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February 28, 2018

Commissioner Tom Landwehr
MN Department of Natural Resources
Division of Lands and Minerals
500 Lafayette Road, Box 45
St. Paul, MN 55155-4045

Re: Objection to the proposed PolyMet/NorthMet mine plan and permit to mine

Dear Commissioner Landwehr,

Friends of the Boundary Waters Wilderness ("Friends") objects to the issuance of a permit to mine to PolyMet Mining Co. This objection is submitted pursuant to Minnesota Rule 6132.4000, subp. 2.

In addition to this objection, Friends is a signatory on a Petition for a Contested Case Hearing that will be submitted by Minnesota Center for Environmental Advocacy. This objection letter should be read in conjunction with the Petition. Friends has earlier submitted comments objecting to the proposed water appropriations permit and dam safety permits. These permits overlap significantly with the permit to mine, and to the extent applicable, we incorporate by reference the objections raised in those submissions.[1] Finally, we note that the permit to mine application refers to a number of mine features and provisions that are found in the proposed NPDES/SDS permit and permit application. The Minnesota Pollution Control Agency ("MPCA") did not put this permit on public notice until January 31, and comments are due on March 16. Friends also intends to file an objection to the NPDES/SDS permit and to the Clean Water Act Section 401 certification. We expect that issues raised and materials submitted to MPCA by the MPCA deadline will be considered by DNR to the extent that they overlap with DNR's jurisdiction. We will submit copies of these materials to DNR when they are filed with MPCA.

The mission of the Friends of the Boundary Waters Wilderness is "to protect, preserve and restore the wilderness character of the Boundary Waters Canoe Area Wilderness and the Quetico-Superior ecosystem." As the mine site is within the Superior ecosystem, its protection falls squarely within our mission and within the interests of our 3,000-plus members and supporters. Our members recreate not only within the Boundary Waters Canoe Area Wilderness, but also in other parts of Minnesota's Arrowhead region, on federal, state, and county land. They paddle, fish, swim, and rice on the St. Louis River downstream from the proposed mine. Impacts on water quality from the mine could affect these activities. Many of our members hunt in the area, and many more enjoy seeing and being in the presence of

[1] Comments on the water appropriations permits are attached as Exhibit 1.

wildlife in its natural habitat. If the proposed mine is built, it will destroy habitat for species that are important to our members, such as moose, Canada lynx, wolves, northern goshawks, and great grey owls. The organization and our members care deeply about the ecosystems of Minnesota's northwoods, and are committed to ensuring that they will not disappear. The proposed mine would destroy hundreds of acres of natural communities that are already considered vulnerable or vulnerable/imperiled, and that will not be replaced.

Most Friends members are Minnesota taxpayers. They are also Minnesota residents who hope their grandchildren and great-great-grandchildren will live in Minnesota and enjoy the Superior National Forest and surrounding lands and waters as they do. The mining project as proposed presents risks to future generations that will include the descendants of Friends members. Those risks are both to natural resources, most especially clean water, and to their financial interests as taxpayers.

In addition to the reasons set forth in the Petition for a Contested Case Hearing and comments on the Water Appropriations and Dam Safety permits, Friends of the Boundary Waters Wilderness objects to the proposed mining operation and permit to mine for four reasons:

1. Friends is opposed to the creation of a polluted site that will be passed on to future generations for an indeterminate time that may extend beyond the life of current financial and regulatory institutions and infrastructure.

2. DNR has not required, and PolyMet has not provided, information necessary to determine whether natural resources will be adversely impacted.

3. The plan for hauling ore by rail will result in water quality violations.

4. The Wetland Replacement Plan is not supported by adequate information, proposes mitigation that the public has not had sufficient time to review, and will have an unacceptable impact on natural resources.

Each of these is addressed below.

1. Creation of a waste site needing perpetual water collection and treatment and perpetual maintenance of mine features cannot and should not be permitted.

The heart of Friends of the Boundary Waters Wilderness' objection to the proposed mining operations and permit to mine is that both rest on the premise that it is acceptable to create a contaminated site where water will need to be treated and infrastructure will need to be maintained in perpetuity. The Friends submit that it is both immoral and contrary to Minnesota law to knowingly create polluted conditions that will be passed on to future generations, particularly when the length of time involved is such that we cannot assume that our current financial and regulatory infrastructure will remain intact for as long as the pollution lasts.

DNR has gone to some length to avoid admitting and facing the fact that this is precisely what this mine would entail. For example, PolyMet and DNR have objected to use of the word "perpetual" in relation to this mine. One of the definitions of perpetual is "lasting an indefinitely long time;"[2] this definition fits the mine proposal quite precisely. And at any rate, the word that is used is immaterial. It is the situation that is being created, not the word that is used, that Friends objects to.

DNR has yet to address this issue in a head-on manner, despite (or perhaps because of) the fact that the issue has turned a majority of Minnesotans against sulfide mining in general, and the PolyMet project in particular. Rather than explain why it believes that perpetual water treatment and infrastructure maintenance is acceptable in light of the long-term uncertainty of human institutions, DNR avers that we do not know how long these activities will actually be required and that PolyMet is attempting to design a workable passive treatment plan. But that very lack of knowledge and of current technology strengthens the concern that DNR is deliberately turning a blind eye to the implications of the PolyMet mine plan.

The question as to the length of time for which water collection and treatment will be necessary is due to DNR's failure to require the necessary information and do the necessary analysis. Despite this failure, there is evidence in the record that indicates that after 200 years, water will still need to be collected and treated before it discharges to the environment. The trends show no indication of a foreseeable end date after 200 years.

Looking at predictions for the south toe of the tailings basin, where surface seeps have been most persistent, the predicted levels of some of the metals and sulfur at year 200 are:[3]

Constituent	Surface water quality standard at a hardness of 100	P90/P50 Predicted concentrations
Arsenic	53 ug/L	70/65 ug/L
Cobalt	5 ug/L	60/18 ug/L
Copper	9.3 ug/L	480/330 ug/L
Nickel	52 ug/L	600/200 ug/L
Lead	3.2 ug/L	72/68 ug/L
Sulfate	10 mg/L in wild rice waters	240/200 mg/L

[2] Dictionary.com, http://www.dictionary.com/browse/perpetual, accessed on Feb. 26, 2018.
[3] PolyMet, NorthMet Project Water Modeling Data Package Vol. II, Plant Site (Version 11), Attachment F (March 13, 2015) (FEIS Ref. PolyMet 2015j).

The data for the south toe shows a steady state with no foreseeable decline in concentrations after year 200.

Water seeping from the Category 1 stockpile and overflowing from the West Pit is also predicted to be significantly above water quality standards at year 200. These predictions show a steady state similar to the tailings basin at year 200 at the Category 1 stockpile, with slowly declining values for the West Pit for all constituents except copper, which is shown at a steady state.[4]

Constituent	Surface water quality standard at a hardness of 100	Category 1 stockpile P90/P50 predicted concentrations	West Pit P90/P50 predicted concentrations
Antimony	31 ug/L	90/54 ug/L	
Cobalt	5 ug/L	320/120 ug/L	40/20 ug/L
Copper	9.3 ug/L	650/240 ug/L	580/240 ug/L
Nickel	52 ug/L	6,500/2,200 ug/L	400/200 ug/L
Lead	3.2 ug/L	100/100 ug/L	6/4 ug/L
Sulfate	10 mg/L in wild rice waters	4,000/2,800 mg/L	
Zinc	120 ug/L	390/190 ug/L	180/60 ug/L

While Friends believes that these predictions are likely to be underestimated, this is the evidence PolyMet has provided as to what the water quality is likely to be and for how long. It clearly indicates that groundwater collection and treatment will be needed for centuries.

