, there is little information in the literature specifically on climate change in Northern Minnesota. Information related to weather trends in the Midwestern United States (based on rainfall measurements, storm damage costs, and other information) is incorporated into FEIS Section 5.2.7.

Theme WI 03

Theme Statement

The FEIS should provide additional analysis of direct, indirect, and cumulative effects (including water, air, and noise pollution, and increased vulnerability due to climate change) on wildlife (e.g., moose and browsing habits, train collisions, additional energy expenditures) and wildlife travel corridors due to the Project and the Land Exchange. In particular, the FEIS should discuss mitigation measures for effects on corridors and species. A new wildlife corridor study should be undertaken, wildlife corridors should be designated and protected, and particular attention should be given to cumulative effects on Corridor 17. Contradictory language about the lynx's use of

corridors such as roads should be revised. Species of concern include moose, Canada lynx, aquatic animals, small vertebrates, wood turtle, and invertebrates.

Thematic Response

The FEIS wildlife sections include an analysis of the wildlife corridors, including their use by various species. The FEIS Section 6.2.5.4.2 discusses cumulative effects to several wildlife corridors, including Corridor 17. The NorthMet Project Proposed Action and other cumulative projects would result in loss and fragmentation of habitat near Corridor 17, and noise and activities during operation would likely discourage wildlife use. *Minnesota Rules*, part 6132.2700 requires that a project site be reclaimed once mining has ceased. The goals of such reclamation are to "control erosion, to screen mining areas from non-compatible uses, and to provide for subsequent land uses such as wildlife habitat or timber production." The rules also include requirements about the characteristics and planting schedule for vegetation used in reclamation. Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process.

Theme WI 04

Theme Statement

Pollution from dust or windborne or waterborne chemicals such as arsenic, mercury, manganese, thallium, copper, nickel, or sulfuric acid, and light pollution from the Project would impact wildlife species such as the common loon, mink, or birds that depend on fish or other aquatic organisms, near and downstream of the Project. The FEIS should model these effects, should more thoroughly identify opportunities for mitigation, and should include a plan to discourage wildlife (e.g., waterfowl) use of mine pit lakes and the Tailings Basin.

Thematic Response

FEIS Section 5.2.5.2.3 includes descriptions of impacts to wildlife, including light and chemical pollution. The wildlife analysis utilizes the modeling in the Water Resources (FEIS Section 5.2.2), Air Quality (FEIS Section 5.2.7), and Visual Resources (FEIS Section 5.2.11) sections to analyze the types of potential wildlife effects. As stated in FEIS Section 5.2.5.2.3, the West Pit and WWTF ponds would be fenced to deter wildlife species from using the water. It is unlikely for the West Pit to provide quality foraging habitat as there would be a lack of emergent or submerged vegetation along the pit limits. Any water discharged from the pits would be treated to meet water quality standards and would not likely affect wildlife species downstream of discharge. As discussed in FEIS Section 5.2.6, the NorthMet Project Proposed Action would meet all Class 2B (aquatic life) water quality standards with the possible exception of aluminum and lead in the Embarrass River. These findings are applicable to non-aquatic species that use the Embarrass River. The responses to themes AIR 04 and AIR 09 discuss the assessment of potentially reactive dust, and the Secondary National Ambient Air Quality Standards that would be protective of vegetation and wildlife. The response to theme MERC 02 provides more information about how mercury bioaccumulation was estimated.

Theme WI 05

Theme Statement

The FEIS should provide additional analysis regarding effects on wildlife (e.g., moose, Canada lynx, gray wolf, northern long-eared bat) displaced by the NorthMet Project due to noise/vibration or habitat disturbance. This analysis should include effects on population dynamics, carrying capacity, and the local ecosystem, and should include an evaluation of potential effects at the local and regional level.

Thematic Response

The FEIS wildlife sections include an analysis of wildlife displacement effects due to the NorthMet Project Proposed Action. FEIS Section 5.2.5.2.3 discusses the potential effects to species based on habitat preferences, and uses available scientific literature to analyze displacement effects on local and regional ecology due to noise or increased human activities. The wildlife analysis cross-references FEIS Section 5.2.8 (Noise). The response to theme N04 also discusses potential effects on wildlife. Although wildlife species are likely to be sensitive to changes in noise levels, there are no local, national, or international standards or limits that are applicable to the NorthMet Project Proposed Action. Information about each individual species' tolerance of noise and vibration may not be available.

Theme WI 06

Theme Statement

The FEIS should describe how Project-related hydrologic changes and flow level fluctuations would affect amphibians and other sensitive wildlife species. The FEIS should also provide more details on long-term beaver control.

Thematic Response

The FEIS wildlife sections include an analysis of hydrology changes and impacts to amphibians or other sensitive species. As cited in the Wetlands Data Package (PolyMet 2015b, as cited in the FEIS), the XP-SWMM model estimates that changes in the average annual flow of the Partridge and Embarrass rivers would be within naturally occurring annual variation; thus, there would be limited hydrologic changes. As a result, effects to amphibians and other sensitive wildlife species due to hydrologic changes would be limited. The Reclamation Plan (PolyMet 2015g, as cited in the FEIS) explains that when roads or railroads are abandoned, culverts would be removed to prevent damming and access impediments for aquatic life. These locations would also be graded and vegetated to provide a stable stream bank.

The Reclamation Plan (PolyMet 2015g, as cited in the FEIS) states that during reclamation monitoring and maintenance, areas that have been damaged by erosion, animal activity (e.g., beaver dams), or that have lost vegetation would be identified and repaired.

Theme WI 07

Theme Statement

The SDEIS does not consider effects on animal populations and wildlife corridors from accidents, system failures, and unforeseen or catastrophic events.

Thematic Response

The FEIS wildlife sections cross-reference FEIS Section 5.2.13 (Hazardous Materials), which discusses probabilities of accidents, spills, system failures, or unforeseen events. FEIS Section 5.2.13 also states that, given the project design and operational commitments, there would be no significant adverse effects expected from the proposed use or generation of hazardous wastes by the NorthMet Project Proposed Action. FEIS Section 5.2.14 (Geotechnical Stability) also discusses slope and dam design, stability, monitoring, and adaptive management of the Tailings Basin and or Hydrometallurgical Residue Facility to reduce the risk of failure. Effects to animal populations and wildlife corridors due to accidents or system failures are not anticipated.

Theme WI 08

Theme Statement

The cumulative effects analysis should be expanded to consider effects on wildlife associated with climate change, and should generally provide the kind of detailed analysis required by NEPA. Analysis should include all projects seeking hard rock mineral prospecting permits, as well as state or local transportation projects. Lake Superior and the St. Louis River should be reconsidered in the cumulative effects analysis.

Thematic Response

FEIS Section 6.2.5, along with the rest of Chapter 6, has been updated since the SDEIS to include additional cumulative projects. The spatial assessment area for each resource has been described along with the rationale for why it is considered adequate in scope.

As described in the response to theme AIR 01, there is little information in the literature specifically on climate change in Northern Minnesota. Information related to weather trends in the Midwestern United States (based on rainfall measurements, storm damage costs, and other information) is incorporated into FEIS Section 5.2.7.

Theme WI 09

Theme Statement

The FEIS should provide additional analysis of effects on wildlife species used for subsistence and/or harvest (game and furbearer species), as well as those considered culturally important to the Bands (e.g., moose), especially within the 1854 Ceded Territory.

Thematic Response

The FEIS wildlife sections provide an analysis of wildlife species used for subsistence/harvest, as well as those culturally important to the Bands. FEIS Section 4.2.9.3.3 identifies species potentially harvested in the 1854 Ceded Territory, while FEIS Section 5.2.9.2.2 explains that a

lack of data regarding use of such species in the NorthMet Project area likely indicates limited present day use in that area due to general inaccessibility. FEIS Section 5.2.5.2.5 discusses the types of potential effects to common and/or game species, which are similar to effects on ETSC species. The FEIS has been revised to include additional detail regarding moose, and this discussion has been moved to the state ETSC species discussion, due to its new state listing status. The response to theme CR 01 also discusses effects to resources important to the Bands.

Theme WI 10

Theme Statement

The FEIS should fully evaluate West Pit Backfill, Underground Mine, or other alternatives to evaluate whether their effects on wildlife and wildlife habitat (in particular Canada lynx) would be less than in the Proposed Action. The FEIS should also consider additional alternatives and mitigation techniques, such as the construction of wildlife tunnels, widening of culverts, and the use of fencing.

Thematic Response

The FEIS wildlife sections have been revised to incorporate changes to the Project Description since the SDEIS, as they relate to impacts on wildlife species or habitat. Mitigation measures would be considered during the Endangered Species Act Section 7 consultation process, and decisions on incidental take would be determined at its conclusion. The FEIS Section 5.2.5.2.3 (Wildlife Corridors) discusses road underpasses (i.e., tunnels) and overpasses. It also discusses examples of low-cost mitigation measures, which could include passage benches under bridges, fencing sizes and options, and offset culverts. The Underground Mine, West Pit Backfill, and other alternatives have been screened against several factors, including the Purpose and Need, technical and economic feasibility, availability, and environmental or socioeconomic benefit. FEIS Section 3.2.3.3 describes alternatives (including the West Pit Backfill and Underground Mine) that have been considered but eliminated from detailed analysis in the EIS. The responses to themes ALT 01 and ALT 03 provide additional information about the Underground Mine and West Pit Backfill alternatives, respectively. FEIS Section 5.2.5.2.3 states that the West Pit and WWTF ponds would be fenced to deter wildlife species from using the water. The Reclamation Plan (PolyMet 2015g, as cited in the FEIS) explains that when roads or railroads would be abandoned, culverts would be removed to prevent damming and access impediments for aquatic life. These locations would also be graded and vegetated to provide a stable stream bank resembling natural conditions. FEIS Table 7.3.5-1 discusses the land exchange alternatives presented in the FEIS to compare effects to wildlife species.

Theme WI 11

Theme Statement

Conclusions in the FEIS should reference and be consistent with the Biological Assessment/Biological Opinion, the Endangered Species Act consultation, and Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act compliance. In particular, the FEIS should ensure consistency when addressing the Canada lynx survey and habitat, mercury risks, and northern long-eared bat habitat.

Thematic Response

The FEIS wildlife sections discuss conclusions from the Biological Assessment (Appendix D of the FEIS)/Biological Opinion and the Endangered Species Act consultation, including conclusions regarding Canada lynx surveys and habitat, mercury risks, and northern long-eared bat. The Biological Assessment has been revised to further clarify Canada lynx surveys, and states that no lynx sign was found on the federal lands or Projects areas, and that lynx sign was found 5 miles south and east of the Mine Site. The Biological Assessment states that the NorthMet Project Proposed Action is likely to adversely affect Canada lynx, and may affect but is not likely to adversely affect Canada lynx critical habitat. Should the northern long-eared bat be listed as threatened or endangered under the ESA, the NorthMet Project Proposed Action may affect but is not likely to adversely affect the northern long-eared bat. The USFWS determined that critical habitat for the northern long-eared bat is not determinable at this time.

Theme WI 12

Theme Statement

The FEIS should discuss how the Project conflicts with or conforms to wildlife-related Forest Plan objectives.

Thematic Response

FEIS Section 5.2.5 discusses Forest Plan objectives in light of unsuitable habitat percentage within Lynx Analysis Units (LAU). For example, FEIS Section 5.2.5.2.1 explains that the percentage of LAU 12 unsuitable for lynx would increase from 4.0 to 6.1 percent under the NorthMet Project Proposed Action. The Forest Plan guideline G-WL-3 states that unsuitable habitat not exceed 30 percent of the LAU.

Theme WI 13

Theme Statement

The risks to sensitive and biodiverse ecosystems—the BWCAW, Lake Superior, and Superior National Forest—and to wildlife and wildlife habitat are too great to proceed with the Project as proposed.

Thematic Response

This comment has been received and acknowledged by the Co-lead Agencies. Impacts to wildlife species and habitats are addressed in FEIS Sections 5.2.5 and 5.3.5.

A.5.23 Issue: Wilderness and Special Designation Areas (WILD)

Theme WILD 01

Theme Statement

The SDEIS fails to adequately analyze, and/or incorrectly characterizes effects on wilderness and special designation areas, including the Superior National Forest, the BWCAW, Voyageurs National Park, and Quetico Provincial Park. Further information is required to assure the public that wilderness will be preserved and protected.

Thematic Response

The FEIS analyzes and characterizes the impacts to wilderness and other special designation areas in FEIS Section 5.2.12. This section uses data presented in Section 4.2.12 for wilderness or special designation areas (including the Superior National Forest, BWCAW). Both Voyageurs National Park and Quetico Provincial Park are outside of the 25 mile analysis area for the NorthMet FEIS and therefore have not been analyzed as no impacts are expected to these areas.

Theme WILD 02

Theme Statement

The NorthMet Mining Project will have unacceptable impacts on the BWCAW , Voyageurs National Park, Superior National Forest, and Lake Superior. Northeast Minnesota should remain pristine and untouched by industrial pollution.

Thematic Response

The NorthMet Project Proposed Action will have no direct effects on wilderness and special designation areas. Please see FEIS Section 5.2.12 for further discussion of this.

Theme WILD 03

Theme Statement

As demonstrated by the SDEIS, the NorthMet Mining Project would not adversely affect the BWCAW and Superior National Forest.

Thematic Response

The impacts from the NorthMet Project Proposed Action on wilderness and other special designation areas are discussed in detail in FEIS Section 5.2.12.2.

A.5.24 Issue: Water Resources (WR)

Please note that, due to the complexity of the subject matter, Themes WR 025, WR 060, and WR 173 each have several subthemes.

Theme WR 001

Theme Statement

When sulfide ore is exposed to water and oxygen, sulfuric acid is produced. A decrease in rock particle size increases the surface area exposed to water and oxygen. As acid dissolves rock, heavy metals are released. Natrojarosite would dissolve and cause acidity.

Acid mine drainage would start sooner than expected, occur for too long and pH would be lower than expected. The Tailings Basin would become acidic. Ferrous mine tailings produce acid runoff. Sulfuric acid, mercury and other metals contaminate water and impact human and aquatic life, wildlife and ecosystems.

The SDEIS does not describe how the future pH of leachate from waste rock and mine pits is predicted, why not all sulfide sulfur has the same potential for release, that predictions of pH are highly uncertain though likely underestimated, and how low pH would be effectively mitigated.

Thematic Response

Solution pH is a dynamic chemical condition, and the GoldSim model did not attempt to predict the actual pH of leachate from the various NorthMet facilities. However, sulfide mineral oxidation in mine waste does cause pH to decrease, and this causes an increase in oxidation rates, modeled concentration caps, and associated solute concentrations in leachate. These effects from pH decreases are incorporated explicitly into the GoldSim model for both non-acid-generating and acid-generating waste.

The non-acid-generating materials are tailings and Category 1 waste rock (0.12 percent sulfide S or less). This classification is based on humidity cell tests operated on 38 samples of NorthMet Category 1 waste rock continuously between 187 to 337 weeks, [PolyMet 2015q, as cited in the FEIS]). None of these materials produced acidic leachate (see time plots of effluent pH in "Attachment 2 Trend Analysis for Rock Humidity Cells" to "Attachment A Water Quality Modeling for Waste Rock and Pit Walls" [PolyMet 2015q, as cited in the FEIS]). The 0.12 percent sulfide S threshold for defining non-acid generating rock is supported by these multi-year humidity-cell tests, which indicate that sulfide minerals oxidize in approximately proportional to the concentration of sulfide, so that the oxidation rate (and thus the acid-production rate) decrease over time as the sulfide sulfur is consumed (PolyMet 2015q Attachment C, as cited in the FEIS). Between approximately 100 and 200 weeks after starting the kinetic tests, the pH of the effluents reaches a minimum, and thereafter the pH becomes steady or increase slightly (PolyMet 2015q, as cited in the FEIS). Thus, the GoldSim model of the tailings incorporates an estimated range for pH, but not temporal trend. Based on the measured pH in multi-year weathering tests on tailings (and also results from tests on Category 1 waste rock, which is also less than 0.12 percent sulfide S), and incorporating a small correction for the possibility that carbon dioxide pressure may be higher in the tailings s than in the atmosphere, the PolyMet tailing effluent over the long-term (i.e., 50 to 100 years, and beyond)

should range between pH of approximately 7.1 and 7.7, and the general trend should be fore pH to increase from the low end to the high end of this pH range with increasing time (PolyMet 2015q, as cited in the FEIS).

In the net-acid-generating waste, the effect of pH is incorporated by accounting for the duration of exposure before onset of acidic conditions (mean values range from 0 for Virginia Formation to 6.8 years for Duluth Complex), and the increase in oxidation rates and concentration caps that occur with acid onset ([PolyMet 2015q, as cited in the FEIS). Once acidic conditions begin, the model accounts for the rapid increase in oxidation rate and then associated decay as an increasing fraction of the original sulfide is consumed (PolyMet 2015q, as cited in the FEIS). Concentration caps also increase as the rock pore water changes from neutral to acidic (PolyMet 2015q, as cited in the FEIS; Barr 2012c, as cited in the FEIS). Leachate from these acid-generating materials are managed so that leachate is captured, either on lined facilities (Category 2/3, Category 4, and ore) or in pits (wall rock of East Pit and West Pit, or backfill to the East Pit) and treated prior to discharge.

The FEIS contains additional detail on the issue of how future pH of leachate is predicted; see FEIS Section 5.2.2.2.3 for more information.

Theme WR 002

Theme Statement

Lack of acidic leachate and pollutants from submerged waste rock and mine pit walls is assumed rather than verified by empirical data and testing. Impacts of high levels of chlorides in the inundated East Pit, Central Pit, and West Pit are not accurately evaluated. Other sources of chloride need to be identified as well. Pits should be lined and bentonite should be considered.

Thematic Response

The rate of oxidation and associated release of acidity and metals from waste rock and wall rock after it is submerged under water is discussed in the NorthMet Project Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS). An analysis based on the rate of oxygen diffusion in water found that after the waste rock was submerged by a layer of oxygenated water, the rate of oxidation in the rock would decrease by a factor of 1,000 relative to the oxidation rate when it was exposed to atmospheric oxygen. The analysis was based on the following two references: 1) Day, S. NorthMet Project Geochemical Uncertainty Analysis for Proposed Action - DRAFT [Memorandum to PolyMet and Barr] October 10, 2008 (Day 2008); and 2) Morin, KA. Rates of sulfide oxidation in submerged environments: Implications for subaqueous disposal. Proceedings of the 17th Annual Mine Reclamation Symposium. Port Hardy, British Columbia: Mining Association of British Columbia, May 4-7, 1993. pp. 235-247 (Morin 1993). Based on this analysis, which is consistent with general results of studies on subaqueous disposal of sulfide-bearing mine waste, the GoldSim model assumed that oxidation in submerged wall rock and waste rock was negligible. Waste rock in the East Pit backfill could undergo slow oxidation by oxygen dissolved in groundwater flows into the pit, and the solutes produced by this mechanism would be subject to capture and treatment of the pore water in the backfill.

Regarding chloride in inundated pits, the GoldSim model incorporates the release of chloride to the backfilled pits, with release rates based on measured chloride leached from waste rock in the weathering tests (i.e., humidity cells). The West Pit Lake, and backfilled East and Central pits,

are included in the monitoring and management planning, so that water from these would be pumped out and treated to achieve water quality targets.

Theme WR 003

Theme Statement

The gaging data used to estimate Partridge River and Embarrass River baseflows are inappropriate. The SDEIS baseflow estimates are based on gaging stations located many miles downstream of the Mine Site and Plant Site and use data that were collected decades ago. Current and future estimated baseflows using this data are unreliable.

Thematic Response

Groundwater baseflows used in the SDEIS are best-estimate values and were retained in the FEIS. SDEIS groundwater baseflow values were based on: 1) winter 1986-1987 and winter 1987-1988 USGS stream gaging in the Partridge River at SW-006--a time when there were no discharges from the Northshore Mine Peter Mitchell Pit; and 2) 1942-1963 gaging data in the Embarrass River, which includes years prior to the LTVSMC Tailings Basin startup (1957). When expressed as a groundwater baseflow yield per unit area, the similar results for both watersheds (approximately 0.05 cfs per square mile) support the approach used. The yield-per-unit area is similar to other watersheds in northern Minnesota. Studies have shown that streamflow characteristics in this part of Minnesota have not changed systematically over the last 50 years.

The only other available gaging data are from a station installed in 2011 at SW-003 on the Partridge River. However, interpretation of groundwater baseflow at SW-003 is not reliable for use in the GoldSim modeling of groundwater baseflow due to the complicating effects of Peter Mitchell Pit pumped discharges, seepage from the Northshore West Pond, and complex storage and release mechanisms in the wetlands that receive these flows.

More broadly, groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms continued reliance on the 1986-1987 USGS data for the Mine Site in the FEIS.

To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted NorthMet Project Proposed Action impacts would be sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. The results indicate that modeled groundwater and surface water concentrations are moderately sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in groundwater baseflow.

Theme WR 004

Theme Statement

Recent and ongoing gaging data collected in the Partridge River was not used in the SDEIS and must be incorporated into the baseflow analyses.

Thematic Response

The MDNR gage data were evaluated in determining the groundwater baseflow estimates for the FEIS. While the low-flow analyses conducted for SW-003 are considered high-quality, it is uncertain if the results can provide reliable estimates of groundwater baseflow for use in GoldSim due to the complicating effects of: 1) pumped discharges from the Northshore Mine Peter Mitchell Pit, 2) seepage from the Northshore West Pond, and 3) complex storage/release mechanisms in the wetlands that receive these flows. These confounding factors associated with use of the SW-003 gage data make using this information in GoldSim problematic. See the response to theme WR 003 for additional information on the groundwater baseflow determination.

Theme WR 005

Theme Statement

Mine Site baseflow does not accurately consider the effects of the Northshore Mine pit dewatering discharge. The use of a higher baseflow value would lead to higher recharge into groundwater, which would decrease solute transport times in groundwater. Higher recharge would also increase the expected groundwater inflow into the dewatered mine pits.

Thematic Response

In GoldSim, groundwater baseflow to the Partridge River and Northshore discharge to the Partridge River are two unrelated flow inputs, which are quantified separately in the model. One does not affect the other. Groundwater baseflow is a natural process (related to aquifer recharge) and Northshore discharge is human-controlled. In quantifying groundwater baseflow at the Mine Site, the complicating effects of Northshore discharge were removed from the analysis by using stream gaging data for a time period when Northshore was not discharging to the river. Northshore discharge is not part of groundwater baseflow as defined in the Mine Site GoldSim model and is therefore not relevant to determining aquifer hydraulic conductivity, areal recharge, or groundwater travel times.

The flow inputs from the Northshore Mine to the Partridge River include more than just pumped discharges at SD-009. Northshore Mine inputs to the river also include: 1) seepage from the Western Pond (which has been observed but cannot be directly measured), and 2) wetland storage and release mechanisms of previously pumped discharges. It is unlikely that flow inputs from the Northshore Mine to the Partridge River go to zero when there is no pumped discharge at SD-009.

The FEIS improves upon the SDEIS modeling by relying on recomputed Northshore flowrates using updated chemical data for surface water, groundwater, and Northshore discharge water.

The updated value is a constant 2.6 cfs at a sulfate concentration of 28 mg/L, which is considered to be a reasonable modeling approximation of a highly variable hydrologic regime.

As reported in the FEIS, PolyMet performed a sensitivity analysis of Partridge River groundwater baseflow to assess the sensitivity of model parameters and results to this input. The analysis involved increasing groundwater baseflows by a factor of four and recalibrating the MODFLOW groundwater model and GoldSim existing conditions model to incorporate this change. The factor of four increase did not reflect a reinterpretation of stream gaging data or the idea that actual groundwater baseflows could be that high. It was a hypothetical increase used to stress the models so that the sensitivity of model results could be assessed. As expected, with higher groundwater baseflows, the following model sensitivities were identified: 1) aquifer recharge was higher; and 2) surficial aquifer hydraulic conductivities were higher, pit inflows were higher, and groundwater chemical transport to the Partridge River was faster. An important result was that some chemical concentrations in the river were higher, but the increases were not sufficient to change conclusions regarding the NorthMet Project Proposed Action impacts.

Theme WR 006

Theme Statement

The Mine Site GoldSim model incorrectly assumes constant discharge from the Northshore Mine to the Partridge River; however, the pumping rates and timing from the Northshore Mine are highly variable and may cease in the future.

Thematic Response

It is acknowledged that pumped discharges from the Northshore Mine are sporadic and vary in magnitude. This discharge greatly affects the flow of the Partridge River. There are two sources of the Northshore Mine to the Partridge River that are more continuous and have less variable flow: Western Pond seepage and wetland storage and release (of previously pumped water). GoldSim consolidates these flows into a single integrated Partridge River input that has a constant flow rate and uniform chemical concentrations. This constant rate input adequately characterizes flow from the Northshore Mine. For the FEIS analysis, this flow was increased to 2.6 cfs and the concentration of sulfate was increased to 28 mg/L.

Theme WR 007

Theme Statement

With regard to bedrock at the Mine Site, there is inadequate or inaccurate characterization, insufficient field testing, and an inadequate number of monitoring wells. There has been no study that proves or disapproves that water pollution would migrate via natural permeability or existing fractures. Additional evaluation is needed.

Thematic Response

Bedrock testing at the Mine Site consisted of:

- Five single-borehole specific-capacity tests conducted in deep coreholes located within the southern portion of the proposed West Pit. These tests were conducted primarily in

the Duluth Complex and are considered most representative of bedrock between the Mine Site and the Partridge River.

- Five single-borehole specific-capacity tests conducted in deep coreholes located near the northern boundaries of the proposed West Pit and East Pit. These tests were conducted primarily in the Duluth Complex, but relatively close to its contact with the Virginia Formation.
- Four multiple-well pumping tests conducted along or near the northern boundaries of the proposed mine pits. These tests were conducted in both the Duluth Complex and Virginia Formation.

The bedrock tests provided reliable transmissivities and hydraulic conductivities of the Duluth Complex and Virginia Formation for impact assessment. In addition, bedrock hydraulic conductivities were estimated from calibration of the Mine Site MODFLOW model. The testing and model calibration program provided adequate characterization of bedrock properties at the Mine Site.

It is recognized that measured hydraulic conductivities from single-borehole tests performed in coreholes can sometimes underestimate the true in situ hydraulic conductivity. In consideration of this possibility and the interpretation that upper bedrock may be more permeable than deeper bedrock, the P50 (mode) hydraulic conductivity of bedrock flowpaths in the Mine Site GoldSim model (3.0 x 10-3 meters/day) was 21+E13 times greater than the geometric mean of values from the five Duluth tests conducted in the southern portion of the proposed West Pit (1.4 x 10^{-4} meters/day).

Bedrock water sampling was conducted in the following wells:

- Three aquifer test pumping wells located along or near the northern boundaries of the proposed mine pits that were sampled during 2005 and 2006. These wells were completed in both the Duluth Complex and Virginia Formation.
- Five observation wells located near the aquifer test pumping wells that were sampled between 2006 and 2013. Two wells were completed in the Duluth Complex and three were completed in the Virginia Formation.

The number of bedrock sampling wells and sampling events at the Mine Site is sufficient for the FEIS. See FEIS Section 5.2.2.3.2 for further information.

Comments cite a November 24, 1976 MPCA memorandum titled, “Minnamax Exploration Project Tour” that pertains to the historical Minnamax/Amax exploration project located 1 to 2 miles east of the NorthMet Project area. The relevant text in this memo is as follows:

The depth of the [exploration] shaft, at the time of the inspection was approximately 520 feet. At the 147 foot level, a fracture zone was encountered. Approximately 14 gallons a minute of water was infiltrating into the shaft. The fracture was grouted and sealed. In the core drilling operation, the fracture was noted; however, it was not identified as a water bearing fracture. In the core drilling, another fracture zone was identified at the 900 foot level. It is possible that additional water would be encountered at 900 feet.

It is uncertain if the observations made during this shaft excavation can be realistically applied to bedrock at the NorthMet Project area. The historical Minnamax/Amax project was located miles

away from the NorthMet project and it is uncertain if geologic units and structures penetrated by the shaft are similar to those in the location of the NorthMet project. Further, it is not stated in the memo if the 14 gpm inflow was a sustained flow or if it decreased over time as commonly occurs in fractured rocks. The comments do not indicate if the fracture zone identified by core drilling at 900 feet caused significant inflows when the shaft reached that depth. It would be speculative to characterize the NorthMet Project area using observations made in the referenced MPCA memorandum.

Comments also cite a September 8, 1976 MPCA memo titled, "Amax Exploration, Incorporated Salt Water Spill" that discusses saline water encountered in an air-driven downhole hammer borehole at the Minnamax/Amax site. The relevant text in this memorandum is as follows:

The [saline] discharge began after hitting a confined pocket of water at the 1391 foot level on July 13, 1976. Although large quantities of water, as much as 275 gallons a minute, were being discharge, the drilling operation was continued to July 15.

It is uncertain if observations described in the MPCA memorandum are relevant to the NorthMet Project area including bedrock types and hydrogeologic conditions. The maximum depths of proposed NorthMet pits (approximately 700 feet) would be far less than 1,391 foot depth at which saline water was encountered at the Minnamax/Amax site. It is also uncertain if the 275 gpm flow rate was short-term or maintained for an extended period of time. Note that inflows to the PolyMet mine pits would be treated by the WWTF during operations, reclamation, and closure, so if saline water were encountered, it would be treated and discharged at concentrations meeting applicable water quality standards. See FEIS Section 5.2.2.3.2 for a discussion of potential impacts from saline waters.

In response to fracture flow issues raised, the FEIS expands the SDEIS analysis by further evaluating the possibility of fractures and faults at the Mine Site and Plant Site to determine what (if any) changes would be made to model assumptions to more accurately predict potential environmental effects for purposes of environmental review. Note that PolyMet proposes to grout and seal any permeable, water-bearing fractures identified in the mine pit walls during excavation. These issues are further discussed in FEIS Sections 4.2.2.2.1 and 5.2.2.2.1.

Theme WR 008

Theme Statement

With regard to bedrock at the Plant Site, there is no site characterization, no monitoring wells, and no field testing. Hydraulic and water chemistry data from discrete intervals in shallow (less than 50 feet) bedrock at the Tailings Basin would be useful to test the inference of a no-flow bedrock boundary. Bedrock groundwater chemistry could be useful at the Plant Site because constituents resulting from past activities at the former LTVSMC Tailings Basin may serve as a tracer to better understand solute transport through the bedrock. Additional evaluation is needed.

Thematic Response

The comments in this theme correctly note that there are no bedrock monitoring wells between the Tailings Basin and the Embarrass River.

During winter 2013-2014, an investigation of bedrock was conducted along the north, northwest, and west perimeter of the Tailings Basin. The investigation included five coreholes advanced

into upper bedrock and 10 packer tests conducted in these holes. The investigation provided rock core, Rock Quality Designation data, and hydraulic conductivity of discrete intervals within the upper bedrock. The results of this investigation are reported in the document titled, "Hydrogeology of Fractured Bedrock in the Vicinity of the NorthMet Project" (Barr 2014b, as cited in the FEIS). Based on this investigation and studies performed at other Iron Range mine sites such as, "Hydrogeology of Glacial Drift, Mesabi Iron Range, Northeastern Minnesota" (Winter 1973, as cited in the FEIS) it is considered that bedrock at the Plant Site is adequately characterized for the FEIS; see FEIS Section 4.2.2.3.1 for more information. The Co-lead Agencies acknowledge that this investigation evaluated the hydraulic characteristics of upper bedrock, but did not sample bedrock groundwater for water quality analysis. However, bedrock groundwater sampling conducted at the Mine Site and regional studies of bedrock water quality are considered by the Co-lead Agencies to be adequate for characterizing bedrock water chemistry at the Plant Site.

The above investigation provides good evidence that upper bedrock has hydraulic conductivity that is about two orders of magnitude lower than that of the overlying surficial deposits. Further, investigations at the Mine Site suggest that deeper bedrock has hydraulic conductivity that is substantially lower than upper bedrock. Given these characterizations, it is reasonable to not consider flow/transport in bedrock between the Tailings Basin and the Embarrass River. Mathematical incorporation of a no-flow boundary at the base of the surficial aquifer in both the MODFLOW and GoldSim models is consistent with idea that flow/transport at the Plant Site is dominated by the hydrology of the surficial aquifer and that flow/transport in bedrock is comparatively not significant.

Considering chemicals in bedrock to constitute groundwater tracers of bedrock flow/transport is not likely to be definitive because there has been substantial surface seepage from the Tailings Basin for decades. This seepage migrates through wetlands and monitoring shows that in some locations the seepage has interacted with groundwater. If tailings basin chemicals were identified in bedrock, it would be uncertain if the chemicals were transported through bedrock or were derived from overlying groundwater in the surficial aquifer.

A comment states that "substantial contamination" has been found in domestic bedrock water wells north of the Plant Site. Based on a desktop review conducted by the MPCA of the residential well and monitoring well results (which in part included the consideration of chemical tracers), it is not apparent that elevated concentrations in some of the residential wells are caused by the Tailings Basin, but more likely reflect natural or localized background concentrations.

Theme WR 009

Theme Statement

The assumed bedrock hydraulic conductivity at the Mine Site is too low. It is lower than values used at similar sites and with similar rock types, and values used in regional studies.

Thematic Response

Bedrock hydraulic conductivity data from NorthMet Project Proposed Action site-specific field testing and information obtained from other similar mine sites were compiled Barr 2014b, as cited in the FEIS. The results of this compilation, which was prepared to address comments on this issue, show that bedrock hydraulic conductivity for different bedrock units is variable and

tends to be higher in the uppermost portions of bedrock. This new information supports the position that revised bedrock hydraulic conductivity probability distributions used in the FEIS are reasonable for impact analysis in the GoldSim model. In summary, the field-estimated conductivities are generally considered to be the lower-bound of hydraulic conductivity. The conductivity variable was adjusted in the FEIS Mine Site GoldSim model to recognize the potential higher hydraulic conductivities in the upper portion of the bedrock.

Theme WR 010

Theme Statement

Chemical migration in bedrock is not adequately addressed in the SDEIS. Chemical migration is treated as negligible at the Mine Site and is ignored at the Plant Site. The water quality models do not consider fracture transport, assume no hydraulic connection between bedrock and surficial deposits, and assume no connection to wetlands along flowpaths. The SDEIS does not consider flow through faults that could divert groundwater in uncertain directions, depth of pollution in bedrock, the presence of brackish water, or the area of the pollution plume within the groundwater flowpaths.

Thematic Response

Impact assessment modeling relies on site characterization data that indicate the bulk hydraulic conductivity of upper bedrock is two to three orders of magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at both the Mine Site and Plant Site are dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting site-derived chemicals to the Partridge River and Embarrass River.

It is acknowledge that there could be some hydraulic connections between bedrock and the surficial aquifer where transport is expected to be negligible. Given these factors, the approach was to not consider this possible connection in the NorthMet Project Proposed Action water quality models, but to recommend extensive monitoring during operations and closure to assess if interactions occur and if they would raise concerns for permitting agencies. If monitoring data indicate trends toward permit non-compliance, adaptive mitigation measures would be implemented to prevent or eliminate what is expected to be a small transport-related bedrock impact relative to surficial flows. See FEIS Section 5.2.2.3.5 for more information on adaptive mitigation measures and Section 5.2.2.3.6 for more information on monitoring.

The FEIS further evaluated the possibility of fractures and faults at the Mine Site and Plant Site to determine what (if any) changes need to be made to model assumptions to accurately predict potential environmental effects for purposes of environmental review. Although no change was made to the Plant Site GoldSim model, the FEIS Mine Site GoldSim model was modified to include a flow/transport zone 15 meters thick from that present in the SDEIS. The results of the analysis are included in FEIS Section 5.2.2.3.2. The responses to themes WR 169 and WR 007 also contain additional information.

It is incorrect to interpret that the presence of fractures necessarily implies higher groundwater flow and chemical transport rates. Regardless of the nature of fracture flow, the chemical flux (chemical mass per unit time per unit cross-sectional area) from source areas to perennial streams is controlled by the bulk hydraulic conductivity of the rock mass (as quantified by Darcy's law). Site-specific and regional studies of the bedrock hydrology indicate that the bulk hydraulic

conductivity of bedrock is low. It doesn't matter if the flow is primarily through the rock matrix or fractures; the chemical mass flux on bedrock is simply not great enough to cause impacts to the Partridge or Embarrass rivers, or to any other receiving surface water bodies. Regardless of the interpretation of fracture flow, potential impacts to surface water are dominated by groundwater flow in the surficial aquifer, and the negligible effects of bedrock transport can be easily shown by hand calculations.

There are no bedrock boreholes at the Mine Site that have identified saline water at depths down to the ultimate pit bottoms. It is therefore unlikely that pit inflows would exhibit saline groundwater. Even if this were to occur, the pit water would be treated to reduce TDS to acceptable levels prior to discharge to surface water.

Theme WR 011

Theme Statement

Groundwater modeling does not consider that upper bedrock is more fractured and tends to be more permeable than deeper bedrock--a characteristic that is known to occur at similar sites. The models do not reflect the results of several well tests conducted in the upper bedrock Virginia Formation that exhibited relatively high hydraulic conductivities. The SDEIS does not consider more recent and reliable geologic data.

Thematic Response

In the FEIS Mine Site GoldSim model, bedrock flowpaths have been reconfigured with a bulk hydraulic conductivity that is approximately one order of magnitude higher than what was used in the SDEIS. In addition, the flowpaths are remodeled to be 15 meters thick to account for new information indicating that upper bedrock tends to have higher hydraulic conductivity, and this zone tends to control the overall groundwater flow within the bedrock. Note that there are no groundwater flowpaths in the Plant Site GoldSim model.

The Mine Site MODFLOW model does consider the Virginia Formation as a separate hydrostratigraphic unit and assigns a higher hydraulic conductivity to this unit compared to the Duluth Complex. The presence of higher hydraulic conductivity Virginia Formation explains the higher pit inflows predicted for the East Pit, which is partially excavated into this bedrock unit. Note that Virginia Formation is not relevant to bedrock flowpaths in the Mine Site GoldSim model because the flowpaths only exist in Duluth Complex rock.

The responses to themes WR 007, WR 008, and WR 017 contain additional information.

Theme WR 012

Theme Statement

The SDEIS does not consider the presence of known faults and fracture zones in the NorthMet Project Proposed Action area or the fact that isostatic rebound can create shallow open fractures. There is no site characterization or field testing of fracture properties and no acknowledgement that faults can transport groundwater in uncertain directions. Geological survey maps and PolyMet's own reports for the Canada Stock Exchange reveal significant faults and fractures. The SDEIS consistently downplays the significance of fracture flow and transport in bedrock,

while also documenting that Area of Concern #8 has a plume of pollution propagating through fractures.

Thematic Response

The SDEIS disclosed that bedrock is variably fractured. The effects of fracturing are incorporated into the bulk hydraulic conductivity values used to characterize bedrock for the water quality impact assessment modeling. This is common practice in large-scale evaluations of bedrock hydraulics and the Mine Site GoldSim model was updated for the FEIS to better represent the likelihood of an upper zone of more fractured bedrock than deeper in the formation. Background bedrock-related conductivity information was also updated for the FEIS.

Structural faults may exist between mine facilities and perennial streams that receive groundwater discharge. Because the landscape is covered with surficial deposits and there are few bedrock outcrops, the existence of faults can only be inferred. It is unknown if faults (if and where they exist) behave as conduits or barriers to groundwater flow. Given these uncertainties, it is unlikely that any reasonable field program would be able to identify the existence, location, and hydraulic characteristics of faults that may or may not be present at the site. The FEIS documents the need to require a robust monitoring program during operations and closure to provide direct or indirect evidence on the existence of hydrologically significant faults. If significant faults were identified (i.e., faults that could lead to violation of water quality standards), then adaptive measures would be employed to mitigate the fault-related effects. See FEIS Section 5.2.2.3.5 and theme WR 169 for additional information.

Site characterization data indicate that the bulk hydraulic conductivity of upper bedrock is two to three orders of magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at both the Mine Site and Plant Site are dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting site-derived chemicals to the Partridge and Embarrass rivers.

Cross-section MODFLOW models of the Tailings Basin surface and groundwater seepage containment system indicate that very high capture (greater than 90 percent) would be achieved in both the surficial deposits and underlying upper fractured bedrock. If there were leakage from the Tailings Basin into bedrock, it would be collected by the containment systems and bypass (if any) would be sufficiently small to not cause impacts that exceed water quality evaluation criteria.

Finally, field-testing and MODFLOW modeling performed at the Mine Site indicate that geologic materials between the Biwabik Iron Formation and the pit excavations (combination of Duluth Complex and Virginia Formation) have sufficiently low hydraulic conductivity to limit pit inflows of water derived from the Biwabik Formation. Geologic maps and cross sections of the Mine Site show that the geologic unit below the Duluth Complex is the Virginia Formation, not the Biwabik Iron Formation. The linear distance between the Biwabik Iron Formation and the three proposed mine pit excavations is greater than 150 feet, which is a sufficient buffer zone to limit pit inflows.

It is incorrect to interpret that the presence of fractures necessarily implies higher groundwater flow and chemical transport rates. Regardless of the nature of fracture flow, the chemical flux (chemical mass per unit time per unit cross-sectional area) from source areas to perennial streams is controlled by the bulk hydraulic conductivity of the rock mass (as quantified by Darcy's law).

Site-specific and regional studies of the bedrock hydrology indicate that the bulk hydraulic conductivity of bedrock is low. It does not matter if the flow is primarily through the rock matrix or fractures; the chemical mass flux in bedrock is simply not great enough to cause impacts to the Partridge or Embarrass rivers, or to any other receiving surface waterbodies. Regardless of the interpretation of fracture flow, potential impacts to surface water are dominated by groundwater flow in the surficial aquifer, and the negligible effects of bedrock transport can be easily shown by hand calculations.

Theme WR 013

Theme Statement

The SDEIS does not consider that ammonia and tritium are observed in two deep Mine Site wells. Their presence indicates young groundwater at depth, an observation that conflicts with the assumption that bedrock has very low hydraulic conductivity. Reverse osmosis pilot testing did not consider ammonia and tritium pollutants.

Thematic Response

Tritium and non-ionized ammonia can be indicators of relatively young water. However, when these constituents are identified in water extracted from a borehole, the overriding question is whether or not foreign (young) water was introduced during the drilling process. There are many documented cases where tritium in borehole water could be traced to makeup water introduced during the drilling process to help maintain circulation. Experience indicates that conclusions about the age of groundwater based on tritium and non-ionized ammonia are unreliable unless it can be absolutely verified that no foreign (makeup) water was introduced during the drilling process. Given the isolated occurrences, additional verification is not warranted for the FEIS. Based upon this rationale, RO pilot-testing of ammonia and tritium is not justified.

Theme WR 014

Theme Statement

The SDEIS does not make use of bedrock information from hundreds of Mine Site boreholes including fracture traces, fracture weathering, and the presence of fault breccia or gouge.

Thematic Response

The FEIS relies on the report, “Hydrogeology of Fractured Bedrock in the Vicinity of the NorthMet Project” (Barr 2014b, as cited in the FEIS), which was reviewed by the Co-lead Agencies. Its relevant points include:

- There are, “...over 14,000 RQD measurements for the Duluth Complex within PolyMet’s data base” (“RQD” is a measure of breaks in a segment of rock drill core, where 100 percent indicates no breaks and 0 percent indicates that all pieces of core within a core run are less than 10 centimeters long); and

- In Duluth Complex rock, the “average RQD increases from 73 percent at the top of bedrock to 94 percent within 40 feet below the top of bedrock” (lower RQD indicates higher frequency of core breaks).

In particular, Figure 3-6 of the report "Number of Fractures per Foot (Fracture Index) with Depth in the Duluth Complex" (Barr 2014b, as cited in the FEIS) illustrates the borehole data on RQD in bedrock. The hydrology of bedrock in the Mine Site and Plant Site has been revised in response to the further evaluation of bedrock hydrology, and these are described in FEIS Section 5.2.2.2.1.

The RQD data provide strong evidence that the upper 10 to 15 meters of bedrock tend to be more fractured and have higher hydraulic conductivity than deeper bedrock. This new information has been incorporated into the FEIS Mine Site GoldSim model. In the FEIS GoldSim model, groundwater flowpaths are 15 meters thick (compared to 100 meters in the SDEIS) and have hydraulic conductivities that are about one order-of-magnitude higher than the SDEIS values.

Theme WR 015

Theme Statement

The SEIS does not make use of bedrock information from geotechnical boreholes in the Tailings Basin area.

Thematic Response

During winter 2013-2014, an investigation of bedrock was conducted along the northern, northwestern, and western perimeters of the Tailings Basin. The investigation included five coreholes advanced into upper bedrock and 10 packer tests conducted in these holes. The investigation provided rock core, RQD data, and hydraulic conductivity of discrete intervals within the upper bedrock. The results of this investigation are reported in FEIS Section 4.2.2.3.1. Based on this investigation and studies performed at other Iron Range mine sites, bedrock at the Plant Site is adequately characterized for the FEIS.

Theme WR 016

Theme Statement

The SDEIS does not consider that blasting can create fractures and increase bedrock hydraulic conductivity. It is also possible that acid mine drainage could cause fractures to widen and become more permeable.

Thematic Response

Case histories provide strong evidence that blasting effects in open pits tend to extend no more than several tens of feet from the pit walls. As stated in Scott 2009, "…provided the operations are designed using the approaches recommended and implemented to a reasonable standard then there should be negligible impact on the permeability of the pit walls more than 15 meters from the blast." This zone is very narrow when compared to the scale of the pits and the overall mine site. It is acknowledged that within this narrow zone, there may be increased fracture hydraulic conductivity and greater fracture surface area for chemical reactions to occur. This "damaged rock zone" was considered by the Co-lead Agencies during the Impact Assessment Planning process. The FEIS reasonably considers the effects of a narrow blast zone adjacent to the pit walls for the inputs used in the Mine Site GoldSim model.

Theme WR 017

Theme Statement

The assumed capture efficiency of the water collection systems at the Category 1 Stockpile has not been verified by modeling or calculations. A range of capture efficiency inputs should be used in modeling. The Category 1 Stockpile should be lined.

Thematic Response

The proposed capture system for the Category 1 Stockpile is a unique design that uses a slurry wall keyed into bedrock and a pumped collection trench that maintains depressed groundwater levels on the inside (stockpile-side) of the system. It is acknowledged that there are capture systems at other mine sites that do not operate with a high degree of capture, but these are different designs and cannot be directly compared to the system proposed for the Category 1 Stockpile. Based on a MODFLOW groundwater model specifically developed to assess capture efficiency of the Category 1 system, it was concluded that the system would achieve an overall efficiency between 90 and 94 percent for groundwater flowing in surficial deposits and bedrock. This analysis supports the conclusion that the proposed Category 1 surface and groundwater seepage containment system has a high probability of meeting its performance specifications; thus, there was no need to consider a range of capture efficiency inputs in modeling.

Theme WR 018

Theme Statement

Assumed capture efficiencies described for the Tailings Basin are wrong. The assumed capture efficiency of the water collection systems at the Tailings Basin (90% for groundwater and 100% for surface water) has not been verified by modeling or calculations.

Thematic Response

The FEIS relies on revised cross-section models from the SDEIS to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented in the revised PolyMet 2015i, as cited in the FEIS. These new models consider the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed capture system alignment. Sensitivity analyses have included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 100 feet. The model results predict that the overall groundwater capture efficiencies of the proposed Tailings Basin surface and groundwater seepage containment system would be substantially greater than 90percent. This analysis supports the conclusion that the assumption of 90percent or greater groundwater capture efficiency is justified.

The FEIS describes a 2014 field program that investigated bedrock along the alignment of the proposed capture system on the northern, northwestern, and western sides of the Tailings Basin in FEIS Section 5.2.2.2.3. This investigation provided field data on bedrock hydraulic conductivity, RQD, and depth to top of bedrock. This information was used to develop

MODFLOW cross-section models at three locations on the alignment to assess capture efficiency. The models included bedrock below the slurry wall.

The proposed design for the seepage capture systems include a surface berm with drains into the collection trench. This portion of the system is designed and would be maintained to achieve 100percent capture of surface runoff on the tailings side of the system, which includes surface seepage from the Tailings Basins.

Theme WR 019

Theme Statement

The assumed capture efficiencies are unrealistically high because the SDEIS failed to consider leakage from cracks in the slurry wall at the contact point between the wall and bedrock. Capture efficiencies also did not consider groundwater underflow through bedrock below the slurry wall via fractures. Subsurface obstructions would also disrupt conductivity and the uniformity of the slurry wall. It is infeasible to construct a 1-foot thick slurry wall. The SDEIS is contradictory and unclear if the slurry wall is keyed into bedrock or not. There is a lack of capture system design detail in the SDEIS.

Thematic Response

For the surface and groundwater seepage containment system at the Tailings Basin, commenters expressed a concern that there could be bypass in bedrock below the slurry wall. To address this issue in the FEIS, cross-section models were revised to evaluate containment systems on the northern, northwestern, and western sides of the Tailings Basin, which are documented PolyMet 2015i, as cited in the FEIS. These new models considered the presence of an upper more-permeable bedrock zone directly below the slurry wall, with hydraulic properties based on 2014 packer tests conducted in five boreholes along the proposed capture system alignment. Sensitivity analyses included variable bedrock hydraulic conductivity and different upper bedrock zone thicknesses up to 15 meters. The new models explicitly consider groundwater flow in bedrock below the slurry wall and at the contact between the slurry wall and bedrock. For all scenarios considered, the model results predicted that the overall capture efficiencies of the proposed Tailings Basin surface and groundwater seepage containment system (with bedrock flow) would be substantially greater than 90percent.

The slurry wall would be keyed into bedrock and Figure 3.2-28 in the FEIS has been revised to show this that the slurry wall is keyed into bedrock.

The design basis for the containment system is not to create a groundwater dam that "holds back" groundwater flow, but to reverse the pre-existing hydraulic gradient (and flow direction) across the facility. This is equivalent to saying the groundwater heads on the basin side of the facility would be lower than the heads on the opposite side. Regardless of the hydraulic conductivities of surficial deposits and shallow underlying bedrock, the new flow direction would be toward the Tailings Basin rather than away from it (which is currently the case). The conceptual hydraulics of the proposed capture system are shown on Figures 5.2.2-7 and 5.2.2-57 in the FEIS. If there are flaws in the slurry wall or imperfections at the contact between the slurry wall and bedrock, the amount of reversed groundwater flow into the collection trench may increase, but the degree of system capture would not be affected. Hydraulic gradient (and flow direction) reversal would be verified by field monitoring using appropriately placed piezometers

in both surficial deposits and shallow bedrock. If monitoring shows that gradient reversal has not been achieved at some specific locations along the capture system, a variety of mitigation measures can be employed to insure that the gradient is reversed.

Details of the containment system design are beyond the scope, but are presented in the Plant Site Water Management Plan (PolyMet 2015i, as cited in the FEIS).

Theme WR 020

Theme Statement

The capture efficiency assumed in the SDEIS is higher than what is known to occur with similar collection systems (e.g., SD-026, Minntac and the Dunka Pit).

Thematic Response

The proposed containment system uses pumping on the tailings side of the slurry wall to reverse hydraulic gradients (i.e., groundwater flow directions) across the slurry wall and in underlying bedrock. In the vicinity of the system, the groundwater flows would be inward (toward) the Tailings Basin and not away from it. Relatively few capture systems have been built with this degree of pumping to cause a reversal of the pre-existing hydraulic gradients. The conceptual hydraulics of this type of system provides evidence that it would achieve complete or nearly complete capture. In addition, supporting MODFLOW cross-section models developed for the FEIS and documented in PolyMet 2015i, as cited in the FEIS predict that the system would achieve its performance specifications.

Theme WR 021

Theme Statement

The SDEIS includes no discussion of long-term monitoring to verify capture system performance. The SDEIS does not discuss system performance over time, or acknowledge that performance would likely degrade over time requiring periodic replacement of system components. Pumps within the containment system may also fail. PolyMet should commit to a particular magnitude of head differential upgradient and downgradient of the containment system and to a depth of bedrock penetration for the wall.

Thematic Response

PolyMet's general plan for short- and long-term water monitoring is discussed in the FEIS and documented further in the water management plans (PolyMet 2015r; PolyMet 2015i; PolyMet 2015d, all as cited in the FEIS). The specific details of a comprehensive water monitoring plan would be developed during the permitting phase of the NorthMet Project Proposed Action.

The groundwater containment systems are designed to create inward hydraulic gradients across a low-permeability barrier wall keyed into bedrock. The gradient control is created by a pumped groundwater collection trench drain installed on the inside (facility-side) of the system. As described in the Water Management Plan (PolyMet 2015i, as cited in the FEIS), at important locations along the containment system alignment, paired piezometers would be installed on opposite sides of the barrier wall to verify that groundwater levels were lower on the inside

(facility-side) of the wall compared to the outside. If an inward gradient were not verified at a particular location, adaptive mitigation measures would be implemented to ensure that an inward gradient was re-established. These types of mitigation measures are described in the Water Management Plan (PolyMet 2015i, as cited in the FEIS) and include, but are not limited to, increased pumping of the inside groundwater collection trench drain and installation of pumped boreholes.

It is acknowledged that certain components of containment systems, like pumps, would need to be replaced periodically when water level monitoring indicates that performance is marginal and not readily compensated for by adaptive mitigation measures. The Permit to Mine financial assurance package for the NorthMet Project Proposed Action would ensure that future funding would be available if and when adaptive mitigation measures or component replacements were needed to achieve the containment system performance specifications. PolyMet has not made a commitment to a head differential or depth of penetration of the wall. These details would be specified as part of the permitting process.

Theme WR 022

Theme Statement

The FEIS should include a sensitivity analysis using capture efficiencies with appropriate adjustments of related model inputs. The FEIS should also define the acceptable level of capture efficiency.

Thematic Response

The capture efficiencies used in the FEIS GoldSim models are conservative and/or realistic for the purpose of impact analysis. The FEIS reports or reference documents that justify the assumed capture efficiencies are based on issue-specific groundwater modeling or credible hydrogeologic interpretations. Because these are engineered systems that can be designed and constructed to achieve required performance specifications, conducting a sensitivity analysis does not yield information relevant to understanding potential impacts.

Theme WR 023

Theme Statement

The SDEIS does not make adequate use of studies, experience or history at other relevant mines. Specific studies and sites that should be considered in the FEIS include, but are not limited to: the Regional Copper-Nickel Study; Maest and Kuipers, 2005 Predicting Water Quality at Hardrock Mines; Sudbury Mine; Butte Mine; Eagle Mine; Flambeau Mine; Dunka Pit; INCO exploration site; former LTVSMC Mine, Northshore Mine, Minntac, and data collected under the Cliffs Erie Consent Decree.

History shows that operations like PolyMet's pollute and produce acid mine drainage. There are no exceptions. The FEIS should describe the effectiveness of mitigation of impacted water resources at other mining operations. The FEIS should provide objective reporting of information gained at other mine sites related to the use of bentonite amendments, seepage

capture systems, and reverse osmosis treatment, as well as effects related to sulfide ore and Minnesota pit lakes.

Thematic Response

The Co-lead Agencies rely upon the expertise and experience of their staff that bring to bear their knowledge of various studies and analyses performed on mine sites in Minnesota and elsewhere. This knowledge is applied in the review of documents prepared to evaluate the NorthMet Project Proposed Action potential effects.

It should be noted that the NorthMet Project Proposed Action is different from other mining projects in this part of Minnesota in the following ways: different ore type, designs for groundwater capture systems, and use of long-term mechanical treatment. While experiences gained on other projects are informative, they do not necessarily apply to the NorthMet Project Proposed Action. This is particularly true for groundwater capture systems because the NorthMet Project Proposed Action uses a design that differs from those at other Iron Range mine sites. The FEIS reflects consideration of information pertaining to the Dunka Pit that was directly relevant to the NorthMet Project Proposed Action. It is noteworthy that many aspects of operations at the Dunka Pit are dissimilar to the NorthMet Project Proposed Action in terms of hydrogeology and mine design.

The mitigation designs of the NorthMet Project Proposed Action are unlike measures discussed in the Regional Copper-Nickel Study (MEQB 1969, as cited in the FEIS). The NorthMet Project Proposed Action measures include: long-term mechanical water treatment, uniquely designed surface and groundwater seepage containment systems, subaqueous disposal of reactive waste rock, and synthetic covers and under-liners used at waste rock stockpiles and treatment ponds. In addition, the level of construction QA/QC proposed at the NorthMet Project site would be much higher than what has historically occurred at older mine sites in the Iron Range. It is erroneous to conclude that operation and closure of the NorthMet Project Proposed Action site would necessarily entail the same types of failures that have occurred at some historical mines. In fact, the unique designs and high-quality construction measures proposed are a response to past events.

The detailed and sophisticated water modeling work performed to support the FEIS far exceeds that conducted for existing mines in Minnesota. The models used for the NorthMet Project Proposed Action represent years of development, with input from the Proposer, Co-lead Agencies, Cooperating Agencies, and the public. Based on comments received on the SDEIS, modifications were made to the models to improve FEIS impact evaluations. It is the Co-lead Agencies' position that incomplete or inaccurate predictions made in the past at historical mining operations do not provide a basis for judging the quality of modeling used in the FEIS.

Theme WR 024

Theme Statement

The Cumulative Effects Assessment Area for Water Resources should include the entire St. Louis River Basin and should specifically consider the following mining facilities: the Northshore Mine Peter Mitchell Pit, Laskin Energy Center, ArcelorMittal, United Taconite, and Minntac. The FEIS should list total and cumulative effects in FEIS Table 6.2.2-2 (formerly Table 6.2-2 in the SDEIS) and should acknowledge that water quality standards are already exceeded

in Colby Lake. The FEIS should specifically consider cumulative effects on the BWCAW. The analysis should evaluate the significance of flow reductions from other projects.

Thematic Response

The SDEIS and FEIS provide a rationale for not including the St. Louis River Watershed in the cumulative effects analysis in Section 6.2.3.3.1. The SDEIS and FEIS considered in the CEAA for water resources all of the facilities identified in FEIS Table 6.2.2-1 (formerly Table 6.2-1 in the SDEIS). FEIS Table 4.2.2-18 summarizes existing water quality data for Colby Lake. This table shows the number of samples that exceeded the surface water evaluation criteria, which are based on water quality standards. Evaluation criteria can be found in Section 5.2.2. The BWCAW is in a different watershed than the NorthMet Project Proposed Action. Surface water and groundwater from the NorthMet Project Proposed Action would not enter BWCAW watersheds. If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS sections 5.2.2.3.5 and 5.2.2.3.6. See Section 6.2.2.3.1 for the discussion on cumulative flow impacts to the Partridge River.

Partridge River flows are currently highly influenced by the timing, magnitude, and number of discharges from human activities. The timing of the discharges can be intermittent, continuous, or otherwise varied depending upon the source, or the discharge may have ceased permanently or temporarily. The magnitude of discharges also varies.

Additional text was added to Section 6.2.2.3.1 to describe the effects of flows from other projects on the Partridge River.

Colby Lake water elevations are regulated and managed and this ultimately dictates flows from Colby Lake into the lower Partridge River. Partridge River flows into Colby Lake during peak flow events are pumped to the Whitewater Reservoir, thereby mitigating potential increases in flows from this source to the lower Partridge River. There is a minimum regulated water level threshold of 1,439 amsl on Colby Lake as required under MDNR Water Appropriation Permit 1949-0135. As this threshold is approached, water is diverted out of Whitewater Reservoir through set of gates to Colby Lake to increase Colby Lake water elevations and with it flow to the lower Partridge River. Due to Colby Lake's hydrologic relationship with the Whitewater Reservoir and regulated management, no impacts to Colby Lake hydrology are expected.

Water would be discharged from SD-026 south of the Tailings Basin into Second Creek that is tributary to the lower Partridge River. Flows from SD-026 would be augmented by the NorthMet Project Proposed Action to maintain flows that existed prior to the installation of the containment system. Due to this augmentation, discharges from SD-026 may deviate from plus or minus 0.1 cfs from the baseline. This impact would be added to Mesabi Nugget's 7.4 cfs seasonal discharge, an unknown impact from proposed Mesabi Mining Project, and discharges from LTVSMC pits.

Additional information has been added to Section 6.2.2.3.1 of the FEIS that describes the net effect of various activities on the upper and lower Partridge River and Colby Lake.

Theme WR 025

Theme Statement

There is insufficient geochemical characterization of materials to allow reliable estimates of chemical loading from the NorthMet Project Proposed Action. Geochemical model inputs, the approach to modeling geochemistry, and what pollution would be released to the environment are unclear.

Thematic Response

The geochemical characterization of NorthMet rock is related primarily to its net acid-generating potential, as indicated by the concentration of sulfide S in the rock and tailings. Rock with less than 0.12 percent sulfide S is determined to be non-acid-generating. This classification is based on humidity cell tests operated on 38 samples of NorthMet Category 1 waste rock continuously for between187 to 337 weeks, listed in Large Table 1 of PolyMet 2015q, as cited in the FEIS); none of these materials produced acidic leachate (see time plots of effluent pH in "Attachment 2 Trend Analysis for Rock Humidity Cells" to "Attachment A Water Quality Modeling for Waste Rock and Pit Walls" of PolyMet 2015q, as cited in the FEIS). The possibility of operational error resulting in acidity generation is a possibility. However, only one (0.2 wt% sulfur) of the 15 Category 2/3 Stockpile samples with a sulfur concentration with less than 0.3 wt% sulfur generated a net acidic leachate. Because the Category 2/3 Stockpile rock is on average 0.21 wt% sulfur misplacing the entirety of the Category 2/3 Stockpile with the Category 1 Stockpile rock would not result in a mass weighted sulfur concentration above 0.2 wt% sulfur (combined Category 1 Stockpile rock and Category 2/3 Stockpile would have an average sulfur concentration of about 0.1 wt%).

The samples subjected to humidity cell tests were selected to be: 1) spatially dispersed across the deposit, so that they included samples from each of the lithologic units and thus capture the variability in neutralizing potential and metal concentrations in the host rock (see Large Table 2 of PolyMet 2015q, as cited in the FEIS); and 2) chemically dispersed over the range of sulfide S concentrations, so that the estimates of oxidation rate and associated release of acid and metals could be reliably bracketed by ranges for uncertainty (PolyMet 2015q, as cited in the FEIS).

The estimates of sulfide S in all of NorthMet waste and ore are based on interpolation of sulfide S analyzed in recovered drill core (approximately 18,800 analyzed samples). An independent geostatistical evaluation found that the number and spatial distribution of these sulfide analyzes supported adequately the geologic block model developed to describe the ore and waste rock (Optitech 2012).

The sulfide S in tailings is controlled by the ore-processing method, and composition is constrained to be non-acid-generating (less than 0.12 percent sulfide S). Reaction rates and solute release from tailings are estimated from 33 humidity cells on NorthMet tailings and 4 on LTVSMC tailings (Large Table 5 of PolyMet 2015q, as cited in the FEIS).

Environmental mine-waste guidance does not provide firm sample requirements, but recommendations in the Global Acid Rock Drainage (GARD) Guide (INAP 2010) include: "1 to 2 samples of representative material of each material type"; "Provide adequate information to make cost-effective, sustainable, and environmentally protective decisions regarding the

management and disposal of waste materials;" and "Sufficient to adequately represent the variability within each geological unit and waste type" (INAP 2010, Chapter 4). The Co-lead Agencies believe that the distribution and number existing kinetic-test samples (38 of Category 1, 26 of Category 2/3, and 19 of Category 4) meet these guidance criteria, and are adequate for the NorthMet Mining Project and Land Exchange FEIS.

FEIS Section 5.2.2 reports what constituents would be released to the environment.

Subtheme WR 025-1

Theme Statement

The SDEIS assumes, incorrectly, that the only source of chloride in bedrock is brine that is present in fractures. This ignores the presence of chloride compounds in the bedrock. Include in the model of solute release from waste rock a quantitative estimate for chloride that is present in the mined rock itself and that will be released by blasting and/or crushing.

Thematic Response

The release of chloride from waste rock and tailings is included in the GoldSim water quality models applied to the NorthMet Project Proposed Action. For waste rock, chloride loading produced by dissolution of soluble minerals was estimated by the concentrations measured in the first flush of solutes from humidity cell tests (Waste Characterization Data Package, Large Tables 7 through 11 [PolyMet 2015q, as cited in the FEIS]). For NorthMet tailings, the crushing and metal-extraction processing is assumed to remove the majority of soluble chloride. In the GoldSim model of solute transport in tailings, chloride release from the tailings is thus assumed to be zero after they are emplaced in the tailings basin (PolyMet 2015q, as cited in the FEIS, Large Table 6; Barr 2012c, as cited in the FEIS, Tables 1-13 and 1-14). Instead, chloride released by the tailings is incorporated as a component of the slurry water used in transporting the tailings, with model concentrations listed for the initial Tailings Basin pond waters, and expected seepage of pore water at the toes of the Tailings Basin (PolyMet 2015q, as cited in the FEIS).

Subtheme WR 025-2

Theme Statement

Determine the effect of chloride dissolved in waters of the mine pits to: 1) groundwater quality, 2) the water treatment systems (WWTF, WWTP, and passive) effectiveness, and 3) requirements for disposal of water-treatment sludge.

Thematic Response

The analysis of effects from the NorthMet Project Proposed Action include estimates for the release of chloride from waste rock and tailings, based on chloride released by flushing of exposed rock (Large Tables 7 through 11, PolyMet 2015q, as cited in the FEIS). Results of the GoldSim water quality model incorporates sources of chloride, including water bypassing tailings and Category 1 waste rock interception trenches, in the estimates of surface and groundwater quality at evaluation locations downgradient from the proposed Mine Site (Figures J-01.10.2 and J-06-10.1, PolyMet 2015m, as cited in the FEIS). To support design of the water quality treatment systems, modeling includes estimates of solutes (including chloride) to the

West Pit Lake and backfilled East Pit (i.e., major sources of saline water to the proposed water treatment plants). Pilot-testing of the WWTP RO system produced over 95 percent removal of chloride from test waters (Table 15 of Barr 2013f, as cited in the FEIS). The concentrated brine from the reverse osmosis treatment plants, and (if applicable) from use of equivalently performing technologies, would be evaporated and disposed offsite as waste solids (Section 5.2.2.6, PolyMet 2015j, as cited in the FEIS).

Subtheme WR 025-3

Theme Statement

Conduct acid-base-accounting analyses on more samples of NorthMet waste rock--the current number of samples is fewer than recommended by environmental guidance documents such as the GARD Guide, and the environmental characterization of the waste rock is thus inaccurate.

Thematic Response

The Global Acid Rock Drainage (GARD) Guide (INAP 2010) is not specific on the number of samples required, but suggests enough to determine "the statistical degree of confidence that is required for the assessment." Acid/base accounting in NorthMet rock is estimated using only sulfide S concentration, and approximately 18,800 samples of rock from the NorthMet Project Proposed Action drill core database were analyzed for sulfide S to support development of the deposit block model (Section 8.1.2.3 of PolyMet 2015q, as cited in the FEIS). An independent statistical analysis of this sulfide S data set determined that the number and spatial distribution of samples was adequate to support the model of sulfide S distribution in the NorthMet deposit ore and waste rock (Optitech 2012).

Regarding actual acid production, the host rock for the NorthMet Deposit ("Duluth Complex") differs from most hard-rock mines in that it does not contain carbonate minerals that usually provide the majority of the acid neutralization. Instead, neutralization is provided by silicate minerals, which generally react more slowly to neutralize acids. Acid-generating potential was thus estimated from sulfide S concentration in rock, but actual net-acid release potential was determined by measuring directly the release of excess actual acidity in effluent from multi-year humidity cell test (i.e., 38 tests on Category 1 waste rock, 35 tests on Category 2/3 waste rock, and 22 of Category 4 waste rock; see Attachment A, Table 2 in PolyMet 2015q, as cited in the FEIS).

Subtheme WR 025-4

Theme Statement

Revise the water-quality modeling to address the possibility that virtually all NorthMet waste rock may be net acid generating when considered in terms of acid/base accounting analyses

Thematic Response

See response to WR025-3.

Subtheme WR 025-5

Theme Statement

Include in the groundwater solute transport model an analysis of arsenic (III) and arsenic (V) attenuation values

Thematic Response

The estimate for arsenic soil/water partition coefficient (i.e., "Kd," which is proportional to the retardation of arsenic transport in groundwater relative to water) used in the GoldSim model is 25 L/Kg (Table 1-16, Barr 2012c, as cited in the FEIS). This value was obtained from Table C4 in Appendix C of the USEPA's "Soil Screening Guidance: User's Guide" (USEPA 1986).

The range of arsenic Kd values presented in the USEPA guidance draws on values reported in published studies, but it does not report separate Kd values for arsenic (III) and arsenic (V) oxidation states. However, the NorthMet Project Proposed Action GoldSim model used the lowest value (i.e., the value that produces the fastest transport in groundwater) reported in the 1996 USEPA guidance.

Subtheme WR 025-6

Theme Statement

Add the effect of mineral fibers to the effects of the NorthMet project on air and water quality, and on human-health risk.

Thematic Response

The WWTF and WWTP systems would remove essentially all particulate matter from the inflow prior to discharge. The pilot tests for the water treatment system describe the use of a greensand filter to protect the RO membranes by removing particulate solids in the water before it ever reached the membrane. Beyond this pre-osmosis filtration, the RO water treatment membrane separates particles the size of dissolved ions, and thus removes essentially all particulate matter, including colloidal-sized suspended particulate material (see Sections 4.1.4 and 7.3.3.5, Barr 2013f, as cited in the FEIS). Thus, there is not increase in human health risk associated with mineral fibers in WWTF or WWTP discharge.

Subtheme WR 025-7

Theme Statement

Revise the methods used to estimate solute release from sulfide mine rock (tailings, waste rock, and ore) so that they don't use the complicated methods used in the SDEIS (e.g., Ni:S ratio in solid rock) and instead use simpler methods that rely on empirical releases measured in weathering-test leachates.

