Comments of Water Legacy on

PolyMet NorthMet Mining Project and Land Exchange
Final Environmental Impact Statement

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INTRODUCTION

WaterLegacy is a non-profit organization formed to protect Minnesota's water resources and the communities that rely on them. We have approximately 10,000 members and supporters across the state of Minnesota who may be affected by the adverse impacts of the proposed PolyMet NorthMet sulfide mine due to their exposure to pollutants in air, drinking water, or food, their use of affected resources for fishing, gathering wild rice, hunting or recreation, and due to potential impacts on their patients and communities of sulfide mining health impacts, financial and socioeconomic liabilities and loss of ecological services.

The Final Environmental Impact Statement (FEIS) for the PolyMet NorthMet open-pit copper-nickel mine project is a huge, cumbersome and repetitious document. It would be tempting to put it on a scale and deem it adequate by sheer weight alone. However the PolyMet NorthMet FEIS fails to comply with the National Environmental Policy Act (NEPA), 42 U.S.C. §§4321 *et seq*., and its implementing federal regulations or with the Minnesota Environmental Policy Act (MEPA), Minn. Stat. §116D.01 *et seq*., the state environmental review law patterned after NEPA, and its implementing state rules.

Under both NEPA and MEPA, the purpose of an environmental impact statement (EIS) is to lead government decision makers to take a "hard look" at the environmental impacts of their decisions before those decisions are made. *See e.g. Mid States Coalition for Progress v. Surface Transportation Board*, 345 F.3d 520 (8th Cir. 2003); *Sierra Club Northstar Chapter v. Kimbell,* 2008 U. S. Dist. LEXIS 107239, 68 ERC (BNA) 1664 (D. Minn., Feb. 19, 2009); *Citizens Advocating Responsible Development (CARD) v. Kandiyohi County Bd. of Comm'rs*, 713 N.W.2d 817, 834 (Minn. 2006).

At the most basic level, an EIS must analyze the significant environmental impacts of a proposed action and provide a full and fair discussion of significant environmental impacts. Minn. Stat. 116D.04, Subd. 2a; 40 C.F.R. §1502.1. To ensure this important objective, a final EIS must provide responses to the substantive comments received during draft EIS review. Minn. R. 4410.2800, Subp. 4(B). The EIS must also disclose and respond to any responsible opposing view. Minn. R. 4410.2700, Subp. 1; 40 C.F.R. § 1502.9(b); *Ctr. for Biological Diversity v. U.S. Forest Service*, 349 F. 3d 1157, 1167-1168 (9th Cir. 2003).

Data and analyses in an EIS must be commensurate with the importance of the impact and the relevance of the information to a reasoned choice among alternatives and the consideration of the need for mitigation measures. Minn. R. 4410.2300(H). Impacts must be discussed in proportion to their significance, so the EIS concentrates on the issues that are truly significant to the action in question, rather than amassing needless detail. 40 U.S.C. §1500.1(b), §1502.2(b).

An EIS must provide a thorough discussion of both direct and indirect potentially significant beneficial or adverse effects. Minn. R. 4410.2300(H); 40 C.F.R. §1502.16(a), (b). In describing adverse effects, an EIS may not use a listing of mitigation measures and an unsupported assumption of their success to conclude that effects of a proposed action will be minimal. *Kentucky Riverkeeper v. Rowlette*, 714 F. 3d 402 (6th Cir. 2013); *Ohio Valley Envtl. Coalition v. Hurst*, 604 F. Supp. 2d 860 (S. D. W. Va., 2009).

An EIS must meet basic standards for quality. Environmental impact statements are required to be analytic rather than encyclopedic. Statements must be concise, clear, and to the point, and must be supported by evidence that the agency has made the necessary environmental analyses. 40 C.F.R. §§1500.4(b); 1502.1; 1502.2(a). "The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA." 40 C.F.R. §1500.1(b).

These requirements have been specifically applied to modeling. An EIS may not manipulate models, rely on flawed mitigation analysis, work backwards to achieve a desired result, or otherwise use scientifically unsound analyses to draw conclusions as to the environmental impacts of a proposal. *See Environmental Defense v. U. S. Army Corps of Eng'rs,* 515 F. Supp. 2d 69, 74 (D.D.C., 2007), *appeal dismissed*, 2008 U.S. App. LEXIS 28182 (D.C. Cir, Oct. 10, 2008). NEPA requires up-front disclosures of relevant shortcomings in the data or models. *See Lands Council v. Forester of Region One of the U.S. Forest Service,* 395 F. 3d 1019, 1032 (9th Cir. 2005); *Native Ecosystems Council v. U. S. Forest Service*, 418 F.3d 953, 964 (9th Cir. 2005). Absent baseline groundwater information, conclusions in an EIS of "negligible impact" fail to comply with NEPA's "hard look" requirement. *Gifford Pinchot Task Force v. Perez*, 2014 U.S. Dist. LEXIS 90631, 2014 WL 3019165, *slip. op*. 103-106 (D. Ore. July 3, 2014).

In addition, an agency cannot exclude pertinent information from an EIS. The EIS must include information relevant to reasonably foreseeable significant adverse impacts and a choice among alternatives if the information can be obtained within the state of the art and costs of obtaining it are not exorbitant. Minn. R. 4410.2500; 40 C.F.R. § 1502.22(b). Under NEPA, an EIS must include in its analysis reasonably foreseeable impacts that have catastrophic consequences even if their probability is low, 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. 40 C.F.R. §1502.22(b).

An EIS must also meet basic standards of independence and integrity. An EIS cannot be based on conclusory statements of a project proponent, unsupported by substantial evidence. *See CARD v. Kandiyohi*, *supra*, 713 N.W. 2d at 837, fn. 18. "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in the EIS" and "shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions." 40 C.F.R. §1502.246

One of the most significant roles the EIS must play is to facilitate the consideration of alternatives. An EIS must discuss appropriate alternatives to the action and their impacts and must compare the potentially significant impacts of the proposal with those of other reasonable alternatives to the proposed project. Minn. Stat. 116D.04, Subd. 2a; Minn. R. 4410.2300(G); 42 U.S.C. §4332(C)(iii) and (E); 40 C.F.R. §1502.1.

Under NEPA, the alternatives section of the EIS related to alternatives is "the heart of the environmental impact statement." The EIS "Should 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 decisionmaker and the public." 40 C.F.R. §1502.14. The EIS must (a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated, and (b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits. *Id*. Under MEPA, The EIS must address one or more alternatives of each of the following types of alternatives or explain why no alternative of a particular type is included in the EIS: alternative sites, alternative technologies, modified designs, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through

comments received during the comment periods for EIS scoping or for the draft EIS. Minn. R. 4410.2300(G).

An EIS must also analyze adverse impacts of a proposed action in conjunction with other environmental impacts. An EIS must provide a thorough discussion of potentially significant beneficial or adverse cumulative effects. Minn. R. 4410.2300(H). This analysis includes cumulative impacts that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Minn. R. 4410.022, Subp. 11; 40 C.F.R. §1508.7.

Perhaps most important, an EIS may not be used to justify a decision already made. Minn. R. 4410.0300, Subp. 3; 40 C.F. R. §1502.2(g). An agency must exercise independent judgment and independently investigate a proponent's claims that there are no practicable or less damaging alternatives that would satisfy the project's purpose. *See Sierra Club v. Antwerp*, 709 F. Supp. 2d 1254, 1263-1264 (S. D. Fla. 2009), *aff'd* 362 Fed. Appx. 100 (11th Cir. 2010).

WaterLegacy's comments on the PolyMet NorthMet FEIS demonstrate that the environmental review provided for Minnesota's first proposed copper-nickel sulfide mine fails each of these tests for the quality, integrity, and content of an EIS. Even where the FEIS has appeared to respond to comments, that response has been inadequate, if not affirmatively misleading. The FEIS is highly reliant on the project proponent's modeling and on unsubstantiated assumptions from the project proponent for its conclusions. The FEIS not only fails to discuss opposing scientific views, it misrepresents peer-reviewed literature, the nature of tests conducted regarding the project, and even the documents contained in its own record. The FEIS discounts information as "unavailable," where peer-reviewed literature and scientific best practices would have provided higher quality, if potentially inconvenient, analytic information.

The Project alternatives analysis, intended by law to be the "heart" of the EIS, is a scant few pages of the FEIS, and inadequate documentation is provided to support the rejection of substantive alternatives. Other than a smaller federal land exchange to facilitate the NorthMet open-pit sulfide mine, no alternatives are considered. Although the FEIS mentions in various places that project effects would not occur under a No Action alternative, the FEIS fails to provide a No Action baseline to compare impacts on water quality, thus biasing its results.

The FEIS repeatedly provides a list of possible mitigation options without evidence of their efficacy rather than analyzing relevant and significant potential impacts. The FEIS

manipulates models to avoid consideration of cumulative impacts on water quality and potential violations of the water quality standards. The FEIS fails to analyze issues of great significance and concern, including the synergistic effects of the project on mercury methylation, contamination of fish and resulting impacts to human health and environmental justice and the indirect and cumulative as well as direct impacts of the Project on wetlands and wetlands functions.

The PolyMet NorthMet FEIS is inadequate. For federal agencies, it cannot serve as a basis for decisions following the letter and spirit of NEPA, our basic national charter for protection of the environment. 40 C.F.R. §1500.1. For Minnesota agencies, reliance on this FEIS would defeat the purpose for which our environmental review laws were enacted – to "encourage productive and enjoyable harmony between human beings and their environment; to promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of human beings; and to enrich the understanding of the ecological systems and natural resources important to the state and to the nation." Minn. Stat. §116D.01.

I. MERCURY & METHYLMERCURY

WaterLegacy's comments on the SDEIS emphasized that the PolyMet NorthMet SDEIS was inadequate to analyze mercury and methylmercury impacts at the project site and cumulatively, in the St. Louis River as well as the Partridge and Embarrass River watersheds. The expert opinion of Dr. Brian Branfireun, one of the world's leading mercury researchers, identified inadequacies in the SDEIS, including the failure to address the risk of mercury and methylmercury impacts from the project to downstream waters, including the St. Louis River.

These comments update WaterLegacy's concerns based on changes made and not made in the FEIS. Then, they summarize an additional expert opinion provided by Dr. Branfireun (Branfireun, 2015),[1] based on new methylmercury data, issues raised in the FEIS and supporting documents and recently-published peer-reviewed scientific literature. In summary, this Section of our comments demonstrates that the FEIS' dismissal of downstream impacts of mercury and methylmercury is based on scientific errors, inconsistencies and failure to appropriately evaluate

[1] Expert opinions provided with these comments and WaterLegacy's comments on the Section 404 permit are designated with the expert's last name (i.e. Branfireun, 2015), while expert comments on the SDEIS are designated with the expert's name and the 2014 date (i.e. Branfireun, 2014).

significant and well-established mechanisms of mercury production and transport in the NorthMet project area. Dr. Branfireun's analysis can be summarized as follows:

> There are no modifications to the FEIS from the SDEIS that change my opinion that the likelihood of downstream water quality impairments from mercury and methylmercury as a result of the proposed NorthMet development is not scientifically or rigorously evaluated in the EIS . . . . In conclusion, I reject as unsupported and without scientific justification, any statement or implication in the FEIS that the proposed NorthMet development would not increase risks of methylmercury production and transport in the Partridge and Embarrass River watersheds, particularly in ombrotrophic wetlands near the mine site and wetlands affecting by tailings site seepage collection, changes to hydrology or atmospheric deposition. (Branfireun, 2015, pp. 25, 27)

The FEIS also failed to resolve the deficiencies raised in WaterLegacy's prior comments. In several instances, the FEIS added new language to justify its prior conclusions without providing any new substantive analysis. Gaps, inconsistencies and misrepresentations of research data identified in WaterLegacy's comment on the SDEIS were not addressed. The FEIS continued to omit or mischaracterize data and research, thus minimizing or denying the impact of mercury and methylmercury on aquatic life, wildlife dependent on aquatic resources, human health and environmental justice.

1. The FEIS failed to assess mercury inputs at the tailings site or to demonstrate the efficacy of wastewater treatment to reduce mercury concentrations.

The only change made in the PolyMet NorthMet project in response to WaterLegacy's comments regarding mercury is that the project no longer proposes to use untreated high-mercury Colby Lake water for stream augmentation in the wetlands complex north of the tailings waste facility, identified in the SDEIS as a high-risk location for mercury methylation. The FEIS states that Colby Lake water will be treated at the tailings site wastewater treatment plant (WWTP) prior to use for stream augmentation (FEIS, 2-10). However, the benefit of this change is uncertain, since the FEIS fails to analyze how mercury inputs from Colby Lake water transfer would affect tailings pond, tailings seepage and the WWTP. These impacts are likely to be significant.

Colby Lake water mercury concentrations substantially exceed the Great Lakes Initiative (GLI) and Minnesota water quality standard of 1.3 nanograms per liter (ng/L). Data provided in the FEIS state total mercury concentrations in Colby Lake are between 4.6 and 8.7 ng/L,

averaging 6.0 ng/L (FEIS, 4-37 to 4-38). During operations, maximum plant site water appropriation of water from Colby Lake would be 15.1 million gallons per day (MGD) or 1,300 million gallons per year (MGY) (FEIS, 5-201, Table 5.2.2-40). This maximum is equivalent to 10,486 gallons per minute (gpm) from Colby Lake.

Despite the high concentration of mercury in Colby Lake water and the volume of Colby Lake water that would be piped to the plant site, the FEIS' estimate of mercury in the inflows to the WWTP (FEIS, 5-230, Table 5.2.2-51) does not consider mercury inputs from Colby Lake water. Comparing the FEIS Table for Estimated Mercury Concentration of the Combined Inflows to the Plant Site WWTP to the same Table in the SDEIS (SDEIS, 5-206, Table 5.2.2-52), no adjustment has been made for an increased mercury concentration resulting from the need to treat Colby Lake water. The FEIS' prediction that the combined inflows to the WWTP will have a mercury concentration of precisely 1.3 ng/L, the GLI water quality standard, is unchanged.

This prediction does not seem to reflect analysis, since the maximum volume of Colby Lake water (average mercury concentration of 6.0 ng/L) is estimated at 2,472 gpm, more than the 2,425 gpm total combined stream inflow to the WWTP predicted in the FEIS (FEIS, 5-230, Table 5.2.2-51). The FEIS' failure to assess the ramifications of high-mercury Colby Lake water inputs is exacerbated by unsubstantiated assertions in the FEIS that the PolyMet NorthMet WWTP will be able to treat mercury through reverse osmosis or "equivalently performing technology" so that effluent will not exceed 1.3 ng/L (FEIS, 5-230, 5-238).

No references are provided for the FEIS' conclusions about mercury treatment, but in various other places the FEIS cites PolyMet's "pilot testing" of reverse osmosis to reassure the reader that water quality standards would be met for all constituents of interest at both the WWTP and the mine site wastewater treatment facility (WWTF), once the latter facility is upgraded to a reverse osmosis or equivalent technology in approximately year 52 (FEIS, 3-65, 5-104, 5-147, 5-170, 5, A-639). On closer review, the reference to a pilot test for PolyMet NorthMet mine pollution treatment is somewhat of a misnomer, particularly as applied to mercury reduction. The single pilot test report cited in the FEIS is a Barr document (FEIS ref. Barr 2013f). This report does not substantiate the efficacy of NorthMet wastewater treatment to remove mercury in compliance with the 1.3 ng/L standard.

The PolyMet pilot test was conducted on water drawn from a seep and an aquifer well at the existing LTVSMC taconite tailings waste facility (Barr 2013f, p. 11). Mercury was below

detectible levels in the *influent* for the test (*Id*., autop. 64-69, Table 1, Table 2). The only conclusions regarding mercury in Barr report were based on literature and an inquiry to the membrane supplier. Barr reported, "Mercury removal by RO membranes is highly dependent on the type of membrane used. Mercury rejections [the percentage removed by treatment] ranging from 22 to 99.9% have been reported," (*Id*., p. 39). The report continued, "Mercury removal by RO is highly variable and dependent upon its speciation and the membrane selection. For these reasons, its removal is difficult to quantify," (*Id*., p. 41).

Should mercury influent to the WWTP exceed 1.3 ng/L, the FEIS does not provide any basis to conclude that water quality treatment will result in compliance with the 1.3 ng/L GLI and Minnesota water quality standard for mercury.

2. The FEIS understated and inadequately analyzed mercury air deposition, resulting in unsupportable conclusions about mercury loading.

The FEIS asserts with incomprehensible precision that mercury loading in the Partridge River would *decrease* from 24.2 to 23 grams per year as a result of the PolyMet NorthMet mine project, more offsetting the 0.2 gram increase (from 22.3 to 22.5 grams per year) in mercury loading to the Embarrass River (FEIS, ES-36, 5-462). The FEIS has neither recognized nor responded to concerns about inadequate analysis of mercury air deposition and mercury seepage to substantiate this central claim.

The FEIS still states, "Mercury air emissions and subsequent mercury deposition were not assessed for the Mine Site because potential emissions are less than 1.0 lb/yr," (FEIS, p. 5-462). The FEIS does not acknowledge that 1.0 pound per year is equivalent to 453.6 grams per year. This is an astronomical number when compared to the FEIS' mercury loading offset calculations. If far less than one percent of NorthMet mine site mercury deposition found its way into the Partridge River, the net effect of the NorthMet project, with no other revisions or corrections, would increase mercury loading to the St. Louis River.

Similarly, the FEIS failed to address concerns raised by WaterLegacy regarding mercury deposition near the NorthMet plant site. The FEIS cites the PolyMet Project Air Data Package (PolyMet 2015e) as its primary reference on mercury deposition. This PolyMet document states that the plant will emit 4.6 pounds per year of mercury and describes two scenarios for mercury speciation that affect local deposition, since oxidized mercury can "deposit readily" at a local

and regional level and that some particle-bound mercury may also be deposited locally (PolyMet 2015e, autop.1042). If only 25% of mercury is elemental, the more conservative assumption, up to 3.68 pounds or 1,669.2 grams of NorthMet plant site mercury emissions may be deposited locally each year, within a 10-kilometer radius of the plant site (*Id*., Appendix C to Attachment U, p. 2, autop. 1091).

PolyMet 2015e and the corresponding section of the FEIS analyze the effects of local plant site mercury deposition on the mercury Hazard Quotient in the Embarrass River chain of lakes. Yet, as with the mine site mercury deposition, the FEIS does not evaluate the effects that even a small fragment of the potentially 1,669.2 grams of mercury locally deposited would have on a mass loading calculation that claims mercury in the Embarrass River will only increase by 0.2 grams per year as a result of the PolyMet NorthMet project.

3. The FEIS inadequately analyzed and understated mercury seepage at the mine and plant sites.

The FEIS failed to provide high quality information pertaining to mercury requested in WaterLegacy's prior comments on the SDEIS. The FEIS does not disclose its assumptions as to the mass or concentration of mercury in potential project sources of contamination, including peat, overburden, ore, waste rock, process water, tailings, reject concentrate, filtered sludge, hydrometallurgical residue, coal ash or other potential sources of mercury release from the project. Thus, the FEIS does not permit any verification that mercury projections prepared by PolyMet and adopted by the FEIS (FEIS, 5-226, Table 5.2.2-49, PolyMet 2015m) are consistent with good scientific practice and local geology.

Responses to comments state that estimates for major mercury sources were based on studies done for PolyMet in 2004 and 2005 (FEIS, A-414), but these studies are not included in the FEIS reference documents and neither their methodologies nor numeric values are disclosed.[2] The assertion that mercury loadings to the tailings waste facility will be 16.2 pounds per year (FEIS, 5-229) cannot be verified. The level of mercury assumed for peat placed in the unlined mine site overburden and storage area is not disclosed. Mercury mass loading and concentrations in the most highly concentrated waste facilities -- the mine site equalization pond, and the

[2] Responses to comments state that estimates were based on the 2004 SGS Lakefield Pilot Study and the 2005 Pilot Study, but these documents are not on the reference CDs. (Note: the document identifies on CD-2 as SGS 2004 pertains to mineral fibers not mercury.

hydrometallurgical residue facility are not disclosed in the FEIS. Documents received by WaterLegacy in response to the Minnesota Data Practices Act (DPA), but not included among FEIS references, suggest that hydrometallurgical residue, for example, would contain a highly elevated level of mercury. A PolyMet 2007 mercury mass balance analysis stated that 85 percent of the mercury from the ore, estimated as 164 pounds per year of mercury, would be contained in hydrometallurgical residue.[3]

Next, the FEIS mischaracterized applicable data to claim that mercury in tailings would be adsorbed to tailings. Discrepancies between claims in the PolyMet NorthMet SDEIS regarding mercury and mercury data in underlying documents were not resolved in the FEIS.

The FEIS goes even further than the SDEIS in asserting "the ability of NorthMet tailings to adsorb mercury, in combination with the proven ability of the underlying taconite tailings to adsorb mercury, 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," (FEIS, 5-229). As explained in WaterLegacy's SDEIS comments, this optimistic claim mischaracterizes the NTS bench study cited in the FEIS. The FEIS reports that the 2006 NTS bench study reduced mercury concentrations by 73 percent (from 3.3 ng/L to 0.9 ng/L) after 480 minutes. And, as in the SDEIS, the FEIS fails to disclose either that the plain water in a *control* flask reduced mercury concentrations by 22 percent in that timeframe or that the trend in the experiment, when it was discontinued after eight hours, was that the mercury was *desorbing* from the tailings and may have doubled since the fourth hour of the experiment when mercury was beneath the detection limit of 0.5 ng/L (FEIS reference Barr 2007d, autop. 157, 160).[4]

Even more problematic, the FEIS' assertion that adsorption of mercury by the existing LTVSMC tailings has been "proven" is inconsistent with the data and assertions in Section 4.0 of the FEIS itself. The FEIS states,

> Comparing the existing Cell 2E pond water quality with water quality at the toe of the Tailings Basin can define the effect that passage through the existing LTVSMC tailings has on seepage water quality. Such comparison shows that passage through the LTVSMC tailings apparently reduces the average concentrations of arsenic, fluoride, and

[3] Although the list of FEIS references for responses to comments (FEIS, A-685) states that this study, PolyMet Facility Mercury Mass Balance Analysis (RS66) March 2007, is contained as an addendum to Barr 2007c, the FEIS CD-1 does not include this addendum. However the study is available in this record as Exhibit 4 to WaterLegacy's SDEIS comments.
[4] This document was reference Barr 2007e for the PolyMet SDEIS.

> molybdenum, although it is difficult to determine to what extent these reductions are simply attributable to the effects of dilution. The concentrations of several other parameters, such as calcium, manganese, nickel, and TDS, increase as they seep from the tailings pond to the toe of the Tailings Basin. (FEIS, 4-127)

The FEIS narrative does not state how mercury concentrations are affected as they pass through the existing LTVSMC tailings, but the data is clear. Mercury in the existing Cell 2E pond has a mean concentration of 1.4 ng/L. Mercury in the toe of the existing tailings facility has a mean concentration of 4.9 ng/L (FEIS, 4-126, Table 4.2.2-23) Using simple arithmetic, the FEIS has proved that in passing through the existing LTVSMC tailings mean mercury *more than triples*.

FEIS' claims that mercury concentrations in untreated tailings basin seepage will be 1.0 ng/L (FEIS, 5-230, Table 5.2.2-51) cannot be supported. Given that more than two billion gallons a year of tailings seepage are predicted for the NorthMet project,[5] the implications of mercury in tailings seepage are likely to be significant.

The FEIS, like the SDEIS text criticized in WaterLegacy's prior comments, also understates potential mercury impacts from mercury in the West Pit. The FEIS claims a 92 percent burial rate for the total mercury load in the West Pit (FEIS, 5-226, Table 5.2.2-49 Initial and Final Parameter Values for the Mercury Mass Balance). The underlying literature cited, in fact, estimates actual mercury sedimentation rates at 80 to 90% (FEIS ref. PolyMet 2015m, p. 325). More important, the FEIS' use of the term "burial" suggests that mercury in the West Pit would become permanently unavailable. The FEIS fails to discuss the well-established risk that mercury concentrated in lake sediments will cycle in and out of suspension, become methylated and bioaccumulate, affecting fish and wildlife.[6]

The FEIS' has again failed to provide high-quality mercury information, has failed to model mercury releases and has selectively reported mercury data.

4. The FEIS relied on unsubstantiated assumptions and an inappropriate baseline to predict NorthMet project sulfate seepage affecting mercury methylation.

WaterLegacy's prior comments in the SDEIS raise raised concerns about the implications on mercury methylation of unsubstantiated assumptions that 99.5 percent of seepage from the

[5] Conversion of 3,880 gallons per minute of tailings seepage (FEIS, p. 5-179) to 2,039,000,000 gallons per year using a standard conversion chart.
[6] *See e.*g. U.S. Geological Survey Fact Sheet FS-216-95, *Mercury Contamination of Aquatic Ecosystems*, available at http://pubs.usgs.gov/fs/1995/fs216-95/pdf/fs21695.pdf, last visited Nov. 22, 2015.

unlined tailings waste facility and more than 90 percent of seepage from the unlined Category 1 waste rock pile would be captured without effect on the environment. The FEIS uses the same unsupportable seepage capture assumptions and modeling. These assumptions substantially understate the potential for sulfate seepage, indirect discharge to surface waters and increases in mercury methylation both near the project site and downstream in St. Louis River sediments.

WaterLegacy has previously objected to use of projections of existing conditions as a baseline to evaluate NorthMet project impacts on water quality. This concern is discussed in more detail in Section XI, *infra* in addressing Alternatives, including the No Action Alternative. The FEIS makes the same strategic comparison to suggest that the NorthMet project would reduce sulfate discharge to receiving waters and the resulting potential for mercury methylation, when the opposite is more likely to be true.

The FEIS compares NorthMet project impacts to the Continuation of Existing Conditions (CEC) scenario, even as it admits that the CEC model "does not include future expected additional mitigation such as water quality mitigation at the existing LTVSMC Tailings Basin," (FEIS, 5-94). The FEIS acknowledges that water quality would improve if the project did not take place: "Seepage water quality from the existing LTVSMC Tailings Basin would be expected to improve over time as a result of the Cliffs Erie Consent Decree, other permit requirements (e.g., Permit to Mine), and natural attenuation of Contaminants," (ES-49).

The FEIS states that the NorthMet project would reduce sulfate loading by more than 40 percent in the Embarrass River at PM-13. (FEIS, 6-48), relying on an unsubstantiated nearly perfect tailings seepage collection rate of 99.5 percent. The FEIS did not estimate sulfate reduction achievable through natural attenuation and seepage collection by Cliffs Erie at the existing LTVSMC as a result of regulatory controls. Failing to do so biased the analysis of the NorthMet project's impact on increased sulfate discharge and the resulting potential for mercury methylation.

5. The FEIS failed to appropriately model either mercury or methylmercury impacts.

The EPA, in comments on the SDEIS, recommended that the FEIS model mercury using either GoldSim or a more suitable model, such as the Water Quality Analysis Simulation

Program (WASP)3, which is commonly used by EPA to model elemental mercury. (EPA Comments on PolyMet NorthMet SDEIS, Comment #15, attached as Exhibit 1)[7]

Dr. Branfireun also commented in his review of the SDEIS that models exist to model mercury and that SDEIS had failed to make a reasonable attempt to model the potential impacts of changes in water chemistry impacting mercury and that models were available to do so. (Branfireun, 2014).[8] The FEIS contains no modeling of mercury other than the simplistic mass balance analysis effectively dismissed as unusable by Dr. Branfireun below. Mercury has not been included in the GoldSim modeling for the NorthMet mine site or the plant site (FEIS, 5-223, 5-228), and no other model was used to model either mercury or methylmercury increases .

As in the SDEIS, the FEIS assumed a simple linear relationship between mercury air deposition to a water body and fish tissue methylmercury concentrations (FEIS, 6-85). Dr. Branfireun's expert opinion, summarized below, explains the need to assess scientifically-recognized impacts of sulfate discharge and deposition and hydrological effects on wetlands and sediments in increasing mercury methylation.

The FEIS provides more data on the various types of sulfur-containing air emissions, spillage and dust from the NorthMet mine site and plant site and more text explaining the potential relationship between sulfate deposition and mercury methylation than did the SDEIS. However, rather than using this data to provide a critical analysis of the aggregate impacts of these various forms of sulfate in methylating environments – namely the wetlands closest to the deposition sources - the FEIS obscures and negates the potential impacts of local sulfur inputs on mercury methylation.

The FEIS states that the NorthMet plant site would emit about 7 tons per year of sulfur dioxide, and about 1.9 tons per year of sulfur dioxide from the mine site (FEIS, 5-509). FEIS modeling then focuses on two lakes at least five miles away from the plant site and farther yet from the mine site (Colby Lake and Sabin Lake). The FEIS predicts that sulfur dioxide deposition would increase by 2 percent in each lake (FEIS, 5-510). The FEIS provides no estimates of impacts on wetlands, the methylating environments located proximate to sulfur dioxide sources.

The FEIS then discusses sulfuric acid mist, emissions of which are estimated to be

[7] Exhibits provided with these comments and WaterLegacy comments on the PolyMet NorthMet Section 404 application are designated simply by Exhibit number. Exhibits to other documents are identified by their source.
[8] Expert comments and exhibits submitted with WaterLegacy's comments on the PolyMet NorthMet SDEIS are provided in an Appendix to these comments.

slightly more than 5 tons per year (FEIS, 5-510). Again, the FEIS only models deposition on the two lakes a considerable distance from the site, and dismisses deposition of sulfuric acid mist as a small percentage over the watersheds (*Id*.) Next, the FEIS discusses reduced sulfur compounds, including hydrogen sulfide (1.88 tons per year) and carbon disulfide (5.1 tons per year) with a total volume of 6.98 tons per year from the NorthMet plant site. The FEIS does not estimate the potential deposition of sulfur from reduced sulfur compounds, saying the local deposition "is uncertain, but it is not expected to exceed evaluation criteria," (*Id*.).