The failure to estimate how long water treatment and infrastructure maintenance will be needed itself runs afoul of the permit to mine statute and regulations. The statute requires that "A permit issued by the commissioner pursuant to this section shall be granted for the term determined necessary by the commissioner for the completion of the proposed mining operation, including reclamation or restoration." Minn. Stat. 93.481, subd. 3(a). The regulation states, "The term of a permit to mine shall be the period determined necessary by the commissioner for the completion of the proposed mining operation including postclosure maintenance." Minn. R. 6132.0300, subp. 3. The Statement of Need and Reasonableness (SONAR) for the nonferrous mining regulations explains, "The term of the permit, often

[4] PolyMet, NorthMet Project Water Modeling Data Package Vol. I, Mine Site (Version 14), Attachment G (Feb. 27, 2015) (FEIS Ref. PolyMet 2015m).

referred to as "life of the mine," is established in statute as a requirement of Minn. Stat. Chapter 93.481. To determine the extent of this life, the commissioner requires the submittal of information related to the ore body and the permittee's plans for development;" and, "Information related to the operating life of the mine is necessary for the commissioner to determine the extent of the term of the permit."[5] Pursuant to the statute and regulation, PolyMet must submit adequate information, and the DNR must make a determination as to the length of time that will be needed for all mine-related activities, including reclamation and postclosure activities.

a. Water treatment and infrastructure maintenance stretching for an unknown number of centuries is counter to DNR regulations.

The DNR nonferrous mining regulations taken as a whole evince an intent not to permit a mining operation that will need maintenance of infrastructure and water collection and treatment for an unknown number of centuries into the future. These regulations and the specific ways in which the PolyMet mine plan violates them are discussed in greater detail in the Petition for a Contested Case hearing. We discuss them briefly here in support of Friends' position that the regulations as a whole were not intended to allow a mine "reclamation" plan that requires perpetual water collection and treatment and perpetual maintenance of mine features.

i. The mine regulations require a goal of maintenance-free closure.

The regulation governing closure and postclosure maintenance states as a goal, "The mining area shall be closed so that it is stable, free of hazards, minimizes hydrologic impacts, minimizes the release of substances that adversely impact other natural resources, and is maintenance free." Minn. R. 6132.3200, subp. 1. While other provisions allow for ongoing maintenance if the goal is not met, that does not render the goal meaningless. Rather, this regulation is best interpreted as meaning that mine planning must include maintenance-free closure as a planned endpoint, with the understanding that if things don't go as planned, ongoing maintenance will be required. This simply has not been done for this project. From the start, PolyMet presented a mine plan that would need extensive, on-going activities for centuries after mining ends. DNR has whittled away at that plan over the years, but the fact remains that maintenance-free closure has never been and still is not a goal for this mine. This mine was planned from the start with the assumption that perpetual water collection, water treatment, and maintenance would ultimately be permitted.

Furthermore, allowance for *maintenance* in some situations is not the equivalent of allowing significant water collection and treatment, which are active, on-going activities. In light of the other provisions of the regulations and statements in the SONAR, the best understanding of

[5] Minnesota Dept. of Natural Resources, Nonferrous Metallic Mineral Mineland Reclamation Rules, Statement of Need (Exhibit 2).

"maintenance" that can be allowed and required would include minor, periodic activities such as inspections and repair of waste rock stockpile covers.

At the PolyMet site, even the activities that are appropriately termed as "maintenance" will be extensive. The tailings basin dam, the groundwater cut-off walls, the category 1 rock stockpile, the Virginia Formation pit wall cover, all will need to be maintained through many centuries to avoid additional water quality impacts. This is aside from the active activities of pumping groundwater and piping it to the treatment plant, pumping water from the West Pit and piping it to the treatment plant, treating water, and pumping it to discharge points. The number of long-term activities – both maintenance activities and active, on-going management – belie any claim that this mine was planned with the goal of maintenance-free closure.

ii. The mine regulations do not allow collection and treatment of water for a long-term, indeterminate period as a mine closure strategy

Other mining states are coming to the conclusion that mines that will require perpetual collection and treatment of water should not be permitted.[6] Although Minnesota's regulations do not use the term "perpetual care," they do include specific requirements for closure that ensure that a mine needing perpetual treatment will not be permitted. The Statement of Need and Reasonableness that accompanied the regulations when they were promulgated makes it clear that the reason for those requirements was to preclude the option of long term water treatment after mine closure.

Minnesota Rule 6132.2200 governs the handling of "reactive mine waste" after closure. To understand the scope of this rule, it is important to first understand what is meant by the term "reactive mine waste." According to the regulatory definitions, "mine waste" includes tailings, waste rock, and overburden, as well as the exposed rock in pit walls. Minn. R. 6132.00100, subp. 16. Thus for instance, the closing of the East and West Pit at the PolyMet Mine must meet the requirements for the handling of reactive mine waste if the exposed rock is "reactive."

"Reactive mine waste" is defined as waste "that is shown through characterization studies to release substances that adversely impact natural resources." *Id.,* subp. 28. In other words, "reactive waste" is not limited to waste that creates acidic conditions. Heavy metals can leach from rock under many conditions, some of which do not involve a low pH; whenever those conditions result in a release of metals that could adversely affect natural resources, the rock is deemed "reactive." Thus for instance, the PolyMet tailings will be "reactive" even if they do not result in acid drainage, because they have been characterized (by PolyMet's modeling) to release (at a minimum) copper, nickel, cobalt, lead, arsenic, and sulfate at levels far above surface and/or groundwater quality standards.

[6] For example, Michigan statutes provide, "Both the mining area and the affected area shall be reclaimed and remediated to achieve a self-sustaining ecosystem appropriate for the region that does not require perpetual care following closure." M.C.L.A. 324.63209.

Rule 6132.2200(2)(B) provides two possible means of handling reactive mine waste after closure. Either the waste rock, tailings, and exposed rock must be left in such a way that they are not "reactive" (i.e., they no longer leach heavy metals), or the facilities must be closed in a way that "permanently prevent[s] substantially all water from moving through or over" them. Taken together, the import of the regulations is that nonferrous mine waste and mine pits must be closed in a way that does not result in a significant amount of water that will have to be treated before it can be discharged to the environment.

The Statement of Need and Reasonableness makes it clear that the point of Rule 6132.2200(2)(B) was to preclude perpetual (or indeterminate, long term) water treatment as a planned closure option:

> [M]erely collecting contact water and treating it in order to meet water quality discharge standards, without a substantial effort to minimize the amount of water contacting the waste, has been rejected. While this method may provide acceptable results during active operations, when the permittee is present, the potential for longterm failure of such a system, when the operator is no longer available to correct the situation, is too great. *Because of the necessity to provide a permanent solution to the water quality concerns related to reactive mine wastes*, the two required methods of storing these wastes are the only reasonable methods currently available. (Emphasis added).