Thematic Response

The methods used to estimate the release of metals and other anions from sulfide-bearing waste rock, tailings, and ore was developed among the Co-lead Agencies. Estimates of solute release from mine waste based directly on measured concentrations in mine waste effluent were found to

be inaccurate for estimating long-term solute release from NorthMet rock. The source of this inaccuracy is the secondary precipitation of solutes in the waste material after it is released from the primary minerals. An example is the dissolution of the primary minerals pyrrhotite and olivine, both of which contain nickel. Although these two primary mineral phases dissolved, as indicated by SO_4 and Mg in effluents, nickel concentrations in effluent were initially lower than expected, but would then increase if leachate pH decreased. The rationale for estimating solute-release rates using the combination of solid-phase concentrations and concentration caps is summarized in Section 4.1.3.1, 2011 Geochemical Update, of the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS).

To accommodate this approach, the GoldSim model was altered to better reflect observed solute leaching while also preserving mass balance. Metals were release as primarily minerals dissolved, but allowed to be stored in secondary phases (modeled using "concentration caps") as they leach over time, with adjustment of cap concentration if warranted by changes in pore-water pH. The solute release for tailings are listed in the NorthMet Plant Site Water Modeling Work Plan, Tables 1-13 and 1-14 (Barr 2012d, as cited in the FEIS), and, for rock, in the NorthMet Mine Site Water Modeling Work Plan, Tables 1-24 through 1-27 (Barr 2012c, as cited in the FEIS).

Subtheme WR 025-8

Theme Statement

The pH-dependent concentration caps for Category 1 wastes should use AMAX pile leachate concentrations for pH values between 6.0 or 6.5 and pH 7.5

Thematic Response

The range in pH assumed in Category 1 waste rock effluent (GoldSim model range 7.0 to 7.5) is based on measured pH in leachate tests on Category 1 waste rock, adjusted to lower pH to account for the possibility that the CO_2 pressure in the waste rock pore space would be 10 times higher than atmospheric (PolyMet 2015q, as cited in the FEIS; Section 8.3.1.1 describes the methods and Figure 8-17 illustrates the measured pH in effluent from Category 1 waste rock over a range in sulfide S concentrations, and the pH range after assuming higher pressure of CO_2 in pore gas.) The comment provides no rationale for altering the estimate of the pH for Category 1 waste rock effluent, so the Co-lead Agencies believe that the pH range used in the FEIS is appropriate.

Subtheme WR 025-9

Theme Statement

Re-Evaluate the laboratory-to-field scale-up factors.

Thematic Response

The comments in this subtheme do not provide any rationale for why laboratory-to-field scale-up factors should be re-evaluated or revised. The MDNR thus stands by the laboratory-to-field scale-up factor that they developed for Category 1 waste rock, and scale-up factors would not be further evaluated.

The Co-lead Agencies made the decision to use a "scale factor" approach for modeling solute release rates from NorthMet Project Proposed Action waste, and also selected the specific ranges for each "scale-up factor" used to extrapolate from laboratory or analog field-site conditions to the NorthMet Project Proposed Action. Reaction rates for waste-rock oxidation and solute release under field conditions are extrapolated from multi-year humidity cell tests (Attachment A, PolyMet 2015q, as cited in the FEIS). The scale-up of Category 1 waste rock that would remain permanently aerated is particularly well-supported, with multi-year studies by the MDNR demonstrating solute release rates from laboratory tests to field-scale piles of rock from the Dunka Mine (PolyMet 2015q, as cited in the FEIS).

Subtheme WR 025-10

Theme Statement

Add the effect of nickel dissolution from silicate minerals (e.g., olivene) as a source of solutes leached from mine waste.

Thematic Response

The NorthMet Project Proposed Action GoldSim water-quality model includes nickel released from waste rock and tailings by two mechanisms: 1) oxidation of nickel-bearing sulfide S minerals (calculated as the product of S released and the Ni/S ratio in sulfide minerals); and 2) dissolution of nickel-bearing silicates minerals, calculated as the product of Mg released and the Ni/Mg ratio in silicates (Large Table 3, PolyMet 2015q, as cited in the FEIS). For tailings, nickel release parameter values are in the NorthMet Plant Site Water Modeling Work Plan (Tables 1-13 and 1-14 for sulfide-phase release, and Table 1-17 for silicate-phase release) (Barr 2012d, as cited in the FEIS). For waste rock and ore, Tables 1-24 through 1-27 of the NorthMet Mine Site Water Modeling Work Plan (Barr 2012c, as cited in the FEIS) list nickel release parameter values from sulfide and silicate.

Subtheme WR 025-11

Theme Statement

Revise the method used to estimate sulfate release rates from rock sulfur concentrations for Category 1 and Category 2/3 waste rock to include higher sulfate release rate data and include the effect of the "first flush" from humidity cell tests.

Thematic Response

The relationship between sulfate release rate and rock sulfur concentration is applied as a probabilistic model input as a normal distribution with a 95 percent confidence interval that includes sulfur normalized sulfate release rate values from 12.78 to 15.06 (mg/kg/wk/%S). This value interval covers the average values for the zero-intercept model from each individual rock category. The zero-intercept model was assumed as a reasonable approach based on the chemical reality that a rock containing no sulfur cannot release sulfate. As indicated in the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS) the estimation approach is intended to represent the average of the entire mass of waste rock. The variability of the average value is less than the variability of the entire population and the selection of a more restricted

rate value range reflects the limited variability of the average. The "first flush" from humidity cell tests is an artifact of sample handling, and not applicable to estimating reaction rates. GoldSim accounts for periodic rock flushing by accounting for solutes released between events that flush water through mine waste.

Subtheme WR 025-12

Theme Statement

Conduct humidity-cell tests on more samples of NorthMet waste rock, because the current number (89) is too few to characterize 309 million tons of waste rock.

Thematic Response

The net acid-generating potential in the NorthMet Deposit is based primarily on the concentration of sulfide S in the rock, and an independent geostatistical evaluation found that the number and spatial distribution of analyzes for sulfide S (approximately 18,800 rock samples) supported adequately the geologic block model developed to describe the ore and waste rock (Optitech 2012).

For kinetic tests, the samples were selected to be: 1) spatially dispersed across the deposit, so that they included samples from each rock type and lithologic units, weighed by expected tonnage of each, and thus capture the variability in neutralizing potential and metal concentrations in the host rock (see Large Table 3, PolyMet 2015q, as cited in the FEIS); and 2) chemically dispersed over the range of sulfide S concentrations, so that the estimates of oxidation rate and associated release of acid and metals could be reliably bracketed by ranges for uncertainty (Table 4-1 in SRK 2007b, as cited in the FEIS).

Environmental mine waste guidance does not provide firm sample requirements, but recommendations in the GARD guide include: "One to 2 samples of representative material of each material type" (from 2007 Australian guidance); "Provide adequate information to make cost-effective, sustainable, and environmentally protective decisions regarding the management and disposal of waste materials;" and "Sufficient to adequately represent the variability within each geological unit and waste type" (INAP 2010)

The Co-lead Agencies believe that the distribution and number existing kinetic-test samples (42 of Category 1, 26 of Category 2/3, and 21 of Category 4) meet these guidance criteria, and are adequate for the FEIS.

Subtheme WR 025-13

Theme Statement

Include all results of laboratory and field weathering tests in the GoldSim model, including specifically those test results that produced leachate pH below 6.0.

Thematic Response

The GoldSim model implementation of solute release from sulfide-bearing mine waste used the results of field and laboratory tests before and after the onset of acidic conditions. For Category 1 waste rock and tailings (i.e., non-acid-generating material), the estimates of solute release used

only results from field or lab tests that produced near-neutral pH effluent. But for Category 2/3 and Category 4 waste rock, the duration before onset of acidic conditions and the change in oxidation rate after acid onset are both based on changes in measured humidity-cell effluent as it shifts from neutral to acidic pH (Section 8.2 of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS] and model parameters "Acidic_Onset_Time" and "Acid_Factor" in Table 1 of the Mine Site Water Modeling Data Package [PolyMet 2015m, as cited in the FEIS). This same table includes the decay in oxidation rate after acid onset caused by depletion of sulfide S minerals ("Decay_a1" and "Decay_a2"), as described in Section 9.2 and Attachment A of the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS).

Subtheme WR 025-14

Theme Statement

Change the GoldSim model predictions to include results demonstrating that Category 1 waste rock can produce acidic leachate and release solutes to contact waters.

Thematic Response

The non-acid-generating materials are tailings and Category 1 waste rock (0.12 percent sulfide S or less). This classification is based on humidity-cell tests operated on 38 samples of NorthMet Category 1 waste rock continuously for up to 6.4 years (duration 187 to 337 weeks, (PolyMet 2015q Attachment C) as cited in the FEIS]). None of these materials produced acidic leachate (see time plots of effluent pH in "Attachment 2 Trend Analysis for Rock Humidity Cells" to "Attachment A Water Quality Modeling for Waste Rock and Pit Walls" to the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]). The 0.12 percent sulfide S threshold for defining non-acid-generating rock is supported by the results of these humidity-cell tests, in which none of the samples became acidic, as indicated by a trend of increasing sulfate release rate and decreasing pH.

A stockpiling operational error resulting in acid generation is a possibility. However, only one (0.2 wt% sulfur) of the 15 Category 2/3 rock samples with a sulfur concentration less than 0.3 wt% sulfur generated a net acidic leachate. Because the Category 2/3 rock is on average 0.21 wt% sulfur, misplacing the entirety of the Category 2/3 rock with the Category 1 rock would not result in a mass weighted sulfur concentration above 0.2 wt% sulfur (combined Category 1 and Category 2/3 rock would have an average sulfur concentration of about 0.1 wt%.

Subtheme WR 025-15

Theme Statement

Provide an independent example showing how the release rate of two constituents in waste rock (Cu and Ni) are altered from laboratory test results to values applied in the model in response to application of factors for fragment size, temperature, pH, time to onset of acidic conditions, and water contact.

Thematic Response

The rate at which soluble copper and nickel are released from NorthMet mine rocks is proportional to the rate at which sulfide-sulfur minerals in these rocks oxidize. The sulfide-mineral oxidation rates in NorthMet rocks under field conditions are based on measured oxidation rates in multi-year laboratory weathering tests, where the rates are scaled from laboratory to field conditions by incorporating the effects of sulfide-mineral concentration, rock fragment size (Ksize), temperature (Ktemp), and acidity in the pore water. Once acidic conditions begin, rates increase and then decay, matching behavior seen in kinetic tests. Presented here is an example if metal leaching from ore (Duluth Complex).

- Ksize = 0.14: Average value of 0.14 is based on literature values (PolyMet 2015q, as cited in the FEIS)
- Ktemp = 0.229: Ktemp = Kt = e^{[Ea/R] * [(1/Tlab) - (1/Tfield)]}, where:
  - Ea = 55 kj/mole (activation energy of pyrrhotite oxidation)
  - Tfield = 2.004 C (temperature in the field, annual average, =275.154 K)
  - Tlab = 20 C (temperature in laboratory humidity cell tests, = 293.15 K)
  - R= 0.008134 kj/mole-deg K (Gas constant)
  - Ktemp = exp{(55/0.008134)*[(1/275.154)-(1/293.15)]} = 0.229 [unitless]

(Equation 8-17 of PolyMet 2015q, as cited in the FEIS)

- Time to Acid Onset (field) = 23.6 years.
  - Time to Acid Onset in laboratory conditions = 5.41 years (Figure 8.13 of PolyMet 2015q, both as cited in the FEIS) Correcting for the effect of field temperature; and
  - Time to acid onset (field) = 5.41 yrs lab * (1/0.229 yrs lab/yrs field) = 23.6 years.
- Sulfur_Conc = 0.608 %S (Average for ore: PolyMet 2015q, as cited in the FEIS)
- Oxidation_Rate_Regression = 13.92 mg SO_4/kg-rock/week/%S (Slope of oxidation rate vs. Sulfide S, PolyMet 2015q, as cited in the FEIS)
- Sulfate Release Rate: At the end of year 1, leaching to percolating water oxidation is:
  - Sulfur_conc (%S) * Oxidation_Rate_Regression (mg SO_4/kg/week/%S) * Ks [unitless] * Kt [unitless] = 0.608 * 13.92 * 0.14 * 0.229 = 0.194 mg SO_4/kg rock/wk
  - Converting sulfur release from SO_4 to S: 0.194 mg SO_4/kg rock/wk * (32 mg S/96 mg SO_4) = 0.0646 mg S/kg rock/wk
- Metal Release Rates: Copper and nickel are released in proportion to S (sulfide mineral oxidation), and additional nickel is also released in proportion magnesium release (olivine dissolution) in the following ratios (PolyMet 2015q, as cited in the FEIS):
  - Cu/S = 0.504 mg Cu/mg S;

  - Ni/S = 0.153 mg Ni/mg S
  - Mg/SO_4 = 0.0729 mg Mg/mg SO_4

  The metal-release rates are then:

  - Copper: (0.0646 mg S/kg rock/wk) * (0.504 mg Cu/mg S) = 0.0326 mg Cu/kg-rock/wk.
  - Magnesium: (0.194 mg SO_4/kg-rock/wk * 0.0729 mg Mg/mg SO_4) = 0.0141 mg Mg/kg-rock/wk.
  - Nickel: (0.0646 mg S/kg rock/wk * 0.153 mg Ni/mg S) + (0.0141 mg Mg/kg-rock/wk * 0.00459 mg Ni/mg Mg) = 0.0099 mg Ni/kg-rock/wk.

- After onset of acidic conditions: After 23.6 years of weathering, the ore is assumed to become acidic, and the oxidation rate (as SO_4 release rate) is estimated using only the a0 and a1 parameters derived from observed increase and decay in reaction rates in kinetic tests: SO_4(mg/kg-rock/wk) = 10^{((a1 * log(time)) + a0}, where (Table 1-1 of PolyMet 2015m, as cited in the FEIS—values are P50 used in GoldSim model of Mine Site):

  - Time = duration since onset of acidic conditions [in weeks since peak rate with acid onset]
  - a0 = 2.54 (sulfate production decay parameter [unitless])
  - a1 = -0.5875 (sulfate production decay parameter [unitless])

  For example, at the end of year 25, ore has aged 72.8 weeks beyond the time when acidic conditions begin (i.e., [25yrs -23.6 yrs]*52 wks/yr = 72.8 weeks).

  - SO_4 (mg/kg-rock/wk) = Ktemp * Ksize * 10^{(a1 * log(time))+a0}
  - =0.1 * 0.229 * 10^[{(-0.5875*log(72.8)} + 2.54]
  - = 0.64 mg SO_4/kg-rock/wk

  Thus the oxidation rate has increased at the onset of acidic conditions, but the rate decays after onset reflecting the observed decay as the remaining sulfide S is consumed.

The Co-lead Agencies conducted independent calculation to confirm that the scale factors, oxidation rates, and associated release of sulfate and metals before and after inundation by Mine Site pit water were applied in the GoldSim model as described in the Waste Characterization Data Package (NorthMet Mining Project GoldSim Water Quality Model - Phase 3 Quality Assurance, memo from ERM to Bill Johnson, MDNR, February 25, 2013 [ERM 2013]).

Subtheme WR 025-16

Theme Statement

Include the effect of rock dust (produced by blasting) on the quality of Mine Site surface runoff to the Partridge R.

Thematic Response

Dust emissions from blasting in the NorthMet Project Proposed Action open pits are not assessed quantitatively in the GoldSim modeling, and are not included in air quality analysis because the air dispersion models employed are not suitable for this type of potential emission source. Instead, blasting and associated dust releases are limited under applicable permitting and safety requirements, including:

- The Fugitive Emission Control (FEC) Plan, which would require proper blast design and other procedures to minimize dust generation and transport beyond the mine pits;
- A "blast monitoring plan" in the Permit to Mine, which, in accordance with state regulations, requires that "Mining shall be managed to control avoidable dust," that "overpressure and ground vibrations from production blasts shall be kept at levels which would not be injurious to human health or welfare and property outside mining areas," and requires monitoring for "meteorological conditions, including temperature inversions, wind speed, and directions" (Minnesota Administrative Rules 6130.700 Air Pollution, Rule 6130.3800 Goal of Blasting, and Rule 6130.3900 Blasting Requirements, respectively); and
- The Mine Health and Safety Administration (MHSA) Rules and Regulations, which include requirements for drilling and blasting activities that protect worker safety, including exposure to dust.

Collectively, these require that that blasting be conducted in a manner that minimizes dust to a level that protects human health. Further, much of the ground closest to the pits is disturbed "contact area" (e.g., waste rock and haul roads), where all runoff water would be captured and treated prior to discharge. Based on these requirements and existing controls, it is assumed that dust release from blasting would be below a level that would adversely affect water quality.

Theme WR 026

Theme Statement

Given the inadequate geochemical characterization, the GoldSim models unrealistically minimize the uncertainty associated with predicting future chemical loading. The probabilistic and deterministic inputs used for geochemical parameters in the GoldSim models should compensate for this uncertainty by using more conservative mean values and larger standard deviations, or greater ranges of values. The FEIS should disclose the uncertainties and discuss what they mean in regard to impacts on water quality and quantity. Water quality modeling should also take into account changes in flow due to the NorthMet Project Proposed Action.

Thematic Response

The geochemical characterization of NorthMet rock is related primarily to its net acid-generating potential, as indicated by the concentration of sulfide S in the rock and tailings. The humidity cell samples (38 of Category 1, 26 of Category 2/3, and 19 of Category 4) were dispersed spatially across the deposit to include the different formations (see Large Table 2 of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]), and covered the range of sulfide S concentrations (Table 4-1 [Matrix for Sample Selection in Waste Rock Types] [SRK 2007b, as cited in the FEIS]). The chemical behavior of non-acid generating rock (less than 0.12 percent sulfide S) is based on long-term (up to 5-year duration) humidity cell tests on NorthMet Category 1 waste rock (duration 187 to 337 weeks, listed in Large Table 1 of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]). None of these Category 1 materials produced acidic leachate (see time plots of effluent pH in "Attachment 2 Trend Analysis for Rock Humidity Cells" to "Attachment A Water Quality Modeling for Waste Rock and Pit Walls" from the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]). For tailings, ore processing would produce non-acid generating material (sulfide S less than or equal to 0.12 percent), and solute releases are estimated from 33 humidity cells on NorthMet tailings and 4 on LTVSMC tailings (Large Table 5, Waste Characterization Data Package [PolyMet2015q, as cited in the FEIS]). The sulfide S distribution in NorthMet waste and ore is estimated from approximately 18,800 analyses of sulfide S in core samples, and an independent geostatistical evaluation found that these data adequately supported PolyMet's model of the deposit (Optitech 2012). These geochemical data are adequate for the NorthMet FEIS.

The parameters used to estimate solute release rates applied in the GoldSim models were developed by the Co-lead Agencies as part of the Impact Assessment Planning process, and parameters values were selected to bracket evenly the uncertainty in model parameters and avoid underestimating estimates of chemical loading (MDNR et. al. 2011, as cited in the FEIS). In a few instances, model parameters are selected to produce larger ranges than indicated by simple statistical application of test data (e.g., solute release rates from waste rock are based on the range in individual humidity-cell tests, not the range in the average; Section 8.1.2.1 of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]) release rate from an entire waste rock stockpile.

Uncertainty in model parameters is described in Table 1-1 of Water Modeling Work Plan – Plant Site (Barr 2012d, as cited in the FEIS), and Table 1-1 of the Water Modeling Work Plan – Mine Site (Barr 2012c, as cited in the FEIS).

Regarding changes in flow, the GoldSim models track surface and groundwater flow at both the Mine Site and Plant Site, to make up in part the flow removed by the Plant Site groundwater containment system, and modeling accounts for the augmentation of Plant Site tributary stream flows (at plus or minus 20 percent of existing flows) with treated water from the Plant Site WWTP.

Theme WR 027

Theme Statement

For the Mine Site, the SDEIS does not discuss the addition of lime to waste rock or pits to control pH. It does not discuss lining the pits with bentonite. These options should be studied.

Thematic Response

The mine waste rock would be sorted into and stored as four categories based on its potential to contaminate water, with Category 1 waste rock having a low potential and Category 4 waste rock having a high potential. Category 1 waste rock would be stored in a permanent stockpile that would be surrounded by a seepage collection system encompassed by a water containment system to capture surface and groundwater from the stockpile and direct it to a water treatment facility, as well as a geomembrane cover to limit infiltration at closure. Because Category 1 waste rock has a low potential to generate acid or metal leachate, and because water from the stockpile would be captured and treated, lime is not anticipated to be needed for neutralization, and, therefore, the addition of lime for Category 1 waste rock is not proposed. Category 2/3 and 4 waste rock would be stored temporarily in stockpiles with underliners and seepage collection, and then used to backfill the East Pit following completion of mining there. Lime would be added to the waste rock during East Pit backfilling to maintain pH in the pit pore water as needed. The volume of lime required would be based on operations monitoring results. Waste rock characterization and categorization, as well as management and storage during operations and closure and water management at the stockpiles, is addressed in FEIS Sections 3.2.2.1.7, 3.2.2.1.8, 3.2.2.1.9, and 3.2.2.1.10. A low-permeability soil barrier could be constructed along the Ore Grade Material portions of the exposed West Pit wall and this may be considered as a contingency mitigation.

Theme WR 028

Theme Statement

The SDEIS does not consider leaching from the coal ash landfill at the Plant Site.

Thematic Response

The coal ash landfill would be removed and disposed in the Hydrometallurgical Residue Facility. This is described in FEIS Section 3.2.2.3.5.

Theme WR 029

Theme Statement

It is not clear in the SDEIS whether the waste rock from the stockpiles would simply be deposited in the East Pit in year 11 and remain partly exposed for 20 years while the water rises around it, or if the placement of the waste rock would occur in stages to ensure the rock is either still on the stockpile liner (and leachate is collected and treated) or entirely submerged within the East Pit to minimize acid production and metal leaching.

Thematic Response

As soon as excavation of the East Pit is complete in mine year 11, backfilling of the East Pit would begin, using waste rock from the temporary Category 2/3 and 4 Stockpiles, and freshly mined material from the West Pit. To reduce oxidation in the backfill and wall rock, the backfill would be flooded with excess water from the Central Pumping Station as quickly as practicable leaving only approximately 5 feet of exposed backfill above the water elevation at any point in time. To the extent practicable, the thickness of unsaturated waste rock in the East Pit would not be more than 5 feet during the reclamation/closure periods. Thus, the reactive Category 2/3 and 4 waste rock would either be in lined stockpile facilities, where leachate is captured, or in the East Pit as backfill, where it would be flooded to stop oxidation and the extracted pore water would be treated prior to discharge or recycling back to the East Pit. This is described in Section 6.1.2.2 and Figure 6-6 of PolyMet 2015m, as cited in the FEIS.

The rate of oxidation and associated release of acidity and metals from waste rock and wall rock after it is submerged under water was considered directly by the Co-lead Agencies as part of the Impact Assessment Planning Process (See Table 1 of MDNR et. al. 2011, as cited in the FEIS). Supporting analysis found that after the rock was submerged by a layer of oxygenated water, the rate of oxidation in the rock would decrease by at least a factor of approximately 800 relative to the oxidation rate when it was exposed directly to atmospheric oxygen (PolyMet 2015q, as cited in the FEIS). Based on this analysis, which is consistent with general results of studies on subaqueous disposal of sulfide-bearing mine waste, the GoldSim model assumed that oxidation in submerged wall rock and waste rock was negligible.

Theme WR 030

Theme Statement

The FEIS discussion of solute release from Tailings Basin should be based on site-specific materials and conditions, not other tailings basin sites.

Thematic Response

The solute release rates from tailings (proposed NorthMet and existing LTVSMC) were based directly on laboratory measurements conducted on representative samples of these two materials, including tailings generated as part of the proposer's processing and metallurgical pilot-testing. Specific measurements included total concentrations of metals and other elements in the tailings (e.g., based on elements extracted in dissolution by a strong acid "aqua regia" digest), or for the more soluble constituents, the rate at which they leach in multi-year humidity cell tests (Table 1-13 in the Plant Site Water Modeling Work Plan—Barr 2012d, as cited in the FEIS).

The oxidation rates measured under laboratory conditions were scaled so as to more accurately estimate weathering rates under site-specific field conditions in the NorthMet Project area -- a process that accounts for well-established effects on weathering rates due to temperature, fragment size, and pore-gas oxygen concentrations (Section 10.2 of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]).

It is the concentration caps, applied in the GoldSim models to reflect chemical limits on the concentrations of some solutes in pore waters that incorporated estimates from analogous mines (Table 1-15 in the Plant Site Water Modeling Work Plan). The decision to use effluent

concentrations measured at analog mine sites and the selection of specific method of incorporating values from these analog sites to the NorthMet Project Proposed Action modeling was made by the Co-lead Agencies as part of the Impact Assessment Planning process (See Table 1 of MDNR et. al. 2011, as cited in the FEIS; the discussion of Waste Rock Solubility Caps for Category 1 rock is applied to tailings).

Analog site data were applied because the standard laboratory procedure used to measure oxidation rates and solute release in mine waste (humidity cells) used water to rock ratios hundreds of times higher than expected under some NorthMet Project area field conditions. Assuming that maximum concentrations in humidity-cell tests were "concentration caps" could thus underestimate solute caps in the Mine Site's GoldSim tailings model. The analog data were selected from sources with similar host rock and climate (e.g., AMAX stockpiles, near the NorthMet Project area, and the Whistle Mine in Canada). The approach used in the FEIS to estimate solute release from tailings is valid.

Theme WR 031

Theme Statement

The FEIS discussion of solute release from waste rock at the Mine Site should be based on site-specific materials and conditions, not other mine sites.

Thematic Response

The solute release rates for NorthMet waste rock were based on laboratory measurements conducted on drill core samples of bedrock types that would ultimately become waste rock. Specific measurements included total concentrations of metals and other elements (e.g., based on elements extracted in dissolution by a strong acid "aqua regia" digest, or direct analysis of mineral phases by electron microprobe), or for the more soluble constituents, the rate at which they leach in multi-year humidity cell tests (see Tables 1-24 through Table 1-27 of Barr 2012c, as cited in the FEIS). The oxidation rates measured under laboratory conditions were scaled so as to more accurately estimate weathering rates under site-specific field conditions at the Mine Site -- a process that accounts for well-established effects on weathering rates due to temperature, fragment size, and water contact (see Section 8.2 of PolyMet 2015q, as cited in the FEIS).

It is the concentration caps, applied in the GoldSim models to reflect chemical limits on the concentrations of some solutes in pore waters that incorporated estimates from analogous mines (see Table 1-30 through Table 1-33 of Barr 2012c, as cited in the FEIS). The decision to use effluent concentrations measured at analog mine sites and the selection of specific method of incorporating values from these analog sites to the NorthMet Project Proposed Action modeling were made by the Co-lead Agencies as part of the Impact Assessment Planning process (See Table 1 of MDNR et. al. 2011, as cited in the FEIS).

Analog site data were applied because the standard laboratory procedure used to measure oxidation rates and solute release in mine waste (humidity cells) used water to rock ratios hundreds of times higher than expected under some field conditions in the NorthMet Project area. Assuming that maximum concentrations in humidity-cell tests were "concentration caps" could thus underestimate solute caps in the Mine Site's GoldSim tailings model. Further, analog field data provided estimates of solute under longer-duration weathering, broader ranges in effluent pH than laboratory tests. The analog data were selected from mines with similar host

rock and climate (e.g., Amax Stockpile, near the NorthMet Project area, and the Whistle Mine in Canada). The Co-lead Agencies stand behind the approach used in the FEIS to estimate solute release from tailings.

Theme WR 032

Theme Statement

The FEIS needs to consider increased nitrate and ammonia loading at the Mine Site due to blasting.

Thematic Response

Blasting would occur when pits are developing and being dewatered. The WWTF would treat mine pit water before being pumped to the Plant Site where it would be treated again by reverse osmosis or equivalently performing technology before being discharged to the environment. The potential environmental effects to water resources due to blasting would be negligible.

Theme WR 033

Theme Statement

The SDEIS does not fully describe the technical basis for concentration caps. Concentrations caps should not be used. Concentrations caps for West Pit water quality obscure the duration of water treatment. To better reflect the measured and likely pH conditions of Category 1 Stockpile leachate, pH-dependent concentration caps should use AMAX pile leachate concentrations for pH values between 6.0 or 6.5 and pH 7.5.

Thematic Response

Laboratory humidity cell tests are not intended to directly represent field conditions, but are instead standardized tests that provide a reference for the environmental behavior of mine wastes that contains sulfide minerals. Humidity-cell tests have been conducted on rock samples from most existing mines, and there are many published studies that compare weathering results in these laboratory scale tests to solute release from full scale mine waste facilities. Details on how the humidity cell test results are "scaled up" from laboratory results to estimate solute release in NorthMet mine waste under field conditions are presented in the NorthMet Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS) (Section 8.2 describes for waste rock, and Section 10.2 for tailings).

Theme WR 034

Theme Statement

Laboratory humidity cell tests do not represent anticipated field conditions.

Thematic Response

Laboratory humidity cell tests are not intended to directly represent field conditions, but are instead standardized tests that provide a reference for the environmental behavior of mine wastes that contain sulfide minerals. Humidity-cell tests have been conducted on rock samples from

most existing mines, and there are many published studies that compare weathering results in these laboratory tests to solute released from full-scale mine waste facilities. Details on how the humidity cell test results are "scaled up" from laboratory results to estimate solute release in NorthMet Project Proposed Action mine waste under field conditions are presented in the NorthMet Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS]) (Section 8.2 describes for waste rock, and Section 10.2 for tailings).

Theme WR 035

Theme Statement

The SDEIS states that water treatment at both the Mine Site and Plant Site would occur for "as long as necessary" to achieve applicable water quality criteria. There is no indication of whether this is decades, centuries, or is perpetual. A long-term water treatment plan is imperative to evaluate the environmental effects of this the NorthMet Project Proposed Action. Long-term treatment requires long-term monitoring. The need for perpetual augmentation requires the need for perpetual treatment. It is not clear which water quality parameter(s) drive the need for long-term treatment. Influent water quality to the WWTP and WWTF should be modeled and disclosed in the FEIS out to 500 years. The East Pit backfill would reduce treatment requirements over the long term.

Thematic Response

Water quality modeling performed in support indicates that water treatment systems in some form and at some scale would be needed indefinitely at the Mine Site and Plant Site. The water models constructed to assess the potential effects from the NorthMet Project Proposed Action were not designed to predict the duration of treatment nor do they capture all the factors that influence the duration of treatment (e.g., potential future regulatory and technological changes). Therefore, the models cannot be used to predict the year treatment would end. It is the sulfate wild rice standard of 10 mg/L that drives the need for long-term water treatment. Two hundred years of influent water quality predictions provide reasonable estimates of what can be expected over the long term.

Water monitoring would persist as long treatment is needed. Actual treatment requirements would be assessed on a reoccurring basis throughout operations and closure based on results of ongoing discharge, performance, and water resource monitoring, ensuring continuous protection of groundwater and surface water quality and compliance with applicable water quality standards. This reassessment process would rely on measured monitoring results (evaluated through modeling) rather than the results of the predictive modeling included in the FEIS. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there are measures available to address impacts to natural resources. Augmentation water would be treated for as long as necessary and augmentation would continue for a long as necessary. If and when non-mechanical water treatment is implemented at the Plant Site, Unnamed Creek, Trimble Creek and Mud Lake Creek stream augmentation would no longer be necessary.

Theme WR 036

Theme Statement

The FEIS should include a mathematical analysis to estimate the likely range of years that mechanical water treatment and monitoring would be required.

Thematic Response

Although precise estimates cannot be developed, the FEIS modeling indicates that the East Pit, West Pit, and Category 1 Stockpile would be permanent features that would provide solute-loading for a minimum of 200 years at the Mine Site. Similarly, the Tailings Basin is a permanent feature that would provide solute loading for a minimum of 500 years at the Plant Site. Monitoring would be required for the duration of permitted discharges. See Response WR 035.

Theme WR 037

Theme Statement

The FEIS should acknowledge that the NorthMet Project Proposed Action would not be maintenance free at closure. This violates Minnesota Rules. Treatment would also be expensive especially in meeting the wild rice sulfate standard. Given the duration of site maintenance post-closure, which is on the order of hundreds of years, and PolyMet's current assets and liabilities, it would be difficult if not impossible for PolyMet to meet its obligations in closure. There are likely to be financial consequences for Minnesotans.

Thematic Response

It is acknowledged that operation, maintenance, and periodic replacement of environmental controls would be required during closure. *Minnesota Rules* 6132.3200 specifies that it is a goal for a mining area to be maintenance-free. Financial assurance would be required under *Minnesota Rules* 6132.1100 before the State's Permit to Mine can be issued. Permit conditions and financial assurance would be required to perform reclamation and closure activities for as long as these activities are needed. If and when non-mechanical water treatment is implemented at the Plant Site, Unnamed Creek, Trimble Creek and Mud Lake Creek stream augmentation would no longer be necessary. FEIS Section 3.2.2.4 describes the financial assurance process and requirements. See the response to theme WR 035 for more information on monitoring.

Theme WR 038

Theme Statement

The FEIS should predict how long chemical sources would contribute pollutants to discharge water that has concentrations above regulatory standards. The FEIS should acknowledge that treatment of the West Pit water would be necessary until West Pit water meets water quality standards.

Thematic Response

Water quality modeling performed in support indicates that water treatment systems in some form and at some scale would be needed at the Mine Site and Plant Site indefinitely. The water models used to assess the potential effects from the NorthMet Project Proposed Action were not designed to predict the duration of treatment nor do they capture all the factors that influence the duration of treatment (e.g., potential future regulatory and technological changes). Therefore, the models cannot be used to predict the year treatment would end. Actual treatment requirements would be assessed on a reoccurring basis throughout operations and closure based on results of ongoing discharge, performance, and water resource monitoring, ensuring continuous protection of groundwater and surface water quality and compliance with applicable water quality standards. This reassessment process would rely on measured monitoring data (evaluated through modeling) rather than solely on the results of the predictive modeling as was done in the FEIS. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there are measures available to address impacts to natural resources. All affected water, including that from West Pit surface water discharges, would be treated until the discharge met applicable standards without treatment.

Theme WR 039

Theme Statement

The FEIS should include monthly monitoring and reporting of water quality in city and residential wells and drainage areas surrounding the Mine Site. Sufficient and properly trained state agency staff should be used to accomplish this task. The location of groundwater monitoring wells at the Mine Site and Plant Site should be sufficiently upgradient from the PolyMet property boundary to allow for mitigation if and when groundwater quality does not meet standards.

Thematic Response

There are no municipal or residential wells surrounding the Mine Site that would be potentially impacted by the NorthMet Project Proposed Action. Water quality monitoring of the Partridge River is anticipated. The details of PolyMet's proposal are disclosed in the FEIS in Section 5.2.2.3. Existing groundwater wells are upgradient from residential wells, including those at the toe of the Tailings Basin. See Figures 4.2.2-16, 4.2.2-17, and 4.2.2-18.

Theme WR 040

Theme Statement

The SDEIS does not provide a complete inventory of drinking water wells located near the Mine Site and Plant Site.

Thematic Response

There are no municipal or residential wells surrounding the Mine Site that would be potentially impacted by the NorthMet Project Proposed Action. There are 27 known domestic wells between the Tailings Basin and the Embarrass River, with the closest being approximately 1.6 miles from the toe of Cell 2E. Characteristics of the wells are presented in FEIS Table 4.2.2-26. Locations of

all residential wells (sampled and unsampled) were added to Figure 4.2.2-18 (formerly Figure 4.2.2-17 in the SDEIS). Analytical results for water collected the 15 sampled residential wells are summarized in FEIS Table 4.2.2-25.

Theme WR 041

Theme Statement

The SDEIS does not evaluate how drinking water has been and would be impacted by mine-affected groundwater. Treating impacted water to meet drinking water regulations would be expensive.

Thematic Response

There are no municipal or residential wells surrounding the Mine Site that would be potentially impacted by the NorthMet Project Proposed Action. At the Plant Site, characterization data indicate that the bulk hydraulic conductivity of upper bedrock is two to three orders of magnitude lower than the hydraulic conductivity of the surficial aquifer. Thus, groundwater flow and transport at the Plant Site is dominated by the hydraulics of the surficial aquifer. Bedrock plays a negligible role in transporting site-derived chemicals to the Embarrass River. Therefore, domestic wells screened solely in the bedrock aquifer are not anticipated to be affected by the NorthMet Project Proposed Action. Wells that are within a surficial aquifer flowpath and screened in the alluvium would have water quality similar to the corresponding flowpath reported in Table 5.2.2-38. Finally, the NorthMet Project Proposed Action is predicted to meet groundwater evaluation criteria at the property boundary and thus significant impacts to residential wells beyond the property boundary are not expected.

Theme WR 042

Theme Statement

The FEIS should address the NorthMet Project Proposed Action's impacts and risks on drinking water throughout St. Louis River Watershed including the City of Duluth and the City of Superior. Cumulative effects on drinking water from other current and proposed mining and industrial projects within the watershed should also be analyzed. Mitigation for drinking water impacts should be identified.

Thematic Response

In Chapter 6, the discussion of cumulative impacts in the St. Louis River watershed was expanded and all relevant tables were modified (to the extent that there was information to make these revisions).

Groundwater and surface water quality model predicts that the NorthMet Project Proposed Action would have a minimal effect on drinking water standard-based groundwater evaluation criteria at the NorthMet Project area boundaries, in the Embarrass and Partridge rivers, and in Colby Lake (the locations at which drinking water standards apply). Evaluation criteria can be found in Section 5.2.2. Based on this, it is therefore expected that the NorthMet Project Proposed Action would not have any significant impacts on water quality downstream of the NorthMet Project area or significantly contribute to any cumulative effects on drinking water supplies.

Given the downstream distance to the cities of Duluth or Superior, it is highly unlikely that the water supplies for these cities would be affected.

In the unlikely event that downstream water supplies were affected, mitigation would involve improving engineering controls at the NorthMet Project area and/or upgrading municipal water treatment plants to provide drinking water that meets applicable USEPA and state standards.

Theme WR 043

Theme Statement

The FEIS should specifically evaluate the NorthMet Project Proposed Action's effects on Colby Lake, which is used for domestic consumption by the City of Hoyt Lakes. The evaluation should include contributions of pollutants to Colby Lake from the NorthMet Project Proposed Action and water appropriations from Colby Lake. PolyMet should assist with water supply contingency planning for the City of Hoyt Lakes.

Thematic Response

The Mine Site water quality model was revised in the FEIS to more accurately reflect existing conditions and explicitly evaluate chemical concentrations in Colby Lake for the NorthMet Project Proposed Action. The primary modification was the addition and calibration of a new chemical source to the lake that accounted for non-NorthMet Project Proposed Action sources of chemical loading. For future conditions, the chemical concentrations in the lake were predicted by considering the mass loading of this new source and mass loading that enters the lake from the Partridge River (which may be affected by the NorthMet Project Proposed Action). The revised FEIS model provides a more accurate prediction of chemical concentrations in Colby Lake and a more accurate assessment of potential impacts related to the NorthMet Project Proposed Action.

Maximum P90 concentrations in Colby Lake were updated in Table 5.2.2-34 for the FEIS. Colby Lake is a Class 1B water. As such, primary and secondary drinking water standards apply. These standards are reported for comparison purposes in Table 5.2.2-34.

In the unlikely event that the NorthMet Project Proposed Action were to adversely affect drinking water quality in Colby Lake, mitigation would involve upgrading the City of Hoyt Lakes water treatment plant to provide drinking water that meets applicable USEPA and state standards. The Permit to Mine would specify the conditions under which PolyMet would be obligated to make improvements to the City's drinking water treatment plant.

Theme WR 044

Theme Statement

The Mine Site GoldSim model does not adequately predict existing chemical concentrations in the Partridge River, including trends of concentration versus downstream river distance.

Thematic Response

The FEIS Mine Site GoldSim model was recalibrated to provide a better correspondence between predicted and observed water chemistry in the Partridge River for existing conditions.

This calibration considered new surface water chemistry data collected through the end of 2013. For Colby Lake, a new chemical source term was added to the Mine Site GoldSim model and calibrated to measured concentrations in the lake to ensure there was an adequate basis for assessing potential impacts from the NorthMet Project Proposed Action.

Theme WR 045

Theme Statement

The Plant Site GoldSim model does not adequately predict existing chemical concentrations in the Embarrass River.

Thematic Response

The FEIS Plant Site GoldSim model was recalibrated to provide a better correspondence between predicted and observed water chemistry in the Embarrass River for existing conditions. This calibration considered new surface water chemistry data collected through the end of 2013 to ensure there was an adequate basis for assessing potential impacts from the NorthMet Project Proposed Action.

Theme WR 046

Theme Statement

The Mine Site GoldSim model does not adequately predict existing chemical concentrations in Colby Lake.

Thematic Response

The Mine Site GoldSim model was modified for the FEIS to include a new chemical-loading source in Colby Lake that was calibrated to the measured chemical concentrations in the lake. The same chemical-loading source was applied to both the Continuation of Existing Conditions model and Propose Action model in GoldSim. The chemical-loading source was constant and did not exhibit seasonal or long-term variations for future conditions. Incorporation of the loading source addressed the issue by providing predicted chemical concentrations in Colby Lake for existing conditions that are similar to currently measured concentrations.

Theme WR 047

Theme Statement

The Mine Site GoldSim model does not adequately predict existing streamflow in the Partridge River.

Thematic Response

In the Mine Site GoldSim model, Partridge River streamflows are based on results of an XP-SWMM surface water flow model calibrated to 10 years of stream gaging data collected at location SW006 by the U.S. Geological Survey. The gaging data are considered high-quality and appropriate for assessing river flow characteristics. The flow analysis performed for the Partridge River and incorporated into the GoldSim model is appropriate for impact analysis.

Theme WR 048

Theme Statement

The Plant Site GoldSim model does not adequately predict existing streamflow in the Embarrass River.

Thematic Response

In the Plant Site GoldSim model, Embarrass River streamflows are based on 20 years of measured stream gaging data collected at a U.S. Geological Survey gaging station located downstream of the Plant Site. The gaging data are considered high-quality and appropriate for assessing river flow characteristics. The flow analysis performed for the Embarrass River and incorporated into the GoldSim model is appropriate for impact analysis.

Theme WR 049

Theme Statement

Because the GoldSim models do not adequately reproduce existing flow and water quality conditions, the models cannot reliably predict future conditions associated with the NorthMet Project Proposed Action.

Thematic Response

For the FEIS, both the Mine Site and Plant Site GoldSim models were recalibrated to provide better correspondence between predicted and observed water quality for existing conditions. This calibration considered new surface water chemistry data collected through the end of 2013. Model calibrations, other model assumptions, and the resulting impact predictions provide a reasonable estimate of potential environmental effects for purposes of the EIS.

Theme WR 050

Theme Statement

The FEIS should include a scientific explanation of the calibration factors used for solutes leaving the former LTVSMC Tailings Basin.

Thematic Response

At the Plant Site are a number of monitoring wells in the surficial aquifer that have clearly been impacted by the existing LTVSMC tailings. The chemical concentrations in these wells are considered to be the direct result of chemical release from the existing tailings. Theoretical release rates from the existing LTVSMC tailings have been developed using humidity cell data and measurements made at other similar tailings facilities. Using the theoretical chemical release rates, the existing conditions GoldSim model simulates chemical release from the LTVSMC tailings and transport to the monitoring wells. When this simulation was first attempted, it was found that for tailings-related constituents, the predicted chemical concentrations at these monitoring wells were generally higher than the measured concentrations. To provide a better match between predicted and measured concentrations, a factor was applied to the theoretical chemical release rates for the LTVSMC tailings. Referred to as “calibration factors,” these

calibrated inputs reduce the rate of LTVSMC tailings chemical release so that the predicted concentrations in affected monitoring wells are similar to the measured concentrations. Depending on the chemical constituent, the values of the calibration factors range from 1 (no modification) to 0.0001 (large reduction). It is interpreted that the calibration factors account for geochemical and hydrological processes that tend to reduce chemical concentrations (e.g., mineral precipitation and adsorption), but which are not explicitly incorporated into the GoldSim model. Note that there is no field basis for calibrating the future tailings from the NorthMet Project Proposed Action, so no calibration factors are used to adjust the chemical release rates from these tailings.

Theme WR 051

Theme Statement

The Mine Site existing conditions model does not account for variable discharge from the Northshore Mine into the Partridge River. It is unclear whether the Northshore Mine appropriations permit would be transferred or if it is an approximation of the discharges expected for the East Pit and West Pit.

Thematic Response

The theme correctly notes that pumped discharges from the Northshore Mine are sporadic with a variable flow rate. The GoldSim model is not designed to simulate flow/chemical conditions in the Partridge River when the Northshore Mine is actively pumping and its discharge dominates the river flow. There are two sources of Northshore inputs to the Partridge River that are more continuous and with less variable flow rates: seepage from the Western Pond and storage/release from wetlands (of previously discharged water). GoldSim consolidates these flows into a single integrated Partridge River input that has a constant flow rate and uniform chemical concentrations. Based on calibration to existing Partridge River water quality, the Northshore discharge flow rate used in the FEIS GoldSim model is 2.6 cfs and has a sulfate concentration of 28 mg/L. For the impact assessment, this constant rate input to the river adequately characterizes flow inputs from the Northshore Mine when it is not actively pumping. See FEIS Section 5.2.2.3.2 for more information.

Note that the Northshore Mine is expected to end operations about calendar year 2070 and this would result in cessation of mine-related flow inputs into the Partridge River. The FEIS GoldSim models for Project Conditions and Continuation of Existing Conditions incorporate the ending of Northshore inputs in calendar year 2070 (mine year 52).

The Northshore Mine permit would not be transferred to PolyMet, but could be transferred to new owners of the Northshore Mine (in the event that the ownership changes), although no such transfer is currently anticipated.

Pit inflows and pit discharges from the NorthMet Project Proposed Action are estimated from site-specific data and analyses. Current Northshore discharges are not used to approximate potential discharges from the future NorthMet Project Proposed Action-related mine pits.

Theme WR 052

Theme Statement

Due to underestimated baseflow at the Plant Site, the GoldSim model's recharge and surficial deposit hydraulic conductivities are too low. This results in underestimated chemical loading to the Embarrass River.

Thematic Response

Groundwater baseflows used in the SDEIS and FEIS Plant Site GoldSim model are best-estimate values based on reliable stream gaging data. Areal recharge and surficial aquifer hydraulic conductivity are tied to groundwater baseflows, so at the Plant Site, these are best estimates, as well. See FEIS Section 5.2.2.2.3 for more information.

For the Partridge River at the Mine Site, a detailed GoldSim sensitivity analysis was conducted using groundwater baseflows four times larger than the best-estimate values. As part of the sensitivity analysis, appropriate modifications were made to surficial aquifer hydraulic conductivities and aerial recharge based on a recalibration of the Mine Site MODFLOW model. In addition, a recalibration was performed for surface water runoff concentrations. Results of the high groundwater baseflow rate scenario were compared with the best-estimate scenario to evaluate the degree to which predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow and related inputs. The FEIS reports the results of the sensitivity analysis in FEIS Section 5.2.2.3.2. The Mine Site sensitivity analysis indicates that modeled groundwater and surface water concentrations are sensitive to changes in baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.

In addition, because the Plant Site GoldSim model uses similar equations and inputs pertaining to groundwater baseflow and related flow/transport processes, it is expected that the results of conducting similar sensitivity analyses would show that groundwater and Embarrass River chemical concentrations would also have little sensitivity to assumed groundwater baseflows.

Theme WR 053

Theme Statement

The Plant Site GoldSim model does not account for the hydraulic connection between groundwater in surficial deposits and overlying wetlands; it incorrectly assumes that they are hydrologically disconnected. The GoldSim model also incorrectly assumes that areal recharge is the only flow connection between ground surface and surficial aquifer groundwater.

Thematic Response

Using an observational approach based on data from similar nearby mine sites (i.e., analog method), drawdowns in the surficial aquifer are not expected to extend very far from the mine pits. This is explained by the following factors: 1) the surficial aquifer is thin and moderately permeable, 2) the surficial aquifer is subject to aerial recharge, and 3) the surficial aquifer is underlain by low-permeability bedrock that limits downward leakage from the surficial unit. These factors support the conclusion that some degree of hydraulic connection between the

surficial aquifer and wetlands did not need to be included in the GoldSim model. See FEIS Section 5.2.2.3.2 for more information.

Theme WR 054

Theme Statement

With regard to the east side of the Tailings Basin, the GoldSim model does not provide a groundwater flowpath, incorrectly assumes a no-low boundary condition at the embankment toe, and does not provide a transport analysis for tailings water that leaves the Tailings Basin.

Thematic Response

The theme correctly notes that there would likely be subsurface flow below the East Embankment from west to east and that surface seepage may occur at the toe. The FEIS Plant Site MODFLOW model was modified from the SDEIS to include: 1) the presence of surficial deposits below the East Embankment, 2) boundary conditions (drain and/or river cells) along the embankment toe to allow the potential for surface seepage, and 3) hydrologic inputs to account for the presence of the proposed drainage swale. See FEIS Section 5.2.2.3.3 and PolyMet 2015j and PolyMet 2015i, both as cited in the FEIS, for more information.

Similar to other locations along the perimeter of the Tailings Basin, the NorthMet Project Proposed Action was modified to include installation of a containment system along the East Embankment where it is underlain by surficial deposits. Given the hydrogeology of the area east of the Tailings Basin and the proposed swale to be constructed there, this containment system would have higher hydraulic head on the east side compared to the west (tailings) side where a pumped trench would depress the groundwater level. This would create hydraulic gradients in the slurry wall and in shallow bedrock that would drive (low) flows from east to west across the containment system. This set of hydraulics would result in complete capture of all tailings water approaching the containment system from the Tailings Basin. Because the system would achieve complete capture of tailings water, an east side chemical transport flowpath is not needed in the Plant Site GoldSim model. There is no hydrologic reason to expect that impacted water from the Tailings Basin would migrate east of the containment system.

Theme WR 055

Theme Statement

The FEIS should analyze the effects of water and soil contamination from copper smelting. There is considerable evidence that leaching from the slag waste piles at smelting facilities may extract and concentrate soluble radioactive materials, potentially affecting drinking water supplies.

Thematic Response

The NorthMet Project Proposed Action would not use smelting to produce metal concentrate. The Project Proposer plans to use chemical flotation and an autoclave as described in FEIS Section 3.1.1.6.

Theme WR 056

Theme Statement

There are numerous general concerns about the Plant Site GoldSim model. Two critical issues are that the model does not include a flow/transport analysis on the south side of Tailings Basin (including the SD-026) and that it does not include any bedrock flowpaths. In addition, the SDEIS does not show important GoldSim results including process makeup water requirements, Colby Lake pumping over time, and flow rates of treated and untreated water sent to or received from the Mine Site. The GoldSim model needs to consider lower capture efficiencies, more conservative assumptions in general, the effects of buried channels on flow/transport, and more accurate Tailings Basin runoff estimates. Due to incorrect assumptions about baseflow, the model underestimates chemical load to the Embarrass River. Inputs to the model do not consider all the available data, and model results would be different if all data had been used.

Thematic Response

PolyMet committed to upgrading and/or installing containment systems at the south side of the Tailings Basin (near SD0026) to achieve 100 percent capture of tailings water that migrates beyond the basin perimeter as groundwater or surface water. In conjunction with containment systems installed by Cliffs, PolyMet would be required to upgrade the performance of existing containment systems and/or construct additional controls to achieve this performance specification. Because 100 percent capture of tailings water would occur at the SD0026 location, there is no need to include a south groundwater flowpath in the Plant Site GoldSim model.

The Mine Site model and the Plant Site model explicitly consider buried stream channels by including a rendering of bedrock topography based on a compilation of bedrock topographic data. Additional information and modeling results is reported in the FEIS including process makeup water requirements, Colby Lake pumping over time for process makeup, surface water augmentation, and flow rates of treated/untreated water sent to (or received from) the Mine Site.

As discussed in the responses to themes WR 018, WR 019, WR 020, and WR 022, the assumed capture efficiencies of the groundwater containment systems are justified and supported by modeling.

As discussed in the responses to themes WR 003 and WR 052, the groundwater baseflows used for the Embarrass River are reliable and based on good-quality stream gaging data.

Inputs to the Plant Site GoldSim model are based on all site data collected through the end of 2013. Data not directly used to develop model inputs was either unreliable or not relevant.

Theme WR 057

Theme Statement

With regard to the Tailings Basin pond water balance, the GoldSim model is incomplete, does not justify the hydraulic conductivity value or calculations used to compute 6.5 in/yr of leakage, and does not evaluate Tailings Basin pond overflow during extreme storm events. There is no explanation of how the Tailings Basin pond size or chemistry affects water concentrations at the Tailings Basin toes or why the Tailings Basin must remain saturated. The FEIS should

acknowledge that the Tailings Basin pond would increase the leakage of impacted water to groundwater. Pond water would be toxic.

Thematic Response

Water from the Tailings Basin currently seeps and would continue to seep at its toe. The chemical makeup of this water is affected by the reactions with tailings materials as it moves through the Tailings Basin. These chemical reactions are minimized if the tailings remain saturated, thus removing oxygen from the chemical equation. Under the NorthMet Project Proposed Action, the tailings would remain saturated during operations as new tailings (saturated with process water) were added to the Tailings Basin. In post-closure, the Tailings Basin pond seepage would be managed by placing a bentonite layer at the bottom of the pond to reduce this seepage. Fluctuation in pond size would occur during operations and post-closure, which would affect the volume of water entering the underlying tailings. A containment system would be built around the Tailings Basin to capture all surface seepage and nearly all groundwater seepage from the Tailings Basin.

The FEIS contains new text describing pond leakage and how the chemistry of this leakage would affect chemical concentrations at the Tailings Basin toes. In general, the chemistry of water at the Tailings Basin toes results from a combination of chemical-loading from pond leakage, meteoric infiltration, chemical release from currently existing LTVSMC tailings, and chemical release from future NorthMet Project Proposed Action-related tailings. See FEIS Sections 5.2.2.2.1 for additional information.

The 6.5-inches-per-year pond leakage flux is not computed, but is a stated engineering performance specification. The hydraulic conductivity that achieves this leakage flux is computed using a credible Darcy's law calculation.

The GoldSim model contains algorithms that can allow the pond to overflow during periods of high rainfall, so the model does in fact evaluate pond overflow. The pond size and design are such that the GoldSim model predicts that the pond never overflows during the 500-year simulation period.

The FEIS acknowledges that there would be future leakage from the Tailings Basin pond and the GoldSim model performs calculations to estimate the flow rate and chemical loading associated with this leakage.

Theme WR 058

Theme Statement

There are numerous issues associated with how surficial groundwater flowpaths are modeled in GoldSim. Issues include the inappropriate assumption of constant saturated thickness; flowpath orientations that are inconsistent with MODFLOW results; failure to consider heterogeneity or the presence of high permeability features; failure to consider lateral and vertical dispersion; and the lack of a rationale for the assumption that groundwater can migrate long distances without discharging to wetlands. With regard to hydraulic conductivity, the assumed input probability distribution is not justified and does not include the full range of measured values; it is unclear whether different values are applied to different flowpaths for each simulation. The assumed longitudinal dispersivity values are highly speculative. The assumed sorption coefficients are

speculative, not sufficiently conservative and do not account for the saturation of adsorbed solutes within flowpaths or fractures. The FEIS should acknowledge that other constituents would be affected by sorption. With regard to capture system bypass, the calculated best-estimate flow rate of 21 gpm is too small for a facility this size, and even this flow rate represents too much chemical load leaving the site.

Thematic Response

The surficial groundwater flowpaths in the Plant Site GoldSim model were set up with one-dimensional uniform flow and were considered reasonable approximations to the site conditions for the purpose of evaluating groundwater chemical transport. Important inputs to the GoldSim transport analysis were flowpath length, width, saturated thickness, hydraulic conductivity, recharge, hydraulic gradient, porosity, and sorption. The input values used in GoldSim were reasonable given the one-dimensional nature of the transport analysis.

Longitudinal dispersivity is a scale dependent parameter (rather than a fixed material property) and the values used in the GoldSim surficial flowpaths were reasonable given their physical lengths. Neglecting lateral and vertical dispersivity was conservative and would tend to overestimate chemical concentrations within the flowpaths.

Treating the flowpaths as homogeneous was reasonable in that the purpose transport analysis was to estimate average groundwater travel times to the evaluation locations for impact assessment.

Most sorption values used for selected chemical constituents were based on USEPA guidance documents. The mean and max antimony values were based on the lowest two values from site-specific sorption test work. Due to the low absolute concentrations of constituents modeled with adsorption, it was reasonable (and standard practice) to assume that adsorption sites would not become "saturated." This was also a reasonable assumption for fractured bedrock, because diffusion can transport chemicals from fractures into the rock matrix, which greatly increases the available adsorption sites. For constituents not modeled with adsorption, the approach was conservative in that groundwater concentrations and travel times would both tend to be underestimated in the transport analysis.

In GoldSim, the distribution used for hydraulic conductivity was meant to represent the uncertainty in the "mean" or a really averaged hydraulic conductivity within the flowpath. As such, the range of the input hydraulic conductivity did not need to cover the full range of measured values. For the GoldSim Plant Site model, the same hydraulic conductivity was used in all three flowpaths, but the value was statistically changed for each realization of the Monte Carlo simulation.

The capture systems along the Tailings Basin perimeter would collect (for treatment) groundwater, surface water, and wetland water on the inside (tailings side) of the containment system alignment and these water sources were incorporated into the GoldSim model. The assumed capture efficiency (90 percent) and bypass flow rates were conservatively low based on a series of vertical-section MODFLOW models presented in Attachment A of the Water Modeling Data Package - Plant Site (PolyMet 2015j, as cited in the FEIS).

It is acknowledged that the FEIS GoldSim model did not explicitly simulate groundwater upwelling into wetlands between the containment systems and the Embarrass River (if any). No attempt was made to model this highly uncertain process, but instead the FEIS relies on long-

term monitoring of the wetlands and implementation of adaptive mitigation measures (if necessary) in the event that wetlands are affected in the future.

In response to SDEIS comments, the FEIS Plant Site MODFLOW model was modified and recalibrated for the FEIS as follows: 1) updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain or river cells along the East Embankment to allow surface seepage of tailings water, 4) incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available site data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin. As a result of these changes, the FEIS Plant Site MODFLOW model no longer has no-flow boundary condition at the toe of the East Embankment, and river and/or drain cells in surficial deposits are in place to allow the potential for surface seepage ("upwelling") were added. The model was calibrated to insure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.

Theme WR 059

Theme Statement

Based on the Plant Site GoldSim model, the FEIS should show groundwater concentration profiles along flowpaths at different points in time and groundwater concentrations up to 500 years. The FEIS should acknowledge that lead loading would increase compared to existing conditions. Concentrations of selenium are above the standard, and that constituents treated as non-absorbed would have migration velocities less than or equal to the simulated velocity. The FEIS should better describe the "dilution effect" on aluminum.

Thematic Response

Potential groundwater impacts are assessed at specific evaluation locations defined for each flowpath. This methodology satisfies both federal and state environmental review requirements to inform regulators, the project proponent, and public of the type, extent, and reversibility of impacts. Monitoring would typically occur at the source origins to document whether flowpath water quality predictions are being satisfied. If not, then contingency and/or adaptive measures would be applied to address potential concerns. See FEIS Section 5.2.2.1.1 for information on evaluation locations.

The FEIS Section 5.2.6 Aquatic Species, Table 5.2.6-5, indicates that under the NorthMet Project Proposed Action, lead concentrations (maximum P90 values) are higher at Plant Site surface water stations than under Continuation of Existing Conditions (Stations MLC-2, PM-11, PM-13, and PM-19). The load rates for lead in each of the Plant Site surface water stations are listed in the Water Modeling Data Package Vol. 2 – Plant Site (PolyMet 2015j, as cited in the FEIS), Attachment K Median Loading Rates to the Surface Water Evaluation Locations (Culpability Analysis).

Regarding constituents assumed to be non-attenuated in groundwater, the FEIS has been modified and now states that one the constituents modeled as unattenuated in the GoldSim model may in fact exhibit some attenuation due to adsorption onto surfaces in the surficial and bedrock aquifer. The peak concentrations of these solutes would arrive at the evaluation locations later than estimated in the GoldSim model, though the peak concentrations of such late-arriving solutes would be lower than the concentrations estimated under the assumption in the FEIS of un-attenuated transport (FEIS Section 5.2.2.3.2 Partridge River Watershed, subheading "Contaminant Transport in Groundwater from Waste Rock).

The FEIS Section 5.2.2.3.3, Embarrass River Watershed (subsection Aluminum in Surface Waters of the Embarrass River Watershed), has been revised as follows to clarify the meaning of the "dilution effect" on aluminum: Because the aluminum concentration in the Tailings Basin seepage (5 to 20 µg/L) is lower than the aluminum concentration in the ambient groundwater (50 to 90 µg/L), the net effect of mixing these two waters is that the aluminum concentration in the ambient groundwater is decreases relative to what it was before mixing.

Theme WR 060

Theme Statement

The Plant Site GoldSim model as described in the SDEIS has numerous deficiencies. These include inadequate explanation and justification of general geochemical inputs, calibration factors, and concentration caps. GoldSim model inputs also do not capture the full range of possible chemical loadings, and do not account for increased leaching due to acidic conditions. The FEIS should include a better geochemical discussion of sulfate and the dilution factors applied in the model. The model underestimates seepage through the Tailings Basin and underestimates chemical loading to groundwater due to the unreasonable assumptions about high capture efficiency. In addition, the FEIS should report the following GoldSim information:

- Source concentrations over time;

- Chemical loading over time and a comparison to existing conditions;

- Long-term residual concentrations at chemical sources during closure; and

- P90 flow rates and chemical concentrations.

Thematic Response

Specific values for geochemical parameters, including calibration factors (applied only to the existing LTVSMC tailings) and concentration caps, were developed during the Impact Assessment Planning process for Geochemistry (MDNR et. al. 2011, as cited in the FEIS). These are presented in the Water Modeling Data Package Vol 2 - Plant Site (PolyMet 2015a, as cited in the FEIS), and in the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS). The calibration factors applied to the LTV SMC tailings model were approved for use in the EIS during review of the model Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS). The geochemical parameters were selected based on direct measurements on material from the NorthMet and LTVSMC facilities, and where appropriate, from empirical studies at analogous mine sites, and the review of the technical studies deemed the selected and presentation of these values to be appropriate and sufficient for the FEIS.

The geochemical behavior of NorthMet rock is related primarily to its net acid-generating potential, as indicated by the concentration of sulfide S in the rock and tailings. The humidity cell samples (38 of Category 1, 26 of Category 2/3, and 19 of Category 4) were dispersed spatially across the deposit to include the different formations (see Large Table 2 of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]), and covered the range of sulfide S concentrations (Table 4-1 [Matrix for Sample Selection in Waste Rock Types] in SRK 2007b, as cited in the FEIS). The accuracy of PolyMet's ability to categorize the waste rock in the NorthMet deposit was assessed by a comparison of the chemical data set (approximately 18,800 sulfide S analyses) to their geostatistical model of sulfide S in ore and waste. Results of this statistical audit found that the number and spatial distribution of these sulfide analyzes supported adequately the geologic block model developed to describe the ore and waste rock distribution in the deposit (Optitech 2012). Based on these results, and other supporting data, the Co-lead Agencies believe that the existing data is sufficient to support water quality modeling for the FEIS.

The increase in oxidation rate and solute release in response to the onset of acidic conditions is included explicitly in the GoldSim Mine Site model, as described in the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS), Section 9.4 Acidification and Long-Term Decay in Constituent Release.

The discussion of sulfate release from mine waste and its transport in surface and groundwater, as described in the FEIS and Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS), is complete, as required to support the FEIS water quality modeling.

Seepage rates in the Tailings Basin (and hydraulic conductivity of the underlying surficial aquifer) are based on a calibration of the Plant Site MODFLOW model to past measurements of flow rates during drain down of the LTVSMC tailings. This model has been recalibrated and rerun for the FEIS to incorporate new data and input assumptions, and it is the results of the calibrated hydraulic model that produces the values of solute dilution between sources and the evaluation locations in surface and groundwater.

The capture efficiencies in water quality modeling were provided by the PolyMet (Barr 2015e, as cited in the FEIS). Cross-section MODFLOW models of the tailings basin capture systems indicate that very high capture (greater than 90 percent) would be achieved in both the surficial deposits and underlying upper bedrock. Containment on the south side of the Tailings Basin (near SD-026) was presented as an adaptive mitigation approach. If there were leakage from the tailings basin into bedrock, it would be collected by the capture systems and bypass (if any) would be sufficiently small to not cause impacts that exceed water quality evaluation criteria. Further, the project Proponent has committed to upgrading existing containment systems and/or constructing new systems as necessary to achieve 100 percent capture. The estimates for tailings seepage and tailings basin capture system are sufficient for the NorthMet FEIS.

Estimates for mass loading and effluent concentrations from Mine Site facilities over the model simulation period are presented in Attachment I and J of PolyMet 2015m, as cited in the FEIS; and for Plant Site tailings facility, values for these model results are presented in Attachments D through I of PolyMet 2015j, as cited in the FEIS.

Subtheme WR 060-1

Theme Statement

Provide values for volumetric flow rates and solute concentration estimates for the water released from each source and in each waste-water stream, with concentrations shown before and after application of concentration caps and adsorption and reported in units comparable to water quality standards.

Thematic Response

Estimates for mass loading and concentrations from the Plant Site Tailings Basin are presented in the attachments to the Plant Site Water Modeling Data Package (PolyMet 2015j, as cited in the FEIS).

The NorthMet GoldSim water quality has not been run without concentration caps in source materials or adsorption-related attenuation in groundwater because these are widely observed effects in mine environments. Thus eliminating these effects from the GoldSim model would not be realistic, and such a model would not improve the assessment of environmental effects.

The effect of concentration caps can be seen in measured composition of effluent from the Amax Stockpiles, in this case showing their dependence on pH (Large Figures 23 through 27, PolyMet 2015q, as cited in the FEIS).

The selection of specific values for concentration caps was considered by the Co-lead Agencies (PolyMet 2015q, as cited in the FEIS). The specific ranges for concentration caps were estimated from mineral solubilities (for those solutes commonly found as secondary minerals in mine wastes) or observed in effluent from field-scale mine wastes (see Table 1-30 through 1-33 in the NorthMet Mine Site Water Modeling Work Plan [Barr 2012c, as cited in the FEIS] and Table 1-15 in the NorthMet Plant Site Water Modeling Work Plan [Barr 2012d, as cited in the FEIS]). Concentration caps were based on field studies rather than laboratory studies so that the rock-to-water ratios would be similar to conditions expected at the Mine Site and Plant Site, and thus would avoid the higher rock to water ratios in humidity-cell tests that could underestimate caps. The use of concentration caps is described in Section 5.2.2.2.3, Water Quality Modeling (GoldSim), in the FEIS. The antimony concentration cap was in part based off of lab data.

Regarding adsorption, the values are from USEPA guidance intended to support exposure assessments, and the specific values applied in the NorthMet GoldSim model are from the low end of the ranges, (i.e., tend to produce estimates of rapid transport; PolyMet 2015j, as cited in the FEIS), with the exception of antimony which relied upon site-specific material testing data to establish an adsorption probabilistic input range.

Subtheme WR 060-2

Theme Statement

Provide substantiation for reduction in reaction rate in tailings produced by bentonite-amended layers.

Thematic Response

The proposal to blend bentonite clay into tailings layers is intended to reduce hydraulic conductivity and thus the rate of water flux, and to increase moisture retention in the amended layer and thus reduce the rate of oxygen diffusion and associated sulfate release. The effectiveness of a properly installed bentonite-amended layer of tailings to reduce oxygen diffusion and associated sulfate release was evaluated quantitatively as part of the QA review of the GoldSim model of water and solute flow in the Plant Site. Although this review did not match exactly the GoldSim results, it did find that the discrepancies were "not large compared to the higher sulfur generation rates in other subareas of the FTB," and "did not recommend modifying the current model for this QA audit" (ERM 2013, as cited in the FEIS).

The amendment approach at the Plant Site is discussed in PolyMet 2015d (AWMP Version 9, as cited in the FEIS). Published field-scale tests of bentonite amendment found that bentonite layers remain effective through freeze-thaw cycles, and, in one specific test, a 0.46-meter thick layer of sand (range 3 percent to 8 percent bentonite by weight) found that the amendment could reduce oxygen diffusion by approximately 90 percent. However, these publications indicate that uniform blending is important, so that amendments would probably be applied in multiple layers, and that site-specific field tests would be required prior to full-scale application to tailings surfaces or the tailings pond bottom.

The current bentonite amendment plan for the Tailings Basin dam and beaches can be found in the Flotation Tailings Management Plan, Section 7 (PolyMet 2015n, as cited in the FEIS). The plan would be updated as necessary as part of facility permitting, with future in-laboratory material testing performed to confirm percentage of bentonite addition requirements, and with in-field test plots constructed preceding initial cover construction activities to confirm material placement procedures. The specific methods for bentonite amendment at the Tailings Basin, including a material testing program and construction quality control plan would require approval by the facility engineer of record and PolyMet prior transitioning to full-scale implementation.

Subtheme WR 060-3

Theme Statement

Expand model analysis to consider solute transport in groundwater with no retardation effect.