Finally, the FEIS discusses sulfur in particulate matter that would be emitted from the plant site. Again, focusing on Colby Lake and Sabin Lake, but without disclosing the tons per year emitted, the FEIS predicts that deposition of sulfate in particulate matter would be 4 percent of background, once more deemed a small percentage of background. (FEIS, 5-510 to 5-511). However, here the FEIS provides an important additional analysis. Based on the assumption that all sulfur in fugitive dust converts to sulfate and mixes with surface water in wetlands. Assuming that all sulfur in fugitive dust converts to sulfate and mixes with surface water in wetlands, the FEIS predicts a *potential increase in wetlands sulfate concentrations of 4.2 mg/L*. (FEIS, 5-339)

The FEIS admits, "small sulfate increases in sulfate-poor wetlands would be expected to increase the production of methylmercury in wetlands," (FEIS, 5-164). But the FEIS fails to explain that the three Upper Partridge tributary streams that drain relatively undisturbed watersheds --Wetlegs Creek, proposed West Pit Outlet Creek and Longnose Creek (FEIS, 4-83) -- reflect drainage from low-sulfate wetlands. Even according to the revised data in the FEIS, sulfate concentrations are 3.9 mg/L for Wetlegs Creek, 2.6 mg/L for proposed West Pit Outlet Creek and 0.91 mg/L for Longnose Creek (FEIS, 4-84).[9] Increased wetlands concentrations from fugitive dust alone, without considering ore spillage or sulfur-compound air deposition would more than double sulfate in all three undisturbed mine site creek watersheds and more than quadruple sulfate in the Longnose Creek watershed. It is undeniable, based solely on FEIS data, that mine site sulfate deposition would be expected to increase the production of methylmercury in mine site wetlands.

Dr. Branfireun's opinion below calculates sulfate deposition from dust as sulfate

[9] The SDEIS documented lower rates of mean sulfate concentration in these creeks: with mean sulfate levels of 0.74 mg/L in Longnose Creek, 2.6 mg/L in Wetlegs Creek; and 1.2 mg/L in the proposed West Pit Outlet Creek. (SDEIS, p. 4-80, Table 4.2.2-15).

loading and concludes that sulfate deposition of this magnitude could *nearly double* methylation in affected wetlands. However, even his analysis is likely to understate potential impacts of sulfate deposition on wetlands, since the FEIS does not provide sufficient high quality data to aggregate the various sulfur-containing emissions or the combined impacts of sulfur-containing emissions, ore spillage and dust on the nearest or most ecologically sensitive waters.

The FEIS' discussion of sulfur deposition as a result of spillage and dust are provided in other sections of the document. This discussion minimizes the impacts of ore spillage. The FEIS accepts as fact PolyMet's assertion that refurbishing old rail cars (at about one-sixth the cost of new rail cars) would reduce potential spillage from each car to 0.2 tons per year, a 97 percent reduction from the original calculation of 6.14 tons per year potential spillage from each car (FEIS, 5-164, citing PolyMet 2014a). The Co-Lead Agencies do not require verification that refurbishment will succeed; they simply assert the position taken in the SDEIS that no impacts from rail car spillage and dust on wetlands and streams are expected (FEIS, 8-24). The FEIS states that surface water quality in the mine site Upper Partridge tributary streams (Wetlegs Creek, Longnose Creek, proposed West Pit Outlet Creek and Wyman Creek) "would be affected by ore spillage from the rail cars," but fails to analyze either the magnitude of this effect or the impacts of ore spillage on wetlands and mercury methylation.(FEIS, 5-164) Approximately 543 acres of wetlands along the railroad corridor could be affected by rainfall contacting spilled ore and fines and releasing solutes (FEIS, 5-314).

As explained in WaterLegacy's comments on the SDEIS, assessment of sulfate impacts on methylation in mine site wetlands should also consider the potential that mine site seepage in the surficial aquifer will daylight in wetlands. At the mine site, although predictions have been changed since the SDEIS to model fewer project impacts as compared to continuation of existing conditions,[10] at P90 sulfate is predicted to more than triple along the overburden storage and laydown flowpath and along the West Pit flowpath (FEIS, 5-129, Table 5.2.2-23). There are 516 acres of wetlands within the mine site surficial aquifer flowpaths (FEIS, 5-320; Table 5.2.3-7).

Rather than recognizing that the NorthMet project would increase production of

[10] Compare FEIS p. 5-129, Table 5.2.2-23 with SDEIS p. 5-109, Table 5.2.2-22. Although no mine site project elements have changed since the SDEIS, the FEIS models, for example, that West Pit sulfate at the property boundary will be 34.0 mg/L, where the SDEIS had predicted 41.9 mg/L.

methylmercury as a result of sulfate in wetlands adjacent to the mine site, the FEIS minimizes this significant environmental impact, stating "methylmercury produced in wetlands is not necessarily incorporated into food chains and concentrated to levels of concern" and proposing that the potential incremental change in methylation "may warrant future monitoring." (FEIS, 5-339)

These statements contradict the purpose of an EIS and basic scientific integrity. It is beyond dispute that methylmercury is exported to streams as they pass through wetlands and that precipitation events and seasonal wetting cycles release methylmercury from peatlands into streams where that methylmercury can be incorporated into food chains. In fact, these points are both made in a recent Report of the Minnesota Department of Natural Resources (MDNR), one of the Co-Lead agencies preparing the FEIS.[11]

The FEIS does not discuss the potential that hydrologic changes resulting from mine dewatering and tailings seepage capture would increase mercury methylation. Dr. Branfireun's opinion below explains the effects of drying and rewetting cycles in increasing mercury methylation in wetland and peatland environments. Given potential mine site drawdown impacts on as much as 5,720 acres of wetlands (Section V, *infra*) and the combined impacts of sulfate loading and drying and wetting cycles, the methylation processes described by Dr. Branfireun presents a significant risk.

Despite statements of concern regarding methylmercury by the U. S. Environmental Protection Agency (EPA) and Tribal Cooperating Agencies,[12] as well as by WaterLegacy and medical organizations (see Exhibit 18, attached), the FEIS still makes no effort to analyze potential methylmercury effects from the NorthMet project. As Dr. Branfireun's expert opinions explain, the NorthMet mine, processing plant, waste facilities and ponds create conditions that increase production of methylmercury, including discharge and deposition of mercury, discharge and deposition of sulfate, and drying and rewetting of wetlands at both the mine site and tailings site. The FEIS fails to model mercury dynamics and claims that current scientific understanding of the factors affecting mercury methylation is too limited to perform an analysis (FEIS, 5-223).

[11] Johnson et al, *Methyl mercury production and transport in a sulfate-impacted sub-boreal wetland*, Final Project Data Report, Minnesota DNR MWRAP 2012-2013 Study, June 30, 2014 available at http://files.dnr.state.mn.us/lands_minerals/reclamation/johnson_et_al_2014.pdf, last visited Nov. 22, 2015.
[12] *See* EPA Comments on PolyMet NorthMet DEIS, Feb. 18.2010, WaterLegacy SDEIS Exhibit 29 provided in Appendix – SDEIS Materials; Tribal Major Differences of Opinion # 2, FEIS, pp. 8-5 to 8-6; FEIS, App. C, Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Mercury Section, pp. 1-8

The FEIS analyzes only NorthMet plant mercury air emissions to model changes in fish methylmercury concentration. Without qualifying its conclusions to explain the limited analysis done, the FEIS goes yet farther than any prior EIS document to broadly dismiss methylmercury human health concerns on the basis of the small increases in this limited analysis; "Given that evidence and finding, no potential change in human health risks related to the fish consumption pathway is expected," (FEIS, 7-16). The simultaneous failure to analyze methylmercury production in the FEIS and its categorical denial of methylmercury effects is unacceptable under either NEPA or MEPA environmental assessment laws.

Denial that the NorthMet sulfide mine project will increase mercury and production of methylmercury results in the continued failure of the FEIS to consider adverse effects of the Proposed Project on water quality, human health, tribal treaty and reservation resources or environmental justice. This analysis is fundamental both to consideration of mitigation alternatives and to assessment of whether the PolyMet NorthMet project can be permitted under the Clean Water Act Section 404 and 401(a) as well as under applicable state laws.

6. Brian Branfireun's expert review demonstrates that the FEIS is inadequate and that the PolyMet NorthMet project poses a substantial risk of ecologically significant increases in downstream mercury and methylmercury.

Dr. Brian Branfireun reviewed pertinent sections of the preliminary FEIS, the FEIS, supporting documents and recent peer-reviewed literature to update his opinions on the PolyMet NorthMet SDEIS (Branfireun, 2014). His opinion on the FEIS (Branfireun, 2015) is attached as well as summarized below.

Dr. Branfireun's prior Opinion 1 focused on characterization of the current methylating environment associated with and potentially impacted by the proposed NorthMet project and concluded that the data regarding mercury and methylmercury was insufficient to evaluate potential impacts of the proposed project. His updated opinion reviewed new data on mercury and methylmercury used for the FEIS (Barr 2014d) and found numerous errors and internal inconsistencies in the data as well as a failure to perform an uncertainty analysis. He concluded that the data could not be used to assess environmental effects on mercury or methylmercury and that the margin of error alone would discount the firm conclusions made in the FEIS regarding mercury mass balance calculation. (Branfireun, 2015, pp. 2-3, 5-9)

Dr. Branfireun also concluded, based on the methylmercury data in the Partridge and Embarrass Rivers and in mine site creeks, that the NorthMet project area is a highly methylating environment, making these watersheds sensitive both to hydrological impacts due to changes in surface or subsurface hydrology and to additional sulfate either from surface water or deposition. (*Id*., pp. 3-4).

Dr. Branfireun's prior Opinion 2 criticized the SDEIS for failure "to consider scientifically documented factors beyond simple changes in mercury in the environment that govern mercury methylation and uptake when evaluating the potential impacts of mercury release as a result of the proposed development," (*Id.,* p. 9). His updated opinion found the FEIS misleading in its implication that there is no relationship between methylmercury and sulfate. He explained that the sulfate limit of 10 mg/L to protect wild rice may still allow increased methylation to take place in wetlands or tributary catchments and that the mine site creeks demonstrate sulfate-limited conditions with a high potential for mercury methylation, where "even small additions of sulfate to sulfate-poor wetlands can increase methylmercury production." (*Id*., pp. 9-12).

Dr. Branfireun opined that the FEIS "analyzed a very limited scope of the impacts the proposed NorthMet project would have due to changes in hydrology" and stated that augmenting streams to stay within a specified percentage of variation would not preclude increased methylation in soils and sediments adjacent to the streams. He cited evidence from rigorous peer-reviewed science that demonstrates the role of drying and wetting of peat soils on sulfate regeneration and mercury methylation, and concluded in light of this evidence and the "contradictory mention and dismissal of the state-of-the-science on mercury methylation, the FEIS is simplistic if not misleading." (*Id*., pp. 12-13).

Dr. Branfireun's prior Opinion 3 concluded that the SDEIS had not made a reasonable attempt to model the potential aquatic system impacts of changes in mercury and sulfate water chemistry due to the NorthMet project. His updated opinion emphasized that "a mass balance model *cannot* by definition incorporate mechanistically the input and removal processes for mercury, and *cannot* address the biogeochemical aspects of mercury methylation across the landscape which are at the root of the potential impacts associated with the PolyMet proposal." He criticized the FEIS' continuing reliance on this "cheaper and easier" method when much more defensible approaches exists. (*Id*., p.13). Dr. Branfireun emphasized that neither the FEIS'

statements of certainty based on grams of sulfate or mercury released nor conclusions from this asserted mass balance that the proposed development will not have appreciable impacts on water quality could be supported, given the level of uncertainty in the data. (*Id*., p.14)

Dr. Branfireun also challenged the FEIS' assumption of proportionality between atmospheric deposition of mercury and mercury in fish tissue as "an archaic approach to this problem" that "does not reflect current scientific thought or the best available tools." He cited research in Minnesota's Voyageur's National Park published in 2014 demonstrating that fish tissue mercury will vary under the same atmospheric deposition, based on hydrology and other characteristics of that specific water body. (*Id*. pp. 14-15).

Dr. Branfireun's prior Opinion 4 stated that ombotrophic bogs (peat-dominated, rain-fed, acidic wetlands) play important roles in methylmercury supply, and the SDEIS improperly considered them decoupled from project impacts. His opinion on the FEIS emphasized the significance of bogs as methylating environments, and concluded,

> Since there is clear evidence that the watersheds in which the NorthMet development is proposed should be considered 'sensitive' with respect to the production of methylmercury (see Munthe et al., 2007), it logically follows that impacts on these watersheds and wetlands that could influence the methylating environment should have been considered in the EIS. Even small changes that increase methylation could have marked detrimental and cumulative effects downstream. (*Id*., p. 16)

Dr. Branfireun's prior Opinion 5 criticized the use of an unproven analog system and the SDEIS' resulting failure to evaluate hydrological impacts of the proposed development on surrounding wetlands and subsequent changes in methylmercury production and release. His updated opinion acknowledged that the FEIS had reclassified ombrotrophic bogs to have a "low likelihood" of affect rather than "no effect." However, on closer review of the underlying documents (PolyMet, 2015b and Eggers, 2015), Dr. Branfireun found that PolyMet and the FEIS had misrepresented Eggers' conclusions, which did not suggest a "low likelihood" of effects to bogs, but rather "that the potential for indirect impacts to all bog communities within the 0-1,000 foot analog zone is acknowledged." (*Id.*, pp. 16-18). Dr. Branfireun determined that the FEIS proposed no mitigative action, not even proactive monitoring, in ombrotrophic bogs despite this new classification and found the shift from a "no effect" classification "meaningless." (*Id*., pp. 18-19).

Dr. Branfireun then explained that monitoring done to evaluate changes in wetland vegetation would be insufficient to detect indirect impacts on methylation. "Even relatively small changes in water table position and wetting and drying frequency in the ombrotrophic wetlands at the NorthMet mine site have the potential to impact sulfate and methylmercury concentrations of receiving waters," and evaluating these changes would require baseline and future monitoring of flow volumes and water chemistry, including methylmercury and sulfate. He emphasized, "considering the potential for mercury methylation, bog wetlands around the proposed mine site must be considered to have a very high likelihood of indirect impacts from the proposed NorthMet development." (*Id*., p. 19).

Dr. Branfireun then explained that methylmercury would be continuously exported from wetlands under base flows and during high flow events, such as spring snow melts, as well as during rain storms and that "all bogs shed water via outflows to downstream systems, and as such strongly influence the chemistry of receiving waters." He noted that none of these potential impacts of the proposed NorthMet project are considered in the FEIS. (*Id.*, p. 20).

The next section of Dr. Branfireun's opinion applied recent peer-reviewed research to conclude that "stimulation of methylmercury production by the rewetting process is a ubiquitous process" in Minnesota bog-type wetlands and that "we must expect that a significant proportion of bog wetlands that are within the zone of drawdown from the proposed mine development will also exhibit sulfate regeneration and increased export of methylmercury, under natural rewetting cycles as well as storm events." (*Id*., pp. 20-21). Hydrologic changes as a result of drying and rewetting would promote methylation as well as contribute to repeat flushes of methylmercury and inorganic mercury from the proposed unlined mine site storage area. Dewatering of wetlands surrounding the tailings basin through seepage collection and even modest impacts on the water table resulting from dewatering could increase total mercury, methylmercury and sulfate in the Partridge, Embarrass and ultimately, the St. Louis River. (*Id*., p. 22).

Dr. Branfireun applied recent peer-reviewed research to estimate impacts of sulfate deposition in methylation at mine site wetlands. Using background and deposition rates from Barr and PolyMet documents, Dr. Branfireun calculated that the increased sulfate loading resulting from the NorthMet proposal is, in fact 3.76 times background deposition. Based on results in experimental peatlands, he calculated that mercury export from sensitive peatlands near the mine site may increase up to 1.88 times. Given the magnitude of this potential impact, even if

less than all sulfur is liberated to the environment as sulfate, there will still be a substantial stimulatory effect on peatland mercury methylation. Effects of sulfate deposition on peatlands will persist to some degree even after loading has ceased. (*Id*., pp. 22-23).

Dr. Branfireun's prior Opinion 6 stated that the SDEIS inadequately addressed the potential for discharges of mercury and sulfate from the tailings site and understated the potential for downstream water quality impairments. His update to this opinion emphasized the inappropriate reliance in the FEIS on a mass balance model that "in the absence of a modeled cumulative error, presents us with mass loadings of sulfate, mercury and methylmercury to the Partridge and Embarrass Rivers that are unusable" because cumulative errors embedded within the estimates "cast serious doubt on the extremely small gains or losses used in the FEIS to claim that the NorthMet impact would have no net impact on downstream loading of inorganic mercury." (*Id*., p. 24).

Dr. Branfireun found the FEIS has not changed its reliance on unsubstantiated assumptions regarding seepage collection from both the mine site and the tailings site. Based on the comments of environmental consultant Daniel Pauly, Dr. Branfireun reviewed the underlying Barr report (Barr 2013f) and concluded that the pilot test "includes no testing and provides no certainty concerning the removal of mercury or methylmercury from tailings basin seepage or other recovered waters" of the NorthMet project. He concurred with Pauly that biogeochemical lag time would mean that potential impacts may not be revealed in a way that would allow adaptive engineering to prevent a permanent downstream impairment. (Branfireun, 2015, pp. 24-25).

Dr. Branfireun concluded that no changes to the FEIS altered his prior opinions that the PolyMet NorthMet EIS failed to rigorously or scientifically evaluate downstream water quality impairments from mercury and methylmercury or that the NorthMet project would result in potential impacts to ecosystems to human health, as a result of increased methylmercury in surface waters and the food chain. In fact, Dr. Branfireun stated that his prior opinions had been reinforced and strengthened as a result of new methylmercury data in the record and newly-published peer-reviewed literature. *(Id*., p. 25). Dr. Branfireun summarized the known mechanisms of methylmercury production, export and transport to proximate streams and downstream waters. He then concluded,

> It is my opinion that the NorthMet development could create a substantial risk of ecologically significant increases in water column and fish methylmercury concentrations in downstream waters, including the St. Louis River. Finally, even if appropriate monitoring for biogeochemical changes in wetlands and sediments near the development were to be designed and implemented (a difficult and complex undertaking requiring collection of baseline data not supplied in the FEIS), it is highly likely that lag times for expression of methylmercury increases, multiple mechanisms of transport, and the likelihood of legacy regeneration of sulfate stored in the watershed would preclude effective adaptive management prior to irreversible impairment of downstream waters. (*Id*., p. 27).

II. MINE SITE WATER QUALITY & WATER MODELING

The PolyMet NorthMet FEIS does not address either WaterLegacy's comments on the SDEIS or those of experts sponsored by WaterLegacy pertaining to insufficient data and unsubstantiated and unreasonable assumptions regarding the chemistry of mine site sources of contamination and the efficacy of contaminated seepage character. The opinions of chemist Bruce Johnson regarding insufficient and potentially biased sampling of mine site rock and inappropriate characterization of mine site chemistry have not been addressed or resolved in the FEIS. Similarly, the opinions of mechanical engineer and hydrologist Donald Lee that the SDEIS contained unsubstantiated and unreasonable assumptions regarding seepage collection efficiency, liner impermeability beneath the toxic WWTF equalization basin, efficacy of subaqueous disposal in reducing contaminants, and regarding the risk of degradation of capture and treatment facilities over a time frame exceeding 100 years, apply equally to the FEIS.

The FEIS, similarly, makes no change and provides no additional justification for its use of "evaluation criteria" rather than water quality standards and its failure to determine water quality impacts at surface water locations closest to the source of seepage and discharge. The FEIS' claims that the NorthMet mine would not violate water quality standards or would not increase the violations beyond the "continuation of existing conditions" scenario are based on these improper qualifications of the data as well as the unsupported assumptions of its modeling. WaterLegacy's prior comments on the SDEIS regarding these issues still stand.

WaterLegacy's FEIS comments in this Section focus on mine site hydrogeology, and concerns raised in the expert opinions of Dr. Lee and geologist J.D. Lehr on the SDEIS. Our concerns have been exacerbated, rather than resolved, as a result of additional disclosures and

investigations since the SDEIS was released and treatment of hydrogeology and water modeling issues in the FEIS. As a result of concerns about the completeness, accuracy and reliability of water modeling performed to date for the PolyMet NorthMet sulfide mine project and about the potential harm that would result from the project, WaterLegacy requests that federal agencies and state reviewers of the FEIS require that independent water quality modeling for the project be performed by the U. S. Geologic Survey or other undisputed experts.

1. The FEIS failed to disclose opposing views and mischaracterized the connection between mine site surface and groundwater.

The connection between water in surficial materials and groundwater at the mine site is an important determinant of wetland drawdown impacts from mine dewatering and may affect water quality impacts on surface waters, groundwater and wetlands.

When the SDEIS was released, geologist J.D. Lehr (Lehr, 2014) challenged its conclusion that there was a "weak" connection between bedrock groundwater and surficial water and its claims that a single 30-day pump test was sufficient:

- The single 30-day pump test cited in the SDEIS is insufficient to infer that there is a "weak" hydrologic connection between bedrock and surficial deposits.
- It is likely that there would be would be significant interaction between ground water in surficial materials and bedrock along the lateral trends of bedrock fractures.

It is undisputed that the FEIS still relies only a single 30-day pumping test conducted in 2006 at bedrock well P-2 to conclude that the "small amount of drawdown in the nearest deep wetland piezometer, and no detectable drawdown at other water table or deep piezometers" demonstrated "the hydraulic connection between surficial deposits and the underlying bedrock, although present, is weak or non-existent" and that there is a "general lack of interaction between the surficial and bedrock aquifers." (FEIS, 4-47, 4-53, 4-173, 4-174).

Since the SDEIS was released, newly prepared and released documents call into question the sufficiency and scientific reliability of the P-2 pump test on which the FEIS relies to minimize the connection between the mine site surficial aquifer and groundwater.

The location of the P-2 pump test is shown in FEIS Figure 4.2.2-8, attached as Exhibit 2. Reviewing FEIS Figure 4.2.2-8 alongside Large Figures 1 and 2 in the recent Barr Hydrogeology

of Fractured Bedrock report (FEIS ref. Barr 2014b, Large Figures 1 and 2, provided as Exhibit 3), it seems that the P-2 test was located where it would be least likely to demonstrate a hydraulic connection. Although areas of high concern – the north side of the East Pit and the 100 Mile Swamp peatlands north of the East Pit -- are both located in more conductive Virginia Formation rock, the P-2 test was conducted at the edge of the rock unit for Duluth Complex.

Conductivity data on Barr 2014b Large Figure 2 (Exhibit 3) illustrate the difference between Duluth Complex rock and Virginia Formation rock in the vicinity of the P-2 test. Hydraulic conductivity in Duluth Complex rock was measured between 1.3E-06 and 3.5E-06 centimeters per second and that of nearby Virginia Formation rock between 1.7E-05 to 2.5E-04 centimeters per second; hydraulic conductivity was *up to 100 times greater* in proximate Virginia Formation rock than the Duluth Complex rock.

Barr Engineering's report for PolyMet on the P-2 pumping test concluded that, with the exception of the deep piezometer located closest to the well, "the decrease in water levels in the piezometers are not attributed to pumping" and "significant and widespread drawdown of the water table within these deposits is not anticipated." (Barr 2007a, p. 6, p.12). However, documents received through the Minnesota Data Practices Act show that both Tribal Cooperating Agencies and consultants for the MDNR disputed Barr's conclusion that the RS10A pump test demonstrated a lack of wetlands impacts. GLIFWC's John Coleman disagreed with Barr, stating that, "4 out the 5 wetland wells monitoring for drawdown showed noticeable drops in water level during the pump-test" and that "Although the pump-test was poorly designed and the results are ambiguous, if any conclusion could be made it would be the opposite of that stated in the report." (John Coleman, GLIFWC emails to Stuart Arkley, MDNR, Sept. 10 -12, 2008, Exhibit 4).

In addition, the MDNR's own consultants, Jim Kunkel and Cory Conrad[13] criticized both the conclusions and the methodology of the RS10A study. They concluded, "The bottom line is there was some impact on the wetlands and most likely other surface water bodies for this relatively short-term test." (Reviewer Comments RS10A, Apr. 20, 2007, Exhibit 5). MDNR's consultants urged additional analysis of distance-drawdown and vertical hydraulic conductivity between surficial deposits and bedrock to assess wetlands impacts. They proposed that the MODFLOW model should include a factor for surface water and groundwater interaction and, if MODFLOW could not calculate impacts to surface water during mine dewatering, a better

[13] Jim Kunkel and Cory Conrad no longer listed as preparers of the FEIS. The last version of the EIS with which they were associated is the 2009 DEIS. (FEIS ref. MDNR and USACE 2009, 8-5)

conceptual model was needed. (*Id*.)

A single pump test is insufficient to assess the connection between surficial deposits and bedrock, and a test solely in Duluth Complex rock seems calculated to understate the connection. Both Tribal Cooperating Agencies and MDNR's reviewers challenged the conclusions of Barr's consultants and recommended additional testing with better designs. Yet, seven years later, the FEIS still follows PolyMet's lead and characterizes the P-2 pump test as demonstrating a "weak or non-existent" connection between mine site surface and groundwater without disclosing either the test's design flaws or the scientific assessment that additional testing and modeling was needed. Both the P-2 test and the conclusions drawn from it in the FEIS fail to meet the requirements of scientific rigor, integrity and disclosure of opposing views required for an EIS**.**

2. The FEIS minimized and failed to assess the effects of mine site fractures and hydraulic conductivity on wetlands and water quality.

When the PolyMet NorthMet SDEIS was released, WaterLegacy's comments and the expert opinions of J. D. Lehr and Donald Lee challenged errors and omissions in PolyMet's technical references adopted in the SDEIS to minimize the transmission of pollutants from the mine site's unlined sources of perpetual pollution, the Category 1 waste rock pile, the East Pit and the West Pit. Their opinions included the following:

- Bedrock beneath the mine site is known to contain fractures and faults. Groundwater flow through bedrock occurs through fractures or other secondary porosity features. (Lehr, 2014)

- It cannot be assumed that mine site bedrock fractures lack hydrologic significance. There is a potential that mine site bedrock fractures will serve as conduits for significant quantities of contaminated groundwater. (*Id*.)

- Weathering from mine dewatering may increase the aperture of existing bedrock fractures. (*Id*.)

- SDEIS bulk horizontal and vertical conductivity values for Duluth Complex bedrock fail to consider transmission through faults, fractures and secondary porosity features. (*Id*.)

- Average bulk conductivities for SDEIS surficial zone modeling fail to reflect and inappropriately exclude zones of much higher than average conductivity. (*Id*.)

- Hydrologic significance of mine site bedrock fractures, faults and secondary porosity features should be evaluated through further testing. (*Id*.)

- Fractured media are very conductive in the fractures but not conductive in the unfractured portion of the media. Consequently, pump test data interpreted as porous media yield an average value that underestimates the transport rate in the fractures. The connectivity of the fractures is also difficult to interpret simply from pump testing. Tracer testing is best used to establish the connectivity of fractures. (Lee, 2014)

- The numbers presented in Table 5.2.2-8 [similar to data in FEIS Table 5.2.2-8] show very small recharge fluxes for the East and West Pits. These rates can be no more than assumptions that are not justified. Not only are the materials in the East and West Pits fractured, their fractures are certain to be further enhanced by the blasting associated with open pit mining. The assumed low conductivities result in lowered fluxes of contaminants from the pits with reduced concentrations. The information contained in this Table is misleading. (*Id*.)

Although new illustrations showing the direction and location of fractures and bedrock mine site geology were provided in a Barr report (Barr 2014b, Figures 1 and 2, Exhibit 3), no such depiction of fractures appears anywhere in the 3,576-page FEIS. The FEIS still minimizes the potential impacts of fractures and focuses its discussion on the primary conductivity of Duluth Complex rock. (FEIS, 4-51 to 4-52) The FEIS agrees that secondary porosity affects groundwater flow (FEIS, 4-48), but provides no new testing or modeling of secondary porosity features or assessment of the impacts of these secondary channels as conduits for mine pollution.

As the end of environmental review approached, PolyMet updated its modeling of hydraulic conductivity. The purpose of this exercise was not to evaluate pollution or wetlands impacts, but "to estimate transient flows to the mine pits during operations and subsequent closure." (FEIS, p. 5-19, citing PolyMet 2015m). It is instructive.

As a result of PolyMet's new MODFLOW calibration, several bulk horizontal and vertical conductivity values changed between the SDEIS and the FEIS. Mean horizontal conductivity of wetland deposits *increased to 400 percent* of that calculated in the SDEIS (from 5.6 feet per day to 23.7 ft/day), as did both mean horizontal and mean vertical conductivity in lower Virginia Formation bedrock (from 0.019 ft/day to 0.079 ft/day for horizontal conductivity and from 0.0019 ft/day to 0.0079 ft/day for vertical conductivity). (Comparison is based on SDEIS, 5-27, Table 5.2.2-7 and FEIS, 5-29 Table 5.2.2-7).

Updated estimates of groundwater inflow rates to the pits (FEIS, 5-511) are also

significantly different from the predictions in the SDEIS. There are modest decreases for most years in the predicted inflow to the West Pit, with a maximum decrease of 20 gallons per minute (gpm) inflow. However, for the East Pit, as a result of recent recalibration of hydraulic conductivity for Virginia Formation bedrock, significant increases in inflows are predicted from year 1 through year 20. Total increased East Pit inflow for the 20 years increases by 5,890 gpm, with an average annual increased inflow of 294.5 gpm and *an average annual percentage increase of nearly 300 percent (289%)*. (Comparison is based on SDEIS, 5-91, Table 5.2.2-18 with FEIS, 5-111, Table 5.2.2-19).

Although the FEIS is quick to deny that its newly-calibrated information could be used to predict mine site wetlands impacts due to the "complex geology with the presence of bedrock, surficial deposits, and wetland soils at the Mine Site" (FEIS, 5-111), WaterLegacy remains unconvinced that modeling NorthMet drawdown impacts on wetlands is infeasible rather than just a potential source of inconvenient truth. Tribal Cooperating Agencies have long maintained that an uncalibrated analog approach should not be the only method used for evaluating drawdown impacts on wetlands. (FEIS, App. C, autop. 2985, 2994).