While PolyMet may claim that it will make a "substantial effort to minimize the amount of water contacting the waste," this phrase needs to read in conjunction with the regulatory requirement and the rest of the SONAR statement. In determining how "substantial" the effort needs to be, it clearly needs to be substantial enough so that "substantially all water" is prevented from moving through the rock. The real consideration is the amount and fate of contaminated water that would enter the environment if mitigation measures end or fail.

iii. The structure of the financial assurance requirements indicates that the long-term risks presented by this mine cannot be permitted.

The financial assurance regulation for nonferrous mining provides,

> The purpose of financial assurance is to ensure that there is a source of funds to be used by the commissioner if the permittee fails to perform: A. reclamation activities including closure and postclosure maintenance needed if operations cease; and B. corrective action as required by the commissioner if noncompliance with design and operating criteria in the permit to mine occurs.

Minn. R. 6132.1200, subp. 1. This point is emphasized repeatedly in the SONAR:

> The fourth requirement of this section, documents relating to financial assurance, are those deemed necessary by the commissioner to protect against the potential for expenditure of public funds . . . .
>
> The overall rationale behind this section is that there should be no possibility that public funds will have to be expended to correct accidents, reclaim lands, or rectify adverse effects resulting from a mining operation.
>
> Because of the importance associated with ensuring that funding will always be available in the proper amount . . .
>
> Section 6132.1200 of the proposed rule, requires that there be no possibility of public funds being expended to reclaim mine lands.
>
> [O]ne of the reasons for requiring reclamation, is to prevent the public from having to accept liability for abandoned mined lands . . . .
>
> Likewise, the commissioner wants to limit any future public responsibility in the event that the lands revert to the state through tax forfeiture, as has been the past experience with some mine sites.

It is thus clear that a fundamental assumption underlying the regulations is that they do not allow a situation in which the public could end up holding the bag for clean-up of a mine. And yet that is an entirely foreseeable outcome of the PolyMet mine plan.

The regulatory scheme is not designed to address unforeseen problems and expenses that are likely to arise at some point in the decades and centuries following mine closure at a mine that will need as much care and maintenance as this one will. The regulations provide that the permittee must provide financial assurance equal to the "contingency reclamation cost" if operations cease within the year. However, financial assurance for "corrective action" is provided for only if "the commissioner determines that a corrective action plan is required." Minn. R. 6132.1200, subp. 3 and 4(C).

In other words, financial assurance for corrective action is required only *after* something goes wrong. But if the problem occurs after mining has ceased, it is unlikely that the mining company will still be available to provide that financial assurance. The DNR was clearly aware of this when the regulations were promulgated; as quoted above, the SONAR notes that mine operators are generally no longer available after mining ceases, and goes on to say, "Past experience and observation by the commissioner, at former mining operations in Minnesota, has indicated that the permittee will want to have as little ongoing involvement with the site as practical, once the operations cease."

If there is to be "no possibility of public funds being expended to reclaim mine lands," the only possible interpretation of the regulations is that they do not allow the permitting of a mine that

involves a very long stretch of time after mining has ceased when problems needing corrective action could occur.

At least three features of the PolyMet mine plan present the possibility that costly corrective action will be needed decades or centuries after mine operations cease, when PolyMet is unlikely to have assets or income that could be used to provide financial assurance for corrective action. These features are:

1. Enormous pits that will slowly fill with contaminated water. That water will eventually leave the pits and travel toward the Partridge River. The migration of water from the pits will not begin until long after mining ceases, and both the quality of the water and the rate of flow are uncertain.

2. Two five-mile-long underground barrier walls and water collection systems that will need to remain intact and continually operational for centuries.

3. A tailings basin in which mine tailings are stored in a wet slurry behind a rock dam 230 feet high, which again will need to remain intact and fully functioning for centuries or even millennia.

The length of time that these mine features will remain on the landscape results in an inescapable likelihood that at some point over the centuries, something will go wrong. While it is impossible to say ahead of time what that will be, the odds are great that problems will arise that will require money to address. That money will not be there, and there will be no viable entity from which to require financial assurance for corrective action.

An example of a problem that may arise concerning the mine pits is that contaminated mine pit water may have a greater impact on the Partridge River than predicted. Contaminated water is predicted to begin leaving the East Pit and entering groundwater in Mine Year 21, the year after mining ends. Contaminated water is predicted to begin leaving the West Pit and entering groundwater in Mine Year 48, 28 years after mining ends. FEIS 5-117. PolyMet has provided predictions of how contaminated that water will be and what impacts it will have on groundwater and the Partridge River, but those predictions are highly uncertain for many reasons.

Mining projects are notorious for under-predicting their impacts on water quality.[7] In this case, PolyMet relied on many factors that are not well-understood or defined to reach its conclusions about the impact of mine pit water on groundwater and the Partridge River, presenting a

[7] *See, e.g.,* Jim Kuipers et al., Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements (2006) (Exhibit 3); Bill Slater and Sue Moodie,. Investigation of Predictions for Acidic Drainage at the Vangorda Plateau, Faro Mine Complex (Faro, YT) (MEND Report 1.70.1) (2008) (Exhibit 4); Laura Gauger PolyMet Decision: The Flambeau Factor (2015) (Exhibit 5a); Foth & Van Dyke, Prediction of Groundwater Quality Downgradient of the Reclaimed Pit for the Flambeau Project (1989) (Exhibit 5b); Flambeau Mining Co., 2013 Annual Report (2014) (Exhibit 5c).

likelihood that water quality will be worse than predicted. These factors are explained in geochemist Ann Maest's reports that were submitted during environmental review, [8] in addition to her report that will be filed with the Petition for a Contested Case Hearing. They include the use of analog mine data, the use of default adsorption factors, the failure to account for fracturing and faults in bedrock, unrealistic simplification of the heterogeneous hydraulic conductivity at the site, the failure to include the full range of pH values that have emerged in testing of Category 1 waste rock, the use of averaging in a number of inappropriate contexts, and the failure to account for uncertainty inherent in sorting large volumes of rock into categories based on sulfur content.

All of these factors contribute to an enormous amount of uncertainty in the water quality predictions, both for leachate from waste rock, tailings, and pit walls, and for impacted groundwater and surface water. The many layers of uncertainty in PolyMet's predictions and the history of underpredictions of water quality impacts from mining present the very real possibility that water quality in the pits and in groundwater discharging to the Partridge River will prove much worse than predicted, and will require a significant amount of money to address. But this may not be known until after mining ends, when money will not likely be available.

The length of time that the water collection and treatment systems and the tailings basin will need to remain operational presents another likelihood that some type of failure will eventually occur that will be expensive to correct. Here the problem is not the uncertainty in prediction methods but the statistical risk of problems over very long time frames.

For example, if the probability of a wastewater treatment plant malfunction and resulting release of polluted water to the environment is 1 per 50 years and wastewater treatment was planned to operate for 25 years, there would be a 50 percent probability of such an event during the life of the project. On the other hand, if wastewater treatment is planned for a 500-year period, 10 such events could be expected. Similarly, the probability of major failures resulting in severe impacts increase over time, to the point of certainty for some events. Complete failure of the treatment plant, a blowout of a groundwater containment wall, and catastrophic failure of the tailings basin are all events that have unacceptable probabilities of occurrence over the time frames that they may need to operate.