Thematic Response

Adsorption is widely observed in studies of metal transport in groundwater, and is an important enough effect that the USEPA provides guidance documents with screening level values for adsorption (as "Kd") to support estimates of exposure to solutes migrating in groundwater (USEPA 2005, as cited in the FEIS). This literature review by the USEPA indicates that Kd for

the four metals assumed to be affected by adsorption in the NorthMet Project area surficial aquifer (arsenic, antimony, copper, and nickel) vary widely across different sites. In response, the GoldSim modeling selected values from the low end of this range, with the exception of antimony (i.e., values that produce rapid transport in groundwater, and thus earlier arrival at groundwater evaluation locations [PolyMet 2015j, as cited in the FEIS, Section 5.2.1.3.3 Sorption, Table 5-7 Sediment Sorption Factor (Kd)]. Antimony which relied upon site-specific material testing data to establish an adsorption probabilistic input range. But eliminating entirely the effect of adsorption from the GoldSim model would not improve the assessment of environmental effects. The Co-lead Agencies thus do not believe that the GoldSim water quality model needs to be re-run without adsorption-related attenuation in groundwater.

Subtheme WR 060-4

Theme Statement

Provide estimates for pH, sulfate, and alkalinity predicted in the PolyMet pit lakes and tailings effluent, and compare these to the values observed in natural and mine-produced lakes in the region.

Thematic Response

Estimates for the concentration of all modeled solutes in the West Pit Lake are presented in the Attachment H of the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). For the tailings basin effluent, estimated concentrations are presented in Attachment G of the Plant Site Water Modeling Data Package (PolyMet 2015j, as cited in the FEIS).

The pH and alkalinity of water is a dynamic parameter that reflects chemical equilibrium condition, and is not predicted explicitly by the GoldSim model for any of the NorthMet Project area waters, including the West Pit Lake and the tailings effluent. However, the West Pit Lake is a component of the active water management and treatment system during and after the 20-year operating life of the mine, and its water quality would be monitored as part of the NorthMet Project Proposed Action (PolyMet 2015d, as cited in the FEIS, Large Figure 1, Water Treatment Overall Flow Sheet-Operations, and Large Figure 3, Water Treatment Overall Flow Sheet- Long-Term Closure.)

Water quality in the West Pit lake would thus be controlled by pumping and, where necessary, treatment. Most of the effluent from the Tailings Basin would be captured and treated, and the GoldSim model results and associated effects presented in the FEIS account for some bypass of the capture system. Because the environmental effect of the West Pit Lake and Tailings Basin are not dependent on water quality of other lakes, the Co-lead Agencies do not plan to compare model results for the West Pit Lake to a compilation of water quality in other lakes in the region.

The acid-generation potential (as defined by the sulfide S concentration) in NorthMet floatation tailings would be low enough to ensure that these never produce acidic leachate. Specifically, the sulfide S concentration in the tailings , which would be controlled by the flotation process, would have a maximum value of 0.12 percent. Multi-year synthetic weathering tests (humidity cells) on NorthMet tailings demonstrated that the sulfide-mineral oxidation rate (and associated acid production) in the tailings decreases over time (Attachments C and A of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS]). Further, at some time between approximately 100 and 200 weeks after they start weathering under atmospheric

conditions, the pH of the effluents reaches a minimum, and thereafter the pH becomes steady or increases slightly (Attachment F of the Waste Characterization Data Package [PolyMet 2015q, as cited in the FEIS).

Based on these weathering tests on tailings (and also results from tests on Category 1 waste rock, which is also less than0.12 percent sulfide S), and incorporating a small correction for the possibility that CO_2 pressure may be higher in the tailings than in the atmosphere, the PolyMet tailing effluent should range between pH of approximately 7.1 and 7.7. Over the long-term (i.e., 50 to 100 years, and beyond), the general trend should be for pH to increase from the low end to the high end of this range (PolyMet 2015q, as cited in the FEIS).

Subtheme WR 060-5

Theme Statement

Provide details on field studies (e.g., monitoring results from existing mines and water treatment facilities) demonstrating that effluent from the NorthMet Project would not violate water quality criteria.

Thematic Response

The GoldSim model water quality predictions relied heavily on field-scale observations of water quality at analog mine sites, including the Dunka and Amax rock piles, which are located near the NorthMet Project area and are comprised of Duluth Complex rock.

The Amax Shaft Test Piles are six, 1,000-ton test piles constructed from rock removed from a test shaft sunk into the Babbitt Deposit in 1977 by AMAX, Inc. (Lapakko 1993, Lapakko et. al. 2002, and MDNR 2004). The rock contained sulfur concentrations varying from 0.64 to 1.41 percent, copper concentration of 0.3 to 0.4 percent, and nickel concentrations of 0.08 to 0.09 percent. The copper and nickel content were comparable to the NorthMet Project area but sulfur concentrations were much higher than would be expected for most waste rock at Mine Site. The piles were constructed on lined pads, and some of the rock surfaces were reclaimed with soils and glacial tills, and, in select cases, vegetated. Drainage from the piles was monitored from 1977 to 1994, after which the piles were dismantled and the rock encapsulated in concrete (SRK 2007b, as cited in the FEIS).

The Dunka Pit Stockpile is Duluth Complex rock that was removed to access underlying iron formation at the Dunka Pit, beginning in the 1960s (MDNR 1994 and MDNR 1996). Eight stockpiles varying in quantity from 0.1 to 21 million tons were constructed of which five contained mixed iron formation and Duluth Complex and three contained mainly Duluth Complex rock. Sulfur, nickel, and copper concentrations were determined on the rock. Treatment of the drainage from the stockpiles using wetlands has been investigated (Eger and Lapakko 1980, Eger and Lapakko 1988, and Eger et al. 2000). The ratio of solute release from stockpiles at the Dunka Mine relative to MDNR kinetic tests on Dunka Rock was used as the basis for the scale-up of solute release from NorthMet kinetic tests to estimate NorthMet Category 1 waste rock under field conditions (Section 8.2.8 of PolyMet 2015q, as cited in the FEIS).

The estimates for the concentration caps in NorthMet Project Proposed Action waste rock and tailings that drew from the analog-site effluent quality are described in Section 4.1.3.1 and Section 8.3 of PolyMet 2015q, as cited in the FEIS.

In tailings, resulting cap values are in the Water Modeling Work Plan – Plant Site, Table 1-15 Category 1 Concentration Cap Distributions (Barr 2012c, as cited in the FEIS). In waste rock, resulting caps values that are drawn from analog mines are listed in the Water Modeling Work Plan – Mine Site, Tables 1-30 (Category 1 rock), Table 1-31 (Category 2/3 Duluth complex rock and ore, non-acidic), Table 1-31 (Category 2/3 Duluth Complex rock and ore, acidic conditions), and Table 1-33 (Virginia Formation, acidic conditions) (Barr 2012d, as cited in the FEIS).

Finally, the reliability of the GoldSim model used for NorthMet Project Proposed Action acid-generating waste rock was checked by applying the model to observed effluent from the existing Amax waste rock piles (sulfide S concentration between 0.64 percent and 1.41 percent sulfide S). The comparison applied laboratory-scale humidity-cell test results and the model factors for temperature, fragment size, and oxidation rate change following the onset of acidification. Results found that the model fit well to median sulfate-release rates, but that 95th percentile model concentrations exceeded observed sulfate-release rates (Table 8-6 of PolyMet 2015q, as cited in the FEIS).

Reverse osmosis pilot plant results using water from NorthMet Project Proposed Action site has demonstrated the ability of the treatment technology to meet water quality standards. The FEIS Section 5.2.2 discusses modeling results using field-scale observations and other sources of information.

Theme WR 061

Theme Statement

The Plant Site GoldSim model has the following critical deficiencies pertaining to bedrock:

- The model has no bedrock groundwater flowpaths;

- The model assumes without justification that bedrock flow and transport are negligible;

- The model does not consider vertical flow or vertical dispersion of chemicals from surficial deposits into bedrock; and

- The model does not consider the likely presence of high permeability structures and fault zones.

Thematic Response

Field-testing at the Plant Site indicates that upper bedrock hydraulic conductivity is about two orders of magnitude lower than the hydraulic conductivity of surficial deposits. Given this difference, calculations show that groundwater flow and chemical transport between the Tailings Basin and Embarrass River are dominated by the surficial aquifer and the bedrock system can be safely neglected in the impacts analysis. As a consequence, bedrock flowpaths are not needed in the Plant Site GoldSim model. If bedrock flowpaths were included, the model would show that they would have minimal effect on chemical concentrations in the Embarrass River.

Vertical dispersion from the surficial aquifer into bedrock is not considered in the GoldSim model because chemical migration in bedrock can be shown to have minimal effect on chemical concentrations in the Embarrass River.

The FEIS indicates that structural faults may exist between mine facilities and perennial streams that receive groundwater discharge. Because the landscape is covered with surficial deposits and

there are limited bedrock outcrops, the existence of faults is conjectural and locations at best can only be inferred. It is unknown if faults (if and where they exist) behave as conduits or barriers to groundwater flow. Given these uncertainties, it is unlikely that a new, practical field program, with a goal to identify faults, would provide data to reasonably inform the impact assessments. The management approach is to set up a robust monitoring program during operations and closure to provide direct or indirect evidence on the existence of hydrologically significant faults. If significant faults are identified (i.e., faults that could lead to violation of water quality standards), then adaptive measures would be employed to mitigate the fault-related effects. See FEIS Sections 4.2.2.2.1 and 5.2.2.2.1 for further information.

Theme WR 062

Theme Statement

The FEIS should discuss differences between the Myers flow/transport model and modeling performed for the SDEIS. The Myers model predicts generally higher groundwater concentrations, higher concentrations in the Embarrass River, and greater flow effects on the Embarrass River. The FEIS should also discuss the higher recharge rates and hydraulic conductivities used in the Myers model, and it should acknowledge that the Myers model allows for lateral and vertical dispersion while the SDEIS model did not.

Thematic Response

The differences between the Myers model and the FEIS models can be compared/contrasted as follows:

- The Myers model considers higher groundwater baseflows in perennial streams and this leads to higher recharge and higher hydraulic conductivities for surficial deposits. Reliable gaging data for the Partridge and Embarrass Rivers justify the lower baseflows and associated lower recharge and hydraulic conductivities used in the FEIS models.

- The Myers model generally assigns higher hydraulic conductivities to bedrock units. These values are higher than what can be justified by field-testing at the NorthMet Project area or indicated in (Barr 2014b, as cited in the FEIS).

- The Myers model does not include all groundwater capture systems presented in the FEIS Project Description.

- The Myers model does not use concentration caps, so that computed chemical concentrations in some mine-related chemical sources are much higher than what is reasonable or observed at other similar mine sites.

- The Myers model uses lateral and vertical dispersion, while the FEIS models do not. These uncertain processes would tend to reduce chemical concentrations in the surficial aquifer, which is the dominating hydrogeologic unit that transports chemicals from mine facilities to the perennial rivers. With regard to dispersion, the Myers model would tend to compute lower chemical concentrations in the surficial aquifer compared to the FEIS models. By not considering lateral and vertical dispersion, the FEIS models tend to be conservative (i.e., more likely to overestimate impacts) compared to the Myers model.

These issues are discussed in more detail in the memorandum titled: "Comparison of the Myers Groundwater Flow/Transport model with the FEIS Impacts Analysis Models" (ERM 2015). Given the above deficiencies of the Myers model, it is not considered a reliable basis for evaluating future impacts associated with the NorthMet Project Proposed Action.

Theme WR 063

Theme Statement

The FEIS should present WWTF and WWTP flow rates and influent concentrations over time, justify assumed effluent concentrations, and describe treated water discharge locations, including flows and timing. Some figures show that treated water would be discharged in a diffuse manner from a pipe that parallels and is close to the Tailings Basin groundwater capture system; however, the GoldSim model assumes that treated water is discharged at tributary streams close to the Embarrass River. The FEIS should explain this discrepancy.

Thematic Response

The FEIS contains 5.2.2-27, influent flows for WWTF, 5.2.2-41, outflows from WWTP for stream augmentation and 5.2.2-28 which reports effluent target concentrations for the WWTF. The assumed effluent concentrations are based on pilot-testing conducted by PolyMet and these results are summarized in the FEIS.

At the Mine Site, water balance modeling estimates are that discharge would begin in mine year 53, which is when the West Pit is predicted to be completely flooded by the combination of natural inflow (groundwater inflow and surface runoff) and the addition of treated water pumped into the pit from the Plant Site. Prior to discharging Mine Site water, the WWTF would be upgraded with a reverse osmosis or similar treatment system to meet the 10 mg/L sulfate standard for wild rice. The WWTF effluent would be discharged into an existing wetland via a culvert under Dunka Road, and eventually into the Partridge River via an existing tributary. This is described in the NorthMet Project Description (Section 4.4.2.1 Mine Pit Reclamation, and Large Figure 30), and in FEIS Section 5.2.2.3.2.

At the Plant Site, treated effluent would be discharged to either tributary streams feeding the Embarrass River or as diffuse flow from a discharge pipe that parallels the containment and is located on the north and west sides. As an acceptable approximation, the Plant Site GoldSim model only considers effluent discharges to tributary streams of the Embarrass River. With regard to groundwater concentrations, this is considered conservative because it does not consider the dilution effect that would occur if treated water were to discharge and infiltrate into the surficial aquifer just north and west of the Tailings Basin containment systems. Detailed design of the discharge would be addressed during water quality permitting.

Theme WR 064

Theme Statement

The evaluation locations in the Plant Site GoldSim model are not adequate to assess all potential groundwater and surface water effects, do not acknowledge that impacted groundwater may affect wetlands, do not consider the closest locations where impacted groundwater could discharge to surface water, do not consider the area in which groundwater emerges into surface water, and do not consider that impacted groundwater could affect drinking water wells. The FEIS should acknowledge that groundwater concentrations would violate surface water quality standards at the point of discharge to surface water, that water quality in the Embarrass River would be degraded, that sulfate concentrations in groundwater and surface water are likely underestimated, and that there would be increased (or decreased) loading of lead and aluminum to groundwater and surface water. In addition, the GoldSim model does not evaluate specific conductance (a state water quality parameter with a standard). There needs to be more detailed discussion of chemical travel times to evaluation locations that are underestimated and a more detailed comparison of NorthMet Project Proposed Action-related effects on existing conditions. In addition to water quality criteria, effects should also be assessed using Health Risk Limits. The FEIS should also discuss the vertical extent of groundwater effects and the potential for chemicals migrating into bedrock.

Thematic Response

The groundwater quality evaluation criteria used in the FEIS are intended to be used to assess for impacts to groundwater at the Mine Site and Plant Site property boundaries, not within the NorthMet Project Proposed Action footprint. This approach is typically used in EISs for mining and industrial facilities, and the evaluation locations used in the NorthMet Mining Project and Land Exchange FEIS are consistent with this approach.

At the Plant Site, evaluation locations for surface water (other than the Embarrass River) are based on locations where groundwater is known to be released to perennial tributaries of the Embarrass River including Trimble Creek, Mud Lake Creek, and Unnamed Creek. These are verified groundwater release locations. To consider locations where groundwater release “could” occur would be speculative.

The groundwater capture system at the Plant Site would greatly minimize the potential for seepage to discharge to or otherwise affect downgradient wetlands. A comprehensive monitoring approach is recommended during operations, reclamation, and closure to identify such affects (if any). If effects are identified, adaptive mitigation measures would be invoked to remediate the situation and assure that water quality standards are met.

Because the GoldSim models predict that water quality evaluation criteria would be met at the property boundary, it is highly unlikely that water wells (all located downgradient of the property boundary) could be impacted. This is because natural groundwater transport processes always lead to a reduction in chemical concentrations. The Co-lead Agencies would recommend a comprehensive groundwater monitoring program during operations, reclamation, and closure to evaluate groundwater chemistry outside the NorthMet Project area boundaries. In the unlikely event that groundwater was adversely affected, adaptive mitigation measures would be invoked to remediate the situation and assure that water quality standards are met.

Groundwater evaluation criteria apply to groundwater at the NorthMet Project area boundary and the GoldSim models predicts that these criteria would be met. Surface water quality evaluation criteria apply instream after the groundwater discharge has mixed with ambient surface water (independent of proximity to the NorthMet Project area boundary); the GoldSim models predict that these criteria would be met, as well. Evaluation criteria can be found in Section 5.2.2.

The Co-lead Agencies acknowledge that there would be increased loading of lead, aluminum, and sulfate in certain portions of the groundwater and surface water systems at the Mine Site and Plant Site, but these would not cause exceedances of water quality evaluation criteria at the applicable evaluation locations.

Some of the comments attached to this theme state that concentrations of some constituents have been underestimated by the GoldSim model, but do not provide technical explanations for this claim. Without technical explanations, the Co-lead Agencies cannot provide a more comprehensive response to these comments.

For the different flowpaths, groundwater travel times to groundwater evaluation locations and surface water discharge points are presented in the FEIS, including the times for initial change in chemical concentrations and the times to reach peak concentrations. Once chemicals discharge from groundwater to surface water, it is assumed that migration is instantaneous to surface water evaluation locations.

The water quality evaluation criteria used in the FEIS are based on a combination of health-based water quality standards for drinking water sources (such as groundwater and Colby Lake) and mercury in surface water (fish consumption) and on aquatic life-based standards for surface waters.

Desktop calculations and GoldSim results clearly show that chemical migration in bedrock is negligible compared to migration in the surficial aquifer. Chemical migration in bedrock is not sufficient to affect chemical concentrations in surface water.

Electrical conductance provides an estimate for TDS and is used if there are no direct measurements of TDS. There are TDS standards for surface water (700 mg/L) and groundwater (500 mg/L), and at the request of the MPCA, GoldSim results include estimates for TDS at each time-step, calculated by summing major solutes (Water Modeling Data Package Vol 1 – Mine Site; PolyMet 2015m, as cited in the FEIS). In the FEIS, TDS has precedence over electrical conductance as a water quality criterion.

Theme WR 065

Theme Statement

The Plant Site GoldSim model does not account for seasonal effects, including variable recharge.

Thematic Response

Estimates of monthly and annual rainfall amounts were based on best available data obtained from weather stations near the NorthMet Project area. In both GoldSim models, these parameters were treated as uncertain inputs and assigned probability distributions to capture the range of conditions.

Theme WR 066

Theme Statement

The SDEIS does not adequately describe the design, performance, monitoring, and long-term operation of the Hydrometallurgical Residue Facility. Water would flow from the Tailings Basin to the Hydrometallurgical Residue Facility and this has not been analyzed.

Thematic Response

Text in FEIS Sections 3.2.2.3 and 5.2.14.2.3 discusses the design and construction of the Hydrometallurgical Residue Facility, and the Geotechnical Data Package Volume 2 (PolyMet 2014c, as cited in the FEIS) indicates the design would meet all factors of safety as required. The Hydrometallurgical Residue Facility would be constructed over the LTVSMC emergency basin. During operations, the double liner system for the Hydrometallurgical Residue Facility would minimize release of residue leachate, and any collected leakage would be pumped back to the Hydrometallurgical Residue Facility pond. During reclamation and closure and long-term maintenance, leakage would be routed and cycled through the Plant Site WWTP.

Seeps have been observed along the southern edge of the LTVSMC Tailings Basin Cell 2W. These seeps have diminished since the termination of the LTVSMC operations and are expected to remain minimal as Cell 2W is not proposed for use as part of the NorthMet Project Proposed Action. The design of the Hydrometallurgical Residue Facility acknowledges the presence of these seeps by including a collection drain that would collect water from the seeps below the proposed constructed embankment and liner systems to transmit the collected seepage away from the Hydrometallurgical Residue Facility. This seepage collection system would consist of a layer of free-draining soil that would reduce the potential for phreatic build-up below the liner.

The two liner layers on the Hydrometallurgical Residue Facility would be separated by a leakage collection system designed to collect any potential leakage. Each liner layer would consist of a geomembrane layer above a geosynthetic clay layer. A drainage collection system would also be installed during reclamation to collect drainage above the upper liner. The cap would consist of a geotextile fabric, overlain by a clay barrier layer, and a 40-mil low-density polyethylene layer. This would be covered with additional LTVSMC tailings or local till soils to sustain a vegetated cover. The FEIS includes available details from the updated Residue Management Plan (PolyMet 2014r, as cited in the FEIS).

Theme WR 067

Theme Statement

The assumed performance of the Hydrometallurgical Residue Facility liner system is not realistic for long-term closure and likely underestimates the amount of downward leakage from the Hydrometallurgical Residue Facility into groundwater and surface water. Leakage should be probabilistic input to the model. Seepage quality should be disclosed.

Thematic Response

The Hydrometallurgical Residue Facility would be double-lined to minimize release of water that has contacted the hydrometallurgical residue. The double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner

placed above the first, separated by a leakage collection system. This would substantially remove all hydraulic head from the lower liner and thereby virtually eliminate leakage from the Hydrometallurgical Residue Facility. It is expected that no water would be released directly from the Hydrometallurgical Residue Facility, so, appropriately, leakage from the Hydrometallurgical Residue Facility is not included in modeling.

PolyMet initiated laboratory testing to consider the chemical compatibility of the potential geosynthetic liner to be used with leakage from residue (PolyMet 2014r, as cited in the FEIS). Results indicated that a polymer-treated geosynthetic liner should be used that is manufactured specifically in anticipation of the chemical characteristics of the liquid and the pore water that would be contained within the facility. The hydraulic conductivity of the soil leakage collection system is not expected to degrade over time. Typical liner performance assumes a 500-year service life of the geomembrane; therefore, hydraulic conductivity of the liner is not expected to degrade over that time. Specific attributes would be determined during the geosynthetic clay layer development to achieve the desired performance before final installation. Findings of studies on geosynthetic liners indicate that performance is minimally affected by freeze-thaw cycles (PolyMet 2014c, as cited in the FEIS). At the Hydrometallurgical Residue Facility, the majority of the geosynthetic liner system would be below the water elevation, and therefore not exposed to freeze-thaw cycles.

Theme WR 068

Theme Statement

The SDEIS does not show the composition and flow of Hydrometallurgical Residue Facility pore water over time. Hydrometallurgical Residue Facility waste needs to be re-evaluated based upon the change to the hydrometallurgical process.

Thematic Response

The Hydrometallurgical Residue Facility would be double-lined to minimize release of water containing the hydrometallurgical residue. The double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a leakage collection system. This would substantially remove all hydraulic head from the lower liner and thereby virtually eliminate leakage from the Hydrometallurgical Residue Facility. It is expected that no water would be released directly from the Hydrometallurgical Residue Facility. The purpose is to assess effects on the environment; thus, it is not relevant to evaluate the flow of pore water within the Hydrometallurgical Residue Facility. A description of the hydrometallurgical waste material is provided in FEIS Section 3.2.2.3.7; also refer to the response to HAZ002 for more information.

Theme WR 069

Theme Statement

The SDEIS does not describe the fate and transport of impacted water that leaks from the Hydrometallurgical Residue Facility.

Thematic Response

The Hydrometallurgical Residue Facility would be double-lined to minimize release of water that has contacted the hydrometallurgical residue. The double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a leakage collection system. This would substantially remove all hydraulic head from the lower liner and thereby virtually eliminate leakage from the Hydrometallurgical Residue Facility. It is expected that no water would be released directly from the Hydrometallurgical Residue Facility.

Theme WR 070

Theme Statement

The SDEIS does not address leaks and seeps of untreated, contaminated water. Possible discharges from the Tailings Basin emergency overflow is one example. The former LTVSMC Tailings Basin seeps and exceeds water quality standards for some parameters. Millions of gallons of polluted, untreated seepage would leave the Plant Site and Mine Site annually. The ground may filter this water. Clean-up may be needed and may not be possible.

Thematic Response

The FEIS identifies several features at the Mine Site and Plant Site where seeps may enter into surface water or groundwater, as well as environmental controls to eliminate or reduce and treat seepage exiting the NorthMet Project area. Discussion of seeps occurs throughout FEIS Section 5.2.2 in numerous subsections. During operations and in the initial portion of the closure and long-term maintenance period, the Tailings Basin would have substantial freeboard to accommodate large rainfall events, including precipitation from up to the 72-hour Probable Maximum Precipitation event (PMP). The PMP does not have an assigned return period, but it is usually assumed by hydrologists to be on the order of 100 million to 10 billion years. Tailings Basin pond water level would also be managed by pumping it to the WWTP. In the unlikely event that the pond fills, water would be directed to a constructed overflow channel that would manage water in order to maintain dam integrity.

Theme WR 071

Theme Statement

Field data for characterization is inadequate. The analysis has selectively used data, omitted important data, and failed to use recent data. Groundwater hydrology is not adequately characterized, and fractures are incorrectly characterized. Better hydraulic and water chemistry information would improve conceptual models for the prediction of solute transport and improve predictions of potential impacts to groundwater, engineering of containment systems, and design of monitoring systems. The FEIS is not credible because it misquotes cited references and assumptions on geology and hydrogeology go unsupported. The FEIS should depict the spatial relationship between the lowest rock quality designation values and fault zones and lineament trends mapped using LIDAR data.

Thematic Response

The FEIS relied on data collected through the end of 2013, which included 12 new monitoring wells at the Mine Site. In addition, the FEIS made use of new geotechnical data collected in 2014 along the northern, northwestern, and western perimeters of the Tailings Basin, which included geologic logs, 10 new surficial aquifer piezometers, slug tests in the piezometers, and 10 bedrock packer tests performed in five coreholes advanced into upper bedrock. Hydrogeologic site characterization was sufficient for purpose of environmental impact analysis.

All publically available and relevant studies were considered in developing the FEIS. These include technical reports prepared by the Proposer, reports from state and federal agencies, technical papers in peer-reviewed journals, and technical reports associated with other mine sites. The FEIS preparers drew on these information sources to the degree that they were reliable and relevant to the assessment of potential impacts from the NorthMet Project Proposed Action.

The FEIS provided a description of data used to assess impacts. An explanation was provided regarding any data used and not used in finalizing the FEIS MODFLOW and GoldSim models.

It is well-known that unexplained sampling/laboratory issues can cause occasional chemical results to be incorrect and unusable for site characterization. This happens to some extent on all large projects where sampling is conducted at many locations and for long periods of time. When an occasional data value is clearly anomalous and does not fit in any reasonable way with the bulk of the related data, it is an acceptable practice to not use the anomalous value for characterization to develop a more accurate site characterization.

During winter 2013-2014, an investigation of bedrock was conducted along the northern, northwestern, and western perimeters of the Tailings Basin. The investigation included five boreholes advanced into upper bedrock and 10 packer tests conducted in these holes. The investigation provided rock core, RQD data, and hydraulic conductivity of discrete intervals within the upper bedrock. The results of this investigation are reported in Barr 2014b, as cited in the FEIS) and in FEIS section 4.2.2.3.1.

It is correct that currently there are no bedrock monitoring wells at the Plant Site. Installation of bedrock monitoring wells would be specified as part of the permitting process, with the results used to assess the NorthMet Project Proposed Action performance on an ongoing basis.

The MODFLOW and GoldSim models for the Mine Site and Plant Site were modified and recalibrated using groundwater level and sampling data collected through the end of 2013. At the Mine Site, this included all 24 monitoring wells, including data from 12 newer wells.

Stream gaging data used in the SDEIS and FEIS are adequate to characterize groundwater baseflow, seasonal flow, and storm runoff in the Partridge and Embarrass rivers.

See the responses to themes WR 011 and WR 012 for additional discussions of fracture flow and hydrology.

Theme WR 072

Theme Statement

The FEIS should provide specific justification for the data that were collected (or not collected), as well as justification for any data excluded from the modeling.

Thematic Response

FEIS Chapter 4 contains a new table showing the categories of hydrology and water quality data collected. The table indicates the data were used and not used in the FEIS evaluation. Explanations are provided for data not used.

The SDEIS water quality modeling predicted that there would be no substantial flow/chemistry impacts to the Partridge River at downstream evaluation location SW-005, or to the Embarrass River at downstream evaluation location PM-13, both of which are downstream of all NorthMet Project Proposed Action-related effects. These results not conducting extensive characterization or impact assessment of the St. Louis River watershed downstream of these evaluation locations. The FEIS impacts analysis corroborates the SDEIS predictions of minimal impacts at SW-005 and PM-13.

Theme WR 073

Theme Statement

The FEIS should justify where assumed or extrapolated input values are used instead of field measurements.

Thematic Response

The Co-lead Agencies are responsible for determining the requirements and adequacy of data used for the EIS. Where field measurements were not available, model assumptions were reviewed and approved for use in impact analyses.

Theme WR 074

Theme Statement

The FEIS should acknowledge that the overall characterization of the Mine Site and Plant Site is less detailed than what is typically found in EISs for similar mines.

Thematic Response

Data collection and site characterization for any project's environmental review is unique based upon potential environmental impacts and applicable state regulations or guidance. The Mine Site characterization is adequate to assess the NorthMet Project Proposed Action impacts and measures available to avoid or minimize those potential impacts.

Theme WR 075

Theme Statement

The water resources analysis in the SDEIS includes no water samples from lakes near the Tailings Basin.

Thematic Response

Sampling these lakes would not have added substantially to the overall Plant Site characterization for the purpose of impacts assessment. Note that Spring Mine Lake is located upstream of the eastern side of the Tailings Basin and has been sampled for water quality.

Theme WR 076

Theme Statement

The FEIS needs to address why the SDEIS did not use sampling data from PM-11, nine sampling events from PM-12.1, and sampling data from wells GW-008, GW-009 and GW-010.

Thematic Response

Sample data from wells GW-008, GW-009, and GW-010 (see FEIS Figure 4.2.2-16) are used in the FEIS. Analyses of water from wells GW-009 and GW-010 (and GW-011) are used to estimate existing groundwater quality in the surficial aquifer downgradient of the existing LTVSMC Tailings Basin (FEIS Table 4.2.2-24), and well GW-008 is one of the wells used to estimate existing water quality in the surficial Plant Site aquifer at the toe of the existing LTVSMC Tailings Basin (see FEIS Table 4.2.2-23).

Surface water sampling location PM-11 is on Unnamed Creek, which is downgradient from the existing LTVSMC Tailings Basin (see FEIS Figure 4.2.2-1). Sampling results from PM-11 include measured flows and water quality (Table 4-6 Summary of Recent Observed Flow Data Around the Tailings Basin, and Large Table 4 Surface Water Data Summary Embarrass River Watershed, Plant Site Water Modeling Data Package—PolyMet 2015j, as cited in the FEIS). These monitoring results from PM-11, along with results at other surface water locations (PM-19, MLC-2, and PM-13), "were used to validate or corroborate other model inputs and assumptions," and "the calibration of the No Action Model was approved by the Co-lead

Agencies before modeling of the Project was conducted" (see Section 5.2.1.4.5 of PolyMet 2015j, as cited in the FEIS).

Surface water sampling location PM-12.1 is on Spring Mine Creek, which receives discharge from Pit 5NW outflow (see FEIS Figure 4.2.2-1). It discharges upstream on the Embarrass River from where the existing LTVSMC tailings seepage reaches the Embarrass River, but samples at PM-12.1 were collected and analyzed (see FEIS Chapter 4, Table 4.2.2-29), and results were used to assess dilution in the water quality model based on sulfate downstream of the Pit 5NW outflow (see Section 4.4.3.3 of PolyMet 2015j, as cited in the FEIS).

Theme WR 077

Theme Statement

Climate inputs to the models did not fully account for variation in precipitation, given recent conditions. The FEIS should explain how water dependent aspects of the NorthMet Project Proposed Action, such as the storage of waste rock under water to limit the production of toxic leachate as well as groundwater and surface water resources in the NorthMet Project Proposed Action area, would be affected during severe droughts or flooding.

Thematic Response

The SDEIS was based on data generally collected through October 2012. The FEIS relied on new data collected through the end of 2013, which included 12 new monitoring wells at the Mine Site. In addition, the FEIS made use of new geotechnical data collected in 2014 along the northern, northwestern, and western perimeters of the Tailings Basin, and included geologic logs, 10 new surficial aquifer piezometers, slug tests in the piezometers, and 10 bedrock packer tests performed in five coreholes advanced into upper bedrock. Hydrogeologic site characterization was sufficient for purposes of environmental review.

All publically available and relevant studies were considered in developing the SDEIS and FEIS. These include technical reports prepared by the Proposer, reports from state and federal agencies, technical papers in peer-reviewed journals, and technical reports associated with other mine sites. The SDEIS and FEIS preparers drew on these information sources to the degree that they were reliable and relevant to the assessment of potential impacts from the NorthMet Project Proposed Action.

For the Mine Site, a GoldSim sensitivity analysis was conducted to assess the possible effects of future climate change on groundwater and surface water. It was concluded that reasonably foreseeable climate change would have little effect on pit inflows, pit lake water quality, groundwater chemical concentrations, and surface water chemical concentrations. These results are reported in the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). By analogy, the Plant Site is also expected to be minimally affected by possible future climate change.

Estimates of monthly and annual rainfall amounts were based at a minimum on the 30-year climatic normal data obtained from weather stations near the NorthMet Project area. In the GoldSim models, annual precipitation is treated as an uncertain input and assigned a probability distribution to capture the range of possible future conditions. While climate change may occur in the future, it cannot be stated at this time if rainfall would increase or decrease over the long

term. Uncertain inputs to the GoldSim Model translate to a 50 percent probability that annual precipitation would be greater than 27.8 inches, a 15.7 percent probability that annual precipitation would be greater than 32.2 inches, and 2.3 percent probability that annual precipitation would be greater than 36.9 inches. Note that there are additional uncertain inputs to GoldSim for evaporation, runoff, and meteoric infiltration. Thus, the probabilistic approach to rainfall and associated climate parameters used in GoldSim represents a reasonable method for dealing with possible future climate change.

Severe drought conditions are not expected to affect the subaqueous storage of the tailings (under the pond) or the waste rock disposed of in the East Pit because a positive water balance is predicted for these facilities, making it unlikely that drought conditions would result in a long-term negative water balance that would affect constituents in those areas. The NorthMet Project Proposed Action facilities would be designed with excess storage to handle large storm events. If climate change gradually increased the frequency and size of storms, there would be ample time to identify the issue and increase storage and treatment requirements at the site.

Theme WR 078

Theme Statement

The number of monitoring wells at the Mine Site is insufficient and the deep groundwater wells should include continuous electrical conductivity monitoring to detect salinity changes as it is likely saline water would be encountered during the development of the East Pit and West Pit. The FEIS should disclose that exploratory drillings do not have to be sealed for 10 years and the possible impacts at these locations, especially to ubiquitous briny water formations. All monitoring wells should be hydraulically tested.

Thematic Response

The number and spatial distribution of monitoring wells installed and sampled at the Mine Site (24 wells in the surficial aquifer and 9 wells in bedrock; see FEIS Figure 4.2.2-8 [formerly Figure 4.2.2-7 in the SDEIS]) was recommended by the Co-lead Agencies in consultation with the USEPA. The USEPA's specific recommendations included the number of wells to install, the total number of samples to collect, and the statistical method to evaluate the adequacy of the dataset for reliably indicating baseline water quality (Westlake 2011). A statistical summary of the groundwater quality data set that responded to these sampling requirements is presented in Large Table 5 (surficial aquifer) and Large Table 6 (bedrock) in PolyMet 2015m, as cited in the FEIS.

Regarding monitoring for salinity in bedrock groundwater, the Impact Assessment Planning review of groundwater quality concluded that "the Co-lead Agencies believe that the [sampling] data the from 5 wells provide sufficient data to characterize the baseline groundwater quality of the bedrock groundwater at the Mine Site" (MDNR et al. 2011, as cited in the FEIS). Continuous electrical conductivity monitoring is required to measure conductivity and salinity. As the mine pits are excavated to greater depths, the groundwater inflows would be sampled on a frequent basis for salinity and other chemical parameters. While unlikely, if saline water were encountered, mitigation measures would be invoked to deal with it. This would likely involve modifications to the WWTF to handle water with higher TDS. Under any conditions, the WWTF would produce effluent that meets regulatory standards for discharge to surface water.

Regarding hydraulic conductivity in bedrock, the SDEIS was based on data generally collected through October 2012 and no additional hydraulic testing was performed after that time. The FEIS was updated to use sampling data collected through the end of 2013, which included 12 new monitoring wells at the Mine Site. The Co-lead Agencies further evaluated the possibility of fractures and faults at the Mine Site and Plant Site to determine what (if any) changes needed to be made to model assumptions to accurately predict potential environmental effects for purposes of environmental review. The results of the analysis are included in FEIS Sections 4.2.2.2.1 and 4.2.2.3.1. The MODFLOW and GoldSim models for the Mine Site and Plant Site were modified and recalibrated using groundwater level and sampling data collected through the end of 2013, which included all 24 Mine Site surficial-aquifer monitoring wells. Contaminant transport considerations applied in GoldSim are addressed in FEIS Section 5.2.2.2.3 and results are provided in Section 5.2.2.3.2 for the Partridge River watershed and Section 5.2.2.3.3 for the Embarrass River watershed.

Theme WR 079

Theme Statement

The number of existing surface and groundwater monitoring wells and data at the Mine Site is insufficient, and there is no bedrock monitoring at the Plant Site.

Thematic Response

At the direction of the USEPA, additional monitoring wells were installed at the Mine Site after the DEIS. There are now 24 monitoring wells installed between proposed mine facilities and the Partridge River. These wells were sampled on a monthly basis for at least one year after installation and continue to be sampled on a less frequent basis. The current Mine Site groundwater monitoring network is adequate for developing the FEIS.

The number of monitoring wells at the Plant Site is adequate for preforming the impact analysis and developing the FEIS. The Co-lead Agencies acknowledge that there are no monitoring wells installed in bedrock at the Plant Site. Available information indicates that the bulk hydraulic conductivity of upper bedrock is about two orders of magnitude lower than the hydraulic conductivity of the overlying surficial deposits, so flow in the overall groundwater system is dominated by flow in the surficial aquifer and not bedrock. For this reason, the focus of groundwater monitoring is on the surficial aquifer. The installation of additional monitoring wells at the Plant Site, including bedrock wells, would be assessed as part of the permitting process.

Theme WR 080

Theme Statement

Hydrologic interpretation of the One Hundred Mile Swamp is not adequate and does not consider flow to other watersheds. The correctly delineated boundary of the One Hundred Mile Swamp should be included in the FEIS. A comparative government map of the swamp area, available at www.nationalatlas.gov/streamer, shows the swamp to be considerably larger. PolyMet should include time prior to the commencement of operations to plan and execute water flowage tests within and out of the One Hundred Mile Swamp.

Thematic Response

A National Atlas shows a single wetland complex (referred to as One Hundred Mile Swamp) as straddling the major watershed divide separating the Superior Basin from the Rainy River Watershed. This appears to indicate that this wetland complex creates a conduit for surface water and surficial groundwater originating from the Mine Site to reach the Dunka River and, ultimately, the BWCAW. This single wetland complex shown on the National Atlas is not a delineated wetland; it does not meet the definition in accordance with the Manual (USACE 1987, as cited in the FEIS). The One Hundred Mile Swamp has not been delineated. The FEIS shows the approximate boundary of this complex. Wetlands are delineated using many factors in addition to hydrology; the boundary of One Hundred Mile Swamp, shown on the National Atlas as continuous, does not equate to a hydrologic connection. There are two surface water and surficial groundwater hydrologic barriers between the Mine Site and the Rainy River Watershed. The first barrier is high ground north of the Partridge River that creates a watershed divide separating the St. Louis River Watershed and Rainy River Watershed that prevents surface water from passing between the two. This major watershed divide is included in the National Atlas, as well as USGS and MDNR data sets. This divide is accurately presented in the FEIS Figures 4.2.2-2 and 5.2.2-22. The second barrier is Yelp Creek and the Partridge River which encircle the northern, eastern, and southern sides of the Mine Site. These streams create a hydrologic "sink" for sources of surface water and groundwater originating at the Mine Site. Surface runoff or surficial groundwater seepage leaving the Mine Site would follow a gradient into Yelp Creek or the Partridge River, as opposed to continuing uphill towards the watershed divide (see FEIS Figure 5.2.2-7). Yelp Creek and the Partridge River extend farther west (i.e., more fully encompassing the Mine Site) than is shown on the map in question.

If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS Sections 5.2.2.3.5, 5.2.2.3.6, and 6.2.2.3.1.

Theme WR 081

Theme Statement

The SDEIS does not accurately study the flow of water leaving the Mine Site to other surface water features. The FEIS should consider flows and water quality to and from other surface water features including Birch Lake, Unnamed Creek, Wetlegs Creek, Longnose Creek, Wyman Creek, Yelp Creek, Langley Creek, Dunka River, St. Louis River, Harris Lake, Lake Vermillion, Lake Superior, Hudson Bay, and the BWCAW. The SDEIS also does not analyze historical creeks beneath the Tailings Basin.

Thematic Response

Sampling of and impact analysis for surface waterbodies near the NorthMet Project area was sufficient for the purpose of impact analysis in FEIS (Sections 4.2.2 and 5.2.2). Most of the surface water features named in theme WR 081 are located in areas that have essentially no possibility of being affected by NorthMet Project Proposed Action-related activities, or for some features are outside the Lake Superior watershed (within which the NorthMet Project area is located). The FEIS impacts analysis predicts minimal impacts downstream of SW-006 on the Partridge River and PM-13 on the Embarrass River, so watersheds downstream of these

evaluation locations would not experience NorthMet Project Proposed Action-related impacts. The FEIS analysis predicts essentially no impacts north of the Mine Site or south of the Partridge River. The FEIS analysis predicts essentially no impacts north or west of the Embarrass River. The historic creeks beneath the Tailings Basin no longer exists, but are considered in the Plant Site MODFLOW model by an increased thickness of surficial deposits below the tailings in this area.

Theme WR 082

Theme Statement

The discussion of current lead and aluminum exceedances in the Embarrass River is misleading. The NorthMet Project Proposed Action should not be allowed to result in or contribute to an exceedance of lead or aluminum. For pollutants that are based on hardness, such as lead, the WWTP effluent may meet the evaluation criteria but fail to do so in-stream where hardness is diluted by rainwater and groundwater. No analysis of the headwaters was done, so no conclusion can be drawn regarding lead and copper.

Thematic Response

FEIS Sections 4.2.2.3.2 and 5.2.2.3.3 discuss lead concentrations in the Embarrass River. New text is provided to avoid misinterpretation.

For surface water constituents with hardness-based evaluation criteria (including lead), a modified screening procedure was developed in the FEIS that, based on GoldSim results, predicted the frequency at which the NorthMet Project Proposed Action would exceed the criterion when CEC would not exceed for the same month. The constituent was retained for further evaluation if the frequency for this condition was greater than 5 percent of all monthly timesteps and realizations used in the GoldSim models. At the Mine Site and Plant Site, the only constituent/location that exceeded the 5 percent frequency was lead and PM-11. The FEIS contains text that fully explains this procedure and summarizes the initial screening results.

The GoldSim models predict that aluminum commonly exceeds its evaluation criterion of 125 µg/L in surface water at the Mine Site and Plant Site. A more detailed evaluation of GoldSim results indicated that at surface water locations where aluminum exceeds the criterion, the magnitude and frequency of exceedance for the NorthMet Project Proposed Action was approximately equal to or less than the frequency or magnitude of exceedance for CEC conditions. It was concluded that the NorthMet Project Proposed Action would not cause significant additional exceedances of aluminum above and beyond what would occur without it. It was also concluded that predicted aluminum concentrations under the NorthMet Project Proposed Action would generally not be higher than predicted CEC concentrations. The FEIS contains text that describes this evaluation and summarizes the associated results.

Chemical impacts to surface water were analyzed at designated evaluation locations on the Partridge River, Embarrass River, and Embarrass River tributaries. The evaluation locations were surface water locations that were either upstream of the NorthMet Project area or could potentially be impacted by the NorthMet Project Proposed Action. Evaluations were not performed at other locations that were unlikely to be impacted.

Theme WR 083

Theme Statement

The discussion of current sulfate exceedances in the Partridge River is misleading. This is in part due to the continuation of existing conditions modeling scenario.

Thematic Response

FEIS Section 4.2.2.1.3 discusses current sulfate concentrations in the Partridge River. New text has been provided to avoid misinterpretation.

The wild rice sulfate standard of 10 mg/L only applies to waters determined by the MPCA to be waters used for production of wild rice. MPCA staff previously recommended that the 10 mg/L standard be applied downstream of Upper Partridge River Station SW-005 and downstream of Embarrass River station PM-13. Other upstream surface water monitoring stations might have sulfate values greater than 10 mg/L, but as these have not been designed wild rice waters, the standard does not apply at these locations. Additionally, as part of wild rice surveys conducted in 2009-2011, several monitoring stations reported relatively high concentrations of sulfate downstream of Colby Lake. Some of these stations were located in waters recommended by the MPCA to be waters used for production of wild rice, and therefore the sulfate values reported for those locations exceeded the current 10 mg/L wild rice sulfate water quality standard.

Surface water sampling data indicate that under existing conditions, the 10 mg/L wild rice evaluation criterion is exceeded about 50 percent of the time at SW-005 on the Partridge River, which is largely attributed to discharges into the river from the Northshore Mine located upstream of the NorthMet Project area. At PM-13 on the Embarrass River, the 10 mg/L sulfate evaluation criterion is exceeded 94 percent of the time, and this is attributed to Pit 5NW that discharges to the Embarrass River upstream of the NorthMet Plant Site.

Theme WR 084

Theme Statement

The SDEIS fails to include water wells listed in the Minnesota County Well Index database. Any unused or unsealed wells found during an inventory of wells could be conduits for contaminant transport and therefore need to be sealed.

Thematic Response

The Minnesota County Well Index Database was searched to identify domestic or other water supply wells near the NorthMet Project area as part of the 2008 draft EIS, and "This search found that no domestic wells are located up- or down-gradient between the Mine Site and the Partridge River" (Barr 2015a, as cited in the FEIS). All wells identified in the search were presented in this 2008 CDEIS (Table 4.1-20. Existing Wells Located Between the PolyMet Tailings Area and Embarrass River). Another search was undertaken in January 2015 to identify groundwater wells near the NorthMet Project area. Two additional wells were identified both approximately 2 miles north of the Tailings Basin. Wells listed in the Minnesota County Well Index are shown in FEIS Figure 4.2.2-18.

Theme WR 085

Theme Statement

The SDEIS does not provide characterization of the Rainy River Watershed.

Thematic Response

The Rainy Lake Watershed is located on the opposite side of the Laurentian Divide (the major watershed divide between the Rainy River Watershed and Lake Superior Basin) from the NorthMet Project area. As such, the Rainy Lake watershed would not be impacted by surface water or surficial groundwater flows of the NorthMet Project Proposed Action and therefore is not included in the FEIS. See FEIS Section 4.2.2.1 for more information. If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS Sections 5.2.2.3.5 and 5.2.2.3.6.

Theme WR 086

Theme Statement

The Mine Site MODFLOW model should be rerun and the FEIS should be revised to address the following issues:

- The FEIS should provide a better description of layers, boundary conditions, and material properties;

- The model should be probabilistic, and the automated calibration procedure should be better described;

- The model is not sufficiently accurate for effects evaluation, is not representative of actual hydrologic conditions, is not adequately calibrated to heads and river baseflows, and does not demonstrate that groundwater would not migrate into other watersheds;

- The model results are not clearly presented, and the SDEIS does not show all the groundwater flowpaths; and

- The model computes unconfined hydraulic heads next to the perennial Partridge River that are well above or below the river level, which is not reasonable, and does not reproduce known flow losses along some reaches of the river.

- The FEIS should explain and list the baseflow calibration targets, and compare these with the model results. The FEIS should also acknowledge that the NorthMet Project Proposed Action would cause a permanent loss or drawdown of groundwater resources. In contrast to the SDEIS modeling, the Myers MODFLOW model predicts more extensive drawdown between the pits and the Partridge River and more flow loss from the river into groundwater flowing toward the dewatered pits. The FEIS should explain these discrepancies.

Thematic Response

Attachment B of the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS) has been updated to provide a complete description of the Mine Site MODFLOW model. The attachment no longer references earlier documents to provide basic information about the model and provides justifications for the layers, boundary conditions, material properties, and

areal recharge. The model has been recalibrated and rerun using all head data through 2013 and groundwater baseflows used in the SDEIS (and carried forward into the FEIS). Calibration targets are fully described in Attachment B.

The revised Mine Site MODFLOW model is well-calibrated and sufficiently accurate for impacts evaluation for the EIS.

An additional calibration step in the MODFLOW model was to ensure that computed heads in the surficial aquifer were not unrealistically above ground surface or above the level of the Partridge River.

It is noted that an independent flow/transport model developed by Myers uses higher bedrock hydraulic conductivities and predicts greater pit inflows and more extensive bedrock drawdown than the Mine Site MODFLOW model. In addition, the Myers model is calibrated to Partridge River groundwater baseflows that are too high and uses bedrock hydraulic conductivities that are higher than what is indicated by field-testing results.

The purpose of the Mine Site MODFLOW model was to: estimate pit inflows, define groundwater flowpaths between the Mine Site and the Partridge River, and provide refinement of surficial aquifer hydraulic conductivity and areal recharge. The parameters obtained from the MODFLOW model are considered best estimates that are carried forward to the GoldSim water quality model. Uncertainties associated with these best estimates are dealt with in the probabilistic GoldSim model.

Theme WR 087

Theme Statement

The FEIS should be revised to address the following deficiencies in the Mine Site MODFLOW regarding bedrock:

- The model's hydraulic conductivity is too low;

- The model does not consider that upper bedrock is likely more permeable than deeper bedrock;

- The calibrated hydraulic conductivities are not reasonable given hydrogeologic information from other nearby sites;

- The model is biased in using the Duluth Complex as the basis for very low hydraulic conductivity for all bedrock;

- The model uses an incorrect top of bedrock surface and does not explicitly consider the effects of fractures and faults on groundwater flow directions and quantities;

- The FEIS should present a map showing the areal distribution of bedrock types used in the model;

- Table 4.2.2-5 should provide the actual test results rather than ranges;

- The conceptual model for bedrock does not consider the possibility of artesian flow conditions as has occurred at the Minnamax site; and

- In comparison to the SDEIS model, the Myers MODFLOW model uses higher bedrock hydraulic conductivities and provides different results; the FEIS should acknowledge and explain these discrepancies.

Thematic Response

In Barr 2014b, as cited in the FEIS, bedrock hydraulic conductivities used in the Mine Site MODFLOW model are consistent with the results of site-specific field testing and information obtained from other similar mine sites. The MODFLOW model does not consider the presence of an upper zone of more permeable bedrock because if overall measured transmissivity is retained, this approach would tend to underestimate pit inflow, which is a primary purpose that the model. The Duluth Complex justifies the low bedrock hydraulic conductivity used in much of the model domain because the mine pits are excavated in Duluth Complex rocks and the bedrock flowpaths used on the GoldSim model are also in Duluth Complex rocks. Higher-permeability Virginia Formation is modeled in the northern portion of the model and this affects inflows from the north wall of the East Pit, which is excavated into the Virginia Formation. The top of bedrock surface used in the model is reasonable given site-specific information. The effects of faults and fractures are considered in developing the bulk hydraulic conductivities used for the bedrock units. The model treats bedrock as an equivalent porous medium, which is a standard approach in large-scale groundwater flow models.

The FEIS references an appendix in revised Mine Site Water Modeling Data Package that provides a map showing the distribution of bedrock types in the Mine Site MODFLOW model.

The FEIS references a new table in the Mine Site Water Modeling Data Package that summarizes the results of all borehole tests performed in bedrock at the Mine Site.

The bedrock conceptual model for the Mine Site does not consider artesian conditions because bedrock boreholes at the site have not consistently exhibited artesian flow at ground surface.

Differences between the Myers model and the SDEIS Mine Site MODFLOW model are also discussed in the response to theme WR 062.

Theme WR 088

Theme Statement

The FEIS should be revised to address the following deficiencies in the Mine Site MODFLOW model:

- Mine pits, waste rock stockpiles, and WWTF ponds are not correctly incorporated into the Mine Site model;

- Pit water quality should be disclosed through the life of the mine.

- The physical models for the mine pits are fundamentally incorrect;

- The capture system surrounding the Category 1 Stockpile and the East Pit backfill are not explicitly incorporated into the model;

- The model does not demonstrate that the capture system would work or that pump-and-treat of the East Pit backfill is technically feasible;

- The model does not demonstrate that the East Pit backfill can be maintained in a saturated condition; and

- The FEIS should present model results to estimate the West Pit pumping rate required to prevent overflow during closure.

Thematic Response

The mine pits would be pumped dry during the operations to allow for safe access.

Attachment B of the Mine Site Water Modeling Data package (PolyMet 2015m, as cited in the FEIS) has been updated to provide a complete description of the Mine Site MODFLOW model. The attachment no longer references earlier documents to provide basic information about the model and provides justifications for the layers, boundary conditions, material properties, and areal recharge. The model has been recalibrated and rerun using all head data through 2013 and groundwater baseflows used in the SDEIS (and carried forward into the FEIS). Calibration targets are fully described in Attachment B.

The revised Mine Site MODFLOW model is well-calibrated and sufficiently accurate for impacts evaluation for the EIS.

An additional calibration step in the MODFLOW model was to ensure that computed heads in the surficial aquifer were not unrealistically above ground surface or above the level of the Partridge River.

It is noted that an independent flow/transport model developed by Myers uses higher bedrock hydraulic conductivities and predicts greater pit inflows and more extensive bedrock drawdown than the Mine Site MODFLOW model. In addition, the Myers model is calibrated to Partridge River groundwater baseflows that are too high and uses bedrock hydraulic conductivities that are higher than what is indicated by field-testing results.

The purpose of the Mine Site MODFLOW model was to: estimate pit inflows, define groundwater flowpaths between the Mine Site and the Partridge River, and provide refinement of surficial aquifer hydraulic conductivity and areal recharge. The parameters obtained from the MODFLOW model are considered best estimates that are carried forward to the GoldSim water quality model. Uncertainties associated with these best-estimates are dealt with in the probabilistic GoldSim model.

Theme WR 089

Theme Statement

Groundwater flowpaths associated with the Mine Site MODFLOW model are inaccurate and incorrectly interpreted from the model results. The FEIS should acknowledge that the model predicts northward flowpaths from the Category 1 Stockpile and the East Pit areas, and these flowpaths must be incorporated into the effects analysis. The flow trajectories predicted by the model are not accurately transferred to the GoldSim water quality model and grossly oversimplify the actual groundwater flow patterns. In contract to the SDEIS model, the Myers MODFLOW model has different flowpaths, and the FEIS should explain the discrepancies between these two models. The FEIS model cannot provide accurate flowpaths if it does not

incorporate the Category 1 Stockpile containment system, the East Pit backfill, and East Pit pump and treat.

Thematic Response

The groundwater flowpaths in the Mine Site GoldSim model are set up with uniform linear groundwater flow. The surficial deposit and bedrock material properties used in the these streamtubes are based on a combination of the Mine Site MODFLOW model calibration results, site-specific borehole testing, and information obtained from other similar mine sites. While the linear flowpath streamtubes do not exactly line up with flow trajectories predicted by the Mine Site MODFLOW Model, the streamtubes have hydraulic gradients, recharge, flow directions, and flowpath distances that are similar to those generated by the MODFLOW model. It is the Co-lead Agencies' position that difference between the GoldSim flowpaths and results of the MODFLOW model are of secondary importance and do not diminish the reliability of the GoldSim predictions of groundwater transport from mine facilities to the Partridge River.

Results of the Mine Site MODFLOW model, the Category 1 3D MODFLOW model, and hydrogeologic interpretations indicate that northward flow from the Category 1 Stockpile and East Pit during operations and closure would be non-existent or of sufficiently low-flow rates to not cause impacts to groundwater or surface water at or beyond the property boundary. For this reason, northward groundwater flowpaths are not developed in the Mine Site GoldSim model.

Hydraulics and capture efficiency of the Category 1 containment system is evaluated in a separate groundwater model referred to as the Category 1 3D MODFLOW model, which is reported in an appendix in the Water Management Plan (PolyMet 2025r, as cited in the FEIS). Hydraulics of the East Pit pump-and-treat system is evaluated using analytical calculations in the Water Management Plan (PolyMet 2015r, as cited in the FEIS).

Differences between the Myers model and the SDEIS Mine Site MODFLOW model are also discussed in the response to theme WR 062.

Theme WR 090

Theme Statement

The SDEIS does not mention testing, mitigation, or monitoring procedures or duration of these activities for the transfer of pollutants and contaminants. Transfer could occur through fractures, surface water, aquifers, soils, or watersheds, among other vectors.

Thematic Response

PolyMet has developed an Adaptive Water Management Plan (AWMP) (PolyMet 2015d, as cited in the FEIS) that includes adaptive engineering controls and contingency mitigation measures. Additionally, the NorthMet Project Proposed Action includes a water quality and quantity monitoring plan that would be finalized in permitting and updated as required. Overviews of the water monitoring plans at the Mine Site and Plant Site, with PolyMet recommended monitoring locations and frequencies, are presented in Tables 5.2.2-52 and 5.2.2-53. The specifics of monitoring—including specific locations, frequencies, and parameters—would be finalized during the NPDES/SDS permitting process. Monitoring and maintenance activities would continue for as long as needed to ensure permit water quality requirements are met.

Theme WR 091

Theme Statement

Calibration of the Mine Site MODFLOW model to erroneously low Partridge River baseflow targets leads to underestimates of areal recharge and surficial deposit hydraulic conductivity and may result in incorrect groundwater flowpaths. Use of incorrect baseflow calibration targets invalidates the MODFLOW results. The model must be recalibrated to the correct baseflow values. The FEIS should also include a baseflow sensitivity analysis. The Myers MODFLOW model considers higher Partridge River baseflow, which leads to results that are different from the SDEIS model. The FEIS should discuss and explain the discrepancies between the two models.

Thematic Response

The estimates for groundwater baseflow derived from the surficial aquifer applied in the SDEIS and FEIS are based on best available information (see the response to theme WR 003). Thus, the MODFLOW inputs related to groundwater baseflow did not change significantly in the FEIS (except for general recalibrations based on new water level and water quality data). It should be noted that an independent flow/transport model developed by Myers uses higher rates of surficial recharge and Partridge River groundwater baseflow than the Mine Site MODFLOW model. The revised Mine Site MODFLOW model is well-calibrated and sufficiently accurate for impacts evaluation, and that the Myers model is calibrated to Partridge River groundwater baseflows that are too high.

Attachment B of the Mine Site Water Modeling Data package (PolyMet 2015m, as cited in the FEIS) has been updated to provide a complete description of the Mine Site MODFLOW model. The attachment no longer references earlier documents to provide basic information about the model, but instead provides directly the justifications for the layers, boundary conditions, material properties, and areal recharge. Calibration targets are also fully described in Attachment B. The model has been recalibrated using all head data through 2013 and groundwater baseflows used in the SDEIS (and carried forward into the FEIS). The surficial- and bedrock-aquifer flowpaths used to estimate solute transport in Mine Site groundwater are consistent with the calibrated MODFLOW model.

To address comments on the relationship between groundwater baseflow and the impact assessment, a sensitivity analysis was conducted for the Mine Site to evaluate if predicted NorthMet Project Proposed Action impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. The results of the sensitivity analysis are reported in FEIS Section 5.2.2.3.2.

Theme WR 092

Theme Statement

With regard to surficial deposits, the Mine Site MODFLOW model uses erroneously low hydraulic conductivity (due to the baseflow issue) and at the Plant Site does not consider the known presence of buried stream channels that likely have higher hydraulic conductivity. Table 4.2.2-5 should present all test results rather than ranges.

Thematic Response

The SDEIS groundwater baseflow values developed for the Partridge River are reasonable best estimates and are retained in the FEIS. Because the FEIS Mine Site MODFLOW model is calibrated to the SDEIS/FEIS groundwater baseflows, the calibrated recharge rates and hydraulic conductivities of surficial deposits are also appropriate best estimates. See FEIS Sections 5.2.2.2.1 and 5.2.2.3.2 for more information.

The Mine Site model and the Plant Site model explicitly consider buried stream channels by including a rendering of bedrock topography based on a compilation of bedrock topographic data. It is acknowledged that buried stream channels could exist in surficial deposits at the Mine Site, but given that the average thickness of surficial deposits is only 5 to 10 meters, it is unlikely that buried channels (if any) would have materials much higher in permeability than adjacent materials. Variation in the hydraulic conductivity of surficial deposits is accounted for by the probabilistic approach used in the GoldSim model, where hydraulic conductivity is input as a probability distribution rather than as a fixed, deterministic value.

Based on a pre-construction topographic map of the Tailings Basin area and an interpreted map for the top of bedrock, the thickness of surficial deposits varies below the Tailings Basin and this may reflect the presence of buried stream channels. This aspect has been incorporated into the FEIS model.

Theme WR 093

Theme Statement

The Plant Site MODFLOW model needs to be corrected and rerun. In particular, the model incorrectly treats the embankment outer surfaces as no-flow boundaries; where there are no drain cells or modeled wetlands, the model incorrectly treats ground surface adjacent to the embankment toes as no-flow boundaries. Both of these assumptions are theoretically incorrect for an unconfined groundwater system. The incorrect use of no-flow boundaries artificially shows a lack of surface seepage, rather than allowing the model to determine if surface seepage would occur. There are insufficient drain cells placed at the toes of the Tailings Basin perimeter to provide a credible evaluation of where seepage may or may not occur during and after operations. The placement of a small number of drain cells biases the model to allow surface seepage only at pre-determined locations and to underestimate total surface seepage. The model does not explicitly incorporate the groundwater capture system or the adjacent treated-water discharge pipe that are components of the Project Description. There are insufficient drain or river cells to simulate the known wetland areas. The FEIS should disclose where the model

predicts upwelling of groundwater into wetlands and other surface water features. The FEIS should disclose capture system design details so modeling assumptions can be assessed.

Thematic Response

In response to these issues, the Plant Site MODFLOW model was modified and recalibrated as follows: 1) Updated areal distribution of surficial deposits and bedrock outcrops, 2) established surficial deposits below and adjacent to the East Embankment, 3) used drain or river cells along the East Embankment to allow surface seepage of tailings water, 4) incorporated the hydrologic effects of the future swale to drain surface water from the East Embankment area, 5) recalibrated model material properties and boundary conditions using all available site data through 2013 (this is mostly new hydraulic head information), and 6) expanded the use river and drain cells to provide a more accurate representation of wetlands outside the Tailings Basin.

As a result of these changes, the FEIS Plant Site MODFLOW model no longer has a no-flow boundary condition at the toe of the East Embankment, and river and/or drain cells in surficial deposits are in place to allow the potential for surface seepage along the embankment toes (Reference: Attachment A, Plant Site Water Modeling Data Package—PolyMet 2015j, as cited in the FEIS).The model was checked to ensure that hydraulic heads in the tailings and adjacent surficial deposits were not well above ground surface. In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.

As discussed in the responses to themes WR 018, WR 019, WR 020, and WR 022, the assumed capture efficiencies of the groundwater containment systems are justified and supported by modeling. FEIS Section 5.2.2 appropriately summarizes the methodology and results of the water impact analysis. Full technical details on modeling including the assumptions made with regards to the capture system design are provided in the Water Modeling Data Packages for the Mine Site and Plant Site (PolyMet 2015m and 2015j, respectively, both as cited in the FEIS).

Theme WR 094

Theme Statement

The Plant Site MODFLOW model used an incorrect and outdated Tailings Basin design and footprint.

Thematic Response

The Tailings Basin design and footprint used in the FEIS Plant Site MODFLOW model was updated from the version used in the SDEIS to address the theme.

Theme WR 095

Theme Statement

The Plant Site MODFLOW model applies unreasonable storage coefficients and/or specific yields to surficial deposits and bedrock outcrops. The supporting documents mislead the reader into thinking that that the storage parameters were fully determined by calibration.

Thematic Response

In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.

Theme WR 096

Theme Statement

The Plant Site MODFLOW model uses the hydraulic conductivity rates for surficial deposits that are much greater than values used in the GoldSim and Seep-W models, and greater than values indicated by field testing. The FEIS should provide an explanation for these discrepancies. The hydraulic conductivity of surficial deposits should be reduced to more reasonable levels, or a justification provided for the higher values used. Inappropriate no-flow boundary conditions used in the model lead to unrealistic calibrated hydraulic conductivity values for the surficial deposits. The model does not consider the hydraulic effects of known buried channels that exist in surficial deposits below the Tailings Basin.

Thematic Response

The Co-lead Agencies acknowledge that the calibrated hydraulic conductivity of surficial deposits in the FEIS Plant Site MODFLOW model (approximately 70 feet per day) is greater than the hydraulic conductivities of surficial deposits used in the FEIS Plant Site GoldSim model (lognormal distribution with mean of 13 feet per day and standard deviation of 5.2 feet per day).

The GoldSim hydraulic conductivity distribution is based on the results of field tests and calculations showing that the values are reasonable given recharge, saturated thickness, and hydraulic gradients between the Tailings Basin and the Partridge River. It is the Co-lead Agencies' opinion that the hydraulic conductivity distribution used in the GoldSim model is reasonable given the purpose of the model, which is to evaluate groundwater flow and transport in flowpaths to the Embarrass River.

The main purpose of the MODFLOW model is to evaluate the distribution of tailings water flow from the interior of the Tailings Basin to the toes and this is an entirely different focus and area of interest from the GoldSim model. The hydraulic conductivity in the FEIS Plant Site MODFLOW model is a calibrated value that achieves a reasonable model match to measured hydraulic heads below the Tailings Basin and estimated leakage rates from the Tailings Basin ponds. For the purpose of the MODFLOW model, the higher calibrated hydraulic conductivity of surficial deposits allows that model to function in a more credible manner.

It is the Co-lead Agencies' position that the different surficial deposit hydraulic conductivities used in the Plant Site GoldSim model and Plant Site MODFLOW model allow each model to function more appropriately for its intended purpose. To force the hydraulic conductivities of the two models to be similar would be artificial and would detract from each model's ability to fulfill its purpose. Accordingly, the Co-lead Agencies recognize the difference between the two models, but do not recommend that the values be changed.

The extensive no-flow boundary condition used in the SDEIS Plant Site MODFLOW model has been corrected in the FEIS model by assigning a greater distribution of drain and river cells along the perimeter of the Tailings Basin. This is where significant wetlands are observed between the Tailings Basin and the Embarrass River. Drain and river cells allow the potential for groundwater discharge to ground surface, which is prevented by "no-flow" cells in MODFLOW.

Based on a pre-construction topographic map of the Tailings Basin area and an interpreted map for the top of bedrock, the thickness of surficial deposits varies below the Tailings Basin and this may reflect the presence of buried stream channels. This aspect has been incorporated into the FEIS model.

Theme WR 097

Theme Statement

At some locations in the Plant Site MODFLOW model, the predicted hydraulic heads are well above ground surface, which is not possible for unconfined groundwater conditions.

Thematic Response

The FEIS Plant Site MODFLOW model has been modified using different boundary conditions (drain and river cells) and calibrated with new hydraulic conductivities so that predicted hydraulic heads are below or just slightly above ground surface, but not well above ground surface as was the case in portions of the SDEIS model.

Theme WR 098

Theme Statement

In the Plant Site MODFLOW model, the areal distribution of surficial deposits and bedrock outcrops is inconsistent with geologic information. Use of the RS13 (Barr 2007a) areal distribution map is incorrect and should be replaced with the revised RS13b (2008c, as cited in the FEIS) distribution map.

Thematic Response

In the FEIS Plant Site MODFLOW model, storage coefficients for the surficial deposits and bedrock outcrops were assigned and/or calibrated to be more in line with literature values for these types of materials.

Theme WR 099

Theme Statement

The Plant Site MODFLOW model does not consider the presence of bedrock below the surficial deposits (as is the case in the Mine Site MODFLOW model). Except for outcrop areas, deeper bedrock is incorrectly assumed to be impermeable and excluded from model. The model does not consider known faults and fractures in bedrock. MODFLOW does not consider the effect of low pH water on bedrock hydraulic conductivity or capture system. In contrast to the SDEIS model, the Myers MODFLOW model does include deeper bedrock and assigns this material reasonable hydraulic conductivity values. The Myers model shows that groundwater flow in bedrock cannot be ignored. The FEIS should address the discrepancies between these models.

Thematic Response

The Co-lead Agencies acknowledge that the calibrated hydraulic conductivity of surficial deposits in the FEIS Plant Site MODFLOW model (approximately 70 feet per day) is greater than the hydraulic conductivities of surficial deposits used in the FEIS Plant Site GoldSim model (lognormal distribution with mean of 13 feet per day and standard deviation of 5.2 feet per day).

The GoldSim hydraulic conductivity distribution is based on the results of field tests and calculations showing that the values are reasonable given recharge, saturated thickness, and hydraulic gradients between the Tailings Basin and the Partridge River. It is the Co-lead Agencies' opinion that the hydraulic conductivity distribution used in the GoldSim model is reasonable given the purpose of the model, which is to evaluate groundwater flow and transport in flowpaths to the Embarrass River.

The main purpose of the MODFLOW model is to evaluate the distribution of tailings water flow from the interior of the Tailings Basin to the toes and this is an entirely different focus and area of interest from the GoldSim model. The hydraulic conductivity in the FEIS Plant Site MODFLOW model is a calibrated value that achieves a reasonable model match to measured hydraulic heads below the Tailings Basin and estimated leakage rates from the Tailings Basin ponds. For the purpose of the MODFLOW model, the higher calibrated hydraulic conductivity of surficial deposits allows that model to function in a more credible manner.

It is the Co-lead Agencies' position that the different surficial deposit hydraulic conductivities used in the Plant Site GoldSim model and Plant Site MODFLOW model allow each model to function more appropriately for its intended purpose. To force the hydraulic conductivities of the two models to be similar would be artificial and would detract from each model's ability to fulfill its purpose. Accordingly, the Co-lead Agencies recognize the difference between the two models, but do not recommend that the values be changed.

The extensive no-flow boundary condition used in the SDEIS Plant Site MODFLOW model has been corrected in the FEIS model by assigning a greater distribution of drain and river cells along the perimeter of the Tailings Basin. This is where significant wetlands are observed between the Tailings Basin and the Embarrass River. Drain and river cells allow the potential for groundwater discharge to ground surface, which is prevented by "no-flow" cells in MODFLOW.