In his review of the SDEIS, hydrologist Dr. Donald Lee bluntly rejected the argument that MODFLOW could not be used to evaluate NorthMet wetlands impacts.

> At this stage of the SDEIS, where MODFLOW has already been used extensively to evaluate the consequences of the proposed action, suggesting MODFLOW cannot be used for wetlands assessment discredits all of the preceding analysis of hydrology and water quality. Suggesting MODFLOW cannot be used because of the nature of the surficial deposits is to say MODFLOW has not been appropriate to evaluate all of the preceding impacts of the proposed action contained in the SDEIS. This internal contradiction is sufficient to reject the analysis of hydrology and water quality in the SDEIS as inadequate. (Lee, 2014, p. 12)

Mercury and wetlands expert Dr. Brian Branfireun also opined that wetlands impact modeling should be completed for the PolyMet NorthMet mine project,

> The reliance on the analog case to evaluate the potential extent and magnitude of the cone of depression and dewatering impact of surface wetlands and streams is completely unsatisfactory, in my opinion, given the availability of robust hydrogeological models that could reasonably evaluate potential impact scenarios. (Branfireun, 2014, p. 14).

At this point in the development of the NorthMet project, when PolyMet has recalibrated its models to accurately address inflow to pits during mining and water balance needs, denying

that models are available to evaluate secondary wetlands impacts strains credulity.

New information on faults and hydraulic conductivity also underscores the need to effectively model impacts on water quality from the East and West mine pits. New mapping shows that inferred faults transect the locations where the West Pit and East Pit would be located. (Barr 2014b, Large Figures 1 and 2, Exhibit 3). The 100 Mile Swamp wetlands and the northern side of the East Pit are located in Virginia Formation bedrock. (*Id.*) Faults and higher measured conductivity could increase seepage from mine pits as well as affecting wetlands.

3. The FEIS relied on unsubstantiated assumptions to minimize potential seepage from the Category 1 waste rock pile.

Neither the FEIS nor responses to comments addressed WaterLegacy's comments or the opinion of Dr. Lee (Lee, 2014) that assumptions regarding seepage collection at the permanent, unlined Category 1 waste rock pile were unsubstantiated and unreasonable.

The hydrogeologic conditions beneath the unlined Category 1 waste rock piles are not discussed in the FEIS. But comparing the Mine Site Plan (FEIS, Figure 4.2.14-1) with figures in the Barr Hydrogeology of Fractured Bedrock report (FEIS ref. Barr 2014b, Figures 1 and 2, Exhibit 3) shows that the majority of the Category 1 waste rock pile would be located on Virginia Formation rock, rather than less hydraulically conductive Duluth Complex rock. There are two faults confirmed by Barr and at least one additional inferred fault transecting the proposed site for the Category 1 waste rock pile. (*Id*.)

The FEIS predicted, based on PolyMet's modeling and assumptions (PolyMet 2015h), that more than 98 percent of affected groundwater seepage from the Category 1 stockpile would be captured by the containment system or would migrate as groundwater into the West Pit and East Pit. (FEIS, 5-7). PolyMet's modeling (PolyMet 2015h), also adopted in the FEIS, predicted that only negligible volumes of uncaptured seepage would flow north. (FEIS, 5-65).

Reference documents undermine these claims for seepage collection. Although the FEIS refers to the containment to be installed to collect seepage as a "low-permeability cut-off wall keyed into bedrock" (FEIS, 5-7), the actual design provides for the use of "compacted soil" as a barrier around the waste rock pile. (FEIS ref. PolyMet 2015h, p. 10). Specifications for the hydraulic conductivity are 1 x 10^{-5} centimeters per second (*Id*., p. 13), which is generally classified as "semi-permeable" soil. The drainage system would consist of pipes and ditches and

rely only on gravity for collection. (*Id*., p. 14). PolyMet admits that along the west, north, and east sides of the stockpile, there may be localized areas where the drain pipe cannot be installed at an elevation low enough to ensure that groundwater will not flow beneath the cutoff wall. (*Id*.) Dr. Lee has summarized after reviewing PolyMet's seepage collection plan, "the proposed drainage system is unlikely to work as anticipated." (Lee, Category 1 stockpile opinion, 2015).

Failures of engineering controls for seepage are not counted in PolyMet's modeling. Instead, "PolyMet assumed that water collection performance monitoring points will be defined in SDS permitting to confirm (via monitoring differential hydraulic head) whether or not post-construction seepage loss is occurring beneath the cutoff wall. *If monitoring confirms that seepage losses are occurring to an extent potentially detrimental to water quality*, then groundwater recovery wells can be installed to supplement the containment system. (*Id*., emphasis added).

The FEIS' predictions of minimal Category 1 seepage flow were also based on assumption that the cover placed on the rock pile would reduce infiltration by more than 99 percent (from 360 gpm to 2.8 gpm). (FEIS, 5-145). PolyMet's document from which this conclusion is drawn admits that geomembranes have not been used for many waste rock stockpile covers and that use is generally limited to projects with an average size of less than 30 acres. (PolyMet 2015d, p. 45). Yet, PolyMet (2015d) and the FEIS calculate infiltration solely on the basis of liner defects per acre of liners, without considering the topography of massive waste rock piles. PolyMet identifies three mine sites where geomembranes have been used as a cover, but does not describe seepage results. One of these featured sites is the Dunka Mine (*Id*., p. 46). Unsurprisingly, the FEIS does not cite the Dunka Mine in its predictions that infiltration and seepage will be prevented. Despite its geomembrane, Dunka Mine waste rock seepage has resulted and continues to result in ongoing violations of Minnesota water quality standards for copper, nickel, hardness and specific conductivity. (See Dunka Mine DMR summaries, provided in Exhibit 34).

4. The FEIS failed to analyze potential water quality impacts resulting from northward flow from the mine site, despite clear evidence of this risk.

Prior comments by WaterLegacy and expert opinions of J.D. Lehr and Donald Lee disputed assertions in the SDEIS that all PolyMet NorthMet mine site surficial aquifer flow

would migrate to the south or southwest. J.D. Lehr cited a PolyMet technical document (SDEIS reference PolyMet 2012s, Figure 2-3) showing flowpaths from the mine site north to Yelp Creek and the 100 Mile Swamp with travel times of 1-10 years. (Lehr, 2014, p. 30). Dr. Lee noted the fact that existing runoff from the northernmost part of the mine site currently drains north to the 100 Mile Swamp and stated that absent explanation or analysis, any conclusion excluding northern surficial flow was "simply unjustified." (Lee, 2014, pp. 6, 12)

When the SDEIS was released, neither WaterLegacy nor the experts we consulted were aware that there was a risk that groundwater would flow north from the East Pit and across the Laurentian Divide to the Rainy River Basin. That changed in October 2014 when a proposal was submitted by Northshore Mining Company (Northshore) for a 108-acre expansion into high sulfur rock at the Peter Mitchell Pit. The Environmental Assessment Worksheet (EAW) for the Northshore expansion (Northshore EAW 2014, Exhibit 6) established that Northshore had already removed the pillar within the Peter Mitchell Pit that historically separated the two watersheds, maintaining the divide only by the placement and operation of pit sumps. (*Id*., p. 8). The EAW stated that the maximum level of the pit lake at mine closure would be 1,500 feet above mean sea level (AMSL) and that the outfall from the low point at the east end of the Peter Mitchell pit would discharge to the Dunka River in the Rainy River Basin. (*Id*., p. 5). Barr Engineering maps provided by MDNR in connection with the Northshore expansion (Barr Maps 12 and 13, Current and Post-Closure Pit Stratigraphy, Exhibit 7) showed current Peter Mitchell Pit depth of approximately 1,550 feet AMSL at its lowest point and planned expanding depth to less than 1,300 feet AMSL. (*Id.*)

Not only had the MDNR allowed the Northshore Mining Company to do away with the watershed divide between the Lake Superior and Rainy River Basin. The planned expansion promised a significant increase in the hydraulic gradient from the NorthMet mine site down to the base of the Peter Mitchell Pit and the potential for interBasin transfer of water and contaminants from the Lake Superior Basin to the Rainy River Basin.

As part of work on behalf of Tribal Cooperating Agencies to analyze mine site groundwater baseflow, GLIFWC examined documents related to historic and future Peter Mitchell Pit levels. GLIFWC then communicated to Co-Lead Agencies that PolyMet's most recent baseflow modeling erroneously assumed that water flowed out from rather than into the Peter Mitchell Pit from 1979 to 1988, resulting in an inaccurately low assessment of base flow

groundwater in the upper Partridge River. (GLIFWC letter to Co-Lead Agencies Northward Flowpath & Groundwater Modeling, Aug. 11, 2015 with attachments and figures, Exhibit 8)

Reviewing the expansion and closure plans for the Northshore Mine in conjunction with the PolyMet NorthMet project, GLIFWC informed the Co-Lead Agencies that "detailed (MODFLOW) and simplistic (MathCad) models predict that a northward contaminant flowpath is probable under likely closure conditions." (*Id*., p. 1). GLIFWC provided attachments and figures with the August 2015 Northward Flowpath letter to illustrate both the errors in baseflow modeling and the new prediction of northward groundwater flow, given the water levels expected at closure of the Peter Mitchell Pit. GLIFWC explained that water flows downhill and that the base of the Peter Mitchell Pit at closure and the surface elevation of the Peter Mitchell Pit lake under long-term reclamation would draw groundwater from NorthMet mine site features, particularly the backfilled East Pit. The hydraulic gradient would result in groundwater flow downhill between the saturated East Pit water level (1,592 feet AMSL) and the Peter Mitchell water level at closure (1,300 feet AMSL) and under long-term reclamation (1,500 feet AMSL). (*Id*., p. 4, Attachments autop. 13, 27)

The volume of northward groundwater flow from the East Pit may be quite significant. GLIFWC's preliminary modeling using the PolyMet MODFLOW model suggests that approximately 90% of the post-closure outflow from the NorthMet East Pit would migrate north due to the higher conductivity of the Virginia Formation and Biwabik Iron Formation and the lower elevations of the Peter Mitchell Pit at closure (1,300 feet) and over the long-term (1,500 feet) as compared to the Duluth Complex rock and Partridge River elevation (1,548 feet) on the south of the mine site. At closure, when the Peter Mitchell Pit is 1,300 feet deep, northward outflow is estimated at 300 gpm, stabilizing at 75 gpm in long-term closure. (GLIFWC letter to Co-Lead Agencies Discharge from PolyMet East Pit at Closure, Oct. 20, 2015, Exhibit 9).

GLIFWC also analyzed the potential that contaminants in the PolyMet NorthMet mine surficial aquifer would flow northward as a result of the increase in pit depth and future closure of the Peter Mitchell Pit. Given the proximity of the NorthMet Category 1 stockpile (0.8 miles) and East Pit (1.2 miles) to the Peter Mitchell Pit and the experience with other taconite pits where a cone of depression affecting surficial water can extend 1.4 to 1.5 miles from the pits, preliminary MODFLOW modeling showed northward flow of contaminants at the time of the Peter Mitchell Pit closure. (GLIFWC Northward Flowpath Letter, Exhibit 8, p. 5).

The response of Co-Lead Agencies to the potential for northward flow was memorialized in an Interagency Technical Memorandum on October 12, 2015. (FEIS reference MDNR et al. 2015c). This Memorandum suggested that the PolyMet MODFLOW model used by GLIFWC might need to be adjusted to accurately predict northward flow, but admitted that "the well data and the NorthMet Mine Site MODFLOW model do not exclude the possibility of a future northward bedrock flowpath from the proposed NorthMet pits to the Northshore pits." (*Id*., pp.1-2). Without assessing the reasonableness of a "leakage" assumption or the consequences for wetlands if it were to be valid, the Memorandum then hypothesized, "If this leakage rate is large enough, a bedrock groundwater mound would form between the two mines and prevent water from the proposed NorthMet pits from flowing northward to the Northshore pits." (*Id*., p. 1) This theory is carried forward in the FEIS. (FEIS, 6-40 to 6-41).

GLIFWC's analysis suggests that formation of a bedrock groundwater mound at the level necessary to prevent northward flow from the PolyMet NorthMet mine site as a result of the gradient to the expanded Peter Mitchell Pit is "hydrologically impossible." (GLIFWC Northward Flowpath Letter, Exhibit 8, p. 5). In addition, if the Co-Leads' theory were plausible and enough water could flow through the 100 Mile Swamp to create a large mound of water in bedrock, statements in PolyMet documents and in the FEIS that there is minimal connection between wetlands and groundwater north of the mine site would all be called into question. (GLIFWC email to MDNR et al. Bedrock-Wetland Connections at PolyMet Mine Site, July 29, 2015, Exhibit 10). The Co-Lead Agencies' new "leakage" theory would suggest that secondary wetland impacts to the 100 Mile Swamp from NorthMet mine drawdown would be virtually certain and highly damaging.

The Co-Lead Agencies' theory that leakage from rain through the surficial aquifer to groundwater could prevent northward flow of PolyMet NorthMet contaminants may or may not be correct. What is clear to WaterLegacy is that the potential consequences of the northward flow of NorthMet pollution into the Boundary Waters watershed *and* the potential consequences of a large leakage rate and significant secondary impact on 100 Mile Swamp wetlands should have been provided in the FEIS, preferably with an assessment of which risk is more probable.

The indefinite formulation in the Co-Lead Agencies' Memorandum (MDNR et al. 2015c) and the FEIS (FEIS, 6-40 to 6-41) allows project proponents to have it both ways. When it is time to evaluate the adverse impacts of NorthMet mine drawdown on 100 Mile Swamp wetlands,

it is claimed that there is little or no connection between wetlands and bedrock groundwater. Then, when it is time to evaluate the adverse impacts of PolyMet NorthMet pollution flowing north to the Boundary Waters, it is claimed that there is a robust connection, sufficient to form a huge underground mound of water preventing northward flow. Neither state nor federal laws allow this type of gamesmanship in environmental review.

5. Neither monitoring nor a laundry list of mitigation options, the effectiveness of which have not been substantiated, relieves responsible agencies from the responsibilities of environmental review.

The PolyMet NorthMet FEIS uses a singular approach to environmental review. Rather than analyzing adverse environmental effects and mitigation alternatives so the permitting authority can make a reasoned decision about whether to permit the project and, if is permitted, which mitigation measures to mandate in the permit, the FEIS declines to analyze environmental impacts and then provides a laundry list of mitigation options that may or may not be effective and may or may not come to pass. This FEIS strategy may be convenient for a project proponent, but it is contrary to state and federal environmental law.

The FEIS contains a long list of "contingency mitigation" measures that would not be financially assured or triggered by any set of findings, but might be "appropriate" should monitoring or "refined modeling" demonstrate that they are "needed." (FEIS, 5-239). Several of these measures pertain to the likely performance failures of engineered systems, such as liners and seepage collection systems. As reflected in WaterLegacy's SDEIS comments, PolyMet's work plans for the mine site (FEIS ref. Barr 2012c) and plant site (FEIS ref. Barr 2012d) required that performance of engineered systems be modeled as an "uncertain" input. Rather than conduct an experiment with Minnesota's environment, the FEIS should require upfront disclosure of risks.

References in the FEIS to "refined" modeling and "contingency mitigation" in case water quality was "worse than expected" or as a result of "compliance issues" (FEIS, 5-239 to 5-240) should be setting off klaxons. Interception wells often ameliorate pollution at Superfund sites, but their potential future use should not justify creating a new contaminant source.

The problematic nature of the "contingency mitigation" approach is underscored by the lack of evidence that mitigation options would be effective. It is suggested that if East Pit or

West Pit fractures or faults create conduits to groundwater, use of grout "would be evaluated" to mitigate polluted seepage from pits. (FEIS, p. 5-239). However, the cited reference (FEIS ref. PolyMet 2014l) is only a "conceptual plan." No data is cited to suggest that grout would effectively prevent seepage from a fractured mine pit for any extended period of time, let alone permanently.

The "contingency mitigation" proposal for northward flow of NorthMet contaminants into the Boundary Waters watershed exemplifies the risks of this approach. Again, the FEIS proposes that grouting might be used to prevent northward flow even though "its effectiveness at the NorthMet site is uncertain." (FEIS, 5-240). The next option on the list is lowering the water level in the East Pit and West Pit below the level (1,500 feet AMSL) of the Northshore Peter Mitchell Pit. (FEIS, 5-241). The FEIS notes that this option would "require a higher capacity water treatment facility and possibly additional treatment processes entailing additional expense." (*Id*.) The FEIS does not mention that the East Pit and West Pit are both permanent sources of contamination or the fact that the GoldSim model upon which the FEIS relied to assume that oxidation would be minimal in the East Pit was based on a Geochemical Uncertainty Analysis stating that exposure of East Pit walls to air would increase sulfate levels by a factor of at least 823 times, with resulting increases in toxic metals leachate. (FEIS, p. A-534 citation to Day, Geochemical Uncertainty Analysis, October 10, 2008, Exhibit 11).[14] At best, lowering the water level in the East Pit is an improbable mitigation strategy; at worst, it is an additional untenable threat to water quality.

The third item on the contingency mitigation list is a system of groundwater extraction wells, the number, geographic extent and configuration of which are unknown. In addition to being unproved, this option would involve building roads, laying water lines, electrical lines and access pads across the 100 Mile Swamp. (FEIS, 5-242). The final option suggested is to dig an infiltration trench between the mine pits and the Partridge River, construct an undetermined number of wells, water supply lines and roads, ensure recharge water is free of particulates to prevent clogging and artificially create a bedrock groundwater mound. (FEIS, 242-243). Although the reference cited (Barr 2015b) to suggest this option might work uses

[14] Although this document is cited in the FEIS responses to comments, A-534, as "Day 2008," the document on FEIS reference CDs identified as "Day 2008_as cited in the FEIS" pertains to other issues. Exhibit 11 was obtained through a Data Practices Act request.

the word "mound," it is an unrelated document pertaining to mounding beneath the tailings waste facility.

The FEIS states, "The exact type, location, scale, and timing of mitigation measures are not known at this time." (FEIS, 5-240). They may never be known, may never be feasible beyond a conceptual stage, and may never be constructed, particularly since they would not be financially assured. Allowing fantasy mitigation instead of environmental impact assessment is not acceptable under either state or federal law.

WaterLegacy would also emphasize that monitoring does not prevent pollution of surface or groundwater. Minnesota has a long history of monitoring pollution from mining facilities, including those that have gone into bankruptcy, leaving a legacy of contamination. In order to prevent irreparable harm to wetlands and water quality, environmental risks of a proposed mining project must be rigorously analyzed, publicly disclosed and mitigated *before* a project is permitted.

6. Independent water modeling should be performed for the PolyMet NorthMet project to assess base flow, volume and directions of surficial and bedrock groundwater flow, and drawdown impacts on wetlands.

WaterLegacy believes the current FEIS is incomplete and unreliable in its characterization of the groundwater system at the mine site, in its description of the connection between surficial deposits and groundwater and in its characterization of the volume and direction of polluted seepage. We are concerned that the FEIS fails to evaluate environmental impacts, such as an increase in propagation of pollutants due to fractures, destruction or degradation of wetlands through mine dewatering, and northward groundwater flow of pollutant to the Boundary Waters watershed not because these impacts cannot be modeled, but because to do so could reveal significant environmental concerns. We have also found the MDNR's changes in position regarding the appropriate level of mine site groundwater baseflow[15] both troubling and confusing.

Although characterization of groundwater seems like an arcane issue, we share GLIWFC's perception that it is the key to understanding both the NorthMet project's impacts on

[15] Compare Michael Liljegren, MDNR, Memorandum, Partridge River Base Flow Analysis, December 17, 2013, MDNR 2013i cited in WaterLegacy's SDEIS comments with FEIS, pp. 8-11 to 8-12, "The Co-lead Agencies have concluded after additional analysis and discussion that the USGS gage data and derived XP-SWMM values used in the EIS remain the most reasonable estimate of groundwater baseflow conditions in the Partridge River for the purposes of MODFLOW and GoldSim modeling."

water quality and its impacts on wetlands. As John Coleman explained in GLIFWC's recent letter to Co-Lead Agencies,

> Adequate characterization of the groundwater system at a proposed mine site is essential to understanding most of the potential impacts from the project. The amount of water entering the groundwater system, be it precipitation or discharge from the bed of lakes, rivers or mine pits, determines the direction of flow and dilution of contaminants, and dictates points of compliance for both ground and surface waters. The horizontal and vertical conductivity of the soil and bedrock materials determines how the groundwater system responds to stresses and the rate at which the groundwater flows horizontally and vertically. The character of interaction between surface water features and the groundwater system, whether it is loss of water from rivers or wetlands to the groundwater system, or discharge from the groundwater system to the surface water features, determines predicted impacts to surface water features by stresses such as mine dewatering. (GLIFWC Northward Flowpath Letter, Exhibit 8).

With so much at stake, we believe it is incumbent upon responsible agencies to test a project proponent's modeling and verify the proponent's conclusions. According to GLIFWC's Preliminary FEIS Comments, this has never been done:

> We have learned from the MNDNR project managers that ERM and lead agency staff never ran the mine site MODFLOW model during their technical review. In fact, only the applicant's consultant (Barr Engineering) and Tribal staff have run the model and tested its functionality. It is surprising to discover that at no time during the eight years of project review have the lead agencies and/or their consultant tested how the model works. This fact leads to serious questions about the legitimacy of the conclusions reached by the ERM and lead agencies regarding the quality of the applicant's model. (GLIFWC PFEIS Comments, Technical Review of the Mine Site MODFLOW Model, Exhibit 12).

By this point in project review, when the Co-Lead Agencies have already vouched for the FEIS and the modeling done by PolyMet's consultants, it is too late for these agencies to perform the role of independent review. WaterLegacy requests that the U.S. Geologic Survey or other undisputed and unbiased experts be retained to perform independent water modeling for the NorthMet project. The late timing of this review is certainly not ideal. But no other course of action would ensure that reliable information is available to assess significant environmental effects of the PolyMet NorthMet sulfide mine project on Minnesota's wetlands and waters.

III. TAILINGS SITE CAPTURE OF POLLUTED SEEPAGE

One of the most basic requirements of environmental review is that an EIS must not rely on the unsubstantiated claims of a project proponent to draw conclusions as to the environmental

impacts of a proposal. Fundamentally, EIS modeling and predictions must work forward from substantial evidence, not work backwards to model a desired result.

Since WaterLegacy's comments on the SDEIS, the FEIS has made no change and provided no additional justification for its use of "evaluation criteria" rather than water quality standards and its failure to determine water quality impacts at surface water locations closest to the source of seepage and discharge. The FEIS' claims that the NorthMet tailings waste facility would not violate water quality standards or would not increase the violations beyond the "continuation of existing conditions" scenario are based on these improper qualifications of the data as well as the unsupported claims regarding chemistry and capture rates of tailing seepage.

Although the PolyMet NorthMet FEIS relies on many other dubious and unsupported claims, those made for seepage collection at the tailings waste facility are among the most clear-cut and troubling. Former agency staff, engineers and hydrologists find the FEIS claims of nearly perfect seepage collection laughable, while citizen advocates refer to tailings seepage claims as The "Big Lie." Comments below summarize changes made since the SDEIS and remaining concerns about the analysis of tailings seepage collection that we believe must result in a finding that the FEIS is inadequate under applicable laws and insufficient to protect water quality.

1. PolyMet NorthMet project water quality and alternatives analysis depend on tailings seepage collection system performance.

PolyMet NorthMet tailings would be deposited in a wet slurry on top of the existing unlined LTVSMC taconite tailings piles. (FEIS, pp. 4-427, 5-5, 5-185) The 4 ½ mile square LTVSMC tailings waste facility was built above wetlands and three small streams to facilitate drainage of water through taconite tailings piles. The historical development of the tailings waste facility over wetlands and streams is shown in Exhibit 13.

The NorthMet tailings waste facility would not be lined to contain seepage. (FEIS, 3-104, 3-158). NorthMet sulfide mine tailings slurry would be deposited immediately above LTVSMC tailings and slimes. (FEIS, Figure 5.2.14-6) The completed tailings height of the NorthMet waste cells would be 1,735 above sea level. (FEIS, 3-104). That is 60 feet higher than the highest feature to the east and more than 200 feet higher than gradient on the west, northwest, north and south sides of the tailings. (FEIS, Figure 4.2.2-17). Elevations above surrounding land create hydraulic pressure for seepage.

The PolyMet NorthMet project would produce 110,736 tons of wet tailings slurry per day, of which liquids would be 68.5 percent by weight or 86 percent by volume. (FEIS ref. PolyMet 2015q, autop. 621). The seepage rate from slurry tailings is considerably higher than that of either past or thickened tailings. The Senior Director of Geotechnical Engineering and Hydrogeology for Newmont Mining Corporation has estimated the seepage rate from slurry tailings at 6.4 gallons per minute per acre, the seepage rate from paste or thickened tailings at 0.06 gallons per minute per acre and the seepage from dry filtered tailings at 0.007 gallons per acre.[16] As compared to dry filtered tailings, slurry tailings produce approximately 914 times as much seepage. PolyMet's wet slurry tailings waste facility is predicted to produce 3,880 gallons of tailings seepage per minute. (FEIS, 5-179, 5-181), equivalent to 2,041,000,000 gallons of contaminated seepage per year.[17]

PolyMet NorthMet tailings seepage would be collected from the toe of the tailings heaps and would contain sulfates and heavy metals from copper-nickel processing slurry, effluent from the mine site treatment plant, and LTVSMC tailings. (FEIS ref. NorthMet 2015j, FEIS Figure 3.2-12). PolyMet's modeling of seepage at the tailings toe is likely to understate actual tailings chemistry. Since leaching depends on surface area, data from MinnAMAX copper-nickel *tailings* would provide more comparable field experience than data from waste rock piles used in FEIS modeling. (FEIS, 5-62). Such data was not used. Leachate from MinnAMAX copper-nickel tailings contained maximum levels of cobalt more than 30 times the tailings seepage concentration predicted for the NorthMet project, levels of nickel more than 21 times the predicted P90 NorthMet concentrations, and sulfate concentrations more than 11 times higher than predicted NorthMet concentrations. (Johnson, 2015).

2. The PolyMet NorthMet FEIS failed to test or consider effects of bedrock fractures and groundwater flow on its claimed seepage efficiency.

Objections raised by geologist J.D. Lehr in his review of the SDEIS have not been addressed in the FEIS. Mr. Lehr objected to the "simplistic and cursory treatment of the role that bedrock fractures may play in the transmission of groundwater" at the tailings site. (Lehr, 2014, p. 3). He objected to the assumption of a "no-flow boundary" beneath the tailings piles and the

[16] See John Lupo, Ph.D., P.E., Dry Stack Tailings Overview, slide presentation available at http://www.slideshare.net/Rosemont-Copper/dry-stack-tailings-overview
[17] Conversion site at http://www.convert-me.com/en/convert/flow_rate_volume/gallon_day.html

resulting implication that groundwater flow through bedrock at the tailings site "is so insignificant that it can be ignored." (*Id.*). He commented that the failure to identify fractures or assess groundwater flow through fractured bedrock "was a major omission, resulting in unsupported assumptions and inadequate information regarding groundwater flow" at the tailings waste site (*Id*., p. 4) and raised concerns that neither the project proponent nor the Co-Lead Agencies have required any study of bedrock fractures or their hydrogeologic properties. (*Id*., p. 15)

Mr. Lehr objected to language in the SDEIS interjecting ambiguity by stating that faults have been "inferred but not confirmed." He explained, "Essentially all aspects of geologic maps are inferred because they usually cannot be viewed or measured directly. This fault's location [beneath the tailings site] is mapped based on sound geologic inference or it wouldn't be shown." He noted that faults can only be "confirmed" by excavation along their entire length. (*Id*., p. 14).

Mr. Lehr also criticized the prior EIS for failing to include any hydraulic testing of bedrock in the tailings site area. (*Id*., p. 12, p. 15). He explained that analogies between Duluth Complex at the mine site and Giants Range Granite at the tailings site cannot be used to assume hydraulic conductivity of bedrock at the tailings site, since Giants Range Granite is 1,600 million years older than Duluth Complex and "would have experienced a different stress, weathering and erosional history than the Duluth Complex." (*Id*., p. 15).

Mr. Lehr emphasized that, to assess hydraulic conductivity, "What the SDEIS requires is data." (*Id*., pp. 15-16). "Unless a solid scientific basis is provided, the SDEIS' claims – both explicit and implicit – that groundwater flow through bedrock is minimal, cannot be sustained." (*Id*., p. 16). Based on the scientific literature and his professional knowledge of the region's geology, J.D. Lehr concluded, "bedrock fractures will play a significant role in groundwater and contaminant transport" at the tailings site. (*Id*., p. 17).

Anthony Runkel, the Chief Geologist for the Minnesota Geological Survey, echoed these concerns, in an opinion on the SDEIS attached as Exhibit 14. Mr. Runkel stated that the investigations done for the NorthMet mine and tailings site "are not sufficient to recognize the hydrogeologic features known to be characteristic of other crystalline bedrock" on the Canadian Shield and not sufficient to support the modeling used for the project. He described techniques needed to investigate the Hydrogeologic conditions of fractured bedrock and explained:

When these techniques have been used in generally similar hydrogeologic settings

> elsewhere on the Canadian Shield, the results support hydrogeologic conceptual models that differ substantially from those proposed for the Duluth Complex and Giants Range Batholith described in the SDEIS. Of particular significance for solute transport, the conceptual models commonly include key fractures or fracture zones of relatively high hydraulic conductivity, and multiple flow systems within the bedrock at individual sites. These flow systems are variably connected to the surface water system, have variable residence times, can have upward and downward vertical gradients within a local area, and horizontal flow directions that differ from one another. (Runkel, opinion on SDEIS, 2014, p.1, Exhibit 14)

Mr. Runkel stated that use of a Duluth Complex analogy to assume that Giants Range Granite has a similar stress, weathering and erosional history "is not valid." (*Id*., p. 2). He noted that faults are known to be common across much of mapped extent of the Giants Range Batholith, including in the plant site/tailings basin area. Mr. Runkel explained that nearby fractures in the same bedrock have had significant environmental effects, reporting, "Hydraulically significant fractures in the Giants Range Batholith are documented to have transported contaminants at the Northwoods Closed Landfill (MPCA reports) several miles north of the Plant Site/Tailings Basin area." (*Id*., p. 3).