As explained elsewhere in this objection and in the Petition for a Contested Case Hearing, the mine plan runs afoul of several other provisions of the nonferrous mining regulations. Given what would otherwise be a gaping hole in the financial assurance requirements, it is clear that when taken as a whole, the nonferrous mining regulations were written to preclude the kind of operation that PolyMet has proposed. The provisions do not protect taxpayers from things that

[8] Ann Maest, Technical Memorandum Re: Comments on Polymet's Supplemental Draft Environmental Impact Statement: Water quality and geochemical issues (2014) (Exhibit 6); Ann Maest, Technical Memorandum Re: Comments on PolyMet Mining's Final Environmental Impact Statement: Water quality and geochemical issues at the proposed NorthMet Mining Site (2015) (Exhibit 7).

may go wrong decades or centuries after mining ceases because the regulations were intended to preclude the creation of environmental risks that do not manifest until long after the mine closes.

Nor is the problem remedied in this case by the provision of liability insurance or a percentage for contingency in the reclamation costs. As explained by DNR's consultants, the contingency percentage is designed to cover such things as underestimated costs, overlooked reclamation requirements, the costs for a third party to perform the work, state administrative costs, "holding years," and the like. "Other potential costs associated, for instance, to catastrophic events or future changes in environmental regulations and standards, are difficult to assess and may be better addressed by environmental insurance coverage or other vehicles."[9]

In this case, the insurance included in the financial assurance requirements is liability insurance, and is only $10 million. While this might be expected to cover natural resource damages, it would unlikely be an adequate amount to fix many of the potential causes of such damages. It is doubtful in any event that liability insurance would cover such expenses.

Ultimately, the only reasonable interpretation of the nonferrous mining regulations as a whole is that they do not allow the creation of the types of risks that could need financial assurance for corrective action that begins after a mine closes. Because the PolyMet mine as planned creates many such risks, the permit should not be granted.

b. The development of passive treatment is uncertain at best.

PolyMet and the DNR have attempted to assuage objections to the long-term implications of PolyMet's mine plan with promises of "passive" treatment to replace the waste water treatment plant at some unidentified point in the future. However, there appears to be no consideration of the uncertainty that passive treatment will ever be successful at this scale and at this site based on current knowledge and technology. Furthermore, passive treatment would raise its own potentials for failures that could need expensive corrective action. The Petition for Contested Case Hearing explains our conclusion that technology has not advanced to the point where we can assume that PolyMet will be successful implementing a passive system that meets regulatory requirements for waste water discharge.

2. The mine plan and permit are not supported by necessary data and information

Another primary objection to the issuance of a permit to mine is that some of the necessary work to characterize the site still has not been done. As frustrated as PolyMet supporters purport to be with the length of time that environmental review and permitting has taken, those of us who have concerns about the project are equally frustrated with the agencies' ten-year failure to require some of the most basic information and data.

[9] EOR, Spectrum Engineering, and JLT Consulting, Phase I – Task 1A Report, Financial and Technical Metrics (2016).

a. PolyMet has not adequately characterized the hydrology of the site

Friends pointed out in our comments on the water appropriations permit that a hydrological study of the site is required and has not been done. It is unfathomable that after all this time, this most basic requirement for understanding what is likely to happen at a site during and after mining has not been required or produced.

The lack of a hydrological study affects a wide range of water resource issues. Some of the implications include:

- The characterization of groundwater flowpaths is at best a guess, and at worse dishonest. The locations where groundwater from mine features will discharge to the Partridge River above SW-004a are unknown, and nothing has been done to ascertain this. We thus also do not know what the water quality impacts are likely to be over a five-mile stretch of the river.

- Virtually nothing is known about the likely impacts on wetlands surrounding the mine site due to groundwater drawdown. The agencies have settled on an absurdly low estimate of "indirect" wetland impacts, especially in light of the very high limits proposed for the water appropriations permits.

- Impacts on upper Partridge River and Yelp Creek flow have not been characterized. Modeling for the Supplemental Draft and Final EIS ignored the impacts of groundwater drawdown on river flow.

- Questions about the potential for northward flow of groundwater across the watershed divide after the closure of the Northshore Mine still have not been answered. We fail to see the wisdom in having PolyMet conduct this study after it has already been permitted and has begun construction of mine infrastructure.

To repeat our comments on the water appropriations permit:

The entire history of public review of this project has been punctuated by repeated calls from many parties for adequate hydrological investigation and modeling. Most recently, the organization WaterLegacy provided an expert report reviewing the assessment of impacts on wetland hydrology. The report was prepared by Jonathan Price, a Professor of Geography at the University of Waterloo who teaches hydrology and conducts research in the area of wetland hydrology. In particular, his work examines the impact of resource development, such as mine dewatering and contaminant transport on peatlands. Price has an in-depth knowledge of the type of hydrological study that is usually required and conducted prior to mine permitting. The Price report[10] is worth quoting at length:

[10] Jonathan Price, Evaluation of the Proposed NorthMet Mine on Local Wetlands (July 2017) (Exhibit 8).

> As an applied scientist who has worked with mining facilities and other extractive industries, the lack of information regarding the PolyMet mine site hydrology was striking. At the Victor Mine in Canada, for example, dozens of monitoring wells were required to identify area hydrogeology. In contrast, underlying consultants' reports and the PolyMet FEIS appear to rely heavily on a short-term pump test in a single well in one of the pertinent rock formations to reach their conclusions about the impacts of mine drawdown on wetlands and peatlands. From a scientific point of view, the information disclosed in the PolyMet FEIS and its underlying studies is inadequate to estimate impacts on wetlands.
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> . . . . .
>
> It is also my opinion that it would have been feasible and reasonable to secure sufficient data and use customary hydrologic modeling, such as the MODFLOW model, along with calibration and sensitivity analysis to provide a scientifically justifiable set of drawdown scenarios from the PolyMet mine and its potential impacts on wetlands and peatlands. Since PolyMet has used the MODFLOW model to estimate water inflow to its mine pits, a working model that could evaluate drawdown, and its sensitivity to the potential range of hydrogeological conditions in the bedrock underlying wetlands, is already available. PolyMet and its consultants disingenuously argue that the model cannot be relied on to make accurate predictions, yet rely on it to estimate water flows to the mine.

Price further explains,

> Had an appropriate hydrogeological study been done for the NorthMet mine, a more defensible map of the cone of depression could be drawn, as it was for the Victor mine – based on depth of overburden, primary conductivity of the bedrock, groundwater pressure and those fractures that were identified through testing. The area and extent of NorthMet drawdown impact on wetlands has not been reliably estimated because the NorthMet hydrogeology investigations rely on few direct measurements, and an analog that is not representative of NorthMet mine conditions.

Finally, Price provides a description of a minimally adequate hydrological study:

> 1. Additional hydrogeological testing must be done. At a minimum, monitoring wells into the Virginia Formation at the 200 ft and 1000 ft radial distance should be installed and be tested for hydraulic conductivity with a pump test at least 60 days in duration. Without this, the connectivity of the local hydrology of the 100 Mile Swamp to the NorthMet mining operation cannot be ascertained, and the sensitivity of the wetland to mine dewatering cannot be credibly argued.
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> 2. Given that the mine dewatering pumping rates have been modeled with MODFLOW for the FEIS and water appropriations permit application, it is clear that the model

domain and boundary conditions have been established, and the head distribution should be available. Model domain, boundary conditions, and head distribution along with pumping rate calculations should be presented, along with overburden thickness and a sensitivity analysis of hydraulic conductivity of the bedrock and overburden, to illustrate the range of potential drawdowns. This should be done following improved calibration as suggested by USACE (2016). While the local conditions can be exacerbated by connected fractures, the general extent of water table drawdown should be reasonably predicted for the system.