Based on a pre-construction topographic map of the Tailings Basin area and an interpreted map for the top of bedrock, the thickness of surficial deposits varies below the Tailings Basin and this

may reflect the presence of buried stream channels. This aspect has been incorporated into the FEIS model.

MODFLOW is a groundwater hydraulics model and does not specifically consider water chemistry. Site characterization studies and water quality modeling do not predict that low pH groundwater would be generated by the Tailings Basin. As a consequence, the possible effects of low pH groundwater on hydraulic conductivity of surficial deposits or bedrock are not considered in the FEIS.

Theme WR 100

Theme Statement

The Plant Site MODFLOW model needs to include the groundwater capture system and adjacent treated-water discharge pipe on the north and west sides of the Tailings Basin. A groundwater capture system on the east side of the Tailings Basin is also required.

Thematic Response

The FEIS Plant Site MODFLOW model has been modified using different boundary conditions (drain and river cells) and calibrated with new hydraulic conductivities so that predicted hydraulic heads are below or just slightly above ground surface, but not well above ground surface as was the case in portions of the SDEIS model.

Theme WR 101

Theme Statement

The Plant Site MODFLOW model does not include a south groundwater flowpath and does not allow for potential surface seepage along most of the south side of the Tailings Basin.

Thematic Response

Local topography influences the behavior of seepage at the southern end of the Tailings Basin. It is expected that seepage at this part of the facility emerges as surface seepage within a short distance of the Tailings Basin toe rather than being transported via subsurface flow. The effectiveness of the recent improvements to the existing seepage management system, which include a dam, are currently being assessed by Cliffs Erie and PolyMet through water quality monitoring downstream of the existing system. PolyMet has committed to collecting essentially all of the seepage from the Tailings Basin in this area (Plant Site Water Management Plan, Section 4.1.3 [PolyMet 2015i, as cited in the FEIS]), and would implement additional improvements to the seepage management system if necessary. Potential measures that could bring the capture efficiency of the seepage management system to 100 percent include improvements to the existing in-stream dam such as lining the upstream dam face with bentonite and injecting grout into the dam. If seepage were observed to bypass the existing dam, a second structure could be constructed approximately 500 feet downstream of the existing system, in an area where the Second Creek headwaters valley is more constricted and any remaining subsurface seepage would have surfaced. This potential second structure could be constructed as an earthen dam with a clay or concrete cutoff wall (extending to bedrock if necessary) in order to achieve 100 percent capture of the Tailings Basin surface seepage. Based on PolyMet's

commitment to collect essentially all seepage to the south, the proposed South Surface Seepage Management System is assumed for the GoldSim modeling to capture 100 percent of the surface water and that there is no groundwater flow or seepage.

Theme WR 102

Theme Statement

At the east embankment of the Tailings Basin, the Plant Site MODFLOW model uses incorrect no-flow boundary conditions that prevent any possibility of surface seepage. The incorrect assumed distribution of surficial deposits also prevents the model from potentially showing significant eastward groundwater flow away from the Tailing Basin. The model should be revised to include the correct distribution of surficial deposits and to apply drain cells along the toe of the east embankment, which is the theoretically correct boundary condition for an unconfined groundwater system. The model materials and boundary conditions used in the MODFLOW model should be consistent with the hydrogeologic conceptual model for the east embankment area, including the Spring Mine Lake and Spring Mine Creek.

Thematic Response

The Plant Site MODFLOW model was modified for the FEIS to better represent natural and NorthMet Project Proposed Action-related conditions. These include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many of the improvements pertained to the East Embankment area of the Tailings Basin, where it is acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately. These changes in response to the theme improve the SDEIS MODFLOW model that limited tailings seepage on the east side of the Tailings Basin.

Theme WR 103

Theme Statement

The groundwater flow trajectories predicted by the Plant Site MODFLOW model are not accurately transferred to the GoldSim model to create flowpaths. The areal recharge used in the model is too low, which might lead to incorrect flowpaths. The model does not demonstrate that groundwater would not migrate into other watersheds.

Thematic Response

The Plant Site MODFLOW model was modified for the FEIS to better represent natural and NorthMet Project Proposed Action-related conditions. These modifications include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many

of the improvements pertained to the East Embankment area of the Tailings Basin, where it is the acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately. These changes correct deficiencies in the SDEIS MODFLOW model that limited tailings seepage on the eastern side of the Tailings Basin. With these modifications, the FEIS MODFLOW model provides reliable groundwater flow directions away from the Tailings Basin to the north, northwest, and west. Note that on eastern side of the Tailings Basin, current groundwater flows are from east to west -- i.e., toward and not away from the Tailings Basin.

The Plant Site GoldSim model uses one-dimensional flow/transport to simulate the migration of affected groundwater away from the Tailings Basin in the northern, northwestern, and western directions. For these analyses to be accurate, flow/transport parameters from the MODFLOW model were transferred to each GoldSim flowpath including average linear flow direction and hydraulic gradient. Saturated thickness, hydraulic conductivity, and porosity values used in the GoldSim flowpaths were based on field data and generic information, not the MODFLOW model. Recharge in the GoldSim flowpaths was based on Embarrass River baseflow analysis and not on the MODFLOW model.

The main purpose of the Plant Site MODFLOW model was to evaluate groundwater flows beneath the Tailings Basin and groundwater flows away from the Basin in the northern, northwestern, western, and eastern directions. The model was generally local to the Tailings Basin area and was not intended to evaluate the potential for groundwater flows outside the Embarrass River watershed.

Theme WR 104

Theme Statement

The Plant Site MODFLOW model does not account for known buried stream channels, with potentially higher hydraulic conductivity, below the Tailings Basin.

Thematic Response

The thickness of surficial deposits at the Plant Site is interpreted to vary below and adjacent to the Tailings Basin. The interpretation relies upon: 1) a preconstruction topographic map of the area, 2) a 2014 geotechnical investigation conducted along the Tailings Basin perimeter, and 3) an interpreted map for the top of the underlying bedrock. This allows for the model to at least partially reflect the presence of buried stream channels. The interpreted variable thickness of surficial deposits is incorporated into the Plant Site MODFLOW model. This is of interest because surficial deposit thickness affects transmissivity such that enhanced groundwater flow occurs in portions of the model having thicker surficial deposits. See FEIS Section 5.2.2.2.1 for more information.

Theme WR 105

Theme Statement

The Plant Site MODFLOW model should be re-run to address numerous general issues. Two critical issues are that all known wetlands and seepage areas are not modeled, and drain/river cells are based on current wetlands and seeps and do not account for future conditions. In addition, the SDEIS does not adequately explain the general model setup. The model does not conform to the known hydrogeology, is not adequately calibrated to steady-state and transient heads, predicts incorrect baseflows to the Embarrass River, and does not adequately show all groundwater flowpaths. The site hydrogeology is not sufficiently understood to develop a reliable model, and the model is therefore not sufficiently accurate for effects evaluation. The model should be probabilistic. Based on the model results, the FEIS should describe mounding below the Tailings Basin, present estimates of leakage from the unlined tailings into the surficial and bedrock groundwater systems, and provide estimates of groundwater discharge into wetlands upstream of surface water evaluation locations. The results of the Myers MODFLOW model are different from the SDEIS model. The FEIS should explain the discrepancies between the two models.

Thematic Response

The Plant Site MODFLOW model was modified for the FEIS to better represent natural and NorthMet Project Proposed Action-related conditions. These include: 1) more accurate representation of surficial deposits and bedrock outcrops around the perimeter of the Tailings Basin, 2) more extensive distribution of drain and/or river cells to provide for potential surface seepage and distribution of wetlands, 3) more appropriate storage coefficients, and 4) steady-state and transient calibrations using new data extending through the end of 2013. Many of the improvements pertained to the East Embankment area of the Tailings Basin, where it is acknowledged that tailings water seepage would be likely to occur and model changes were made to simulate this seepage more accurately. These changes correct deficiencies in the SDEIS MODFLOW model that limited tailings seepage on the east side of the Tailings Basin. With the modifications described above, the FEIS MODFLOW model has provided reliable flow directions in this area.

See the response to theme WR 003.

Rather than conduct probabilistic flow modeling, a detailed sensitivity analysis of baseflow was conducted to evaluate if impacts to groundwater and surface water are sensitive to baseflow values used in the water quality (GoldSim) models. The sensitivity analysis fully considered the relationship of various model inputs to baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations.

It is also acknowledged that the Myers model provides some results that are different from the FEIS Plant Site MODFLOW model. A major difference is that the Myers model considers higher groundwater baseflows in the Embarrass River and this leads to higher hydraulic conductivities and recharge at the Plant Site. As stated in other theme responses, the FEIS groundwater baseflows for the Embarrass River are reasonable and represent a better estimate than what is assumed in the Myers model. In addition, the Myers model does not use concentration caps so that chemical concentrations and mass loading associated with tailings is unrealistically high.

Due to these differences, it is thought the Myers model unrealistically overestimates NorthMet Project Proposed Action-related flow and chemical impacts at the Plant Site.

Theme WR 106

Theme Statement

The water modeling (XP-SWMM, MODFLOW, and GoldSim) in the SDEIS does not incorporate known hydrology, is not calibrated to correct baseflows and heads, and gives different results from Myers MODFLOW model; therefore, it is not sufficiently accurate for evaluation of effects. The modeling needs to be redone and should use probabilistic methodology. Most of the available data was used in calibrating the model and thus is not usable to validate it.

Thematic Response

The inputs and assumptions of the water models used to predict the potential effects of the NorthMet Project Proposed Action have been subject to rigorous review over the course of the EIS. The Myers model was independently developed and its conclusions have been considered in the development of the FEIS.

It is acknowledged that the Myers model provides some results that are different from the FEIS Plant Site MODFLOW model. A major difference is that the Myers model considers higher groundwater baseflows in the Embarrass River and this leads to higher hydraulic conductivities and recharge at the Plant Site. As stated in other theme responses, FEIS groundwater baseflows for the Embarrass River are reasonable and represent a better estimate than what is assumed in the Myers model. In addition, the Myers model does not use concentration caps so that chemical concentrations and mass loading associated with tailings is unrealistic.

See the response to theme WR091.

Development of the site models used all available data for calibration in accordance with accepted industry practice. Validations would be performed as new data become available.

The models used for FEIS development are complete and sufficiently accurate for impact evaluation. There is no need to redo any of the FEIS models. Probabilistic analyses are performed by the GoldSim models and are not needed in the MODFLOW models.

Theme WR 107

Theme Statement

For the Mine Site, the FEIS should acknowledge that the NorthMet Project Proposed Action would increase chemical loading of contaminants, including fibers to groundwater and surface water compared to current existing conditions. Water quality standards would not be met.

Thematic Response

The FEIS reports that the NorthMet Project Proposed Action facilities would release solutes and cause an increase in loading of some solutes to surface water and groundwater relative to the continuation of existing conditions; See FEIS Section 5.2.2.3 for more detail and consideration

of these results with respect to water quality evaluation criteria. Estimates for mass loading from the Plant Site tailings facility are presented in the Water Modeling Data Package Vol 2 - Plant Site, Attachment G (PolyMet 2015j, as cited in the FEIS).

There is no technical reason to believe that groundwater affected by the Tailings Basin would have unacceptably high concentrations of fibers. The generally fine-grained nature of tailings materials would effectively filter suspended solids including fibers.

Based on modeling results, the Co-lead Agencies conclude that water quality evaluation criteria would be met. Evaluation criteria can be found in Section 5.2.2.

Theme WR 108

Theme Statement

For the Plant Site, the FEIS should acknowledge that the NorthMet Project Proposed Action would increase chemical loading of contaminants including fibers to groundwater and surface water compared to current existing conditions, as well as to no-action conditions that properly account for future mitigations associated with the Cliffs Erie Consent Decree.

Thematic Response

The Co-lead Agencies acknowledge in FEIS Section 5.2.2.3.3 that concentrations of some parameters at some evaluation location would increase at the P90 level as result of the NorthMet Project Proposed Action in comparison to the continuation of existing conditions modeling scenario. See response to theme ALT014.

There is no technical reason to believe that groundwater affected by the Tailings Basin would have unacceptably high concentrations of fibers. The generally fine-grained nature of tailings materials would effectively filter suspended solids including fibers.

Theme WR 109

Theme Statement

At some compliance locations, the NorthMet Project Proposed Action would cause exceedances or increase the chemical concentrations of constituents that already exceed water quality standards such as mercury. Thus, the FEIS should evaluate whether or not the NorthMet Project Proposed Action would comply with Minnesota nondegradation rules. Metals are toxic to aquatic life and would threaten public health.

Thematic Response

The evaluation and decision of whether or not the NorthMet Project Proposed Action could discharge into surface waters where water quality standards are exceeded is a permit decision.

The FEIS reports that the NorthMet Project Proposed Action facilities would release solutes and cause an increase in loading and concentrations of some solutes to surface water and groundwater relative to the continuation of existing conditions at some evaluation locations. See FEIS Section 5.2.2.3 for more detail and consideration of these results with respect to water quality evaluation criteria. The FEIS identifies potential impacts on water resources and

measures available to anticipate and control these same impacts. Potential effects on aquatic resources are addressed in FEIS Section 5.2.6. Public health considerations are summarized in FEIS Section 7.3.4. See Theme WR 173 and Theme WR 177 responses.

Theme WR 110

Theme Statement

The SDEIS uses the wrong criteria used for assessing water quality effects, and underestimates effects by using criteria that are not risk-based; thus, factors of safety are not appropriate. P90 is an unacceptable level of significance. The FEIS should use P99.

Thematic Response

Evaluation criteria are based on applicable water quality standards. Evaluation criteria can be found in Section 5.2.2. Where a waterbody is classified as Domestic Consumption (1B) or for groundwater, USEPA primary drinking water standards apply. The USEPA primary drinking water standards set mandatory maximum contaminant levels for drinking water to protect the public from consuming water that presents a risk to human health.

As described in FEIS Section 5.2.2.2.3, the P90 threshold is deemed appropriate for the EIS and has been adopted for other mining NEPA documents where probabilistic modeling was used (e.g., Idaho Cobalt Project—USFS 2009b, as cited in the FEIS). The use of the P90 criterion for determining whether or not evaluation criteria are being met is not equivalent to how WQBELs would be developed for NPDES permitting. Appropriate WQBELs would be derived based on water quality standards and implemented in the permit. Discharges would be evaluated during the NPDES permitting stage and WQBELs applied according to 40 CFR 122.44(d).

Theme WR 111

Theme Statement

NorthMet Project Proposed Action discharges would put at risk and potentially degrade water quality far beyond the mine, including Colby Lake, the BWCAW, St. Louis River, Lake Superior, Superior National Forest, the entire State of Minnesota, the Great Lakes, and Atlantic Ocean. No level of risk to these resources is acceptable. More analysis is necessary. Increased federal scrutiny is needed. Mining has already impacted the St. Louis River and efforts have been made to clean it up.

Thematic Response

As addressed in FEIS Section 5.2.2, the NorthMet Project Proposed Action would have the potential to affect groundwater and surface water hydrology and quality in both the Partridge River and Embarrass River watersheds. These two rivers are both tributaries to the St. Louis River and within the Lake Superior Basin. FEIS Section 6.2.2 identifies that the NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River or Lake Superior.

The BWCAW and the Rainy Lake Watershed is located on the opposite side of the Laurentian Divide (the major watershed divide between the Rainy River Watershed and Lake Superior

Basin) from the NorthMet Project Proposed Action, and as such surface water and surficial groundwater would not be impacted by it; therefore, this is not included in the FEIS.

If it is predicted that water via bedrock would flow north from the Mine Site, mitigation would be implemented to prevent this from occurring. See FEIS Sections 5.2.2.3.5 and 5.2.2.3.6.

Theme WR 112

Theme Statement

The SDEIS does not adequately evaluate the water quality effects of drying up or inundating thousands of acres of wetlands, nor the water quality effects of dredging and filling wetlands or water discharges to wetlands that are likely to result in violations of wetland water quality standards.

Thematic Response

The hydrology of the wetlands outside the Tailings Basin containment system would be maintained within an established range through flow augmentation so that wetlands would not experience substantial inundation or desiccation. Wetland hydrology is a complex mix of precipitation, surface runoff, and, in some cases, groundwater. The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects. The Co-lead Agencies agree that multiple factors can affect whether a wetland would experience indirect effects due to a project. The direct and potential indirect effects from the NorthMet Project Proposed Action, as well as the proposed monitoring and mitigation, are described in detail in FEIS Section 5.2.3.

Theme WR 113

Theme Statement

The SDEIS does not adequately evaluate the water quality and fisheries effects of acid generation.

Thematic Response

The FEIS considers the release of acidity from proposed NorthMet facilities in that leachate from all acid-generating material (Waste Rock and pit wall rock composed of Category 2/3 and Category 4 material) would be captured and treated prior to discharge. The permanent surficial waste facilities (Category 1 stockpile and tailings basin) would contain material that is not expected to would never produce acidic leachate. The non-acid generating waste was identified using multi-year kinetic tests (humidity cells) on NorthMet rock samples, in which alkalinity released (by dissolution of the silicate minerals) exceeded acidity production (by sulfide-mineral oxidation) in all rock and tailings that contained less than 0.12 percent sulfide S. This less than 0.12 waste rock with 0.12 percent sulfide S or less is the threshold for selecting non-acid generation mine waste is further supported by long-term humidity cell tests on NorthMet waste (i.e., 42 samples of Category 1 waste rock, with tests now run for over 450 weeks; and 33 humidity cell tests run between 84 and 304 weeks [Waste Characterization Data Package v12 (PolyMet 2015q, as cited in the FEIS), Section 4.3 and Attachment E, respectively]). These tests

demonstrate that tailings and Category 1 waste rock materials do not generate acidic leachate, and acid generation rates decreases over time as sulfide S minerals are depleted. The NorthMet Project design thus prevents the introduction of acidic leachate to surface water that could affect fisheries.

Theme WR 114

Theme Statement

The SDEIS does not adequately evaluate the loss of stream headwaters and its effect on fisheries and wildlife.

Thematic Response

The SDEIS and FEIS acknowledge a possibility that habitat could be affected from water chemistry changes resulting from the Land Exchange Proposed Action. Habitat loss from flow changes or riparian activities is not expected as a result of the NorthMet Project Proposed Action.

It is noted that under the Land Exchange Proposed Action, the federal estate would have a slight loss to first-order stream spawning habitat.

Theme WR 115

Theme Statement

The NorthMet Project Proposed Action would cause detrimental and irreversible effects on water resources at and near the Mine Site and Plant Site and in other non-designated areas. These effects include chemical effects, loss of water resources, loss of wild rice and loss of wetlands. The SDEIS does not provide assurance that chemical concentrations in groundwater and surface water would continue to meet water quality standards. The detrimental effects cause by the NorthMet Project Proposed Action would persist for hundreds of years and mining would last only 20 years.

Thematic Response

The FEIS acknowledges that the NorthMet Project Proposed Action would cause adverse effects. FEIS modeling indicates that water quality impacts would not be significant as measured against FEIS evaluation criteria. It is also acknowledged that water quality modeling performed in support indicates that water treatment systems in some form and at some scale would be needed indefinitely at the Mine Site and Plant Site. This long-term treatment is proposed as part of the NorthMet Project Proposed Action. As described in FEIS Section 3.2.2.4, *Minnesota Rules* 6132.1200, require that before a Permit to Mine can be issued, financial assurance instruments covering the estimated cost of reclamation must be submitted and approved by the MDNR. Irreversible effects are disclosed in FEIS Section 7.3.1.

Theme WR 116

Theme Statement

Assumed leakage from WWTF ponds is lower than values cited in literature.

Thematic Response

The WWTF equalization basins have a single geomembrane liner. During the summer months (April through September), when water is expected to be in the basins, the liner leakage rate is 5 gallons/acre/day as determined in the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). The USEPA HELP model was used to estimate this value. This is a reasonable value for ponds installed with good site preparation and installation practices. It is unclear in the comments which literature values are being cited.

Theme WR 117

Theme Statement

The FEIS should acknowledge that current mitigation at the south end of the Tailings Basin does not capture all seepage, and that some of the tailings water is being released to Second Creek. A topographic map figure should be included in the FEIS to demonstrate this finding. This discharge would continue with the NorthMet Project Proposed Action. Additional details on the location of the cut-off berm and trench, groundwater contours, and water quality should be disclosed.

Thematic Response

It is acknowledged that there is currently incomplete capture of impacted water at SD026. Cliffs Erie is currently addressing this issue by upgrading the performance of the existing capture system and, if necessary, constructing new systems to enhance capture. If 100 percent capture is not attained by the Cliffs Erie upgrades, the Proposer has committed, under the NorthMet Project Proposed Action, to installing additional systems in Second Creek to achieve this level of performance regardless of the types of measures required. A summary of the southern seepage collection system is provided in FEIS Section 3.2.2.3.10; details are available in the Plant Site Water Management Plan (PolyMet 2015i, as cited in the FEIS).

Theme WR 118

Theme Statement

The FEIS should describe how the south Tailings Basin capture system would be modified to achieve acceptable capture efficiency. Designs should aim for 100 percent capture.

Thematic Response

The Project Proposer has committed to collecting all of the south seepage from the Tailings Basin that makes its way to Second Creek by implementing additional improvements to the existing seepage management system, if necessary. Potential measures that could bring the capture efficiency of the system to 100 percent include improvements to the existing dam such as

lining the upstream dam face with bentonite and injecting grout into the dam. If seepage were observed to bypass the existing dam, a second dam could be constructed approximately 500 feet downstream of the existing system, in an area where the Second Creek headwaters valley is more constricted and any remaining subsurface seepage would have come to the surface. This potential second dam could be constructed as an earthen dam with a clay or concrete cutoff wall (extending to bedrock if necessary) in order to achieve 100 percent capture of the surface seepage. See FEIS Section 5.2.2.3.2 for more information.

Theme WR 119

Theme Statement

The "analog method" used in the SDEIS is not acceptable for evaluating wetland effects associated with mine pit dewatering; this issue must be evaluated using a mathematical analysis that considers site-specific geology and hydrologic conditions. Alternatively, the analog method should be based not on the Canisteo Mine, but instead on the Soudan Mine in Soudan Underground Mine State Park, which is overlain by till similar in thickness and composition to that found at the NorthMet Mine Site, so the results would not be as overestimated.

Thematic Response

FEIS Section 5.2.2.3.2 summarizes the analog approach and its use in evaluating the extent of pit drawdown. The complex mix of bedrock, glacial till, and wetland soils at the Mine Site makes it difficult to accurately quantify drawdown at any specific location; thus, the use of the analog method was utilized in lieu of MODFLOW to estimate pit drawdown. Additionally, there is a general lack of connectivity between the shallow water table in the wetlands and the deeper bedrock aquifer.

The analog approach was developed using available well data from the Canisteo Mine Pit, which is the only mine pit within the Mesabi Iron Range that has an associated water balance study with well data that could be used to assess potential drawdown effects. Additionally, the Canisteo Mine Pit data are believed to provide a reasonably conservative estimate of the maximum extent of surficial groundwater drawdown that would result from the proposed PolyMet mine pits. Insufficient data exists for the Soudan Mine to be useful as an analog.

The Co-lead Agencies are not relying solely on the potential impact zones determined in the analog method for the FEIS, but would be monitoring wetlands for potential indirect effects as part of an adaptive management plan. Permit conditions would include a plan for additional compensatory mitigation if indirect wetland impacts were identified, and appropriate changes to the adaptive management plan would be made as required.

The Co-lead Agencies believe that the use of the analog approach and the use of 20 percent metric described in FEIS Section 5.2.3 as factors considered in identifying potential indirect effects to wetlands is a credible and reasonable approach consistent with the requirements of NEPA.

Theme WR 120

Theme Statement

The SDEIS assumption that wetlands have limited hydraulic connectivity to the underlying surficial aquifer is not supported by site information. There are no data to suggest that wetlands are perched or semi-perched waterbodies. The SDEIS does not indicate the closest locations where impacted surficial aquifer groundwater or impacted surface water could affect wetlands.

Thematic Response

The FEIS evaluates drawdown effects on wetlands and associated surface water features using observations made at other Iron Range mine sites with open pits and similar geology (i.e., analog method). See FEIS Sections 5.2.2.3.2 and 5.2.3 and responses to themes WR 119, WET 08, and WET 09 for additional information.

Theme WR 121

Theme Statement

Information from the Minnamax project was not used to evaluate wetland dewatering effects.

Thematic Response

FEIS Section 5.2.2.3.2 summarizes the analog approach used to evaluate dewatering effects. Available well data from the Canisteo Mine Pit near the Cities of Coleraine and Bovey, Minnesota -- which is the only mine pit within the Mesabi Iron Range that has an associated water balance study with well data -- was used to evaluate dewatering effects. Please refer to the responses to themes WET 08 and WET 09 and FEIS Section 5.2.3 for more information on the potential for wetland drawdown.

Theme WR 122

Theme Statement

Constructed wetlands for water treatment require substantial acreage and are not feasible if the wild rice standard is applied year-round (that is, not seasonally) due to cold weather.

Thematic Response

Non-mechanical treatment systems (e.g., constructed wetlands) are not part of the NorthMet Project Proposed Action, which relies solely on mechanical treatment. Non-mechanical treatment as an adaptive management measure may be considered during operations and closure if pilot studies demonstrate their utility and cost-effectiveness for water treatment and water disposal, and, if eventually proposed, would be addressed in future permitting.

Theme WR 123

Theme Statement

The FEIS should acknowledge that certain constituents in Colby Lake currently exceed water quality standards and arsenic concentrations are elevated and the NorthMet Project Proposed Action would increase these concentrations. A TMDL study on Colby Lake is needed.

Thematic Response

The water quality results of Colby Lake are reported in FEIS Section 5.2.2.3.2.

The Co-lead Agencies acknowledge that arsenic currently exceeds the water quality criterion of 2 µg/L in Colby Lake and is predicted to do so under the NorthMet Project Proposed Action. However, it is also predicted that Colby Lake arsenic would continue to exceed the criterion under the CEC scenario (i.e., without the NorthMet Project Proposed Action). As predicted by the water quality model, the NorthMet Project Proposed Action arsenic concentrations are virtually identical to the CEC concentrations up to mine year 52. After that time, the NorthMet Project Proposed Action concentrations are slightly higher than the CEC concentrations; however, the difference is not more than 0.05 µg/L. The Co-lead Agencies conclude that this small increase above CEC concentrations does not constitute an unacceptable impact associated with the NorthMet Project Proposed Action.

A TMDL study is not required to assess impacts in the FEIS.

Theme WR 124

Theme Statement

Colby Lake water used for augmentation is higher in sulfates than existing tributary stream water, and would result in damage to downstream wild rice beds. The use of Colby Lake water for augmentation would require reverse osmosis treatment prior to discharge to surface water. FEIS Table 6.2.2-6 (formerly Table 6.2-6 in the SDEIS) does not include NorthMet augmentation flow from Colby Lake to Embarrass River tributaries. This source has a higher sulfate concentration than the Waste WWTF effluent, and should be included in the Table.

Thematic Response

The NorthMet Project Proposed Action has been modified since the SDEIS to address this issue. The Project Description in the FEIS indicates that no Colby Lake water would be used for direct surface water augmentation. All water used for stream augmentation would be treated prior to being added to hydrologically affected waters. If and when non-mechanical water treatment is implemented at the Plant Site, Unnamed Creek, Trimble Creek and Mud Lake Creek stream augmentation would no longer be necessary.

Theme WR 125

Theme Statement

The FEIS should acknowledge that use of Colby Lake water for augmentation would increase mercury loading to the Embarrass River.

Thematic Response

The Project Description in the FEIS indicates that no Colby Lake water would be used for direct surface water augmentation. All water used for augmentation would be treated by the WWTP prior to discharge. See FEIS Section 5.2.2.3.2 for more information.

Theme WR 126

Theme Statement

Based on case history information, the SDEIS consistently underestimates liner leakage rates for waste rock stockpiles, WWTF equalization basin and the Hydrometallurgical Residue Facility. The FEIS should provide clear justification for assumptions and inputs used to estimate liner leakage. Liner leakage would pollute groundwater.

Thematic Response

The assumed liner leakage rates are based on a combination of literature values, experience at mine sites, experience at other types of industrial facilities, manufacturer documentation, and information provided in standard engineering guidance documents (Section 5.2.2.3 in the Mine Site Water Modeling Data Package [PolyMet 2015m, as cited in the FEIS]). Liner leakage rates were estimated using the USEPA-approved HELP model, where simulations combined NorthMet Project Proposed Action design values for slopes and subgrade design with the published values for average liner defects per acre.

It is acknowledged that there have been historical instances where poor-quality liner installations have failed or leaked at relatively high rates. However, for the high-quality liner installations to be used for the NorthMet Project Proposed Action, the assumed liner leakage rates are reasonable and consistent with industry standards. While solid waste landfills may typically be smaller than the project facilities, the liner leakage rates are expressed on a unit area basis, so the results can be scaled to larger facilities. Further, the waste rock stockpiles where liners would be used are only temporary and monitoring would provide early warning if they are not functioning properly.

Theme WR 127

Theme Statement

The assumed effectiveness of the Category 1 Stockpile cover is not supported and may be over-estimated. Cover effectiveness should be a probabilistic input. The FEIS should address deterioration in liner and cover performance and the need for periodic cover replacement. These assumptions should be reviewed to determine whether the FEIS should assume an increase in

liner leakage over time as the membranes deteriorate. The FEIS should describe the replacement schedule for the Category 1 Stockpile cover membrane, as well as contingencies if leakage below the Hydrometallurgical Residue Facility liner causes unacceptable effects on groundwater.

Thematic Response

Some water is predicted to leak through the liners as a result of tears or defects in the geomembrane liners and this potential effect is included in the GoldSim model. The quantity of water leaking through the liners is determined by the liner design and effectiveness.

The Hydrologic Evaluation of Landfill Performance model was used to estimate liner leakage, including the use of uncertainty analysis. Leakage rates are summarized in FEIS Table 5.2.2-27 and Section 5.2.2.5.4, and are included in the Mine Site and Plant Site Water Modeling Data Packages (PolyMet 2015m and 2015j, respectively, both as cited in the FEIS).

Water mitigation measures are summarized in Section 5.2.2.3.5.

It should be noted that the liners used for the Category 2/3 and 4 Stockpiles would be temporary and only be used for a maximum of 20 years. It is unlikely liner replacement would be required in this timeframe if the liner were installed properly.

For the Category 1 Stockpile geomembrane cover, which would be overlain by a vegetative soil cover, maintenance would be required to ensure its effectiveness. The Adaptive Water Management Plan (AWMP) (PolyMet 2015d, as cited in the FEIS) describes modification to the cover system in Section 3.4.3.2 that could also be made before and after installation. This is also summarized in FEIS Section 5.2.2.3.5. Despite maintenance and modifications, if deterioration of the liner were indicated, either visually or by systematic increases in flows to the containment system, then mitigative actions would be undertaken that may include liner repair/replacement and replacing soil that may have been eroded. If full depletion of constituents from the stockpile required more than 1,000 years, the geomembrane could need to be replaced.

The Hydrometallurgical Residue Facility would be double-lined at the bottom to facilitate collection of water that has contacted the hydrometallurgical residue. More specific, the double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a leakage collection system, substantially removing all hydraulic head from the lower liner. This design would virtually eliminate leakage from the Hydrometallurgical Residue Facility to groundwater resources. The collection system capture rate was calculated and included in Section 5.2.2.5.4 of the document Plant Site Water Modeling Data Package (PolyMet 2015j, as cited in the FEIS). The Residue Management Plan (PolyMet 2014r, as cited in the FEIS) includes a description of the operating plans, monitoring procedures, and adaptive management approaches for the Hydrometallurgical Residue Facility. Information on the design of the Hydrometallurgical Residue Facility is in the FEIS in Section 3.2.2.3.7 and 3.2.2.3.10, and further detailed with respect to geotechnical stability in Section 5.2.14.2.3.

Theme WR 128

Theme Statement

The SDEIS places too much reliance on untested and unproven engineered mitigation measures and technologies, such as reverse osmosis, that must work flawlessly for very long periods of time to reduce pollutants from entering surface waterways and groundwater. There is no acknowledgement that many of these measures would degrade over time and require constant monitoring, periodic replacement, and financial assurance to pay for their upkeep. It is unclear what mitigation PolyMet has committed to, and who and by what means NorthMet Project Proposed Action performance would be enforced.

Thematic Response

It is the Co-lead Agencies' opinion that engineered systems can operate successfully over long periods of time is they are property monitored and maintained. The FEIS provides a comprehensive description of proposed water treatment and seep collection systems including groundwater containment and synthetic liners/covers. This includes conceptual designs and discussions of the types of monitoring used to assess performance. Detailed designs are provided in supporting documents, which are fully referenced in the FEIS. The FEIS also discusses long-term operation, maintenance, and periodic replacement of engineered systems. It is acknowledged that certain components of the engineered systems would need to be replaced when monitoring indicated that performance is marginal and not readily compensated for by adaptive mitigation measures.

A detailed financial assurance analysis would be part of the permitting phase and is not a required component of the FEIS. The financial assurance process would fully consider long-term monitoring and periodic replacement of equipment including, but not limited to, water treatment hardware and synthetic liners/covers. The Financial Assurance package for the NorthMet Project Proposed Action would insure that future funding would be available if and when adaptive mitigation measures or component replacements are needed to achieve performance specifications.

Mitigation measures have been adopted into the NorthMet Project Proposed Action through engineering design and management. An overview of the evolution of the NorthMet Project Proposed Action with respect to alternatives analysis is provided in FEIS Section 3.2.3.3. PolyMet commits to monitoring and management through application of management plans that form the NorthMet Project Proposed Action; these plans are listed at the start of FEIS Section 3.2.2. Specific mitigation and monitoring measures relating to water are described in FEIS Sections 5.2.2.3.5 and 5.2.2.3.6.

Theme WR 129

Theme Statement

Over timeframes of hundreds of years, it is likely that some mitigation measures would fail and release contaminated water to the environment before corrective actions can be taken.

Thematic Response

Provided that financial assurance and long-term management is in place, engineering controls could be operated within performance specifications for as long as necessary to meet environmental objectives. Monitoring would allow potential failures to be recognized and corrected before there is a release of impacted water to the environment. With appropriate monitoring and pre-planned contingency actions, and adequate financial assurance, it is technically feasible to maintain the operation of engineered systems indefinitely into the future.

Theme WR 130

Theme Statement

The NorthMet Project Proposed Action does not incorporate adequate mitigation. The SDEIS does not adequately discuss the adaptive mitigation measures that would be used to control unexpected water releases that could impact water chemistry, hydrologic or thermal regimes from the NorthMet Project Proposed Action sites to waterbodies such as the St. Louis River and its tributaries. In many cases, the SDEIS states that mitigation measures would be implemented if needed, but does not describe what those measures would be. What has been committed to by PolyMet is unclear. Triggers for potential changes to designs to collect and manage polluted drainage should be outlined in the FEIS, including why or how underdrains would be added to certain stockpiles should be fully described.

Thematic Response

Mitigation measures have been adopted into the NorthMet Project Proposed Action through engineering design and management. An overview of the evolution of the NorthMet Project Proposed Action with respect to alternatives analysis is provided in Section 3.2.3.3. PolyMet commits to monitoring and management through application of management plans that form the NorthMet Project Proposed Action; these plans are listed at the start of FEIS Section 3.2.2.

FEIS Section 5.2.2.3.5 describes Mine Site and Plant Site adaptive water management measures and under what circumstances they would be triggered and implemented. These adaptive measures would be adjusted accordingly during the construction and operation of the NorthMet Project Proposed Action, based on monitoring results, performance modeling, and engineering assessments. Examples include improving WWTP performance and Tailings Basin pond cover performance.

With regards to the use of foundation underdrains in stockpiles, these would be used to provide gravity drainage should elevated groundwater be encountered, to prevent or minimize the potential for excess pore pressures adversely affecting the performance of the liner system as the stockpile is loaded. As stated in FEIS Section5.2.2.3.2, all temporary stockpiles (Category 2/3,

Category 4, and Ore Surge Pile) would have an underdrain system of minimum grade of 0.5 percent.

Theme WR 131

Theme Statement

The SDEIS does not discuss monitoring or contingencies for failure of pumps, the Colby Lake pipeline, the tailings pipeline, or pipelines between the Plant Site to the Mine Site, despite the fact that these systems may need to run and be funded for centuries after the mine closes. What water is piped where and when is confusing.

Thematic Response

As discussed in the FEIS, financial assurance and long-term management would be in place to assure that engineering controls could be operated within performance specifications for as long as necessary to meet environmental objectives. The Permit to Mine, which would be required before the NorthMet Proposed Action Project could begin, would describe the monitoring required to comply with discharge requirements.

The monitoring would allow potential failures to be recognized and corrected before a release of impacted water to the environment. With appropriate monitoring and pre-planned contingency actions, it is technically feasible to maintain the operation of engineered systems indefinitely into the future. Financial assurance adequate to: 1) monitor/inspect the engineered systems, 2) repair or replace components as necessary, and 3) apply adaptive mitigation measures that are shown to be cost-effective would be required under the Permit to Mine. Financial assurance is described in FEIS Section 3.2.2.4.

FEIS Figures 3.2-5 through 3.2-8 show the proposed water management features, infrastructure, and flow at NorthMet Project area.

Theme WR 132

Theme Statement

The SDEIS provides no contingencies for tailings embankment failure.

Thematic Response

The Project Description in the FEIS indicates that the Tailings Basin design would meet appropriate Factors of Safety and that Tailings Basin embankments would be monitored and inspected on a routine basis and repaired or strengthened on an as-needed basis. Financial assurance would be in place to perform these activities indefinitely into the future.

Theme WR 133

Theme Statement

The SDEIS includes no discussion of the installation of the south Tailings Basin seepage capture system and the proposed seepage capture system has not been designed to collect any seepage from the east side of the Tailings Basin.

Thematic Response

The Project Proposer has committed to collecting all of the south seepage from the Tailings Basin that makes its way to Second Creek by implementing additional improvements to the existing seepage management system if necessary. Potential measures that could bring the capture efficiency of the system to 100 percent include improvements to the existing dam such as lining the upstream dam face with bentonite and injecting grout into the dam. If seepage is observed to bypass the existing dam, a second dam could be constructed approximately 500 feet downstream of the existing system. This is an area where the Second Creek headwaters valley is more constricted and any remaining subsurface seepage would have come to the surface. This potential second dam could be constructed as an earthen dam with a clay or concrete cutoff wall (extending to bedrock if necessary) in order to achieve 100 percent capture of the surface seepage.

The east side seepage containment system is designed in the same manner as the groundwater containment system on the northern and western sides of the Tailings Basin. The east side seepage containment system would be designed to efficiently collect the Tailings Basin seepage while minimizing the collection of unimpacted water that would continue to flow from east to west towards the Tailings Basin. The unimpacted water flowing towards the Tailings Basin would be directed to the swale that would be constructed north of the East Dam consistent with the NorthMet Project Proposed Action as described in the SDEIS and FEIS, while the seepage collection system on the interior of the groundwater containment system would be constructed at an elevation lower than the swale to maintain an inward gradient across the containment system.

Theme WR 134

Theme Statement

The SDEIS provides no technical justification for the finding that waste rock segregation would be effective. It is unclear why Category 1 Stockpile seepage capture and treatment is necessary given its percentage of sulfur and the predictions that it would not generated acidic leachate. Why doesn't PolyMet stockpile the higher sulfur rock from the Category 1 stockpile in the Category 2/3 stockpile? This would potentially lower post-closure costs if it would eliminate the need to treat water that comes in contact with the Category 1 stockpile.

Thematic Response

Rock segregation by chemical properties is the primary purpose of mining operations. The designation of rock as waste and ore is a universally applied method for directing material excavated from hard rock mines. There is a long history of rock segregation on the Iron Range and regulatory agencies annually review the placement of rock. Technology like GPS has improved segregation practices. Moreover, calculations show if all Category 2/3 Stockpile rock

were to be placed in the Category 1 Stockpile, the average rock sulfur concentration would be 0.10 weight-percent sulfide S. This is less than the 0.12 weight-percent sulfide cut-off that defines the rock at the Category 1 Stockpile. While acid generation is not expected, the proposed containment system that would be constructed around the Category 1 Stockpile to capture water coming from the stockpile would ensure that water is managed in the event of unexpected constituent-loading from the stockpile.

To support the environmental classification of waste rock, 89 rock samples were subjected to kinetic tests (synthetic weathering). The samples were pre-selected to be spatially dispersed across the deposit, included rock from each of the major lithologic units, and captured the range in metal and sulfide S concentrations (see Table 4-1 in SRK 2007b, as cited in the FEIS). Non-acid-generating material (Category 1 waste rock samples defined as having no more than 0.12 weight-percent sulfide S) was identified through the results of 13 long-term (greater-than 420 weeks) kinetic tests. These tests found that all Category 1 rock samples, "...yielded pH above 6 throughout the program, typically fluctuating between 6.5 and 7.5 after an initial decline" (Section 4.1.4 and Large Table 1 in PolyMet 2015q, as cited in the FEIS). Although leachate from the Category 1 Stockpile is not predicted to be acidic, water quality model predictions indicate the need for mitigation.

To support mine planning and waste-rock handling, PolyMet developed a geologic "block model," which is a three-dimensional grid that represents the deposit and that provides an estimate for ore grade and sulfide S concentration in each grid block. The estimates of sulfide S in all of NorthMet waste and ore are based on interpolation of sulfide S analyzed in recovered drill core (approximately 18,800 analyzed samples). To ensure that the estimates of sulfide S concentration in the waste rock are accurate, the Co-lead Agencies commissioned an independent review of the geostatistical analysis used to develop the sulfide S distribution in the block model. For this, the reviewer obtained the entire dataset of sulfide S analyses on core samples. This audit found that the number and spatial distribution of the sulfide analyzed supported the geologic block model, which was developed to describe the ore and waste rock distribution in the deposit (Optitech 2012).

Theme WR 135

Theme Statement

Groundwater mapping is incomplete. The FEIS should address the flow and seepage of groundwater and should include information related to the stability of aquifers.

Thematic Response

Groundwater mapping has been performed by a combination of water levels measured in monitoring wells and calibrated groundwater flow models that predict hydraulic head distributions between the measurement locations. The calibration procedure refines the estimated hydrologic properties (e.g., hydraulic conductivity) of hydrogeologic units. The hydraulic head maps and refined properties developed in this manner are considered sufficiently reliable and accurate for impacts analysis and design of mitigation measures.

Theme WR 136

Theme Statement

The SDEIS provides no technical justification for the assumed effectiveness of land application of impacted waters.

Thematic Response

The NorthMet Project Proposed Action would not rely upon land application of impacted waters as a means for treatment.

Theme WR 137

Theme Statement

The SDEIS provides no technical description of potential non-mechanical water treatment systems. The SDEIS provides no technical justification of its effectiveness, details on when it would be implemented, nor does it describe how the commitment to transition to non-mechanical treatment would be enforced.

Thematic Response

A specific design of non-mechanical treatment is not included in the Project Description and the NorthMet Project Proposed Action would rely on mechanical treatment for as long as necessary. During operations and closure, the use of non-mechanical treatment may be considered as an adaptive management measure if pilot and other feasibility studies indicate that this method has potential utility in accordance with permit conditions, and is cost-effective. In the FEIS, the possible future use of non-mechanical treatment is stated as a long-term goal, but the details of how such systems would operate would be determined once operations begin and site specific data could be used for pilot/feasibility studies, and if the systems are eventually proposed they would be addressed in future permitting. Obtaining water quality measurements is highly desirable when designing site-specific non-mechanical treatment systems because they provide better reference points than modeling for necessary system performance. Reference to a seasonal application of the wild rice standard has been removed from the description of these potential future non-mechanical treatment systems for the FEIS.

Theme WR 138

Theme Statement

The SDEIS does not describe the frequency of cover and liner replacement or acknowledge that leaks are most often due to accidental flaws in installation.

Thematic Response

Some water is predicted to leak through the Category 2/3 and 4 geomembrane liners as a result of tears or defects and this effect is included in the GoldSim model. The Hydrologic Evaluation of Landfill Performance model was used to estimate liner leakage, including the use of uncertainty analysis. Leakage rates are summarized in FEIS Table 5.2.2-27 and Section 5.2.2.3.2, and are included in the documents Mine Site and Plant Site Water Modeling Data Packages

(PolyMet 2015m and 2015j, respectively, both as cited in the FEIS). Mitigation measures are summarized in FEIS Section 5.2.2.3.5. It should be noted that the liners used for the Category 2/3 and 4 Stockpiles would be temporary and would only be used for a maximum of 20 years. It is unlikely liner replacement would be required in this timeframe if the liner is installed properly.

For the Category 1 Stockpile geomembrane cover, which would be overlain by a vegetative soil cover, maintenance would be required to ensure its effectiveness. The Adaptive Water Management Plan (AWMP) (PolyMet 2015d, as cited in the FEIS) describes modification to the cover system in FEIS Section 3.4.3.2 that could also be made before and after installation. This is also summarized in FEIS Section 5.2.2.3.5. Despite maintenance and modifications, if deterioration of the liner were indicated, either visually or by systematic increases in flows to the containment system, then mitigative actions would be undertaken that may include liner repair/replacement and replacing soil that may have been eroded. If full depletion of constituents from the stockpile required more than 1,000 years, the geomembrane could need to be replaced.

The Hydrometallurgical Residue Facility would be double-lined at the bottom to facilitate collection of water that contacted the hydrometallurgical residue. More specifically, the double liner would consist of a composite liner system utilizing a geomembrane liner above a geosynthetic clay liner with a second liner placed above the first, separated by a leakage collection system, substantially removing all hydraulic head from the lower liner. This design would virtually eliminate leakage from the Hydrometallurgical Residue Facility to groundwater resources. The collection system capture rate was calculated and included in Section 5.2.2.5.4 of PolyMet 2015j, as cited in the FEIS. The Hydrometallurgical Residue Management Plan includes a description of the operating plans, monitoring procedures, and adaptive management approaches for the Hydrometallurgical Residue Facility. Information on the design of the Hydrometallurgical Residue Facility is in FEIS Section 3.2.2.3.10.

Theme WR 139

Theme Statement

The FEIS should describe the groundwater and surface water monitoring plans and systems rather than stating that monitoring plans would be determined during the permitting phase. Furthermore, the FEIS should state who would be responsible for water monitoring. It seems inadvisable to depend on PolyMet to perform such a critical function, especially when it is potentially hurtful to their bottom line. Where monitoring shows effluent limit exceedances, enforcement and corrective actions needs to be taken. An understanding of baseline groundwater flow direction is necessary before implementing a monitoring system.

Thematic Response

FEIS Section 5.2.2.3.6 provides a description of the monitoring plans proposed by PolyMet. Monitoring would be used on a continual basis to document compliance with permit conditions, annually validate and update water models, and provide input to optimize operations of adaptive engineering controls. The FEIS provides information on objectives, monitoring summary, and general location for monitoring of process water streams, storm water, surface discharges, groundwater, wetlands, and surface water in the Partridge River and Embarrass River watersheds (as applicable). For groundwater monitoring, the general number of sampling locations and frequency are identified. For surface water, general sampling locations and timeline are

identified. As mentioned in the FEIS, the water monitoring plans would be finalized in detail (including specific locations, frequencies, and parameters) during the NPDES/SDS water permitting and water appropriations processes and updated as required during the life of the NorthMet Project Proposed Action.

PolyMet, as the assigned Permittee for the NorthMet Project Proposed Action, would be responsible of carrying out the proposed monitoring activities as described in the legally enforceable permits. The permits, supported by state and federal laws, include provisions that address failure to comply with the terms and conditions of the permit, including those related to conducting required monitoring.

Theme WR 140

Theme Statement

The FEIS should discuss contingencies in the event that Colby Lake and Whitewater Reservoir cannot be used for drinking water due to mine withdrawals and contributions of polluted water.

Thematic Response

Colby Lake is classified listed as a Class 1B waterbody (protected for domestic consumption) and is currently used as a potable water source for the City of Hoyt Lakes. As stated in FEIS Sections 4.2.2.2.2 and 5.2.2.3.2, recent monitoring data show elevated concentrations of aluminum, iron, mercury, and manganese, which at times exceed secondary drinking water standards. The City of Hoyt Lakes currently treats the water drawn from Colby Lake to remove these constituents prior to distribution. Additionally, Colby Lake is classified as "impaired waters" as it is on the Minnesota 303(d) TMDL List due to mercury concentrations in fish tissue.

With the proposed designs and engineering controls, the water quality model predicts that the NorthMet Project Proposed Action would not cause or increase the magnitude of a current exceedance of Colby Lake surface water evaluation criteria at the P90 level. Furthermore, the model predicts a slight decrease in P90 concentrations of aluminum, iron, and manganese over time.

Based on current conditions and uses and the predicted conditions, no issues with continued use Colby Lake as a potable water source have been identified.

Theme WR 141

Theme Statement

The FEIS should discuss the monitoring necessary to ensure wildlife protection, human health, and water quality related to open water in the East Pit wetland, West Pit Lake, and Tailings Basin pond.

Thematic Response

Based on the results of water quality modeling, the water quality of the West Pit Lake, East Pit wetland, and Tailings Basin pond is predicted to be at concentrations not injurious to wildlife or incidental human contact. On-site monitoring of waterbodies within facility boundaries would likely be a part of a monitoring program. Monitoring details would be finalized in the permitting

process. FEIS Section 5.2.5.2.3 discusses potential effects on wildlife from incidental contact with the Tailings Basin pond and pit lakes. FEIS Section 7.3.4 discusses potential human health impacts. FEIS Section 5.2.2.3.6 discusses on-site water monitoring.

Theme WR 142

Theme Statement

The FEIS should discuss monitoring and mitigation associated with potential effects on drinking water wells.

Thematic Response

With regard to water wells, the FEIS groundwater impacts analysis indicates that drinking water standard-based evaluation criteria would be met at the Mine Site and Plant Site property boundaries, which are upgradient of current and possibly future residential or domestic water wells. Evaluation criteria can be found in Section 5.2.2. If evaluation criteria are met at the properties boundaries, it is highly unlikely that the NorthMet Project Proposed Action could cause exceedances of groundwater standards outside the property boundary. Note that at the Plant Site, groundwater standards for some parameters may currently be exceeded beyond the property boundary as a result of legacy issues with the Tailings Basin; however, engineering controls included as part of the NorthMet Project Proposed Action are expected to address these exceedances over time.

Theme WR 143

Theme Statement

SDEIS does not adequately describe the dual proposed reverse osmosis systems including: the design, discharge locations, and timing of implementation; treatment processes; the results of pilot testing; reliability; cost, effectiveness; operations; and management, including that of potential overflows.

Thematic Response

The Project Description in the FEIS indicates that an RO system (or equivalent performing technology) would be constructed at the WWTP at the Plant Site at the beginning of the NorthMet Project Proposed Action and that an RO unit would be added to the WWTF at closure if water monitoring of sulfate concentrations during operations indicated the need to do so. Pilot-testing of an RO system was conducted by the Proponent and is reported in the document *Final Pilot Testing Report* (Barr 2013f, as cited in the FEIS). The final detailed design, treatment process, operation, and maintenance of the RO systems to be installed would be included as part of the permitting process.

Theme WR 144

Theme Statement

The SDEIS does not adequately describe measures that would be taken in the event of short-term or long-term reverse osmosis system failure.

Thematic Response

RO is a standard water treatment technology and industrial-scale systems have been operated around the world for decades. The FEIS describes the proposed RO system as being modular with redundant treatment streams. If one or more of the membranes were to fail, the flow could be quickly diverted to standby cells and no flow would pass through the RO system untreated. Further, membrane failure tends to be gradual and provide advanced warning so corrective actions could be taken before there was a loss of treatment. The system would be designed to have storage capacity for the incoming influent so the system could be shut down for brief periods for equipment repair/replacement, with the stored influent treated after the system were back online.

PolyMet would contract with specialty service companies providing self-contained truck-mounted RO systems that could transported to the site on short notice for temporary treatment while modifications were made to the resident RO system (if ever necessary).

Theme WR 145

Theme Statement

The FEIS should provide additional detail on the characterization, and the risks of temporary storage, transportation and disposal of treatment residuals (brines and solids), including uranium.

Thematic Response

Sludge produced by the chemical precipitation system would be managed at the Hydrometallurgical Residue Facility during operations or disposed off-site at an appropriately licensed solid waste disposal facility. During reclamation sludge would be hauled to an approved off-site landfill. During operations, the reject concentrate from the WWTP would be transported to the WWTF via railcar, fed to the precipitation system via a transfer pump, and directed to the applicable precipitation train. During closure and long-term maintenance, the WWTP residual solids generated from thermal treatment would be transported off site for disposal. The description of treatment residual disposal in the FEIS is at a sufficient level of detail for the FEIS to assess their potential for impact on the environment. There is no uranium risk or exposure associated with the NorthMet Project. FEIS Section 5.2.13 addresses risk and management of hazardous materials associated with the NorthMet Project Proposed Action.

Theme WR 146

Theme Statement

The SDEIS does not adequately describe the precipitation process to be used at the WWTF.

Thematic Response

FEIS Section 5.2.2.3.1 describes the chemical precipitation and membrane filtration treatment methodologies to be used at the WWTF based on the predicted water loads and constituents modeling.

Theme WR 147

Theme Statement

The FEIS should describe the influent and effluent assumptions and targets for the WWTF and WWTP. Influent concentrations for some parameters are underestimated or not considered which effects effluent concentrations.

Thematic Response

The influent concentrations of all chemical constituents to the WWTF and WWTP, based on information from GoldSim modeling, are presented in the Mine Site Data Package and Plant Site Data Package (PolyMet 2015m and PolyMet 2015j, respectively, both as cited in the FEIS).

Because the water treatment facilities would be designed systems, they could be engineered to achieve target effluent concentrations. The assumed effluent treatment concentrations in the FEIS are based on extensive laboratory-scale and pilot-scale testing conducted by PolyMet and on case histories of currently operating systems at mine sites.

Theme WR 148

Theme Statement

The FEIS should describe contingencies if water treatment flow rates are higher than expected.

Thematic Response

The WWTF to be used at the Mine Site for mine years zero to 40 would be designed to have a larger treatment capacity than expected. The excess treatment capacity would be sufficient to handle all reasonable flow rates that could occur during mine operations and reclamation. In the unlikely event that influent flow rates were greater than the WWTF capacity, the excess flow could be diverted to the Plant Site RO system, which would also be designed to have excess treatment capacity. The preliminary design of the WWTP would be based on estimates for the volumetric flow and chemical composition of Plant Site water from the seepage capture pond-level management systems, but the WWTP treatment system would be part of the adaptive management system, so that its capacity could be "adapted, as necessary, in response to the actual conditions encountered during the Project, the monitoring results, and the conditions estimated by continued model updating" (Section 4.2.4 of PolyMet 2015d, as cited in the FEIS).

RO systems (or equivalent performing technology) would be used at the Plant Site for the entire life cycle of the NorthMet Project Proposed Action and at the Mine Site during closure. These systems would be designed with excess flow capacity and redundant treatment streams. The modular design of the RO systems would allow the ability to add capacity in the unlikely event that influent flow rates exceeded both the primary and redundant design flow rates. PolyMet would contract with specialty service companies providing self-contained truck-mounted RO systems that could transported to the site on short notice for temporary treatment while modifications were made to the resident RO system (if ever necessary).

Theme WR 149

Theme Statement

The SDEIS generally underestimates sulfate concentrations at points of compliance. There is insufficient information to determine whether this mine would contribute to significant degradation of the waters of the United States due to sulfate discharges. Permits must be denied on this basis.

Thematic Response

NorthMet Project Proposed Action-related sulfate concentrations at groundwater and surface water evaluation locations would mostly be dependent on chemical release rates from chemical source areas including mine pits, stockpiles, and the Tailings Basin. In addition, sulfate concentrations would be strongly influenced by the capture efficiency of containment systems along the outside perimeter of the Tailings Basin and surrounding the Category 1 Stockpile.

GoldSim inputs pertaining to chemical release rates were scrutinized by the Co-lead Agencies and extensively reviewed and modified through a cooperative process with the Project Proponent and Cooperating Agencies. These inputs are considered realistic median values based on NorthMet geochemical characterization and information obtained from similar mine sites. The capture efficiencies used for containment systems at the Mine Site and Plant Site are considered reasonable or conservatively low based on subsidiary MODFLOW modeling specifically meant to address this issue. The Co-lead Agencies believe that GoldSim inputs for these processes are reasonable and do not have any systematic tendencies leading to underestimates in sulfate concentrations at the evaluation locations.

The GoldSim modeling is probabilistic so that most chemical release inputs are put into the model as probability distributions (rather than single deterministic values). The mean (or central-tendency) values in these distributions are considered by the Co-lead Agencies to reasonably conform to median values based on geochemical characterization. In addition, the range of probable values above and below the mean do not bias the overall probability distributions to higher or lower release rates from what is indicated by the data. Note further that evaluation of NorthMet Project Proposed Action-related impacts is based on P90 sulfate concentrations, which are always higher than the P50 (median) concentrations.

Given the above discussion, the Co-lead Agencies believe that GoldSim-computed sulfate concentrations are not systematically underestimated at evaluation locations at the Plant Site and Mine Site.

The evaluation and decision of whether or not the NorthMet Project Proposed Action may or may not discharge into surface waters where water quality standards are exceeded is a permit decision.

Theme WR 150

Theme Statement

The SDEIS does not account for accumulation of sulfate in tailings or other waste.

Thematic Response

The GoldSim water- and solute-transport models track the mass of all sulfate released from the oxidation of sulfide minerals. If sulfate concentrations in pore water were below the concentration cap, all of the sulfate released in a time step could migrate out with the flowing water. But if enough sulfate were released over a time step that the sulfate concentrations in pore water exceeded the concentration cap, then the pore water would be set equal to the concentration cap, and the mass of excess sulfate would be stored in the model as a "labile" phases (i.e., a solid phases that remains in place, but is assumed to be able to dissolve in each new model time step). The result of this method is that when solute release produces sulfate concentrations above the concentration cap, the effluent remains at the concentration cap, and the eventual release of the stored "labile" sulfate causes the sulfate concentrations in effluent to remain at the cap for a longer duration. This method is applied to waste rock and tailings. Waste rock and wall rock contains "non-contacted" rock an additional reservoir for "labile" sulfate. This is the portion of the rock that is not flushed by percolating water, and sulfate is released from this zone when (and if) the rock is submerged in water. This same approach is applied to all solutes as part of the model design to preserve mass balance.

Theme WR 151

Theme Statement

The SDEIS does not adequately consider the amount or effects of dust and depositional impacts, and ore spillage from rail cars on groundwater, surface water, and wetlands.

Thematic Response

The Project Description in the FEIS includes routine inspections of the Transportation and Utility Corridor to identify accumulations of dust or ore spillage.

Regarding dust, given the majority of the dust that could leave the NorthMet Project area could be characterized as low sulfide/low metal, potential impacts would be controlled by: 1) the commitment to treat all runoff from disturbed areas as process wastewater, and 2) the facilities would be subject to an air quality Fugitive Emissions Plan. Significant impact on water resources or historic properties is not expected.

All active areas at the Mine Site and Plant Site would be subject to a Fugitive Dust Control Plan approved by the MPCA, which describes management of fugitive dust generated from unpaved roads across the NorthMet Project area, rock dumping and loading locations on the Mine Site,

and areas potentially subject to wind erosion on the Plant Site (see Section 4.1.6 and Section 4.3.9 in PolyMet 2015a, as cited in the FEIS).

Regarding potential spillage, any significant accumulations would be removed by a combination of machines and hand work. Ore transport would be by special railcars that minimize dust and spillage, where, since the SDEIS, the Proposer has committed to retrofit the railcars to better control spillage. It is unlikely that there would be sufficient spillage to affect the quality of surface water or groundwater, as discussed in FEIS Section 5.2.2.3.2. See FEIS Section 3.2.2.4 for more information on the railcars, and Sections 5.2.3 and 5.2.7 for impacts of railcar spillage and dust on wetlands and air quality, respectively. The effect of dust falling on the disturbed portions of the Mine Site would be controlled by the perimeter dike and ditch system, which would route runoff to the WWTF (see Section 4.1.5.3 and Large Figures 19 through 21 of PolyMet 2015a, as cited in the FEIS).

Theme WR 152

Theme Statement

The SDEIS does not adequately incorporate the findings of recent research on the influence of sulfates and sulfides on the growth of wild rice. Research into and evaluation of the Minnesota sulfate wild rice water standard are ongoing, and application of the standard (where it applies, what time of year, and what the numeric standard should be) may change. The FEIS should incorporate the most recent MPCA research and needs to consider the findings of "Effects of Sulfate on the Biomass and Seed Production of Wild Rice." Given regulatory uncertainty and the lack of wild rice locational data, the FEIS should assume all waters surrounding the NorthMet Project Proposed Action site are wild rice waters.

Thematic Response

The FEIS recognizes the MPCA is overseeing a variety of studies on wild rice. At applicable surface water locations, the FEIS evaluated impacts using an evaluation criterion based on the current 10 mg/L standard for sulfate concentration in waters used for production of wild rice. This impact assessment metric is keyed to the current regulation.

It is recognized that the MPCA is currently evaluating the current wild rice sulfate water quality standard and, as part of that process, new information on potential contributing factors on the growth of wild rice has been generated. However, that information has not yet been holistically reviewed in the context of its possible influence on the wild rice standard. Future change to the wild rice sulfate standard, if any, is speculative and outside the scope; applying research findings outside the basis of the current rule is not appropriate.

The FEIS includes descriptions of the Plant Site WWTP and Mine Site WWTF, both of which would be capable of discharging treated wastewater at concentrations at or below 10 mg/L as demonstrated by pilot-testing already conducted. More detailed information on these treatment systems would be available as part of the permitting process. However, should a more stringent standard be developed in the future, operation of the RO treatment systems (or equivalent performing technology) could be adjusted to meet a more stringent effluent limit.

See FEIS Sections 5.2.2.1.2, 5.2.2.3.2, and 5.2.2.3.3 for more information.

Theme WR 153

Theme Statement

Seasonal application of the Minnesota sulfate standard is not technically justified; the standard needs to be applied year round. If seep collection and non-mechanical water treatment after closure do not work as planned, the seasonal discharge would have a greater effect than predicted in the SDEIS.

Thematic Response

Neither seasonal application of the wild rice standard nor non-mechanical treatment systems would be part of the NorthMet Project Proposed Action, which would rely solely on mechanical treatment and year-round application of the sulfate standard. Non-mechanical treatment may be considered during operations and closure if pilot studies demonstrated their utility and cost-effectiveness for water treatment and water disposal.

Theme WR 154

Theme Statement

Regulatory standards need to consider historical and current wild rice areas. Historical wild rice harvesting occurred upstream of MPCA-designated waters. The wild rice standard therefore needs to be applied to entire Embarrass River Watershed and additional portions of the Partridge River Watershed.

Thematic Response

For purposes of the EIS, the MPCA has previously provided draft staff recommendations as to what waters in the Embarrass River and Partridge River should be considered waters used for production of wild rice, to which the current 10 mg/L wild rice sulfate standard applies. The MPCA staff reviewed all available relevant information in making their recommendations.

Theme WR 155

Theme Statement

The Land Exchange Proposed Action would not compensate for current and future loss of wild rice areas. The SDEIS must be rejected until it contains an analysis of the effects of groundwater pollution on Land Exchange Alternative B.

Thematic Response

The Land Exchange Proposed Action would result in the public ownership of additional wild rice beds by the acquisition of Tract 1. Tract 1 contains Little Rice Lake, which supports a continuous population of wild rice. Wild rice also grows along the Pike River south of Little Rice Lake and in isolated populations on Hay Lake. FEIS Section 4.3.4.2.5 provides further discussion of wild rice on Tract 1. Wild rice does not currently grow within the proposed federal land boundaries. As a result, the public would have better opportunities for wild rice harvesting on Tract 1, where there is currently no opportunity to harvest wild rice directly on the federal lands (i.e., no known wild rice populations) despite the public water access onto the federal lands. A carry-down boat

launching access is located on Tract 1, which may provide private access for wild rice harvesting on the Tract 1 lands. Access to wild rice beds on the federal lands would not be lost as a result of the Land Exchange Proposed Action, but access to wild rice beds on Tract 1 would be gained.

The Land Exchange Proposed Action and Lane Exchange Alternative B would not directly result in groundwater pollution. Any impacts from the NorthMet Project Proposed Action on groundwater within the federal lands included under Land Exchange Alternative B are considered in FEIS Section 5.2.2.3.2.

Theme WR 156

Theme Statement

Sulfates and toxic metals from the NorthMet Project Proposed Action that are not captured for treatment would affect water quality and wild rice production. This would harm and could even prevent the traditional, treaty-protected harvesting of wild rice by the Bands. Water quality is a legal right for Native Americans.

Thematic Response

It is acknowledged that the NorthMet Project Proposed Action would increase concentrations of some metals at some evaluation locations. However, the NorthMet Project Proposed Action would not cause predicted concentrations to be above applicable water quality standard-based evaluation criteria. Evaluation criteria can be found in Section 5.2.2. Water quality and quantity modeling predictions for SW-005 and PM-13 indicate that the NorthMet Project Proposed Action would not result in adverse impacts on wild rice. These locations are the nearest downstream locations in the Partridge River and Embarrass River, respectively, and were previously recommended by the MPCA staff to be considered as waters used for production of wild rice. Impacts on wild rice further downstream in these waters, or on wild rice resources regionally throughout the treaty areas, would not be expected.

Theme WR 157

Theme Statement

The NorthMet Project Proposed Action may affect wild rice and other aquatic plants that are making a recovery in these waters. Effects on wild rice in the vicinity of the NorthMet Project Proposed Action must be more rigorously analyzed and reported, including the extent to which wild rice beds would decrease as a result of the NorthMet Project Proposed Action and how this could impact the quality and quantity of wild rice available for consumption by people or wildlife. The FEIS should assess the effects of winter water releases from the NorthMet Project Proposed Action on spring sulfite levels in the seedlings of downstream wild rice beds. The FEIS should also provide additional details about mitigation of wild rice effects.

Thematic Response

Water quality and quantity modeling predictions for SW-005 and PM-13 indicate that the NorthMet Project Proposed Action would not result in adverse impacts on wild rice. These locations are the nearest downstream locations in the Partridge River and Embarrass River, respectively, and were previously recommended by MPCA staff to be considered as waters used

for production of wild rice. Impacts on wild rice further downstream in these waters, or on wild rice resources regionally throughout the treaty areas, would not be expected.

Theme WR 158

Theme Statement

The NorthMet Project Proposed Action would increase mercury and sulfate pollution in the St. Louis River Watershed, including the Partridge River and Embarrass River, which is already impaired for these pollutants. This has serious implications for human health and wild rice. Iron mines have already created water quality problems like wild rice dead zones and concerning mercury levels.

Thematic Response

The FEIS indicates that the NorthMet Project Proposed Action would result in a reduction in sulfate-loading to the Embarrass River at the monitoring site (PM-13), and a small increase in sulfate-loading to the Partridge River resulting in an overall decrease in loading to the St. Louis River. The FEIS also indicates a net decrease of mercury-loadings of approximately 0.6 grams per year (i.e., a net decrease of 1.2 grams per year in the Partridge River and a net increase of 0.6 grams per year in the Embarrass River) and therefore would not contribute to cumulative effects on mercury-loading to the St. Louis River. Based on FEIS modeling predictions, the NorthMet Project Proposed Action is not anticipated to have adverse effects on downstream wild rice. Consequently, the NorthMet Project Proposed Action does not include, or need to include, mitigation for the cultivation of new wild rice beds in unaffected waters.

Theme WR 159

Theme Statement

The St. Louis River downstream from the PolyMet site is already heavily impacted by sulfate, and wild rice production in the watershed is a fraction of what it once was. The state should reduce or eliminate problem pollution sites before permitting. The FEIS should analyze cumulative effects of the NorthMet Project Proposed Action on sulfates and wild rice in the NorthMet Project area and the St. Louis River Watershed as a whole. Cumulative effects on wild rice in the 1854 Ceded Territory also need to be addressed.

Thematic Response

Sulfate loading is predicted to decrease overall as a result of the NorthMet Project Proposed Action. Although sulfate loadings are predicted to increase slightly in the Partridge River Watershed (0.1 percent) as a result of the NorthMet Project Proposed Action, this is offset by a large decrease in the Embarrass River Watershed (21 percent at PM-13), resulting in a significant net decrease in overall sulfate-loadings to the St. Louis River as a result of the NorthMet Project Proposed Action. The NorthMet Project Proposed Action is also predicted to have negligible impact on the hydrology of either the Partridge River or Embarrass River. Therefore, the NorthMet Project Proposed Action is not considered to have the potential to contribute to cumulative effects on hydrology and water quality in the St. Louis River. As a result, the CEAA

for surface water is defined by the Partridge River and Embarrass River watersheds as shown on Figure 6.2.2-1.

Theme WR 160

Theme Statement

Given the mounting evidence demonstrating negative effects on wild rice from relatively low levels of sulfides, the positive correlation between levels of sulfate in water column and sulfides in sediment combined with the remaining uncertainties about long-term effects and the relationship between sulfate and methyl mercury, add to the weight of evidence against weakening the 10 mg/L sulfate standard.

Thematic Response

The water quality evaluation criterion for sulfate for the SDEIS and the FEIS for waters previously recommended by MPCA staff to be waters used for production of wild rice (represented by evaluation locations SW-005 in the Partridge River and PM-13 in the Embarrass River) is the current Class 4A wild rice sulfate water quality standard of 10 mg/L.

Theme WR 161

Theme Statement

The NorthMet Project Proposed Action would meet the strict Minnesota standard for wild rice waters. The SDEIS makes it very clear that there would be a net decrease in both sulfate and mercury loadings as a result of this NorthMet Project Proposed Action. The NorthMet Project Proposed Action is not expected to damage downstream wild rice beds. Overall concerns about wild rice beds are unfounded, since wild rice beds are found in many nearby lakes that historically had no wild rice. Wild rice harmed by sulfides associated with the NorthMet Project Proposed Action could be mitigated through the cultivation of new wild rice beds in unaffected waters. The USFS and the State of Minnesota have planted wild rice in the area with very good success.