The FEIS did not discuss these expert opinions or resolve their concerns. Although fractures beneath the tailings site are mapped in an FEIS reference document (FEIS ref. Barr 2014b, Large Figures 1-2, Exhibit 3), the FEIS continues to minimize the significance of geologic evidence of fractures, stating "on published geologic maps, the faults in these areas are dashed and identified as conjectural with inferred (not exact) locations." (FEIS, 4-445).

The FEIS conceptual cross-section of the tailings basin groundwater containment system still characterizes the bedrock as an "assumed no flow boundary." (FEIS, Figure 3.2-28). Responses to comments on the SDEIS state that the no-flow boundary has been changed at the "toe of the east embankment." (FEIS, A-179, A-251, A-259, A-284, A-612). However this "change" is meaningless, since the FEIS assumes 100 percent collection of all seepage on the east side even without a no-flow assumption. (FEIS, 5-186). The FEIS also continues to use the mine site Duluth Complex bedrock for an analogy to assume hydraulic conductivity at bedrock depths in the Giants Range Granite beneath the tailings piles. (FEIS, 4-44).

The FEIS contains *no* investigation of fractures beneath the tailings waste site. The FEIS estimates the hydraulic conductivity of the top 20 feet of bedrock around the plant site at 0.14 feet per day (FEIS, 4-113), but neither the FEIS nor the recent hydrogeology report prepared for

PolyMet provide *any* information on hydraulic conductivity of tailings site bedrock beneath the top 20 feet. (See FEIS ref. Barr 2014b, pp. 21-22). Even the maps of geologic conditions identify only the top layers of schist beneath the existing LTVSMC tailings site. (*Id*., Large Figures 1-2, Exhibit 3).

In addition to explaining EIS inadequacies in modeling transmission of pollutants through groundwater at the tailings site, J.D. Lehr demonstrated that NorthMet tailings seepage would emanate from the south and east sides of the tailings waste piles as elevations of tailings in Cell 1E increased above Spring Mine Lake, reversing topography and hydraulic flow. (*Id*., pp. 18-19).

On first reading of the FEIS, it might seem that the document addressed comments of WaterLegacy and J.D. Lehr's opinion regarding seepage, since both south side and east side tailings seepage are now discussed. That impression would be mistaken. The FEIS mentions seepage on the east side of the tailings piles only long enough to assert that seepage containment "would be expected to capture 100 percent of tailings surface seepage and groundwater seepage." (FEIS, 5-8). Similarly, on the south side, the FEIS simply asserts, "an existing seepage containment system would be upgraded by PolyMet to achieve 100 percent capture of tailings surface and groundwater seepage that otherwise would flow into Second Creek, a tributary of the Partridge River." (FEIS, 5-102).

The Change Definition Form documenting the direction given by the Co-Lead Agencies on modeling changes resulting from east pit seepage is instructive. The form states, "The capture efficiency of the East Side Seepage Containment System is assumed to be 100% (i.e., all water that reports to the East Containment System both surface and/or groundwater, is captured)." Thus, modeling can reflect 100% collection and 0% flow toward Mud Lake and no "eastern" flowpath need be added to the project description. (NorthMet Project CDF 251, East Dam GoldSim Modeling Changes, Sept. 12, 2014, Exhibit 15).

Based on the information provided by PolyMet in its Water Modeling Data Package (FEIS ref. PolyMet 2015j) the FEIS claims that, during mine operations, 3,860 gallons per minute of the total 3,880 gpm modeled would be collected. (FEIS, 5-181, Table 5.2.2-37). This would be a nearly perfect collection rate of 99.5%.

The FEIS and underlying PolyMet documents characterize all but 200 gpm (0.5%) of NorthMet tailings seepage as "surface seepage," since that is the volume that currently seeps out

of groundwater at the toe of the existing LTVSMC basin. (FEIS, 5-179, PolyMet 2015j). No analysis is done to determine if the increased volume and hydraulic head created in the tailings piles during NorthMet operations would result in more water being retained further into groundwater than under existing conditions. As Dr. Lee noted in his opinion regarding tailings basin performance, given the lack of data on bedrock groundwater, it is an open question how much groundwater is actually flowing in bedrock. (Lee, tailings opinion, 2015, p. 4).

PolyMet's underlying analysis (PolyMet 2015j) and the FEIS do not evaluate a range of tailings seepage collection performance or the effects of that performance on environmental quality; "for purposes of impact evaluation they are assumed to capture: 100 percent of the Tailings Basin's surface seepage; 100 percent of the groundwater approaching the containment system from the Tailings Basin's east and south toes; and 90 percent of the groundwater approaching the containment systems from the Tailings Basin's north, northwest and west toes." (FEIS, p. 5-186).

3. Claims of nearly perfect tailings seepage collection made in the FEIS are based on PolyMet's unsubstantiated assumptions and models.

The claims of capture efficiency on the northwest, north and east sides made in the FEIS are based on PolyMet's assumptions and models:

> "The capture efficiencies in water quality modeling were provided by the PolyMet (Barr 2015e, as cited in the FEIS)." (FEIS, A-583).
>
> "[T]he assumed capture efficiencies of the groundwater containment systems are justified and supported by modeling." (FEIS, A-578, A-612).
>
> "Performance modeling of the north and northwest flowpaths has indicated that the proposed systems would provide greater than 90 percent capture of surficial aquifer and bedrock groundwater to 100 ft below the top of bedrock. Containment systems are assumed to capture 100 percent of tailings surface seepage." (FEIS, 5-77).

On the south side of the tailings piles, the FEIS' claims of 100 percent tailings seepage collection are based on a promise by PolyMet. Since 2011, the current owner, Cliffs Erie, LLC has installed a seepage collection system on the south side of the existing LTVSMC tailings waste facility at surface discharge location SD026. This system includes a cutoff berm and trench, seep collection sump, pump and pipe system. (PolyMet 2015i). Although neither the FEIS nor PolyMet documents specify what percentage of south tailings seepage is currently

collected by Cliffs Erie, water is bypassing the cutoff dam, and improvements in collection would be required to comply with the Cliffs consent decree.[18] "It is acknowledged that there is currently incomplete capture of impacted water at SD026." (FEIS, A-625).

Claims in the FEIS that the proposed NorthMet project will result 100 percent seepage capture on the south side of the tailings piles are based on a vague but repeated promise that unspecified future upgrades will achieve perfect collection: "PolyMet has committed to future upgrades to achieve 100 percent capture by this system if the NorthMet Project Proposed Action is approved." (FEIS, 3-120, A-84, A-195, A-197, A-616, 3-120). Although several possible changes in the dam on the south side are listed, no evidence is provided that any of them would be effective in capturing *all* seepage that comes to the surface on the south side of the tailings piles. (FEIS, 3-120, 5-102). No discussion in the FEIS proposes to identify or collect contaminated groundwater seepage on the south side of the tailings site. Even though no investigation has been done of bedrock groundwater at the tailings waste site, the FEIS assumes, "groundwater migration is not expected to the east or south." (FEIS, 5-77)

Dr. Lee reviewed the FEIS conclusions on tailings basin performance and concluded, "The analytical support for these conclusions is based on assumptions of performance that are not justified or supported by data." (Lee, tailings opinion, 2015, p. 1). Dr. Lee's concerns included the failure to verify modeling to show that the predictions of groundwater movement were representative of the tailings basin site (*Id*., p. 3) and the fact that the plant site model did not include bedrock or consistently describe groundwater flow in and around the tailings basin. (*Id*., p. 4)

4. PolyMet's capture efficiency claims are not substantiated by field experience; evidence supports the need for a range of more realistic probable capture rates.

In responses to comments, the Co-Lead Agencies explained, "The design basis for the containment system is . . .to reverse the pre-existing hydraulic gradient (and flow direction) across the facility." (FEIS, p. A-547). They also acknowledged, "Relatively few capture systems have been built with this degree of pumping to cause a reversal of the pre-existing hydraulic gradients." (FEIS, p. A-548). WaterLegacy's research has disclosed no similar systems operating long-term to reverse hydraulic gradient.

[18] Barr, Water Balance Evaluation of SD026 Seepage Collection System and Cell 1E Pond Water Levels (May 1, 2013); MPCA (John Thomas) letter to Cliffs Natural Resources (Craig Hartmann), April 4, 2013.

Field experience and local geological conditions do not support claims made in the FEIS that a bentonite slurry trench would serve as an impermeable "cut-off wall" (FEIS, p. 5-197), or that it could be "keyed into" the tailings site bedrock. (FEIS, p. 5-185). J.D. Lehr explained in his comments on the SDEIS that the granite bedrock at the tailings site would not be favorable to allow a keyed in trench. Large boulders and cobbles known to exist at the site would also impede construction of an effective slurry trench. (Lehr, 2014, pp. 17-18). Dr. Lee noted that the proposed slurry wall at a depth exceeding 40 feet in some locations was a significant undertaking, and that claims that a slurry wall would be nearly impermeable for the indefinite future were not justified. (Lee, tailings opinion, 2015, p. 3). These concerns are similar to those raised by Barr Engineering in a 2007 evaluation report of Tailings Basin Modifications to Eliminate Water Release via Seepage. (FEIS ref. Barr 2007f). The Barr 2007f report noted that variability in ground surface elevation would complicate construction, and both open trench construction and the "low strength of slurry walls" could also affect long-term embankment stability. Further, a slurry wall was "not suitable if boulders or cobbles are present." (*Id*., p. 21).

WaterLegacy's SDEIS comments reflected our efforts to find field experience verifying the feasibility and efficacy of the proposed seepage containment and pump-back system. FEIS reference CDs include a 2012 Barr Engineering memo for PolyMet citing the common use of slurry walls and collection trenches for water quality management. (FEIS ref. PolyMet 2015h, Attach. D, Groundwater Containment System: Degree of Use in Industry). This memo cites several examples of allegedly successful containment facilities. No information was found for any of these examples suggesting that the capture efficiency claimed for the PolyMet NorthMet tailings seepage collection system was achieved in practice.

Barr's memo highlighted the Fort McMurray tailings pond seepage containment system in Alberta Canada as an example of the successful use of slurry walls to isolate mine tailings seepage from downgradient water:

> Another example is the installation of a soil-bentonite cutoff wall around the perimeter of a mine tailings pond located in the province of Alberta, Canada. The cutoff wall is approximately 100-feet deep and 3 feet wide, and has a hydraulic conductivity of less than $1x10^{-7}$ cm/sec. The cutoff wall was used to isolate the tailings pond from downgradient surface water features including wetlands and the Athabasca River. (*Id*., pp. 1-2).

However, information available since 2012 demonstrates that the Fort McMurray tar sands tailings seepage containment has been a serious failure. Canadian federal research using

chemical profiling to confirm the contaminant source in the Athabasca River has shown that toxic chemicals from McMurray Formation oil sand tailings ponds are leaching into groundwater and seeping into the Athabasca River, despite ditches, cutoff walls, groundwater interception wells and a system where captured water is pumped back into tailings ponds.[19] One dam has been reported to seep wastewater at a rate of 75 liters per second (625,200,000 U.S. gallons per year) into groundwater feeding the Athabasca River.[20] Industry is working to address the tailings seepage issue, budgeting more than $1-billion in tailings-reduction technology.[21]

WaterLegacy is unaware of any data on capture of unlined tailings waste seepage that would support PolyMet's modeling assumptions. In Minnesota, MPCA concluded in 2008 that the maximum estimated percentage of seepage to the Sandy River that could be collected from the unlined Minntac tailings waste facility was approximately 55 to 60 percent.[22] In 2013, U.S. Steel confirmed that the dike and pump back system on the east side of the Minntac facility was collecting roughly 50 percent of the total seepage volume.[23] After extensive research, the highest rate of seepage capture identified for any unlined facility using slurry walls appears to have been at the Hill Air Force Base in northern Utah, where a combination of the slurry walls, landfill covers, groundwater interception and extraction wells, and treatment succeeded in reducing metals concentrations from a Superfund site by 80 percent.[24]

In the EPA's recent Pebble Mine assessment, the Agency recently concluded, "Water collection and treatment failures are a common feature of mines."[25] EPA stated that the probability of potential *failure* of water collection and treatment during operations is 93 percent, and results include "exceedance of standards potentially including death of fish and

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[19] Frank et al., *Profiling Oil Sands Mixtures from Industrial Developments and Natural Groundwaters for Source Identification*, Env. Sci & Tech. accepted Jan. 21, 2014. Available at http://www.thetyee.ca/Documents/2014/02/21/Profiling-Oil-Sands-Mixtures.pdf; Bob Weber, *Federal study says oil sands toxins are leaching into groundwater, Athabasca River,* Edmonton Globe and Mail, Feb. 20, 2014. Available at http://www.theglobeandmail.com/news/national/federal-study-says-oil-sands-toxins-are-leaching-into-groundwater-athabasca-river/article17016054/

[20] Andrew Nikiforuk, *Large dams of mining waste leaking into Athabasca River study*, Feb. 21, 2014, http://thetyee.ca/Blogs/TheHook/2014/02/21/Tailings-Waste-Athabasca/

[21] Weber, *supra* note 4.

[22] MPCA (John Thomas) letter to Tom Moe (U.S. Steel Corporation) of Jan. 10, 2008, available at http://waterlegacy.org/sites/default/files/PolyMet_SuppEIS/WL_Ex19_MPCA_MinntacSeepLtr_2008.pdf

[23] U.S. Steel (Chrissy Bartovich) letter to U.S. Army Corps of Engineers, July 9, 2013, letter with attachment excerpt available at http://waterlegacy.org/sites/default/files/PolyMet_SuppEIS/WL_Ex20_U.S.Steel_MinntacLtr_2013.pdf

[24] EPA, *Engineering Bulletin Slurry Walls* (October 1992), p. 5, available at http://nepis.epa.gov/Exe/ZyPDF.cgi/10002DPY.PDF?Dockey=10002DPY.PDF

[25] EPA, *An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska*, Volume 1 – Main Report (EPA 910-R-14-001A (January 2014), p. 8-19, available at http://www2.epa.gov/sites/production/files/2015-05/documents/bristol_bay_assessment_final_2014_vol1.pdf

invertebrates." Post-closure probability of failure of water collection and treatment was "somewhat higher than operation," and "failures are likely to result in release of untreated or incompletely treated leachates for days or months." If the site were to be abandoned, EPA noted that failure of water collection and treatment was "certain."[26]

The NorthMet Plant Site Water Modeling Plan stated that "performance of engineered systems" is an "uncertain input," for which a probabilistic distribution should be defined. (FEIS ref. Barr 2012d, pp. 1-2). Although slurry walls, trenches, and pumps to capture tailings seepage are engineered systems, the FEIS contains no modeling of impacts for a reasonable range of tailings seepage capture probabilities. It assumes near-perfect collection for the indeterminate future.

As with the potential mine site contamination discussed previously, the FEIS proposes a combination of monitoring and "contingency mitigation." It is suggested that we wait and assess fractures "that could function as high-permeability conduits for groundwater" or "lead to violation of water quality standards" by monitoring once the PolyMet NorthMet project is in place and contaminated seepage is detected. At that point, unspecified "contingency mitigation measures would be employed to mitigate the fracture-related effects." (FEIS, 5-37).

The FEIS identifies several likely failures of the proposed tailings seepage collection system: new surface seepage locations may emerge as the tailings basin is developed; tailings pond water quality may be worse than expected; and groundwater or surface water downgradient of the tailings basin may fail to comply with water quality standards. (FEIS, 5-239 to 5-240). Such failures may or may not be revealed by monitoring, may be revealed only after irreparable harm has been caused to fish, wild rice or human beings or may only come to light after mining has ceased and the mining company has declared bankruptcy to minimize liabilities.

Both NEPA and MEPA were enacted precisely to prevent this scenario. State and federal environmental review laws require analysis of significant environmental consequences before the fact, not after contaminated seepage permeates surface and groundwater. An EIS that models a realistic range of seepage capture efficiencies and discloses their impacts on water quality, supports the consideration of alternatives to protect aquatic life and human health. An EIS, like the PolyMet NorthMet FEIS, that relies on unsubstantiated assumptions by the project proponent

[26] *Id*., Table ES-4 and Table 14-1

and allows models to be used to produce a desired outcome threatens to create a new Superfund site, with only indeterminate hope of mitigation.

IV. HYDROMETALLURGICAL RESIDUE FACILITY

WaterLegacy's comments on the SDEIS reflected our concern that the hydrometallurgical residue facility (HRF) would contain some of the most concentrated and toxic wastes produced by the PolyMet NorthMet project. Yet, the SDEIS failed to disclose the chemical composition of the HRF wastes and failed to disclose the seepage rate under various reasonable assumptions of liner leakage. Instead, without providing any information from which it could be verified that this conclusion was reasonable, the SDEIS determined that any leakage from the HRF could be ignored and need not be modeled to evaluate environmental impacts.

The FEIS does not address WaterLegacy's prior concerns. The FEIS provides no information regarding the chemical composition of the 313,000 tons per year of HRF waste expected to be produced by autoclave processing of metals at the Hydrometallurgical Plant. Since the SDEIS was prepared, the FEIS has proposed two additional sources of contamination to the HRF waste facility. Water treatment plans solids, primarily gypsum, and coal ash wastes from the existing LTVSMC site Coal Ash Landfill are proposed to be located with the HRF wastes. (FEIS, 5-178, PolyMet 2014c). These additional and potentially toxic and reactive wastes may represent up to 10 percent of the HRF facility solids volume. (FEIS, 4-445). As with the residue from the Hydrometallurgical Plant, the FEIS provides no characterization of the mass or concentration of chemicals resulting from disposal of gypsum and coal ash wastes.

The FEIS' conclusion in that HRF waste will not exceed federal RCRA hazardous waste thresholds is based on 2005 pilot test residues from a different process and on incomplete testing in 2009. Rather than assessing the contaminant levels actually proposed for the HRF under the current project plan, the FEIS states that, if the project is approved, the residue should be tested to verify that it is not hazardous. (FEIS, 5-609).

Once the HRF pond becomes full and during reclamation, water from the HRF pond and drainage from the residue would be removed and treated at the plant site WWTP. (FEIS, 3-134). However, the modeled WWTP influent water quality during project reclamation does not reflect any of the expected concentrations from HRF contaminated wastewater. (FEIS ref. PolyMet 2015j, pp. 274-275).

The FEIS continues to assume that leakage from the HRF into underlying groundwater or adjacent surface water "would be negligible" due to the double liner proposed and does not evaluate any potential environmental impacts from HRF waste facility seepage. (FEIS, 5-179). The PolyMet plant site Water Modeling Data Package explains, "The double liner system designed for the HRF is impermeable enough so that its effect on the environment can be ignored." (PolyMet 2015j, p. 117). The Data Package assumes a leakage rate of 2 defects per acre in the upper layer and that defects are circular with a diameter of 1 centimeter and that no defects will occur in the lower liner. (*Id*.) However data in PolyMet's own Residue Management Plan suggests that 40% of installed liners have a defect density from 4 to 10 per acre and 10% a defect density from 10 to 20 per acre. (FEIS ref. PolyMet 2014r, p. 11). Although the hydraulic head between the upper and lower liner may be low, leakage could still occur.

Neither the FEIS nor the Residue Management Plan address the difference between the HRF proposal and modern landfill siting and performance. Modern landfills, on which the optimistic expectations of HRF leakage performance are based, cannot be sited on locations like the one proposed in the PolyMet NorthMet FEIS. As summarized on the EPA's website, municipal solid waste landfills must comply with the federal regulations in 40 C.F.R. § 258 (Subtitle D of RCRA), or equivalent state regulations. Federal standards for solid waste landfills include: "Location restrictions—ensure that landfills are built in suitable geological areas away from faults, wetlands, flood plains, or other restricted areas."[27] Minnesota law similarly precludes the siting of either a hazardous or a solid waste facility in a wetland or in a location where the topography, geology, hydrology or soil is unsuitable for the protection of the ground water and the surface water. Minn. R. 7045.0460, Subp. 2, Minn. R. 7035.1600.

The FEIS and supporting documents demonstrate that the proposed HRF is an unsuitable location for either a hazardous or an industrial waste landfill. The HRF would be located on approximately 36.1 acres of wetlands, 7.5 acres of which would be newly impacted by fill and are subject to both state and federal regulations. (FEIS, 5-321). In addition to the wetlands, the HRF would be located on top of as much as 50 feet of fine tailings and slimes in the existing LTVSMC Emergency Basin. (FEIS, 5-664, Fig. 5.2.14-9). Although the FEIS proposes that a preload could be placed on these materials to compress them in order to reduce stress deformation and strain on the liner system, it is expected that the material would rebound a small

[27] EPA, Landfills, available at http://www3.epa.gov/epawaste/nonhaz/municipal/landfill.htm. See also 40 C.F.R. §257.9 for restrictions on location of new or expanding non-municipal, non-hazardous waste facilities on wetlands.

amount after the preload is removed. (FEIS, 5-667). Differential settlement of foundation materials is known to create longitudinal strain for liner materials. (FEIS, 5-661).

The FEIS now recognizes that Minnesota Geological Survey maps show the existence of a fault directly beneath the proposed HRF location. (FEIS, 4-435, Barr 2014b Large Figures 1 and 2, Exhibit 3). The FEIS has identified yet another risk to liner deformation and integrity. Seeps along the southern edge of the existing LTVSMC tailings basin Cell 2W have been observed with the potential to create phreatic build-up below the HRF liners. The HRF would require a collection drain beneath the proposed embankment and liner systems to transmit the collected seep to the exterior of the HRF facility and reduce this risk. (FEIS, 5-662 to 5-663).

Concerns about potential failure of containment related to the hydrometallurgical residue facility are discussed in Section IX, *infra*, along with other risks of failure not assessed by the FEIS. The FEIS remains inadequate both due to its inappropriate secrecy regarding the nature and concentration of hydrometallurgical residue facility contaminants and because it has assumed a level of liner integrity that is inconsistent with the unsuitable location selected for disposal of PolyMet's hydrometallurgical wastes.

V. WETLANDS

WaterLegacy's comments on the SDEIS discussed both the unacceptable adverse impacts of the PolyMet NorthMet project on wetlands and the inadequate mitigation proposed by PolyMet for adverse wetland impacts. WaterLegacy's substantive arguments that the project's wetlands impacts and improper mitigation do not allow issuance of a Clean Water Act Section 404 permit are presented in separate comments on the permit. Comments below reflect our concern that the FEIS does not analyze the adverse environmental effects of the proponent's mitigation plan, but instead argues on behalf of this plan. This advocacy is contrary to the requirements of environmental review.

We then focus on the inadequacy of the FEIS' assessment of the NorthMet project's indirect effects on wetlands. At the end of Section II, *supra*, discussing project mine site impacts, WaterLegacy requested independent water modeling. Such independent water modeling could be used to quantify indirect impacts on wetlands. In the alternative, since it is the only quantification of wetlands drawdown impacts in this record, the Co-Lead Agencies should accept

GLIFWC's analysis of mine site impacts to wetlands for purposes of alternatives analysis, wetlands mitigation and permitting.

1. The FEIS presented and argued for PolyMet's wetlands mitigation plan rather than evaluating its impacts.

Rather than assessing the adverse impacts on wetlands acreage and function in the St. Louis River watershed and the Lake Superior Basin resulting from the proponent's failure to provide in-watershed and in-kind compensatory mitigation, the FEIS attempts to justify the mitigation proposal by claiming that PolyMet selected most of its mitigation before the Federal Mitigation Rule was finalized. (FEIS, 5-363). This argument is substantively invalid, as explained in the expert opinion of Morgan Robertson (Robertson, 2015, pp. 11-13) and in WaterLegacy's comments regarding the Section 404 permit application. In addition, by advocating for some type of exemption from federal mitigation rules, rather than explaining the adverse effects of operating outside the rules, the FEIS adopts a role of justifying, rather than analyzing the proposed mitigation. This advocacy is inconsistent with NEPA regulations. 40 C.F.R. §1502.2(g).

2. The FEIS failed to adequately assess indirect impacts of the PolyMet NorthMet project on wetlands.

Under both state and federal law, an EIS must analyze the significant environmental impacts of a proposed action. Minn. Stat.§116D.04, Subd. 2a; 40 C.F.R.§1502.1. Under both regulatory regimes, an EIS must provide a thorough analysis of both direct and indirect potential adverse effects. Minn. R. 4410.2300(H); 40 C.F.R. §1502.16(a)(b). In most cases, the Clean Water Act Section 404 process relies on final EIS for the evaluation of the least environmentally damaging practicable alternative (LEDPA) and related factual findings of compliance or non-compliance with restrictions on discharge. 40 C.F.R. §§ 230.10(a)(4), 230.12. Secondary effects on aquatic systems and on wetlands must be determined in order to assess whether a project may be permitted. 40 C.F.R. §§ 230.11, 230.41(b).

There is no dispute that indirect effects of the NorthMet project are significant, no matter what scale of comparison is provided. The FEIS acknowledges that the proposed sulfide mine project could indirectly affect up to 7,694.2 acres of wetlands located within and around project sites. (FEIS, 5-251). This potential indirect wetland impact is more than eight times the 913.8-

acre (FEIS, ES-36) direct impact of the project on wetlands. Taken together, potential impacts of the NorthMet project on wetlands in the Partridge and Embarrass River watersheds affect up to 8,608 acres, equivalent to 13 percent of the 65,567 *remaining* acres of wetlands in the two watersheds combined. (FEIS, 6-57, Table 6.2.3-3).[28]

The FEIS acknowledges that indirect effects on wetlands would result from wetland fragmentation; alteration of wetland hydrology resulting from changes in watershed area, groundwater drawdown, seepage containment at the tailings facility and changes in stream flow at the mine and plant site; and water quality changes related to deposition of dust, ore spillage and leakage and seepage and leakage from mine pits, waste rock storage and other mine features. (FEIS, 5-319, 5-347)

The PolyMet NorthMet mine site and potentially impacted proximate wetlands are within the 100 Mile Swamp and the Upper Partridge River site. (FEIS, 4-481, A-509; WaterLegacy SDEIS comments, Exhibit 30). Approximately 92 percent of the wetlands within the mine site are high quality. (FEIS, 4-196) Wetlands that would be directly and indirectly impacted by the NorthMet mine site are sites of high biological diversity, based on high quality peatlands in the 100 Mile Swamp and Partridge River Peatlands sites and on the numerous rare species in the Upper Partridge River site. (WaterLegacy SDEIS comments, Exhibit 30).

The EPA's comments on the PolyMet NorthMet SDEIS emphasized the need to quantitatively assess indirect wetlands of the tailings basin and mine site project:

> *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, 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. (U.S.EPA, Comments on PolyMet NorthMet SDEIS, Exhibit 1)

The FEIS does not follow this recommendation and does not quantify indirect wetlands impacts. The FEIS states, "The indirect effects analyses performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place

[28]Section XII, *infra*, discusses Cumulative Effects and provides a more detailed analysis of wetlands impacts on the Partridge and Embarrass River watersheds.

for those areas that were identified as having a potential for indirect wetland effects." (FEIS, 5-259). This phrase is not an oversight, since it was repeated in the FEIS and in responses to comments at least 14 times (FEIS, 5-342, 5-348, A-25, A-37, A-39, A-116, A-225, A-294, A-342, A-481, A-482, A-496, A-504, A-623), along with the admonishment that "the identification of specific mitigation for indirect effects . . is not a requirement for an EIS. (FEIS, A-116, A-295, A-343, A-481, A-482).

By its own language, the FEIS has failed to comply with the basic requirements of NEPA and MEPA, has failed to provide the foundation for a Clean Water Act Section 404 permit and has rejected the recommendation of the EPA to quantify indirect impacts on wetlands and describe a clearer plan for their mitigation.

3. Information needed to quantify indirect wetlands impacts of mine site water drawdown from the PolyMet NorthMet project is available.

The FEIS asserts that the information needed to evaluate indirect wetland effects is unavailable, paraphrasing applicable state and federal law. (FEIS, 5-260). However, at no point in this record do the Co-Lead Agencies allege any factual basis to support this assertion. Both Minnesota law and federal law limit the situations in which a responsible agency can claim information needed for environmental assessment is "unavailable." Under Minnesota rules, if information about potentially significant environmental effects is essential to a reasoned choice among alternatives, information is unavailable only if the "cost of obtaining it is excessive" or "the means to obtain the information are beyond the state of the art." Minn. R. 4410.2500; *Mid States Coalition for Progress v. Surface Transp. Bd., 345 F.3d 520, 549-550 (8th Cir. 2003*)

Under federal regulations, if information is relevant to reasonably foreseeable significant adverse impacts, it is only considered to be unavailable if "overall costs of obtaining it are exorbitant or the means to obtain it are not known." 40 C.F.R.§1502.22(b). Absent these findings, detailed quantitative assessments of possible mitigation measures are necessary when a federal agency prepares an EIS to assess the impacts of a relatively contained, site-specific proposal. *See Neighbors of Cuddy Mountain v. U.S. Forest Service*, 137 F. 3d 1372, 1380-81 (9th Cir. 1988); *The Wilderness Soc'y v. Bosworth*, 118 F. Supp. 2d 1082, 1106-07 (D. Mont. 2000).

The FEIS makes no claim that modeling to predict wetlands drawdown would be exorbitant, excessively costly, beyond the state of the art or that the means to obtain this

information are not known. The FEIS merely states a preference for using the analog method to evaluate wetlands drawdown:

> The Co-lead Agencies have thoroughly considered throughout the development of the EIS and through the Wetland IAP Working 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 that the use of the analog method and the 20 percent change in watershed area metric described in this section as factors considered in identifying potential indirect effects to wetlands is a credible and reasonable approach consistent with the requirements of NEPA. (FEIS, 5-260)

The FEIS also stated, citing the PolyMet Wetland Data Package, that analog data were used instead of a model such as MODFLOW because MODFLOW "could not practicably be used to estimate potential indirect wetland effects, due to complex mixes of bedrock, surficial deposits, and wetland soils at the Mine Site" and since "It is challenging to accurately represent this complex hydrology through modeling." (FEIS, 5-257, 5-263, citing PolyMet 2015b).