3. The implications of relatively small changes in hydraulic head on peatland water table should be recognized and quantified in terms of the potential change in recharge rates, and the map of wetland impacts adjusted accordingly. Isopleths based on MODFLOW modeling should replace those derived from the inappropriate analog. Potential cones of depression should then be presented, along with a scientific argument outlining the range of potential effects.

4. The peatland system should be evaluated in terms of its recharge/discharge relations (rather inexpensively) with hand-augured piezometers, coupled with drive-point piezometers installed into the mineral overburden sediments, in at least five representative locations. Hydrological measurements over a wet and dry period would ascertain the strength of the hydraulic gradients, and pumping tests could be done so the flux can be calculated. These data on recharge should then be integrated with the modeling and maps (#2 and #3 above) and used to evaluate the change in recharge likely in the case of a lowered water pressures resulting from NorthMet mine site dewatering.

This latest report echoes objections from the United States Environmental Agency (EPA) and the Great Lakes Indian Fish & Wildlife Service (GLIFWC) through the years, pointing out that the hydrological assessment done by PolyMet used unwarranted assumptions and inadequate data. Appendix C1 to the Supplemental Draft EIS consists of memos from John Coleman of GLIFWC, the first of which is dated 2008. Coleman has pointed out repeatedly that the lack of data regarding vertical conductivity and the assumption that bedrock vertical conductivity is extraordinarily low at this site casts doubt on any assessment of the likely impacts of groundwater drawdown. Although PolyMet prepared a sensitivity analysis using higher baseflow and horizontal conductivity parameters, the assumptions regarding vertical conductivity of the bedrock remained unrealistically low.

The EPA's objections to the lack of data that went into characterizing the hydrology of the site also begins with the Draft EIS. In February of 2010, the EPA wrote:

> The DEIS states "The MODFLOW model was not developed to accurately predict drawdown in the surficial aquifer or the impact, if any, such drawdown would have on adjacent wetlands and surface waters" (p. 4.1-60). Consequently, its use and ability to represent potential impacts due to pit dewatering and maintenance pumping are very

> limited. Furthermore, given this caveat to using MODFLOW to evaluate the effects of mine pit dewatering on the Partridge River flows, it is not the optimal tool for predicting this information.
>
> . . . . .
>
> Recommendations: The revised/supplemental DEIS should include an adequate hydrogeological and hydrological evaluation of the mine site. EPA maintains that additional data gathering is crucial to assessing impacts. Additional field data may be necessary. . . . . If models continue to prove uncertain in this area, we suggest reevaluating groundwater analysis and developing more protective management and mitigation measures. The same applies to the use of the model for evaluating mine dewatering impacts on the Partridge River.[11]

Particularly to address the potential northward flow issue, U.S. Army Corps of Engineers modeling experts conducted a review of the MODFLOW model. The review reiterates what has been said by PolyMet and the DNR before: the MODFLOW model was intended only to estimate groundwater inflows to the mine in order to size the wastewater treatment plant. The report's conclusion is that the model was acceptable for that purpose, but only because groundwater inflows are a relatively small percentage of the total water needing to be treated. The report states:

> This model is not an appropriate tool for investigating or predicting drawdown due to operations dewater or flow conditions post-closure. It is unclear how these predictions were used in or affect the final conclusions of the FEIS.
>
> . . . . .
>
> This model is not valid for investigating or predicting flow paths from the pits, drawdown during dewatering or post-closure groundwater conditions. The majority of the uncertainties discussed in this review have little impact on the flow calculations for the purpose of sizing a treatment plant, but may have significant impact on other uses for the model.[12]

Friends objects to the issuance of a permit to mine until a sufficient hydrological study has been completed.

[11] Bharat Mathur, EPA Region V Acting Regional Administrator, to Colonel Jon L. Christensen, St. Paul District Engineer, U.S. Army Corps of Engineers (Feb. 18, 2010) (Exhibit 9).
[12] U.S. Army Corps of Engineers, Final Review of NorthMet Mine Site Modflow Model (Aug. 2016) (Exhibit 10).

b. The efficacy of groundwater cutoff walls and collections systems has been overstated, with unknown implications for water quality impacts.

In the modeling done for the Final Environmental Impact Statement (FEIS), the contaminated groundwater containment systems at both the Flotation Tailings Basin and the Category 1 Waste Rock Stockpile were assumed to collect ninety percent of groundwater moving out of these facilities.[13] This is a level of effectiveness which to our knowledge has never been achieved before for a cut-off wall, drain, and pump type of system. WaterLegacy included a review of evidence regarding the effectiveness of these systems in its comments on the FEIS, which we incorporate here.[14]

The Petition for Contested Case Hearing includes a more detailed assessment of the likelihood that the containment systems will not operate as well as assumed in modeling done for the NorthMet project. The discussion here is limited to the point that if the permit to mine does not require the degree of efficacy assumed in environmental review, the DNR does not have the information necessary to conclude that there will be no adverse impacts on natural resources, and the permit cannot be issued.

The EIS co-lead agencies (including DNR) apparently accepted the assumption that the collection systems would collect at least ninety percent of leachate from mine features because the systems are designed to maintain an inward hydraulic gradient. Theoretically, any breach in the wall would result in water flowing into the tailings basin side of the wall, rather than water escaping from the tailings basin into the surrounding environment.[15] The EIS predictions of impacts on water quality below the tailings basin are based on the assumption that the inward gradient would operate at all times to keep water from escaping through the barrier. At the mine site, the decision not to assess impacts on Yelp Creek is equally based on the assumption that no groundwater would flow toward Yelp Creek from the Category 1 stockpile due to the constant maintenance of the inward hydraulic gradient.

It now appears that PolyMet will not be required to maintain an inward hydraulic gradient at the cutoff walls at all times. This change is buried in an appendix to the NPDES/SDS permit application; the only reference to operational requirements found in the Permit to Mine application is the statement that "Proposed performance monitoring for the FTB Seepage Containment System is described in Appendix C of Reference (4)." Permit to Mine Application p. 269.

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[13] For discussion of the containment systems as described in environmental review, *see* FEIS 3-47, 3-119, 5-51, 5-65, 5-76 to 81, 5-120, 5-145, 5-184 to 187; PolyMet, Groundwater Modeling of the NorthMet Flotation Tailings Basin Containment System, Att. C to Water Management Plan, Plant (FEIS Ref. PolyMet 2015i).

[14] Paula Maccabee, Comments of Water Legacy on PolyMet NorthMet Mining Project and Land Exchange Final Environmental Impact Statement 43-47 (Dec. 14, 2015) (Exhibit 11).

[15] As explained in the Petition for Contested Case Hearing and accompanying reports, uncertainty regarding the degree of the gradient and its consistency over the length of the cut-off walls calls this conclusion into question.

Reference (4) is PolyMet's NPDES/SDS permit application. Appendix C provides, "Successful containment system performance will be defined by: maintenance of an inward hydraulic gradient *during average annual conditions*; and consistent pumping rates, with changes attributable to weather." "Average annual conditions" is not defined. Although it downplays the risk, the permit application admits,

> *As long as heads are higher on the exterior side, there will be negligible flow escaping capture* through the cutoff wall. It is possible that there could be temporary localized ponding of water on the interior side of the cutoff wall during certain events, such as large rain events or snowmelt, *causing heads to temporarily be higher on the interior side* of the containment system than on the exterior side.