Thematic Response

The FEIS indicates that the NorthMet Project Proposed Action would result in a reduction in sulfate loading to the Embarrass River at the monitoring site (PM-13), and a small increase in sulfate-loading to the Partridge River resulting in an overall decrease in loading to the St. Louis River. The FEIS also indicates a net decrease of mercury-loadings of approximately 0.6 grams per year (i.e., a net decrease of 1.2 grams per year in the Partridge River and a net increase of 0.6 grams per year in the Embarrass River) and therefore would not contribute to cumulative effects on mercury-loading to the St. Louis River. Based on FEIS modeling predictions, the NorthMet Project Proposed Action is not anticipated to have adverse effects on downstream wild rice. Consequently, the NorthMet Project Proposed Action does not include, or need to include, mitigation for the cultivation of new wild rice beds in unaffected waters.

Theme WR 162

Theme Statement

Sulfate and wastewater from the NorthMet Project Proposed Action would exceed the state 10 mg/L standard for wild rice and would likely eliminate wild rice in the St. Louis River and its tributaries. Since sulfate levels in wild rice beds downstream of the Proposed Mine already exceed the standard, the FEIS should demonstrate that the NorthMet Project Proposed Action "would have an acceptably high probability of not increasing sulfate concentrations in these areas." The SDEIS does not currently meet this test. The Partridge River would exceed the standard during low-flow conditions.

Thematic Response

The discharge from WWTFs using RO technology (or equivalent performing technology)is expected to meet the wild rice sulfate standard of 10mg/L during operations and closure. The FEIS closely evaluated the potential changes to sulfate concentrations as a result of the NorthMet Project Proposed Action in the Embarrass River and Partridge River at evaluation locations representing the location of wild rice production waters subject to the wild rice sulfate water quality standard of 10 mg/L. The analysis showed that the NorthMet Project Proposed Action would result in a reduction of sulfate loading to the Embarrass River and only a very slight potential increase in loading to the Partridge River. Consequently, the NorthMet Project Proposed Action is not anticipated to have adverse effects on downstream wild rice. As part of the permitting process, the MPCA would continue to evaluate the NorthMet Project Proposed Action's potential sulfate contributions to the Embarrass River and Partridge River based upon all available relevant information to ensure compliance with applicable standards.

Theme WR 163

Theme Statement

Although the MPCA has specified that only certain wild rice producing waters are protected under the wild rice sulfate water quality standard, the rights of Ojibwe people to gather wild rice on off-reservation land was affirmed by the U.S. Supreme Court in 1999. Therefore, all wild rice beds in the Ceded Territory are protected under 1864 Treaty. The SDEIS fails to explain how the NorthMet Project Proposed Action would meet the statutory requirements regarding wild rice water quality standards and the Clean Water Act.

Thematic Response

Water quality and quantity modeling predictions for SW-005 and PM-13 indicate that the NorthMet Project Proposed Action would not result in adverse impacts on wild rice. These locations are the nearest downstream locations in the Partridge River and Embarrass River, respectively, and were previously recommended by MPCA staff to be considered as waters used for production of wild rice. Impacts on wild rice further downstream in these waters, or on wild rice resources regionally throughout the treaty areas, would not be expected.

Theme WR 164

Theme Statement

The MPCA has postponed their decision on sulfate levels in waters that support wild rice beds. When standards are still undecided, decisions pertaining to those standards ought not to be concluded. If the rule-making process is not complete, the FEIS should not rely on a preliminary draft recommendation from MPCA based on incomplete knowledge.

Thematic Response

The evaluation in the FEIS is based on the current Class 4A wild rice sulfate standard of 10 mg/L applicable to waters used for production of wild rice and previous draft MPCA staff recommendations identifying the location of waters used for production of wild rice. It is not appropriate for the EIS to speculate as to if or how the standard, or application of the standard, may evolve.

Theme WR 165

Theme Statement

Underestimated Partridge River baseflows in the Mine Site GoldSim model lead to underestimated recharge, incorrect surficial deposit hydraulic conductivities, and underestimated chemical loading to groundwater and the Partridge River in the Mine Site GoldSim model. As a result, the SDEIS version of the Mine Site GoldSim model is invalid, and the model should be revised to include inputs that are consistent with the correct baseflows.

Thematic Response

As discussed in the response to theme WR 003, Partridge River groundwater baseflows used in the SDEIS and transferred to the FEIS are reliable best estimates and are not erroneously low. This is because the SDEIS (and FEIS) groundwater baseflow values were based on winter 1986-77 and winter 1987-88 stream gaging in the Partridge River that occurred when there were no discharges from the Northshore Mine. When expressed as a groundwater baseflow yield per unit area, the similar results for both the Partridge and Embarrass River watersheds (approximately 0.05 cfs per square mile) lends credibility to the approach used.

As discussed in the response to theme WR 004, the low-flow measurements at gaging station SW-003 are not reliable indicators of groundwater baseflow due to the complicating effects of Northshore Mine pumped discharges to the Partridge River.

The Mine Site MODFLOW model was recalibrated based on new groundwater level data collected through the end of 2013; however, calibrations performed for the FEIS used the same Partridge River baseflows as were used in SDEIS. Revised hydraulic conductivities and recharge values that come from MODFLOW recalibration informed the FEIS Mine Site GoldSim model.

Groundwater baseflow discharge varies with time and is a reflection of longer-term weather and climatic conditions. The variability of groundwater baseflow discharge is demonstrated by the examination of estimated values for several years using different methods. Evaluation of these values affirms that groundwater baseflows used in the Mine Site GoldSim model are reliable and appropriate for FEIS impact evaluation.

Theme WR 166

Theme Statement

The Mine Site GoldSim model does not adequately consider hydraulic connectivity between wetlands and groundwater in the surficial deposits.

Thematic Response

Using an observational approach based on data from similar nearby mine sites (i.e., analog method), the Co-lead Agencies concluded that drawdowns in the surficial aquifer would not be expected to extend very far from the mine pits. This is explained by the following factors: 1) the surficial aquifer is thin and moderately permeable, 2) the surficial aquifer is subject to aerial recharge, and 3) the surficial aquifer is underlain by low-permeability bedrock that limits downward leakage from the surficial unit. These factors support the conclusion that wetland drawdown did not need to be included in the Mine Site GoldSim model. See FEIS Section 5.2.2.3.2 for more information on the analog method.

It is acknowledged that there is some degree of hydraulic interaction between wetlands and the surficial aquifer at the Mine Site. However, attempts to quantitatively model the effects of these interactions on drawdown and water quality would be highly uncertain and potentially misleading. The FEIS approach was to not model hydraulic connections between wetlands and the surficial aquifer in the Mine Site GoldSim model, but instead to rely on future monitoring and adaptive mitigation measures in the unlikely event that wetlands were affected by the NorthMet Project Proposed Action. See FEIS Sections 5.2.2.3.5 and 5.2.2.3.6 for more information on adaptive mitigation and monitoring at closure.

Theme WR 167

Theme Statement

There are numerous discrepancies and concerns regarding surficial groundwater flowpaths in the Mine Site GoldSim model. Three critical issues are that the model does not account for northward flowpaths (e.g., to Yelp Creek and One Hundred Mile Swamp), inappropriately assumes constant saturated thickness for the surficial flowpaths, and uses the wrong distance to the Partridge River for the East Pit—Category 2/3 flowpath. In addition, the hydraulic conductivity distributions for the surficial aquifer are not technically justified, are based on means rather than the full range of measured values, and do not consider the likely presence of higher permeability features such as buried stream channels. It is unclear if different hydraulic conductivity values are chosen for each flowpath during each simulation. The GoldSim flowpaths are not accurate, compared to flow trajectories in the Mine Site MODFLOW model. With regard to transport, the effective porosity value is not justified and sorption parameters are speculative and not sufficiently conservative and do not account for the saturation of adsorbed solutes within flowpaths. Pollutant travel times are underestimated. The model does not consider lateral dispersion in the surficial flowpaths or vertical dispersion of chemicals into bedrock. The SDEIS provides no rationale for the assumption that groundwater can migrate long distances without any discharge to wetlands and streams. The FEIS should disclose where the model predicts upwelling of groundwater into wetlands and other surface water features.

Thematic Response

FEIS Mine Site MODFLOW modeling and hydrogeologic relationships for operations and closure conditions indicate that northward flow from the mine pits and Category 1 Stockpile would be non-existent or minimal. Northward flows (if any) would not be sufficient to cause impacts to groundwater or surface water. As a consequence, there are no northward groundwater flowpaths in the FEIS Mine Site GoldSim model.

The groundwater flowpaths in the Mine Site GoldSim model are simple streamtubes with uniform linear groundwater flow. While the linear flowpath streamtubes do not exactly line up with flow trajectories predicted by the Mine Site MODFLOW Model, the streamtubes have hydraulic gradients, recharge, flow directions, and flowpath distances that are similar to those generated by the MODFLOW model. The difference between the GoldSim flowpaths and results of the MODFLOW model are of secondary importance and do not diminish the reliability of the GoldSim predictions of groundwater transport from mine facilities to the evaluation locations and the Partridge River.

The assumption of constant saturated thickness for the GoldSim groundwater surficial flowpaths is reasonable given site data and the purpose of the flowpath analyses in the GoldSim model (that is, average groundwater flow and chemical transport).

The distance from the East Pit to the Partridge River is based on the average distance to the river shown on FEIS Figure 5.2.2-7 (2,120 meters or 6,955 feet).

The surficial aquifer hydraulic conductivity distribution used in the FEIS Mine Site GoldSim model represents the probabilistic distribution of the mean hydraulic conductivity and should not represent the full range of measured values. The range of the probability distribution is expected to capture natural heterogeneity in the flowpaths including the effects of buried channels (if any).

In the Mine Site GoldSim model, a different hydraulic conductivity distribution is used for each groundwater flowpath. A new hydraulic conductivity value for each flowpath is statistically selected at the beginning of each realization of the Monte Carlo simulation.

The effective porosity of 30 percent is reasonable for an unconsolidated granular material.

Not considering lateral and vertical dispersion tends to overestimate chemical concentrations in the surficial flowpath, which is conservative for impacts analysis.

The sorption values used for selected constituents are based on USEPA guidance documents. Due to the low absolute concentrations of constituents modeled with adsorption, it was reasonable (and standard practice) to assume that adsorption sites would not become "saturated." This was also a reasonable assumption for fractured bedrock, because diffusion can transport chemicals from fractures into the rock matrix, which greatly increases the available adsorption sites. For constituents not modeled with adsorption, the approach was conservative because the transport analysis would tend to overestimate groundwater concentrations and underestimate travel times.

It is acknowledged that there could be groundwater discharge to wetlands along a surficial groundwater flowpath and this process is not incorporated into the GoldSim model. This process was not modeled because it is considered speculative and quantitatively uncertain. The Co-lead Agencies' approach is to monitor water levels and water quality in the wetlands during operations, reclamation, and closure to identify mining effects on wetlands (if any). If monitoring

were to identify the potential for violation of regulatory criteria, adaptive mitigation measures would be initiated to mitigate the impact. See FEIS Section 5.2.3.3 for more information on wetland monitoring and possible future mitigations.

Theme WR 168

Theme Statement

There are numerous discrepancies and concerns regarding bedrock flowpaths used in the Mine Site GoldSim model. One critical issue is that the bedrock hydraulic conductivity is far too low compared to field testing and information from other sites. In addition:

- The model does not consider the effects of fractures, and uses inputs that are intentionally chosen to eliminate significant bedrock flow and transport;

- The model is biased in that it uses the Duluth Complex as the basis for very low bedrock hydraulic conductivity;

- The model inappropriately treats bedrock as being hydraulically isolated from the overlying surficial deposits; and

- The effective porosity and sorption values used for bedrock are unrealistic.

The SDEIS needs to be reviewed to account for these discrepancies.

Thematic Response

In the FEIS Mine Site GoldSim model, bedrock flowpaths have been reconfigured with a bulk hydraulic conductivity that is approximately one order of magnitude higher than what was used in the SDEIS. In addition, the flowpaths are remodeled to be 15 meters thick, consistent with the concept of an upper more-permeable bedrock zone interpreted from RQD data (in the SDEIS model, the bedrock flowpath was 100 meters thick). Fracture flow in bedrock is considered by using an appropriate bulk hydraulic conductivity and low effective porosity (0.05) as a reasonable surrogate for fracture porosity and chemical diffusion into the matrix between fractures.

The bedrock flowpaths in the Mine Site GoldSim model are physically situated in Duluth Complex rocks, so it is appropriate to use the Duluth Complex as the basis for bedrock hydraulic conductivity.

In the FEIS Mine Site GoldSim model, the bulk hydraulic conductivity of the bedrock flowpaths is two to three orders of magnitude lower than the hydraulic conductivity of the surficial flowpaths, so it is reasonable to neglect flow between bedrock and surficial deposits.

The sorption values used in the model are based on USEPA guidance documents.

Theme WR 169

Theme Statement

The Mine Site GoldSim model does not consider the presence of higher permeability bedrock structures (faults and fracture zones), despite the fact that these types of features are known to exist in bedrock. The model incorrectly assumes that pit water would not enter the bedrock groundwater system.

Thematic Response

The FEIS indicates that structural faults may exist between mine facilities and perennial streams that receive groundwater discharge. Because the landscape is covered with surficial deposits and there are limited bedrock outcrops, the existence of faults is conjectural and locations, at best, can only be inferred. It is unknown if faults (if and where they exist) behave as conduits or barriers to groundwater flow. Given these uncertainties, it is unlikely that a new, practical field program, with a goal to identify faults, would provide data to reasonably inform the impact assessments. The management approach is to set up a robust monitoring program during operations and closure to provide direct or indirect evidence on the existence of hydrologically significant faults. If significant faults are identified (i.e., faults which could lead to violation of water quality standards), then adaptive measures would be employed to mitigate the fault-related effects. See FEIS Sections 5.2.2.3.5 and 5.2.2.3.6 for further information.

Theme WR 170

Theme Statement

The Mine Site GoldSim model does consider the fact that uppermost bedrock tends to have higher hydraulic conductivity than deeper bedrock. This characteristic has been documented in evaluations at other nearby mine sites and in studies conducted by the Minnesota Geological Survey.

Thematic Response

In the FEIS Mine Site GoldSim model, bedrock flowpaths have been reconfigured with a bulk hydraulic conductivity that is approximately one order of magnitude higher than what was used in the SDEIS. In addition, the flowpaths are remodeled to be 15 meters thick, consistent with the concept of an upper more-permeable bedrock zone interpreted from RQD data (in the SDEIS model, the bedrock flowpath was 100 meters thick). Fracture flow in bedrock is considered by using an appropriate bulk hydraulic conductivity and low effective porosity (0.05) as a reasonable surrogate for fracture porosity and chemical diffusion into the matrix between fractures.

Theme WR 171

Theme Statement

An independent flow/transport model of the Mine Site and Plant Site developed and reported by Myers differs substantially from the SDEIS models. In particular, compared to the SDEIS models, the Myers model predicts: higher groundwater flow rates, higher pit dewatering rates, greater effects on the Partridge River, higher flow rates to the WWTF, higher sulfate concentrations in groundwater, higher stockpile seepage rates and concentrations, higher areal recharge, higher hydraulic conductivity of surficial deposits, and higher bedrock hydraulic conductivities. In addition, the Myers model predicts that copper concentrations would exceed water quality standards at the Partridge River that pump-and-treat of East Pit backfill is not hydraulically feasible, and that extensive drawdown would occur between the dewatered pits and the Partridge River. Some commenters have noted that the Myers model computed negative concentrations near chemical sources/sinks, which is impossible, and that some chemical sources have concentrations that are orders-of-magnitude higher than reasonable maximum field values.

Thematic Response

The differences between the Myers model and the FEIS models can be described as follows:

- The Myers model considers higher groundwater baseflows in perennial streams and this leads to higher recharge and higher hydraulic conductivities for surficial deposits. Reliable gaging data for the Partridge and Embarrass rivers indicate lower baseflows and associated lower recharge and hydraulic conductivities used in the FEIS models.
- The Myers model generally assigns higher hydraulic conductivities to bedrock units. These values are higher than what can be justified by field-testing at the NorthMet Project area or indicated in Barr 2014b, as cited in the FEIS).
- The Myers model does not include all groundwater capture systems presented in the FEIS Project Description.
- The Myers model does not use concentration caps, so that computed chemical concentrations in some mine-related chemical sources are much higher than what is reasonable or observed at other similar mine sites.
- The Myers model uses lateral and vertical dispersion, while the FEIS models do not. These uncertain processes tend to reduce chemical concentrations in the surficial aquifer, which is the dominating hydrogeologic unit that transports chemicals from mine facilities to the perennial rivers. With regard to dispersion, the Myers model would tend to compute lower chemical concentrations in the surficial aquifer compared to the FEIS models. By not considering lateral and vertical dispersion, the FEIS models tend to be conservative (i.e., more likely to overestimate impacts) compared to the Myers model.

These issues are discussed in more detail in the memorandum titled: “Comparison of the Myers Groundwater Flow/Transport model with the FEIS Impacts Analysis Models” (ERM 2015). Given the above deficiencies of the Myers model, it is not considered a reliable basis for evaluating future impacts associated with the NorthMet Project Proposed Action.

Theme WR 172

Theme Statement

The Mine Site GoldSim model should be revised to show groundwater concentration distributions along flowpaths at different points in time, as well as concentration distributions 200 years after closure. The FEIS should justify the use of cobalt as an indicator of nonreactive transport. For constituents assumed to be nonsorbed, the FEIS should state that actual migration velocities would be less than or equal to modeled seepage velocity. The FEIS should also acknowledge that groundwater concentrations are generally underestimated by the GoldSim model.

Thematic Response

Potential groundwater impacts are assessed at specific evaluation locations for each flowpath. This methodology satisfies both federal and state environmental review requirements to inform regulators, the project proponent, and public of the type, extent, and reversibility of impacts. Monitoring would typically occur at the source origins to document whether flowpath water quality predictions are being satisfied. If not, then contingency and/or adaptive measures would be applied to address potential concerns. See FEIS Section 5.2.2.1.1 for information on evaluation locations.

Cobalt was used to illustrate groundwater transport at the Mine Site because it is released by oxidation of the major source materials (waste rock and pit walls), is assumed in the GoldSim model to migrate unattenuated (i.e., travels in groundwater at an average velocity equal to the rate at which groundwater travels), and enter the surficial flowpaths at concentrations higher than baseline groundwater. Groundwater cobalt concentrations thus illustrate the time required for solutes released from sulfide-bearing mine waste to reach their peak concentration at the evaluation locations, as illustrated in concentration-versus-time plots (see FEIS Figure 5.2.2-19) and described in FEIS Section 5.2.2.3.2.

The FEIS has been modified to indicate that, “Some the constituents modeled as unattenuated in the GoldSim model may in fact exhibit some attenuation due to adsorption onto surfaces in the surficial and bedrock aquifer. The peak concentrations of these solutes would arrive at the evaluation locations later than estimated in the GoldSim model, though the peak concentrations of such late-arriving solutes would be lower than the concentrations estimated under the assumption in the FEIS of unattenuated transport” (FEIS Section 5.2.2.2.3, subheading “Contaminant Transport in Groundwater from Waste Rock”).

The GoldSim modeling was designed to evenly bracket uncertainty in model parameters, though ranges for a few parameters were skewed so as to tend towards producing higher concentrations at model evaluation locations. Thus, model results are an attempt to accurately represent a balanced assessment of uncertainty.

Theme WR 173

Theme Statement

There are numerous issues associated with chemical sources used in the Mine Site GoldSim model. Critical issues are that the model:

- Does not consider internal storage with the Category 1 and other stockpiles;

- Consistently underestimates chemical loadings (flow and concentration);

- Incorrectly assumes that chemical loading from submerged backfill and pit walls is near zero; and

- Provides no technical justification that East Pit backfill can be maintained saturated during pump-and-treat.

The FEIS should show flows and concentrations of water leaving chemical sources over time, flows and concentrations of water transferred between the Mine Site and Plant Site, residual concentrations at chemical sources after closure, and P90 concentrations over time. The use of concentration caps is not adequately explained or justified. In addition, the model does not consider: chemical leaching from unsubmerged pit walls, pit lake stratification, leaching from submerged pit walls due to dissolved oxygen in pit water, seasonal flushing of waste rock and pit walls, and that Category 1 stockpile drainage (and chemical loading) may vary over time or occur as slugs. The probabilistic inputs associated with chemical sources do not capture the full range of possible chemical loadings. The FEIS should acknowledge that the East Pit rinsing plan is untested and may fail, and that the north pit wall of the East Pit would contribute a substantial load of sulfate and metals to pit water. No groundwater capture systems are proposed downgradient of the pits, seepage through the Category 1 Stockpile may be underestimated, and pits and stockpiles remaining after closure would leach contaminated water for hundreds of years. With regard to the West Pit, the FEIS should acknowledge that the pit would not be a hydraulic/chemical sink when full, and that the plan for accelerated refill would cause contaminants to reach the Partridge River sooner, and the FEIS does not provide contaminant levels from the West Pit flowpath at the Partridge River where groundwater discharges to surface water. For the East Pit and West Pit, the FEIS should show predicted outflows (and concentrations) into surficial deposits and bedrock over time after closure. The Reclamation Plan should ensure that specific goals for pit pools are established and achieved.

Thematic Response

The GoldSim Mine Site model assumes that the waste rock and ore stockpiles start with water at an approximate “field capacity” (i.e., no water drains from the facility unless water enters the top, but if water does enter the top of the facility in a time step, then same amount would flow out the bottom). Although excess water is not stored in the rock, GoldSim maintains a mass balanced on all chemical constituents, so any solutes released from the rock than can’t dissolve and leach out in a time step are stored and released in later time.

The specific ranges for GoldSim parameters were selected to bracket evenly the uncertainty in model parameters and avoid underestimating estimates of chemical loading (MDNR et. al. 2011, as cited in the FEIS). In a few instances, model parameters are selected to produce larger ranges than indicated by simple statistical application of test data (e.g., solute release rates from waste

rock are based on the range in individual humidity-cell tests, not the range in the average; see Section 8.1.2.1 of PolyMet 2015q, as cited in the FEIS). But the Co-lead Agencies do not believe that there is a systematic bias toward underestimating flow or chemical load.

The rate of oxidation and associated release of acidity and metals from waste rock and wall rock after it is submerged under water was considered directly as part of the Impact Assessment Planning process (MDNR et. al. 2011, as cited in the FEIS). Supporting analysis found that after the rock was submerged by a layer of oxygenated water, the rate of oxidation in the rock would decrease by at least a factor of approximately 800 relative to the oxidation rate when it was exposed directly to atmospheric oxygen (Day 2008). Based on this analysis, which is consistent with general results of studies on subaqueous disposal of sulfide-bearing mine waste, the GoldSim model assumed that oxidation in submerged wall rock and waste rock was negligible.

FEIS Section 5.2.2.3.1 accurately describes how East Pit backfill would be flooded as it is emplaced during operations to maintain water within 5ft of the backfill surface using effluent from the WWTF and storm water runoff. The Co-lead Agencies' review of the model found that the footprints and depths of East/Central Pit are correctly incorporated into the three-dimensional model mesh, and that appropriate boundary conditions are used to simulate pit inflows. During reclamation (year 21 – 40), "water from the East Pit would also be pumped to the WWTF and treated...", after which treatment of water in the East Pit may continue into closure and long-term maintenance (Section 2.1.1 of PolyMet 2015d, as cited in the FEIS).

Estimates for mass loading and effluent concentrations from Mine Site facilities are presented in Attachment I and J of PolyMet 2015m, as cited in the FEIS; for Plant Site tailings facility, values for these model results are presented in Attachments D through I of PolyMet 2015j, as cited in the FEIS. Estimated flows between facilities vary in response to stochastic parameters such as monthly precipitation, but characteristics describing water flow into groundwater flowpaths and average flows to treatment facilities are in Attachment B of PolyMet 2015j, as cited in the FEIS, and Attachment B (Input Variables for the Mine Site Model) of PolyMet 2015m, as cited in the FEIS.

Concentration caps are, "empirical upper-concentration values…estimated in part using measured behavior of laboratory tests on waste rock from the NorthMet Deposit [and] measured in effluent from field-scale facilities of similar waste rock Section," is accurate (FEIS Section 5.2.2.2.3). Concentration caps are illustrated in measured composition of effluent from the Amax Stockpiles, in this case showing their dependence on pH (Large Figure 23 through 27 in the Waste Characterization Data Package—PolyMet 2015q, as cited in the FEIS).

Regarding the release of chemical loads as "slugs" from pit wall or waste rock, this can occur in the GoldSim model if solutes that exceed concentration caps are stored as labile phases. These stored loads would be released as a "slug" over a single time step if higher precipitation increases. Submerging backfill and wall rock produce a second type of slug, as any solutes stored in "non-contacted" rock are assumed to be released immediately upon inundated by water.

The ranges for probabilistic solute-release parameters were developed during the Impact Assessment Planning effort (MDNR et. al. 2011, as cited in the FEIS), and are adequate for representing uncertainty in estimates of water quality for the FEIS.

Regarding the absence of groundwater capture systems down gradient from the East Pit and West Pit, the analysis of effects presented in the FEIS are based on a model that does not have pit capture systems in place, and no additional capture trenches are proposed.

Seepage through the Category 1 stockpile is based on liner leakage rates for the cover, which are derived from combination of literature values, experience at mine sites, experience at other types of industrial facilities, manufacturer documentation, and information provided in standard engineering guidance documents (Section 5.2.2.3 in PolyMet 2015m, as cited in the FEIS). Liner leakage rates were estimated using the HELP model, where simulations combined NorthMet Project design values for slopes and subgrade design with the published values for average liner defects per acre.

It is acknowledged that there have been historical instances where poor-quality liner installations have failed or leaked at relatively high rates. However, for the high-quality liner installations to be used for the Proposed Action, the assumed liner leakage rates are reasonable and consistent with industry standards. While solid waste landfills may typically be smaller than the NorthMet facilities, the liner leakage rates are expressed on a unit area basis, so the results can be scaled to larger facilities.

It is acknowledged that the NorthMet Project Mine Site pits and waste rock would be long-term loads of some solutes to groundwater relative to the continuation of existing conditions. Estimates for these loads are presented in Attachment I of PolyMet 2015m, as cited in the FEIS.

The FEIS does not assume that the West Pit would be a sink, but instead acknowledges that outflow to the surficial and bedrock aquifers would be related to lake level. Concentrations in the West Pit Lake surficial and bedrock flowpaths are presented in Attachment J (Concentration Statistics at the Groundwater Evaluation Locations) of PolyMet 2015m, as cited in the FEIS.

The FEIS recognizes that active site management would be tied to attaining specific water-quality goals: “The objective of closure is to provide mechanical or non-mechanical treatment for as long as necessary to meet regulatory standards at applicable groundwater and surface water compliance points” (FEIS Section 5.2.2).

Finally, State rules for mineland reclamation and water appropriations require impacted watershed to be returned as close as possible to pre-mining characteristics.

Subtheme WR 173-1

Theme Statement

Provide values for volumetric flow rates and solute concentration estimates for the water released from each source and in each waste water stream, with concentrations before and after application of concentration caps and adsorption and reported in units comparable to water quality standards. Include specific values for solute concentrations and routing of runoff from waste rock.

Thematic Response

Estimates for mass loading and concentrations from the Mine Site facilities, including effluent from waste rock and ore stockpiles, are presented in Attachment H of the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). The assessment of

environmental effects is not based on concentrations in specific mine features, so the source concentrations are not presented with regulatory criteria. Rather, groundwater evaluation criteria are provided in Large Table 1 Groundwater Quality Standards Applicable to the NorthMet Project Modeling in the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). They also can be found in Section 5.2.2 of the FEIS.

The NorthMet GoldSim water quality model has not been run without concentration caps in source materials or adsorption-related attenuation in groundwater because these are widely observed effects in mine environments. Thus, eliminating these effects from the GoldSim model would not be realistic, and such a model would not improve the assessment of environmental effects.

Adsorption is widely observed in studies of metal transport in groundwater, and is an important-enough effect that the USEPA provides guidance documents with screening level values for adsorption (as "Kd") to support estimates of exposure to solutes migrating in groundwater (USEPA 2005, as cited in the FEIS). This literature review by the USEPA indicates that Kd for the four metals assumed to be affected by adsorption in the NorthMet surficial aquifer (arsenic, antimony, copper, and nickel) vary widely across different sites. In response, the GoldSim modeling at NorthMet selected values from the low end of this range (i.e., values that produce rapid transport in groundwater, and thus earlier arrival at groundwater evaluation locations [PolyMet 2015j, as cited in the FEIS]). But eliminating entirely the effect of adsorption from the GoldSim model would not improve the assessment of environmental effects. The Co-lead Agencies thus do not believe that the GoldSim water quality model needs to be been run without adsorption-related attenuation in groundwater.

The effect of concentration caps can be seen in measured composition of effluent from the Amax Stockpiles, in this case showing their dependence on pH (Large Figures 23 through 27, PolyMet 2015q, as cited in the FEIS). The selection of specific values for concentration caps was considered by the Co-lead Agencies (see Table 1, MDNR et al. 2011, as cited in the FEIS), and specific ranges for concentration caps in waste rock are presented in Tables 1-30 through 1-33 in the NorthMet Mine Site Water Modeling Work Plan (Barr 2012c, as cited in the FEIS).

Subtheme WR 173-2

Theme Statement

Provide estimates for pH, sulfate, and alkalinity predicted in the PolyMet pit lakes and tailings effluent, and compare these to the values observed in natural and mine-produced lakes in the region.

Thematic Response

Estimates for the concentration of all modeled solutes in the West Pit Lake are presented in the Attachment H of the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). For the Tailings Basin effluent, estimated concentrations are presented in Attachment G of the Plant Site Water Modeling Data Package (PolyMet 2015j, as cited in the FEIS).

The pH of water is a dynamic parameter that reflects chemical equilibrium condition, and is not predicted explicitly by the GoldSim model for any of the NorthMet Project area waters, including the West Pit Lake. However, the West Pit Lake is a component of the active water

management and treatment system during and after the 20-year operating life of the mine, and its water quality would be monitored as part of the NorthMet Project Proposed Action (PolyMet 2015d, as cited in the FEIS; Large Figure 1, Water Treatment Overall Flow Sheet-Operations, and Large Figure 3, Water Treatment Overall Flow Sheet- Long-Term Closure.)

Water quality in the West Pit Lake would be controlled by pumping and, where necessary, treatment. Most of the effluent from the Tailings Basin would be captured and treated, and the GoldSim model results and associated effects presented in the FEIS account for some bypass of the capture system. Because the environmental effect of the West Pit Lake and Tailings Basin are not dependent on water quality of other lakes, the Co-lead Agencies do not plan to compare model results for the West Pit Lake to water quality in other lakes in the region.

Subtheme WR 173-3

Theme Statement

Provide estimates of water balance on the Mine Site to illustrate whether the West Pit will eventually overflow.

Thematic Response

Plans for managing water in the West Pit during operations and into closure include actively maintaining the West Pit Lake water level so that it remains below the spillway to the Partridge River until the lake meets discharge standards. Specifically: "No discharges are planned from the Mine Site during operations and reclamation. During long-term closure, West Pit water would be pumped to the Mine Site Waste Water Treatment Facility (WWTF) as needed to prevent the West Pit from overflowing. An NPDES/SDS permit would be required to discharge WWTF effluent to the Partridge River" (PolyMet 2015m, as cited in the FEIS). Maintaining the West Pit Lake level below the discharge point is incorporated in the GoldSim modeling.

The FEIS Section 5.2.2.3.2 indicates that West Pit Lake water would not be allowed to overflow direct to the Partridge River until it can meet effluent limits.

Subtheme WR 173-4

Theme Statement

PolyMet should "bolt, wire, and shotcrete" the pit walls to inhibit the migration of water and pollutants in and out of the pit (as done by Kennecott at its Flambeau Mine).

Thematic Response

The current Mine Site GoldSim water quality model of the proposed West, Central, and East pits does not include any plans to add bolts or surficial coatings to the pit wall rock. Instead, the assessment of effects in the FEIS considers oxidation reactions and the associated solute release assuming that the wall rock is exposed to the atmosphere, and that oxidation ceases only when the wall rock is covered by backfill (in the East and Central pits), submerged by the pit lake (in the West Pit), or the available sulfide minerals are fully oxidized. The parameters used to estimate oxidation rates in pit walls (thickness of reactive veneer, decay in reaction rate, oxidation after wall rock is submerged in the lake, metal releases for different wall rock types,

etc.) were considered in detail by the Co-lead Agencies, and are described in the Waste Characterization Data Package (PolyMet 2015q, as cited in the FEIS), Section 9 Geochemical Parameters – Pit Lake. The estimates for wall rock oxidation rates used in GoldSim were consistent with observed rates in field studies at other mines. The Co-lead Agencies thus believe that that the current analysis of environmental effects is adequate, and that the NorthMet Project Proposed Action does not need to alter the pit wall surfaces with bolts, wire, shotcrete, or other surface treatments.

Subtheme WR 173-5

Theme Statement

Provide estimate for the effects of outflow from the West-Pit and backfilled East and Central Pits on the quality of receiving groundwater, including an analysis where the sulfate concentration is much higher than currently predicted.

Thematic Response

Estimates for mass loading from the Mine Site facilities are presented in Attachment H of the Mine Site Water Modeling Data Package (PolyMet 2015m, as cited in the FEIS). The effect of effluent from these Mine Site facilities on the quality of receiving groundwater is presented in Attachment J.

The specific ranges for GoldSim parameters were selected by the Co-lead Agencies to evenly bracket the uncertainty in model parameters and avoid underestimating estimates of chemical loading. Comparison tests of the GoldSim model found that the model may underestimate solute release in some cases (e.g., a comparison of GoldSim estimates to measured effluent from the existing Amax piles found that the model tended to overestimate sulfate concentrations [PolyMet 2015q, as cited in the FEIS, Section 8.2.7 Scale-Up Model Verification]). But the Co-lead Agencies do not believe that there is a systematic bias toward underestimating chemical loading or concentration of sulfate or other constituents.

Subtheme WR 173-6

Theme Statement

Demonstrate that the reactive backfilled East Pit would remain saturated during mining and perpetually beyond this in closure.

Thematic Response

Water quality in the backfilled East Pit would be managed by actions taken before, during, and after flooding of the pit. At the time of initial backfilling, the waste rock and overburden material that is backfilled into the East Pit would be treated with limestone to reduce acidity and maintain basic pH (PolyMet 2015q, as cited in the FEIS). During operations, the East Pit would be flooded as backfill is emplaced to maintain water within 5 ft of the backfill surface using effluent from the WWTF and storm water runoff, as described in Section 5.2.2.3.1 of the FEIS. The Co-lead Agencies' review of the GoldSim model found that the footprints and depths of the combined East/Central Pit are correctly incorporated into the three-dimensional model mesh, and that appropriate boundary conditions are used to simulate pit inflows. The plan for treating water

in the East Pit backfill is not contingent on rapid flushing, but instead allows pumping at a rate that would not dewater the backfill.

During reclamation (years 21 to 40), "…water from the East Pit would also be pumped to the WWTF and treated..." after which treatment of water in East Pit may continue into long-term closure (PolyMet 2015d, as cited in the FEIS). The Co-lead Agencies believe that the existing plans, as described in the FEIS, are sufficient to ensure that the East Pit backfill would remain saturated perpetually beyond closure.

Subtheme WR 173-7

Theme Statement

Provide an estimate for pH in the West Pit Lake, along flow paths, and in the Partridge River.

Thematic Response

Solution pH is a dynamic parameter that reflects chemical equilibrium condition, and is not predicted explicitly by the GoldSim model for any of the NorthMet Project area waters, including groundwater, the Partridge River, and the West Pit Lake. However, sulfide minerals oxidation in the NorthMet mine rock can cause pH to decrease, and where pH becomes acidic, this causes an increase in oxidation rates, modeled concentration caps, and associated solute concentrations in leachate. These effects from pH are incorporated explicitly into the GoldSim model in the calculations of solute loads from both the non-acid-generating and acid-generating wall rock in the West Pit (PolyMet 2015q, as cited in the FEIS).

The lake water quality would be affected by pH (e.g., if the lake water became acidic, then concentration caps would be higher, and the concentrations of some metals could be higher). However, the West Pit Lake is not a passive basin, but is instead a component of the NorthMet Project Proposed Action's active water management system, so that during and after the 20-year operating phase, its water quality would be monitored and treated as part of the NorthMet Project Proposed Action (Large Figure 1 and Large Figure 3 of PolyMet 2015d, as cited in the FEIS).

Regarding predicting water quality along flowpaths, please see the response to theme WR 177.

Subtheme WR 173-8

Theme Statement

Expand model analysis to determine whether a slug of water and solutes could be released periodically from Waste Rock stockpiles.

Thematic Response

The GoldSim model of waste rock stockpiles is configured so that it can release slugs of accumulated solutes under three conditions. As observed in weathering of waste rock under field conditions, solutes are released from waste rock in proportion to the time over which it is exposed to air. During a dry period, GoldSim stores constituents released by oxidation as a soluble but immobile phase. These stored constituents are then available to dissolve and flush out as a slug in the first occurrence of percolating water, as would occur in a rainy month following one or more dry months. A second type of concentration slug occurs at the onset of acidic

conditions, where the constituent-release rates and concentration caps applied in the GoldSim model both increase (PolyMet 2015q, as cited in the FEIS). Third, waste rock submerged under water (i.e., as occurs in the East Pit backfill) produces a slug release when the solutes stored in non-contacted portion during the air-oxidation period are allowed to dissolve (up to the concentration caps) when the rock is submerged. The Co-lead Agencies believe that the GoldSim model configuration described in the FEIS adequately addresses slug releases of constituents from waste rock.

Subtheme WR 173-9

Theme Statement

Expand model analysis to consider solute transport in groundwater with no retardation effect.

Thematic Response

Adsorption is widely observed in studies of metal transport in groundwater, and is an important enough effect that the USEPA provides guidance documents with screening level values for adsorption (as "Kd") to support estimates of exposure to solutes migrating in groundwater (USEPA 2005, as cited in the FEIS). This literature review by the USEPA indicates that Kd for the four metals assumed to be affected by adsorption in the NorthMet surficial aquifer (arsenic, antimony, copper, and nickel) vary widely across different sites. Adsorption parameters were also used from laboratory studies for antimony. In response, the GoldSim modeling selected values from the low end of this range (i.e., values that produce rapid transport in groundwater, and thus earlier arrival at groundwater evaluation locations [PolyMet 2015m, as cited in the FEIS]).

But eliminating entirely the effect of adsorption from the GoldSim model would not improve the assessment of environmental effects. The Co-lead Agencies thus do not believe that the NorthMet GoldSim water quality model needs to be rerun without adsorption-related attenuation in groundwater.

Subtheme WR 173-10

Theme Statement

Modify the model of the West Pit Lake to include the effect of sulfide oxidation caused by air pulled into the pit walls to fill the voids that are desaturated by groundwater drawdown.

Thematic Response

PolyMet provided the Co-lead Agencies with calculations used to determine the mass of sulfate released by the additional oxidation in pit wall rock caused by air pulled in to replace the voids emptied as groundwater in bedrock drains into the pit (PolyMet 2014b). This approach assumes that the volume of water extracted from bedrock is replaced by an equal volume of air, and all of the oxygen in this entering air reacts with sulfide minerals in the wall rock.

The volume of water extracted from bedrock was estimated to be equal to the total inflow to the pits from bedrock in the time between the beginning of mining and the time when pit flooding begins (i.e., the point of maximum drawdown in the bedrock). At the concentration of oxygen in

air (8.89 mole O_2/m^3), the reaction ratio for pyrrhotite oxidation (0.44 mole SO_4/mole O_2), and the molecular weight of sulfate (96 g/mole), each cubic meter of air pulled into the bedrock wall rock would release 375 g SO_4.

In the West Pit, the estimated volume of water extracted from bedrock is $2.79x10^5$ m^3, which when converted to airflow into pit wall rock, would release $1.13x10^5$ kg SO_4.

When this mass is mixed into the full West Pit ($1.05x10^8$ $m^{3)}$, this would add 1.1 mg/L to the concentration of the West Pit, or approximately 1.5 percent increase relative to the P50 concentration of 77 mg/L SO_4 estimated by GoldSim without this air-advection effect, and also approximately 1 percent of the range in uncertainty in West Pit sulfate concentration at year 20 (i.e., P10 to P90 range is approximately 50 to 100 mg/L [PolyMet 2015m, as cited in the FEIS; Figure H-11-24.2 SO_4 in the West Pit]).

For the East Pit, the MODFLOW model result indicates that $2.55x10^6$ m^3 of bedrock groundwater would be removed, and the air to replace it would produce $9.7x10^5$ kg SO_4. At the full volume of the East Pit ($1.44x10^7$ m^3), this would add 67 mg/L to the sulfate concentration, or an increase of 2.6 percent relative to the GoldSim model P50 prediction of 2,578 mg/L sulfate in the current model without the air-advection effect.

The effects of advection-induced air oxidation are small for the Mine Site pits in part because the bedrock porosity is small (0.05; Barr 2012c, as cited in the FEIS, Table 1-1), so that drawdown around the pits would produce a relatively small amount of water from bedrock.

The Co-lead Agencies believe that constituent release from this advective air flow into bedrock by dewatering is small enough relative to both absolute concentrations and current uncertainty in the GoldSim model that this effect can be ignored in the FEIS.

Theme WR 174

Theme Statement

The Mine Site GoldSim model underestimates chemical concentrations in non-contact runoff from the mine facilities (particularly sulfate).

Thematic Response

Non-contact runoff from the NorthMet Project Proposed Action-related mine facilities represents overland flow that would not contact ore, tailings, waste rock, or processing residues. This flow would generally contact natural ground, soil/vegetated covers, and synthetic plastic materials. This water would not be chemically impacted to any significant extent and its chemical concentrations would be similar to natural runoff. See the response to theme WR 151 for additional information.

Theme WR 175

Theme Statement

The FEIS should include a sensitivity analysis for numerous parameters used in the Mine Site GoldSim model, including Partridge River baseflow. In the model, evapotranspiration from stockpiles should use a sample standard deviation rather than population standard deviation. The

FEIS should indicate what all pumped flows are used for, and should acknowledge that accelerated refill of the West Pit would increase chemical loading to groundwater. The FEIS should also acknowledge that chemical loading from the Mine Site is very small compared to natural loading in the Partridge River, and that the One Hundred Mile Swamp flows into the BWCAW.

Thematic Response

To better understand the relationship of groundwater baseflow to the GoldSim model's water quality impact projections, a sensitivity analysis for the Mine Site was conducted to evaluate if predicted Project impacts are sensitive to groundwater baseflow values. The sensitivity analysis considered the relationship of various model inputs to groundwater baseflow including hydraulic conductivity, recharge, and surface runoff chemical concentrations. It also reflected consideration of the flow data collected at SW-003 in requiring groundwater baseflows at all locations on the Partridge River be increased by a factor of 4 (e.g., 0.5 to 2 cfs at SW-003). The results indicate that modeled groundwater and surface water concentrations are sensitive to changes in groundwater baseflow. However, the NorthMet Project Proposed Action's ability to meet groundwater quality and surface water quality evaluation criteria is not sensitive to changes in baseflow. Evaluation criteria can be found in Section 5.2.2.

The probabilistic inputs for evapotranspiration are based on an evaluation performed at the Amax test pile (Eger and Lapakko 1985). Measurements and back-calculations performed in that study were used to develop a best-estimate mean and standard deviation of the stockpile evapotranspiration.

The FEIS has revised text to indicate where pumped flows are transported at both the Mine Site and Plant Site and between the sites. It is acknowledged in the FEIS that accelerated refill of the West Pit would result in seepage of impacted pit water into the West Pit surficial flowpath sooner than if the pit were to refill naturally. The FEIS acknowledges that chemical loading from the Mine Site would be small compared to natural chemical loading in the Partridge River and that there are portions of the One Hundred Mile Swamp that contribute water to the BWCAW, however those portions would be unaffected by the NorthMet Project Proposed Action.

Theme WR 176

Theme Statement

With regard to water treatment and discharge, the Mine Site GoldSim model underestimates pit inflows and, therefore, underestimates water treatment flow rates. If treatment rates are higher, sludge production would be higher and costs would be higher. The FEIS should provide flow rates and influent concentrations over time, treated water discharge locations, flows, and timing, and contingencies to handle extreme weather events.

Thematic Response

Pit inflows predicted by the FEIS Mine Site MODFLOW model and used to inform the FEIS Mine Site GoldSim model are sensitive to the hydraulic conductivities of surficial deposits and bedrock units. The MODFLOW model's prediction of pit inflows is reasonable because the hydraulic conductivities used in the model are best estimates, based on site characterization.

The FEIS contains new text and tables indicating water treatment flow rates, influent concentrations, and effluent concentrations over time. The FEIS also indicates where treated water would be transported to at different stages of the NorthMet Project Proposed Action. Because the GoldSim model uses monthly time steps, the analysis does not explicitly consider extreme storm events. However, the design of engineered facilities would entail Factors of Safety that ensure the ability to handle a 100-year storm event.

Theme WR 177

Theme Statement

Evaluation locations in the Mine Site GoldSim model do not adequately assess effects on groundwater and Partridge River surface water, and specifically do not address effects on the Partridge River upstream of evaluation location SW-004, which would be affected by chemicals from the Category 2/3 Stockpile and East Pit. In general, evaluation locations need to consider the nearest locations where impacted groundwater could affect wetlands and other surface waterbodies. The Mine Site GoldSim model does not provide a quantitative analysis of wetland effects, and incorrectly assumes that groundwater does not upwell into wetlands or other surface waterbodies along the surficial flowpaths. The FEIS should disclose that the groundwater quality criteria for cobalt, aluminum, and possibly copper are exceeded in the Category 2/3-East Pit surficial flowpath. The FEIS should provide a more detailed discussion of sulfate in the Partridge River, and should acknowledge that the model likely underestimates sulfate concentration in the River. The FEIS should show the distribution of chemical concentrations in the groundwater flowpaths at 200 years after closure. The model does not simulate appropriate (seasonal) timing of natural processes such as recharge. The model should evaluate specific conductance, which is a regulated water quality criterion. The assessment of effects should be based on both Health Risk Limits and Clean Water Act compliance points. Implementation of the Land Exchange alternative would also require different evaluation locations (property boundaries).

Thematic Response

Potential groundwater impacts are assessed at specific evaluation locations defined for each flowpath. This methodology satisfies both federal and state environmental review requirements to inform regulators, the project proponent, and public of the type, extent, and reversibility of impacts. Monitoring would typically occur at the source origins to document whether flowpath water quality predictions were being satisfied. If not, then contingency and/or adaptive measures would be applied to address potential concerns. See FEIS Section 5.2.2.1.1 for information on evaluation locations.

Surface water monitoring station SW-004 is used to estimate the effects of Mine Site facilities on surface water because it has baseline values for water quality and flow (Mine Site Water Modeling Data Package, Large Table 10 Surface Water Data Summary Partridge River Watershed and Wyman Creek) and incorporates the cumulative effects of solutes released from the Category 2/3 Stockpile and East Pit, Ore Surge Pile, WWTF ponds, and Overburden Storage and Laydown Area (PolyMet 2015m, Large Figure 28 Mine Site Groundwater Flow Paths – Surficial Aquifer). Thus, if the NorthMet Project Proposed Action did not cause a water quality exceedance at SW-004, then it would not produce an exceedance farther upstream, where

cumulative mine site loads would be proportionately smaller than the lower flows that would be observed upstream.

Figures showing sulfate groundwater concentration distributions through time for the West Pit and the Category 2/3 flowpaths are in Section 6.3.2 of PolyMet 2015m, as cited in the FEIS.

It is acknowledged that there could be groundwater discharge to wetlands along a flowpath and the Mine Site GoldSim model does not explicitly incorporate wetlands or potential hydraulic connectivity between wetlands and the surficial aquifer. This process was not modeled because it is considered speculative and quantitatively uncertain. The Co-lead Agencies' approach is to monitor water levels and water quality in the wetlands during operations, reclamation, and closure to identify mining effects on wetlands (if any). If regulatory criteria were violated, adaptive water mitigation measures would be initiated to mediate the impact. The monitoring and mitigation for potential indirect effects would be determined during permitting. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects.

Regarding exceedances in groundwater quality evaluation criteria in the Category 2/3-East Pit Surficial flowpath, predicted concentrations were compared to applicable criteria (Large Table 1 in PolyMet 2015m, as cited in the FEIS). Aluminum is a secondary standard (range 50–200 µg/L), established by the USEPA to assist with managing drinking water for aesthetic considerations; it is not based on risk to human health. Aluminum concentrations were estimated by GoldSim (Figure J-01-02.2 of PolyMet 2015m, as cited in the FEIS), but because local groundwater already exceeds the aluminum sMCL, estimated concentrations above the sMCLs are not be considered exceedances of the groundwater evaluation criteria (Section 2.1 of PolyMet 2015m, as cited in the FEIS). Cobalt is reported in the Category 2/3-East Pit Surficial flowpath (Figure J-01-02.2 of PolyMet 2015m, as cited in the FEIS), but cobalt does not have a groundwater quality criterion. The maximum copper concentration at the property boundary in this flowpath is far lower than 1,000 µg/L, the groundwater standard for copper of (Figure J-01-13.2 and Large Table 1, respectively, in PolyMet 2015m, as cited in the FEIS).

The GoldSim modeling was designed so as to bracket evenly the uncertainty in model parameters. The Co-lead Agencies do not believe that the Mine Site GoldSim model produces a systematic underestimate of sulfate concentrations in the Partridge River.

Recharge is simulated as a fraction of precipitation, and precipitation varies monthly (Attachment, B Input Variables for the Mine Site Model, Table 1-11 Seasonal Distribution of Annual Open Water Evaporation and Annual Precipitation, in PolyMet 2015m, as cited in the FEIS).

Electrical conductance provides an estimate for TDS. There are TDS standards for surface water (700 mg/L) and groundwater (500 mg/L), and, at the request of the MPCA, GoldSim results include estimates for TDS at each time step, calculated by summing major solutes (Section 6.2.6.2 of PolyMet 2015m, as cited in the FEIS).

The FEIS and associated estimates of solute concentrations in groundwater are for the evaluation locations as identified under the Land Exchange Proposed Action. There is no change in applicable evaluation locations across the land exchange alternatives.

The surface water quality standards used in the FEIS are from *Minnesota Rules* 7050, which derive from the Clean Water Act; where Lake Superior Basin rules apply (Chapter 7052, which

do consider human health), they are used as evaluation criteria (Section 2.2 of PolyMet 2015m, as cited in the FEIS). The groundwater evaluation criteria are generally federal or state drinking water standards, which are mostly health-based. Evaluation criteria can be found in Section 5.2.2.

Theme WR 178

Theme Statement

The Mine Site GoldSim model should be rerun. It does not incorporate known hydrology and geochemistry, and is not sufficiently accurate for effects evaluation. The Myers model produces results that are different from the SDEIS modeled effects.

Thematic Response

The Mine Site GoldSim model has been modified and rerun for the FEIS based on new monitoring data, recalibrations, and issues raised in comments to the SDEIS. The FEIS model is considered to be sufficiently accurate for impacts analysis.

The Co-lead Agencies have reviewed the Myers model (ERM 2015), but given the reliability issues discussed in WR 171, the Co-lead Agencies do not believe the results are valid for assessing NorthMet Project Proposed Action-related impacts in the FEIS.

Theme WR 179

Theme Statement

Due to the low bedrock hydraulic conductivities assumed at the Mine Site, the pit inflow rates used on the Mine Site GoldSim model are underestimated. The Myers model predicts pit inflow rates approximately two times higher than the rates used in the GoldSim model and also predicts extensive drawdown between the pits and the Partridge River. The GoldSim model should consider ranges of pit inflow rates, and should treat these as probability inputs in the model. West Pit inflows are also underestimated because Partridge River water would enter bedrock fractures and flow to the pit.

The GoldSim model does not evaluate the effects of large-scale drawdown associated with pit dewatering. The SDEIS should provide both the modeled drawdown at SW-003 and an explanation of the area used for groundwater inputs to the Partridge River and how those inputs correlate with the groundwater elevation contour map.

Thematic Response

Pit inflows predicted by the FEIS Mine Site MODFLOW model and used to inform the FEIS Mine Site GoldSim model are sensitive to the hydraulic conductivities of surficial deposits and bedrock units. These hydraulic conductivities are reasonable best-estimates, so the inflow predictions are reasonable best-estimates, as well. The Co-lead Agencies do not agree that the predicted pit inflows are underestimated.

The Co-lead Agencies have reviewed and acknowledge the existence of the Myers model, but given the reliability issues discussed in WR062 and WR171, the Co-lead Agencies do not

believe the results are valid for assessing NorthMet Project Proposed Action impacts in the FEIS. These issues are discussed in more detail in ERM 2015.

Best estimate pit inflows over time are determined from the calibrated FEIS Mine Site MODFLOW model and these results are used to inform the FEIS Mine Site GoldSim model. The uncertainty in the groundwater inflow rate is represented with a probability distribution that scales the model-estimated inflow values. This log-normal distribution is defined such that the mean is the MODFLOW-estimated value (scaling factor of 1.0) and the 95 percent confidence interval extends from approximately 0.75 to 2.0.

There is no evidence of pervasive fractures or faults that behave as groundwater conduits connecting the Partridge River mine pits. Pit inflows are related to the bulk hydraulic conductivity of bedrock units, which are inputs to the FEIS Mine Site MODFLOW model. Best-estimate pit inflows predicted by the MODFLOW model are used to inform the FEIS Mine Site GoldSim model.

Large-scale drawdown affects in bedrock associated with pit dewatering is assessed in the FEIS Mine Site MODFLOW model, not the Mine Site GoldSim model. See the Water Model Data Package for more information (PolyMet 2015m, as cited in the FEIS).

In the Mine Site MODFLOW model, the Partridge River is modeled with river cells having high conductance values. As a consequence, there is no appreciable groundwater drawdown at the River, including the SW-003 location. The model predicts that the Partridge River at SW-003 is a gaining stream for both the NorthMet Project Proposed Action and for Continuation of Existing Conditions. The areas used to compute river cell conductance values are explained in PolyMet 2015m, as cited in the FEIS. Conductance values were calibrated so that hydraulic heads in the vicinity of the river cells were similar to estimated groundwater levels in the surficial aquifer adjacent to the Partridge River.

Theme WR 180

Theme Statement

The SDEIS does not adequately consider future climate change impacts, including its effects on: weather patterns, rainfall, storm events, droughts, sea level rise, vegetation types, vegetation distributions or mitigation.

Thematic Response

Estimates of monthly and annual rainfall amounts were based on best available data obtained from weather stations near the Proposed Action site. In the GoldSim models, these parameters were treated as uncertain inputs and assigned probability distributions to capture the range of possible future conditions. While climate change may occur in the future, it cannot be stated at this time if in the long-term there would be more or less rainfall. Thus, the probabilistic approach to rainfall used in GoldSim represents a technically defensible method for dealing with this issue.

Individual storm events and frequency are not incorporated into the GoldSim models. Rainfall inputs are monthly and annual. The effects of individual storms are considered by designing facilities to handle a 100 year - 24 hour storm event based on current data. If over time, climate change causes a gradual increase in annual rainfall, the 100 year storm event would be redefined to a larger value and mine facilities would be upgraded to handle a larger design storm.

Theme WR 181

Theme Statement

The FEIS should describe the water balance and mechanisms of consumptive use at the Mine Site, including diversion of Colby Lake water for mine process, reduction of flows in the Partridge River, evaporation from ponds and pit lakes, increased evapotranspiration from wetlands, and evaporation and disposal of reverse osmosis reject water. The use of Colby Lake water for augmentation or consumptive use should be discouraged since it is a small lake and fresh water is scarce and valuable. Appropriating water from Colby Lake would lower its water quality. Regional impacts from water use should be considered.

Thematic Response

In the FEIS Project Description, there is no direct diversion of Colby Lake water to the Mine Site.

During operations, some of the mine pit inflow water would be sent to the Tailings Basin pond and used for process makeup water. This represents a water diversion from the Partridge River watershed to the Embarrass River watershed. Some of this water would percolate into the tailings, be collected at the tailings toes, treated, and discharged to Embarrass River tributaries for augmentation. The consumptive use this component of Colby Lake water would be evaporation from the Tailings Basin pond, water loss during ore processing, and disposal/evaporation of RO reject water when this water is eventually treated at the WWTP.

There is no expectation of increasing the overall area of wetlands at the Mine Site, so evapotranspiration from wetlands would not increase under the NorthMet Project Proposed Action compared to current (natural) conditions.

The Mine Site GoldSim model tracks all water diversions and the main consumptive uses at the Mine Site including evaporation from ponds, evaporation from pit lakes, and disposal/evaporation of RO reject water. Most other water flows are returned to the natural system with or without treatment.

The annual average water withdrawal rate from Colby Lake (sent to Plant Site) would be 1.68 cfs during operations. The annual maximum withdrawal rate during operations would be 3.89 cfs. During reclamation and closure and long-term maintenance, water would not be withdrawn from Colby Lake. There are no plans to use Colby Lake water to directly augment flows in perennial streams at the Plant Site.

During operations (mine years 0 to 20), water would be pumped from Colby Lake to the Plant Site and used for makeup water at the processing plant and the Hydrometallurgical Residue Facility. GoldSim tracks these flows and computes the water balance for Colby Lake on a time-step by time-step basis. The average Colby Lake drawdown was modeled at 0.3 feet, with an average annual water level fluctuation of about 3.6 feet, compared to 3.9 feet for zero withdrawal. During operations, the average inflow reduction to Colby Lake is estimated to be 0.6 cfs and the maximum inflow reduction (year 12) is estimated to be about 1 cfs. During closure and long-term maintenance, inflow to Colby Lake would be increased by an annual average of about 0.6 cfs. In the FEIS, the GoldSim model has been modified to provide more accurate estimates of the Lake water quality. While there are some project-related effects on the lake water chemistry, the Co-lead Agencies have concluded that the effects do not constitute an

unacceptable impact to Colby Lake. Because flow and water quality impacts to Colby Lake are minimal, it is further concluded that impacts downstream of Colby Lake would also be minimal and not constitute an unacceptable NorthMet Project Proposed Action-related impact.

Theme WR 182

Theme Statement

The FEIS should describe the water balance and mechanisms of consumptive use at the Plant Site, including reduction of flows in the Embarrass River, evaporation from the Tailings Basin pond, water use in ore processing, transfer of water to the Mine Site, and evaporation and disposal of reverse osmosis reject water. Dewatering water should be reused on site if possible. The FEIS should also describe the volume of water required, the water's origin, and the timeframes for use at the Tailings Basin.

Thematic Response

See the response to theme WR 181 for information on water diversions from Colby Lake, and between the Partridge River Watershed and the Embarrass River Watershed.

The Plant Site GoldSim model tracks all water diversions and the main consumptive uses at the Plant Site including evaporation from the Tailings Basin pond, water loss to ore processing, and disposal/evaporation of RO reject water. Most other water flows are returned to the natural system with or without treatment. The FEIS has a new table summarizing the quantities of consumptive water use at the Mine Site and Plant Site, including but not limited to items listed in the theme. See Mine Site Data Package and Plant Site Data Packages (PolyMet 2015m and PolyMet 2015j, respectively, both as cited in the FEIS) for a summary of NorthMet Project Proposed Action-related consumptive uses.

The GoldSim models track water balances for the Mine and Plant Site facilities, and many of these flows are reported in the FEIS. More comprehensive reporting of water balances is provided in the NorthMet Project Water Modeling Data Package Volume 1 - Mine Site" and "NorthMet Project Water Modeling Data Package Volume 2 - Plant Site" (PolyMet 2015m and 2015l, respectively, both as cited in the FEIS).

Theme WR 183

Theme Statement

The SDEIS does not demonstrate that mine water use and augmentation would maintain wetlands, headwater streams, and the St. Louis River Watershed hydrology.

Thematic Response

FEIS Section 5.2.2.3.2 summarizes that the NorthMet Project Proposed Action would not affect groundwater levels along the Transportation and Utility Corridor (other than as a result of the West Pit dewatering, which is discussed as part of the Mine Site) or at the former LTVSMC processing plant. The NorthMet Project Proposed Action would affect groundwater levels at the Mine Site during operations by dewatering the active mine pits and pumping water to the Plant Site (years 0 to 11) or to the East Pit and Tailings Basin (years 11 to 20). During years 20 to 40,

water from the Plant Site would be pumped to the West Pit to accelerate flooding and help return groundwater levels to near pre-mining conditions. However, potential impacts on wetland or stream hydrology are not expected beyond areas immediately adjacent to the West Pit (as estimated from the analog method of estimating indirect wetland impacts from mine pit dewatering). The monitoring and mitigation for potential indirect effects would be determined during permitting. FEIS Section 5.2.3.3 has been revised to include more information on the monitoring and mitigation plan for the potential indirect wetland effects.

The cumulative effects analysis in FEIS Section 6.2.3.3.1 of the SDEIS concludes that the NorthMet Project Proposed Action would not have a significant effect on the St. Louis River hydrology.

Theme WR 184

Theme Statement

Use of Colby Lake water (which has mercury concentrations of approximately 5 ng/L) to augment upstream flow would violate Great Lakes mercury standard of 1.3 ng/L.

Thematic Response

The NorthMet Project Proposed Action described in the FEIS would include treatment of all water that would be discharged at the Plant Site, including water used for flow augmentation. The amount of water from Colby Lake used for flow augmentation would be low; however, any water used for augmentation would be treated prior to discharge. PolyMet proposes that tributaries be monitored that extend from the Tailings Basin. Additional information has been included in FEIS Section 5.2.2.3.6.

Theme WR 185

Theme Statement

The SDEIS does not provide a technical justification for the requirement to augment flows to within 20 percent of current conditions, nor does it address minerals and nutrients to maintain aquatic ecology, wetland ecology, or the need of riverine systems to be flushed to maintain ecosystem health.

Thematic Response

The NorthMet Project Proposed Action described in the FEIS includes treatment of all water that would be discharged at the Plant Site including water used for flow augmentation. The amount of water from Colby Lake used for flow augmentation would be low; however, any water used for augmentation would be treated prior to discharge. PolyMet proposes that tributaries that extend from the Tailings Basin be monitored. Additional information has been included in FEIS Section 5.2.2.3.6. Potential impacts on aquatic species are addressed in FEIS Section 5.2.6.

Theme WR 186

Theme Statement

The FEIS discussion of stream augmentation needs to consider flows in Yelp Creek and other tributaries of the Partridge River and Embarrass River.

Thematic Response

The FEIS evaluated the need for stream augmentation as a result of the NorthMet Project Proposed Action. The flow of Yelp Creek would not change. Flow to the tributaries of the Embarrass River and Second Creek would be augmented under the NorthMet Project Proposed Action. Partridge River flows would not require augmentation. The FEIS recommends surface water flow monitoring in creeks and rivers surrounding the NorthMet Project area. If data were to indicate that the NorthMet Project Proposed Action had resulted in unacceptable flow reductions, augmentation would be considered.

Theme WR 187

Theme Statement

The FEIS discussion of stream augmentation needs to consider flows in the Partridge River at SW-004a, SW-004, SW-003 and SW-002.

Thematic Response

Partridge River flows would not require augmentation because the MDNR does not require augmentation unless the median annual flow changes by more than 20 percent. This threshold is not predicted to be exceeded at SW-004, which is an appropriate location to assess potential drawdown. The FEIS recommends surface water flow monitoring in creeks and rivers surrounding the NorthMet Project area. If data were to indicate that the NorthMet Project Proposed Action had resulted in unacceptable flow reductions, augmentation would be considered.

Theme WR 188

Theme Statement

The FEIS discussion of consumptive use and augmentation must consider the effects of prolonged droughts.

Thematic Response

This issue would be relevant to the NorthMet Project Proposed Action if augmentation water were not available to maintain surface water flows to within 20 percent of what they would be under drought conditions without the NorthMet Project Proposed Action. Typically the two go hand-in-hand. During a drought, there could be less water available for augmentation, but the amount of augmentation water needed to maintain lower surface water flows under drought conditions would also be less. The sources of augmentation water for the NorthMet Project Proposed Action (mainly water treatment effluents) are expected to be sufficient to handle

normal and drought conditions. The Co-lead Agencies' approach is to monitor the amount of augmentation water required and available for years with variable rainfall and evaluate if a shortfall could occur during a prolong drought. If it were apparent that a shortfall could occur, adaptive measures would be proposed to ensure that the 20 percent requirement could be met during a prolonged drought.

Theme WR 189

Theme Statement

There are numerous general concerns with and deficiencies in the GoldSim model used for the SDEIS. These concerns relate to model assumptions, inputs, and methodology, as well as inadequate QA/QC and the appropriateness of using GoldSim for a mining project. In addition, the model should include a scenario with probable maximum precipitation. Modeling is not reliable out hundreds of years. The water models should be re-run.

In addition, the SDEIS itself has numerous general deficiencies. The FEIS should have a better discussion and explanation of GoldSim setup, inputs, accuracy, and assumptions, which inputs are treated as probabilistic, and should acknowledge that GoldSim has not been widely used for NEPA effects analysis. The FEIS should better explain the reasons for using 200- and 500-year simulations. In addition, the FEIS should report flows and concentrations at all facilities and discharge locations; should acknowledge that chemically impacted mine water would enter groundwater and surface water outside the property boundary; and should acknowledge that under closure, streamflows would not return to pre-mining conditions. Presentation of exceedances is inconsistent between supporting documentation and the SDEIS.

Thematic Response

The GoldSim model was selected because it includes the computational tools required to conduct probabilistic simulation of the NorthMet Project Proposed Action water balance, solute release, and solute transport. Specific QA/QC procedures that were applied to the data collection and modeling are in Section 4.3.4.3 and Attachment L of PolyMet 2015m, as cited in the FEIS, and Section 4.3.4.3 and Attachment N of PolyMet 2015j, as cited in the FEIS. The level of QA/QC conducted for the FEIS is adequate, and the GoldSim Model is an appropriate tool for simulating water balance and water quality.

The FEIS provides adequate detail on the GoldSim model's setup. FEIS Section 5.2.2.2.3 (Water Quality Modeling [GoldSim]) describes GoldSim as a computer platform designed to conduct dynamic simulations and that includes the ability to conduct probabilistic analysis. Subsections of FEIS Section 5.2.2.2.3 provide details on the assumptions used to estimate water flow and the release and transport of solutes at both the Mine Site (Partridge River Watershed) and Tailings Basin (Embarrass River Watershed). In particular, details of the GoldSim model design and its simulation of proposed features are presented in FEIS Figures 5.2.2-7 and 5.2.2-10.

It is acknowledged that the NorthMet Project Proposed Action would release solutes and cause an increase in loading of some solutes to surface water and groundwater relative to the continuation of existing conditions. Estimates for mass-loading from Mine Site facilities are presented in Attachment I of the Mine Site Water Modeling Data Package. Estimates for mass-loading from the Plant Site Tailings Basin are presented in Attachment G of PolyMet 20105j (as cited in the FEIS).

It is also acknowledged that the NorthMet Project Proposed Action would alter stream flows relative to existing conditions. However, the flows would be similar to existing conditions. Where and when necessary, surface streams would receive treated augmentation water to maintain stream flow to within plus or minus 20 percent of existing natural flows. The augmentation water would generally consist of water obtained from the capture systems or mine pits, and treated at the WWTF or WWTP prior to discharge.

The Co-lead Agencies have made an attempt to communicate modeling results clearly in the FEIS. Deviations from the presentations in technical documents were at times necessary. Mine Site GoldSim inputs—be they deterministic or uncertain—are contained in Attachment C of PolyMet 2015m, as cited in the FEIS, and Attachment B of PolyMet 2015j, as cited in the FEIS. It is acknowledged that modeling results for hundreds of years in the future should be viewed with appropriate caution.

An Environmental Impact Statement need not evaluate worst-case scenarios associated with extreme flooding or drought or identify mitigation or management activities around those scenarios. The FEIS and its supporting documentation do disclose a range of potential environmental effects that can be anticipated and identifies mitigation for those effects as appropriate.

Theme WR 190

Theme Statement

The NorthMet Project Proposed Action minimizes water resource impacts. Similar mines have experienced success. Water model runs sufficiently disclose impacts by presenting results out to 200 or 500 years to address slow moving water. Effects on water resources in the NorthMet Project area and in the Lake Superior Basin have been thoroughly addressed in the SDEIS and reviewed by Co-lead agencies and deemed satisfactory. Water treatment and capture systems designs, engineering controls, and monitoring and mitigation measures would protect water resources. The water model demonstrates that the NorthMet Project Proposed Action would meet the standards set in Minnesota state law and federal initiatives. Acid rock drainage would not be created.

Thematic Response

These comments generally supported the findings in the SDEIS that the NorthMet Project Proposed Action would minimize impacts to water quality. Because no specific information was provided, no changes were made to the EIS.

Theme WR 191

Theme Statement

The FEIS should address the quantities or volumes of sediment from erosion that could contaminate surface water.

Thematic Response

PolyMet proposes to collect non-contact storm water runoff from undisturbed and reclaimed vegetated areas within the Mine Site and route it to the Partridge River via existing drainage patterns to the extent possible. There would be the potential for increased suspended solids. PolyMet would provide sedimentation ponds at the outlet locations to manage suspended solids prior to discharge to surface waterbodies (see Figures 3.2-5, 3.2-6, 3.2-7, and 3.2-8). These sedimentation ponds should be adequate to manage suspended solids, but monitoring of the discharge is recommended as part of any water quality permit. Due to the containment systems at the Plant Site, no erosion is expected to impact surface waters downgradient from the tailings basin.