Acknowledging the availability of other modeling tools in responses to comments, the Co-Lead Agencies explained, "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." (FEIS, A-489 to A-499). The preference for the analog approach, even if it is reasonable, does not meet the requirements for "unavailable" information under either NEPA or Minnesota's comparable MEPA rules.

In his comment on the PolyMet NorthMet SDEIS, wetlands expert Brian Branfireun opined that reliance on an analog case to evaluate the potential extent and magnitude of the cone of depression and dewatering impact of surface wetlands and streams is unsatisfactory, "given the availability of robust hydrogeological models that could reasonably evaluate potential impact scenarios." (Branfireun, 2014, p. 14). Hydrologist Donald Lee stated both that an analog approach would need to be validated, which hadn't been done in the SDEIS and that "MODFLOW has the capability to calculate the effects of pit dewatering providing the appropriate input is incorporated into the model." Dr. Lee also pointed out that selectively rejecting MODFLOW for the purpose of wetlands assessment called into question the legitimacy of all other EIS analysis of hydrology and water quality. (Lee, 2014, p. 12)

Since the SDEIS, MODFLOW has been used to update the precise predictions most relevant to the assessment of the nature and cone of depression. As described in more detail in

Section II, *supra*, discussing mine site modeling, PolyMet recently updated its assessment of the hydraulic conductivity of wetland deposits and of Virginia Formation bedrock (FEIS, 5-19. 5-29, Table 5.2.2-7) and revised its estimates of groundwater inflow to the west and east mine pits. (FEIS, 5-111, Table 5.2.2-19). The Co-lead Agencies also recently used MODFLOW to predict the number of inches of downward leakage through wetlands necessary to prevent northward flow as a result of the downhill hydraulic gradient of the Northshore Mine Peter Mitchell Pit. (FEIS, 6-41, MDNR et al 2015c). There is every indication that MODFLOW is a robust, practicable and readily available model for analysis of conductivity, hydrology and flow through mine pits, bedrock, and surficial materials at the NorthMet mine site, except in the case where a request is made to evaluate indirect impacts on wetlands from mine dewatering.

Even if one were to assume that an analog method is preferable to using MODFLOW or another hydrological model to provide a quantitative assessment of indirect wetlands drawdown impacts, there is no logical reason why this would make an evaluation of wetlands drawdown impacts "unavailable." Nothing would have prevented the project proponent and Co-Leads from providing a quantitative evaluation of mine drawdown impacts, sufficient to assess mitigation, using their preferred analog method. They chose not to do so.

However, this record *does contain* a quantitative assessment of wetlands drawdown impacts using the Co-Leads' preferred analog approach. An Analysis of Indirect Wetland Impacts from Groundwater Drawdown using a calibrated analog approach was provided by GLIFWC prior to the preparation of the SDEIS in November 2013 and is included in Appendix C of the FEIS. (FEIS, App. C, autop. 2985-3025). Neither the SDEIS nor the FEIS challenged the methodology or conclusions of this analysis, even in responding to Major Difference of Opinion with Tribal Cooperating Agencies. (see e.g. FEIS, 8-13 to 8-14).

Calibrating the analog method to other pits on the Iron Range, using the three zones of proximity to mine pits, and specifying the level of drawdown, acreage and types of wetlands that would be affected, GLIFWC concluded that wetlands likely to be severely impacted by dewatering totaled 3,188.62 acres in Zone 1 (0 to 1,000 feet), 2,458.12 acres in Zone 2 (1,000 – 2,000 feet) and 273.01 acres in Zone 3 (2,000 – 5,000 feet). Severe indirect impacts to wetlands from mine pit drawdown would total 5,719.75 acres. (FEIS, App. C, autop. 2994). This calibrated analog model provides available and uncontroverted quantification of indirect impacts on wetlands from mine dewatering.

4. Rather than disclosing and mitigating indirect effects of the PolyMet NorthMet project on wetlands, the FEIS mischaracterized impacts and obstructed their mitigation.

As with other changes in language since the SDEIS discussed in preceding Sections of our comments, there are several places where the FEIS appears to recognize the potential indirect impacts on wetlands, only to mischaracterize references and reject findings that those impacts are likely to occur. The FEIS states it "has been updated to make a more conservative assumption of the potential indirect effects for all bog communities within the zero to 1,000-ft analog zone." (FEIS, 5-253) The FEIS admits that "although the hydrology of ombrotrophic bogs is solely precipitation-driven, these wetlands can have flowpath connections to groundwater." (FEIS, 4-168, citing Eggers 2015).

However, the way in which the FEIS makes this update is to classify both ombrotrophic and minerotrophic bogs as having a "low likelihood" of being affected by groundwater drawdowns associated with proposed mining operations, (FEIS, 5-273) and to state that ombrotrophic bogs have a low susceptibility to effects from groundwater drawdown (FEIS, 4-169) and a low degree of effect from groundwater drawdown associated with mining. (FEIS, 4-169). For each of these conclusions on each of these pages the FEIS references a January 15, 2015 memorandum of U.S. Army Corps of Engineers (Corps) staff member Steve Eggers. (Eggers 2015).

As Dr. Branfireun explains in his recent opinion on the PolyMet NorthMet FEIS, these statements mischaracterize the professional conclusions reached by Eggers (2015). (Branfireun, 2015, pp. 15-16). Eggers' memorandum doesn't minimize the likelihood of hydrology impacts on either ombrotrophic bogs or minerotrophic bogs. Eggers states, that although some reviewers would focus on whether the designation of "low likelihood" is accurate or "moderate likelihood" or "high likelihood" is a better designation, "The bottom line is that the potential for indirect impacts to all bog communities within the 0-1,000 foot analog zone is acknowledged." (Eggers 2015, p. 4). Eggers' reason for this recognition is simple, "Ombrotrophic bogs, although precipitation-driven, can have flowpath connections with groundwater; therefore, these wetlands could be impacted by groundwater drawdown." (*Id*., p. 5). Thus, Eggers recommends, as a conservative approach responsive to public comments, that all bogs within the 0-1,000 foot

analog zone be assigned to the same category for likelihood of hydrology effects "to acknowledge a potential for adverse impacts." (*Id.*, p. 5).

Since the FEIS does not quantify any impacts of mine drawdown on any wetlands, the primary result of any new classification of ombrotrophic bogs would be related to the monitoring proposed in the FEIS. The formulation of how monitoring and mitigation might take place is unclear. In some places it is suggested that if monitoring showed indirect wetland effects had occurred "adaptive management practices to reduce wetland effects would be considered" and additional compensation "may be required." (FEIS, 5-361). Other sections of the FEIS suggest that the agencies would be relying on potential analog impact zones to determine monitoring, but in the event that wetland monitoring identified "additional" indirect effects (additional to what is not specified) "permit conditions would likely include a plan for adaptive management practices to be implemented." (FEIS, 5-254). Plans for monitoring, mitigation or adaptive management seem vague, but the degree to which this loose formulation fails to protect dewatered mine site wetlands becomes more clear once other indirect wetlands impacts are reviewed.

As noted above, the FEIS text seems to recognize that there are potential impacts on wetland hydrology as a result of groundwater seepage containment at the tailings site. (FEIS, 5-347). Given the high volume of tailings seepage proposed to be collected (Section III, *supra*) and the fact that there are 2,754.8 acres of wetlands abutting Mud Lake, Trimble and Unnamed Creek at the tailings facility (FEIS, 5-335, Table 5.2.3-11), one might think there would be a rigorous analysis of indirect impacts of changes on wetlands from capturing seepage. The FEIS first states that, despite augmentation, the response of complex natural systems can only be estimated. (FEIS, 5-334) Then, citing PolyMet 2015b, the FEIS concludes that due to stream augmentation within 20 percent of existing flows, no potential indirect wetland effects would be identified or anticipated for any of the wetlands abutting Second Creek, Mud Lake Creek, Trimble Creek or Unnamed Creek. (FEIS, 5-334, 5-335).

Mine site water quality impacts on wetlands are also discussed in the FEIS only to be summarily dismissed. The FEIS discloses that there are 515.9 acres of wetlands within mine site groundwater flowpaths, 351.2 acres of which are designated minerotrophic (FEIS, 5-320, Table 5.2.3-7). The FEIS states that it was assumed that all downgradient minerotrophic wetlands located within the five mine site surficial aquifer flowpaths "may have potential indirect wetland

effects related to water quality changes as a result off leakage/seepage from mine features." (FEIS, 5-313, 5-319).

However, by now unsurprisingly, the impact of reasonably foreseeable mine site leakage/seepage on wetlands is not modeled or assessed in the FEIS. The FEIS explains that PolyMet's water quality model "assumed that the leakage/seepage from mine features releases directly to the Partridge River; *therefore, it is assumed that groundwater would not emerge in surface water or wetlands along intermediate portions of the flowpaths* (PolyMet 2015m)." (FEIS, 5-320, emphasis added).

The FEIS does not propose a new or better model. It advises, "The water quality model cannot be used to quantify the amount of leakage/seepage from mine features that discharge directly to individual wetlands" (*Id*.), and more generally, "The leakage/seepage analysis could not indicate or suggest that an effect or adverse effect would occur on wetlands." (*Id*.) In the same text emphasizing that no water modeling would assess or mitigate an *actual* adverse effect, the FEIS insists that this approach was "conservative" because it had identified a *potential* effect. (*Id*.) The only consequence of this elaborate discussion: wetlands with potential effects would be "identified for consideration in the proposed wetland monitoring plan." (FEIS, 5-319).

The potential that tailings seepage/leakage would have an indirect water quality impact on wetlands is similarly mentioned only to be dismissed. The FEIS identifies 4,638.4 acres of wetlands potentially indirectly affected by changes in water quality (FEIS, 5-345, Table 5.2.3-12) only to say that the potential for indirect effects as a result of changes in groundwater quality is "identified to be small." (FEIS, 5-346). Since the hydrology downstream of the tailings basin is "too complex" to be incorporated into PolyMet's model for the plant site, again no adverse effects are identified and monitoring is proposed. (FEIS, 5-346).

It should be clear from the preceding discussion that the FEIS has not only asserted without grounds that information on wetlands drawdown impacts is "unavailable," it has systematically provided "conservative" assumptions about potential adverse impacts, only to completely avoid modeling or evaluating any *actual* adverse indirect impacts on wetlands from the NorthMet project.

The replacement offered by the FEIS for assessment and mitigation of adverse indirect impacts on wetlands is monitoring. However, even this monitoring proposal comes with a catch. Potential risks to wetlands are rated based on a system devised by PolyMet, where each different

impact factor (several of which are categorically excluded in the above discussion) is given a point from 1 up to a maximum of 6 (FEIS, 5-361, PolyMet 2015b). Monitoring is generously 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." (FEIS, 5-390). A quick look at the data reveals that this rating system would place only 3% of the 7,694.2 (or 6,568.8) acres of wetlands in the zone where they would be thoroughly monitored. (FEIS, 5-361, Table 5.2.3-15). Other wetlands would be sampled "based on those wetlands that would have a high likelihood of indirect effects as a result of groundwater drawdown," (FEIS, 5-397) a definition, as discussed above, that excludes both ombrotrophic and minerotrophic bogs.

VI. LAND EXCHANGE

WaterLegacy's prior land exchange comments focused on substantive grounds for rejecting the exchange of Superior National Forest lands in order to facilitate development of the PolyMet NorthMet open-pit copper mine. Our concerns in these comments are with the adequacy of the FEIS to analyze the issues that must determined under laws applicable to a land exchange. As explained in the other Sections of this comment, the FEIS inadequately considered the impacts of the PolyMet NorthMet sulfide mine project – the proposed future use of federal lands.

The FEIS' discussion of the land exchange appears to separate the comparison of federal and private lands from the analysis of adverse environmental impacts of the NorthMet project. This distinction cannot be sustained under applicable law. An authorized officer of the U.S. Forest Service may complete a land exchange pursuant to 36 C.F.R. §254.3 only on a finding that:

> (b)(2)(ii). *The intended use of the conveyed Federal lands* will not substantially conflict with established management objectives on adjacent Federal lands and Indian trust lands. (emphasis added)
> (3) The findings and supporting rationale shall be documented and made part of the administrative record.

Among other considerations for this public interest determination, the U.S. Forest Service must consider the result of the intended use of the conveyed federal lands on protection of fish, wildlife habitats, cultural resources, watersheds, and its fiduciary responsibilities to Indian tribes and the protection of tribal resources, including fish, wild rice and human health. 36 C.F.R. §254.3.

Failure to consider the environmental impacts of the future use of the federal land proposed to be exchanged fatally undermines a land exchange FEIS, establishing that the agency failed to take a "hard look" at the environmental consequences of the action, in violation of NEPA. *Ctr. for Biological Diversity v. United States Dep't of the Interior*, 623 F. 3d 633, 636 (9th Cir. 2010); *see also Nat'l Parks & Conservation Ass'n v. BLM*, 606 F. 3d 1058, 1063 (9th Cir. 2010).

These comments, WaterLegacy's comments on the SDEIS, and the expert opinions and references they cite, demonstrate that the FEIS is inadequate to support the determinations the U.S. Forest Service is required to make. The FEIS has based its conclusions regarding water quality on unsubstantiated assumptions regarding the collection of polluted seepage and leakage, failure to investigate geochemistry, inappropriate selection of compliance points, failure to analyze relevant pollutants, and improper comparisons of pollution with "evaluation criteria" instead of water quality standards and conditions that don't accurately reflect a no action scenario.

The FEIS has used scientifically indefensible methods to minimize mercury impacts and avoid analysis of methylmercury impacts and has, thus, failed entirely to assess a highly significant risk to aquatic life, human health, tribal resources and impacts to Indian trust lands. The FEIS has provided no evaluation of the risks of northward flow of pollutants through the 100 Mile Swamp and to the Rainy River watershed and no evaluation of the indirect impacts of mine site and tailings site dewatering and pollution on wetlands, thousands of acres of which are in the 100 Mile Swamp and the Upper Partridge River, federal lands of high biological diversity. The FEIS has failed to analyze impacts of dam failure or failure of seepage collection and has used unsupported assumptions to avoid consideration of the transport of sulfate, mercury and methylmercury downstream to the St. Louis River and to reservation waters. Perhaps most troubling in terms of the substantive requirements for a land exchange, the FEIS has failed to analyze cumulative impacts on Indian trust lands and rights retained by Indian tribes in ceded territories.

Failure to resolve the many deficiencies in these comments on the FEIS precludes the Forest Service from proceeding with the proposed land exchange. WaterLegacy's separate comments on the Draft Record of Decision for the land exchange will summarize pertinent

deficiencies as well as substantive impacts of the NorthMet project that preclude proceeding with the federal land exchange.

VII. AQUATIC LIFE

1. SDEIS deficiencies in evaluation of impacts on aquatic life have not been resolved.

The FEIS has not rectified the deficiencies previously raised by WaterLegacy regarding impacts on aquatic life resulting from polluted seepage and discharge. As discussed in previous Sections I, II and III of these comments on the FEIS, deficiencies in sampling and modeling contaminant sources, unsubstantiated assumptions regarding collection of polluted seepage, assessment of water quality using misleading "evaluation criteria" and discharge evaluation locations, and failure to scientifically assess mercury releases and increased production and transport of methylmercury result in the inadequacy of the FEIS to assess impacts on aquatic life.

2. The FEIS failed to consider or evaluate specific conductivity, a signature pollutant of mining known to impair macroinvertebrates and aquatic life.

The PolyMet NorthMet FEIS completely failed to assess a pollutant that is characteristic of mining and is of particular concern for benthic macroinvertebrates and fish, the combination of ions and salts that is tested as specific conductivity.[29] WaterLegacy's comments on the SDEIS referenced EPA's research, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams,*[30] which set a benchmark conductivity level for Appalachian streams at 300 microSiemens per centimeter (µS/cm). Since the SDEIS, chemist Bruce Johnson and biologist Maureen Johnson, both former regulators for Minnesota and federal government agencies, have produced a report, *An Evaluation of a Field-Based Aquatic Life Benchmark for Specific Conductance* (hereinafter "Conductivity Evaluation"), attached as Exhibit 16.

Specific conductivity is regulated in Minnesota's numeric water quality standards to permit use for irrigation with a limit of 1000 micromhos per centimeter ("µmhos/cm" and "µS/cm" are equivalent) applicable to waters and wetlands. Minn. R. 7050.0224, subp. 2, subp. 4. Aquatic life are also protected from pollutants, including specific conductivity, by Minnesota

[29] These comments use the terms "specific conductivity" and "specific conductance" interchangeably.
[30] U.S. Environmental Protection Agency, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams,* Office of Research and Development, National Center for Environmental Assessment, Washington, DC, 2011 EPA/600/R-10/023F. (hereinafter "EPA Conductivity Benchmark Study")

narrative standards that prevent degradation of Class 2 waters and require that "lower aquatic biota" upon which fish depend not be seriously impaired or altered materially. Minn. R. 7050.0150, subp. 3.

Minnesota rules apply to aquatic life a test of toxic pollution similar to the XC95% benchmark used in the *EPA Benchmark Conductivity Study*, which used the 5th centile of a species sensitivity distribution (SSD) as the benchmark value to determine what conductivity level is considered to be "associated with significant biological degradation."[31] Minnesota rules protect the aquatic community from toxic effects, defined to mean "the protection of no less than 95% of all the species in any aquatic community." Minn. R. 7050.0217, subp. 1, 2.

The *Conductivity Evaluation* applied the methods used by the EPA to develop a specific conductance aquatic life benchmark for Appalachian ecoregions to recommend specific conductance aquatic life protections for three ecoregions in Northeast Minnesota, including the areas that would be affected by the NorthMet project. The *Conductivity Evaluation* analyzed baseline water chemistry and benthic invertebrate data from the Minnesota Regional Copper-Nickel Study[32] and concluded that regional similarities in streams order, unimpacted water chemistry, and populations of benthic invertebrates allowed application to Northeast Minnesota ecoregions the methods used by the EPA to determine a 300 µS/cm specific conductivity benchmark for Appalachian ecoregions. (Conductivity Evaluation, Exhibit 16, pp. 8-14,Table 1).

The *Conductivity Evaluation* used data from taconite mining facilities, including the Dunka Mine, where Duluth Complex rock was removed in order to mine the underlying deposit, to demonstrate that both mine-related seepage and passive wetland treatment have resulted in elevated levels of specific conductivity, often exceeding even Minnesota's numeric irrigation standard of 1,000 µS/cm. (*Id*., pp. 14-19). After reviewing testing methods and pollution tolerances of Minnesota benthic invertebrates (*Id*., pp. 20-24), the *Conductivity Evaluation* analyzed of the impacts of mining-related specific conductivity on impairments of benthic invertebrates in receiving and downstream waters, include the St. Louis River. (*Id*., pp. 24-41).

Based on the *EPA Conductivity Benchmark Study* and Minnesota data on baseline and

[31] The XC95% benchmark is explained in the *EPA Conductivity Benchmark Study, supra*, pp. xiv, 26 and applied in U.S. EPA, *Improving EPA Review of Appalachian Surface Coal Mining Operations Under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order*, July 21, 2011, pp. 32-33. Guidance approved in *National Mining Association v. McCarthy*, 758 F.3d 243 (D.C. Cir. 2014).
[32] State of Minnesota, *Regional Copper-Nickel Study*, 1976-1980, a collection of research papers located at the Minnesota Legislative Reference Library, www.leg.state.mn.us/lrl/lrl.asp. Several specific research papers are referenced in this review. (hereinafter "Copper-Nickel Study").

impacted conditions, the *Conductivity Evaluation* concluded: 1) EPA protocols to set a limit for specific conductivity to protect aquatic life are applicable to Northeast Minnesota surface waters; 2) The median specific conductivity level in all Minnesota Copper-Nickel Study samples (including impacted streams) was 68 µS/cm, so background unimpacted conductivity in this region would be less than 68 µS/cm; 3) Existing data from identified Minnesota ecoregions demonstrate impacts on invertebrate genera from elevated specific conductance in mining-impacted waters; and 4) In the Minnesota ecoregions discussed in the *Evaluation* "discharge of specific conductance above the level of 300 µS/cm, established as guidance for Appalachian streams is highly likely to result in extirpation of 5% or more of invertebrate genera." Thus, "Such discharge should be prohibited under Minnesota narrative standards preventing degradation and toxic pollution." (*Id*., p. 42).

In order to protect aquatic life, the *Conductivity Evaluation* recommended applying the 300 µS/cm aquatic life benchmark for Minnesota discharges in the ecoregions reviewed, pending further analysis to determine if a more stringent limit is needed. (*Id*.) The *Evaluation* also recommended data collection and analysis for environmental review, including assessment of background site-specific conductivity and invertebrate community data to the genera if not species level; modeling specific conductance from mine facilities based on representative sampling of waste rock; and estimates of mass loading from all facilities and quality assured data sufficient to evaluate compliance with both Minnesota's numeric standard and with Minnesota's narrative degradation and toxicity standards. (*Id*., pp. 44-45).

In addition to the *Conductivity Evaluation*, the Minnesota Pollution Control Agency's (MPCA) Draft St. Louis Stressor Identification Report explicitly attributed impairments in the vicinity of the PolyMet NorthMet project to specific conductance discharge from mining facilities:

> Fish results from the upper Embarrass River (the portion upstream of the town of Embarrass) show extremely low fish counts and limited taxa richness. . . Two of the impaired streams in this watershed zone, Spring Mine Creek and the Embarrass River, receive water originating from mine pits. Sampling results from these streams show elevated specific conductance and sulfate concentrations. (MPCA, Draft St. Louis River Stressor Identification Report, October 2013, p. 16, provided as Attachment B to the Conductivity Evaluation, Exhibit 16).[33]

[33] FEIS references include an earlier version of the MPCA, Draft St. Louis River Stressor Identification Report, from March 2013, which does not contain this analysis (MPCA, 2013c).

The Tribal Cooperating Agencies Cumulative Effects Analysis concluded that elevated specific conductance is a water chemistry "signature" for mining discharges that should be analyzed in the PolyMet NorthMet EIS. (FEIS, App. C. Tribal CEA, autop. 3001-3003).

The FEIS provides no data on *existing* concentrations of specific conductivity in any receiving waters for the proposed NorthMet tailings site or for the mine site tributary creeks, although the FEIS provides average existing conductivity concentrations at several Partridge River sites. (FEIS, 4-258, Table 4.2.6-3). Moreover, none of the narrative, tables, or figures in Chapter 5 model or predict specific conductivity levels that would result from NorthMet mine or plant site facilities. The FEIS notes that "portions of the Embarrass River, from the headwaters to Embarrass Lake, are listed on the 303(d) list as impaired for 'Fishes Bioassessment'" (FEIS, 4-285), but fails to disclose that the MPCA has identified mine discharge with elevated specific conductance as a stressor for this impairment.

The FEIS provides limited and inadequate baseline information on macroinvertebrate populations. No aquatic biota studies have been conducted in Longnose Creek, Wetlegs Creek, or Second Creek, and no fish or macroinvertebrate community or habitat characteristics were evaluated for these creeks although they all are first-order streams proximate to the NorthMet mine site. (FEIS, 4-260). For the Partridge River, data is either provided for a single year or with a single sample; and no data is provided at the genera level, so no assessment can be made whether invertebrates sensitive to conductivity are present. (FEIS, 4-267, Table 4.2.6-6). The FEIS notes that aerial photography review and habitat descriptions suggest that the Partridge River reference site (PR-B1) and the Colvin Creek and South Branch Partridge River sites should have quality habitat for macroinvertebrate assemblages. (FEIS, 4-258).

For the Embarrass River, sampling numbers are not provided; data is not provided at any consistent locations over time; and, again, no data is provided at the genera level, so prevalence of pollution-tolerant and intolerant invertebrates cannot be determined. (FEIS, 4-284, Table 4.2.6-14). The FEIS states that total taxa and distribution of macroinvertebrate families (Ephemeroptera - mayflies, Plecoptera -stoneflies, Trichoptera - caddisflies) were variable, although some desirable, non-degraded stream characteristics are likely to be present. (FEIS, 4-275)

Since there is no water chemistry data for the Embarrass River, none for tailings or mine site creeks, and little benthic invertebrate data in the FEIS, with no sampling for genera, no

uniform protocols over time and no data in mine site tributaries, even if monitoring were proposed to evaluate effects of the PolyMet NorthMet project on conductivity, that monitoring would be meaningless. It would neither be possible to determine if project seepage had increased conductivity levels or if those levels had begun to extirpate sensitive macroinvertebrate genera and impair aquatic life. The FEIS is completely inadequate to assess or protect aquatic life from specific conductivity pollution.

VIII. ASSESSMENT OF HEALTH RISKS

WaterLegacy's comments on the SDEIS identified the following unexamined risks to health: the EIS failed to analyze health risks for on-site workers; the EIS failed to analyze the health risks from mineral fibers; the EIS failed to assess impacts of tailings seepage to residential wells; the EIS failed to analyze cumulative inhalation risks including off-site fossil fuel combustion to meet PolyMet NorthMet energy demands; and the SDEIS inadequately evaluated certain health risks, including risks of arsenic and manganese in drinking water. We highlighted our most serious health concern - the failure of the EIS to evaluate project and cumulative adverse health effects from methylmercury and requested a rigorous and independent assessment of health risks and adverse health impacts. The FEIS does not resolve any of these deficits.

1. The FEIS inadequately evaluated adverse health impacts of the PolyMet NorthMet sulfide mine project, including impacts from inhalation of pollutants, from contaminated drinking water and from toxic methylmercury in fish.

The FEIS addressed none of our concerns about the adequacy of the SDEIS. The FEIS fails to analyze health risks for on-site workers at either the NorthMet mine or tailings site, although it has now been acknowledged that the land exchange boundary was set to allow PolyMet to meet air quality requirements at the mine site boundary.[34] The FEIS provides no summary of Minnesota Department of Health testing results and, in comparison with the SDEIS, further minimizes the health risks associated with mineral fibers. (compare FEIS, 5-513 to 5-19 with SDEIS, 5-435 to 5-443). As explained in more detail in the expert opinion of John Ipsen, M.D., PhD, "the FEIS incompletely addresses particulate air pollution. The analysis provided in the FEIS is inadequate to reasonably address the health risks of the proposed mine – risks to the

[34] U.S. Department of Agriculture, Forest Service, NorthMet Project Land Exchange Draft Record of Decision, November 2015, p. 24

mineworkers and to people living in the surrounding communities." (Ipsen, 2015, p. 2)

Preparation of the FEIS has resulted in no additional sampling of residential wells potentially impacted by contaminated seepage, and 23 out of 38 wells downgradient from the tailings waste site remain unsampled. (FEIS, 4-120).

The FEIS continues to compare project seepage to an artificial "continuation of existing conditions" rather than a prediction based on the no action alternative, as is required by law (See Section XI Alternatives, *infra*). Despite a contrary recommendation by the Commissioner of the Minnesota Department of Health, the FEIS continues to use "evaluation criteria" based on the projection of current pollution into the indefinite future, rather than applying Minnesota Health Risk Limits (HRL) or Risk Assessment Advice (RAA) to evaluate releases of manganese, beryllium and thallium to groundwater. (Ehlinger SDEIS Comment, Mar. 13, 2014, p. 3, Exhibit 17). The FEIS also fails to discuss hydrogeology at the tailings site that may reduce seepage capture efficiency and impact residential supply wells, despite Dr. Ehlinger's recommendation. (*Id*., pp. 1-2)

The method by which the FEIS addressed concerns about Hoyt Lake drinking water remains opaque to WaterLegacy, despite our review of all the data in the FEIS. Where the SDEIS had concluded that PolyMet NorthMet project Colby Lake arsenic would increase by 38.5% as compared to continuation of existing conditions (SDEIS, Table 5.2.2-34), the FEIS reassures the reader that the increase resulting from the project would be less than 1 percent (FEIS, Table 5.2.2-34). Differences in SDEIS arsenic concentrations predicted for the proposed action and continuation of existing conditions along the Partridge River are no longer evident in the FEIS. (compare SDEIS Table 5.2.2-31 with FEIS Table 5.2.2-31). The FEIS provides no explanation for this discrepancy, and none is evident from review of sampling data.

Commissioner Ehlinger also raised concerns about Hoyt Lakes drinking water, stating that modeling of seepage of contaminants from the mine site appears to be inconsistent with field leaching tests and hydrogeological conditions. (Ehlinger SDEIS Comment, Exhibit 17, pp. 2, 4). These concerns have not been addressed in the FEIS.

As detailed in Section I, *supra*, the FEIS has not addressed WaterLegacy's comments regarding mercury or the scientific opinions expressed by Dr. Branfireun. Dr. Branfireun's recent opinion concluded that the NorthMet project could present a substantial and ecologically significant risk of increased production and transport of mercury and methylmercury to

downstream waters, including the Partridge, Embarrass and St. Louis River.

It is beyond dispute in the medical profession that increasing fish methylmercury in these waters would create human health risks. As Margaret Saracino, M.D., a Duluth child adolescent psychiatrist, summarized in her opinion attached with these comments:

> In terms of methylmercury, exposure is largely due to ingestion of fish with high mercury content. Methylmercury builds in the food chain. When pregnant women eat fish high in methylmercury, the fetus is then exposed to this lipophilic heavy metal. The placenta is not protective and the blood brain barrier is not well formed until after age two years, which makes fetuses, infants and young children most vulnerable to methylmercury's neurotoxic effects. Neurons in the developing brain multiply at a rapid rate and are particularly vulnerable to toxic effects of heavy metals, hence brain damage is more likely to occur during this vulnerable time. Neurotoxicity is also transferred to the infant through breast milk.
>
> The adverse effects of methylmercury depend on timing and amount of exposure. Methylmercury is a strong toxin that influences enzymes, cell membrane function, causes oxidative stress, lipid peroxidation and mitochondria dysfunction, affects amino acid transport and cellular migration in the developing brain. Exposure in utero can cause motor disturbances, impaired vision, dysesthesia, and tremors. Even lower level exposure can result in lower intelligence, poor concentration, poor memory, speech and language disorders, and decrease in visual spatial skills in children exposed to methylmercury in utero. Fetuses, infants, and young children are four to five times more sensitive to the adverse effects of methylmercury exposure than adults. (Saracino, 2015, p. 2).