NPDES App. Appendix C (emphasis added). The draft NPDES/SDS permit provides,

> The Permittee shall maintain an inward hydraulic gradient across the Category 1 Waste Rock Stockpile Groundwater Containment System as determined by comparing water level measurements from the paired monitoring wells and piezometers taking into account temporary conditions that may result from short-term precipitation or snowmelt events.

NPDES Permit 41, provision 6.10.21. What is intended by "taking into account temporary conditions that may result from short-term precipitation or snowmelt events" is again undefined.

As far as we have been able to determine, it appears that no one – not PolyMet, not DNR, not MPCA – has assessed what this might mean for water quality, either in Yelp Creek and the upper Partridge River, or in the Embarrass River and its tributaries below the tailings basin. Given that the determination that there will be no significant water quality impact from this mine is dependent on the effectiveness of these systems, this is an assessment that *must* be done before the mine is permitted.

Over the length of time that these walls will need to retain their integrity, it is difficult to imagine that they will not develop cracks, openings between the bottom of the wall and the bedrock, or other preferential flowpaths. Furthermore, modeling indicated that *even with* an inward hydraulic gradient, there was some potential for contaminated water to escape through the upper, fractured portion of the bedrock.

In regard to the tailings basin, modeling indicated that any contaminated water escaping the system would escape through the bedrock aquifer, and would not surface until miles downstream. But the reversal of the hydraulic gradient for a period of weeks of snowmelt conditions could result in contaminated water escaping through the surficial aquifer and surfacing quickly in the wetlands and headwaters of Embarrass River tributaries, where the impact on water quality would be far greater. If a reverse hydraulic gradient is not required at

all times, or if PolyMet, DNR, or MPCA is not convinced that a reverse hydraulic gradient *can* be maintained at all times, the permit cannot be granted until a new analysis is done.

c. The predictions of water quality impacts are unreliable due to manipulation of and uncertainties in the mine waste characterization and water quality analyses.

Friends objects to the issuance of a permit that relies on a mine waste characterization that used inappropriate assumptions and data to estimate leachate quality and movement from mine features, including waste rock, pit walls, and tailings. The DNR did not appropriately account for uncertainties in modeling input when concluding that releases of leachate to groundwater and pit water would not adversely affect water quality. As a result, predicted impacts to groundwater and surface water may prove significantly underestimated.

The nonferrous mining rules provide:

> Persons intending to submit an application for a permit to mine shall meet with the commissioner to outline chemical and mineralogical analyses and laboratory tests to be conducted for mine waste characterization. This characterization will be used by the commissioner in the evaluation of the applicant's mining and reclamation plan.

Minn. R. 6132.1000, subp. 1. As the Statement of Need and Reasonableness for Rule 6132 puts it, "Such information is essential in determining whether mining can be allowed, or what type and degree of reclamation might be necessary to protect natural resources."

An expert report from geochemist Ann Maest submitted with the Petition for Contested Case Hearing along with her reports submitted during the environmental review process outline some of the ways in which the mine waste characterization and water quality analyses fail to meet industry standards and to present adequate information and data to support DNR's conclusions.[16] This objection incorporates the issues raised in the Maest reports.

Friends particularly objects to the lack of transparency in the use of what is termed "concentration caps." These "concentration caps" are based on observed sulfate and metals levels in water at three other mine sites, two of which are completely unrelated to the PolyMet site. These three sites are the local AMAX test site, which is at least in the Duluth Complex, and the Whistle Mine in Ontario and the Vangorda Mine in the Yukon Territory, which are not.[17] This analog data is used with no clear description of how the data points would compare to prediction methods based on humidity cell test data or other methods that assess rock from the mine site in the context of environmental conditions at the mine site.

In fact, it is unclear what is meant by the term "concentration cap." The phrase implies that only the highest value for each constituent at the analog site was used, and this value was

[16] *See* footnote 9.
[17] Waste Characterization Data Package Version 12 (FEIS Ref. 2015q).

substituted for any higher values that had been identified using NorthMet-specific data (thus "capping" the concentrations). This is difficult to discern from the record, but it appears that instead, the term is used simply to mean empirical data drawn from an existing mine site. In other words, rather than *capping* concentrations at a particular level, PolyMet appears to have used a range of data drawn from these other sites as direct inputs into the model.

Ironically, one of the analog mine sites used in PolyMet modeling was the subject of a Canadian government report comparing water quality predictions with subsequent monitoring data. The original predictions for that mine used analog data, and the report specifically cautions against reliance on this type of data.[18] The report found large discrepancies between predicted and realized zinc concentrations in water leaching from waste rock dumps. The report compared the results of modeling of long-term contamination that was done prior to mining with the results of modeling of long-term contamination done at the close of mining, when more field data was available.

> The largest differences in load estimates relate to predicted loadings from waste rock, where the pre-development estimates are substantially lower than the post-operations estimates, especially for Vangorda Dump. . . .
>
> It appears that the estimates of contaminant concentrations have the greatest variability from pre-development to post-operational modeling. The prediction methodologies for both modeling exercises were fundamentally quite similar. Both exercises relied on use of empirical data as the primary method of prediction. Both exercises also considered the results of humidity cell tests, but they used these results mostly for confirmation purposes. In both cases, the humidity cells predicted worse conditions than the empirical based models, but the adversity of these conditions did not lead to revision of modeling inputs and assumptions.

The report concludes:

> Reliance on seepage data from existing facilities as an empirical input for modeling should be done with caution. Unless the empirical data come from sites that have been in place for long periods of time, the empirical data could underestimate the future concentrations and loadings: travel times, wetting of dumps, attenuation, delays in onset of ARD, and complex chemistry with changing characteristics and driving forces over time. All of these parameters could result in lower empirical concentrations than those which may develop in the long-term. It should be stressed that the geology needs to be very similar between the ore bodies for the seepage data to be of much use.
>
> The results of laboratory testing (i.e. humidity cells) should be considered carefully. When modeling that utilizes laboratory testing indicates conditions more adverse than those predicted by modeling that uses empirical data, the laboratory based modeling

[18] *See* footnote 8 (Exhibit 4).

approach may warrant further consideration especially when the empirical data are from data sets with short time spans. The comparison for Vangorda/Grum suggests that seepage concentrations reflected by laboratory analyses may materialize, even if they are not present on the site.

Although the PolyMet Waste Characterization Package states that the analog mines have "similar characteristics" to NorthMet waste rock, no analysis is presented by which to conclude that the geology of the two sites is similar enough "to be of much use." Furthermore, monitoring data from Vangorda indicates that water quality is still deteriorating, indicating that taking earlier data to represent the highest that concentrations will get at the PolyMet mine may underestimate impacts.

We have not found an analysis of the HCT data in the PolyMet record that would allow a comparison of predicted leachate levels derived from HCTs to the analog mine data used in the GoldSim modeling. We submit that such a comparison is necessary to determine whether use of the analog mine data approximates likely conditions at the PolyMet site, and is truly "conservative" in the sense of over-predicting rather than under-predicting impacts. The comparison must include a **transparent** explanation of the methods and assumptions used to arrive at predictions based on HCT data.