Theme WR 192

Theme Statement

The P90 impact threshold can be interpreted differently. One in ten projects might result in unacceptable contamination. Ten percent of the time concentrations of solutes would be higher. Descriptions of how P90 values are determined from GoldSim runs (described in the SDEIS page 5-77) appears incorrect. P90 level presents the worst-case analysis of water quality (SDEIS page 5-77) are simply untrue as the P90 level presents a worst-case scenario only if everything goes exactly as intended: if no mistakes were made in designs, calculations, or modeling inputs, if no mistakes are made in operations, if no larger-than-expected storms occur, etc.

Thematic Response

The GoldSim model was developed primarily to estimate the effects on surface and groundwater quality from the NorthMet Project Proposed Action. NEPA does not require probabilistic analysis for disclosing effects, but a probabilistic model yields a more realistic estimate for predictions by addressing the uncertainty of some input parameters than simpler modeling methods. A second benefit of using a probabilistic model is the ability to accommodate divergent opinions. In this case, competing perspectives among technical experts could often be addressed by widening the range of values for specific model parameters.

A disadvantage of using a probabilistic model is that it increases the burden on the EIS preparer by producing results that are more complicated to interpret and explain. For the NorthMet Mining Project and Land Exchange FEIS, the major simplification is to use the P90 model results when comparing simulation results to water quality evaluation criteria. If the P90 concentration of a solute equals the evaluation criteria, then there is a 10 percent probability that the actual concentration would exceed the criteria. The P90 concentration is not a “worst-case” value, but rather a model threshold selected so that plans are based on solute concentrations than are probably higher than would actually occur. In the NorthMet GoldSim results, nearly all of the

P90 solute concentrations were below the evaluation criteria at evaluation locations, so the chance that any of these would exceed the criteria is less than 10 percent. Further, when comparing model results to evaluation criteria, the comparison used the maximum P90 model value obtained from over the entire simulation period (200 or 500 years for Mine Site and Plant Site, respectively). In these cases, if the P90 equaled the evaluation criterion, it would mean that there is a 10 percent chance that the concentration of the solute would ever exceed the criteria, and that over most of the simulation period, the chance of exceedance would be less than 10 percent. Importantly, the water quality model is designed to provide a reasonable estimate for water-quality effects and to help plan for water treatment, but it is not a guarantee of outcomes. Actual protection of quality in receiving waters would rely on the monitoring and contingency plans put in place during the permitting and financial assurance process.

The discussion in the FEIS under the "Application of Evaluation Criteria to Probabilistic Modeling Results" heading in Section 5.2.2.2.3 has been revised to more clearly describe the interpretation of probabilistic water quality model results.

Theme WR 193

Theme Statement

The XP -SWMM and GoldSim models are not accurate predictors of potential pollutant inputs into these riverine systems. The potential for overflow during large storm events were not part of these model calculations. The Co-lead Agencies did not require PolyMet to consider the stochastic modeling capabilities of MODFLOW and MT3DMS (the transport module available for use with MODFLOW). Nor does PolyMet provide any support for its statement that GoldSim is "widely used in the industry." The Co-lead Agencies have not demonstrated why a publicly available model, such as MODFLOW, which was used in the initial DEIS in 2009, is not adequate and more accepted to characterize the water quality and quantity at the PolyMet site. Use of a publicly available model, such as MODFLOW, rather than a proprietary one, would have made review and analysis of the PolyMet model far easier for the public.

Thematic Response

The NorthMet Project Proposed Action facilities would be designed with excess storage to handle large storm events by routing water to mine pits or the Tailings Basin pond instead of discharging untreated contact water. In the event of an extreme event (e.g., 100-year storm), excess water would remain in the mine pits, which would essentially have unlimited storage capacity with mine operations in the pits temporarily shut down. Even during an extreme event, no untreated water would be discharged to a natural waterbody. More information on storm water would be acquired during permitting.

Regarding use of a publicly available model, selecting GoldSim was in part a response to public comments on the DEIS to improve the transparency and comprehensibility of the modeling, as well as disclose probabilities of outcomes to help the public and Co-lead Agencies assess environmental risks. See FEIS Section 5.2.2 and FEIS definitions for more information.

By downloading the free GoldSim Player, one can view, navigate, and run GoldSim models. This allows a modeler to distribute a model to others without requiring them to license GoldSim. Manuals are also available free for download.

Theme WR 194

Theme Statement

The use of the Duluth Complex as a hydrogeologic analogue is difficult to support. The Giants Range Batholith is Archean in age, more than 1.5 billion years older than the Duluth Complex, and therefore the assumption that the two units have similar stress, weathering, and erosional histories is deficient when applied to numerical modelling of smaller-scale sites, especially for predicting solute transport. Instead, the development of conceptual models that employ techniques whereby discrete fractures or fracture zones are more fully considered, results in improved prediction of solute transport, including better estimates of travel times, and recognition of variation in flow directions and discrete pathways in three dimensions.

Thematic Response

It is presumed that this comment refers to using the Duluth Complex as a hydrologic analog for the Giants Range Granite at the Plant Site. In fact, the only conceptual connection made between the Duluth Complex and Giants Range Granite is the idea of the upper 10 to 15 meters of bedrock being more fractured and more permeable than deeper bedrock. Due to the large number of exploration coreholes at the Mine Site, there are abundant RQD data to support this concept. The limited RQD data at the Plant Site do not conflict with this concept, but do not provide sufficient independent data for a firm interpretation. There are studies conducted at other sites to indicate that an upper more-permeable zone in bedrock is typical of the Iron Range, regardless of the bedrock rock type. So the RQD observations in Duluth Complex rocks at the Mine Site are taken as credible evidence that upper Giants Ridge Granite at the Plant Site also has an upper zone 10 to 15 meters thick with increased fracturing and hydraulic conductivity compared to deeper bedrock. Note that the hydraulic conductivity of the upper zone of Giants Range Granite is determined from 2014 packer tests conducted in five boreholes along the perimeter of Tailings Basin that were advanced 4.0 to 6.2 meters below the top of rock (not Duluth Complex testing conducted at the Mine Site).

Methods have been developed evaluating chemical transport through discrete fracture systems in hard rock. However, it is acknowledged within the industry that these theoretically based methods are simply not practical and reliable for large field sites. Discrete fracture transport models require intensive characterization of fracture apertures, orientations, and pervasiveness that can never be accomplished for a large field area. These models have only been applied successfully to small rock masses at pilot test sites, but never to a large-scale field problem. For field-scale evaluations, the standard of the industry is to treat fractured rock as an equivalent porous medium and use surrogate parameters (e.g., low effective porosity) to model chemical transport within the large rock mass. This is the approach taken in the FEIS and it is the only practical method that can be employed for impact evaluation.

Theme WR 195

Theme Statement

The NorthMet Project Proposed Action is a source of great concern and should not proceed due to potential impacts to water resources or the duration of water treatment necessary. There is a lack of experiential and other evidence to support the claim that sulfide, open pit copper nickel, or copper cobalt mining can be done without causing watershed pollution; it cannot be demonstrated that contaminated groundwater or surface water won't leave the site; it is contrary to MDNR's mission, the NorthMet Project Proposed Action would violate water quality standards for generations to come; the costs would not be worth the benefits, water is a natural resource with inherent economic value, it is more valuable than ore, it is essential to Minnesotans' quality of life and water quality in lakes and rivers should be protected.

Thematic Response

The hydrologic and water quality modeling indicate that impacted groundwater would leave the NorthMet Project. At the Mine Site, this would include seepage of West Pit and East Pit water into groundwater during closure that would slowly migrate south to the Partridge River. If flow to the north via bedrock is predicted, mitigation will be implemented to prevent it. At the Plant Site, surficial groundwater would bypass the capture system and allow subsurface tailings water to continue a slow migration towards the Embarrass River. A key feature of the NorthMet Project Proposed Action is to evoke management strategies and engineered facilities that would minimize the flow of impacted water leaving the NorthMet Project area to a rate that is small compared to diluting recharge and diluting flows in the rivers (hundreds to thousands of gpm). The GoldSim water quality models acknowledge and quantify the flow rates and chemical concentrations of these excursions from the Mine Site and Plant Site, but show that the associated chemical-loading would be sufficiently small that groundwater quality evaluation criteria would not be exceeded at the evaluation locations. Further, the modeling shows that water quality evaluation criteria either would not be exceeded in surface water or would not increase the frequency of exceedances that would occur under non-NorthMet Project Proposed Action conditions.

It is acknowledged that operation, maintenance, and periodic replacement of environmental controls would be required during closure. Regardless of the precise duration of effects or water treatment at either the Mine Site or Plant Site, there would be measures available to address impacts to natural resources. *Minnesota Rules* 6132.3200 specifies that it is a goal for a mining area to be maintenance-free. Passive water treatment is described as a long-term goal if future pilot studies were to demonstrate that it could be successful. The decision to go to passive treatment at some time in the future would be based on monitoring of actual NorthMet Project area conditions and pilot-testing, rather than predictive modeling and would be subject to applicable permitting requirements at that time. Regardless of treatment mechanism, financial assurance would be required under *Minnesota Rules* 6132.1100 before the State of Minnesota's Permit to Mine can be issued. Permit conditions and financial assurance would be required to perform reclamation and closure activities for as long as these activities are needed. FEIS Section 3.2.2.4 describes financial assurance process and requirements.

Theme WR 196

Theme Statement

The effects to water resources cannot be modeled satisfactorily due to climate change and the uncertainty about future hydrology, which prevents a comprehensive analysis of water flow. Climate change is progressing so rapidly that it is not possible to predict with accuracy the extent of pollutant migration into the hydrological system. Mitigation must be planned from the basis that passive water treatment is not applicable due to the inability to accurately project rainfall and to accurately project future rainfall and climate change.

Thematic Response

Passive water treatment is not part of the Project Description and is only described as a long-term goal if future pilot studies were to demonstrate that it could be successful. The decision to go to passive treatment at some time in the future would be based on monitoring of actual NorthMet Project area conditions and pilot-testing, rather than predictive modeling and would be subject to applicable permitting requirements at that time.

Climate change is a legitimate concern, but its effects are not rapid as indicated by climate modeling done by research institutions and government agencies. It is the Co-lead position that long-term monitoring of climate and NorthMet Project area conditions would provide adequate advanced warning that climate change issues needed to be addressed and adequate time to implement adaptive mitigation measures if they are needed.

Theme WR 197

Theme Statement

The FEIS should address potential environmental impacts to water resources from the NorthMet Project Proposed Action, not only state if the water quality standards would be met. Potential environmental analyses or discussions that should be added to the FEIS include: how water quality is determined; if the environmental impacts are greater as water is being released into two watersheds; how evaporation in backwaters, marshes and ephemeral flooded ponds affects constituent loading; if filling of wetlands would increase flooding; whether or not there is any point along the Embarrass, Partridge, or St. Louis Rivers where sulfate or metals would tend to precipitate (due to local chemistry) and accumulate mass of additional sulfate and other metals build up in Colby Lake (Partridge River) or Sabine or Wynne Lakes (Embarrass River); whether or not the mass of sulfate would lead to an increase in the methyl mercury concentrations in Colby, Sabine, or Wynne Lakes; and whether the high volume carries those pollutants down to Lake Superior and the St. Louis River delta.

Thematic Response

Water resources are considered not to be significantly impacted if water quality evaluation criteria are met at evaluation locations and there are no substantial changes to surface water flows. If water quality evaluation criteria are not met under the Continuation of Existing Conditions modeling scenario, the FEIS evaluates whether the NorthMet Project Proposed Action causes or increases concentrations to an unacceptable degree. Using these definitions,

GoldSim water quality modeling predicts that the NorthMet Project Proposed Action would not lead to impacts to groundwater and surface water.

The modeling indicates no significant impacts at downstream station SW-005 on the Partridge River and PM-13 on the Embarrass River. Although modeling was generally not performed downstream of these surface water locations (except Colby Lake), it is concluded that there would be no impacts downstream of the locations since natural processes tend to not increase surface water concentrations.

Surface water features mentioned in the theme text are generally not on flowpaths with water potentially affected by the NorthMet Project Proposed Action.

Predicted chemical concentrations in off-site, potentially NorthMet Project Proposed Action-affected waters are not high enough to cause precipitation or solids accumulation in surface waterbodies.

Theme WR 198

Theme Statement

The Mine Site and Plant Site are in a water rich part of the country that is subjected to freeze and thaw conditions. This would cause extreme challenges to pollution prevention.

Thematic Response

Given the mitigation proposed for the NorthMet Project Proposed Action and the experience of the mining industry in cold climates, freeze and thaw are not expected to compromise PolyMet's ability to operate in accordance with regulatory requirements.

Theme WR 199

Theme Statement

Studies should be done of the water quality in areas proposed to substitute for the exchanged lands in the Partridge River watershed.

Thematic Response

FEIS Sections 4.3.2, 5.3.2, and 6.3.2 discuss water resources in area of the Land Exchange Proposed Action.

Theme WR 200

Theme Statement

Mining does not appear in the list of six water allocation priorities allocation determined by the commissioner (SDEIS page 4-23), and would appear to be a low priority for allocation of water. It is not explained who the commissioner is or what organization the commissioner is with.

Thematic Response

The MDNR Commissioner (currently Commissioner Landwehr) has responsibility for adopting rules allocating waters for consumptive use based upon priorities contained in Minnesota Statute 103G.261.

Theme WR 201

Theme Statement

Much of the information in Chapter 5 of the SDEIS depends upon the use of water models with which a layperson has no familiarity. Chapter 5 also uses technical terms and technical documents which are difficult to understand. Supporting information for technical documents sometimes cannot be found. Therefore, the ability to judge whether the models being used for decision making are competent has to fall to the experts; however, there is no discussion of the water models by experts in the SDEIS. Despite the use of many water models, a lot of this work appears to be "educated guesswork" that would have to be field monitored and checked for accuracy at the time the mine is operating and that is pretty late to make changes.

Thematic Response

The Co-lead Agencies have attempted to clarify and simplify FEIS text. Summaries are provided in the Executive Summary, and in the first part of each section within FEIS Chapter 5, including Section 5.2.2 for water impacts from the NorthMet Project Proposed Action. FEIS supporting information can be acquired by contacting the MDNR Environmental Review Unit. The text in the FEIS reflects the opinions of water resources experts from the Co-lead Agencies and that of other experts who have provided input to the FEIS through comments or direct dialogue with the Co-lead Agencies. It is acknowledge that monitoring of the NorthMet Project Proposed Action is a critical element to understanding and controlling environmental impacts and enforcing regulatory requirements.

Theme WR 202

Theme Statement

The SDEIS does not describe water resources impacts from probable or worst-case NorthMet Project Proposed Action failure scenarios or weather events.

Thematic Response

Neither NEPA nor MEPA implemented through Environmental Quality Board Rules requires the evaluation of worst-case or failure event scenarios. By not explicitly considering these scenarios, the Co-lead Agencies are adhering to these regulations.

Theme WR 203

Theme Statement

Mineral exploration leads to environmental harm. This impacts baseline conditions and was not considered. How can the USFS ignore the lack of funding to monitor the extent of exploratory drilling and the necessary future monitoring of the sites for acid mine drainage?

Thematic Response

Natural background (unimpacted) conditions have been disclosed in the FEIS informing the baseline for the evaluation of environmental effects.

Theme WR 204

Theme Statement

The discussion of beryllium, thallium and manganese groundwater concentrations at the NorthMet Project Proposed Action site is misleading. Water samples have been impacted by mining. Concentrations of manganese in surface waters at the former LTVSMC tailing basin already exceed Minnesota's Health Risk Limit.

Thematic Response

Natural background concentrations were used to establish groundwater evaluation criteria for impact evaluation in FEIS Section 5.2.2.1. The same dataset that was used to define natural background water quality for use in the water quality impact modeling was used to develop site-specific evaluation criteria for the FEIS. At the Plant Site, 49 background thallium samples were collected from the bedrock and 50 background manganese groundwater samples were collected from the surficial aquifer. At the Mine Site, 320 background beryllium groundwater samples were collected from the surficial aquifer and 49 samples were collected from the bedrock. Three hundred and eleven background manganese groundwater samples were collected from the surficial aquifer and 49 background manganese samples were collected from the bedrock. Forty-nine background thallium samples were collected from the bedrock. For information on how evaluation criteria were determined, see Section 4.3.4.2 of PolyMet 2015j, as cited in the FEIS, and Section 4.3.4.2 of PolyMet 2015m, as cited in the FEIS.

A.5.25 References Cited in Thematic Responses

The following references, cited in the Thematic Responses in Section A.4, have not been cited elsewhere in the FEIS. References used in the FEIS are listed in that document.

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A.6 RESPONSES TO EDITORIAL COMMENTS

Table A-4 lists each editorial comment, the name of the sender, and the corresponding response.

Table A-4 Editorial Comments and Responses

Sender	Comment	Response
1854 Treaty Authority	This section also contains language about "1854 Treaty Authority-regulated species". We suggest removing or altering this language. The Fond du Lac Band also exercises treaty rights in the 1854 Ceded Territory, and has their own regulations. Further, the 1854 Treaty Authority maintains seasons and limits on some species, but these are not the only species of importance.	Text has been added to clarify the definition of "1854 Treaty Authority-regulated species" in Section 5.2.9.2.2. As discussed in this section, Fond du Lac has its own regulations applicable to the 1854 Ceded Territory. The discussion of "1854 Treaty Authority-regulated" species or resources is not inclusive of all species important to the Bands. Instead, the lists serve as the most updated and best available data for the most common game species or tribally harvested resources on the 1854 Ceded Territory.
Becky Milanese	GLOSSARY Page lx- geosynthetic membrane cover- what is this made of and would we expect decomposition over time from natural forces or the sulphuric wastes?	Chapter 3 includes information on the proposed geomembrane covers.
Becky Milanese	IMPLAN- How accurate is this model? Who or which agency uses this modeling?	IMPLAN is described in Section 5.2.10.
Becky Milanese	MODFLOW- How accurate is this and who uses it?	MODFLOW is a water model used for impact analysis as described in FEIS Section 5.2.2.
Becky Milanese	National Pollutant Discharge Elimination System (NPDES) Permits- No agency is listed as responsible for issuance of these permits and setting their limits and requirements.	FEIS Section 2.6 discusses permits and describes that the MPCA would be responsible for NPDES permits
Becky Milanese	Page lx-GoldSim- what is a engineered systems model? Which analysis gets used in which place and who uses these models?	GoldSim is a water model used for impact analysis as described in FEIS Section 5.2.2.
Becky Milanese	Page lxi- Humidity cell- Who or which agency uses this test? Hydrometallurgical residue- what is an amorphous form?	Humidity cell tests are described in FEIS Section 5.2.2.2.3. The term "amorphous form" has been removed from the glossary.
Becky Milanese	Page lxiii- Monte Carlo Simulation- Who or what agency uses this simulation and determines its use and outcome?	Monte Carlo is defined in the glossary as, "A computerized mathematical technique that allows people to account for risk in quantitative analysis and decision-making. The simulation furnishes the decision-maker with a range of possible outcomes and the probabilities they will occur for any choice of action." It generates model permutations for probabilistic results and ranges as described FEIS in Section 5.2.2.2.3.
Becky	Page lxiv- Paste or thickened tailings- what is a homogeneous nonsegregated	Homogeneous nonsegregated mass is material that is uniformly mixed so there are not defined layers of different

Sender	Comment	Response
Milanese	mass?	materials.
Becky Milanese	Page lxix- Wastewater treatment facility (WWTF) & Wastewater Treatment Plant (WWTP) - What is the difference between these two and who permits and oversees their discharges?	The WWTP (Plant Site) and WWTF (Mine Site) are described in FEIS Sections 3.2.2.3.10 and 3.2.2.1.8, respectively, and discharges would be managed under the permits described in Section 2.6.
Becky Milanese	Page lxv- Permeable reactive barrier- Huh? Who installs and maintains this barrier? Is it a separate facility?	A permeable reactive barrier is an option for non-mechanical water treatment and is discussed in FEIS Chapter 3 and Section 5.2.2.
Becky Milanese	Page lxvi- Reject concentrate- What happens to this water or brine?	Reject concentrate from the WWTP would be treated at the WWTF, and the reject concentrate from the WWTF RO would be evaporated and the residual solids disposed of off-site.
Becky Milanese	Page lxvi-lxvii- Spill Prevention Control and Countermeasure (SPCC) Plan- Who produces, writes, revises and oversees this plan.	The project proponent would be responsible for the SPCC plan and would be overseen by regulators under permit.
Becky Milanese	Pumping Test- Who uses these tests and determines the results and effects that need to be considered?	Pumping tests are used and interpreted by the project proponent and their consultants. Results are analyzed in the FEIS to characterize groundwater flow and contaminant transport.
Becky Milanese	Reclamation- Who oversees this and decides that it is done in a proper manner?	Reclamation would be undertaken by the project proponent and overseen by the MDNR under the Permit to Mine per FEIS Section 3.1.1.6.
Becky Milanese	XP-SWMM- Which agency uses this modeling software and what is it used to determine.	XP-SWMM is a surface water model used for impact analysis as described in FEIS Section 5.2.2.
Bert Hyde	Pg 4-45 and 46, 47 – The content of these pages is so well hidden that I could not understand what the author was trying to communicate.	The FEIS has been revised to improve writing clarity.
Bert Hyde	Pg 3-114, 3.2.2.3.7. High purity gypsum is a useful product – it should not be managed as waste – waste is ultimately very expensive.	No change made.
Bob Tammen	It has been my experience in the industry that acid draining from a mine is referred to as Acid Mine Drainage. Industry efforts to euphemize the term to Acid Rock Drainage is sadly unprofessional and should be corrected in the glossary and in the SDEIS. 4-165 “The Plant Site is located north of the Laurention Divide...Misprint? The plant is South of the divide. See map. 4-376 Last paragraph. Heal should be heel. 5-5 “located in...Mesabi Iron Range” The mine is located in the Duluth Complex in the Superior National	Regarding the use of the term, “Acid Mine Drainage” or “Acid Rock Drainage,” no change has been made. Regarding the location of the Plant Site in relation to the Laurentian Divide, change has been made as requested. Regarding the use of “heal” or “heel,” change has been made as requested.

Sender	Comment	Response
	Forest. Once again, the SDEIS deserves an EU-3. 6-9 6.2.2.1.6 Essar...begin operation in 2014. Essar will not begin operation in 2014. Update SDEIS. 6-7 Table 6.2-1 Mesaba Energy Project. The IRRRB has granted Mesaba Energy an option to purchase land near Hibbing for a gas power plant. Update table. 6-1 reasonably foreseeable. The impacts of developing a 10 billion ton ore body as described by geologists in Minnesota should be evaluated as reasonably foreseeable.	
Bob Wagner	II. Contradicting statements on stream flow, Executive Summary p. 39, table 51 and (appendix C sub sec 1) "reduce water flows to range of annual natural variability	The text of the Executive Summary has been updated to improve clarity.
Center for Biological Diversity	the discussion of mine pit inflow does not provide a citation at all, see SDEIS 5-90.	Change has been made, as requested.
Grand Portage Band	The SDEIS also speculates that the tribes will benefit economically from the Project through additional visitation to Band-operated Casinos, but provides no data to back up the statement: "Increased employment and income associated with the NorthMet Project Proposed Action could increase visitation and revenues at [area tribal gaming] facilities." This statement is entirely unsupported by any market analysis and must be deleted from the socioeconomic assessment of the Project.	No change made.
Joel Roberts	There are discrepancies among the various descriptions of this construction in the SDEIS and the relevant references. These should have been resolved before the SDEIS was released.	No change made.
klhanson@frontiernet.net	[Text from SDEIS] "Based on the results...would not exceed applicable environmental evaluation criteria except for two water constituents as a side effect of the project." - [should read] Would exceed applicable environmental evaluation criteria for two water constituents.	FEIS text has been revised to read, "Based on the results….would exceed applicable environmental evaluation criteria for two water constituents as a side effects of the project."
Michele Ross	In most cases, either the federal MCL or the Minnesota Health Risk Limit (HRL) is selected, but higher SDEIS evaluation criteria were chosen for beryllium, manganese and thallium "…based on background water quality". Although manganese exceeded the federal MCL of 50 µg/L in most samples, Table 4.2.2-6 in the SDEIS indicates most of the groundwater samples collected near the proposed Mine Site were near or below the state Risk	There are no drinking water wells at the Mine Site. The FEIS bases water quality evaluation criteria off of regulatory requirements. Using regulatory requirements to assess risk best informs the permitting process--a major objective of EISs. RAA guidance is not likely to be promulgated, either because of a high level of uncertainty

Sender	Comment	Response
	Assessment Advice (RAA) levels of 100 µg/L for infants and 300 µg/L for children and adults. MDH recommends the RAA values be used as the groundwater evaluation criterion for manganese… Use 100 µg/L for infants and 300 µg/L for children and adults as the groundwater evaluation criterion for manganese.	about the numeric guidance, because the methods used to develop the guidance are different than the methods in rule, or because the resulting guidance is qualitative rather than a water value. The RAA values were added as a footnote to FEIS Table 5.2.2-1.
Michele Ross	[T]he detections of beryllium near the proposed Mine Site indicate background concentrations in the aquifers are generally below the federal MCL of 0.4 µg/L and only slightly above the MDH HRL of 0.08 µg/L. MDH recommends the HRL be used as the groundwater evaluation criterion, as beryllium concentrations in the Plant Site flow paths are also predicted to exceed the HRL in areas where domestic wells are present…Use 0.08 µg/L as the groundwater evaluation criterion for beryllium.	Groundwater standards include primary and secondary drinking water standards and the HRL. *Minnesota Rules*7060.0600, subpart 8, states that "where the background level of natural origin is reasonably definable and is higher than the accepted standard for potable water and the hydrology and extent of the aquifer are known, the natural level may be used as the standard." The groundwater evaluation criterion for beryllium at the Mine Site is 0.39 µg/L. At the Plant Site, it is 0.54 µg/L. The basis for the evaluation criteria is Minnesota Rules. The MDH HRL of 0.08 µg/L is disclosed in FEIS Table 5.2.2-1.
Northeastern Minnesotans for Wilderness	[The SDEIS] states that the proposition that "taconite tailings appear to be a sink for mercury in full-scale actual tailings basins in northern Minnesota, at least similar to other media like soils . . . is supported by surface and groundwater monitoring around the existing LTVSMC Tailings Basin, which found mercury concentrations consistent with baseline levels (see Table 4.1-31), generally averaging less than 2.0 ng/L." SDEIS 5-202. This statement in regards to groundwater appears to be blatantly false. And an attempt to learn more from Table 4.1-31 was thwarted by the fact that there is no Table 4.1-31.	Change has been made, as requested. The reference to Table 4.1-31 has been removed from the text, and replaced with an appropriate table reference.
Northeastern Minnesotans for Wilderness	Regarding scenic integrity objectives (SIOs), the SDEIS states that it used SIO definitions in the Forest Plan for evaluating the Federal lands but used a 1995 Forest Service publication to evaluate the non-Federal lands. SDEIS 4-349. The discrepancy is not explained. The SDEIS needs to provide sufficient information to determine whether this difference could lead to inaccurate comparisons.	No change made.
Patty Lange	It has been brought to my attention that the maps outlining the drainage area around the proposed mine in the environmental study for the Polymet mine are incorrect.	The referenced figures have been revised for the FEIS, and now include additional features that add clarity to the hydrology.
Patty Lange	The fact that the incorrect maps outline the swamp with a dashed teal line on satellite maps with green backgrounds makes it extremely difficult to see. This discrepancy between the environmental impact statement maps and US	The outline of the One Hundred Mile Swamp on figures has been revised to make it more visible. No other changes made.

Sender	Comment	Response
	government maps makes this environmental impact study inadequate.	
Paul Stolen	Sulfate loadings, reference to MPCA {2006), p. 5-208. This MPCA document is quoted in Reference #42 in Appendix A of these comments. This MPCA document refers primarily to sulfate permitting issues rather than impact assessment, and is also outdated in enough respects to question its utility for this EIS.	Citation has been revised to "MPCA 2006a," to refer to the MPCA Strategy to Address Indirect Effects of Elevated Sulfate on Methylmercury Production and Phosphorus Availability, published by the MPCA in October 2006, which is the approach source in this context.
Phil Larson	Glossary The glossary contains a number terms whose definition is inconsistent with standard usage. These include: Drift: Material such as sand, clay, gravel, and rocks transported and deposited by a glacier or glacial process. Glacial deposit: A collection of various-sized rocks and debris that is deposited by a glacier as it advances or recedes across a landscape. There are many types of deposits, including till, drift, erratics, and moraines. (Note: sediment deposits of glacial origin are termed 'drift', less commonly 'glacial drift'. Erratics refers to individual clasts, while 'moraines' refer to a landform, not a sediment type.) Glacial till: Direct glacial deposits of rocks, gravel, or boulders that are unsorted and unstratified. (Note: all till is by definition glacial in origin; there is no need to include the modifier 'glacial'.) Surficial glacial deposit: A collection of various sized rocks and debris deposited by glacial activity that is left on the earth's surface after the glacier recedes. (Note: 'surficial glacial deposit' is not used in the text of the SDEIS.) Till: see Glacial till These definitions should be revised to conform to accepted usage. The following definitions are taken from the Glossary of Geology (5th Edition) : Drift A general term applied to all rock material (clay, silt, sand, gravel, boulders) transported by a glacier and deposited directly by or from the ice, or by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines, and stratified deposits that form outwash plains, eskers, kames, varves, fluvioglacial sediments, etc. Outwash Stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier. The coarser material usually is deposited nearer to the ice. Till Dominantly unsorted and unstratified drift, generally unconsolidated,	The glossary is deemed adequate for the FEIS.

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	deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape. In addition to adapting these definitions, I recommend that the definition of 'surficial aquifer' be modified to indicate that the aquifer is hosted by unconsolidated sediment, including drift.	
Phil Larson	Notes on Nomenclature The text of the SDEIS contains a number of inconsistent usages of terminology: • The text mentions 'glacial till' 33 times, and 'till' alone 29 times. 'Till' should be used in all cases. • The text mentions 'glacial drift' 6 times, and 'drift' alone 7 times. 'Drift' should be used in all these cases. • The glossary does not define 'outwash'. The text mentions 'glacial outwash' 5 times, and 'outwash alone 3 times. 'Outwash' should be used in all these cases. • The text uses the term 'surficial deposits' 25 times, although the term is not defined in the glossary. The usage suggests that this refers to all unconsolidated sediments lying above bedrock, including drift (till and outwash), peat, and other sediment. • In a number of cases, usage of the term 'till' is confused or inconsistent: • Page 4-95 – "several soil borings into the surficial till identified the composition as layers of clay and sand, plus cobbles and boulders". In this case 'till' is the sediment type, and by definition contains particle sizes ranging from clay to boulders. • Page 4-151 – "The depth of soil and till overlying the bedrock". • Page 4-367 – "areas of glacial till (typically silty sand)". Either the sediment is till, or silty sand. By definition it cannot be both. • Page 4-376 - "native till material that ranges from clay to gravel". In this case 'till' is the sediment type and by definition contains particle sizes ranging from clay to gravel. In several instances, the term 'till soil' is used. Till is a sediment type. A soil may develop at the surface of a till deposit, however the entire thickness of the till is not soil. 'Till' alone suffices in these instances. In a number of other cases, convoluted sediment descriptions are given, when	Text within the FEIS has been updated since the SDEIS - not all suggested edits have been applied.

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	it is likely the sediment is simply till. In these cases, the non-specific and complex description gives the impression of extreme heterogeneity in sediment deposits, rather than a relatively homogeneous till deposit. For example: • Page 4-45 – "The overlying surficial sediments at the Mine Site are poorly sorted and range from very dense clay to well-sorted sand with boulders and cobbles". This sediment is highly likely to be simply till. • The term 'overburden' as defined in the glossary appears to be inconsistently applied. Although it is defined as all unconsolidated sediment and waste rock overlying the mineral deposit, in most places it appears to refer to only the unconsolidated material overlying bedrock. For example: • Page 3-15 – "overburden and waste rock" • Page 3-17 – "overburden and waste rock" • Page 3-37 – "use of waste rock, overburden, and peat" • In other cases, 'overburden' clearly refers to only the unconsolidated sediment overlying bedrock. For example: • Page 3-44 – "Three types of overburden are present at the site: unsaturated overburden, saturated overburden, and peat." The term 'soil' is not defined in the glossary. In most cases, the term is used in a manner referring to unconsolidated materials at the surface, containing organic matter, and capable of supporting life. In other cases, it appears to be used in a geotechnical sense, referring to unconsolidated sediment overlying bedrock, equivalent to usage of the term 'overburden'. In these cases, the term appears to be applied to the entire thickness of drift or till overlying bedrock, similar to usage of 'surficial deposits' noted above. For example, • Page 4-149 – "lateral flow that is either on the surface or within the subsurface soil." Soil used in this sense refers to either drift or the surficial aquifer. • Page 5-201 – "mercury stored in rock, soil, peat, and vegetation." Soil used in this sense refers to drift. • Page 5-227 – "The Mine Site contains localized heterogeneous vertical and horizontal hydraulic conductivities within each soil unit." Soil used in this sense refers to drift. A clear distinction need to be made between soil referring to the shallow	

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	surface layer containing or	
Phil Larson	Note on usage of Unified Soils Classification System (ASTM D 2487-83) The USCS was used to describe unconsolidated sediments recovered from boreholes drilled in support of the NorthMet Project. It is important to note that this system is designed to best describe and name relatively well-sorted unconsolidated sediments with a unimodal particle size distribution. As such, poorly sorted sediments with potentially multimodal particle size distributions (e.g. till) are not well-described using this classification. Relatively minor changes in the relative proportions of clay-silt-sand-pebble-boulder may lead to application of multiple group symbols and the perception of significant heterogeneity within what is in actuality a relatively homogeneous till sequence. In cases where USGS group symbols and nomenclature are utilized in the SDEIS and supporting documents, it is advisable that sediment identified as till be explicitly name as such, e.g. GC (till).	Not all instances changed. The FEIS is for public use - technical description can be found in the reference materials.
Phil Larson	Geology of the Mine Site: The observation is made that "the surficial till is a heterogeneous and laterally discontinuous zone with a composition ranging from very dense clay to well-sorted sand." This statement seems to use the term 'heterogeneous' to refer to the poor sorting and wide particle size range of what is likely a relatively homogeneous till. The lateral discontinuity in the till referred to in this case is likely its thickness, not its sedimentological heterogeneity. Here, and elsewhere in the document, well-defined, consistent, and judicious application of the terms 'heterogeneous' and 'homogeneous' when describing tills is advised.	No change made.
Robert Tammen	Several documents refer to PolyMet and Poly Met (Two words). There must be a reason for having two different legal entities. The SDEIS should explain the difference and perhaps declare which will get dividends and which will have environmental clean up liability.	FEIS text has been revised to ensure consistent use of "PolyMet."
Robert Tammen	4-165 "The Plant Site is located north of the Laurentian Divide...Misprint? The plant is South of the divide. See map.	Text has been revised to indicate the Plant Site is south of the Laurentian Divide.
Robert Tammen	4-376 Last paragraph. Heal should be heel.	FEIS text has been revised to refer to the "base of the dam."
Robert Tammen	5-5 "located in...Mesabi Iron Range" The mine is located in the Duluth Complex in the Superior National Forest. Once again, the SDEIS deserves an EU-3.	Text has been revised to state, "The NorthMet Project Proposed Action would be located near an historic mining area, known as the Mesabi Iron Range …"
Robert Tammen	Table 6.2-1 Mesaba Energy Project. The IRRRB has granted Mesaba Energy an option to purchase land near Hibbing for a gas power plant. Update table.	The list of Projects has been updated.

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	At the same meeting the IRRRB granted the City of Hibbing an option to purchase land for a possible Racino. This was probably an effort to pressure tribal interests by threatening to compete with Fortune Bay and Black Bear casinos. The actions were connected and should be analyzed.	
Robert Tammen	6-9 6.2.2.1.6 Essar...begin operation in 2014. Essar will not begin operation in 2014. Update SDEIS.	The FEIS has been revised to address this comment.
Robert Tammen	A-5 Thematic Response. AQ-1. Oar should be ore.	Change has been made, as requested.
Roger A Powell	Figure 6.2.3-1 does not show the corridor that the text on page 5-374 states that it shows. The figure must be revised to show the corridor.	The SDEIS cited an incorrect figure number. The FEIS has updated the figure number to be 6.2.5-1.
Roger A Powell	Figures 5.2.2-18, 19 and 41a of the SDEIS show PSO, contradicting the text.	No change has been made to FEIS Figures 5.2.2-18 and 5.2.2-19. The text associated with FEIS Figure 5.2.2-44 has been changed, as requested.
PolyMet	PolyMet suggests revising the first sentence in the second full paragraph on page 5-6 to read: "…PolyMet proposes a containment system that would capture about 99 percent of seepage from the Tailings Basin…"	No change made.
PolyMet	The first sentence on page 5-54 states that for Category 1 rock, "…instead of using lab tests, the rate of oxidation and constituent release was estimated from studies of seepage release measured in Dunka Mine rock…. .". PolyMet suggests revising the first sentence to read "… instead of using lab tests, the rate of oxidation and constituent release in the field was estimated from lab release rates that were scaled using the results of studies of seepage release measured in Dunka Mine rock… ."	Change has been made, as requested.
PolyMet	It is important to note that the Central Pit will not exist until after the Category 4 Stockpile has been decommissioned and the Category 4 waste rock has been relocated to the East Pit for subaqueous disposal. The most apparent benefit of relocating the Category 4 Stockpile as part of the Proposed Action Design Changes is that by locating the stockpile over an area that will be subsequently engulfed by the Central Pit, the overall area of surface disturbance (including vegetation, wetlands, etc.) of the NorthMet project will be reduced.	No change made.
PolyMet	The second to last sentence should read: "Compensation proposed at the Aitkin Site would be expected to meet in-kind compensation, resulting in a compensation ratio for effects to wetlands with rare or exceptional functions or difficult-to-replace bogs of 1.75:1, and if in advance, the ratio would be reduced to 1.5:1."	No change made.

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PolyMet	The second to last sentence in the second paragraph should read: "Compensation proposed at the Hinckley Site would be expected to meet the in-kind incentive, resulting in a compensation ratio for effects to wetlands with rare or exceptional functions or difficult-to-replace bogs of 1.75:1, and if in-advance, the ratio would be reduced to 1.5:1."	No change made.
PolyMet	The last full sentence on the page should read: "Compensation proposed for the Zim Site would be expected to meet both in-kind and in-place incentives, thereby reducing the compensation ratio for effects on wetlands with rare or exceptional functions or difficult-to-replace bogs from 2:1 to 1.5:1."	No change made.
PolyMet	The third paragraph states that the United States Army Corps of Engineers ("USACE") and the Minnesota Department of Natural Resources ("MDNR") studied "the original NorthMet Project Proposed Action" between 2005 and 2009. Use of the defined term "NorthMet Project Proposed Action" in this context is confusing because the proposed action studied in the Draft EIS was substantially different than the proposed action being studied in the SDEIS. To avoid confusion over the nature of the alternatives studied in the two documents, PolyMet recommends changing the language to state that "Between 2005 and 2009, the USACE and MDNR evaluated PolyMet's original mining proposal."	Change has been made, as requested.
PolyMet	The terms "NorthMet Mining Project" and "Land Exchange," rather than the defined terms "NorthMet Project Proposed Action" and "Land Exchange Proposed Action," are used on these pages. To avoid confusion, PolyMet recommends consistent use of the defined terms.	FEIS text has been reviewed to ensure consistent use of these terms.
PolyMet	Under the heading "Cooperating Agencies," the SDEIS describes USEPA's responsibilities to review and comment on an EIS under Section 309 of the Clean Air Act. USEPA does this for all Environmental Impact Statements, even when it is not acting as a cooperating agency. USEPA has formally participated in the preparation of the current SDEIS as a cooperating agency, which is not the same thing as fulfilling its responsibilities under CAA Section 309. PolyMet recommends clarifying this point by adding a sentence to this paragraph that explicitly notes EPA's status as a cooperating agency.	Section 1.2.1 has been revised to provide improved clarity on the USEPA's role.
PolyMet	PolyMet recommends explicitly referencing and incorporating into the SDEIS those portions of the FSDD and the 2009 DEIS that address alternatives. This should increase understanding of the iterative process of alternatives review that the SDEIS already references in several places… these changes should also be reflected in the Executive Summary, which tends to focus on the SDEIS alternatives review process, without fully acknowledging the role	FEIS Section 3.2.3 has been revised to address this comment.

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	played by alternatives review in the FSDD and the 2009 DEIS.	
PolyMet	PolyMet recommends including an updated version of Table 3.2-4 from the 2009 DEIS somewhere in the Final EIS, either directly in the discussion of alternatives or as an appendix. This would provide context for the discussion of alternatives review and the elimination of alternatives that are not discussed as part of the SDEIS process… [these changes should also be reflected in the Executive Summary, which tends to focus on the SDEIS alternatives review process, without fully acknowledging the role played by alternatives review in the FSDD and the 2009 DEIS.]	No change made.
PolyMet	The Final EIS accordingly should clarify that the alternative of proceeding with the Land Exchange Proposed Action in the absence of the NorthMet Project Proposed Action was considered but eliminated from detailed analysis in the SDEIS because it is represented by the combination of "no action" on the NorthMet Project Proposed Action and Land Exchange Proposed Action Alternative A. This could be accomplished by adding a brief description of the Land Exchange Proposed Action as a "stand alone" action in Section 3.3.3.3. The alternative would not be eliminated as unreasonable, but rather it would not require further analysis because its impacts were already revealed and evaluated in the SDEIS detailed evaluation of other alternatives.	The FEIS presented the range of alternatives that were developed for the Land Exchange Proposed Action as well as those that were considered but eliminated from detailed analysis. The Land Exchange Proposed Action would not have been entertained if not for the NorthMet Project Proposed Action. While benefits of the Land Exchange Proposed Action could accrue without associated mining, this could be true for lands throughout the Superior National Forest. The catalyst for the Land Exchange Proposed Action is the proposed mining activities, current permit applications, and the need to address the conflict associated with split ownership of mineral and surface rights.
PolyMet	PolyMet recommends that the USFS ensure that the Executive Summary is updated to conform to any changes made in the Final EIS. The independent grounds for undertaking the Land Exchange Proposed Action should be particularly clear in the revised Executive Summary, because many readers likely will rely on the Executive Summary to understand the contents of the EIS.	The Executive Summary has been revised to reflect updated information since publication of the SDEIS.
PolyMet	the SDEIS concludes that there will be no cumulative impact on recreational and visual resources. It bases this conclusion on the fact that there are no significant cumulative impacts on individual specific resources that factor in to the assessment of recreational and visual resources (such as air quality, wetlands, etc.). The phrasing used implies that the co-leads have analyzed the effects on recreational and visual resources from impacts to these specific resources individually, rather than collectively. PolyMet suggests clarifying that the agencies have analyzed whether the impacts on these resources, although insignificant when considered individually, would have any impact on recreational and visual resources when combined and has concluded that	No change made.

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	there would be no significant impact.	
PolyMet	The SDEIS should also use consistent language regarding the scope of the cumulative effects assessment areas throughout Chapter 6. On page 6-2, the SDEIS states: "For all resources, future temporal boundaries are the expected service life of the mining activities, including closure (years 20 to 40) and post-closure restoration (year 40 and beyond)." PolyMet recommends removing this sentence, which is not an accurate description of the temporal boundaries for all resources. Indeed, the very next sentence on page 6-2 rightly states that "temporal boundaries for each resource are defined within the respective resources' sections of this analysis." That sentence should remain as the sole, accurate explanation of temporal boundaries.	FEIS language will be updated as appropriately
PolyMet	The first sentence on this page indicates that completion of mining in the East Pit will occur in "approximately year 11" after the start of mining. By contrast, the first sentence in the paragraph following the three bullet points states that mining in the East Pit will end "by year 11" after the start of mining. The second statement is inaccurate. Mining in the East Pit will end approximately 11 years after mining, but not necessarily by year 11.	No change made. The SDEIS stated that "after year 11," mining would be completed in the East Pit.
PolyMet	In the last paragraph of the Mining Operations Section on page ES-23, the SDEIS defines "process water" in connection with the Mine Site. On page ES-24, the SDEIS refers to "Plant Site process water." To clarify and define terms, page ES-23 should be changed to refer to "Mine Site process water," and "Plant Site process water" should be defined by adding a sentence (see bold text below) to the last paragraph of the Processing Operations Section on page ES-23: "Water seepage from the Tailings Basin would be collected by the groundwater containment system and sent to either the Tailings Basin pond or the Plant Site WWTP. All other water that is collected at the Plant Site, such as water used during processing, and water that contacts the plant site facilities (collectively referred to as Plant Site process water) will also be treated at the Plant Site WWTP. Treated water would be used to augment flows in the streams that would otherwise receive reduced flows because of the Tailings Basin groundwater containment system."	Terminology has been revised for clarity.
PolyMet	PolyMet recommends that the Executive Summary explicitly state that aluminum concentrations in the water, or the lowering of the hardness caused by storm water, represent natural or background concentrations and/or are the result of natural processes, not process water from the NorthMet Project.	The Executive Summary text has been updated to improve clarity.
PolyMet	The SDEIS indicates that the NorthMet Project could potentially "affect	The Executive Summary text has been updated to improve

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	water quality by increasing solute concentrations above Class 2B (aquatic life) standards." This appears to refer to the aluminum and lead exceedances discussed earlier in the Executive Summary. As explained in Comment 6 above, PolyMet recommends that the Executive Summary explicitly state that any such exceedances would be the result of background and/or naturally occurring concentrations or processes, not process water from the NorthMet project.	clarity.
PolyMet	The second full paragraph beginning with the phrase "natural resources" does not accurately summarize the discussion of cultural resources in the SDEIS. PolyMet recommends that the paragraph be replaced with the following: "Cultural resources under NEPA can also include natural resources of cultural importance to the Bands. The Co-lead agencies have considered the effects of the Proposed Action on such resources, including 1854 Treaty resources, under NEPA. The Co-lead agencies have concluded that, while the Proposed Action has the potential to have effects on 1854 Treaty resources, construction and operation of the Proposed Action is not likely to significantly reduce overall availability of 1854 Treaty resources that are typically part of subsistence activities in the 1854 Ceded Territory."	No change made.
PolyMet	In Table 1, the Land Use effects of the Proposed Connected Actions are described in the first bullet point as "[n]o effects on land use that would require changes in ordinances or comprehensive forest plans." This language is confusing, given that the NorthMet Project Proposed Action would involve the construction of an open pit mine. PolyMet proposes changing this language to say: "Changes in land use would occur after the Land Exchange Proposed Action and would not require changes in ordinances or comprehensive forest plans."	No change made.
PolyMet	Although the co-lead agencies have concluded that a segment of the Beaver Bay to Lake Vermilion Trail is an eligible historic property, the SDEIS alternates between referring to the "BBLV Trail" and the "BBLV Trail Segment." To ensure consistency with the co-leads' eligibility determination, PolyMet recommends that the agencies consistently refer to the property as the "BBLV Trail Segment." This comment applies throughout all Cultural Resources sections in the SDEIS.	FEIS text has been revised to ensure consistent use of "BBLV Trail Segment."
PolyMet	PolyMet recommends that the section of the chart dealing with "Cultural Resources & Historic Properties" be referred to simply as "Cultural Resources" since that term is inclusive of historic properties.	Change has been made, as requested.

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PolyMet	The first sentence in Section 2.3.2.2, "Revised Proposed Action and Alternatives," states that the NorthMet Project Proposed Action has "changed greatly since the release of the DEIS." The use of the phrase "changed greatly" is ambiguous. The modifications to the proposal studied in the DEIS are described in detail elsewhere in the SDEIS. PolyMet accordingly recommends revising the first sentence in Section 2.3.2.2 to read: "As a result of input from the public, Cooperating Agencies, and the Co-lead Agencies via the workgroups, and additional modeling and impact analyses, PolyMet's mining proposal has been modified since the release of the DEIS."	Section 2.3.2.2 has been revised based on this comment and other project modifications since publication of the SDEIS.
PolyMet	The second bullet point in Section 2.4.2, "Adequacy Determination/Records of Decision," states that the USACE will issue a ROD "[f]ollowing a 30-day comment period." Under NEPA, the 30-day period following issuance of a Final EIS is not a "comment period." Rather, under 40 C.F.R. § 1506.10(b), agencies are simply prohibited from making a decision on the proposed action until 90 days after publication of a notice of availability for a draft EIS, or 30 days after publication of a notice of availability for a final EIS. The Council on Environmental Quality regulations do not require agencies to solicit comments on the FEIS during this 30-day waiting period.	Section 2.4.2 of the FEIS, which addresses the Adequacy Determination and Record of Decision process, has been revised since the SDEIS.
PolyMet	The first bullet on this page does not specify which permits would be transferred to PolyMet. The Minnesota Pollution Control Agency has stated that the NPDES permit for the Tailings Basin would not be transferred. Instead, a new permit would be issued.	Section 2.6 of the FEIS, which identifies the key permits that would be required for the NorthMet Mining Project and any further changes would be beyond the scope of this EIS.
PolyMet	The fourth bullet on this page refers to a "bentonite layer on top of the Tailings Basin to restrict oxygen and water infiltration with pond." PolyMet recommends clarifying that there is a bentonite layer on the outer dam slopes during construction and that, during closure, a bentonite layer will be added to the top of the Tailings Basin. As currently written, the reader may incorrectly assume that a bentonite layer will be added at construction, below the new tailings.	Change has been made, as requested.
PolyMet	Reclamation of the Category 1 Stockpile is scheduled to begin in Year 14. As currently written, reclamation of the Category 1 Stockpile is included only in Years 16-20. It should also be included in Years 11-16.	Change has been made, as requested.
PolyMet	The movement of waste rock from the Category 2/3 stockpile to the pit will be completed by the end of operations (Year 20). As currently written, the SDEIS incorrectly indicates that this activity will occur after year 20.	Change has been made, as requested.
PolyMet	The transmission lines are not shown correctly on these figures [Figures 3.2-5 through 3.2-9]. The figures should show a connection between the	Change has been made, as requested, based on updated GIS mapping provided by PolyMet.

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	transmission line south of the Central Pit and the line south of the Category 1 stockpile.	
PolyMet	The second paragraph on this page states that unsaturated overburden use would require MDNR approval. This is not accurate. Unsaturated overburden should not require approval from the MDNR.	Change has been made, as requested.
PolyMet	The fourth sentence of the third paragraph on this page should state: "Applications for saturated overburden would include those where water contacting the construction material would be collected or drained to the mine pits, where it would be placed back below the water table or above a membrane liner system." There should be an 'or' in this sentence.	Change has been made, as requested.
PolyMet	For clarity, PolyMet suggests editing the second paragraph and the beginning of the third paragraph in this section as follows: "Figure 3.2-11 shows the containment system that would consist of a cutoff wall (a low permeability hydraulic barrier extending down to bedrock) combined with a drainage collection system surrounding the perimeter of the stockpile near its toe. The cutoff wall would have a hydraulic conductivity specification of no more than 1x10-5 centimeters per second (cm/sec)."	Change has been made, as requested.
PolyMet	The last sentence in the paragraph under the heading "Reclamation Planning" correctly states that PolyMet will submit an annual Contingency Reclamation Plan pursuant to *Minnesota Rules* 6132.1300. In the interest of completeness, the paragraph should also note that the rules require PolyMet to provide financial assurance sufficient to carry out that reclamation plan.	Change has been made, as requested.
PolyMet	The second paragraph inaccurately refers to disposal of material (remaining ore and sediment from ditches and process water ponds) in the West Pit. This material would be disposed in the East Pit, as described in Section 2.1.2 of the Reclamation Plan (v3) (Rail Transfer Hopper).	Change has been made, as requested.
PolyMet	The fifth sentence of the second paragraph on this page refers to the overburden sloping as "height-to-vertical ratio of 2.5:1." Height and vertical mean the same thing (i.e., both refer to the vertical plane). PolyMet suggests changing this to read either "horizontal-to-vertical" or "length-to-height".	FEIS text has been revised to "horizontal-to-vertical ratio of 2.5:1".
PolyMet	On page 3-64, the SDEIS states: "The WWTF would be upgraded to include RO treatment to achieve an effluent with a sulfate concentration of less than 10 mg/L." Similarly, the SDEIS states on page 3-123: "The WWTP would be constructed south of the Tailings Basin near the coarse-crusher and would	No change made.

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	include a RO unit designed to achieve a sulfate concentration of 10 mg/L in effluent. The design of the WWTP could be adjusted to accommodate varying influent streams and discharge requirements." It is not clear when reading the two statements copied above that the water treatment goal for the effluent sulfate concentration of 10 mg/L is based on meeting the current 10 mg/L sulfate standard for waters used for the production of wild rice (Minnesota Rule 7050.0224, Class 4A water quality standard). To clarify, and because that standard is subject to adjustment, the statement "to achieve an effluent sulfate concentration that meets the sulfate standard for waters used for the production of wild rice" should be used instead of "to achieve an effluent with a sulfate concentration of less than 10 mg/L."	
PolyMet	The last sentence inaccurately states state the Category 4 Stockpile would be completely removed by year 12 to allow mining in the Central Pit. The Central Pit mining begins in Year 11, as stated earlier in the SDEIS (such as Table 3.2-4). Therefore, the Category 4 Stockpile would be completely removed by year 11.	Change has been made, as requested.
PolyMet	The second paragraph describes reclamation of the Ore Surge Pile as "…any remaining material would be relocated to the West Pit after operations cease." However, no material will be disposed of in the West Pit. As described in Section 7.2.2 of the Rock and Overburden Management Plan (v5), any material remaining in the Ore Surge Pile at the end of operations will be transported to the Process Plant for processing or disposed of in the East Pit.	Change has been made, as requested.
PolyMet	The fifth paragraph on this page, which lists all ponds that would be either filled or converted to wetlands, should include the Rail Transfer Hopper Pond.	Change has been made, as requested.
PolyMet	The fourth paragraph under the heading "Water Management" states that "[b]ased on the current GoldSim P90 model predictions, treatment activities could be required for a minimum of 200 years at the Mine Site . . . ." This statement is inaccurate and inconsistent with the discussion of the GoldSim water quality modeling elsewhere in the SDEIS.	Change has been made, as requested.
PolyMet	Section 1.3.2.2 should identify the fact that PolyMet does not agree with the USFS legal position. This could be done by cross-reference to the appropriate sections in the 2009 DEIS that discuss this issue in greater detail than the SDEIS. For example, a simple cross-cite to Section 1.3.2.2 of the 2009 DEIS would ensure that the reader is aware that additional information on this topic is contained in the 2009 DEIS. PolyMet notes that the SDEIS repeats the	The FEIS has been revised to address this comment.

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	USFS position (i.e., that mining cannot occur within the Federal Lands) in many places; as a result, it would be appropriate to note that PolyMet does not agree in most of the places where this issue is described.	
PolyMet	The SDEIS states: "Throughout operations, the average annual makeup water drawn from Colby Lake would vary between 20 and 810 gallons per minute (gpm), with an average annual demand of 275 gpm." These numbers are inaccurate. The sentence should be revised to show a variation between 120 and 860 gallons per minute (gpm), with an average annual demand of 320 gpm. This section should also acknowledge that additional Colby Lake water would be needed for stream augmentation.	Change has been made, as requested.
PolyMet	In the second full paragraph on this page, PolyMet recommends providing additional details on the probable maximum precipitation (PMP) to make it clear that the likelihood of the emergency overflow channel being used is extremely low. PolyMet suggests editing the text to read: "Pond elevation would be controlled by pumping any excess FTB pond water to the WWTP. An emergency overflow channel would be constructed as a backup means of controlling pond elevation, but discharge from the emergency overflow is not expected. The emergency overflow is provided for protection of the dams in the rare event that freeboard within the FTB is not sufficient to contain all stormwater. Such instances have the potential to occur in the event of a probable maximum precipitation (PMP) rainfall event or some fraction thereof. PMP rainfall events are rare and such an event has a low likelihood of being experienced during the life of the basin. The PMP does not have an assigned return period, but it is usually assumed by hydrologists to be on the order of 100 million to 10 billion years. Based on extrapolation of 72-hour rainfall depth data from US Weather Bureau-Office of Hydrology Technical Paper TP 49, and the assumed return period of the PMP of 100 million years, a 1/3 PMP event could occur roughly once in 1,000 years and a 2/3 PMP could occur once in 500,000 years. On this basis, even though there is a low likelihood of overflow, it is standard practice in dam design to accommodate even low probability overflows in a manner that protects the integrity of the dams. Given the low likelihood that there would ever be flow in the emergency overflow channel, it is not considered in the impact analysis."	Change has been made, as requested.
PolyMet	The third paragraph in Section 3.2.2.3.12, "Reclamation and Long-term Closure Management," contains a list of "reclamation objectives" and "post-reclamation activities." These terms are not used consistently with the	Change has been made, as requested.

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	applicable Minnesota Rules. Under the non-ferrous rules, there are two distinct periods during reclamation: closure and post-closure. "Closure" is a "process" that begins when mining ceases, and ends when the reclamation standards identified in the reclamation plan have been achieved. Thus, while it may be reasonable to describe "reclamation objectives" for the NorthMet Project Proposed Action, it would be more accurate to indicate that these objectives will be achieved during the closure process. "Post-closure maintenance" activities are defined in the applicable rules as activities necessary to "sustain reclamation." Postclosure maintenance activities begin when the closure process is complete, and end when active reclamation (e.g., water treatment plants) is no longer necessary to sustain reclamation standards. Thus, the activities described in this paragraph as "postreclamation" are more accurately described as "post-closure maintenance activities." The same comment applies to text on page 3-137.	
PolyMet	The first sentence of the third paragraph in Section 3.2.2.4, "Financial Assurance," states that the engineering design and planning needed to calculate financial assurance "is typically made available during the permitting process and was not available at the time that this SDEIS was prepared." While this statement is generally accurate, it leaves a misleading impression that something is missing from the SDEIS. The paragraph should specify that NEPA and MEPA regulations do not require a discussion of financial assurance, and that PolyMet has voluntarily provided as much information as possible at the present time.	Section 3.2.2.4 has been revised to address this comment.
PolyMet	The first sentence in the second full, non-bulleted paragraph on this page indicates that a final Reclamation Plan and Contingency Reclamation Cost Estimate will be based on studies "finalized through permitting (pursuant to the EIS process)." This reference to permitting pursuant to the EIS process is confusing and should be clarified. PolyMet is not certain what the SDEIS is trying to convey about the relationship between the permitting and EIS processes, but it should be noted that those are separate processes and that information gathered during the EIS process will be used when agencies make permitting decisions.	Change has been made, as requested.
PolyMet	Table 3.2-16 on page 3-147 provides a comparison of DEIS and SDEIS proposed actions. The table cell corresponding to the first row/first column of the table should state that "Category 1 and 2 waste rock would be stored in a permanent lined/ soil covered stockpile (Category 1/2 Stockpile) north of the	Change has been made, as requested.

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	west pit (years 1-11).” This edit makes clear that the SDEIS proposed action (described in the second column of the table as including “a geomembrane cover system”) will include a significantly improved cover system relative to the cover described in the DEIS. The third column of Table 3.2-16 should also acknowledge the other improved outcomes related to the addition of a geomembrane cover system to the Category 1 Stockpile. For example, the following additional bullet could be added to column three: “Substantial reduction of stockpile seepage volume that will need to be collected and treated at the WWTF and significant improvement in West Pit water quality in closure.”	
PolyMet	General comment on all Cultural Resources Sections in Chapters 4, 5 and 6: The SDEIS often references consultation with the Bands and SHPO, but fails to include PolyMet in these references. When discussing consultation under Section 106 of the NHPA, PolyMet, as the project proponent, should be identified as a consulting party and should be included in the explanation of the Section 106 process. Examples of where PolyMet should be noted/included as a consulting party include: the third to last sentence on page 4-259 (Section 4.2.8.3); the last full sentence on page 4-262 (Section 4.2.9.2.1); the second to last sentence in Section 4.2.9.2.2 on page 4-263; the second to last sentence in the second to last paragraph on page 4-264; the second to last paragraph on page 4-302; the last full paragraph on page 4-303; the third paragraph on page 4-555; the second and third paragraphs on page 5-479; the first full paragraph on page 5-482; the second to last full paragraph on page 5-483; the last paragraph on page 5-673; and the first paragraph on page 6-89.	Change has been made, as requested.
PolyMet	This table lists the mercury TMDL target date for Sabin Lake, Esquagama Lake, and Colby Lake as 2015. The target date for those water bodies is 2025. (source: MPCA 2013. Minnesota’s Final 2012 TMDL List (Section 303(d) Impaired Waters List. List approved by USEPA, July 25, 2013).	Change has been made, as requested. Table 4.2.2-2 has been revised to include 2025 as the TMDL target date for Sabin Lake, Esquagama Lake, and Colby Lake.
PolyMet	In the first sentence of the second paragraph, the order of Duluth Complex and Partridge River intrusion should be switched. The Partridge River intrusion is part of the Duluth Complex.	Change has been made, as requested.
PolyMet	In the second sentence of the second paragraph, the use of “Mesabi Iron Range” is misleading, as it could give the impression that the Duluth Complex is in direct contact with the Biwabik Iron Formation, which is not the case. PolyMet recommends listing a geologic unit (Virginia Formation)	Change has been made, as requested.

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	here, rather than the more vague term "Mesabi Iron Range." In addition to the cross-section shown on Figure 3.2-10, it would be helpful to include a plan view bedrock geology map to illustrate the geometric relationships between the various bedrock units.	
PolyMet	The second sentence of the second full paragraph states: "Based on limited MDNR well records within the NorthMet Project area, natural groundwater levels in the glacial till vary seasonally between 3 and 10 ft bgs." This sentence incorrectly states that the data is limited. Site-specific data on seasonal water level fluctuations is found in the Water Modeling Data Package Volume 1 – Mine Site (referenced in the SDEIS as PolyMet 2013i). PolyMet 2013i provides information on water level fluctuations observed in 24 wells completed in the glacial till at the Mine Site, some with over nine years of water level measurements. Water level fluctuation varies between wells, but the overall range observed in a single well is typically less than 4 ft.	Change has been made, as requested.
PolyMet	The range of dates cited in the bullets listed under "Baseline Groundwater Quality" is inconsistent with the groundwater data used for water quality modeling. For example, 2012 data from MW-05-02, MW-05-08, and MW-05-09 were used for the modeling. PolyMet recommends removing the dates from these bullets or revising the list so that range of dates is consistent with data used to develop Table 4.2.2-6. The range of dates for groundwater data used for the water quality modeling is as follows: • Three older wells in the surficial aquifer, sampled from March 2005 through June 2012. • 21 newer wells in the surficial aquifer, installed in November 2011 – February 2012, sampled following installation through June 2012. • Five observation wells in the upper 100 ft of the bedrock, sampled from 2006 to 2010 (current SDEIS text is correct for this bullet). • Four large-diameter bedrock wells, sampled during aquifer testing in 2005 and 2006.	Change has been made, as requested.
PolyMet	It is not clear how the baseline values that are shown in Table 4.2.2-6, and used for comparison with the site-specific data, were selected. The Northeast MN baseline data appear to be derived only from the "unconfined buried Quaternary aquifer" category. However, the MPCA study also includes data for "buried Quaternary artesian aquifers" and "Quaternary water table aquifers." Either the range shown in Table 4.2.2-6 should reflect data from all	Values in FEIS Table 4.2.2-6 were taken only from one of the three tables provided in the 1999 MPCA study. For the FEIS, minimum and maximum data was extracted from all three tables and provided. Conclusions have not changed; however, the range of concentrations has increased.

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	Quaternary aquifers in the MPCA report or the Final EIS should provide an explanation as to why only a certain subset of data presented is provided.	
PolyMet	The first paragraph describes USGS gage 04015475 as the flow record most representative of the Project area. However, this section also should acknowledge the presence of the recently-installed (for Teck American) flow gage at the Dunka Road crossing near the southeast corner of the proposed Mine Site (monitoring location PM-3/SW003) and note that, while closer to the Mine Site, the short period of record is insufficient for use in the SDEIS. This gage also should be shown on Figure 4.2.2-1.	Change has been made, as requested.
PolyMet	In the first paragraph, the text describing existing upper Partridge River water quality should mention mercury and aluminum concentrations exceeding water quality standards. The text also describes dissolved oxygen at SW002 as the only consistent exceedances. PolyMet reads the term "consistent" as meaning that all samples at that location exceeded the standard, but that should be made more clear the text. The term "consistent exceedances" also appears in section 4.2.6.1.2 (page 4-220), and it should be used in the same way in that section.	No change made.
PolyMet	There are multiple inaccuracies in Table 4.2.2-14 that should be addressed: 1. The average concentrations presented in Table 2.2.2-14 should include 2012 data. The 2012 data is included in Large Table 10 of the Water Modeling Data Package, Volume 1 – Mine Site v12. 2. The number of samples at SW004a and SW004b in footnote 5 is incorrect and should also include 2012 samples. The 2012 data omitted from the number of samples is included in Large Table 10 of the Water Modeling Data Package, Volume 1 – Mine Site v12. The number of samples at SW004a and SW004b should be 12 samples for each location. 3. The ranges of concentrations presented in Table 4.2.2-14 do not include the 2012 data and, therefore, may be inaccurate if maxima or minima occurred in 2012. 4. The range provided for mercury concentrations (<0.0025 ng/L to 0 ng/L) is not accurate; mercury concentrations provided in the Water Modeling Data Package – Volume 1 Mine Site v10 range from <0.5 ng/L to 18.5 ng/L.	Change has been made, as requested.
PolyMet	Section 4.2.2.2.2, p. 4-77, Table 4.2.2-14, Section 4.2.2.2.2, p. 4-80, Table 4.2.2-15, Section 4.2.2.2.2, p. 4-87, Table 4.2.2-18, Section 4.2.2.3.2, p. 4-123, Table 4.2.2-29, Section 4.2.2.3.2, p. 4-132, Table 4.2.2-35:	The referenced tables have been revised to address this comment.

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	The minimum values in constituent concentration ranges shown in these tables are presented as less than half the minimum detection limit. Minimum concentrations (when not detected) should be presented consistently as either less than the minimum detection limit (e.g., " < 10 mg/L") or as a numeric value equal to half the minimum detection limit without a less than symbol (e.g., " 5 mg/L"). If the latter approach is used, the footnotes should note that minimum values represent one half the detection limits.	
PolyMet	The third sentence of the fourth paragraph presents a recharge rate of 0.3 in/yr, which is inconsistent with the mean value of 0.61 in/yr used in the GoldSim model. As discussed in Sections 5.2.1.3.1 and 5.2.1.3.2 of this document, average net recharge in the Embarrass River watershed is estimated at 0.61 inches per year. A recharge rate of 0.3 in/yr represents the minimum value used in the GoldSim recharge distribution (PolyMet, 2013j; Section 5.2.1.3.2); however, it would be more appropriate to use the average value, rather than the minimum value, for the groundwater flow discussion in the SDEIS.	FEIS Table 5.2.2-11 reports the GoldSim P50 (median) aquifer recharge flux input of 0.76 in/yr for all Tailings Basin flowpaths.
PolyMet	Data for the Cell 1E pond should be included in this table. Cell 1E pond data are shown in Large Table 7 of the NorthMet Project Water Modeling Data Package, Volume 2 - Plant Site, Version 9, March 1, 2013.	No change made.
PolyMet	Regarding the first sentence, PM-13 is not "just downstream of the Heikkila Lake tributary." It is more accurate to say PM-13 is downstream of the Unnamed Creek tributary.	The FEIS has been revised to address this comment.
PolyMet	In the second sentence, it is unclear what "low flows" refers to. Based on the low flows presented in Table 4.2.2-27, PolyMet assumes the co-leads are referring to "baseflow." This should be clarified.	Change has been made, as requested.
PolyMet	In the third paragraph, the text describing the number of samples collected at PM-12.2, PM-12.3, and PM-12.4 should include data from 2012 (2012 data appears to be included in subsequent Table 4.2.2-29). The 2012 data is included in Large Table 4 of the Water Modeling Data Package, Volume 2 – Plant Site v9.	The FEIS has been revised to address this comment.
PolyMet	The row for PM-12 should reflect that data was collected in 2012 at this location.	Change has been made, as requested.
PolyMet	Data for PM-11 should not be presented in Table 4.2.2-34, which is titled "Summary of Surface Water Quality Monitoring Data for the Tailings Basin Surface Seeps." Monitoring location PM-11 is located downstream of the Tailings Basin on Unnamed Creek and is not representative of a seep. Data for PM-11 should be included in Table 4.2.2-35 (which includes tributary	Change has been made, as requested.