Dr. Saracino explained that neurodevelopmental disorders can be managed, but not cured. (*Id*., p. 1). In addition to the suffering of exposed individuals and their families, neurodevelopmental disorders resulting from increased methylmercury and lead exposure can result in significant costs to families and communities as a result of needs for occupational therapy, physical therapy, speech and language therapy, special education service, outpatient and in-patient treatment and as a result of reduction in earning capacity. (*Id*., pp. 2-3). The FEIS neither recognized nor assessed any of these costs.

2. An independent assessment of health risks and impacts is needed to ensure that adverse effects on human health have been evaluated and mitigated.

Dr. Ehlinger's comments on the SDEIS suggested that a health impact assessment be performed "to mitigate or prevent possible negative health outcomes to improve the public's

health." (Ehlinger SDEIS Comment, Exhibit 17, p.7). As a result of the EIS deficiencies and the human health risks posed by the PolyMet NorthMet sulfide mine project, medical and health organizations and individuals throughout Minnesota have requested a comprehensive and independent health risk and impact assessment be prepared for the project. Excerpts of their letters, which are attached as Exhibit 18, are provided below:

Minnesota Nurses Association (March 10, 2014)
"The PolyMet NorthMet Supplemental Draft Environmental Impact Statement (SDEIS) contains inadequate analysis of the impacts on public health from the proposal. The co-lead agencies should conduct and include a health impact assessment (HIA) in the Environmental Impact Statement to fully analyze the public health implications of PolyMet's proposed mine."

Concerned Doctors & Nurses (March 11, 2014)
"We respectfully request that the PolyMet SDEIS be deemed inadequate due to unresolved concerns and insufficient assessment of health risks of the proposal. We would further request that, in revising the PolyMet SDEIS, a comprehensive Health Risk Assessment be prepared under the guidance of the Minnesota Department of Health."

Minnesota Public Health Association (July 2014)
"We write to request a comprehensive analysis of the health risks and public health impacts of the PolyMet sulfide mine project before any decisions are made about this controversial project. . . Mercury contamination of fish and impacts on neurotoxicity in the developing fetus as well as in infants, children and adults is a significant public health concern in Minnesota."

Minnesota Medical Association (September 25, 2014)
"On behalf of the Minnesota Medical Association, I am writing to offer support for the request that a comprehensive analysis of the health risks and public health impacts of the PolyMet NorthMet Sulfide Mine Project be conducted. This assessment will assist the state of Minnesota in making an informed decision as to the proposed project, taking into account any potential adverse effects this type of mining may have on the health of Minnesotans."

Concerned Health Professionals and Scientists (October 20, 2014)
"We are concerned that the proposed PolyMet copper-nickel mine project could have significant adverse impacts on human health as a result of pollutants released to air, surface water and drinking water. We believe that analysis performed thus far is insufficient to assess important risks to human health and public health impacts of the pollutants that would be released from the PolyMet project."

Minnesota Academy of Family Physicians – Lake Superior Chapter (March 9, 2015)
"We join our colleagues in the fields of medicine, nursing, and public health as well as our state Health Department to advocate for the health of our region. A health risk assessment and a health impact assessment are the next critical steps in understanding

both the short and long term consequences that PolyMet's NorthMet project may have on our health."

Minnesota Academy of Family Physicians – Statewide Organization (July 1, 2015)
"The Minnesota Academy of Family Physicians (MAFP) is the largest medical specialty organization in Minnesota, representing over 3000 family physicians, family medicine residents, and medical students. . . As physicians, our priorities are the health of our patients and the communities we serve. We must be proactive in asking, "How will PolyMet's NorthMet Project affect the long-term health of our patients and communities?" Health Risk and Health Impact Assessments are needed to answer these questions."

The PolyMet NorthMet FEIS' analysis of health risks suffers from the same inadequacies discussed in other sections of these comments. Unsupportable models and unsubstantiated assumptions affect assessment of impacts of surface water and groundwater pollution on human health. The failure to apply Health Risk Limits and Risk Assessment Advice to groundwater further biased FEIS conclusions. The FEIS denial of methylmercury increases and other adverse impacts, results in a failure to evaluate potentially serious threats to human health, particularly to children's health. It is rare for Minnesota's rather conservative medical community to be united in their concern. It is not too late to require an independent and rigorous assessment of the adverse health impacts of the PolyMet NorthMet sulfide mine project.

IX. CATASTROPHIC & ROUTINE FAILURE

As WaterLegacy explained in our comments on the SDEIS, NEPA requires the assessment of "reasonably foreseeable" adverse impacts, which "includes impacts which have catastrophic consequences, even if their probability of occurrence is low, 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." 40 C.F.R. §1502.22(b)(4). Since our prior comments, new information underscores the need for this disclosure. Yet, the PolyMet NorthMet FEIS provides no assessment of the risk or consequences of any variation from their modeled performance or "expected" conditions. As a result of this omission, the FEIS obstructs consideration of alternatives to mitigate harm, justifies non-disclosure of important information regarding chemical contaminants and provides an insufficient foundation from which to derive financial assurance.

1. The FEIS improperly failed to assess the impacts of catastrophic tailings dam failure.

International headlines, research reports and expert opinions over the past year and a half underscore the fact that catastrophic failure of mine tailings dams is a significant and foreseeable risk. On Monday, August 4, 2014, on a sunny summer day, the tailings dam at the Mount Polley copper-mine in British Columbia, Canada collapsed. The breach released an estimated 24.4 million cubic meters (6.3 billion gallons) of tailings and wastewater into Polley Lake, which rose by 1.5 meters. Hazeltine Creek, which flows out of Lake Polley, was transformed from a 2-metre-wide stream to a 50-metre-across "wasteland" and Cariboo Creek was also affected. By August 8, the spill had reached Quesnel Lake, considered until then one of the cleanest deep-water lakes in the world.[35]

By one year later, water quality in 70-kilometer once-pristine Quesnel Lake had changed. After the dam collapse, Imperial Metals sent water filters to owners around the spill area of the lake: first 50 micron, then 25 micron, then 0.4 micron filters after scientists said a filter less than one micron was needed. These clogged, so the company supplied drinking water. Imperial Metals acknowledged tailings contain arsenic and lead. The Interior Health Authority has issued a bulletin not to eat the fish in Quesnel Lake due to mercury. Many homes and cabins on the lake are vacant or for sale, and residents say both property values and tourism have declined.[36]

On November 6, 2015, an iron ore tailings dam collapsed at the Samarco mine in Brazil. The dam collapse started a mudslide that flattened a village of 600 people in the historic mining region of Minas Gerais. The fire chief confirmed that 17 people were killed and 50 injured, while others were still missing. The local miners' union said the sludge was toxic, but the company operating the mine said it was "inert" and contained no harmful chemicals.[37] Two weeks later, it was estimated that 60 million cubic meters (nearly 16 billion gallons) of mine waste had been

[35] Gordon Hoekstra, Mount Polley mine tailings spill nearly 70 percent bigger than first estimated, Vancouver Sun, Sept. 3, 2014, http://www.vancouversun.com/Mount+Polley+mine+tailings+spill+nearly+cent+bigger+than+first+estimated/10172302/story.html?__lsa=3d36-42fe#ixzz3VcdRA2uw

[36] Rod Marining, One year later, *Wilderness Committee*, August 1,2015, http://commonground.ca/OLD/iss/289/cg289_MtPolley.shtml; Monica Lamb-Yorski, Mine still supplying drinking water to Quesnel Lake residents, *Williams Lake Tribune*, Jan. 15, 2015, http://www.wltribune.com/news/288759341.html

[37] Brazil dam burst: 17 dead, dozens missing as mudslides flatten a village and engulf homes at BHP co-owned site, ABC News, http://www.abc.net.au/news/2015-11-07/brazil-dam-desperate-search-for-survivors/6921062

released, requiring 600 people to be evacuated.[38] On November 30, 2015, Brazil announced that they would file a $5.2 billion lawsuit against the BHP mine company, and BHP said they would set aside a $260 million fund for community members affected by the spill. A large number of fish had already died.[39] Laboratory testing in downstream samples of water from the impacted Rio Doce detected mercury, aluminum, iron, lead, boron, barium, copper, arsenic and other chemicals. Arsenic in sampling after the dam breach was 2,639.4 micrograms per liter -- more than 200 times Brazil's 10 micrograms per liter standard.[40]

These may be particularly gripping examples, but they are not uncommon. A July 21, 2015 report by Lindsay Bowker and David Chambers, *The Risk, Public Liability & Economics of Tailings Storage Facility Failures* (hereinafter "TSF Failures", attached as Exhibit 19) analyzed recorded tailings storage facility failures from 1940 to 2010 using statistical tools. They found an emerging and pronounced trend since 1960 toward a higher incidence of Serious and Very Serious failures:

> 49% (33/67) of all recorded Serious and Very Serious failures from 1940-2010 have occurred since 1990. Of all 525 recorded incidents cited, 1990-2010, 17 (33%) were Serious failures, i.e. large enough to cause significant impacts or involved loss of life. Another 16 (31%), were Very Serious failures, i.e. catastrophic dam failures that released more than 1 million cubic meters of tailings and in some instances resulted in multiple loss of life. 63% of all incidents and failures since 1990 were Serious or Very Serious. The total cost for just 7 of these 16 large failures was $3.8 billion, at an average cost of $543 million per failure. (Bowker & Chambers, *TSF Failures*, pp. 1-2, Exhibit 19)

The *TSF Failures* report noted that very large releases can occur even at a small tailings facility. The Mount Polley tailings storage facility was only about 35 meters high with a total capacity of about 74 million cubic meters (*Id*., p. 2), much smaller than that proposed for the NorthMet project. The report identified factors contributing to the increase in catastrophic dam failures: mining lower grades and falling real prices of metals, pushing older tailings storage facilities to unplanned heights, or stretching the limits of tailings storage facilities that were not built or managed to best practices in the first place. (*Id.*, pp.1, 2,16). These risk factors would all

[38] Kathryn Diss, Samarco mine tragedy: BHP 'deeply sorry' for Brazil dam disaster, pledges review of operations, ABC News, Nov. 19, 2015, http://www.abc.net.au/news/2015-11-19/deeply-sorry-bhp-announces-mines-review-after-dam-disaster/6955084

[39] Esmarie Swanepoel, BHP says Brazil plans $5bn legal suit over Samarco disaster. Nov. 30, 2015. http://www.miningweekly.com/article/bhp-says-brazil-plans-5bn-legal-suit-over-samarco-disaster-2015-11-30

[40] Paula Stange, Analysis indicates the presence of mercury, arsenic, iron and lead in the water do Rio Doce, GazetaOnline, Nov. 12, 2015, http://agazeta.redegazeta.com.br/_conteudo/2015/11/noticias/cidades/3914468-analise-aponta-presenca-de-mercurio-arsenio-ferro-e-chumbo-na-agua-do-rio-doce.html

apply to the NorthMet tailings facility. The *TSF Failures* report projected 11 Very Serious and 12 Serious failures worldwide from 2010-2020 with a likely $7 billion unfunded cost. (*Id*., p. 2).

Although the *TSF Failures* analysis did not cover the past few years, the World Information Service on Energy (WISE) has prepared chronology of major dam failures through mid-November 2015, attached as Exhibit 20. Since 2010, WISE has identified 12 major tailings dam failures, including failures in Canada, the United States, and Europe.

David Chambers' provided expert "Comments on the Geotechnical Stability of the Proposed NorthMet Tailings Basin and Hydrometallurgical Residue Facility in light of the Failure of the Mt Polley Tailings Storage Facility" on April 30, 2015 (Chambers, 2015, Exhibit 21). These comments identified concerns related to the proposed NorthMet tailings waste storage facility. As a general matter, Dr. Chambers noted that tailings dams fail at a rate that is approximately 10 times higher than that of water supply reservoir dams. (*Id*., p.2)

Dr. Chambers also stated that upstream-type dam construction poses the highest risk for both seismic and static failure of tailings dams and that most tailings dam failures have been associated with upstream construction. Referring to the SDEIS, he noted that the NorthMet tailings facility would use upstream dam construction for its expansion, and would also need to depend in part on the safety of the design and construction of the old upstream-type LTVSMC dams. (*Id*., pp. 2-3).Dr. Chambers highlighted the presence of a clay layer beneath a portion of the Mount Polley dam as a significant cause of its failure, explaining that the LTVSMC tailings slimes on which the NorthMet project's tailings dams will be built have a consistency and behavior similar to clays. (*Id*., p. 3).

The FEIS confirms both that the LTVSMC dam was built with upstream construction and that PolyMet still plans to use upstream construction for its tailings storage on top of these old dams. (FEIS, 4-439, 5-646). The FEIS also notes that there were times during the operation of the underlying LTVSMC tailings facility where "significant amounts of fine tailings and slimes" settled near the perimeter dams and dams were then built with coarse tailings on top of them. (FEIS, 4-427) This inclusion of "relatively large zones" of fine tailings and slimes in the dam's outer shell "reduces the drainage ability of the shell, increasing the phreatic surface, and reduces the localized shear strength" of the dam. (*Id*.).

The FEIS identifies the northern dam in Cell 2E as an area of potential weakness since it is "underlain by a layer of fibrous peat up to approximately 20 ft thick that extends north beyond

the toe of the dam into a nearby wetland and due to the presence of interbedded layers of contractive fine tailings and slimes." A deposit of glacial till lies beneath the peat, and the crest of the dam in this area is about 90 feet above the surrounding ground surface and "consists mostly of coarse tailings with some weaker layers of interbedded fine tailings and slimes close to the base of the dam." (FEIS, 4-437). Fully liquefied, this cross-section of the dam (Section F) has a margin of safety at barely the 1.1 minimum required. (FEIS, 5-658, Table 5.2.14-1).

PolyMet's Flotation Tailings Management Plan (PolyMet 2015n) states that there are 34 homes that could be affected by a tailings dam break, and that the time to first arrival of flood flows at the nearest residence would be about an hour. (*Id*., p. 20). The map illustrating the flood path, provided on the last page of PolyMet's Plan, is attached as Exhibit 22. However, the FEIS does not include any Dam Break Analysis. "The potential effects of hypothetical failure scenarios have not been assessed in this FEIS." (FEIS, 5-628).

WaterLegacy does not argue that the NorthMet tailings storage facility dam *will* fail, only that such failure is reasonably foreseeable and may have catastrophic consequences. Assessing these consequences is necessary for decision-makers to understand the risks of PolyMet NorthMet tailings disposal and evaluate alternatives to minimize these risks.

2. The FEIS improperly failed to assess the impacts of catastrophic dam failure at the PolyMet NorthMet hydrometallurgical residue facility.

The PolyMet NorthMet hydrometallurgical residue facility (HRF) would be a relatively small facility, when compared to the combined LTVSMC and PolyMet tailings waste storage facility. Although information in the FEIS regarding the chemical constituents of the hydrometallurgical residue facility is incomplete, there is every indication that this facility would contain highly reactive constituents at very high concentrations. Co-Lead Agency responses to SDEIS comments state that 164 pounds of mercury would be deposited in this facility each year. (FEIS, A-414). Over a 20-year mine life, up to 3,280 pounds of mercury could be deposited in the HRF.

The February 2007 PolyMet RS33/RS65 Hydrometallurgical Residue Characterization (available as WaterLegacy SDEIS Comment Exhibit 27, although not included among FEIS references) disclosed that hydrometallurgical leachate residue would have sulfate levels of 7,347 mg/L. Although we have found no document in the EIS record that provides contaminant levels

for WWTP sludge, before reject concentrate is dewatered it will contain levels of arsenic and metals as much three orders of magnitude above limits and standards. At the P90 level, reject concentrate would contain: 1,150 µg/L of arsenic (2 µg/L criterion for drinking water); 16,600 µg/L of manganese (100 µg/L HRL for drinking water); 847 of cobalt (5 µg/L surface water limit); 11,600 µg/L of copper (9.3 µg/L limit in water with 100 mg/L hardness); 1,290 µg/L of lead (3.2 µg/L limit in water with 100 mg/L hardness); 8,230 mg/L of sulfate (10 mg/L limit in wild rice waters). (Water Modeling Data Package – Mine Site, PolyMet 2015m, autop. 452).

As described previously in Section IV of these comments, the NorthMet hydrometallurgical residue facility would be located adjacent to a source of seepage with the potential to build up flow beneath its liner and on top of an LTVSMC emergency basin containing as much as 50 feet of fine tailings and slimes, which was sited on top of wetlands and a fault line and constructed using an upstream construction method. (FEIS, 4-439) The FEIS contemplates that "liquefaction of the hydrometallurgical residue" may occur, but states that the embankment dam is "sufficiently designed so that containment would not be lost." (FEIS, 5-664).

The probability of containment failure at the hydrometallurgical residue facility may be low. But the consequences of releasing thousands of pounds of mercury as well as sulfates and other toxic metals could be catastrophic. The FEIS improperly failed to disclose what chemicals would be collected in the HRF and at what concentrations and where they would flow if containment were to fail. This information is vital to decision-makers and the public to evaluate alternative methods of storing hydrometallurgical wastes and to plan for contingencies.

3. The FEIS improperly failed to assess the adverse impacts of spills, overflow and routine operating failure of engineered system performance.

In discussing the impact of the project on aquatic life, the FEIS provides one mention of spills: a reassurance that "spill prevention plans" would be implemented. (FEIS, 5-467). The FEIS states that an emergency overflow channel would be constructed to discharge untreated tailings pond water as a back up means of controlling pond levels in the event of "a probable maximum precipitation rainfall event or some fraction thereof." (FEIS, 3-120). The FEIS does not specify what "fraction" of a maximum rainfall event would require emergency discharge or analyze the frequency of extreme weather events given climate change; the FEIS only discusses *average* increases in precipitation as a result of climate change. (FEIS, 5-223, 5-254, 5-506).

Yet, the FEIS asserts that discharge from the emergency overflow "would not be expected." (FEIS, 3-120, 5-120). The FEIS does not estimate any adverse impacts of spills or discharge of untreated wastewater from the tailings pond during heavy rains. As discussed previously, despite work plans explaining the uncertainty in performance of engineered systems, the FEIS assumes certainty or nearly perfect seepage collection and provides no assessment of impacts on water quality should routine operations fail to perform as "expected."

In Minnesota, there is a tendency to assume we are all above average without requiring any proof of performance. It is, thus, worth noting that mining facilities in Minnesota, as well as elsewhere have failed, spilled and leaked. In 1993, an LTV Steel Mining Company coal ash heap at Taconite Harbor liquefied and collapsed after an above-normal rainfall. The system that LTV used to collect surface runoff and leachate and pump it back to the top tier of the ash heap had been approved by the MPCA. *Arrowhead Electric Coop. v. LTV Steel Mining Company*, 568 N.W. 2d 875 (Minn. App. 1997). In 1990, Northshore Mining Company was penalized more than a half million dollars for violations associated with a tailings pipeline break, including late completion of reports and corrective actions.[41] In 2012, Hibbing Taconite discovered a longitudinal crack of approximately 300 feet that had developed suddenly on the crest of its taconite tailings facility dam. HibTac installed a buttress and relief trench as an emergency measure to maintain stability.[42] On three occasions between May 2013 and April 2014, failures in an Arecelor-Mittal mine tailings pipeline and a breach in the tailings basin perimeter dike caused the release of about 8,500 cubic yards (1,716,779 gallons) of tailings slurry and aggregate from a washed-out dike road into a pipeline ditch and 15.3 acres of adjacent wetlands.[43]

The FEIS, by omitting any assessment of the adverse impacts of catastrophic or routine failures of containment at the proposed PolyMet NorthMet mine, has created a closed circle in its reasoning. Once certainty of results has been assumed, first by PolyMet and then by the Co-Lead Agencies, neither environmental impacts assessment nor evaluation of alternatives can be done in conformity with law.

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[41] *In re the Decision on the need for an Environmental Impact Statement for the Proposed Northshore Mining Company – Furnace 5 Reactivation Project*, Findings of Fact, MPCA Conclusions of Law and Order, November 22, 2005. http://www.pca.state.mn.us/index.php/view-document.html?gid=9608

[42] Hibbing Taconite sought a wetlands destruction permit related to this repair. Public Notice of Application for Clean Water Act Section 404 permit, Hibbing Taconite Company 2012-00623-DWW, August 12, 2012.

[43] MPCA, Pipeline, storage basin failures send ore tailings and road aggregate into wetlands; 2 enforcement actions result, June 24, 2015.
http://www.pca.state.mn.us/index.php/about-mpca/mpca-news/current-news-releases/pipeline-storage-basin-failures-send-ore-tailings-and-road-aggregate-into-wetlands-2-enforcement-actions-result.html

X. FINANCIAL ASSURANCE

The PolyMet NorthMet FEIS not only fails to specify the level of financial assurance that will be required for the NorthMet sulfide mine project, as previously requested by WaterLegacy. The FEIS fails to provide either the conceptual or factual basis from which an appropriate calculation might be made either by the MDNR for a permit to mine or by the Army Corps for a Section 404 permit. Even to the limited extent that the FEIS addresses financial assurance, it does so poorly, placing much of the risk of externalities on the public rather than on the PolyMet Company, or its parent company and joint venturer - the entities that would profit from the mine.

On a conceptual level, the FEIS does not recognize that the *only* time in the life cycle of a mine when government agencies have any leverage to secure adequate financial assurance is before permits are issued. When a mine is operating, leverage shifts to the mining company, which can threaten closure when asked to pay costs of mitigation or assurance, irrespective of its actual profits. After a mine closes, bankruptcy is likely, particularly when the mine is a limited liability company's only asset. Unless post-closure contingencies are specifically required to be assured up front, the FEIS' repeated insistence that PolyMet "would be held accountable for maintenance and monitoring required under the permit and would not be released from financial assurance until all permit conditions have been met," (e.g. FEIS, 3-5, 3-59, 3-72, 3-127, 3-140) carries no weight. Once an insufficient instrument is exhausted and the mine has closed, taxpayers and the public will be unprotected. The FEIS contains specific statements as well as gaps in analysis that virtually guarantee that financial assurance will be inadequate.

1. The FEIS improperly deferred to the project proponent to set financial assurance.

The FEIS implies that PolyMet would play a central role in determining the amount of financial assurance needed. The text states that "PolyMet would ensure that the financial assurance amount is established as a function of (but not limited to) the following three main variables: Extent of surface disturbance and potential releases from waste storage facilities; Reclamation and long-term care standards (including mechanical water treatment); and Reasonable assessment of the costs to execute the Contingency Reclamation Plan." (FEIS, 3-142). That this unfortunate language relates to PolyMet's role in setting financial assurance levels, rather than the company's role in financing the level required in the public interest is supported by the next sentence, "PolyMet has developed preliminary cost estimate ranges that

address the above items for hypothetical closure at years 1, 11, and 20." PolyMet's estimate, the only one mentioned in the FEIS, is then summarized. PolyMet's cost estimate for closure is $50-90 million in Year 1, $160-200 million in Year 11, and $120-170 million in Year 20. (*Id*.).

As discussed below, PolyMet's estimates minimize legacy costs and wastewater treatment costs, exclude risks of poor quality modeling and "unexpected" outcomes, deny and minimize assurance to compensate for wetlands impacts and provide no resources for corrective actions resulting from either routine or catastrophic failures.

2. The FEIS financial assurance estimate discounted existing legacy pollution costs.

The only estimate of financial assurance in the FEIS -- PolyMet's estimate -- is inconsistent with PolyMet's disclosure to shareholders of the liabilities associated with legacy pollution. In PolyMet's Form 20-F, filed with the U.S. Securities and Exchange Commission (SEC) in April 2015, PolyMet estimated total costs to indemnify Cliffs for reclamation and remediation obligations assumed in PolyMet's Purchase Agreement as "approximately $72.6 million in present day costs." PolyMet summarized the litigation against Cliffs and the 2010 Consent Decree applicable to the acquired property and disclosed for investors, "based on the expected timing of such payments, our cost of capital, and anticipated inflation rates, we made a provision of $72.3 million in our financial statements at that date." (PolyMet Form 20-F, filed Apr. 21, 2015, pp. 18-19, Exhibit 23).

PolyMet noted in its disclosure to the SEC, "there is substantial uncertainty related to the long-term mitigation plan implementation cost" and that outcomes "that are unfavorable to us could result in material additional liability." (*Id*., p. 19). Before a shovel reaches the site, PolyMet has already estimated that $72.3 million is needed to provide for legacy liabilities. Any financial assurance for the NorthMet mine project must be over and above that amount. Simple arithmetic discloses the discount of legacy pollution costs in the FEIS' estimate of financial assurance.

3. The FEIS provides no foundation to assure long-term water quality treatment.

The FEIS provides no factual foundation from which financial assurance for long-term water quality treatment could be reasonably calculated. The PolyMet NorthMet draft EIS predicted that waste rock stockpile leachate collection would exceed water quality standards for

up to 2,000 years. (DEIS, Table 4.1-45, p. 4.1-80, FEIS reference MDNR et al. 2009). Responding to comments of Tribal Cooperating Agencies suggesting that water treatment would need to be perpetual, the Co-Lead Agencies stated numerous times, "Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual." (Tribal Comments and Co-Lead Agencies' Dispositions, Aug. 19, 2013, attached as Exhibit 24). An EIS with similar language would provide a basis to calculate financial assurance for water quality treatment.

The FEIS provides no such foundation. It states that PolyMet would include funds in its contingency reclamation estimate and financial assurance package to operate mechanical water treatment "for as long as necessary." (FEIS, 3-81). Although the FEIS admits that the potential *effects* of the PolyMet NorthMet project are "based on *mechanical* treatment that would operate indefinitely" (FEIS, 5-8), the FEIS itemization for the financial assurance package in long-term post closure only provides for testing and implementation of *non-mechanical* water treatment. (FEIS, 3-81). While admitting that the effectiveness of non-mechanical water treatment has not been demonstrated, in listing the long-term post-closure monitoring and maintenance activities that must be assured, the FEIS does not include any provision for WWTP treatment of polluted tailings seepage. The FEIS only provides for "Developing and implementing non-mechanical water treatment systems." (FEIS, 3-141).

Minnesota has experience with post-closure use of non-mechanical water treatment to treat mine discharge when a taconite mine encountered Duluth Complex rock. It is not positive. At Minnesota's Dunka Mine, non-mechanical water treatment, implemented when the mine went bankrupt and closed its treatment plant, has resulted in consistent violations of Minnesota numeric as well as narrative water quality standards.[44] Replicating this cheap and ineffectual plan for the PolyMet NorthMet mine project would be the opposite of financial assurance.

4. The FEIS improperly excluded contingency mitigation from financial assurance.

Presumably in response to concerns about assumptions in PolyMet's modeling of seepage concentrations, seepage capture, and the absence of northward flow, the FEIS has a long list of

[44] See WaterLegacy Petition for Program Withdrawal in Minnesota, available at http://www2.epa.gov/mn/npdes-petition-program-withdrawal-minnesota Supplemental Petition materials on Dunka Mine and Dunka Discharge Monitoring Report summaries in Exhibit 34.

contingency mitigation and conceptual mitigation options to address the potential that the project will not operate as "expected" and that polluted seepage would flow north to the Boundary Waters watershed. (FEIS, 5-239 to 5-244). It would be reasonable for regulators to require that PolyMet assume the risks of the errors in its modeling or overreaching in its promises. This could be done by financially assuring contingency mitigation and retaining funds pending verification that the PolyMet NorthMet mine site, tailings and hydrometallurgical residue facilities operate as modeled and claimed.

The FEIS improperly excludes contingency mitigation from the financial assurance package until some unspecified future time if "appropriate and approved" by the MDNR and MPCA. (FEIS, 5-239). Given the potential that pollution would be discovered after mine closure due to seepage times and the relationship between northward flow and Northshore Peter Mitchell Pit closure, plus the difficulty in securing remediation in Minnesota from an operating mine, let alone a bankrupt mine, it is highly unlikely that funds for contingency mitigation would be secured at a future time if they were needed. By excluding contingency mitigation from financial assurance rather the providing a basis for quantifying these costs, the FEIS has effectively externalized to the public PolyMet's risk of modeling and performance failures.

5. The FEIS excluded and undermined assurances for wetlands mitigation.

The FEIS provides no basis to financially assure compensation for the indirect effects of the NorthMet project on wetlands. By providing no assessment of reasonably foreseeable impacts from hydrologic changes and pollution (see discussion in Section V, *supra*), the FEIS precludes assurance that compensation will be available when wetlands near the NorthMet mine or tailings site are indirectly destroyed or impaired.

Even for direct wetlands mitigation, while citing laws that require assurance until the success of mitigation is well-established, the FEIS implies support for waiver of financial assurance. (*see e.g*. FEIS, 3-140, 5-256, 5-367, 5-368, 5-369, 5-370). As explained in the expert opinion of Morgan Robertson attached with these comments, the direct mitigation proposed is already substantially out-of-kind, in addition to other violations of federal rules applicable to wetlands compensation, and would fail to fully compensate for direct destruction of coniferous bog wetlands. (Robertson, 2015, pp. 16-22). Bogs are difficult to replace resources and there is a substantial risk that the "experimental" replacement proposed by PolyMet will fail. (*Id*., p. 21,

citing PolyMet 2014j). The FEIS' equivocation on requiring assurance to mitigate direct wetlands impacts undermines the potential that effective in-kind replacement would be provided for bog wetlands.

6. The FEIS provides no foundation to assure corrective actions.

Although the FEIS states that financial assurance must cover reclamation and post-reclamation activities including implementation of "corrective actions that may become necessary to address any permit non-compliance" and remediation of sites where "potential pollutants may have been released" (FEIS, 3-140), the FEIS provides no analysis that would allow calculation of an appropriate level for this assurance. As detailed in previous Sections of these comments, the FEIS provides no probabilistic estimate of pollutant releases resulting from a range of seepage collection performances and assesses no reasonably foreseeable adverse effects of the failure of engineered systems, whether routine or catastrophic.