Another way of saying this is to ask what the concentrations would be if they were not "capped." Only with a comparison of capped to uncapped concentrations can we understand the potential for the kinds of underpredictions that seem to be standard for the mining industry.

We also note that the modeling assumes the success of mitigation measures to reduce acid formation in the Virginia Formation pit wall and to bring East Pit pore water to a neutral pH. While we do not object to the use of these mitigation measures, the absolute assumption of their success is overly optimistic and makes the use of analog data from nonacidic conditions decidedly *not* "conservative."

The use of analog data creates just one of the many uncertainties in water quality predictions that are not reflected in the water quality modeling. While the modeling purports to present a full range of potential outcomes, in reality the greatest uncertainties were excluded from the model altogether. Until an assessment is done that covers the full range of uncertainty in water quality predictions, this mine should not be permitted because the DNR cannot determine that natural resources will not be adversely affected.

3. The plan for hauling ore will result in water quality violations in wetlands.

PolyMet continues with its plan to use refurbished side-dump rail cars for hauling ore despite modeling indicating that exceedances of water quality standards are likely to occur in a significant acreage of wetlands due to spillage along the haul route. The Great Lakes Indian Fish and Wildlife Commission, a contributing agency in the development of the EIS, has suggested

using new cars with sealed compartments to address this problem.[19] Friends agrees that such cars should be required for this project.

The PolyMet analysis indicated that 542.7 acres could be affected by copper in the spilled material to the point of exceeding water quality standards.[20] Smaller acreages of exceedances were predicted for cobalt and nickel. PolyMet subsequently agreed to refurbish the cars, and claims that spillage will be reduced by 97 percent, resulting in an estimated 16 acres of water quality exceedances for copper, a claim that the FEIS adopts.[21] The document referenced in the FEIS does not explain how the 97 percent reduction figure was arrived at, and includes no author or date. A footnote refers to a consultant, but no consultant is named. The document refers to a PolyMet visit to another site using recently refurbished cars, but the site is not named. In short, the estimate of the reduction in spillage that will be achieved by refurbishing the cars cannot be accepted without more support.

The 97 percent reduction figure was arrived at by assuming that the gaps on refurbished rail cars will measure 0.25" for the hinge gap and 0" for the door gap. But these parameters are not included in the permit to mine application or required in the Draft Special Conditions. Even if the proposed monitoring were adequate (which it is not), it is not sufficient to promise to address water quality problems after they develop. The record more than indicates that there will be water quality standard exceedances, and the permit must require measures to ensure that they do not occur.

The original modeling that produced the 542 acre estimate also likely significantly underestimated the level of impact. First, the modeling used the "concentration caps" used for modeling leachate from waste rock piles.[22] This is a complete misuse of data. The 2015 Waste Rock Characterization Data Package states, "The maximum concentrations of dissolved metals observed under field conditions result from multiple competing geochemical processes such as mineral precipitation and dissolution, sorption, desorption, and solubility of secondary minerals. The concentration cap, therefore, is primarily an empirical method for modeling the combined effect of these complex processes in field-scale waste rock stockpiles."[23] In addition, the modeling assumed a hardness of 100, an assumption that is almost certainly wrong for wetlands.[24] The listed model input parameters do not reveal the range in pH; low pH in bogs could also result in higher metal dissolution. Due to these factors, the impacts are likely to be underestimated.

Aluminum also has a high potential for exceedances of water quality standards along the haulage track. However, the analysis omitted aluminum because background surface runoff

[19] FEIS App. C.
[20] FEIS 5-314; Peter Hinck, Memorandum re: NorthMet Mine Site to Plant Site rail impact modeling (Dec. 21, 2012), (FEIS Ref. PolyMet 2015b, Att. E.)
[21] FEIS 5-164; PolyMet, PolyMet Rail Car Modifications Evaluation (Nov. 26, 2014) (FEIS Ref. PolyMet 2014a).
[22] FEIS Ref. 2015q, p. 102; FEIS Ref. 2015b, Att. E
[23] *Id.* p. 83.
[24] No baseline water quality monitoring has been done in wetlands at the site.

already has a 20 percent likelihood of exceeding the water quality standard. Modeling showed contact water leaving the spillage strip as containing aluminum at 80 times the water quality standard at the P50 level, and 360 times the water quality standard at the P90 level. Even if spillage is reduced by 97 percent, water leaving the spillage strip could contain aluminum at more than 10 times the water quality standard. Aluminum therefore must be considered in regard to this issue despite the lack of quantification of impacts.

PolyMet identified several mitigation possibilities that must be considered by DNR prior to issuing a permit. These measures are listed in FEIS Ref. PolyMet 2014a. PolyMet's analysis is limited to rating various aspects of each of the mitigation measures; no consideration of combining two or more measures is included.

The monitoring plan to determine impacts is also wholly inadequate. Monitoring is planned only for the streams, on the upstream and downstream side of the tracks. It is possible that upstream locations will also be affected by spillage. More importantly, this monitoring will not identify impacts on wetlands. Contaminants in streams are much more likely to be flushed downstream relatively quickly. PH levels will not reflect those found in bog wetlands.

We reiterate that baseline wetland water quality monitoring must be done before a permit is granted. Baseline monitoring and operational monitoring must include wetlands that are likely to have water quality impacts from rail haulage and/or other factors.

In conclusion, Friends objects to the permit as proposed because spillage along the haulage track will result in adverse effects on natural resources, i.e., wetlands. The permit should require measures that will eliminate spillage, along with a monitoring plan that includes wetlands along the track.

4. The permit cannot and should not be issued due to impacts associated with wetland fill and drainage.

Pursuant to Minnesota's Wetland Conservation Act, "Wetlands must not be drained or filled, wholly or partially, unless replaced by actions that provide at least equal public value . . . if a permit to mine is required under section 93.481, under a mining reclamation plan approved by the commissioner under the permit to mine." Minn. Stat. 103G.222, subd. 1(a). "Mining reclamation plans shall apply the same principles and standards for replacing wetlands that are applicable to mitigation plans approved as provided in section 103G.2242. . . . Public value must be determined in accordance with section 103B.3355 . . . ." *Id.*

Many of the principles and standards found in Minnesota Statute sections 103G.2242 and 103B.3355 and the implementing regulations have not been applied in this case. For example, PolyMet has not submitted adequate "wetland delineation field data, observation well data, topographic mapping, survey mapping, and information regarding soils, vegetation, hydrology, and groundwater both within and outside of the proposed wetland boundary" necessary to make wetland delineation and type determinations, as required by Minnesota Statute

103G.2242, subd. 2a(a). The public values of the wetlands that will be lost have not been "determined based upon the functions of wetlands" as listed in Minnesota Statute 103B.3355(a). To our knowledge, PolyMet has never submitted "a map showing the locations of any surface inlets or outlets, natural or otherwise, draining into or out of the wetland[s]," Minn. R. 8420.0330, subp. 3(A)(4).

Furthermore, our understanding is that the delineation of wetlands is still uncertain, based on an August 2017 letter from John Coleman of the Great Lakes Fish and Wildlife Commission.[25] Friends of the Boundary Waters Wilderness submitted a Data Practices Act request to the DNR on February 1, 2018 requesting documents or data relating to wetland delineation following an investigatory field trip by the DNR, Army Corps of Engineers, and PolyMet. DNR acknowledged the request on February 9, but has not yet provided documents or data.