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	streams) instead.	
PolyMet	In the second to last sentence of the first full paragraph, it should be clarified that seepage and dead spruce trees are not a cause-and-effect relationship. There are many beaver dams in the area that likely play a role in the presence of dead spruce trees.	The FEIS has been updated to address this comment.
PolyMet	The last sentence under "National Hierarchical Framework of Ecological Units" reads: "Inclusion of the One Hundred Mile Swamp would likely complete representation of prominent ELTs in LTA 212Le11." Polymet suggests clarifying by revising this sentence is to say: "The One Hundred Mile Swamp and the two other sites surveyed provide a complete representation of the prominent ELTs present within LTA 212Le11."	Change has been made, as requested.
PolyMet	The third sentence of the third paragraph suggests that PolyMet will submit a revised wetland permit application. In fact, PolyMet has already submitted a revised wetland permit application, which appears as "PolyMet 2013q. NorthMet Project Revised Wetland Permit Application, Version 1. Issued August 19, 2013" in the references.	The FEIS has been updated to address this comment.
PolyMet	The first sentence of this section references three figures for the location of the Mine Site, in relation to Iron Lake and the Laurentian Divide. However, none of the figures show Iron Lake or the Laurentian Divide. The text should be revised to account for this or the figures should be edited to include Iron Lake. This issue occurs in other sections as well, such as the first sentence of Section 4.3.3.1.	The FEIS text has been edited. The Laurentian Divide boundary was added to FEIS Figure 4.2.2-1, and FEIS Section 4.2.3 refers to this figure. The reference to Iron Lake was removed.
PolyMet	The third sentence of the first paragraph should cite the USACE memo (USACE, May 2013) in addition to the baseline wetland type evaluation.	No change to EIS; USACE memo does not cite this information.
PolyMet	The first sentence of the third paragraph reads as though vegetation types are indicative of pre-settlement conditions. However, this is misleading, as there has been a significant amount of logging disturbance throughout the mine site.	The FEIS has been updated to address this comment.
PolyMet	General comment in Sections 4.2.4, 4.3.4, 5.2.4 and 5.3.4 Scientific and common names are used inconsistently throughout these sections. PolyMet recommends using consistent terms throughout the document for clarity.	Change has been made, as requested.
PolyMet	The text on page 4-192 names three ETSC species in Transportation and Utility Corridor, but Table 4.2.4-7 only lists one of these species. This inconsistency should be resolved.	No changes made. The text preceding this Table 4.2.4-7 explains that the other species overlap the Mine Site, and thus are not double-counted in the Transportation and Utility Corridor.

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PolyMet	General Comment to Sections 4.2.5, 4.3.5, 5.2.5, 5.3.5[:] PolyMet recommends either substituting the word "bat" for the term "Myotis" or adding "(bat)" after "Myotis."	Change has been made, as requested.
PolyMet	In the fifth paragraph, the statement that lynx critical habitat "includes most of northeastern Minnesota" is imprecise. PolyMet recommends adding the clarification that the USFWS designated critical habitat does not include most of the Iron Range.	No change made.
PolyMet	The last sentence of the third paragraph references "forest and brush habitats" but parenthetically cites MIHs 1 to 14. PolyMet believes the citation was intended to be MIHs 1 and 14.	No change made.
PolyMet	Regarding the last sentence of the third paragraph [(under Bald eagle heading)], there are no standing dead trees in the existing LTVSMC Tailings Basin.	Text has been clarified to state, "Eagles may use standing dead trees near the existing LTVSMC Tailings Basin for perching."
PolyMet	The second paragraph should reference Moose zone 3, not Moose zone 30.	No change made. The moose zone is 30 according to MDNR information and maps.
PolyMet	The fourth sentence of the second paragraph incorrectly states that the Tailings Basin is "unlikely to be heavily used by wildlife." The Tailings Basin is a local refuge for herds of deer, small mammals and wolves.	No change made.
PolyMet	The first sentence in the first paragraph references the Longnose, Wetlegs and Wyman creeks as surface water features in the Upper Partridge River Watershed. However, there is no discussion on these creeks or a reference to a previous discussion in the SDEIS. PolyMet recommends either providing a similar discussion of that provided for Mud Lake, Yelp Creek, and Second Creek on page 4-214 or explaining why such analysis is not provided.	Change has been made, as requested.
PolyMet	The second sentence uses the term "watershed" while the third sentence uses the term "larger watershed." PolyMet suggests explaining the difference between a "watershed" and a "larger watershed."	No change made.
PolyMet	The first sentence of the third paragraph should be revised to add Yelp Creek to the list of streams where "no fish or macroinvertebrate community or habitat characteristics could be documented . . . ."	No change made. Fish and macroinvertebrate sampling occurred at the confluence of Yelp and Partridge River.
PolyMet	The source of data for these stream surveys should be revised as "Source: Breneman 2005, Barr 2011b, and MPCA 2011c." Barr 2011b is the source of the information for the PM sites.	Change has been made, as requested.
PolyMet	PolyMet recommends that the introductory paragraph state that the NHPA process is proceeding on a parallel path to the NEPA process, and that effects on cultural resources have also been considered and analyzed under NEPA.	No change made.

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PolyMet	The last sentence of the introductory paragraph states: "Cooperating agencies have not participated in production or endorsement of any components of the EIS or the NorthMet Project." This statement is not entirely accurate, since the tribes have participated in the production of components of the EIS relative to cultural resources as well as the Major Differences of Opinion. The EIS should describe the tribes' participation in the development of the EIS.	Change has been made, as requested.
PolyMet	The second-to-last paragraph is unclear, both with respect to whether it is discussing groundwater and/or surface water, and with respect to how that discussion fits into the APE analysis. Figure 4.2.9-5, which is not referenced in this paragraph, is a groundwater quality APE, but most of the paragraph discusses surface water quality. PolyMet recommends revising this paragraph to explain how groundwater and surface water affect the APE.	Change has been made, as requested.
PolyMet	The term "Sensitive Fines" is used on the Figure, yet neither Geotechnical Data Package, Vol. 1, Version 4, nor preceding versions use the name "Sensitive Fines." April 12, 2013 Geotechnical Data Package, Vol. 1, Version 4 uses the name "Fine Tailings/Slimes." This material type is missing from the Legend on the lower left corner of Figure 4.2.14-3.	Information in the figure was sourced from the Geotechnical Data Package Volume 1 (PolyMet 2014x, as cited in the FEIS). Sensitive fines have been removed from the FEIS figures.
PolyMet	Units and labels are missing from axes [of Figure 4.2.14-3] (e.g., elevation in feet amsl and distance in feet) and the dashed lines in the figures are not in the legend (layers of material).	Dashed lines removed, distance and elevation on axis.
PolyMet	In the first full sentence [of Section 4.3.3.1.1, p. 4-434], floodplains should be clearly defined, and PolyMet recommends including a figure showing mapped floodplains with wetlands.	A definition of floodplain is included in the FEIS and the floodplains are shown on Figures 4.3.3-2 and 4.3.3-5.
PolyMet	The table combines coniferous bogs and coniferous swamps. PolyMet recommends separating these two wetland types here, in the same way that they are separated for discussions of the federal lands. This is also an issue in Tables 4.3.3-6, 4.3.3-8, 4.3.3-10, 4.3.3-12.	Please refer to theme WET17 response.
PolyMet	The table contains inaccurate acreage for open bog and shallow marsh. Open bog should be 2.1 acres, and shallow marsh should be 84.1 acres. In addition, the third sentence under Table 4.3.3-6 should also be edited from: "Large bogs dominate much of the east-central portion of Tract 1" to the suggested "Shrub swamps dominate much of the east-central portion of Tract 1." The current sentence is inaccurate because there are only 2 small bogs (2.1 acres total) on the Hay Lake parcel.	Tables in the FEIS have been corrected. FEIS language was reviewed and no change to this sentence.
PolyMet	In footnote 2 [of Table 4.3.4-5], PolyMet suggests deleting the phrase "additional populations may be present in more marginal, secondary habitat that was not surveyed, or in wetter areas." There is no evidence (no survey) of	Change has been made, as requested.

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	additional populations in marginal, secondary habitat, and the SDEIS should make that clear.	
PolyMet	This section [(4.3.5.2.1)] discusses "species of tribal concern." This is not a legal category. PolyMet recommends deleting this phrase.	No change made.
PolyMet	The first sentence in the second paragraph should be revised to read "Some of the non-federal lands… ." Not all of the non-federal lands have streams, creeks, rivers, or lakes on them.	Change has been made, as requested.
PolyMet	This paragraph incorrectly compares Coyote Creek with Stony River. These are not comparable systems. The Stony River is a higher order, more diverse aquatic system than the first order, headwaters Coyote Creek. It cannot be assumed that the conclusions drawn from the studies for Stony River are applicable to Coyote Creek.	No change made. The text is not comparing the two systems but only states that since high quality habitat is likely present in Coyote Creek some of the fish species present within the Stony River could be present in the headwater habitats of Coyote Creek.
PolyMet	The second paragraph is one sentence and cites "MIH 14." PolyMet recommends that this paragraph first provide some description of the MIH 14 before making the statement it currently contains.	Change has been made, as requested.
PolyMet	The first sentence of the second full paragraph states that the "groundwater containment system would capture at least 90 percent of seepage from the Tailings Basin." This is incorrect. The system will capture 100% of surface seepage and upwelled water, and at least 90% of seepage that remains as groundwater flow. Overall, 99% of seepage from both surface and groundwater will be captured. The sentence, as written, implies that the system will be less effective than it will be.	Change has been made, as requested.
PolyMet	The 4th paragraph states: "With the proposed design modifications and engineering controls, the water quality model predicts that the NorthMet Project Proposed Action would not cause or increase the magnitude of an exceedance of the groundwater and surface water quality evaluation criteria at the P90 level for any of 28 solutes at 29 groundwater or surface water evaluation locations within the Partridge River and Embarrass River watersheds…" PolyMet proposes the following language: "With the proposed design modifications and engineering controls, the water quality model predicts that the NorthMet Project Proposed Action would not cause or increase the magnitude of an exceedance of the groundwater and surface water quality evaluation criteria at the P90 level for any of the 27 solutes and mercury (further addressed below) at 29 groundwater or surface water evaluation locations within the Partridge River and Embarrass River watersheds…"	The FEIS has been revised to address this comment.

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PolyMet	The 3rd paragraph states: "Within the water quality modeling, estimated concentrations for these six metals are compared to hardness-based standards at each model evaluation location and each model time step to determine compliance with the evaluation criteria." PolyMet proposes the following language: "Within the water quality modeling, modeled concentrations for these six metals are compared to hardness-based standards at each model evaluation location and each model time step to determine compliance with the evaluation criteria."	Change has been made, as requested.
PolyMet	The 4th paragraph states "Methylmercury is much more of a problem than inorganic mercury, in that it can accumulate to concentrations of concern in the aquatic food chain, it is more bioavailable than inorganic mercury, and it can bioaccumulate in fish, wildlife, and humans." The term "problem" suggests a conclusion, when this sentence is actually describing concerns. PolyMet proposes the following language: "Methylmercury is more of a concern than inorganic mercury, in that it can accumulate to concentrations of concern in the aquatic food chain, it is more bioavailable than inorganic mercury, and it can bioaccumulate in fish, wildlife, and humans."	Change has been made, as requested. The word "problem" has been replaced with the word "concern".
PolyMet	The first sentence at the top of the page reads: "Research suggests that total mercury concentrations in streams and methylmercury content in fish are roughly proportional within individual watersheds (USGS 2010), such that, for example, a 5 percent increase in total mercury in water would be expected to result in about a 5 percent increase in mercury content in fish within that watershed." This sentence should be changed to clearly state that the potential incremental change in fish mercury concentration is an evaluation criterion and that MPCA's Mercury Risk Estimation Method (MMREM) was used to assess the potential changes in fish mercury concentrations in nearby lakes. The MMREM is a method that relies on empirical fish contamination data, combined with the principle of proportionality between mercury in fish and atmospheric deposition (MPCA 2006a, as cited in the FEIS, MMREM guidance document).	Change has been made, as requested. Additional text has been included.
PolyMet	Modeling results for location UC-1 are not presented in the SDEIS. Therefore, this location should not be shown in Figure 5.2.2-6 as a model evaluation location.	Change has been made, as requested.
PolyMet	The 3rd and 4th sentences of the first paragraph should be clarified to reflect that the Plant Site MODFLOW model was not calibrated to baseflow in the Embarrass River, nor was the model used to estimate baseflow.	Change has been made, as requested.

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PolyMet	Regarding the last sentence on the page, the regional MODFLOW model calibration was not updated to the revised baseflow estimates from XP-SWMM. The Mine Site Water Modeling Data Package Attachment C provides: "The regional model calibration was not updated because the original calibration did not incorporate a baseflow estimate and previous sensitivity analysis indicated that the local-scale model results were not sensitive to the lateral boundary conditions that were defined by the regional model (Barr, 2007). Therefore, the perimeter boundary conditions for the local-scale model remained unchanged."	Change has been made, as requested.
PolyMet	The footnote on the "Specific yield" column of the table [(5.2.2-9)] only applies to the surficial deposits, not the entire column in the data table.	Change has been made, as requested.
PolyMet	The 1st paragraph states: "GoldSim was programmed with a suite of complex algorithms to estimate the release of contaminants from mine facilities (i.e., "sources") and their transport to groundwater and surface water evaluation locations." PolyMet suggests the following language: "GoldSim was programmed with a suite of algorithms to estimate the release of contaminants from mine facilities (i.e., "sources") and their transport to groundwater and surface water evaluation locations."	Change has been made, as requested.
PolyMet	The 1st paragraph states: "The onset of acidic pore water is also problematic, as these conditions cause the rate of sulfide oxidation to increase and the concentration of metals to increase as precipitates dissolve." PolyMet suggests the following revision: "The onset of acidic pore water is also of concern, as these conditions cause the rate of sulfide oxidation to increase and the concentration of metals to increase as precipitates dissolve."	Change has been made, as requested.
PolyMet	The bulleted list near the middle of the page provides slightly incorrect sulfide sulfur ranges for the waste rock classification criteria, as well as an incorrect reference for this information. The sulfide sulfur classification criteria for the categories of waste rock should be revised as follows: • Category 1 – sulfur content less than or equal to 0.12%. • Category 2 – sulfur content greater than 0.12% and less than or equal to 0.31%. • Category 3 – sulfur content greater than 0.31% and less than or equal to 0.60%. • Category 4 – sulfur content greater than 0.60%. Categories 2 and 3 are combined to produce Category 2/3 with sulfur content greater than 0.12% and less than or equal to 0.60%.	Change has been made, as requested.

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	This information can be found in Section 4.4.1 of the Waste Characterization Data Package v10 (PolyMet 2013)	
PolyMet	The first sentence of the last paragraph on page 5-53 states that "the GoldSim model simulates constituent release from waste rock based on assumptions that either extrapolate from conditions observed under field-scale weathering of similar rock (Category 1 waste rock) or in laboratory tests (Category 2, 3, and 4 waste rock, and ore)." This should be revised to indicate that constituent release for all categories of rock is based on data from laboratory tests. Constituent release rates for all categories of rock are estimated by applying a scaling factor to lab rates to account for likely differences between field and lab conditions. The scaling approach differs between Category 1 and the other categories of rock, but release rates for all categories of rock are based on laboratory data.	Change has been made, as requested.
PolyMet	The second paragraph states: "The 80 percent rate is used because seepage from the south side of Tailings Basin is likely higher than the flow contribution to Second Creek that would occur from the Basin footprint for natural ground conditions (i.e., if the Tailings Basin were not present)". This statement is not correct. The 80% is to limit the project impact on flow to +/- 20% of existing conditions, as is recommended by MDNR on Page 5-14.	Change has been made, as requested.
PolyMet	PolyMet suggests revising the third full paragraph as follows: "WWTP effluent that would be used remaining after flow augmentation to Second Creek would be discharged to the three Embarrass River tributaries (Unnamed, Trimble, and Mud Lake creeks), as partial or complete fulfillment of required augmentation to maintain downstream hydrology and wetland function in Second Creek and the three Embarrass River tributaries (Barr 2013a). Pumping from Colby Lake would be used to meet any remaining augmentation requirement."	No change made.
PolyMet	The second paragraph states: "Tailings seepage bypassing the containment system (approximately 19.4 gpm) would continue… ." On page 5-8 (Section 5.2.2) and in Table 5.2.2-36, the flow bypassing the containment system is said to be "about 21 gpm." PolyMet recommends revising for consistency.	Change has been made, as requested.
PolyMet	The active source period for the Category 4 Stockpile is incorrect. The stockpile will be removed during the development of the Central Pit and will be entirely removed by the end of Mine Year 11.	Change has been made, as requested.
PolyMet	The last full paragraph should acknowledge that the pH in the East Pit backfill will be monitored and adjusted by the addition of alkaline water from the WWTF as backfilling progresses in order to maintain circum-neutral	Change has been made, as requested.

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	conditions in the backfill pore water.	
PolyMet	The SDEIS states: "The quality of this aquifer inflow would reflect the quality of the pit lake water, which would gradually improve over time due to cycling through the WWTF." However, the West Pit water will not be cycled through the WWTF during reclamation. PolyMet suggest revising the text to: "The quality of this aquifer inflow would reflect the quality of the pit lake water, which would gradually improve over time due to the effectiveness of the reclamation activities at the site."	Change has been made, as requested.
PolyMet	The SDEIS states: "Cobalt was generally used to illustrate groundwater transport at the Mine Site because it is not attenuated and would enter the surficial flowpaths at concentrations higher than baseline groundwater." This statement is misleading. PolyMet suggests rewording to the following: "Cobalt was generally used to illustrate groundwater transport at the Mine Site because the model did not account for attenuation, and would enter the surficial flowpaths at concentrations higher than baseline groundwater."	Change has been made, as requested.
PolyMet	The first paragraph incorrectly states that flow augmentation must be at least 145 or 180 gpm, which is 80% of capture flow rate of the current south-side seepage. Table 5.2.2-40 shows 400 gpm, which is the correct rate for augmentation (see The Water Modeling Data Package – Volume 2 Plant Site v9). The same error is made in the last paragraph on Page 5-153 (Section 5.2.2.3.2).	No change made.
PolyMet	The first paragraph of this section only discusses quantities of seepage during closure and not operations. The paragraph below could be added to discuss these aspects during operation: "During operations, the Category 1 Stockpile would be uncovered. Infiltration would percolate to the bottom of the stockpile and be collected by the surrounding groundwater containment system. As the stockpile footprint is expanded, the total seepage during operations will increase up to a maximum annual flow of between 290 gpm and 440 gpm. Most of this seepage would be collected and sent to the WWTF for treatment; an estimated peak flow of 20 gpm to 30 gpm would pass below the containment system and be drawn by gravity into the dewatered West Pit."	Change has been made, as requested.
PolyMet	This table [(5.2.2-28)] is consistent with what was provided in the AWMP, but the corresponding text on Page 5-125 leaves the inaccurate impression that the effluent targets were what was modeled as effluent concentrations. The text should be modified to match the table.	No change made.

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PolyMet	The use of the term "non-contact stormwater" in this table [(5.2.2-29)] and elsewhere in the text is somewhat confusing, as it seems to imply that this is water being managed by PolyMet. PolyMet recommends using the more appropriate term "unimpacted watershed runoff."	No change made.
PolyMet	The first paragraph on this page should acknowledge that there is a low probability for exceedances caused by the project.	No change made.
PolyMet	Unnamed Creek should be included in the discharge locations for the WWTP effluent. SD006 is the location for Unnamed Creek, not Second Creek. The table organization contradicts language found in the last paragraph of page 5-177, which states "augmentation flow to Unnamed Creek would be via a single discharge near the current SD006 discharge."	Change has been made, as requested.
PolyMet	The text states: "The rate at which contaminants would move through the groundwater would be the same as the groundwater seepage velocity downgradient of the containment system for all but four constituents (arsenic, antimony, copper, and nickel)."...Because no attenuation values are used for the constituents – other than arsenic, antimony, copper, and nickel – the modeled rate of groundwater transport will be faster than the actual rate of transport in the ground. PolyMet recommends noting this fact in the text.	Change has been made, as requested.
PolyMet	The second to last paragraph states: "…the concentrations of these metals in the WWTP effluent would be significantly higher than the concentrations in the current Tailings Basin seepage…" This sentence should be revised to use the term "modeled concentrations…" The modeled effluent concentrations from the WWTP are higher than the values reported in pilot testing of the proposed treatment systems for the WWTP, but were selected to be near, and slightly below, the potential effluent limit for the modeled constituents to provide a conservative assessment of potential consequences related to downstream water quality. PolyMet also recommends making this adjustment in Table 5.2.2-47 on page 5-188.	Change has been made, as requested.
PolyMet	The second to last paragraph states: "…the average aluminum concentration in the WWTP influent and effluent would be about 10 mg/L…" This should be 10 µg/L.	Change has been made, as requested.
PolyMet	The first paragraph following the bulleted list states: "This dilution effect is demonstrated by the increase in measured aluminum concentrations from upstream tributary locations (UC-1, TC-1, and MLC-3) to downstream locations (PM-11, PM-19, and MLC-2), where upstream locations would average less than 100 µg/L compared to downstream locations averaging about 142 µg/L." It is unclear whether this refers to observed or modeled	Change has been made, as requested.

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	conditions. The use of the term "measured" implies reference to actual, observed data, but stating that upstream locations "would average less than…" implies model results. It also is unclear whether the 100 µg/L and 142 µg/L figures are modeled or observed.	
PolyMet	There appears to be inconsistency in the chromium standard that is used in this chapter. The referenced pages state: "Among the six constituents with hardness-based evaluation criteria (cadmium, chromium (III), copper, lead, nickel, and zinc)…" and Table 5.2.2-4 lists chromium (III), as the evaluation criteria with a hardness based standard. However, later in the document, the standard for chromium (VI) is used in Tables 5.2.2-30 and 5.2.2-42 for example. Please clarify which standard was used for chromium, and why.	Change has been made, as requested.
PolyMet	The number of pit lakes should be 16, not 21 as reported in this table [(5.2.2-49)].	Change has been made, as requested.
PolyMet	The third paragraph states "…precipitation, which averages about 9.8 ng/L based on average volume-weighted mercury in precipitation as measured at the Marcell Experimental Forest deposition site in Itasca County (NADP 2013)." Barr's analysis, consistent with the table on the next page, is based on 13 ng/L deposition based on the Fernberg Road site. PolyMet recommends citing the Fernberg Road concentration of 13.2 ng/L instead of the Marcell concentration of 9.8 ng/L. This comment also applies to the SDEIS's cumulative impact discussion in the first paragraph of p. 6-31 and second paragraph of p. 6-33 (Section 6.2.3.3.4).	Change has been made, as requested.
PolyMet	The second bullet, when explaining the predicted increase in mercury loading to the Embarrass River, states: "Tailings Basin containment system, which would collect seepage from the Tailings Basin, with an estimated mercury concentration of 1.1 ng/L, and route it to the WWTP, which would discharge with an assumed mercury concentration of 1.3 ng/L, for a net increase of 0.2 ng/L of mercury as a result of wastewater treatment, which is a conservative assumption." PolyMet suggests explaining that the reason this is conservative is because the WWTP would reduce mercury concentrations, and any additional mercury removal from installing a greensand filter, are not accounted for.	Change has been made, as requested.
PolyMet	The second bullet under NorthMet Project Proposed Action Design Changes states: "The location of the Category 4 Stockpile was shifted such that seepage would be captured in the Central Pit and East Pit and would minimize effects on surficial groundwater." The terminology and locations used here are confusing. PolyMet suggests the following instead: "The	Change has been made, as requested.

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	location of the Category 4 Stockpile was shifted such that water contacting the stockpile would be captured in the East Pit and would minimize effects on surficial groundwater."	
PolyMet	The sixth bullet states: "Refined Hydrometallurgical Flowsheet – A single (rather two) autoclave would be fed with nickel concentrate and produce copper concentrate produced with beneficiation refinements. The production of hydrometallurgical residue would be cut approximately in half with this design change. Residual copper would be recovered by cementation (contacting the leach solution with copper concentrate) to further upgrade the copper concentrate and to further reduce the production of hydrometallurgical residue." To be more precise, the last phrase should be changed to: "…, and to potentially further reduce the production of hydrometallurgical residue."	Change has been made, as requested.
PolyMet	The first bullet discusses subaqueous disposal of reactive waste rock, but it does not mention subaqueous disposal of some of the Category 1 waste rock. Although Category 1 waste rock is considered the least reactive waste rock, it should still be mentioned here.	Change has been made, as requested.
PolyMet	The fourth bullet discusses the use of side dump cars to haul ore and states: "Ore Transport – PolyMet proposes to use side-dump rail ore cars that would minimize ore spillage (PolyMet 2013c)." Side dump rail cars were proposed as part of the DEIS, as documented in DEIS Section 3.1.3; therefore, this is not a design change and should not be included in this section.	Change has been made, as requested.
PolyMet	The seventh bullet discusses the tailings basin containment system and refers to it as being "on the western, northern, and northeastern sides of the existing LTVSMC Tailings Basin." The containment system is not located along the northeastern side of the tailings basin; it is located on the western and northern sides of the tailings basin, as described appropriately on SDEIS Page 3-116 (under Engineering Water Controls).	Change has been made, as requested.
PolyMet	The first bullet, as part of a tabulation of fixed engineering controls, states: "Process water management, including pipes, pumps, and process water ponds that would be used to separate and control stormwater and process waters." This statement does not account for the fact that the process water ponds are lined. Accordingly, PolyMet recommends inserting "lined" before "process water ponds."	Change has been made, as requested.
PolyMet	The flow monitoring for stormwater has footnotes stating that flows would be monitored continuously. There are no pumps associated with this infrastructure, so continuous flow monitoring is not proposed for stormwater flows. Flows are proposed to be monitored on a monthly basis as specified in	Change has been made, as requested.

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	the Water Management Plan – Mine (v2) Section 5.2.	
PolyMet	table [5.2.2-53] includes water level monitoring for Whitewater Reservoir. This was not included in the Water Management Plan – Mine and has never been discussed with the agencies.	The FEIS has been revised to reflect most recent documentation.
PolyMet	The fourth bulleted item is misleading and should be clarified by changing the text in parentheses to say "within Area 1."	The FEIS has been revised to address this comment.
PolyMet	The first paragraph states "The analog approach was based on similar mine settings (e.g., within the glacial till region)." PolyMet proposes the following revision: "The analog approach used observations of groundwater response adjacent to iron range mines characterized by moderate to high hydraulic conductivity glacial and fluvial deposits overlying lower hydraulic conductivity bedrock."	The FEIS has been revised to address this comment.
PolyMet	The third sentence of the first full paragraph should be clarified by identifying the source and rationale behind using 675 square meters of watershed area per meter of track in the contributing watershed as the method for identifying potentially impacted wetlands.	The FEIS has been revised to address this comment.
PolyMet	In the second sentence of the third paragraph, it is an overstatement to suggest that wetlands represent pre-European settlement conditions, as the area was likely logged several times since settlement.	The FEIS has been revised to address this comment.
PolyMet	The second bullet should read: "In-kind mitigation means the replacement of the impacted aquatic site with the same wetland plant community type." See USACE, 2009, II.D.3.	The FEIS has been revised to address this comment.
PolyMet	The third bullet should read: "Out-of-kind mitigation means the replacement of an impacted aquatic site with a different wetland plant community type." See USACE, 2009, II.D.3.	The FEIS has been revised to address this comment.
PolyMet	In the second paragraph, the rule citation is incorrect as is the interpretation of the rule. The second paragraph should read: "The Federal Mitigation Rule also states that "difficult-to-replace" aquatic resources include bogs (33 CFR 332.3(e)(3) and Preamble, page 19633). The majority of the wetlands that would be affected by the NorthMet Project Proposed Action would be "difficult-to-replace" (coniferous bog and open bog) (USACE 2013, as cited in the FEIS). The Federal Mitigation Rule includes a provision for a case-by-case determination of mitigation ratios higher than the minimum 1:1 where necessary to account for the difficulty of restoring or establishing the desired aquatic resource type and functions."	The FEIS has been revised to address this comment.
PolyMet	The third sentence of the third paragraph is not supported by the data	The FEIS has been revised to address this comment.

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	collected for the project. None of the wetlands proposed to be affected by the project were rated as having exceptional vegetative diversity/integrity ratings.	
PolyMet	The second to last sentence in the fourth paragraph should read: "For effects on wetlands with rare or exceptional functions or difficult-to-replace bogs, the USACE may require additional compensation in accordance with District Policy and the Federal Mitigation Rule."	The FEIS has been revised to address this comment.
PolyMet	The first sentence of the second to last paragraph should read: "If none of these incentives are met, the minimum mitigation ratio required is 1.5:1."	The FEIS has been revised to address this comment.
PolyMet	The third paragraph states that base compensation ratios could be increased to 2:1. There is not rationale or reference provided for this statement, which is not specifically stated in the District Policy or Federal Mitigation Rule. The same comment applies to page 5-316 and page 5-321.	The FEIS has been revised to address this comment.
PolyMet	The 6 rows [in Table 5.2.3-17] beginning with "<50%..." and "<80%..." are not relevant to the PolyMet project and could be removed in order to maintain clarity.	The FEIS has been revised to address this comment.
PolyMet	The first paragraph after the list should read: "The financial assurance requirements would be part of the WCA permitting process for the NorthMet Project Proposed Action. Wetland replacement for the NorthMet Project Proposed Action is expected to be approved and constructed in advance of any authorized wetland effects (under the WCA approval) and, therefore, would not require financial assurance."	The FEIS has been revised to address this comment.
PolyMet	No reference is provided for the statements made in the fourth paragraph. Justification for why the wetland mitigation opportunities discussed in this paragraph were determined to not be practicable was provided in "Wetlands Mitigation Plan Supplement – Wetland Mitigation Planning and Siting Documentation," RS20T Draft-04, PolyMet, June 1, 2008. One additional difficulty with such wetland mitigation opportunities that was not discussed in the reference provided is the presence of severed mineral rights on many of those lands. In order to place restrictions on the land, as required for wetland mitigation, those mineral rights would need to be controlled.	The FEIS has been revised to address this comment.
PolyMet	In the last paragraph, the third sentence should read: "The mitigation would be considered in advance if the initial phases of restoration on all of the proposed off-site wetland mitigation sites would be completed at least one full growing season in advance of the authorized wetland effects provided initial performance standards are met for which the mitigation would compensate." Also, in the last paragraph, 939.4 acres is stated with no	The FEIS has been revised to address this comment.

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	reference. That number should be referenced to Tables 5.2.3-19 and 5.2.3-20 of the 404 permit application.	
PolyMet	In the fifth paragraph, the first sentence should read: "The minimum replacement ratio that would be allowed by the USACE is 1:1 (USACE, 2009) for those wetlands that would be replaced with the same wetland type, and at least one full growing season in advance of the authorized wetland effects provided initial performance standards are met; however, base compensation ratios could be increased to 2:1 (add reference) for effects on wetlands with rare or exceptional functions or difficult-to-replace bog wetlands."	The FEIS has been revised to address this comment.
PolyMet	The first sentence in the last paragraph (before the bullet), should read: "Under the Minnesota WCA, the replacement ratio that would likely be allowed is 1.5:1, because the Aitkin Site wetlands are out of the NorthMet Project area watershed (see Tables 5.2.3-18 and 5.2.3-20)."	The FEIS has been revised to address this comment.
PolyMet	The first sentence in the second paragraph should read: "The minimum replacement ratio that would be allowed by the USACE is 1:1 (USACE, 2009) for those wetlands that would be replaced with the same wetland type, and at least one full growing season in advance of the authorized wetland effects provided initial performance standards are met; however, base compensation ratios could be increased to 2:1 (add reference) for effects on wetlands with rare or exceptional functions or difficult-to-replace bog wetlands."	The FEIS has been revised to address this comment.
PolyMet	The first sentence in the third paragraph should read: "Under the Minnesota WCA, the replacement ratio that would likely be allowed is 1.5:1, because the Hinckley Site wetlands are out of the NorthMet Project area watershed (see Tables 5.2.3-18 and 5.2.3-20)."	The FEIS has been revised to address this comment.
PolyMet	The first sentence in the last paragraph should read: "The minimum replacement ratio that would be allowed by the USACE is 1:1 for those wetlands that are replaced with either the same wetland type, or at least one full growing season in advance of the authorized wetland effects provided initial performance standards are met; however base compensation ratios could be increased to 2:1 for effects on wetlands with rare or exceptional functions or difficult-to-replace bog wetlands."	The FEIS has been revised to address this comment.
PolyMet	The first sentence on the page (continuing from the previous page) should read: "For low- to moderate-quality wetlands, the recommended base ratio of 1.5:1 would be reduced to 1.25:1 for in place and could be reduced to 1:1 if also either in-advance or in-kind."	The FEIS has been revised to address this comment.

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PolyMet	The section on the Zim Site does not include any description of restoration methods and sequencing, which is included in the descriptions for the Aitkin and Hinckley sites. See "Zim Sod Wetland Mitigation Site Wetland Mitigation Plan" (PolyMet, November 2011) for an appropriate description.	The FEIS has been revised to address this comment.
PolyMet	A footnote should be added to the table [5.2.3-18] describing why there is 101.8 acres of on-site wetland mitigation shown in the second to last column but no associated wetland credits in the last column. Similarly, the same acreage is shown in the "On-Site (acres)" column, but no associated credits are shown in the "Total Credits" column.	The FEIS has been revised to address this comment.
PolyMet	The last paragraph states, "Approximately 72 percent of credits proposed would be located outside of the watershed." This statement is misleading because all of the proposed credits are above the minimum 1:1 replacement ratio. In fact, 48 percent of the proposed impacts are proposed to be replaced in-kind, in-place, and ahead of time. If the on-site wetland mitigation were factored in, approximately 56 percent of the wetland impacts would be replaced within the watershed.	The FEIS has been revised to address this comment.
PolyMet	The numbers in the second sentence of the second paragraph are inaccurate. In this sentence, 7,350.7 acres should be 1,771.5 acres (based on Table 5.2.3-3; excluding the "no effect" acres) and 6,498.1 acres should be 587.1 acres (based on Table 5.2.3-4; excluding the "no effect" acres).	No change was made.
PolyMet	In the third paragraph, the third sentence should read: "At The Mine Site, an additional 16 monitoring locations are proposed and are planned within all wetlands that have received effect factor ratings of 3, 4, or 5 near the North Met Project area features and in several wetland with effect factor ratings of 1 or 2 located throughout the areas of potential indirect wetland impacts." This is consistent with the information provided on page 5-336, second paragraph of the SDEIS.	The FEIS has been revised to address this comment.
PolyMet	The last sentence of the first full paragraph states: "Indirect effects were estimated by comparing the proximity of the NorthMet Project area infrastructure footprints to existing natural features." Polymet suggests revising the text to read: "Vegetation communities can be affected by more than one of these types of indirect effects. For this reason, indirect effects on vegetation cannot be precisely quantified, as this would result in double-counting of vegetation community acreage where multiple indirect effects are manifested. The relative magnitude of indirect effects on vegetation communities can, however, be estimated. Typically, indirect effects are more likely to occur	The FEIS addresses this comment by adding the following text: "Typically, indirect effects are more likely to occur and/or are more likely to be evident in vegetation communities that are closer to Project components and other infrastructure (e.g., roads). Indirect effects tend to diminish with increasing distance from Project components and other infrastructure."

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	and/or are more likely to be evident in vegetation communities that are closer to Project components and other infrastructure (e.g., roads). Indirect effects tend to diminish with increasing distance from Project components and other infrastructure."	
PolyMet	In the discussion of the NorthMet Project's effects on culturally important plants, the SDEIS discusses wild rice but notes that that "a distinct list of plant species important to the Bands is not available." The Bands were cooperating agencies in preparation of the SDEIS, and accordingly had every opportunity to provide a distinct plant species list. If such a list is not available, PolyMet recommends stating that the Bands have not identified culturally important plants not already identified and discussed in the SDEIS.	No change made.
PolyMet	The text describes indirect effects as a certainty, when there is no basis for determining the likelihood and/or magnitude of indirect effects. Where the text makes statements such as "[Species name] may be indirectly affected by changes in hydrology", the word "potentially" should be inserted ("may potentially be indirectly affected ") to more accurately reflect the uncertainty over the likelihood and/or magnitude of indirect effects.	Change has been made, as requested.
PolyMet	The eighth sentence of the second paragraph states: "Disturbance-tolerant species may, in some cases, actually be disturbance-dependent." PolyMet recommends providing a citation for this claim or removing the sentence.	Change has been made, as requested. Sentence has been deleted.
PolyMet	In the second sentence of the eighth paragraph, it is misleading to state that "an average of 2,066 miles per day of vehicular traffic" would contribute to potential lynx impacts. The majority of those miles would be traveled within the pit/mine site and not along outside roads where lynx encounters would be far more likely.	No change made. The FEIS states that this traffic would primarily be from hauling ore within the Mine Site to rail siding and waste rock to the stockpiles. Further, the FEIS states that haul traffic would likely have little direct effect on lynx.
PolyMet	Second paragraph: The Transportation and Utility Corridor runs both parallel and perpendicular to the identified wildlife travel corridors.	Change has been made, as requested.
PolyMet	The last paragraph states: "Effects on aquatic biota from the lead exceedance due to changes in hardness are not well understood, but would likely increase the potential to adversely affect aquatic life." This statement does not acknowledge that the modeling results predict increased potential for a lead exceedance (due to the use of a probabilistic model); rather, the statement incorrectly implies that there will inevitably be a lead exceedance.	Sentence was removed when updating section with v6 modeling results.
PolyMet	In the second paragraph, it should be noted that most of the floodplain on the federal land is outside of the Project Area.	No change made.
PolyMet	The right-most table column heading should be renamed "Non-FEMA	FEIS language has been revised to refer to mapped and

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	regulated floodplains." A column should be added for "FEMA-regulated floodplains." This comment also pertains to Table 5.3.3-7.	unmapped floodplains.
PolyMet	Table 5.3.3-5[:] The subtotal for open bog on non-federal lands is not accurate. The number should be 7.1 acres.	The FEIS has been revised to address this comment.
PolyMet	[In] Table 5.2.7-22… "Inhalation only acute" and "chronic non-cancer HI" should be displayed with 1 significant figure – i.e. 1 not 1.0.	The FEIS has been updated to address this comment.
PolyMet	In the last paragraph, the incremental risk at Wynne Lake for a recreational fisher should be as 0.07 in Plant Site AERA report, not 0.08.	No change made.
PolyMet	The third sentence of the first paragraph inaccurately states that H2SO4 was "screened out." The estimated risk was added to the other chemicals evaluated to obtain the total.	No change made.
PolyMet	The sixth sentence of the first paragraph inaccurately states that H2SO4 was "screened out." The estimated risk was added to the other chemicals evaluated to obtain the total.	No change made.
PolyMet	The third paragraph states: "Conceptual designs of the waste rock stockpiles, Tailings Basin, and Hydrometallurgical Residue Facility have been developed and shown by PolyMet, through an iterative design and model process, to meet the minimum safety factors and water quality criteria (see Section 5.2.2) acceptable to the Co-lead Agencies. PolyMet suggests changing the word 'conceptual' to 'preliminary'.	Change has been made, as requested.
PolyMet	The second bullet under Design Criteria states: "Factor of safety greater than or equal to 1.3 for short-term, undrained strength conditions for soils that are not prone to static liquefaction using undrained strength conditions." This sentence should be revised to indicate that this analysis does not include static liquefaction. Liquefaction is addressed subsequently.	No change made. The cited text is from the work-plan document.
PolyMet	The second paragraph uses the phrase "bulk tailings." PolyMet recommends defining "bulk tailings" to limit potential confusion. LTVSMC Coarse Tailings are proposed for use in dam construction but since the Coarse Tailings may have occasional inclusions of fine tailings and slimes, the term "Bulk Tailings" has been used by PolyMet to describe the planned tailings borrow. The same comment applies to page 5-562, which states: "The proposed dams would be constructed from mechanically placed and compacted bulk tailings taken from the existing LTVSMC Tailings Basin as needed to produce the desired dam lift height and geometry. LTVSMC bulk tailings are currently defined as a mixture of tailings from the existing LTVSMC Tailings Basin."	The use of bulk tailings is used respectively in context of NorthMet or LTVSMC.

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PolyMet	The eighth paragraph states: "As dams are constructed, exterior slopes would be covered with bentonite and vegetated. Upon reaching…" This statement is not completely accurate. On the exterior face of new dams, bentonite will be integrated into the near-surface layer of tailings. The dams will not be "covered with bentonite."	No change made.
PolyMet	The second sentence states: "The predicted Factor of Safety values for Cross Section F at various stages of development of the Tailings Basin are summarized in Table 5.2.14-1. All slope stability factors are designed to meet the factors of safety required by the NorthMet Geotechnical Modeling Work Plan (PolyMet 2013n, Attachment A)." It is more appropriate to say that the slope stability factors are designed to meet the "applicable requirements of *Minnesota Rules* 6115.0300 through 6115.0520 and the factors of safety required by the Co-Lead agencies in the NorthMet Geotechnical Modeling Work Plan (PolyMet 2013n, Attachment A)." The first paragraph under Design Criteria on p. 5-556 contains similar language.	No change made.
PolyMet	The third paragraph states: "Modeling was undertaken to predict the long-term stability of the Tailings Basin. As shown in Table 5.2.14-1 and Table 5.2.14-4, the long-term closure slope stability Factors of Safety are above the minimum value required under the Work Plan." It is more appropriate to say that the slope stability Factors of Safety "are above the minimum value deemed acceptable to the Co-lead Agencies and required under the Work Plan." There is similar language in the last paragraph on p. 5-566.	No change made.
PolyMet	The second paragraph states: "Where monitoring or model updates indicate that the Factor of Safety for the Tailings Basin no longer meets design criteria, appropriate modifications to the Tailings Basin would be considered, modeled, and, if necessary, undertaken." This sentence leaves doubt that prompt action will be taken if Factor of Safety values fall below design requirements. PolyMet recommends clarifying that mitigating measures will be explored and implemented as needed if at any time it is determined that Factor of Safety values have fallen below design requirements.	Change has been made, as requested.
PolyMet	The first paragraph states: "PolyMet took the steps listed below in order to demonstrate that the design of the Hydrometallurgical Residue Facility would meet the respective geotechnical requirements and would be in accordance with the NorthMet Geotechnical Modeling Work Plan (PolyMet 2013n, Attachment A):" PolyMet recommends revising the sentence to read: "PolyMet took the steps listed below in order to demonstrate that the design of the Hydrometallurgical Residue Facility would meet the Co-Lead Agencies respective geotechnical requirements and would be in accordance with the	The section describing the Hydrometallurgical Residue Facility has been updated for the FEIS.

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	NorthMet Geotechnical Modeling Work Plan (PolyMet 2013n, Attachment A) which was reviewed by the Co-Lead Agencies."	
PolyMet	The third item under the first paragraph states: "Developed seepage and stability models using Geo-Slope International, Inc. modeling software (i.e., SLOPE/W, SEEP/W and SIGMA/W as necessary) for maximum facility dam height with minimum and maximum pond elevation, and post-closure – cover effective with minimum pond elevation the maximum." The last phrase is poorly written and confusing. PolyMet suggests using the following revised text: "Developed seepage and global stability models using Geo-Slope International, Inc. modeling software (i.e., SLOPE/W, SEEP/W and SIGMA/W as necessary) for hydrometallurgical residue facility dam lifts 1, 2 and 3; each with maximum pond elevation, and an infinite stability model to analyze facility liner stability."	Change has been made, as requested.
PolyMet	The text describing the figure [5.2.14-6] (see paragraph under "Identification of Design Cross Section" on p. 5-571) makes reference to Node A. Yet, Node A is not shown in the figure. There also is a blue dashed line (presumably denoting the phreatic surface in surrounding materials) that is not defined in the figure legend nor is the dashed line labeled in the figure.	Change has been made, as requested.
PolyMet	This Section [(5.2.14.2.3)] does not clearly distinguish between (1) the settlement of the Hydrometallurgical Residue Facility (HRF) foundation materials and resulting movement of the HRF liner system and (2) future consolidation of the residue deposited within the HRF and resulting movement of the residue surface. PolyMet recommends more detail to provide clarification.	The section describing the Hydrometallurgical Residue Facility has been updated for the FEIS.
PolyMet	The first paragraph states: "The results reported in Geotechnical Data Package Volume 2 Version 3 indicate that the proposed design of the Hydrometallurgical Residue Facility would meet all respective factors of safety as required (PolyMet 2012a). The modeling undertaken and results are summarized below." PolyMet suggests revising the statement to say that the design "would meet all of the Co-Lead agencies' respective factors of safety as required (PolyMet 2012a)."	No change made.
PolyMet	The first paragraph states: "Analysis of the new dams (i.e., those not supported by the existing LTVSMC Tailings Basin or natural topography) at their greatest height (at year 20) resulted in a computed Factor of Safety for the ESSA of 2.32, which is greater than the required minimum of 1.5." The sentence should be revised to state that the resulting Factor of Safety is "greater than the Co-Lead Agencies' required minimum of 1.5."	No change made.

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PolyMet	The fourth sentence of the first paragraph states: "The minimum infinite slope stability safety factor for all Hydrometallurgical Residue Facility liner system components is 1.5." It would be more appropriate if the sentence was revised to read: "The Co-Lead Agencies' required minimum infinite slope stability safety factor for all…."	No change made.
PolyMet	The last sentence in this paragraph is inaccurate because Coyote Creek and Stony River on Tract 3-Wolf Lands are not comparable systems. The Stony River is a higher order, more diverse aquatic system than the first order, headwaters Coyote Creek. It cannot be assumed that the conclusions drawn from the studies for Stony River are applicable to Coyote Creek.	Minor edits to Section 5.3.6.2.4 were made to further indicate that the sites chosen to represent Tract 3 were only assessed qualitatively.
PolyMet	The fifth paragraph states: "The only two reasonably foreseeable actions with the potential to significantly affect flow within the Partridge River and Embarrass River are the Mesaba Energy Project East Range Alternative Site and the Mesabi Mining Project, which would result in a net increase in Lower Partridge River flow as a result of pit dewatering for the foreseeable future." This statement seems to ignore the eventual closure of the Northshore Peter Mitchell Pit (which is recognized elsewhere in the SDEIS). When that pit begins filling, Northshore will stop dewatering discharge to the Upper Partridge River. This would be a net decrease in flow relative to existing and modeled conditions. This action is anticipated within the modeling period but is not incorporated into the GoldSim model because the actual date of when this change would be made is not known. However, the potential for no discharge from Northshore to the Partridge River was considered in the sensitivity analysis conducted for the Project.	
PolyMet	The introduction to Section 6.2.3.4, "Wetlands," on page 6-34 states that the cumulative effects analysis "focuses on direct effects" on wetlands. Page 6-43 indicates that there will not be indirect cumulative effects on wetlands because water flows will not be changed. This discussion is in some tension with the effects analysis in Chapter 5, which anticipates the potential for some indirect effects on wetlands. PolyMet recommends referencing the discussion in Chapter 5 as part of the cumulative effects discussion.	The FEIS has been revised to address this comment.
PolyMet	Regarding the third sentence of the third paragraph, no federally-listed plant species would be affected by the project because there are no federally-listed plant species in all of St. Louis or Lake Counties. PolyMet recommends re-phrasing the sentence to read, "No federally-listed plant species are known to occur on the NorthMet Project site."	No change made.
PolyMet	In the final paragraph below Table 6.2-13, the qualifying statement regarding	No change made. This statement applies mostly to the

Sender	Comment	Response
	the lack of precision and the degree of uncertainty inherent in the evaluation methodology should be stated up front in Sections 4.2.4, 5.2.4 and 6.2.4.	cumulative analysis, as large habitat types are used in lieu of the NHIS database due to lack of data with reasonably foreseeable actions. This approach uses a best estimate based on available data.
PolyMet	The last paragraph states that "forestry management offers a greater range of options for ETSC plants to co-exist with the practice, as it can mimic natural disturbances." This statement seems to be based on the previous statement in Section 5.2.4.2.1, p. 5-348, that "Disturbance-tolerant species may, in some cases, actually be disturbance dependent." As stated in a prior comment, PolyMet believes this statement is misleading and that it is inaccurate to suggest that ETSC plants favor and/or are increased by disturbance regimes.	No change made. The statement regarding forestry management is accurate in that these practices can mimic windthrow or fire disturbances, which many native species are adapted to. Whereas many of the reasonably foreseeable projects would represent a complete land conversion. The statement in Section 5.2.4 was removed.
PolyMet	In the last sentence of the last paragraph, the increased percentage from the NorthMet Project Proposed Action alone should be 0.2 to 1.6 percent, not 0.2 to 1.8.	Change has been made, as requested.
PolyMet	PolyMet also recommends adding the following additional sentence at end of the paragraph at the top of the page: "This potential change is not likely statistically measureable and does not have any effect on the background fish Hg concentrations nor the current fish consumption advisories for the respective lakes."	The following text has been added at the end of the paragraph: "This potential increase is not expected to have an appreciable effect on fish tissue mercury concentrations in the Embarrass River or Partridge River and does not have any effect on the background fish mercury concentrations nor the current fish consumption advisories for the respective lakes."
PolyMet	In the first complete paragraph, the description of how the HQ is calculated does not reflect the calculations in the MMREM spreadsheet. To estimate the potential incremental HQ, the incremental methylmercury exposure in mg/kg body weight per day and the reference dose are accounted for in the calculation. The derivation of the incremental HQ can be described as noted below: The incremental HQ calculation in the MMREM Spreadsheet uses the following methodology: • Incremental daily mercury consumed (mg) = estimated incremental increase in fish mercury due to the Project (mg/kg) x the amount of fish consumed (e.g. 0.142 kg for a subsistence fisher) • Incremental methylmercury exposure (mg/kg BW – day) = Incremental daily mercury consumed x 1.07945 / adult body weight (70 kg) • Incremental HQ = Incremental methylmercury exposure (mg/kg BW – day) / Reference Dose of 1.00E-04 mg HgCH3/kg bw-day (i.e., the ratio	Change has been made, as requested.

Sender	Comment	Response
	of the incremental methylmercury exposure divided by the reference dose in the same units).	
PolyMet	[In] Table 6.2-22… The incremental result for Mesabi Nugget noncancer acute should be 0.03. The percentages at the bottom should be 9% for Cancer and 7% for Noncancer Chronic.	Changes made
PolyMet	The third paragraph under the heading "1854 Treaty Resources" states that the NorthMet Project Proposed Action could affect treaty resources through the bioaccumulation of mercury in fish tissue. This statement is inconsistent with the SDEIS's evaluation of cumulative effects on aquatic resources, which states that there will not be a significant increase of mercury in fish tissue. Because the subjective belief that such an effect may occur does not qualify as an effect under NEPA, the statement on page 6-95 should be removed from the SDEIS.	Increases of mercury in waterbodies from the NorthMet Project Proposed Action are discussed in FEIS Section 5.2.2, and cumulative increases are discussed in Section 6.2.3. Effects on the environment, including those from increased mercury, are all expected to meet the standards and regulations set forth by the appropriate state or federal agency or program. These laws are intended to protect important natural and cultural resources, and include but are not limited to the ESA, the CWA, and the CAA. Relative to 1854 Treaty resources and mercury, FEIS Section 6.2.3.10 is focused on the potential cultural cumulative effects on 1854 Treaty resources. Subsistence fishing and consumption is a common activity for the Bands in the 1854 Ceded Territory. Members of the Grand Portage and Fond du Lac bands are known to consume substantially more fish than the assumed statewide average. As such, increased cumulative mercury concentrations, and associated cumulative increases in mercury bioaccumulation in fish tissue, could therefore constitute an impact for Band members and other subsistence consumers of fish.
PolyMet	The final sentence in Section 7.3.1 indicates that the federal lands contain certain natural resources that are "culturally important" to the Bands. While it is accurate that these resources would be lost if the NorthMet Project Proposed Action moves forward, it is also true, and should be noted, that there is no evidence of the Bands accessing any resources at the Mine Site.	No change made.
PolyMet	The third sentence in the third paragraph of Section 7.3.1, "Irreversible or Irretrievable Commitment of Resources," states that while cultural resources may be adversely affected, those effects would be "minimized through avoidance." Under Section 106 of the National Historic Preservation Act, avoidance is not the only means of addressing adverse effects on historic properties, including the cultural resources identified in the SDEIS. Agencies may also choose to adopt minimization or mitigation measures. Those options	No change made.

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	should also be recognized in this paragraph.	
PolyMet	The final sentence in the first paragraph of Section 7.3.3, "Unavoidable Adverse Effects," states that effects on water quality would remain after the implementation of mitigation measures. The paragraph should note that these effects would be minor, and not qualify as significant environmental effects.	No change made.
PolyMet	The first paragraph of Section 7.4, "PREFERRED ALTERNATIVE," states that CEQ regulations do not require agencies to select a preferred alternative in a Draft EIS like the SDEIS. The same paragraph states that the USACE's NEPA regulations (Appendix B of 33 C.F.R. Part 325) supersede the CEQ regulations' "requirement to identify an agency-preferred alternative." This description of these requirements is confusing. Neither the CEQ regulations nor the USACE regulations require the selection of a preferred alternative in the SDEIS.	The FEIS has been updated to address this comment.
PolyMet	Appendix B, p. 1, 1.2 Assessment of Material[:] In the first sentence, "semi-qualitative" should be changed to "semi-quantitative."	The Underground Mining Alternative Position Paper has not been updated since the SDEIS.
PolyMet	Appendix B, p. 4, 2.2 Availability[:] The last sentence of this section should be changed to: "Notwithstanding economic considerations the underground mining alternative is available at the NorthMet Deposit."	The Underground Mining Alternative Position Paper has not been updated since the SDEIS.
PolyMet	Appendix B, p. 5, 2.4.1 Mineralization at the NorthMet Deposit[:] With respect to the bullet list of metal prices after the first paragraph, the referenced price for cobalt should be $17.69 per pound.	The Underground Mining Alternative Position Paper has not been updated since the SDEIS.
PolyMet	Appendix B, p. 7, 2.4.2 Underground Mining Costs[:] In Table 2, the Pre-production Capital Costs ($ million) of 300 should be changed to 250. The Profit: Metal Value – Costs ($ million) of -$193 should be changed to -$192 and -$364 should be changed to -$314.	The Underground Mining Alternative Position Paper has not been updated since the SDEIS.
USEPA	Comment# 23. Page 6-36, Table 6.2-8 and Pages 6-40 to 6-42, Table 6.2-11: There appear to be some inconsistencies between Table 6.2-8 and Table 6.2-11 with respect to reported future wetland and water resource numbers, including the bullet summaries for the Partridge River (Page 6-40) and Embarrass River (Page 6-42). For the Partridge River, Table 6.2-11 and bullet summary text note future condition with 3,516 acres of deepwater resources, while Table 6.2-8 indicates 1,922 acres. Recommendation: The FEIS should resolve or explain these inconsistencies.	The FEIS has been revised as requested.
USEPA	Comment# 24. Page 6-21, Section 6.2.3.3.2: the "Contributing Past, Present, and Reasonably Foreseeable Actions" section, lists twelve foreseeable future actions with potential cumulative effects on surface water hydrology and	The FEIS has been revised to ensure consistency with project names.

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	quality in the Partridge River and Embarrass River watersheds. There is some inconsistency between this list and Table 6.2-1 (Page 6-7). "Cliffs Erie, LLC-Hoyt Lakes Area (former LTVSMC)," and "Cliffs Erie, LLC- Area 5 NW Pit" are not included in the table, at least not by these names. Recommendation: The FEIS should resolve or explain these inconsistencies, and use consistent names for foreseeable future actions to simplify cross-referencing by the reader.	
USEPA	Comment # 26. Pages 6-22 to 6-25 and 6-27 to 6-28, Section 6.2.3.3.3: This text does not reference sources of hydrological effects data for each action. Recommendation: The FEIS should reference sources of hydrological effects data for each action.	Change has been made, as requested.
USEPA	Comment # 33. Pages 4-261 through 4-264 refer to cultural resources/Section 106 resources solely as historic properties. Recommendation: The FEIS should make it clear that cultural resources include archaeological resources.	Change has been made, as requested.
USFWS	The temporary nature of the projected 500 direct jobs created during construction and additional 631 "operations-phase" jobs may result in a substantial need for temporary lodging that could impact to Voyageurs-area visitors in the form of hotel or motel room shortages.	No change made.
USFWS	Finally, the major differences of opinion between the lead agencies and the Bands, the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), and 1854 Treaty Authority regarding the effects of the proposed actions should be resolved before any permits are issued.	MDOs will be addressed during the appropriate permitting processes.
USFWS	This section needs maps to illustrate the location and extent of Minnesota Biological Survey (MBS) Sites of High Biodiversity Significance in order to support the claim that the number of sites within the project area is small, and to show how much of the 100 Mile Swamp and Upper Partridge River Sites will be impacted.	Change has been made, as requested.
USFWS	Stating that less than 1 percent of the state's Sites of High Biodiversity Significance would be affected is misleading because not all of these sites are of the same type.	No change made.
USFWS	When referring to Canada lynx (Lynx canadensis), page 5-365 the SDEIS states that, "Although the NorthMet Project Proposed Action would result in a reduction and fragmentation of lynx habitat at the Mine Site, little to no effect on statewide lynx populations would occur as it is unlikely that an individual lynx or pair of lynx would be affected by the habitat decrease." This is unclear and misleading. Our suggested rewording of this is, "Although	No change made.

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	the NorthMet Project Proposed Action would result in a reduction and fragmentation of lynx habitat at the Mine Site, little to no effect on statewide lynx populations would occur even if individual lynx are affected by the habitat decrease."	
Water Legacy	[SDEIS, p. 4-45] there are no Foose and Cooper references listed in the SDEIS from either 1979 or 1980, so it is assumed the references and conclusions in this paragraph are from Foose and Cooper 1978 and 1981 which are cited in the list of references.	References to Foose and Cooper have been updated as requested.
Water Legacy	these statements [on pg 4-45] made relating to bedrock fractures are not supported by the references cited in the SDEIS. Neither of the two Foose and Cooper papers report that "the most extensive faults are largely filled with gouge." Their only mention of fault gouge in these two papers is that they used its presence to trace fault zones in the field. Neither paper discusses distance groundwater may flow through faults and fractures in the Duluth Complex - in fact neither mention groundwater flow at all.	The FEIS now states that extensive bedrock fault zones may or may not be filled with gouge (references) and the effect of gouge on groundwater flow is uncertain.
Water Legacy	The SDEIS presents a discussion of lineaments lower on page 4-45 that, contrary to current geologic literature, downplays the relationship of lineaments to bedrock fractures and therefore their significance to the hydrogeology of the NorthMet Site. "Numerous lineaments have been mapped over northeastern Minnesota, but these have been associated with glacial deposition and not fracturing in the underlying bedrock (Morey 1981; Heutmaker and Morey 1982)." (SDEIS, p. 4-45) The cited literature refers to glacial "processes," not glacial "deposition" (Morey, 1981; Heutmaker and Morey, 1982). These terms do not have the same meaning.	The FEIS now states the following: "Numerous lineaments have been mapped over northeastern Minnesota. An individual lineament may be related to glacial deposition/erosion (Morey 1981, as cited in the FEIS; Heutmaker and Morey 1982, as cited in the FEIS), a geologic contact between different bedrock types, and/or bedrock structures such as fault and fracture zones."
Water Legacy	The quote… [(starting with "One exploration" ending with "world")] from page 4-45 of the SDEIS stating that the upper fractured zone of bedrock has been removed by glacial scouring should be properly referenced or otherwise supported by data to be taken seriously. This statement is not supported by any of the cited references and is contrary to common knowledge that fractured bedrock is present at NorthMet. Drilling logs included in the SDEIS' supplementary materials (PolyMet, 2013i; RS-35, RS-42 and RS-46) show intervals of weathered bedrock at multiple locations thereby reducing the credibility of this statement.	The FEIS now states that the top of bedrock has been scoured by glacial processes, but upper bedrock has not been necessarily removed.
Water Legacy	A few pages above, the term "till" was used as a general term, now in this paragraph [on page 4-46] the term "alluvium" seems to be used as a replacement term for all surficial sediments. On page 4-149 the entire package of surficial sediments is referred to as "soil". This is more than	Change has been made, as requested.

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	semantics; it leads to confusion as to exactly which surficial sediments are being referenced: the entire surficial sediment section or only till units or only alluvium units or only the post-glacial soil that exists at the land surface? This usage promotes a simplistic understanding of surficial geology, which in turn is converted into overly simple and inaccurate inputs to predictive models.	
Water Legacy	A figure showing this isopach map [referred to on page 4-45] inserted at this point in the SDEIS would be very helpful in envisioning how the surficial sediment type and thickness varies across the Mine Site. But this map neither appears in the SDEIS or among cited reference documents. The Table of Contents for Golder Associates (2007) lists the isopach map, but the file does not appear in the MDNR DVD set and was not available for review.	No change made.
Water Legacy	A detailed bedrock topography map would also be useful at several places in the SDEIS to illustrate where features such as troughs and bedrock valleys are located on the bedrock surface and to assess pathways that may transmit contaminated groundwater at the interface of the overburden and bedrock.	A figure has been added to the FEIS to address this comment.
Water Legacy	in Table 4.2.2-5… laboratory-derived hydraulic conductivity values for reported "silty sand" are shown as ranging from 0.00043 ft/day to 0.0081 ft/day. The difference between laboratory-derived hydraulic conductivity values of up to 167 ft/day reported in PolyMet, 2013 or even higher in Stark (1977) should be reconciled with the results from a silty sand presented in Table 4.2.2-5 in the SDEIS.	Laboratory permeameter tests nearly always underestimate the in situ hydraulic conductivity of natural materials. While the laboratory test results are reported, they were not used in estimating the hydraulic conductivity of surficial deposits. The estimated hydraulic conductivities of surficial deposits were based on a combination of borehole tests, model calibrations, and generic information.
Water Legacy	The SDEIS' claim [on page 4-43] of hydrologic separation from the Biwabik Iron Formation aquifer should be supported by a more robust reference than personal communication from one of PolyMet's consultants. The SDEIS should include an accurate geologic cross-section based on actual drilling information, showing the locations of faults and fractures, not a schematic or overly generalized cross-section where subsurface conditions can be so easily misrepresented.	Change has been made, as requested.
Water Legacy	The examples of incorrect usage of geologic terminology in the SDEIS below suggest the sections on geology were not given the level of editorial review appropriate for a scientific publication. "The NorthMet Deposit itself is below the surficial till in the layered mafic intrusive rocks of the Duluth Complex, which are part of the Partridge River intrusion." (SDEIS, p. 4-43) Actually the Duluth Complex is not part of the Partridge River intrusion. The Partridge River intrusion is part of the Duluth Complex.	Change has been made, as requested.
Water Legacy	[The examples of incorrect usage of geologic terminology in the SDEIS	Change has been made, as requested.

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	below suggest the sections on geology were not given the level of editorial review appropriate for a scientific publication.] "The oldest of the sedimentary rocks is the Pokegama Quartzite. These sedimentary rocks are underlain by Archean granite of the Giants Ridge batholith." (SDEIS, p 4-43) The correct terminology is Giants Range batholith, not Giants Ridge batholith. This same incorrect usage is repeated in several additional places on pages 4-94 to 4-95.	
Water Legacy	On page ES--- 42, the claim is made that alternatives were identified and screened in accordance with the requirements of 40 CFR 1505.1(e). This is an erroneous citation. The reference to 40 CFR 1505.1(e) refers to NEPA and agency decision-making procedures, not the preparation of an EIS. The correct citation is 40 CFR 1502.14, which states, "Alternatives including the proposed action. This section is the heart of the environmental impact statement. Based in the information and analysis presented in the sections on the Affected Environment (1502.15) and Environmental Consequences (1502.16), it should present the environmental impacts of the proposed action and the alternatives in comparison form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public."	Change has been made, as requested.
Water Legacy	The PolyMet SDEIS misrepresents and overlooks available information regarding tailings site geology. The SDEIS states, "Jennings and Reynolds (2005) mapped the surficial deposits around and beneath the Tailings Basin as Rainy Lobe Till, which functions as the surficial aquifer and is generally a boulder-rich till with high clay content" (SDEIS p. 4-95). However, the cited reference reports the surficial Rainy lobe till mapped in the vicinity of the proposed NorthMet project as "clay-poor." Till matrix textures are reported to range from 48 to 87% sand, 9 to 40% silt and 0 to 13% clay, but "generally much less than 10% clay." (Jennings and Reynolds, 2005). This is a sandy till, not a till with high clay content.	Change has been made, as requested.

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Water Legacy	Statements in the SDEIS regarding groundwater seepage on the south side of the tailings site appear to be inconsistent. In one section, the SDEIS states, "Groundwater currently seeps from the existing LTVSMC Tailings Basin to the headwaters of Second Creek." (SDEIS, p. 5-153) In another narrative, the SDEIS claims that there would be no impacts on wetlands resulting from changes in groundwater flow since, "All of the seepage from the south side of the Plant Site is surface water." (SDEIS, p. 5-297).	Change has been made, as requested.
William K. Dustin	p.5-152 The evaluation criteria are not shown on the graph.	Change has been made, as requested.

A.7 INDIVIDUAL COMMENTS AND THEME ASSIGNMENTS

Each of the 16,469 unique, substantive comments identified within the submissions provided for the SDEIS is provided in Attachment 1 of Appendix A. The list is alphabetized by the sender's name, and also includes the theme(s) to which each comment was assigned.

A.8 DEIS COMMENT THEMES AND RESPONSES

The DEIS was made available to the public in the November 2009, with a 90-day comment period that ended on February 3, 2010. Following the release of the DEIS, public meetings were held in Aurora, Minnesota, on December 9, 2009 and Blaine, Minnesota, on December 10, 2009, to gather public comments on the DEIS.

The Co-lead Agencies received approximately 3,800 DEIS submissions from government agencies (federal, state, and local), tribal entities, local businesses, NGOs, private individuals, and PolyMet. These submissions generated approximately 5,900 distinct substantive comments. The comments were analyzed using a thematic approach, similar to the methodology described in Section A.2 of this appendix. Key issue areas identified by DEIS comments included cultural resources, air quality, wetlands, geotechnical stability, socioeconomics, and water resources.

Individual DEIS submissions, comments and theme assignments are included in Attachment 1 of this appendix.

SDEIS Appendix A listed the thematic statements and responses for public comment received on the 2009 DEIS. Table A-5 repeats these DEIS themes and responses, and also indicates which SDEIS theme(s) best respond to each DEIS theme. This listing does not necessarily include *all* applicable SDEIS themes. The relevant sections of the FEIS should be consulted for more detailed information.