Recent major dam failures have resulted in an average cost of $543 million per failure. (Bowker & Chambers, *TSF Failures*, pp. 1-2, Exhibit 19) Even relatively minor spills can result in costly remediation. The FEIS' failure to consider any risk of pollution not modeled by PolyMet establishes no foundation for assurance of the risk of corrective action. The risk of failures, large or small, could thus be externalized to the public.

IX. ALTERNATIVES

The PolyMet NorthMet FEIS is fatally flawed due to its failure to consider alternatives to any aspect of the proposed open-pit copper-nickel mine, processing plant and waste facilities, including mitigation measures as well as the location, scope or method of mining. Federal law states that the alternatives section is the "heart of the environmental impact statement" and requires that alternatives be compared "thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public," 40 C.F. R. §1502.14. State law, similarly, states that an EIS must discuss appropriate alternatives to the action and their impacts. Minn. Stat.§116D.04, Subd. 2a.

Courts will reject an EIS as inadequate when alternatives are "ignored," "are not adequately set forth and discussed," and are "dismissed with a conclusory statement and little or no discussion." *Nelson v. Butz,* 377 F. Supp. 819, 822 (D. Minn. 1974) (Enjoining dam

construction due to failure of the EIS to comply with NEPA). "A 'viable but unexamined alternative renders [the] environmental impact statement inadequate.'" *Muckleshoot Indian Tribe v. U.S. Forest Service,* 177 F. 3d 800, 814 (9th Cir. 1999) (Rejecting an EIS for a land exchange prepared in violation of NEPA on the grounds that the Forest Service "failed to consider an adequate range of alternatives"); *Oregon Natural Dessert Ass'n v. BLM, 625 F. 3d 1092, 1122 (9th Cir. 2010)*(Reversing judgment for BLM on sufficiency of land plan EIS). *See also Grazing Fields Farm v. Goldschmidt, 626 F.2d 1068, 1072 (1st Cir. 1980)*(Reversing judgment for Federal Highway Administration due to inadequacy of EIS alternatives analysis).

"A cursory dismissal of a proposed alternative, unsupported by agency analysis, does not help an agency satisfy its NEPA duty to consider a reasonable range of alternatives." *Envt'l. Prot. Info. Ctr. V. U. S. Forest Ser***v.,** 234 Fed. Appx. 440, 442-443 (9th Cir. 2007) (Reversing judgment for U.S. Forest Service and enjoining forest-thinning project). Under NEPA, the agency also has a duty "to study all alternatives that appear reasonable and appropriate for study . . . as well as significant alternatives suggested by other agencies or the public during the comment period." *Dubois v. U. S. Dept. of Agr.,* 102 F.3d 1273, 1286-1287 (1st Cir. 1996) (Concluding U.S. Forest Service had not explored reasonable alternatives to withdrawing water from and discharging water to an "outstanding resource value" water*).* Presenting only alternatives that "would authorize the same underlying action" is insufficient to comply with NEPA requirements. *Western Watersheds Project v. Abbey*, *719 F. 3d 1035, 1051 (9th Cir. 2013)*. "It is 'absolutely essential to the NEPA process that the decisionmaker be provided with a detailed and careful analysis of the relative environmental merits and demerits of the proposed action and possible alternatives, a requirement that we have characterized as 'the linchpin of the entire impact statement.'" *Dubois, supra, 102 F. 3d at 1286-1287; NRDC v. Callaway, 524 F.2d 79, 92-93 (2d Cir. 1975)* (Navy EIS inadequate due to failure to provide comparison of alternative dumping sites); *see also Silva v. Lynn, 482 F.2d 1282, 1285(1st Cir. 1973).*

WaterLegacy criticized the SDEIS for its failure to evaluate alternatives for any aspect of the proposed PolyMet NorthMet project, as follows:

- Elimination of the Underground Mining alternative was unreasonable;
- Elimination of the West Pit Backfill alternative was unreasonable;
- A Mine Site Year 1 Reverse Osmosis alternative should be analyzed to minimize and mitigate project impacts to mine site wetlands and water quality;

- Off-site disposal of reject concentrate should be analyzed to minimize leakage;
- Category 1 waste rock pile liners should be analyzed to mitigate seepage;
- Liners for overburden and peat storage should be analyzed to mitigate seepage;
- Alternative tailings management should be analyzed to mitigate seepage, including disposal at a new location, placing liners beneath the tailings, and dry stack tailings;
- Alternative hydrometallurgical residue facility management should be analyzed, including alternative sites, and dewatering and treatment of wastes as hazardous.

None of these alternatives were given a detailed analysis of their relative merits and demerits in either the SDEIS or the FEIS. Each should have been. We incorporate by reference our comments on the SDEIS, and also provide new information that underscores the need to evaluate less environmentally damaging alternatives for the PolyMet NorthMet project.

The FEIS admits that no project alternatives are presented in its thousands of pages, stating, "As a result of screening and analysis, the NorthMet Project No Action Alternative (i.e., the NorthMet Project Proposed Action would not occur) is the only alternative evaluated in detail in this FEIS." (FEIS, 3-6). The comments below will explain that the FEIS has used an inappropriate baseline and, thus, has not evaluated a no action alternative where water quality is concerned. We will then summarize new information that underscores the need to evaluate less environmentally damaging alternatives for the PolyMet NorthMet project.

1. The PolyMet NorthMet FEIS should have used an appropriate baseline to compare project and no action impacts on water quality.

The PolyMet NorthMet FEIS should have compared the impacts of the proposed action on water quality with an appropriate no action baseline. Despite its assertion quoted above, the FEIS has not evaluated the No Action Alternative, let alone done so in detail. After a 250-page chapter analyzing project impacts on water quality, the discussion of the no action alternative is cursory: "Under the NorthMet Project No Action Alternative, the NorthMet Project Proposed Action would not occur and, therefore, the environmental effects associated with the NorthMet Project Proposed Action, as described in Section 5.2.2, would not occur." (FEIS, 5-253).

Under NEPA, a no action alternative must "provide a baseline against which the action alternative" is evaluated. *Ctr. for Biological Diversity v. U. S. Dept. of Interior,* 623 F.3d 633, 642 (9th Cir. 2010). (Finding BLM's approval of an EIS arbitrary and capricious due to flawed assumption regarding result of no action alternative). *See also Ctr. for Biological Diversity v. BLM,* 746 F. Supp. 2d 1055, 1090 (N.D. Cal. 2009) (The "no action" alternative is "the standard

by which the reader may compare the other alternatives' beneficial and adverse impacts related to the applicant doing nothing.") Courts "not infrequently find NEPA violations when an agency miscalculates the 'no build' baseline or when the baseline assumes the existence of a proposed project." *N. C. Wildlife Fed'n v. N.C. DOT,* 677 F.3d 596, 603 (4th Cir. 2012) (Finding EIS inadequate due to assumptions made in the "no build" data); *Friends of Yosemite Valley v. Kempthorne,* 520 F.3d 1024, 1037-38 (9th Cir. 2008).

In evaluating the critical impacts of the NorthMet project on water quality, the FEIS explicitly compares the effects of the proposed action with a "Continuation of Existing Conditions" (CEC) scenario, rather than a no build baseline. Every table predicting water quality under the proposed action contrasts it with modeling of this CEC. The FEIS concludes that the proposed action would not cause any significant water quality impacts because "the NorthMet Proposed Action concentrations were no higher than concentrations predicted for the Continuation of Existing Conditions scenario." (FEIS, 5-9).

The CEC is not a no action alternative, but a biased construct. It is a scenario that disregards science, regulation and the proponent's own obligations in order to compare the NorthMet project's effects on water quality to an artificially elevated prediction of future pollution. The FEIS, in effect, admits as much. "The CEC scenario," the FEIS explains, "is not synonymous with the No Action Alternative because it does not account for other foreseeable changes within the NorthMet Project area." (FEIS, 5-254).

The FEIS mentions that actions are currently underway to reduce the sulfate load to the Embarrass River from the Cliffs Erie Area 5NW mine pit. (FEIS, 5-253). But the most significant differences between the CEC scenario and a true no build alternative may involve the LTVSMC brownfield site and tailings waste facility where the NorthMet project is proposed. Under a no action alternative, the existing LTVSMC brownfield site "would be reclaimed in accordance with the Cliffs Erie reclamation/closure plan." (FEIS, ES-49). In addition, under a no action scenario, if the PolyMet NorthMet project were not built, "the water quality of seepage from the existing LTVSMC Tailings Basin would improve over time as a result of natural attenuation and/or possible additional mitigation measures pursuant to the Consent Decree between the MPCA and Cliffs Erie." (FEIS, 5-470).

A baseline for comparing the adverse effects of a project cannot rely on a false assumption that old pollution would remain unabated if a project were not approved. *Preserve*

Our Island v. United States Army Corps of Eng'rs, 70 ERC (BNA) 1622, *slip op*. 46-47 (D.C.W. D. Wash. 2009). The no action baseline comparison in an EIS also cannot properly include elements that would not comply with law. *Friends of Yosemite Valley v. Kempthorne,* 520 F.3d 1024, 1038 (9th Cir. 2008)*; Ctr. for Biological Diversity v. U. S. Dept. of Interior,* 623 F.3d 633, 642 (9th Cir. 2010)*; Conservation Northwest v. Rey,* 674 F. Supp. 2d 1232, 1245-1246 (D.C. W.D. Wash., 2009). Where an agency has ignored its duty, the result cannot be presented as a *fait accompli* in the baseline for an EIS. *Friends of Yosemite Valley v. Kempthorne, supra,* 520 F.3d at 1037-38.

The LTVSMC taconite tailings plant has been closed since 2000 when the LTV Steel Mining Company declared bankruptcy. Seepage concentrations are naturally attenuating as a result of precipitation and dilution. Cliffs Erie, L.L.C., which became legally responsible for permit compliance in 2001 when it acquired the LTVSMC property, is under the legal obligation of a 2010 consent decree (attached to WaterLegacy's SDEIS comments as Exhibit 8) to remediate tailings waste facility pollution. The failure of the LTVSMC tailings facility to control seepage and remediate pollution may, to some degree, be a regulatory lapse[45] that cannot be considered as a *fait accompli* in the baseline for an EIS. In addition, under the terms of its purchase agreement with Cliffs Erie, since 2006 the PolyMet Company has indemnified Cliffs Erie for remediation obligations at the tailings site and is "working closely" with Cliffs to fulfill Cliffs' legal obligations. (PolyMet 2015 SEC Form 20-F, Exhibit 23, pp. 18-19). It would be an improper use of the concept of "no action" to allow Cliffs' and PolyMet's delay in taking action to remediate tailings basin seepage to distort the baseline for determining the effects of future sulfide mine pollution.

This is not an academic question. As discussed in Section I on mercury, the FEIS claims the PolyMet NorthMet project would reduce CEC modeled sulfate loads to the Embarrass River, at least under the FEIS' assumption of nearly perfect seepage collection. But, if the NorthMet project's sulfide tailings seepage were compared with a "no action" baseline, including attenuation and remediation under the consent decree, this evaluation could show the NorthMet action increases rather than decreases sulfate and other pollutants. The FEIS doesn't even allow an answer to the most basic question – Would sulfate pollution be better or worse if the PolyMet

[45] WaterLegacy filed a Petition for Withdrawal of Program Delegation from the State of Minnesota for NPDES Permits Related to Mining Facilities with the U.S. EPA on July 2, 2015 arguing that mining enforcement violates the Clean Water Act. It is available at http://www2.epa.gov/mn/npdes-petition-program-withdrawal-minnesota

NorthMet project were built? On water quality issues, the FEIS does not allow a fair comparison of environmental outcomes between the proposed action and the no build alternative.

2. Particularly after the Mount Polley tailings dam failure and report, the FEIS should have evaluated tailings waste storage alternatives to mitigate impacts of polluted seepage and catastrophic dam failure.

Since the SDEIS was prepared, the Mount Polley copper mine tailings basin suffered a catastrophic failure. (See Section IX, *supra*). On January 30, 2015, an independent panel of experts released their report, the Independent Expert Engineering Investigation and Review Panel *Report on Mount Polley Tailings Storage Facility Breach* (hereinafter "Independent Report") attached as Exhibit 25. The *Independent Report* analyzed the cause of the Mount Polley tailings impoundment failure and stated, "the dominant contribution to the failure resides in the design." The *Report* made the following key recommendation:

> [T]he future requires not only an improved adoption of best applicable practices (BAP), but also a migration to best available technology (BAT). Examples of BAT are filtered, unsaturated, compacted tailings and reduction in the use of water covers in a closure setting. (*Id.*, at iv)

The *Independent Report* explained, "There are no overriding technical impediments to more widespread adoption of filtered tailings technology." (*Id.*, at 122) Its Expert Panel challenged the practice of maintaining a water cover over tailings to reduce reactivity, stating that so-called water cover runs counter to best available technology principles and that "No method for achieving chemical stability can succeed without first ensuring physical stability." (*Id*., at 124). The *Independent Report* explained the "intrinsic hazards associated with dual-purpose impoundments storing both water and tailings" and identified as the goal of best available technology for tailings management "to assure physical stability of the tailings deposit. This is achieved by preventing release of impoundment contents, independent of the integrity of any containment structures." (*Id*., at 121) To accomplish this objective, the Report continued, "BAT has three components that derive from first principles of soil mechanics: 1. Eliminate surface water from the impoundment. 2. Promote unsaturated conditions in the tailings with drainage provisions. 3. Achieve dilatant conditions throughout the tailings deposit by compaction." (*Id*.).

The Expert Panel recognized that the chief reason why there isn't wider industry adoption of filtered tailings is that comparisons of capital and operating costs alone favor conventional tailings dam. The *Independent Report* recommended that cost estimates include "risk costs, either direct or indirect, associated with failure potential," emphasizing, "Full consideration of life cycle costs including closure, environmental liabilities, and other externalities will provide a more complete economic picture. While economic factors cannot be neglected, neither can they continue to pre-empt best technology. (*Id*., at 123). The Report concluded that "BAT should be actively encouraged for new tailings facilities at existing and proposed mines" and "cost should not be the determining factor." (*Id*., at 125)

On March 18, 2015, WaterLegacy sent a letter to the Co-Lead Agencies summarizing the findings of the *Independent Report* (attached as Exhibit 26) and requesting that the Co-Lead Agencies analyze the best available technology of dry stack tailings disposal and the use of alternative sites in order to comply with NEPA and in order to identify the least damaging practicable alternative for the project under Clean Water Act Section 404. WaterLegacy specifically requested that analysis of dry stack tailings include a rigorous analysis focused on long-term costs for water quality treatment and maintenance during operations, reclamation and closure as well and on benefits of reduced adverse impacts to wetlands and water quality as a result of seepage, as well as the risk of catastrophic impoundment failure.

As discussed in Section IX, in the comments of Dr. Chambers, there are specific similarities between the proposed PolyMet NorthMet tailings storage facility and the Mount Polley tailings impoundment that underscore the relevance of the *Independent Report* recommendation.

In addition to the risk of catastrophic and costly impoundment failure (Section IX, *supra*), hydrologic changes and routine lapses in seepage collection at the proposed NorthMet wet tailings storage facility would increase the risk of mercury methylation (Section I, *supra*; Branfireun, 2015) and impairment of wetlands (Section V, *supra*). Modeled rates of tailings seepage collection are unsubstantiated, and seepage may violate water quality standards, requiring expensive and uncertain mitigation. (Section III, *supra*; FEIS, 5-240). Even without catastrophic or routine performance failure, the proposed NorthMet unlined wet tailings disposal facility would require indefinite mechanical water quality treatment for pollutants modeled to exceed water quality standards for at least 500 years. (Section X, *supra*).

The FEIS does not consider dry stacking or other tailings alternatives. Co-Lead Agency responses to comments state, "A thickened (paste tailings) alternative was considered but eliminated in the DEIS." (FEIS, A-315). In fact, the DEIS screening process found that this thickened (not dry stack) tailings would address tailings basin mitigation issues, but "the operational cost of this measure would be high." (MDNR and USACE, 2009, 3-56, Table 3.2-2) Responses to comments also state that, after the DEIS, this alternative was "reconsidered" and determined not to offer significant environmental benefits, (FEIS, A-315) but no such analysis is provided in the SDEIS, the FEIS or any cited reference.

The Co-Lead Agencies acknowledge that they received the *Independent Report* on Mount Polley after the SDEIS comment period ended and their technical analysis confirmed that "use of dry stacking technology would increase tailings basin stability." Further evaluation of this alternative was rejected, however, on the grounds that use of dry stacking requires a basin liner, which is not feasible on top of the existing LTVSMC tailings basin. Use of a different location and a lined dry stack facility was then rejected on the grounds, "A separate dry stack tailings basin would increase footprint effects of the project" and that "A separate dry stack tailings basin would not address LTVSMC tailings basin legacy issues." (FEIS, A-315).

The Co-Lead Agencies' arguments for rejecting an evaluation of dry stack tailings disposal are spurious. WaterLegacy agrees that a liner is necessary for dry stack tailings; in fact, we believe that a liner is necessary for *any* copper-nickel mine tailings. However, the argument that a separate dry stack tailings basin would increase the "footprint" of the project does not mean it would increase environmental impacts. The Co-Lead Agencies may no longer remember this, but there are many brownfield sites in close proximity to the LTVSMC processing plant. In fact, several of these sites were identified as alternative tailings locations in the 2005 Final Scoping Decision for the NorthMet project, as reflected in the Exhibit 27 map attached. It was incumbent upon the Co-Lead Agencies, based on comments, the *Independent Report* and their own evaluation that dry stacking would improve tailings basin stability, to review these and other nearby brownfield sites, environmental risks and life-cycle costs and rigorously evaluate best available tailings disposal technology for the NorthMet project.

3. Impacts to wetlands and water quality require an analysis of the Mine Site Reverse Osmosis in Year 1 to mitigate wetlands drawdown and seepage impacts.

Both WaterLegacy and Tribal Agencies requested consideration of an alternative to mitigate impacts on wetlands and water quality from mine dewatering and seepage by treating groundwater pumped from mine pits during operations with reverse osmosis to levels that comply with water quality standards and returning that treated water to support wetlands and dilute any seepage released to the Partridge River watershed. The FEIS doesn't mention this alternative. Although the request for consideration of this alternative is documented twice - once for the Tribal Cooperating Agencies' request and once for that of WaterLegacy (FEIS, A-134 to A-135), neither response provides any justification of the failure to evaluate the Mine Site Reverse Osmosis in Year 1 alternative. The Tribes' request, "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)," was reprinted in Appendix A, but no response was provided. (FEIS, A-134 to A-135). WaterLegacy's detailed proposal was deprived of content by phrasing it as "earlier use of the reverse osmosis (RO) system in year one." The response was meaningless; "WWTF would be upgraded to include a RO unit or equivalent technology during closure." (FEIS, A-313).

The NorthMet proposed action currently calls for construction of reverse osmosis (RO) water quality treatment at approximately year 52. (FEIS, 5-142). That RO facility would be scaled to treat overflow discharge from the West Pit. Prior to the predicted filling of the West Pit, at least 52 years away (more if mining is continued beyond 20 years), all water from the Upper Partridge River would be sent to the processing plant nine miles away and removed from the watershed.

The treatment targets for the mine site wastewater treatment plant from year 1 to at least year 52 would not permit discharge of treated water to surface water. Based on current baseline hardness in the proposed West Pit Outlet Creek of less than 50 mg/L (FEIS, 4-91, Table 4.2.2-15), the WWTF target for lead (10 µg/L) would be more than 7 times the water quality standard; the WWTF target for nickel (113 µg/) would be nearly 4 times the water quality standard, and the WWTF target for sulfate would be 250 mg/L, 25 times the standard applicable in wild rice Waters (FEIS, 5-148, Table 5.2.2-29). The predicted mercury concentration in WWTF effluent would be 5.8 ng/L, nearly five times the Great Lakes Initiative water quality standard of 1.3

ng/L. (See PolyMet RS66, Mercury Mass Balance Attach. A, WaterLegacy SDEIS Comments Exhibit 4). This low-quality WWTF effluent could not be used to protect wetlands from water draw-down or to mitigate seepage impacts.

The FEIS proposes that stream augmentation at the tailings site would mitigate effects on Embarrass watershed wetlands due to the maintenance of surface flows within 20 percent of existing conditions. (FEIS, 5-183). Yet, although wetlands at the plant site are degraded by the existing impoundment (FEIS, 4-186) and wetlands at the mine site are high quality (FEIS, 5-266), the proposed action makes no plan to treat and return water to the mine site watershed.

Earlier sections of these comments have raised concerns about adverse environmental impacts due to hydraulic conductivity of Virginia Formation rock and fractures in the East Pit and under the Category 1 waste rock pile (Section II, *supra*), the potential for northward flow (Section II, *supra*), the substantial wetlands drawdown effects modeled by GLIFWC, and the serious consequences of drying and rewetting cycles to mercury methylation in peatlands explained by Dr. Branfireun (Section I, *supra*). It is irresponsible not to evaluate whether implementing Mine Site Reverse Osmosis in Year 1 and returning clean water to mine site tributaries or wetlands would reduce environmental damage and mitigate these risks.

4. Alternative locations and management should have been evaluated to ensure stability of the hydrometallurgical residue facility.

The liquefaction and failure of containment at the hydrometallurgical residue facility (HRF) may or may not be a likely occurrence. But it would be a catastrophic occurrence that can be readily avoided. Nowhere in the FEIS, prior EIS drafts or supporting documents are the actual mass and concentrations of chemicals in the hydrometallurgical residue facility disclosed to the public or to decisionmakers. But, as explained in Section V and Section IX, *supra,* the mercury, sulfates, copper-nickel mining metals, processing chemicals from the hydrometallurgical plant, coal ash, and reject concentrate sludge proposed to be contained at the HRF would present enormous risks to downstream water quality, aquatic life, wild rice and human health should containment fail.

The FEIS has provided no justification for locating these chemicals on a site where no solid waste facility would be permitted and no rationale for attempting to compact slimes and peat rather than excavating to solid ground so that a stable base can be engineered. In the entire

history of the PolyMet NorthMet project, no EIS documents have evaluated alternative sites or methods of disposal. If such consideration has taken place, it has been done outside the light of day required under both state and federal law.

5. The West Pit Backfill alternative should have been evaluated in the FEIS to mitigate impacts of seepage from the Category 1 waste rock pile.

The PolyMet NorthMet FEIS provides an explanation of why the Co-Lead Agencies rejected the alternative of backfilling the West Pit with Category 1 rock generated by mining. This explanation is inadequate. First, the FEIS errs in minimizing the significance of reclamation of its 526-acre surface and the restoration of wetland areas and functions:

> Removal of the Category 1 Stockpile would allow for reclamation of the affected surface footprint, including potential to recreate wetland areas and restore function, and, as noted above, the prior effect would have been offset through mitigation required for the initial effect. . . 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. (FEIS, 3-161 to 3-162)

Although the project proponent may see no value in future wetlands restoration if no mitigation credit is received, this perspective is untenable. Reclamation of 526 acres with wetlands within decades instead of never is a clear environmental benefit,

The FEIS fails to consider a significant additional environmental benefit of the West Pit Backfill alternative. It would reduce contaminated seepage that would otherwise result from leaving the 526-acre Category 1 copper-nickel waste rock pile permanently in a 280-foot-tall unlined pile at the mine site where seepage could impact the 100 Mile Swamp and the Upper Partridge River. (FEIS, 5-119, Table 5.2.2-21). As detailed in Section II, *supra*, hydrogeologic conditions beneath the unlined Category 1 waste rock piles are not discussed in the FEIS. But the majority of the Category 1 waste rock pile would be located on semi-permeable Virginia Formation rock, and there are several fractures transecting the site. (FEIS, Figure 4.2.14-1, FEIS ref. Barr 2014b).

As with the dry stack tailings alternative, reliance on PolyMet's unsubstantiated assumptions of nearly perfect seepage collection allowed the Co-Lead Agencies to dismiss the West Pit Backfill alternative without analyzing its potential environmental benefits. Based on PolyMet's modeling and assumptions (PolyMet 2015h), the FEIS stated that more than 98

percent of affected groundwater seepage from the Category 1 stockpile would be captured by the containment system or would migrate as groundwater into the West Pit and East Pit (FEIS, 5-7) and that only negligible volumes of uncaptured seepage would flow north. (FEIS, 5-65).

These claims are unsupportable. The actual design for Category 1 seepage containment provides for the use of compacted soil as a barrier around the waste rock pile with conductivity specifications generally classified as semi-permeable. (FEIS ref. PolyMet 2015h, pp. 10,13). The drainage system would consist of pipes and ditches and rely only on gravity for collection. (*Id*., p. 14). PolyMet admits that along the west, north, and east sides of the stockpile, there may be areas where the drain pipe cannot be installed at an elevation low enough to ensure that groundwater will not flow beneath the cutoff wall. It is improbable that this system will work as anticipated. (Lee, Category 1 opinion, 2015).

The FEIS' predictions of minimal Category 1 seepage flow were also based on assumption that the cover placed on the rock pile would reduce infiltration by more than 99 percent (from 360 gpm to 2.8 gpm). (FEIS, 5-145). Geomembranes have not been used for many waste rock stockpile covers or projects approaching the size of the Category 1 waste rock stockpile. (PolyMet 2015d, p. 45). Seepage results from Minnesota's Dunka Mine, one of the three examples cited by PolyMet (2015d) of similar liner application, have resulted in significant infiltration and contaminated seepage violating Minnesota water quality. (Dunka Mine DMR summaries, Exhibit 34)

Placing Category 1 waste rock in the West Pit, after grouting any fractures revealed by mining, may reduce adverse effects from uncaptured release of contaminated seepage to surface and groundwater. Maintaining saturated conditions to reduce oxidation may also be more effective within the West Pit than trying to do so with a cover on a tiered pile. These potential benefits from the West Pit Backfill alternative should have been analyzed in the FEIS.

The FEIS suggests that the environmental benefits from the West Pit Backfill alternative do not require its consideration, let alone implementation of this alternative:

> T]he 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 and remains so in this FEIS. (FEIS, 3-162)

The referenced 2013 MDNR memorandum cited the conclusion of PolyMet's consultants that the West Pit Backfill alternative "would significantly decrease net return on the project." (FEIS ref. MDNR et al., 2013b, p. 3). PolyMet's consultants emphasized, "There are known extensions of mineralization outside the mine plan both to the south (down dip) and to the west (along strike). A key consideration in the development of an overall mine plan for the Project, including the ability to backfill open pits, is preserving potential future development of these extensions of mineralization."[46]

Minnesota's Environmental Policy Act does not allow rejection of an environmentally preferable alternative on the basis of economic considerations, Minn. Stat. §116D.04, Subd. 6. Under federal law, "An agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained formality." *Nat'l Parks & Conservation Ass'n v. BLM,* 606 F. 3d 1058, 1070 (9th Cir. 2010). The court found against the BLM on the grounds that the agency had adopted the proponent's "interests as its own" and "As a result of this unreasonably narrow purpose and need statement, the BLM necessarily considered an unreasonably narrow range of alternatives." (*Id*. at 1072). *See also Simmons v. United States Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997)("If the agency constricts the definition of the project's purpose and thereby excludes what truly are reasonable alternatives, the EIS cannot fulfill its role.").

Ironically, while the EIS has rejected an evaluation that could anticipate and develop an environmentally protective plan for backfilling Category 1 rock, the FEIS also keeps the door open for ad hoc disposal "of some excess waste rock or saturated overburden in the West Pit in areas where mining has ceased, if necessary as an adaptive measure." (FEIS, 5-630, F-640).

Rather than analyze alternatives and their environmental consequences to allow a choice of the least damaging alternative, the Co-Leads allow PolyMet to have it both ways. Mineralization outside the mine plan was disregarded in analyzing the Underground Mine Alternative, but yet it still can be used as the basis to deny West Pit Backfill mitigation. Backfilling waste rock can be suggest as indefinite adaptive mitigation, but cannot be considered as a project alternative to reclaim wetlands and reduce seepage.

[46] Foth, Evaluation of Backfilling the NorthMet West Pit, prepared for PolyMet Mining, Dec. 2012. p. 8, provided with WaterLegacy SDEIS Comments as Exhibit 49.

XII. CUMULATIVE IMPACTS

The PolyMet NorthMet FEIS does not rectify the inadequacies of the SDEIS. As detailed in the preceding Sections I through XI, the FEIS fails to evaluate and, in some cases, affirmatively misrepresents the significant potential adverse environmental effects from the proposed PolyMet NorthMet open-pit copper-nickel mine, processing facilities and waste storage facilities. These failures are compounded by the deficiencies of the FEIS' analysis of the cumulative impacts of the project on mercury and mercury methylation, downstream water quality, wetlands destruction and impacts on tribal waters, rights and resources.

Under MEPA and NEPA, an EIS must consider cumulative potential the effect on the environment that results from the incremental effects of a project in addition to other projects past, present or reasonably foreseeable future in the environmentally relevant area that might reasonably be expected to affect the same environmental resources. Minn. R. 4410.2300, Subp. H; *Citizens Advocating Resp. Develop. v. Kandiyohi Cty Bd. Of Comm'rs*, 713 N.W. 2d 817 (Minn. 2006); 40 C.F.R. §1508.7. *Ctr. for Biol. Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F. 3d 1172, 1215 (9th Cir. 2008); *Ohio Valley Envt'l Coal. v. Hurst*, 604 F. Supp. 2d 860, 883-884 (S. D. W. Va. 2009). The FEIS provides an inadequate assessment of the cumulative impacts of the PolyMet NorthMet project.

The cumulative effects of mining and other development on mercury contamination of fish, water pollution, wetlands destruction and impairment of tribal resources are significant. For federal agencies to rely on an FEIS that fails to analyze these cumulative impacts would also conflict with Executive Order 13045 (*Protection of Children from Environmental Health Risks and Safety Risks,* 1997), which requires each federal agency give high priority to the identification and assessment of environmental health and safety risks to children and Executive Order 12898, which directs each agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities" on minority populations, low-income populations and federally recognized Indian tribes.[47]

[47] Executive Order 13045, Apr. 21, 1997, available at https://www.gpo.gov/fdsys/pkg/FR-1997-04-23/pdf/97-10695.pdf; Executive Order 12898, February 11, 1994, available at https://www.archives.gov/federal-register/executive-orders/pdf/12898.pdf.