Table A-5 DEIS Comment Themes and Relationship to SDEIS Themes

DEIS Theme Code	DEIS Theme Statement	DEIS Thematic Response	Corresponding FEIS Theme(s)
Section: Comparison of Alternatives (ALT)			
ALT1	The DEIS does not adequately define or study the No-Action Alternative.	The No Action Alternatives for the NorthMet Project Proposed Action and the Land Exchange Proposed Action are defined in Sections 3.2.3 and 3.3.3 of the SDEIS, respectively. The environmental consequences of the NorthMet Project No Action Alternative are addressed in the respective sections of Chapter 5. Comparisons of the NorthMet Project Proposed Action and the alternatives, including the No Action Alternative, are shown in Chapter 7.	ALT 14
ALT2	The DEIS does not adequately evaluate the Mine Site alternative and it fails to look beyond the proposed Mine Site.	The NorthMet Project Proposed Action and the alternatives have changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The "Mine Site Alternative" was incorporated into the Proposed Action and is no longer applicable as an alternative (refer to Section 3.2.3 of the SDEIS for more information). The Mine Site location depends on the presence of the viable NorthMet Deposit. The location of the Mine Site and alternatives are discussed in Section 3.2.3 of the SDEIS.	ALT 06, ALT 07, ALT 16
ALT3	The DEIS does not adequately evaluate the underground mining alternative. This alternative should not be eliminated from consideration on the basis of costs.	The underground mining alternative was revisited and determined not to be a viable alternative; therefore, it remains eliminated from further evaluation. The Co-lead Agencies prepared a position paper on the underground mining alternative; this document is attached as an appendix to the SDEIS. Alternatives considered for the NorthMet Project Proposed Action in the SDEIS are described in Section 3.2.3.	ALT 01, ALT 02
ALT4	The DEIS does not adequately evaluate the tailings basin alternative and fails to consider the reactions between seepage and the existing tailings.	The SDEIS NorthMet Project Proposed Action (including tailings management) and the alternatives have changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). There is no longer a tailings basin alternative. Management of tailings as part of the NorthMet Project Proposed Action is addressed in Section 3.2.2 of the SDEIS. Environmental consequences are addressed in Section 5.2.	ALT 10, ALT 11
ALT5	The DEIS should provide additional details regarding mitigation and long-term management of the site, particularly related to water treatment.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Mine Site and Plant Site water management are addressed in Section 3.2.2 of the SDEIS. Environmental consequences on water resources are	ALT 04, ALT 13, PD 01

DEIS Theme Code	DEIS Theme Statement	DEIS Thematic Response	Corresponding FEIS Theme(s)
		discussed in Section 5.2.2.	
ALT6	The DEIS fails to include quantitative information, such as numbers from key indicators for each resource, in the comparison of alternatives table.	The NorthMet Project Proposed Action and the alternatives have changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The NorthMet Project Proposed Action and alternatives are described in Chapter 3 of the SDEIS; Chapter 7 of the SDEIS provides a comparison of alternatives.	ALT 22
ALT7	The DEIS fails to adequately identify a preferred alternative.	Chapter 7 of the SDEIS provides a comparison of alternatives and discusses the agency position on offering a preferred alternative. Consistent with the CEQ regulations, the federal Co-lead Agencies are required to identify an agency-preferred alternative in a DEIS, if one exists, and in the FEIS unless another law prohibits the expression of such a preference. At this time, the Co-lead agencies have not identified a preferred alternative, and for the USACE, 33 CFR Part 325, Appendix B, supersedes identification of an agency-preferred alternative. No similar requirement to identify a preferred alternative exists for the MDNR under state law.	ALT 20
ALT8	The DEIS fails to consider a full range of alternatives to meet the intent of NEPA.	CEQ (1997, as cited in the FEIS) requires that a "reasonable range of alternatives" be analyzed. These may include those not carried forward for detailed analysis. The NorthMet Project Proposed Action in the SDEIS represents a project that has incorporated a number of previous alternatives and mitigation measures considered as alternatives at earlier stages of the EIS process. Many other alternatives have been identified but eliminated from detailed analysis because they didn't offer potentially significant environmental benefits, did not meet the project's purpose and need, or were not otherwise reasonable (technically or financially viable) in accordance with CEQ guidance. The NorthMet Project Proposed Action and alternatives are described in Chapter 3 of the SDEIS. Various other alternatives identified but eliminated in the DEIS are discussed in Section 3.2.3.	ALT 21, ALT 23
ALT9	The DEIS must address modifications and mitigation methods with less uncertainty.	The NorthMet Project Proposed Action, alternatives, and mitigation measures have changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Proposed mitigation measures are discussed in the respective parts of Section 5.2 and summarized in Chapter 7 of the SDEIS.	PD 01

DEIS Theme Code	DEIS Theme Statement	DEIS Thematic Response	Corresponding FEIS Theme(s)
Section: Air Quality (AQ) [Please note that "AQ" in the SDEIS applies to Aquatic Species]			
AQ1	The DEIS did not adequately address the potential for fugitive emissions from reactive waste rock, rail cars, tailings basin, or road travel. Further data is needed to evaluate the issue.	Based upon the comments provided on the DEIS, the analyses in Section 5.2.7 of the SDEIS were developed in the Co-lead Air IAP Workgroup. These include revised air emissions protocols for Class I, Class II, mercury deposition, AERA, and GHG assessments. Waste rock acidification was previously addressed and was updated as part of the SDEIS refinements. Based upon the Co-lead Air IAP workgroup, it was determined that any effects on air quality from fugitive dust from rail transport would be minimal due to the coarse nature of the ore. The potential for acidification effects associated with deposition of fugitive dust from rail car hauling was addressed under Water Resources. Surface Water IAP workgroup evaluated this issue and recommended that surface water quality data be collected to address this issue. Emissions from other fugitive emissions including mobile sources are also evaluated.	AIR 04
AQ2	The evaluation that the NorthMet Project Proposed Action would be a "new" rather than an "existing" source of air emissions was made incorrectly or needs further analysis.	Due to the 9-year inactivity of taconite-processing equipment currently owned by Cliffs Erie, LLC and backed by USEPA's well-established reactivation policy, the MPCA has made a preliminary determination that those units would need to go through PSD applicability and new permitting if they were to be restarted by PolyMet.	SDEIS comments did not raise this topic.
AQ3	The potential for GHG emissions that contribute to climate change was not thoroughly analyzed in the DEIS, including the effects on carbon sequestration resulting from the disturbance of peat and the resulting impact on wildlife.	To address these comments, GHG issues have been assessed in a manner consistent with USEPA and MPCA guidance, and the CEQ's Draft NEPA Guidance on Climate Change and Greenhouse Gas Emissions (February 18, 2010). This assessment is addressed in Section 5.2.7 and 5.3.7 of the SDEIS.	AIR 01
AQ4	Air quality modeling and analysis was not complete, lacks accurate data, did not consider all comments, or needs further explanation.	The procedures for inclusion of sources were described in the DEIS. Sources have been evaluated for inclusion based upon their potential to contribute to a significant effect. The proposed facility has not been determined to be a major source under the CAA for any of the criteria pollutants. Therefore, the analysis is consistent with MPCA requirements for permitting. Since the DEIS, the USEPA and federal courts have recently modified major source determination to include GHG emissions. The SDEIS revaluated the major source status for the NorthMet Project Proposed Action and has shown that the proposed facility would not be determined a major source for GHG, or any other regulated pollutant, and thus, no formal major NSR is required, including federal-mandated modeling and BACT requirements. This assessment is addressed in Section	AIR 09

DEIS Theme Code	DEIS Theme Statement	DEIS Thematic Response	Corresponding FEIS Theme(s)
		5.2.7 of the SDEIS. The Class I, Class II, AERA, mercury deposition, and cumulative modeling analyses protocols for the SDEIS were updated to include the latest air quality regulations, including 1-hour NO_2 and SO_2 analyses, $PM_{2.5}$ requirements, and GHG evaluations. The modeling protocols were revised in collaboration with the Co-lead Air IAP Workgroup and are incorporated as part of the SDEIS.	
AQ4A	Further modeling or studies, including a BACT analysis, should be completed.	There are no current requirements for federal BACT analysis for minor sources (see Theme AQ4). However, PolyMet conducted the equivalent of a major source BACT evaluations for $PM_{2.5}$ (a minor source) and mercury. These evaluations contributed to the SDEIS analysis of the AERA, mercury bioaccumulation, $PM_{2.5}$, and asbestos-like fibers. The analyses are summarized in Section 5.2.7 of the SDEIS.	AIR 09
AQ4B	The cumulative impacts analysis for air quality lacked complete analysis. Specific contributing projects should be included.	The procedures for inclusion of sources were described in the DEIS. Sources are evaluated for inclusion based upon their potential to contribute to a significant effect. Specific contributing projects are identified in Chapter 6 of the SDEIS.	CU 02
AQ4C	Evaluation of the potential for asbestiform fibers and mineral fibers must be completed for the assessment of impacts to be considered complete.	Based upon the revised project, a qualitative evaluation of the effects from asbestiform fibers is included in Section 5.2.7 of the SDEIS.	AIR 03
AQ4D	The potential for acid rain and the resulting impacts should be addressed and analyzed.	The potential for acid rain is evaluated in the Class I regions nearby the NorthMet Project area. Effects of acidification were addressed in the DEIS. An expanded discussion of these effects, including additional lake communities, is included in Section 5.2.7 of the SDEIS.	SDEIS comments did not raise this topic.
AQ4E	The geographical scope of the DEIS is not sufficient to capture potential impacts.	Air quality effects are addressed based upon statewide established criteria for significant effects. Additional analyses were conducted for all representative Class I regions, including visibility and mercury deposition. Expanded acidification assessment for additional lake communities surrounding the NorthMet Project area is assessed in Section 5.2.7 of the SDEIS.	AIR 06, AIR 08, AIR 09
AQ5	Air quality monitoring plans and mitigation measures are insufficient or should be more thoroughly explained in the EIS document. Further mitigation measures should be pursued.	As discussed in the SDEIS, air emissions from the NorthMet Project Proposed Action would be less than PSD major source thresholds for all criteria pollutants. The MPCA is responsible for ensuring that the NorthMet Project Proposed Action would not exceed applicable standards during the permitting process. Permit requirements needed to ensure compliance with	PD 01

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		standards will be included in any future permits. There will be an opportunity for public participation in the permitting process, as well.	
AQ6	The NorthMet Project Proposed Action's potential to exceed standards for air quality or endanger the health of humans and wildlife should be more thoroughly addressed. More risk assessment for human health impacts should be completed.	Air quality impact analyses in the DEIS follow State of Minnesota and federal guidelines, and effects were addressed in the DEIS. Based upon comments received on the DEIS and the availability of more recent information, additional analyses were conducted for the Class I, Class II, MAAQS, and NAAQS. In addition, updated AERA and mercury assessments were conducted to address risk assessment of human health effects. The updated analyses are addressed in Section 5.2.7 of the SDEIS.	HU 03, WI 03
AQ6A	The potential for mercury emissions to exceed standards or endanger the health of humans and wildlife was not adequately addressed.	PolyMet has revised the Mercury Deposition Analysis in collaboration with the Co-lead Air IAP Workgroup to include an expanded area up to 10 km from the facility, and includes potential sources up to 25 km from the facility. This expanded analysis incorporates several new lake regions, including Sabin Lake, Wynne Lake, Heikkila Lake, Colby Lake, and Whitewater Lake. Results of this analysis are discussed in Section 5.2.7 of the SDEIS.	AIR 05, AIR 06
AQ7	Permitting questions regarding emission thresholds and permitting criteria should be addressed.	As discussed in the SDEIS, air emissions from the NorthMet Project Proposed Action would be less than PSD major source thresholds for all criteria pollutants. The MPCA is responsible for ensuring that the NorthMet Project Proposed Action would not exceed applicable standards during the permitting process. Permit requirements needed to ensure compliance with standards will be included in any future permits. There will be an opportunity for public participation in the permitting process, as well.	AIR 13
AQ8	Issues regarding Class II classifications were inadequately addressed.	The analysis in the DEIS was based upon the most current available data and guidance. The SDEIS updates the existing analysis with the most current information and reflects the most recent review of potential mitigation measures (See Theme AQ4).	AIR 09
AQ9	Issues regarding Class I classifications were inadequately addressed.	Please see response to Theme AQ8.	AIR 08

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Section: Compatibility with Plans and Land Use (CPLU)			
CPLU1	The NorthMet Project Proposed Action is inconsistent with biodiversity and habitat policies, such as those in the MFRC Landscape Plan.	Although an informative plan, per NEPA, the MFRC Landscape Plan is not part of the legal framework to which the SDEIS must conform. The Land Use Sections of SDEIS Chapters 4, 5, and 6 address the NorthMet Project Proposed Action's performance with respect to the land use aspects of the legal framework.	PER 35
CPLU2	The NorthMet Project Proposed Action is inconsistent with water quality, recreation, and cultural resources policies, such as those in the St. Louis River Management Plan.	Conformance with water quality, recreation, and cultural resources policies is addressed in the Water Resources, Socioeconomics, Land Use, Recreation/Visual, and Cultural Resources sections of SDEIS Chapters 5 and 6.	SDEIS comments did not raise this topic.
CPLU3	The NorthMet Project's compatibility with the Superior National Forest's Forest Plan should be specifically considered.	The Land Use sections of SDEIS Chapters 4, 5, and 6 evaluate compatibility with the Superior National Forest Plan.	LU 05
CPLU4	The Land Exchange Proposed Action with USFS should be concluded and evaluated before the EIS is completed.	The Land Exchange Proposed Action is fully evaluated as part of the SDEIS. See Chapter 5.3 of the SDEIS.	NEPA 13
Section: Cultural Resources (CR)			
CR1	The DEIS does not adequately address impacts to and mitigation measures for cultural resources, including those that relate to 1854 Treaty rights and tribal resource gathering.	The federal Co-lead Agencies are actively consulting with the federally recognized bands that have expressed an interest in consulting for the NorthMet Project Proposed Action to identify and address these and other related concerns. Consideration of effects on cultural resources or culturally significant natural resource that do not qualify for the NHPA addressed in SDEIS Chapters 4, 5, and 6.	CR 01
CR2	Section 106 consultation is needed prior to the completion of the EIS to address the presence of cultural sites and use of resources by tribal members.	The federal Co-lead Agencies have actively consulted with the three federally recognized Bands that have expressed an interest in consulting for the NorthMet Project Proposed Action, including interviews with Band members. Effects to cultural resources and culturally significant natural resources are addressed in the Cultural Resources section of SDEIS Chapters 4, 5, and 6.	CR 06
CR3	The 1854 Treaty Ceded Territory should be considered a traditional cultural property and the NorthMet Project Proposed Action's area of potential effect should be expanded to include 1854 Treaty Ceded Territory.	At the time the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) was prepared, the Co-lead Agencies had not yet formally determined the area of potential effect determination. The Cultural Resources section of SDEIS Chapters 4 and 5 address the Co-lead Agencies' determination of the NorthMet Project Proposed Action's area of potential effect, as well as the	CR 04

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		Co-lead Agencies' consideration of the 1854 Ceded Territory as a traditional cultural property.	
CR4	The EIS should discuss the federal government's trust responsibility as part of the 1854 Treaty and address potential impacts and proposed mitigation/compensation for loss of access to resources.	The Cultural Resources section of SDEIS Chapters 4 and 5 addresses the federal Co-lead Agencies' federal tribal trust responsibilities as part of the 1854 Treaty. These sections, along with relevant sections of Chapter 6, also address effects on, and any proposed mitigation for effects on cultural resources and culturally significant natural resources that do not qualify for listing on the NRHP.	CR 01
CR5	The EIS should further evaluate and /or remove reference and use of the draft work known as, "The Protocol to Assess Expanded Cumulative Impacts to Native Americans."	This document has been reviewed and protocol discussed. The SDEIS complies with CEQ guidance for the cumulative effects analysis.	CR 08
Section: Fish and Macroinvertebrates (FM) [FEIS Section Now Titled "Aquatic Species"]			
FM1	The DEIS does not adequately analyze the impacts from the Mine Site operation on fish and macroinvertebrate species. Particular concerns include seepage of mercury and other constituents, alteration of flow conditions, water quality exceedances, and bioaccumulation.	Effects on aquatic resources, such as fish and macroinvertebrate species, as a result of mercury seepage and potentially harmful constituents, alteration of flow, and bioaccumulation are discussed in detail in Sections 5.2.6 and 5.3.6 of the SDEIS.	AQ 05, AQ 06, AQ 07, AQ 11, AQ, 12, AQ 13, AQ 14, AQ 18, AQ 23, AQ 24, AQ 25, AQ 28
FM2	The DEIS does not provide sufficient baseline characterizations, including sampling and modeling, to effectively describe populations and potential effects on fish and macroinvertebrates.	Existing conditions, including baseline characterizations and any additional threatened or endangered species listed after the DEIS was released, are discussed in detail in Sections 4.2.6 and 4.3.6 of the SDEIS. Potential effects on these species are detailed in Sections 5.2.6 and 5.3.6 of the SDEIS.	AQ 01
FM3	The cumulative effects analysis needs to be expanded to include the effects of sulfate and mercury, bioaccumulation, climate change, and habitat degradation on the fisheries and macroinvertebrates of the region.	Cumulative effects on aquatic species and the metrics used for analysis of potential effects are included in Chapter 6 of the SDEIS.	AQ27
FM4	The DEIS lacks sufficient monitoring, adaptive management, and mitigation measures for aquatic species.	Monitoring plans and potential mitigation measures for the NorthMet Project Proposed Action are discussed in Sections 5.2.6 and 5.3.6, and Chapter 7 of the SDEIS.	AQ 30
FM5	The DEIS does not provide sufficient information to demonstrate compliance with	Existing aquatic habitat and species are described in Section 4.2.6 and 4.3.6 of the SDEIS. Effects to aquatic resources as a result of the NorthMet	PER 26

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	federal and state permitting and guidance requirements including the CWA, state water quality standards, TMDL levels, and fish consumption advisories.	Project Proposed Action are described in Sections 5.2.6 and 5.3.6. The evaluation of the NorthMet Project Proposed Action's potential environmental effects against EIS evaluation criteria is included in Sections 5.2.2, 5.2.6, 5.3.3, and 5.3.6 of the SDEIS. The Adaptive Water Management Plan (PolyMet 2015d, as cited in the FEIS) addresses the wastewater treatment systems that would be used to manage water (see Section 3.2.2 of the SDEIS).	
Section: Geotechnical Stability (GT)			
GT1	Detailed mitigation, alternatives, stability analysis, and contingency plan information must be included in the EIS, not deferred to permitting.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and design and stability of the geotechnical features are further analyzed and addressed in Sections 3.2.2 and 5.2.14 of the SDEIS.	GT 07
GT2	Environmental consequences of dam failures must be disclosed in the EIS.	The NorthMet Project Proposed Action, including the design and geotechnical stability of the Tailings Basin and Hydrometallurgical Residue Facility, has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The design of the Tailings Basin and Hydrometallurgical Residue Facility is discussed in Section 3.2.2 of the SDEIS. The structural integrity of the Tailings Basin and Hydrometallurgical Residue Facility and the proposed maintenance and adaptive management measures of these facilities to maintain that integrity is discussed in Section 5.2.14 and Chapter 7 of the SDEIS. Because the proposed design would meet the minimum factor of safety requirements, the potential for failure of the dams is considered low. Discussion of effects associated with such failure would be speculative and thus outside the scope of the SDEIS.	GT 15
GT3	The EIS must address disposal of coal ash and other non-taconite tailings materials in the existing LTVSMC Tailings Basin and any implications to Tailings Basin stability.	The NorthMet Project Proposed Action, including the design and geotechnical stability of the Tailings Basin and Hydrometallurgical Residue Facility, has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The existing conditions at the existing LTVSMC Tailings Basin, and the structural integrity of the proposed Tailings Basin and Hydrometallurgical Residue Facility, are discussed in section 4.2.14 and 5.2.14 of the SDEIS.	HAZ 02

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Section: Hazardous Materials (HM)			
HM1	The DEIS does not adequately address the assessment of operational type chemical waste for recycling.	Section 5.2.13 of the SDEIS addresses the preparation of a Hazardous Materials Management Plan. The Hazardous Materials Management Plan will describe the methods for handling, storage, and disposal. This may also include recycling of materials used or generated during the operations.	ALT 09, HAZ 02
HM2	The DEIS does not properly characterize ore and waste rock piles from the mining process as hazardous materials and hazardous waste in accordance with Minnesota Rules, nor does it adequately discuss the cumulative effects of these materials as "hazardous materials".	Based on the *Minnesota Rules*, Chapter 7045.0120, Identification and Listing of Hazardous Waste-Exemptions and Special Requirements, this waste is exempted. Also see Chapter 7045.0214: Evaluation of Wastes, Subpart I, "Any waste evaluated and exempted under part 7045.0075 or 7045.0120 does not need to be re-evaluated under this part." Other waste in question will be properly evaluated and managed per the Hazardous Materials Management Plan for the facility. These issues are described in Section 5.2.13 of the SDEIS.	HAZ 02
HM3	The DEIS does not adequately analyze and address the risk associated with the transportation of materials of a hazardous nature.	Transportation of materials of a hazardous nature will be addressed in more detail in the NorthMet Project Proposed Action plan and the Hazardous Materials Management Plan (when developed), and is discussed in Section 5.3.13 the SDEIS.	HAZ 06
HM4	The chemical composition, toxicity, use, impact, and mitigation of chemical products discharged in wastewater and in the hydrometallurgical residue must be further addressed in accordance with federal and Minnesota hazardous waste regulations.	As described in Section 5.2.13 of the SDEIS, hazardous materials and potentially hazardous wastes will be characterized, managed, and disposed of or recycled per the Hazardous Materials Management Plan (to be completed), which will follow requirements of Minnesota Rules, Chapter 7045: Hazardous Waste.	HAZ 03
HM5	The DEIS does not adequately assess the nature and characteristics, including radioactivity, of cobalt.	Hazardous materials are addressed in Section 5.2.13 of the SDEIS. If present, cobalt-60 and other hazardous or potentially hazardous materials or wastes will be characterized and managed per the Hazardous Materials Management Plan (to be completed), which will follow requirements of Minnesota Rules, Chapter 7045: Hazardous Waste.	HAZ 03
HM6	The DEIS does not adequately consider the cumulative impacts of hazardous materials from other projects, including hazardous materials already in the watershed.	Evaluation of cumulative effects of hazardous materials on the watershed, as well as those from other projects, are addressed in further detail as appropriate in Chapter 6 of the SDEIS.	CU 15

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Section: Irreversible and Irretrievable Commitment of Resources (IRR)			
IRR1	The DEIS does not adequately characterize the fossil fuels consumed during mine development, operation, and closure.	Irreversible and irretrievable commitments of these resources are discussed in Chapter 7 of the SDEIS.	AIR 02
IRR2	The DEIS does not adequately characterize the loss of natural and cultural resources, such as high-quality forests, wetlands, and traditional cultural activities.	Effects on cultural resources and the relationship between natural resources and cultural resources are discussed in Section 5.2.9 and 5.3.9 of the SDEIS. Irreversible and irretrievable commitments of these resources are discussed in Chapter 7 of the SDEIS.	NEPA 14
Section: Noise (N)			
N1	Noise impacts from operation of the NorthMet Project Proposed Action on the surrounding region are not properly modeled or explained in the DEIS.	To address this issue, Section 5.2.8 of the SDEIS includes a visual representation of noise contours to show the extent of noise effects on sensitive receptors within the surrounding region.	N 06
N2	The DEIS does not adequately address noise mitigation.	Noise mitigation measures and monitoring plans are addressed in Section 5.2.8 and Chapter 7 of the SDEIS.	PD 01
N3	The DEIS does not adequately characterize the cumulative effects of noise, including vibration, from the NorthMet Project Proposed Action and other activities.	Further modeling of the potential cumulative noise and vibration effects on the surrounding environment has been conducted since the preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Cumulative noise and vibration effects, and the metrics used for analysis of potential effects, are discussed in Chapter 6 of the SDEIS.	N 03
N4	The DEIS does not adequately characterize the effects of NorthMet Project Proposed Action-related noise, including blasting, on wildlife.	NorthMet Project Proposed Action--related noise effects on wildlife, including blasting, are discussed in detail in the Section 5.2.5 of the SDEIS.	N 04, N 05
N5	The DEIS does not adequately characterize the effects of project-related noise, including blasting, on human health.	NorthMet Project Proposed Action-related noise effects on human health, including blasting, are discussed in detail in the Section 5.2.7 of the SDEIS.	N 01
N6	The DEIS does not adequately characterize the impacts of discontinuous noise, such as blasting, on people who use the NorthMet Project area for recreation, fishing, and hunting.	The effects of discontinuous noise, such as blasting, on people who use the NorthMet Project area for recreation, fishing, and hunting are discussed in detail in Section 5.2.8 of the SDEIS.	N 02

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Section: Project Description (PD)			
PD1	The DEIS does not adequately explain the Land Exchange Proposed Action, which is a connected action.	The Land Exchange Proposed Action is addressed as part of the NorthMet Project Proposed Action and alternatives throughout the SDEIS.	LAN 01
PD2	The DEIS NorthMet Project Description does not adequately describe the potential for release of contaminants, hazardous wastes, or acid rock drainage from waste rock, the Tailings Basin, or failure of liner systems on surface and groundwater quality standards.	The NorthMet Project Proposed Action, including management of waste rock and tailings, has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Management of waste rock and tailings is addressed in Section 3.2.2 of the SDEIS. The potential effect of waste rock and tailings on surface and groundwater quality is addressed in Section 5.2.2 of the SDEIS.	GT 15
PD3	The DEIS does not adequately analyze the scope or effectiveness of closure and reclamation plans.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Closure and reclamation of the NorthMet Project area is described in Section 3.2.2 and long term environmental consequences are described in Section 5.2 of the SDEIS.	PD 02, PD 06, PD 20
PD4	The DEIS does not adequately describe financial assurance.	Financial assurance for closure and remediation of the NorthMet Project area is addressed in Section 3.2.2.4 of the SDEIS.	FIN 01
PD5	The DEIS does not adequately describe the WWTF, including the seepage/discharge collection from the Tailings Basin or Hydrometallurgical Residue Facility.	The NorthMet Project Proposed Action, including details of water management at the Tailings Basin has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS), and is further addressed in Section 3.2.2 of the SDEIS.	PD 03, PD 07, PD 11, PD 12, PD 13, PD 18
PD6	The DEIS does not fully evaluate geotechnical stability, including a stockpile stability analysis.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The existing geotechnical conditions at the NorthMet Project area are discussed in Section 4.2.14. The design and structural integrity of the proposed geotechnical features is addressed in Sections 3.2.2 and 5.2.14 of the SDEIS.	All GT themes
PD7	The DEIS does not adequately describe the transportation of ore between the Mine Site and Plant Site or the necessary transportation infrastructure.	The transportation of ore between the Mine Site and Plant Site is discussed in Section 3.2.2 of the SDEIS.	PD 36
PD8	The DEIS contains insufficient baseline data, monitoring measures, mitigation methods, and modeling, and does not include newly identified	Existing environmental conditions including results of baseline modeling are discussed in Chapter 4 of the SDEIS. Management and mitigation measures of the NorthMet Project Proposed Action and alternatives are	Addressed throughout the FEIS.

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	issues.	described in Chapter 3. Environmental consequences are addressed in Chapter 5. A summary and comparison of the mitigation and management measures for the NorthMet Project Proposed Action and alternatives and the environmental consequences is provided in Chapter 7 of the SDEIS.	
PD9	The DEIS NorthMet Project Description is not complete, and/or is not consistent with the PDEIS.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS), and the description of the NorthMet Project Proposed Action and alternatives has been updated in the SDEIS.	All PD themes
PD10	The DEIS does not adequately describe the NorthMet Project Proposed Action's relationship to plant and wildlife species, habitat, and high quality forests and wetlands.	The existing environmental conditions and the potential environmental consequences relating to the NorthMet Project Proposed Action are addressed in Chapters 4 and 5 of the SDEIS, respectively.	All WI, VEG, and WET themes
PD11	The DEIS does not adequately describe the placement of waste rock piles and stockpiles of overburden.	The NorthMet Project Proposed Action, including management of waste rock and overburden, has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Management of waste rock and overburden is addressed in Section 3.2.2 of the SDEIS.	PD 15
PD12	The DEIS does not adequately describe Superior National Forest plans and regulations or whether they will be adhered to.	The Land Exchange Proposed Action is described in Section 3.3. The potential effect of the proposed change in land use at the NorthMet Project area and the considerations for existing and surrounding land management are addressed in Sections 5.2.1 and 5.3.1 of the SDEIS.	PER 35
PD13	The DEIS does not adequately address due diligence on the NorthMet Project Proposed Action.	Due diligence for the NorthMet Project Proposed Action is addressed in Chapter 3 of the SDEIS.	All PD themes
PD14	The DEIS does not adequately describe the moratorium on sulfide mining in Wisconsin.	The moratorium in Wisconsin is outside the scope of the NorthMet Project Proposed Action, and is therefore not discussed in the SDEIS.	SDEIS comments did not raise this topic.
Section: Process (PRO)			
PRO1	The DEIS does not adequately adhere to the EIS/NEPA process or involve appropriate agencies.	Chapter 1 of the SDEIS provides information about the Cooperating Agencies that were included during the scoping period for the DEIS, as well as other agencies involved in development of the SDEIS. The three Co-lead Agencies (MDNR, USACE, and USFS) each ensured that federal and state environmental impact processes were followed, and that the process adhered to each agency's internal requirements.	NEPA 08
PRO2	The DEIS does not adequately analyze project	The NorthMet Project Proposed Action and the alternatives have changed	ALT 16, ALT 21

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	alternatives, as there is too much uncertainty.	substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Alternatives (including the NorthMet Project No Action Alternative) are described in Chapter 3 of the SDEIS; a comparison of alternatives is provided in Chapter 7.	
PRO3	The DEIS contains insufficient data/studies, explanations of methodologies, and proposed mitigation measures.	New data and studies, methodologies, and mitigation measures are discussed in detail in the SDEIS. Individual resource-specific sections incorporate new data or studies and explanations of methodologies in Chapter 4, while mitigation measures are discussed in resource-specific sections of Chapter 5 of the SDEIS.	NEPA 08
PRO4	The DEIS does not adequately incorporate all connected actions and other actions into the cumulative effects analysis.	All connected actions, including the Land Exchange Proposed Action, are included in the cumulative effects analysis in Chapter 6 of the SDEIS. Resource-specific effects of the Land Exchange Proposed Action are included in Chapter 6 of the SDEIS.	CU 02, CU 08, CU 09, CU 13
PRO5	Analysis regarding the Cultural Resources section was not appropriately completed, as Section 106 consultation was incomplete.	The federal Co-lead Agencies are actively consulting with federally recognized Bands that have expressed an interest in consulting for the NorthMet Project Proposed Action. Consultation includes interviews with tribal members. Effects on cultural resources are addressed in the Section 5.2.9 of the SDEIS. The Section 106 evaluation must be complete before the federal agencies can complete their respective RODs.	CR 06
PRO6	The DEIS process did not allow adequate public participation, and specifically lacked adequate public comment periods or meetings. All issues of public opposition should be addressed.	The NEPA public participation process for the DEIS is discussed in detail in Section 2.2 of the SDEIS. Two meetings and a 90-day comment period were provided for the DEIS. A separate scoping period for the Land Exchange Proposed Action occurred in the fall of 2010. For the SDEIS, the number of public meetings and length of the comment period will be determined by the Co-lead Agencies. Public comments and positions voiced in the record at both public meetings and through written comments have been considered in the development of the SDEIS.	NEPA 11
PRO7	The DEIS does not adequately evaluate potential violations of laws or standards, such as the CAA, CWA, etc.	As described in Section 1.4 of the SDEIS, the NorthMet Project Proposed Action must comply with all applicable laws and standards. Resource-specific laws and regulations are discussed in the corresponding resource sections.	PER 26
PRO8	The DEIS does not adequately incorporate the Feasibility Study for the Land Exchange Proposed Action.	The Land Exchange Proposed Action is discussed in detail throughout the SDEIS. Individual chapters incorporate information from the USFS Land Exchange Feasibility Study, as well as other sources.	LAN 06

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PRO9	The DEIS does not fully include tribal Cooperating Agency comments.	The federal Co-lead Agencies are actively consulting with the three federally recognized bands that have expressed an interest in consulting for the NorthMet Project Proposed Action. Discussion of tribal comments and concerns are a part of this consultation. These comments are addressed in the SDEIS and through ongoing consultation.	CR 06
PRO10	The DEIS does not adequately describe any financial assurance for the project or implications of an environmental disaster.	Financial assurance for closure and remediation of the NorthMet Project area is addressed in Chapter 3 of the SDEIS. A Co-lead Agency document dated August 23, 2011, describes the mechanism for addressing financial assurance in the SDEIS (Co-lead Agencies 2011).	FIN 05
Section: Socioeconomics (SE)			
SE1	The DEIS incorrectly implies that there are no economic benefits from the NorthMet Project No Action Alternative.	The SDEIS more clearly states that there would be no additional economic benefits from mining activity in the NorthMet Project No Action Alternative, but that other economic activity in the region would remain unaffected. Existing non-mining economic activity is described in greater detail in Section 4.2.10 the SDEIS.	SDEIS comments did not raise this topic.
SE2	The EIS should include a full EJ evaluation, focused specifically on impacts to local tribes.	The EJ analysis has been expanded, and is presented in Section 5.2.10.2.6 of the SDEIS, based on input from the Socioeconomic IAP Workgroup.	SO 09
SE3	The DEIS overestimates the NorthMet Project Proposed Action's relatively short-term employment benefits, and does not adequately address long-term, post-closure costs, or the "boom and bust" cycle associated with extractive industries.	These issues are addressed in Section 5.2.10 of the SDEIS, based on input from the Socioeconomic IAP Workgroup.	SO 04
SE4	The DEIS does not adequately account for the NorthMet Project Proposed Action's adverse long-term impact on the region's tourism and real estate economies, which are based on high environmental quality (actual and perceived).	Please see response to Theme SE3.	SO 02, SO 03
SE5	The EIS should evaluate the long-term community health impacts associated with pollution from the NorthMet Project Proposed Action.	Effects on human health are primarily addressed in Section 5.2.7 and 5.3.7 of the SDEIS. These include health effects from airborne, water-borne, and other sources related to the NorthMet Project Proposed Action.	HU 01
SE6	The low-grade character of the ore body is not adequately addressed.	Calculations in the DEIS Socioeconomics Section already take the quality of the ore into account. These inputs are more clearly stated in Section	SDEIS comments did not raise this

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		5.2.10 of the SDEIS.	topic.
SE7	The EIS should address whether the NorthMet Project Proposed Action will emphasize hiring of local workers, therefore ensuring economic benefits to local communities.	Please see response to Theme SE3	SO 04
SE8	The DEIS did not discuss the specifics regarding inputs of the IMPLAN model and other economic data.	The inputs and methodology of the IMPLAN model are described in Section 5.2.10 of the SDEIS.	SO 08
SE9	The DEIS does not adequately evaluate socioeconomic impacts.	Potential socioeconomic effects on population, housing, employment, transportation, etc., are addressed in Sections 5.2.10 and 5.3.10 of the SDEIS. A Multi-agency (Co-lead and cooperating agencies) Workgroup met during 2011to help define the scope of the socioeconomics analysis.	SO 04, SO 06
SE10	The DEIS does not adequately evaluate mineral rights.	Mineral rights for the NorthMet Project Proposed Action are discussed in Section 3.2.2 of the SDEIS.	LAN 04
Section: Vegetation (VE)			
VE1	The DEIS does not provide sufficient baseline characterizations of vegetation and other factors related to vegetation, such as groundwater modeling.	Existing conditions, including baseline characterizations and any additional threatened or endangered species listed after the DEIS was released, are discussed in detail in Sections 4.2.4 and 4.3.4 of the SDEIS. Details regarding inputs to modeling are included in resource-specific Sections of SDEIS Chapter 5.	VEG 09
VE2	The DEIS does not adequately address impacts to wild rice, aquatic vegetation, and farming from sulfates, sulfides, mercury methylation, and other constituents.	Effects resulting from vegetation exposure to potentially harmful constituents are discussed in detail in relevant Sections of SDEIS Chapter 5, such as water resources.	VEG 04, VEG 07
VE3	The DEIS reclamation plans are not sufficiently detailed. They do not adequately consider impacts from non-native and invasive species and should instead include native species.	Issues such as the spread of non-native and invasive species and potential effects on vegetation resources are addressed in Section 5.2.4 of the SDEIS. Reclamation plans, revegetation plans (including plant species proposed to be used during closure and reclamation activities), monitoring plans, and potential mitigation measures for the NorthMet Project Proposed Action are discussed in SDEIS Chapter 3.	VEG 05
VE4	The DEIS does not adequately consider the cumulative effect on non-listed flora populations, in addition to threatened and endangered species, in northeast Minnesota from	Cumulative effects on vegetative species, and the metrics used for analysis of potential effects, are discussed in Chapter 6 of the SDEIS.	VEG 08

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	other similar projects, and does not discuss the extent and prevalence of these species in the region.		
VE5	The DEIS contains insufficient information to support its discussion of effects to threatened and endangered plant species, nor does it describe a plan to maintain these populations.	Potential effects on state-listed and RFSS plant species are discussed in Sections 5.2.4 and 5.3.4 of the SDEIS. A Biological Evaluation will be developed to address RFSS. There are no federally listed plant species in the NorthMet Project Area.	VEG 01
VE6	The DEIS does not adequately evaluate tribal utilization of important plant resources (wild rice, cedar, sage, etc.) at the Mine Site and Plant Site, since the Section 106 NHPA consultation was not finished at time of publication and documentation of these uses is often not available or recorded.	Section 106 consultation is ongoing. Potential effects on vegetation and plant species are discussed in Sections 5.2.4 and 5.3.4 of the SDEIS. Tribal utilization of plant species is discussed in the Cultural Resources sections of SDEIS Chapters 4 and 5.	CR 05, CR 06
VE7	The DEIS does not adequately identify the proposed organic nutrient amendments to the Tailings Basin and how these would promote the development of shoreline and near-shore aquatic vegetation.	Potential mitigation methods regarding vegetation are addressed in Section 5.2.4 of the SDEIS. This includes revegetation of the Tailings Basin and development of aquatic vegetation. Reclamation plans, revegetation plans, monitoring plans, and potential mitigation measures for the NorthMet Project Proposed Action are discussed in Chapter 3 of the SDEIS.	VEG 05
VE8	The DEIS does not adequately characterize impacts from sulfuric acid formation on vegetation, during transportation of the rock from the Mine Site to the Plant.	Spillage from rail cars is expected to be minimized through the use of mitigation methods such as seals on rail car doors and a different design than previous operations. Effects on vegetation resulting from rail car spillage are discussed in Section 5.2.4 of the SDEIS.	VEG 04, VEG 06
Section: Visual Resources (VI)			
VI1	The DEIS visual impact assessment does not provide sufficient characterizations of baseline conditions or impacts. A visual impact assessment that is comparable to past USACE practices should be provided.	Section 4.2.11 of the SDEIS includes an expanded discussion of baseline visual conditions.	SDEIS comments did not raise this topic.
VI2	The DEIS should include a discussion on the potential adverse visual impacts from the introduction of non-native species as a revegetation measure.	This topic is discussed in Sections 5.2.11 and 5.3.11 of the SDEIS.	SDEIS comments did not raise this topic.
VI3	The DEIS' conclusions regarding the extent and	This topic is discussed in Sections 5.2.11 and 5.3.11 of the SDEIS.	SDEIS comments

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	impacts of light pollution are inadequate.		did not raise this topic.
VI4	The DEIS should evaluate the potential for haze and haze-related impacts on the BWCAW as a result of the NorthMet Project Proposed Action.	Haze and related effects are discussed in Section 5.2.7 and 5.2.11.	AIR 08
Section: Wetlands (WE)			
WE1	The DEIS does not adequately characterize the wetland baseline information; the wetland delineation and characterization of wetland areas /species should be reevaluated.	Characterization of wetland resources at the Mine Site has been reevaluated since the DEIS. Existing conditions, including baseline characterizations of wetland resources, are discussed in detail in Section 4.2.3 of the SDEIS. Further details regarding inputs to modeling are discussed in Section 5.2.3 of the SDEIS.	WET 07, WET 21
WE2	The DEIS does not adequately characterize the direct and indirect impacts to wetland resources from the NorthMet Project Proposed Action.	Direct and indirect effects on wetland resources from the NorthMet Project Proposed Action are discussed in detail in Section 5.2.3 of the SDEIS. Further analysis of the potential direct, indirect, and cumulative effects on wetland resources has occurred since the development of the DEIS and a Wetlands IAP Workgroup was formed to address the concerns raised on the DEIS. Related discussions are included in other Sections of SDEIS Chapter 5 (such as water resources).	WET 07, WET 08, WET 10, WET 11
WE3	The DEIS does not adequately address wetland mitigation for the NorthMet Project Proposed Action.	Wetland monitoring plans are discussed in Section 5.2.3 of the SDEIS. Wetland mitigation methods, including wetland ratios and justification for mitigation site locations, are also addressed in Section 5.2.3. PolyMet has now proposed a compensatory wetland mitigation site in the St. Louis River Watershed and one in an adjacent watershed, in addition to the two other sites identified in the DEIS.	WET 01, WET 03, WET 04, WET 05
WE4	The DEIS provides insufficient information to demonstrate compliance with federal and state wetland permitting requirements.	Existing wetland habitat, including wetland/habitat quality, is described in Sections 4.2.3 and 4.3.3 of the SDEIS. Effects on wetland resources at the Mine Site and Plant Site are included in Section 5.2.3 of the SDEIS. This discussion includes (where applicable) information to show how the effects of the NorthMet Project Proposed Action compare with federal and state wetland permitting requirements, which includes justification for mitigation site locations.	COE 02, COE 04
WE5	The DEIS does not adequately address the cumulative effects for wetland resources and the analysis should be redone.	Further analysis of the potential cumulative effects on wetland resources has occurred since the development of the DEIS and a Wetlands IAP Workgroup was formed to address the concerns raised in the DEIS. Cumulative effects on wetland resources, and the metrics used for analysis	WET 18

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		of potential effects, are included in Chapter 6 of the SDEIS.	
WE6	The DEIS does not adequately analyze the effectiveness of the wetland treatment system (i.e., WWTF and passive wetland treatment system) and the potential for a longer duration. The SDEIS needs to further analyze the effectiveness and possibility for a longer duration.	Further analysis of the potential effects on wetland resources has occurred since the development of the DEIS, including formation of a Wetlands IAP Workgroup to address the concerns raised in the DEIS. The NorthMet Project Proposed Action no longer includes a wetland treatment system. See Chapter 3 for a description of the mechanical wastewater treatment systems planned for the Plant Site and Mine Site, as well as other wetland monitoring plans. Wetland monitoring plans and other wetlands effects are discussed in Section 5.2.3 of the SDEIS.	SDEIS comments did not raise this topic.
WE7	The DEIS does not adequately address the value of wetlands since the Land Exchange Proposed Action was not included in DEIS and the covenants on the Mine Site (Weeks Act) are being ignored.	Information on the Land Exchange Proposed Action, including conformance to the Weeks Act, Federal Land Policy and Management Act, the Forest Plan, and EOs 11990 (USEPA 1977) and 11988 (USFS 2004d, as cited in the FEIS) are included in Chapter 1 and Section 5.3.3 of the SDEIS.	WET 14, WET 17
WE8	The DEIS is inadequate in demonstrating how the water quality and release of mercury would impact wetlands.	Since publication of the DEIS, additional analysis of indirect wetland effects has been conducted, including effects on wetland water quality. A Wetlands IAP Workgroup was formed to address concerns raised in the DEIS. Potential wetland effects associated with degraded water quality and mercury release from the NorthMet Project Proposed Action have been further evaluated, and further analysis of potential effects on wetland resources has been conducted since the development of the DEIS. These effects are discussed in detail in Sections 5.2.3 and 5.3.3 of the SDEIS, and in related Sections of SDEIS Chapters 4 and 5 (such as water resources).	WET 11
Section: Wildlife (WI)			
WI1	The DEIS does not adequately incorporate the findings of biological assessments or comments prepared by other agencies (USACE, USFWS, USFS) related to impacts on threatened and endangered species or RFSS.	A BA and Biological Evaluation will be developed to address federally listed and RFSS, respectively. Discussions of potential effects on federally listed, state-listed, and Regional Forester Sensitive Species (wildlife) are included in the Vegetation and Wildlife Sections of SDEIS Chapter 5.	WI 11
WI2	The DEIS does not adequately analyze the direct and indirect effects (including habitat loss) on wildlife species including special-status species (e.g., endangered species). More surveys need to be completed for these species, and more emphasis should be placed on the effect on	Please see response to Theme WI1. Updated special-status species lists are included in Sections 4.2.5 and 5.2.5 of the SDEIS. Additional wildlife surveys were completed for the non-federal land exchange parcels and are discussed in Sections 4.3.5 and 5.3.5 of the SDEIS.	WI 01, WI 03

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	specific areas such as the Once Hundred Mile Swamp and Mud Lake/Yelp Lake.		
WI3	The DEIS does not adequately evaluate tribal utilization of important and treaty-protected wildlife species (moose, furbearer species, etc.), because the Section 106 NHPA consultation was not finished at time of publication and documentation of these uses is often not available or recorded.	Section 106 consultation is ongoing. Discussion of potential effects on wildlife species is included in Sections 5.2.5 and 5.3.5 of the SDEIS. In addition, potential effects on 1854 Treaty resources have been addressed in Sections 4.2.9 and 5.2.9.	WI 09
WI4	The DEIS does not adequately consider the cumulative effect on non-listed wildlife populations (in addition to threatened and endangered species) in northeast Minnesota from other similar projects, including synergistic impacts of bioaccumulation of contaminants.	Cumulative effects on wildlife species, including RFSS and SGCN, are discussed in Chapter 6 of the SDEIS. Further discussion of reclamation and post-closure activities are discussed in Chapter 3 of the SDEIS. Non-federal lands to become federal/public are addressed in topic-specific discussions in Section 5.3 and Chapter 6 of the SDEIS. Mitigation for and restoration of wildlife corridors is discussed in Chapter 6 of the SDEIS.	WI 08
WI5	The DEIS does not adequately address the habitat value of quality for restored wetlands, particularly the Hinckley and Aitkin sites. These would not offer the same habitat for northern wildlife species since they are located so far south.	Existing wetland habitat, including wetland/habitat quality, is described in Sections 4.2.3 and 4.3.3 of the SDEIS. Wetland mitigation methods, including justification for mitigation site locations, are addressed in Sections 5.2.3, 5.3.3, and Chapter 7 of the SDEIS.	SDEIS comments did not raise this topic.
Section: Water Resources (WR)			
WR1A	The plan for post closure management to prevent pollution of groundwater or surface water is inadequate or unclear and given the inherent uncertainty in hydrology and geochemistry, and the Mine's long term potential to degrade water quality. The post-closure plan should include contingencies, mitigation strategies, and a detailed reclamation plan and financial assurances.	The Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. PolyMet has developed Adaptive Water Management Plans [PolyMet 2015d, as cited in the FEIS) that include contingencies and mitigation strategies if actual water effects turn out to be greater than modeled. Post-closure management is addressed in Section 3.2.2 and Chapter 7 of the SDEIS. During plant closure activities, demolition and reclamation of Plant Site infrastructure would be completed according to federal, state, and local agency permits and regulations. Financial assurance for closure and remediation of the NorthMet Project Proposed Action is addressed in Chapter 3 of the SDEIS. A Co-lead agency document dated August 23, 2011, describes the mechanism for addressing financial assurance in the SDEIS (Co-lead Agencies 2011).	WR 21, WR 35, WR131, WR 132

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WR1B	The overall NorthMet Project Proposed Action monitoring plan for water quality is not adequate or described in sufficient detail.	Monitoring is addressed in detail in Section 5.2.2.3.6 of the SDEIS. Groundwater specific monitoring points will be located to evaluate the accuracy of predicted water quality effect. These prediction points were selected based on groundwater flow paths between Mine Site facilities (e.g., waste rock, tailings, pits, etc.) and the nearest surface waters (i.e., the Partridge River and Embarrass River). Surface water quality must be monitored and water quality standards met in all Embarrass River and Partridge River tributaries and main branches of these rivers, as determined by the MPCA.	WR 21
WR1C	Leaching of contaminants from waste rock stockpiles is problematic.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The most reactive waste rock will be temporarily stored on liners, then placed in the East Pit and flooded with water before closure. Discussions of water resources effects (Section 5.2.2 of the SDEIS) account for temporary pollutant release by leakage through these liners. The less-reactive Category 1 waste rock pile that remains permanently on the surface will be surrounded with a water containment trench to capture seepage during and after mining. Water captured in the trench would be treated. A proposed geosynthetic cover would decrease water infiltration. The issue is addressed in Sections 3.2.2 and 5.2.2 of the SDEIS.	WR 01, WR 17
WR1D	The potential for pollution from railroad car ore spillage needs analysis.	The estimate of water quality effects in the SDEIS includes the release and transport of pollutants from ore spilled from rail cars. A monitoring plan for characterization of background water quality and evaluation of effects during operations has been developed. Mitigation strategies are part of the monitoring plan. Sections 4.2.2 and 5.2.2 of the SDEIS address this issue.	WR 151
WR1E	Studies and sampling were inadequate to assess and characterize baseline conditions of acid mine drainage, pollution (including sulfates, mercury, and methylmercury), groundwater (including flows), surface water, wetlands, wild rice, wildlife, and financial risks. As a result, the impact analysis of the NorthMet Project Proposed Action is inadequate.	Environmental sampling and analysis has continued into 2012, expanding the set of baseline environmental data since the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). Updated baseline environmental conditions are presented in Section 4.2.2 (water quality, wild rice, and mercury), and Section 4.2.3 (Wetlands). The water quality model used to estimate effects of the project has been calibrated to these current conditions, and the deviation between the calibrated models and observed conditions are considered as one measure of prediction uncertainty (Section 5.2.3).	WR 03, WR 05, WR 08, WR 14, WR 25
WR1F	The proprietary models of pollutant production	The proprietary models used in the DEIS to estimate the release and transport of pollutants under NorthMet Project Proposed Action have been	WR 60, WR 61,

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	and transport cannot be independently evaluated.	replaced in the SDEIS with a model that, though still proprietary, is essentially transparent and can be viewed and executed independently. The technical review included independent assessment to confirm that the model used the parameter values agreed upon by the Co-lead Agencies, and that the major model results could be reproduced using independent calculations. See Section 5.2.2 of the SDEIS.	WR 106
WR2A	The hydrogeology of the NorthMet Project site is not well understood. Therefore, the DEIS cannot reliably determine reliably aquifer drawdown from dewatering or whether pollutants from the Mine could travel in groundwater and degrade water in wells, lakes or rivers.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water balance studies. In particular, the number of wells used to characterize the Mine Site alluvium (the main area affected by dewatering) has been increased (Section 4.2.2), and the new information on water levels and water quality gained from these data have been used in the calibration of the updated water quality model (Section 5.2.2).	WR 07, WR 08, WR 10
WR2B	Climate change could increase (beyond assumptions in the DEIS) the volume of water flowing through the Mine causing increased transportation of pollutants in surface and groundwater.	This issue is addressed in Sections 5.2.2 and 5.3.2 of the SDEIS. Estimates of pollutant transport from the NorthMet Project Proposed Action use results of "down-scale" climate models (i.e., nested models that refine the estimated effect of climate change on local water balance using larger-scale model results) to estimate the range in pollutant migration from mine waste. The effects of extremely wet periods are included in the modeling.	WR 77, WR 180, WR 188, WR 196
WR2C	Pollutants released by the NorthMet Project Proposed Action could contaminate groundwater. These effects need to be estimated.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Estimating the rate at which pollutants from mine waste could leach into groundwater is given high priority in the SDEIS modeling and is specifically discussed in Section 5.2.2 of the SDEIS. Pollutant concentrations in groundwater were estimated using probabilistic models; descriptions of predicted effects on groundwater and surface water quality are presented along with a discussion of uncertainty in model parameters.	WR 10, WR 12
WR2D	The liners under waste rock and waste facilities and /or hydrometallurgical waste cells may fail over time and may need to be replaced.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and the SDEIS has changed accordingly. In particular, the lowest-sulfide (Category 1) waste rock that will be permanently stored in unlined facilities will be surrounded completely by a groundwater containment system that will capture seepage during and after mining to prevent discharge before it has been treated to meet discharge standards. After	WR 67, WR 126, WR 138

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		closure, the Category 1 waste rock will be covered with a geomembrane to reduce water percolation and pollutant transport. The more reactive (Category 2, 3, and 4) rock will be stored temporarily in lined facilities, before being placed in the East Pit for permanent stabilization under the water table. Hydrometallurgical waste will be blended with lime to reduce metal solubility prior to disposal, and this material will be placed in double-lined facilities, which have been shown to have negligible leakage.	
WR2E	The model of pollutant transport from Mine Site facilities to groundwater and surface water does not adequately represent the NorthMet Project Proposed Action. The model does not adequately consider water flow through the Mine Site, all of the chemical constituents that may be leached from mine waste, or the known mechanisms of pollutant release and transport at hard rock sulfide mines.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Estimating the rate at which pollutants from mine waste could leach into groundwater is given high priority in the SDEIS modeling and is specifically discussed in Section 5.2.2 of the SDEIS. The SDEIS expands the number of constituents included in the modeling from eight in the DEIS to 20 to include all inorganic constituents with drinking water standards. Pollutant concentrations in groundwater were estimated using probabilistic models. Descriptions of predicted effects on groundwater and surface water quality are presented along with a discussion of uncertainty in model parameters.	WR 49, WR 61
WR2F	The WWTF may not be able to adequately treat Mine Site water to meet discharge standards and there is no contingency for this. It is also unclear whether the WWTF would treat nitrates.	The state has reviewed the WWTF effluent water quality targets provided by PolyMet and, based upon currently available data, including RO pilot results, believes these targets could be met. Nitrates would be treated if they are included in the discharge permit. The WWTF will also be of modular construction, such that additional modules can be added for increased capacity if necessary.	WR 32
WR2G	The water quality models for the NorthMet Project Proposed Action produced recharge rates through the glacial till that seem implausible, based on USGS data. This should be reconciled by measuring recharge from water table wells and including recharge from all pathways, including meteoric water.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Water quality modeling is specifically addressed in Section 5.2.2 of the SDEIS. Hydraulic characteristics of the glacial till, including hydraulic conductivity and recharge, were refined by reviewing data (including specific measurements of recharge through surficial till) from two nearby mines with similar hydraulic and geologic settings.	SDEIS comments did not raise this topic.
WR2H	Many of the wetlands in the NorthMet Project area may be hydraulically connected to groundwater, contrary to the assumption in the DEIS. Air photo interpretation is inadequate to	The potential for indirect wetland effects at the Mine Site is discussed in Section 5.2.2 of the SDEIS. This discussion is refined and expanded, compared to the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS), in particular by evaluating the effects of dewatering at two nearby	WR 53

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	assess impacts on wetlands and Mud Lake. Empirical data used to address indirect wetland impacts needs better disclosure in the EIS.	mines with similar bedrock and surficial geologic conditions.	
WR2I	The point selected to evaluate impacts to surface or groundwater is inappropriate.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling, proposed monitoring points, and proposed model evaluation locations have been revised accordingly. Water quality monitoring is specifically addressed in detail in Section 5.2.2.3.6 of the SDEIS. For groundwater, specific monitoring points will be located to evaluate the accuracy of predicted water quality effect. These prediction points were selected based on groundwater flow paths between Mine Site facilities (e.g., waste rock, tailings, pits, etc.) and the nearest surface waters (i.e., the Partridge River and Embarrass River). The surface water quality modeling includes 18 evaluation locations along the main branch of the Embarrass River, its tributary streams, and the main branch of the Partridge River, plus one evaluation point in Colby Lake.	WR 64, WR 109
WR2J	The evapotranspiration capability of the vegetated soil layer on the stockpiles has not been demonstrated.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and no longer includes permanent stockpiles of Category 2, 3, or 4 waste rock where minimizing infiltration is important. The Category 1 Stockpile would be covered by a geomembrane liner, thereby dramatically reducing infiltration and the need to accurately model evapotranspiration. Section 5.2.2 of the SDEIS addresses this issue.	SDEIS comments did not raise this topic.
WR3A	The evaluation of tailings discharges is inadequate as there is a significant potential for oxidation from the tailings slurry discharge beach and the tailings pond, winter effects on tailings oxidation need better definition, and water quality and quantity leaving the tailings basin may be problematic, especially in the case of flooding.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Water quality modeling is specifically addressed in Section 5.2.2 of the SDEIS. In addition, the SDEIS now uses a more robust probabilistic modeling approach that incorporates current data and information to present sufficient additional analysis. Finally, the flotation tailings will now be surrounded with a water containment system to capture seepage for storage and eventual treatment prior to discharge. Sections 3.2.2 and 5.2.2 of the SDEIS address this issue.	WR 45, WE 50
WR3B	There are concerns about water quality effects beyond the immediate NorthMet Project area, including BWCAW, the overall St. Louis River	There is no groundwater seepage or surface water drainage from the NorthMet Project area to the BWCAW or its waters. Surficial groundwater seepage and surface runoff from the NorthMet Project area drains to either	WR 38, WR 42, WR 80

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	Watershed, and Lake Superior.	the Partridge River or the Embarrass River, both of which are tributaries of the St. Louis River and Lake Superior. All seepage and surface water runoff must meet applicable water quality standards at or before the property boundary. Section 5.2.2 of the SDEIS addresses this issue.	
WR3C	The DEIS' finding that there will be no surface water discharge is incorrect. The final EIS should acknowledge the application of NPDES permits to a variety of pathways for surface water discharge and to assess the potential for each, including the West Pit outflow.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and the SDEIS has changed accordingly. There will be groundwater seepage from the Tailings Basin and the East Pit after it fills with water. These seepages (which are quantified in Section 5.2.2 of the SDEIS) will eventually become surface water draining to tributaries of the Embarrass River and Partridge River. All applicable groundwater and surface water standards must be met. There may also be direct discharge from the WWTF, which would require a NPDES permit, if there is excess water after make-up water needs are met. Beginning in approximately year 40, there could also be direct discharges from the West Pit Overflow; this discharged water would be treated at the WWTF prior to diversion into the West Pit.	SDEIS comments did not raise this topic.
WR3D	The NorthMet Project Proposed Action could result in AMD and the potential for additive toxicity to Lake Superior.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). There is a discussion on the potential for effects as it pertains to the impaired status of the St. Louis River (which flows into Lake Superior) and/or the TMDL process in Section 5.2.2 and Chapter 6 of the SDEIS. See also response to theme WR3C.	WR 01, WR 08, WR 10, WR 19, WR 25
WR3E	Water level changes in the Partridge River and Embarrass River and wetlands downstream of the tailing basin needs quantifying.	Changes in streamflow to the Partridge River and Embarrass River were modeled for the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS), and that modeling was revised for the SDEIS to reflect substantial changes in the NorthMet Project Proposed Action. These changes are addressed in Section 5.2.2 of the SDEIS. The small reduction in streamflow due to the NorthMet Project Proposed Action will result in an imperceptible change in river water level.	WR 45, WR 46, WR 47, WR 48
WR3F	Water quality and quantity impacts to Colby Lake and Hoyt Lakes' municipal water supply need better analysis. The DEIS should have discussed the following related issues: development of a TMDL or Manganese criterion for Colby Lake; effects on Colby Lake's water levels; quantity of water pumped to the WWTP;	These issues are addressed in Section 5.2.2 of the SDEIS. Colby Lake is one of the water quality modeling evaluation locations downstream of the Mine Site. Effects on Colby Lake are discussed in Section 5.2.2.3.2.	WR 43, WR 123, WR 140

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	and levels of metals removal, including iron reduction, achieved by the Hoyt Lakes treatment plant.		
WR3G	In reference to lining the exposed Virginia Formation along the East Pit's north wall, literature citation notes that lime increases pH which, in turn, increases release of arsenic. The relationship between arsenic solubility and liming should be addressed.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). As described in Chapter 3 and Section 5.2.2 of the SDEIS, the more reactive waste rock and overburden would be backfilled to the East Pit, covering the Virginia formation, and would be permanently stored subaqueously, minimizing oxidation and the subsequent release of contaminants. Lime could be added to the East Pit during backfilling, as needed, in order to maintain circumneutral pH in the pit pore water, which would be pumped to the WWTF and returned to the East Pit as required to manage potential pollutant load. The volume of lime required would be determined through monitoring.	WR 27
WR3H	The DEIS needs to model for dissolved aluminum, not total, since dissolved is the standard.	Minnesota Rules 7050.0222 Subpart 1.B states that in the absence of a listed conversion factor for a particular metal to convert total to dissolved, the applicable conversion factor is one. Aluminum is not listed in Subpart 9; therefore, its conversation factor is one. That means, practically speaking, that total equals dissolved; therefore, modeling total aluminum is acceptable. Since the dissolved form of a metal, by definition, cannot be greater than the total metal, using total aluminum in the modeling can be considered conservative. Modeling criteria for aluminum and other constituents are discussed in Section 5.2.2.1.2, while future concentrations of aluminum are discussed in Section 5.2.2.3.2 (Partridge River) and Section 5.2.2.3.3 (Embarrass River).	WR 82
WR3I	There are potential exceedances of water quality standards due to the NorthMet Project Proposed Action, even after WWTF treatment. To demonstrate compliance with all applicable standards and regulations, the EIS should present additional analysis, suggest alternative designs and methods to prevent contamination that exceeds water quality standards, and should use more rigorous Impact Criteria imposed by downstream impaired waters (including TMDL and nondegradation criteria) for al chemicals on	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Water quality modeling is specifically addressed in Section 5.2.2 of the SDEIS. In addition, the SDEIS now uses a more robust probabilistic modeling approach that incorporates current data and information to present sufficient additional analysis to compare predicted effects against applicable standards and regulations. Specific (i.e., numeric) evaluation criteria related to sulfate and methylmercury for the impaired portion of the St. Louis River do not exist. Section 5.2.2 of the SDEIS therefore discusses potential methylmercury-related effects in downstream impaired waters qualitatively.	WR 52, WWR 54, WR 60, WR 64, WR 70, WR 82, WR 83

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	the GLI list.		
WR3J	Lack of on or near-site streamflow data makes the DEIS' impact assessment questionable.	The Co-lead Agencies are comfortable with the modeling approach used for hydrologic impact assessment, especially since data collected during recent winters confirms that the model's baseflow estimates are conservatively low. It is also important to note that the total watershed area consumed within the NorthMet Project area is less than 7 percent at any location along the Partridge River, meaning that actual changes in streamflow will be very small. One or more permanent gauging stations along the Partridge River will be required during operations to aide in the determination of compliance with water quality standards.	WR 03, WR 04, WR 05, WR 06, WR 81, WR 91, WR 101, WR 105
WR3K	Ditches and dikes are not 100 percent effective. The materials used in ditch and storm water leachate collection systems must preclude seepage and be resistant to freeze/thaw cycles.	It is understood that the ditches and dikes that are part of the Category 1 Stockpile seepage collection system are not 100 percent effective. However, they will be engineered to an acceptable level of efficiency considering the low reactive potential of the Category 1 waste rock, and the modeling used to estimate project effects on water quality have assumed leakage rates observed in similar systems. This issue is addressed in Sections 3.2.2 and 5.2.2 of the SDEIS.	WR 17, WR 127
WR3L	Wetland treatment in the East Pit is inadequate for water treatment.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Water quality modeling is specifically addressed in Section 5.2.2 of the SDEIS.	SDEIS comments did not raise this topic.
WR3M	The DEIS fails to analyze the impacts to water quality from the local deposition and run-off of metal emissions.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Water quality modeling is specifically addressed in Section 5.2.2 of the SDEIS. In addition, the SDEIS now uses a more robust probabilistic modeling approach that incorporates current data and information to present sufficient additional analysis. Projected mercury emissions from the Plant Site have been subjected to an AERA, where potential mercury-related risks were assessed for fishing and subsistence users, where chronic risks are based on fish consumption. The findings of the agency-approved AERA are presented in the SDEIS.	SDEIS comments did not raise this topic.
WR3N	The potential effects of the NorthMet Project Proposed Action on wetlands, bogs, and peatlands were not adequately evaluated in the	Please see response to Theme WR3M.	WR 53, WR 64, WR 105, WR 112, WR 119

DEIS Theme Code	DEIS Theme Statement	DEIS Thematic Response	Corresponding FEIS Theme(s)
	DEIS.		
WR4A	The modeling used for the DEIS must consider mercury methylation and provide a quantitative analysis of the discharge of mercury from all pathways during and after mining based on realistic data. Modeling should also consider estimates of expected variation in measures under varied conditions (e.g., fluctuating water levels in reservoirs and flood plains).	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Water modeling is specifically discussed in Section 5.2.2 of the SDEIS. The SDEIS gives high priority to estimating the rate at which pollutants from mining waste (e.g., tailings, waste rock, stockpiled ore, pit-wall rock, and hydrometallurgical process residue) could leach into groundwater. To ensure that the analysis for the SDEIS identified a realistic range for possible effects on water quality, the Water Resources IAP Workgroup identified ranges for values of most parameters used to estimate pollutant migration. The model of pollutant dissolution and migration considers water percolation rates through mine waste, leakage rates through lined facilities, and uses empirical tests on project materials to estimate dissolution rates for sulfide minerals and chemical attenuation by adsorption and precipitation (see Section 5.2.2.2.3). Quantitative modeling of methylmercury is beyond the scope of the SDEIS, due to the inherent complexity of the fate and transport of methylmercury in the environment. However, the potential for enhanced methylation of mercury and uptake in fish as a result of project discharges is qualitatively addressed in the SDEIS.	WR 158, MERC 02, MERC 08, MERC 23
WR4B	The DEIS fails to adequately address impacts of mercury and methylmercury, particularly on fish and humans. The DEIS should include an analysis of the impacts of methylmercury on fish communities, as well as on people and wildlife that consume the fish, social and economic impacts to fisheries, groundwater, surface water, wetlands, and sensitive areas and waterbodies with existing mercury impairments. The EIS should also explain why the addition of sulfates from the NorthMet Project Proposed Action will not result in additional mercury pollution, how the St. Louis River Watershed will be able to attain TMDL standards, and the potential for mercury demethylation and/or methylation in flooded mine pits.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS) and water quality modeling has been revised accordingly. Estimating the rate at which pollutants from mining waste could leach into groundwater is given high priority in the SDEIS modeling and is specifically discussed in Section 5.2.2. Pollutant concentrations in groundwater were estimated using probabilistic models. Descriptions of predicted effects on groundwater and surface water quality are presented along with a discussion of uncertainty in model parameters. The SDEIS specifically addresses possible effects on people, fisheries, and wildlife based on the estimates of pollutant concentrations from the models. Quantitative modeling of methylmercury is beyond the scope of the SDEIS, due to the inherent complexity of the fate and transport of methylmercury in the environment. However, the potential for enhanced methylation of mercury and uptake in fish as a result of NorthMet Project Proposed Action discharges are qualitatively addressed in the SDEIS.	MERC 02, MERC 03, MERC 24

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WR4C	Monitoring, mitigation measures, and contingency responses for pollutant releases (especially sulfate and mercury) are inadequately described in the DEIS. The DEIS should explain how exceedances of these materials are to be regulated, define the goal of maintenance-free closure, and any financial safeguards that are in place to address future problems to water and soil as a consequence of industrial action.	These issues are addressed in Chapters 3 and 7 of the SDEIS. Under the SDEIS, the Category 1 waste rock facility and the Tailings Basin will be surrounded by containment systems to capture and treat seepage to reduce the pollutant load to groundwater. Groundwater monitoring points will be located to evaluate the accuracy of predicted water quality effect. During mine closure, the East Pit would be reclaimed as a wetland and the West Pit would flood with water to become a pit lake. Water from the West Pit will be treated as necessary at the WWTF and returned to the West Pit, or discharged to the Partridge River at concentrations that meet pollutant concentration thresholds. During post-closure, the WWTF will be used, as necessary, to treat effluent from the West Pit Lake, the Category 1 waste rock and the Tailings Basin to meet surface water quality standards before it is discharged. The WWTF will be run as long as necessary during operations and closure, until passive treatments are adequately demonstrated to meet water quality standards. During plant closure activities, demolition and reclamation of Plant Site infrastructure would be completed according to federal, state, and local agency permits and regulations.	WR 21, MERC 08, MERC 17
WR4D	The permitting of the NorthMet Project Proposed Action would violate the Great Lakes Compact of zero discharge of mercury to the basin and federal or state regulations that prohibit mixing zones (40 C.F.R. § 132, Appendix F, Procedure 3; Minn. R. 7052.0210, Subpart 3). The more rigorous Impact Criteria imposed by the downstream impaired waters and TMDL status and nondegradation under Minnesota Rules 7050 and 7052 should be used instead of the Great Lakes Initiative.	This issue is addressed in Chapter 1 of the SDEIS. Applicability of the Great Lakes Initiative is also discussed in Sections 5.2.2.1.2 (Evaluation Criteria), and Sections 5.2.2.3.4 (Mercury). The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS), and water quality modeling has been revised accordingly. The SDEIS will use a more robust probabilistic modeling approach that incorporates current data and information to present sufficient additional analysis to compare predicted effects against applicable standards and regulations. Specific (i.e., numeric) evaluation criteria related to sulfate and methylmercury for the impaired portion of the St. Louis River does not exist. The SDEIS discusses potential methylmercury-related effects in downstream 'impaired' waters qualitatively in the Chapter 5 of the SDEIS. The water quality evaluation criteria in the SDEIS include the Lake Superior mercury standard.	WR 38, WR 125, WR 158, MERC 01
WR4E	Sequestration of mercury by soil, peatlands, and/or minerals is not adequately discussed in the DEIS. The EIS should include quantitative information on mercury sequestration from the MDNR study.	This issue was addressed in the DEIS. The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The SDEIS uses a more robust probabilistic modeling approach that incorporates current data and information to present sufficient additional analysis. Quantitative modeling	SDEIS comments did not raise this topic.

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		of mercury transport is beyond the scope of the SDEIS, due to the inherent complexity of the fate and transport of methylmercury in the environment. However, the potential for enhanced methylation of mercury are addressed in the SDEIS.	
WR4F	The NorthMet Project Proposed Action could potentially elevate sulfate concentrations above the 10 mg/L wild rice standard and could promote AMD with potential impacts on the health of aquatic vegetation, especially wild rice beds, which have significant cultural and ecological value. The EIS should thoroughly evaluate impacts on wild rice standards.	The NorthMet Project Proposed Action has changed substantially since preparation of the 2009 DEIS (MDNR and USACE 2009, as cited in the FEIS). The MPCA staff have made a draft recommendation that portions of the Partridge River downstream of the Mine Site be treated as waters used for the production of wild rice, meaning that the 10 mg/L sulfate evaluation criterion would apply to these reaches from April 1 to August 31. The NorthMet Project Proposed Action includes controlled outflow from the West Pit to comply with this standard. Modeling of the NorthMet Project Proposed Action indicates that sulfate concentrations in tributaries north of the basin and at PM-13 would decrease in comparison to the Continuation of Existing Conditions modeling scenario. These aspects of the NorthMet Project Proposed Action are described in Chapter 3, Chapter 7, and Section 5.2.2 of the SDEIS.	WR 149, WR 152, WR 156
WR5A	Inadequate consideration has been given to the long-term impact of mercury and sulfate emissions from the NorthMet Project Proposed Action, in combination with other cumulative impacts, on water resources (including groundwater, water supplies, exceedances of water quality standards, metal leaching, flow fluctuations, and hardness), wetlands, wild rice beds, changes in cover, and hydrology.	This issue is addressed Chapter 7 of the SDEIS. The estimates of effects from the NorthMet Project Proposed Action include release of sulfate and mercury from mine waste to groundwater and surface water. Additional mitigation described in the SDEIS includes groundwater containment systems around the Category 1 waste rock and Tailings Basin. Also, Category 1 waste rock will be covered with a geosynthetic layer to reduce infiltration, and the Tailings Basin surface and slopes would be amended with bentonite to reduce oxygen and water flow and thus reduce pollutant releases. The tailings system is designed with a goal of eventual discontinuation of groundwater seepage collection.	WR24, WR 159
WR5B	The cumulative impacts of the NorthMet Project Proposed Action with other mining projects must be addressed, especially the capacity of the rivers to assimilate wastewater effluent.	This issue is addressed Chapter 6 of the SDEIS.	WR 24, WR 159
WR5C	The applicant's assessment of uniquely affected communities is incorrect and cumulative effects of the NorthMet Project Proposed Action on health and biological resources, including wild rice, and wildlife populations (e.g., fish, moose),	These concerns are addressed in the topic-specific portions of Chapter 6 of the SDEIS, including Water Resources, Wildlife, Fish and Macroinvertebrates, and Socioeconomics.	WR 156, WR 159

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	must be considered. These impacts could disproportionately affect minority communities, low income persons, and Indian tribal members, whose diets rely on fish to a greater extent than their non-Indian neighbors.		

A.9 ATTACHMENTS

Attachments to Appendix A, which are available separately from the FEIS, include the following:

- A PDF file containing the full text of all public comments on the SDEIS and corresponding theme assignments (NMetFEIS_AppendixA_All_SDEIS_Comment_Themes.pdf);
- A PDF file containing the full text of all SDEIS submissions received in electronic formats such as email, as exported from the Microsoft Access database used to organize submissions (NMetFEIS_AppendixA_All_SDEIS_Submissions.pdf);
- A PDF file containing one full text copy of each form letter submitted during the public comment period for the SDEIS, as well as a list of all individuals who submitted a copy of that form letter (NMetFEIS_AppendixA_SDEIS_Form_Letter_List.pdf);
- A PDF file containing the full text of all public comments on the DEIS and corresponding theme assignments (NMetFEIS_AppendixA_All_DEIS_Comment_Themes.pdf);
- An electronic folder containing a mix of electronic files comprising all attachments to public submissions on the SDEIS, as well as the full text of submissions not otherwise captured in the abovementioned Microsoft Access database (SDEIS_Submissions); and
- A folder containing PDFs of all public submissions on the DEIS (DEIS_Submissions).

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