1. The FEIS failed to consider cumulative effects of reasonably foreseeable expansions of the NorthMet project.

WaterLegacy's prior comments on the SDEIS discussed additional concerns that the EIS failed to consider additionally reasonably foreseeable cumulative mining actions, including the planned expansion of the PolyMet NorthMet copper-nickel mine itself. The preceding discussion of the FEIS' rejection of the West Pit Backfill alternative underscores that expansion of mining at the West Pit is foreseeable and anticipated in legal agreements. A proponent of mineral development may not choose an arbitrary limit on what is economically recoverable, but must base an EIS on the full range of likely production. *Native Vill. of Point Hope v. Jewell,* 740 F.3d 489, 501, 504 (9th Cir, 2014). NEPA requires that agencies engage in reasonable forecasting of cumulative mining impacts. *N. Plains Res. Council, Inc. v. Surface Transp. Bd.,* 668 F.3d 1067, 1078-1079 (9th Cir. 2005).

While the FEIS considers the environmental impacts of mining 225 million tons of ore (FEIS, ES-17), PolyMet's official Technical Feasibility Report[48] defines the deposit as 694 million short tons of indicated and measured resources and 230 million tons of inferred resources, or a total of 924 million tons of ore that meets PolyMet's accepted grade within their current lease holdings at NorthMet. (PolyMet 43-101 Report, p. 14-38). The Edison Report commissioned by PolyMet to provide information for investors (Edison Investment Report, Nov. 2013, WaterLegacy SDEIS Comments, Exhibit 54) explicitly contemplated mining expansion, **"**A sustained higher metal price regime has the potential to allow expansion of the existing pit phases both laterally and to depth." (*Id.*, p. 15-3). The Report advised, "We believe the size and scope of the ore body could support a much larger project, which would create meaningful additional value." (*Id*., p. 5) The Report continues, "We believe there is a good chance PolyMet will be able to expand the size of its resource by 50-100% based on what we learned on a site visit." (*Id*.)

The Edison Report explained that the proposed PolyMet NorthMet processing plant had historically operated at 100,00 tons per day (t/d), and that an operating rate of at least 90,000 t/d should be attainable. (*Id*., p. 3). The Edison Report stated, "We believe the most likely follow-on project PolyMet will pursue is the expansion of mining and milling to 90,000 t/d, with the second

[48] PolyMet 43-101 Technical Report revised January 14, 2013 (no more recent reports filed) is available on SEDAR at http://www.polymetmining.com/wp-content/uploads/2013/02/2013-Updated-43-101.pdf

most likely third-party ore processing of 50,000 t/d or 100,000 t/d." (*Id*., p. 10) The Report noted that there are 11 mineral properties near PolyMet's mill and that "government permitting agencies may encourage the developers of other mining properties in the area to work out an arrangement with PolyMet to use its pre-existing mill and tailings pond" in order to "limit the footprint of mining and processing in the area." (*Id*., p. 10) The Edison Report valued PolyMet stock based on the potential expansion of processing to 90,000 tons per day (*Id*., p. 1), stating "We assume PolyMet would begin working on permitting the expansion to 90,000 t/d within six months of receiving its permits for Phase I, permitting would take two years and construction would take one year. On this basis, it could complete its expansion by May 2018." (*Id*., p. 12)

Although Edison Investment Research terminated coverage of PolyMet Mining in June 2015,[49] none of the factors contributing to a reasonable forecast of PolyMet's planned expansion at the NorthMet mine, processing plant and tailings facility have changed. This planned expansion should have been considered to evaluate the cumulative impacts of the proposed action on mercury methylation, water quality, wetlands destruction and impairment of tribal resources.

2. The FEIS' assessment of cumulative impacts of the PolyMet NorthMet project on mercury contamination of fish and human health was inadequate.

The FEIS denies that the PolyMet NorthMet sulfide mine project would have any adverse impact on "mercury loadings" to the downstream St. Louis River, into which both the Partridge River and Embarrass River drain. (FEIS, 5-10). The FEIS, relying exclusively on Barr data, claims that increases in mercury loading in the Embarrass River from 22.3 to 22.5 grams per year loadings would be more than offset by the decrease in mercury loading from 24.2 to 23.0 grams per year in the Partridge River. (FEIS, 5-572, 6-32). As the result of this alleged "net decrease" in mercury loading, the NorthMet project "is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River." (FEIS, 6-32)

As summarized in Section I, *supra*, mercury expert Dr. Branfireun has carefully analyzed the Barr mercury data used to support the FEIS, and concluded that it does not meet basic scientific standards for analysis, reporting or addressing the margin of error in data collected. (Branfireun, 2105, pp. 2-9). Dr. Branfireun specifically reviewed the "mass balance" model used by Barr and incorporated into the FEIS and concluded that if an analysis of the margin of error in

[49] Edison Investment Research, http://www.edisoninvestmentresearch.com/search/PolyMet%20Mining.

projections of mercury releases had been performed, the FEIS statements of certainty based on grams of mercury "could not be supported." Thus, Dr. Branfireun explained, "conclusions from this asserted mass balance that the proposed development will not have appreciable impacts on water quality would be similarly unsupported." (Branfireun, 2015, p. 14).

Section I of these comments also details the many errors and omissions in the asserted mercury mass balance. These include the failure to consider mercury seepage in any modeling, misrepresentation of leachate testing results, and the disregard of mercury air deposition to the watershed in an amount (453.6 grams per year) potentially three orders of magnitude greater than the differences in mercury loading described to exclude the St. Louis River from Cumulative Effects Assessment Area (CEAA) for the NorthMet project. The FEIS' false precision regarding mercury loading must be rejected as inadequate due to its concealment of relevant contaminant source information, as well as due to its unsupportable handling of mercury data.

The FEIS briefly discusses the impacts of air deposition on lakes in the Embarrass River watershed on mercury, concluding that the maximum incremental cumulative increase in the Hazard Quotient over existing fish mercury tissue concentrations is no more than a 1.8 percent increase over existing markedly unsafe levels. (FEIS, 6-86, 6-87) Inexplicably, the FEIS states in the same paragraph that as a result of the tiny scope of emissions risk assessment (AERA) done there is "no subsequent change in human health risks related to fish consumption." (FEIS, 6-131). However, the FEIS provides no analysis of impacts on mercury in fish tissue in the Partridge and Embarrass Rivers, immediately proximate to the NorthMet project site, and no analysis of project impacts on mercury bioaccumulation resulting from the factors other than mercury air deposition.

As Dr. Branfireun detailed in his report, the concentration of mercury in fish tissue is not proportional to air deposition. (Branfireun, 2015, pp. 14-15). Sulfate discharge, sulfate air deposition and hydrological changes resulting in the drying and rewetting of wetlands and sediments all contribute to mercury methylation, mobilizing the form of mercury that bioaccumulates in the food chain. (*Id.*, pp. 9-16, 19-27). The wetlands adjacent to the NorthMet project mine site and tailings site are highly methylating environments, and "Even relatively small changes in water table position and wetting and drying frequency in the ombrotrophic wetlands at the NorthMet mine site have the potential to impact sulfate and methylmercury concentrations of receiving waters." (*Id.*, p. 19). Based on experimental data in similar wetlands,

sulfate deposition at the mine site alone could nearly double methylmercury production (1.88 times) in sensitive peatlands. (*Id*., p. 23). Dr. Branfireun explained the many mechanisms of mercury export from project site wetlands and their transport downstream. (*Id*., p. 26). He concluded, after the only comprehensive analysis of methylmercury in the entire FEIS record,

> I reject as unsupported and without scientific justification, any statement or implication in the FEIS that the proposed NorthMet development would not increase risks of methylmercury production and transport in the Partridge and Embarrass River watersheds, particularly in ombrotrophic wetlands near the mine site and wetlands affecting by tailings site seepage collection, changes to hydrology or atmospheric deposition. . . It is my opinion that the NorthMet development could create a substantial risk of ecologically significant increases in water column and fish methylmercury concentrations in downstream waters, including the St. Louis River. (*Id.*, p. 27)

Mercury bioaccumulation in fish can harm the fish themselves, inhibiting fish reproduction. (FEIS, 5-467). As summarized in the opinion of Dr. Saracino quoted in Section VIII, *supra*, consumption of fish containing high levels of methylmercury (the form of mercury that bioaccumulates in the food chain) can also be harmful to human beings, particularly to the developing fetus, when methylmercury crosses the placental barrier. (Saracino, 2015). In Minnesota's Lake Superior Region, the cumulative risk of mercury contamination of downstream fish is highly significant and should have been evaluated.

A recent Minnesota Department of Health study found that 1 out of 10 infants in Minnesota's Lake Superior region were born with unsafe levels of mercury in their blood. At a statistically significant level, a greater proportion of Minnesota babies had unsafe mercury in their blood as compared with babies in the Lake Superior region of Wisconsin or Michigan. Mercury levels were also higher in Minnesota in the summer months, suggesting that increased consumption of locally caught fish during the warm months is an important source of pregnant women's mercury exposure.[50]

In addition to a 1.3 ng/L standard for mercury in the water column discussed previously, Minnesota has a standard limiting mercury in edible fish tissue to protect human health, which is applicable across the range of waters used for fishing and drinking water, of 0.2 milligrams per kilogram (mg/kg). Minn. R. 7050.0220, subp. 3a, 4a, 5a. This standard is lower than the EPA's methylmercury criterion for fish tissue (0.3 mg/kg) because of the high rate of fish consumption

[50] Minnesota Department of Health, Mercury in Newborns in the Lake Superior Basin, http://www.health.state.mn.us/divs/eh/hazardous/topics/studies/newbornhglsp.html and Mercury Levels in Blood from Newborns in the Lake Superior Basin GLNPO ID 2007-942 Final Report November 30, 2011, p.p. 10, 15, http://www.health.state.mn.us/divs/eh/hazardous/topics/studies/glnpo.pdf

in Minnesota.[51]

The Embarrass River chain of lakes downstream of the proposed NorthMet tailings site - Sabin, Wynne, and Embarrass Lakes -- are impaired due to excessive mercury in fish tissue. Colby Lake, into which the Partridge River flows downstream of the proposed mine site, is also impaired due to excessive mercury in fish tissue. (FEIS, 4-29, Table 4.2.2-2). Based on the sampling done for the NorthMet project, the Partridge River and Embarrass River may also be impaired for aquatic consumption due to excessive mercury. Mean concentrations of mercury at surface water sites in the Partridge River (2.3 to 5.4 ng/L) and mean concentrations in the Embarrass River (4.3 to 5.1 ng/L) are two to four times higher than Minnesota's water column standard of 1.3 ng/L. (FEIS, 4-41, Table 4.2.2-4).

Most of the St. Louis River downstream of the proposed NorthMet sulfide mine project is impaired for the designated use for aquatic consumption as a result of excessive mercury in fish tissue. (FEIS, 4-285). Exhibit 28 to WaterLegacy's comments identifies segments of the St. Louis River that are on Minnesota's Section 303(d) impaired waters list due to excessive mercury in the water column or mercury in fish tissue.

The FEIS should have assessed cumulative effects of the NorthMet project on mercury methylation and bioaccumulation in fish tissue in the Partridge and Embarrass River watershed and in downstream waters, including the St. Louis River. The false precision of mercury loading and FEIS "offset" calculations seem designed to obfuscate the cumulative risk to human health resulting from ecologically significant increases in mercury in fish from the PolyMet NorthMet project and the past and present mercury impairments in downstream waters.

3. The FEIS' assessment of cumulative impacts of the NorthMet project on sulfate, specific conductivity and other pollutants with the potential to degrade downstream waters was inadequate.

The FEIS' analysis of cumulative effects of the PolyMet NorthMet project on sulfate and other pollutants is either misleading or just missing. With respect to sulfate, the FEIS' analysis contains two critical distortions. First, as explained in Section XI, *supra*, the FEIS uses an improper baseline to calculate the effects of NorthMet tailings seepage on sulfate concentrations. Rather than comparing NorthMet project impacts to LTVSMC tailings seepage diluted by

[51] MPCA, Minnesota Statewide Mercury Total Maximum Daily Load (TMDL), 2007, available at http://www.pca.state.mn.us/publications/wq-iw4-01b.pdf.

precipitation over time and reduced by Cliffs Eric compliance with its consent decree, the FEIS creates a biased construct comparing NorthMet pollution with "continuation of existing conditions" contradicting science as well a law. Thus, the FEIS concludes that the NorthMet sulfide mine project would have a "positive effect" on sulfate concentrations. (FEIS, 6-48).

Next, in calculating the cumulative effects of the PolyMet NorthMet project on sulfate in either the Partridge or Embarrass River, the FEIS assigns to the NorthMet project an average sulfate rate of 10 mg/L. (FEIS, 6-45, Table 6.2.2-3; 6-48, Table 6.2.2-5). Like other FEIS denials of water quality impacts based on unsubstantiated assumptions (see Sections II, III, and XI.5, *supra*) this cumulative effects assessment is a tautology. Once the FEIS assumes that the only watershed inputs are from water treated to comply with standards its conclusion has written itself.

Since the FEIS hasn't assessed the effects of specific conductance, there is also no assessment of the cumulative effects of mining discharge on specific conductance levels in the St. Louis River. As explained in Section VII, *supra*, elevated specific conductance is a water chemistry "signature" for mining discharges. Regression analysis performed as part of the Tribal Cooperating Agencies Cumulative Effects Analysis suggested that concentrations were highest nearest to mine discharge sites, and tended to gradually decrease downstream, remaining above 150 µS/cm at 203 kilometers (126 miles) downstream of the nearest upstream mine discharge site. (FEIS, App. C. Tribal CEA, p. 16, FEIS autop. 3041). Elevated concentrations of specific conductance could persist far downstream in the St. Louis River, as illustrated in Exhibit 29, a map of cumulative mining discharge impacts on specific conductance included as part of the Tribal CEA.

The FEIS adheres to the most optimistic predictions of PolyMet's modeling and assumes that the project's impact on any water quality exceedance will be insignificant. (FEIS, 6-45). The FEIS doesn't consider potential failures of engineering or modeling (FEIS, 5-236 to 5-244) in its assessment of cumulative effects. The FEIS similarly dismisses loading by other mining projects, "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*." (6-32, emphasis added). Having modeled near-perfect seepage containment and having assumed effective regulatory controls, the FEIS concludes, unsurprisingly that the "potential for exceedances of water quality

evaluation criteria as a result of cumulative effects from the NorthMet Project Proposed Action and other reasonably foreseeable actions is considered unlikely." (*Id*.).

The FEIS' assumption that Minnesota regulatory enforcement would ensure future compliance with water quality standards by the NorthMet project and at other mining facilities is inconsistent with evidence. WaterLegacy's Petition for Withdrawal of Program Delegation from the State of Minnesota for NPDES Permits Related to Mining Facilities (WaterLegacy, NPDES Withdrawal Petition, July 2, 2015, with attachment, Exhibit 30), documents multiple failures of regulatory control of mining pollution by the MPCA, including failure to issue timely NPDES permits despite a Joint Priority Agreement with the EPA, failure to conduct a reasonable potential analysis to determine whether mining pollutants will result in degradation or toxicity in Minnesota waters, use of variances and compliance schedules that do not comply with the Clean Water Act and failure to require compliance with permits and violations of water quality standards.

The Cliffs Erie - LTVSMC tailings basin permit (MN0054089) is among the EPA's top priority expired permits that have not been reissued despite the Joint Priority Agreement, as is the Northshore Mining Company– Peter Mitchell permit (MN0046981). The Northshore mine, which discharges to the Partridge River and is currently expanding into higher sulfate rock, has a permit with "monitor only" requirements for mercury, sulfate, copper, nickel, zinc and cobalt. (WaterLegacy, Comment on Northshore CWA Section 401 Certification, Nov. 4, 2015, with NPDES permit, Exhibit 31).

Neither future performance by PolyMet in response to unexpected contingencies nor water quality compliance by other mining facilities can be assumed. A cumulative effects analysis based on these assumptions is deficient and will fail to protect either adjacent waters in the Partridge and Embarrass River or waters in the downstream St. Louis River from cumulative violations of numeric and narrative standards and cumulative degradation of water quality.

4. The FEIS inadequately assessed the cumulative impacts of the PolyMet NorthMet project on wetlands, both indirect effects and ecological scale impacts.

EPA comments on the PolyMet NorthMet SDEIS recommended, "The FEIS should include indirect impacts in the analysis of cumulative impacts to wetlands." (EPA Comment on the SDEIS, Exhibit 1). The FEIS provides an inadequate and misleading response to this

recommendation.

The FEIS' tables only describe the cumulative losses to wetlands resulting from direct destruction of wetlands by the PolyMet NorthMet project. (FEIS, 6-58). For indirect effects, the FEIS says it is difficult to predict indirect wetland effects either for the proposed project or other mining developments. The FEIS then says, "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." (FEIS, 6-60). Read quickly, the FEIS seems to suggest that the upper bound of cumulative impacts on wetlands would be 12.0 percent. This is not the case.

If both the Partridge and Embarrass River watersheds are aggregated and indirect impacts are considered, the upper bound of cumulative impacts on wetlands is *17 percent*. This is calculated by dividing 11,693 acres of cumulative losses (3,085 acres under the no action alternative and 8,608 acres of loss from the NorthMet project) by the 68,251 pre-settlement acres of both watersheds combined. (See FEIS, 6-56, Table 6.2.3-2; 6-59, Table 6.2.3-5 for pre-settlement and no action alternative wetlands acreage).

However, since most of the cumulative losses from both PolyMet NorthMet project and non-project impacts are in the Partridge River watershed, this calculation understates the impacts to high quality wetlands in the Partridge watershed. The FEIS has provided the lower bound of Partridge River watershed cumulative impacts on wetlands since pre-settlement days. If there were *no* indirect impacts of the PolyMet NorthMet project on mine site wetlands whatsoever, that cumulative impact would be 10 percent. (FEIS, 6-58).

The FEIS does not segregate indirect impacts on the Partridge River watershed. But the GLIFWC analysis of mine dewatering impacts provides a best estimate of indirect wetlands impacts in the Partridge River watershed. Combining GLIFWC's wetland drawdown estimate (5,720 acres), direct wetlands impacts on the Partridge River watershed (768 acres)[52] and losses to the Partridge River watershed under the no action alternative (2,557) and dividing by the pre-settlement acreage of wetlands in the Partridge River (33,601 acres) provides the likely upper bound of cumulative wetlands loss in the Partridge River watershed based on evidence in this

[52] Derived from FEIS Table 6.2.3-4 and Table 6.2.3-5, which include only 10 acres of direct wetlands impacts in the transportation and utility corridor (5-266, Table 5.2.3-1) in the Partridge River watershed.

record.[53] Cumulative wetland loss and degradation in the Partridge River watershed since pre-settlement days resulting from the NorthMet proposed action could reach *26.9 percent*.

The FEIS not only failed to disclose the cumulative impact of the PolyMet NorthMet project on loss of wetlands acreage in the Partridge River, the FEIS provided no ecological scale analysis to consider the importance of Upper Partridge River wetlands and the 100 Mile Swamp in relationship to the Headwaters Site and the St. Louis River downstream. Tribal Cooperating Agencies requested this type of analysis in their Cumulative Effects Assessment, suggesting that this broader and more relevant spatial reference should also assess the cumulative degradation and destruction of the landscape resulting from extensive mineral exploration. (Tribal CEA, p. 41, FEIS autop. 3066).

The direct and indirect destruction and degradation of wetlands that would result from the cumulative effects of the NorthMet mine would take place in the 100 Mile Swamp and the Upper Partridge River Site, both identified by the Minnesota County Biological Survey (MCBS) as sites of high biodiversity significance. (WaterLegacy SDEIS Comments, Exhibit 30). The 100 Mile Swamp has been rated for the high quality of its peatlands, while the Upper Partridge River Site is designated due to numerous rare plant species recorded in the site.

The 100 Mile Swamp and the Upper Partridge River Site are immediately adjacent to the Headwaters Site, and together these important ecological locations form the headwaters of the St. Louis River, the largest United States tributary to Lake Superior. This spatial relationship is shown in Exhibit 35, a map contained in the MDNR's report, *An Evaluation of the Ecological Significance of the Headwaters Site*.[54] This report explains,

> The Headwaters Site straddles the continental divide, with water from the Site flowing both east through the Great Lakes to the Atlantic Ocean and north to the Arctic Ocean. Paradoxically, the divide runs through a peatland. Although the peatland appears flat, water flows out of it from all sides, forming the ultimate source of rivers that eventually reach two different oceans. The Site is the headwaters of four rivers: Stony River, Dunka River, South Branch Partridge River, and the St. Louis River, which is the second largest tributary to Lake Superior. (*Id.,* p. 1)

Understanding the ecological context of the mine site, the FEIS' cumulative effects assessment should have considered both the implications of other existing and proposed mines in

[53] Since this calculation assumes that other indirect impacts at the mine site would occur within the zones where drawdown impacts occur, it may slightly understate impacts.
[54] MDNR, *An Evaluation of the Ecological Significance of the Headwaters Site* (March 2007) http://files.dnr.state.mn.us/eco/mcbs/evaluations/lmf/headwaters/headwaters.pdf

the Partridge River and Dunka River watersheds, and the change that the NorthMet project alone would make in the peatlands and Partridge River headwaters. The NorthMet project, in combination with other existing and reasonably foreseeable projects, would shift maintenance of water quality in the Partridge River and "from natural systems (i.e., essentially an ecosystem service) to mechanical systems (e.g., the NorthMet Project Proposed Action WWTF and WWTP)." (FEIS, 6-83).

Wetlands destruction and degradation, combined with replacement of natural hydrologic systems in the 100 Mile Swamp and Upper Partridge Sites that would result from the PolyMet NorthMet project required the FEIS to consider the cumulative project impacts at an ecological scale, rather than merely totting up directly destroyed wetland acres. This was not done.

5. The FEIS improperly assessed and minimized cumulative impacts of the PolyMet NorthMet project on tribal rights and resources and environmental justice.

The FEIS failed to meet the obligations of federal agencies to fairly assess cumulative impacts of the PolyMet NorthMet project on tribal rights and resources. Federal agencies are obligated under NEPA to determine environmental justice impacts, including "the potential for multiple exposures or cumulative exposure to human health or environmental hazards in the affected population, as well as historical patterns of exposure to environmental hazards."[55] Army Corps' policy specifically commits the Corps to "meet trust obligations, protect trust resources, and obtain Tribal views of trust and treaty responsibilities."[56] The U.S. Forest Service Superior National Forest plan states that the Forest Service has a role in protecting tribal rights "because it is an office of the federal government responsible for natural resource management on land subject to these treaties" and that, "Superior National Forest facilitates the exercise of the right to hunt, fish and gather as retained by Ojibwe whose homelands were subject to treaty in 1854 and 1866." U.S. Forest Serv. Land and Resource Mgt. Plan, Superior National Forest 10-4, 2-37 (2004).

Rather than meeting these obligations, the FEIS minimized and concealed cumulative impacts of the NorthMet project on tribal rights and resources. Each failure of the FEIS to evaluate impacts on water quality, human health, wetlands and habitats has a disproportionate

[55] CEQ, Environmental Justice: Guidance Under the National Environmental Policy Act (Dec. 1997), p. 8 http://www.epa.gov/environmentaljustice/resources/policy/ej_guidance_nepa_ceq1297.pdf
[56] USACE, Tribal Policy Principles (2010), http://www.usace.army.mil/Missions/CivilWorks/TribalNations.aspx

impact on tribes. The PolyMet NorthMet project area is located on lands acquired by the United States on September 30, 1854, when the Chippewa of Lake Superior ceded ownership of the land to the United State, retaining usufructuary rights. (FEIS, 3-1) These lands are 1854 Ceded Territory lands, and any impacts on land use, historical sites, vegetation, aquatic life and wildlife in this Ceded Territory affect tribal resources and treaty rights and can disproportionately result in environmental injustice to tribes. Rather than addressing these impacts holistically as they would impact tribes, the FEIS has narrowed and trivialized each potential impact.

The FEIS rejected the request made by Tribal Cooperating Agencies to consider a larger historic district that would encompass multiple impacts on Ceded Territory. (FEIS, 5-566; FEIS autop. 3032-3033, Tribal CEA, pp. 7-8). The FEIS also denied effects of the project for two of the three historic sites identified by tribes as impacted (Spring Mine Lake Sugarbush, BBLV Trail Segment) and proposed no project modifications to address adverse affects to the third site, the Mesabe Widjiu. (FEIS, 5-535, 5-565).

The FEIS described and then minimized impacts to specific rare and endangered plants and animal species. (FEIS, Ch. 5.2.4, 5.25). The FEIS acknowledged that tribes have usufructuary rights to hunt, fish and gather, but offset any losses on the federal lands as offset by gains in subsistence resources on the more accessible lands proposed for exchange. (FEIS, 5-779). Tribal Cooperating Agencies requested a more robust and less mechanistic cumulative assessment of mining impacts on their Ceded territories:

> The Fond du Lac, Bois Forte, and Grand Portage Bands, as well as the 1854 Treaty Authority (1854) and the Great Lakes Indian Fish & Wildlife Commission (GLIFWC), have consistently advocated for a more robust, comprehensive CEA for the PolyMet NorthMet project and other mining projects. We have observed that current, historic, and 'reasonably foreseeable' mining activities have profoundly and, in many cases permanently, degraded vast areas of forests, wetlands, air and water resources, wildlife habitat, cultural sites and other critical treaty-protected resources within the 1854 Ceded Territory. As we have engaged with the lead federal and state agencies for the environmental review process under NEPA and the tribal consultation process under §106 of the National Historic Preservation Act (NHPA), we have clearly expressed our concerns for the incompleteness and inadequacy of their CEA. (Tribal CEA, p. 3, FEIS autop. 3028)

This request was denied. The FEIS neither recognized the cumulative impacts of mining nor the scale of tribal rights and interests. In every opportunity presented for analysis, the FEIS provided the narrowest possible approach.

This deficiency is illustrated in the FEIS' of cumulative impacts of mercury and methylmercury on fish consumption by Bands of the Lake Superior Chippewa. The FEIS recognizes that members of the Fond du Lac and Grand Portage Bands "are known to consume substantially more fish than the assumed statewide average" so that "potential increases in mercury bioaccumulation in fish tissue could therefore constitute an EJ impact for Band members and other subsistence consumers of fish." (FEIS, 5-591 to 5-592). However, as explained earlier in this Section and in Section I, *supra*, the FEIS only evaluated air deposition impacts on fish mercury in selected lakes, rather than the substantial impacts of *all* NorthMet project impacts on mercury methylation and bioaccumulation. The FEIS did not evaluated cumulative increases in mercury contamination of fish in Ceded Territory watersheds affected by the NorthMet project, downstream Fond du Lac reservation waters, or on Lake Superior fish spawned in the St. Louis River or its estuary, on which the Grand Portage Band may rely for subsistence fishing.

Even in its discussion of Fond du Lac enacted and approved water quality standards, the FEIS impermissibly limited consideration of cumulative impacts. The FEIS acknowledged that the Reservation's reach of the St. Louis River is attaining all of its beneficial uses and meeting all applicable water quality standards with the exception of mercury and that in-stream mercury concentrations in this reach exceed the Band's human health chronic standard of 0.77 ng/L, so "the Fond du Lac Band is especially concerned about any new or expanded discharges to the St. Louis River upstream of the Reservation that may adversely affect mercury bioaccumulation in fish in the St. Louis River." (FEIS, 5-20 to 5-21). But the FEIS failed to assess whether the PolyMet NorthMet project would cause or contribute to violation of Fond du Lac's water column standard for mercury or the Band's narrative water quality standards, including the prohibition on "further water quality degradation which would interfere with or become injurious to existing or designated uses." (Fond du Lac Water Quality Standards, Ord. #12/98 as amended, Sect. 301e.1; Appx. 1, Standards Specific to Designated Use; Sect. 105a.1).

The FEIS failed to evaluate the cumulative impacts of NorthMet project on St. Louis River Reservation waters that are already impaired due to mercury in fish tissue. By improperly narrowing its analysis, the FEIS also negated the NorthMet project's environmental justice impacts to tribes due to tribal consumption of mercury-contaminated fish.

The U.S. Army Corps recognized in its report on Treaty Rights and Subsistence Fishing in the Great Lakes Basin, "subsistence harvesting is a core value for these bands, and the right to fish and hunt for subsistence is cherished by all, even those who are not presently engaged in the practice. It is part of the tribes' cultural identity and an indication of their status as sovereign entities."[57] The Treaty Rights and Subsistence Fishing report also recognized the need for an integrated view of damage to tribal resources,

> Tribal traditions generally include a holistic view of the natural world in which natural features and phenomena are often imbued with a life force and in which the various species and features of the natural world are bound together in a web. Damaging one part damages the whole. (*Id*., p. 2)

The Co-Lead Agencies were obligated under law to assess cumulative impacts of the PolyMet NorthMet project on water quality, human health and particularly children's health, wetlands, tribal rights, tribal resources and environmental justice. The FEIS failed to do so.

CONCLUSION

On the basis of the foregoing analysis and the expert opinions, exhibits and other materials cited herein, it is respectfully requested that the Minnesota Department of Natural Resources determine that the PolyMet NorthMet FEIS is inadequate, that the U.S. Army Corps of Engineers and the U.S. Forest Service find the FEIS insufficient to support either a Section 404 permit or a land exchange for the PolyMet NorthMet Proposed Action, and that other state, federal and tribal agencies rely on the information provided herein to deny and object to any applicable permits and certifications for the PolyMet NorthMet project.

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[57] USACE, Treaty Rights and Subsistence Fishing in the U.S. Waters of the Great Lakes, Upper Mississippi River, and Ohio River Basins (June 2012), p. 2 http://glmris.anl.gov/documents/docs/Subsistence_Fishing_Report.pdf