PolyMet also has not done the most preliminary baseline monitoring of wetland water quality. This monitoring is necessary both to predict and to monitor impacts of the mining operations on wetland water quality. We will discuss this issue more thoroughly in our comments to MPCA, but include it here because we object to the issuance of a permit to mine before fundamental baseline monitoring has been done.

In addition, the amended permit application made available to the public on December 13, 2017 included a completely new and unexpected replacement plan for the proposed mitigation, after more than eight years of mine planning and review based on an entirely different plan. The new plan was not included in environmental review, and the permit application does not provide adequate information by which to determine whether the provisions of Minnesota Rule 8420 have been met. The only information about the wetlands proposed for replacement is that they are in a wetland bank. Despite the thousands of pages of materials that PolyMet has submitted as part of its wetlands application, none of those pages tell us whether the proposed wetland replacement replaces the public value of the wetlands lost, as determined by the functions listed in Rule 8420.0522.

For all of these reasons, Friends submits that DNR's determination that the wetland replacement plan application is complete was premature. Friends objects to approval of the wetland replacement plan at this time because necessary and required information is not included in the application.

Friends also objects to PolyMet's proposal for mitigation credits, the manner in which indirect impacts have been predicted, and the proposed mitigation plan for indirect impacts. We will submit more extensive comments on these issues to the U.S. Army Corps of Engineers, and will copy DNR on those comments.

[25] John Coleman, Technical Memorandum Re: Wetland mapping at the PolyMet mine site (Aug. 6, 2017) (Exhibit 12).

Finally, Friends objects to approval of the wetland replacement plan because of the impacts on two important natural resources that are specially protected under the regulations, without adequate mitigation.

a. The project as proposed would permanently adversely affect a rare natural community

In regard to the Northern Rich Spruce Swamp, we agree with the DNR that this is a "rare natural community" pursuant to Minnesota Rule 8420.0515, subp. 3. However, we disagree that the proposed mitigation would ensure that destruction of this acreage would not permanently adversely affect the natural community.

We are submitting internal DNR email correspondence and attached draft memos that Friends obtained through a Data Practices Act request to support the conclusion that Northern Rich Spruce Swamp is a rare natural community.[26] In addition, we note that Northern Rich Spruce Swamp was given an S3 rating (and thus is considered a rare natural community by the DNR) before the impacts of climate change were considered. A recent assessment by the U.S. Forest Service indicates that climate change will likely alter hydrology in many Minnesota forests, and that Forested Rich Peatlands (such as Northern Rich Spruce Swamp) may become particularly stressed by hydrologic variation. These communities are rated as "highly vulnerable" to climate change.[27]

Under Minnesota regulations, "A replacement plan for activities that involve the modification of a rare natural community as determined by the Department of Natural Resource's natural heritage program must be denied if the local government unit determines that the proposed activities will permanently adversely affect the natural community." Minn. R. 8420.0515, subp. 3. The BWSR/DNR Technical Guidance on application of this rule reads:

> Once a rare natural community has been identified at the project site, it is the LGU's responsibility (or the responsibility of DNR LAM Division, in the case of mining-related wetland replacement plans) to officially determine whether the proposed activity will "permanently adversely affect" the rare natural community. When making this determination, the LGU/DNR LAM Division should consider indirect, as well as direct, impacts that the activity may have on the rare natural community. This is a site-specific determination that involves the analysis of a number of factors including, but not limited to:
>
> •The permanence of the impact to the rare natural community;

[26] Email from Bruce Carlson to Doug Norris, Re: FW: FPn62, with Attachment: Rare Nat Comm Analysis_DNR Response Memo – DRAFT.docx (June 19, 2017) (Exhibit 13); Email from Hannah Texler to Doug Norris, Re: Polymet and FPn62, with Attachment: FPn62 significance and rarity summary Polymet.docx (May 31, 2017) (Exhibit 14).
[27] Stephen Handler, et al., Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis: A Report from the Northwoods Climate Change Response Framework Project, pp. 108, 134 (2014) (Exhibit 15)

- The scope of the impact, in terms of the size of the area affected and the extent to which the impact will alter the character and quality of the community;
- The potential for ongoing and reasonably foreseeable future impacts to those portions of the rare natural community that will remain, such as fragmentation, sedimentation/erosion, or introduction or spread of non-native, invasive species;
- On-site mitigation measures aimed at sustaining the rare natural community, such as setbacks, buffers, restrictive covenants and enhancement actions;
- Compensatory mitigation measures that restore comparable rare natural communities (preferably in the same watershed or ecological section) in a setting that will permanently maintain the native community attributes, or measures that permanently protect another at-risk rare natural community. WCA requires that wetlands affected by unavoidable impacts be replaced by wetlands of at least equal public value. Minn. Stat. § 103G.222, subd. 1. Consequently, the standard for replacing impacts to a rare natural community is quite high.[28]

DNR apparently plans to determine that the destruction of 225 acres of Northern Rich Spruce Swamp will not permanently adversely affect these natural communities due to the proposed mitigation. Friends disagrees with this determination. To begin with, the very fact that this type of community has an S3 rating indicates that we cannot afford to permanently lose any more of these communities. This is particularly true given the additional stresses the community type will face due to climate change. Adequate compensation thus must result in no net loss of this community type.

It appears that DNR is ignoring all of the considerations in the guidance except the last one. The mine would completely and permanently destroy a relatively large acreage of this community type. DNR likely knows very little about the actual character and quality of the communities that would be destroyed, because they have not been surveyed on the ground. An analysis of impacts to the communities is also nonexistent; for example, we do not know if some of this acreage is in areas where only part of particular communities will be affected, with potential indirect impacts "such as fragmentation, sedimentation/erosion, or spread of non-native, invasive species" or groundwater drawdown.

DNR also appears to be ignoring indirect impacts on additional Northern Rich Spruce Swamp communities that are not covered by the proposed mitigation. According to the USFS Report on Climate Change, these communities are vulnerable to small changes in hydrology:

> Forests that depend on a more stable regime of soil moisture or water levels throughout the year or between years may be more stressed by hydrologic variation—particularly Mesic Hardwood Forests, Forested Rich Peatlands, and Acid Peatlands (Minnesota DNR 2003). Peatlands have been shown to respond in a matter of years to water table fluctuations of a few inches, and the productivity and functioning of these systems could

[28] Minnesota Board of Water and Soil Resources and Minnesota Dept. of Natural Resources, Technical Guidance on "Rare Natural Communities" (Nov. 7, 2017).

be especially sensitive to the combination of water table variability and the direct effects of warming.[29]

This is particularly problematic for the communities surrounding the PolyMet Mine site and within the wetland impact area, because under the plan presented in the FEIS, mitigation will be required only when the groundwater level decreases significantly beyond a few inches. Friends objects to the Wetland Replacement Plan because it does not require mitigation for indirect impacts to Northern Rich Spruce Swamp communities.

Friends also objects to the mitigation options for direct impacts. The permit "draft special conditions" allow three alternatives for mitigation:

i. Transfer private lands containing FPn62 – Northern Rich Spruce Swamp to the United States Forest Service as part of the proposed NorthMet project land exchange. Any mitigation under this option will be at a 1:1 ratio.

ii. Restore previously disturbed or protect currently imperiled FPn62 – Northern Rich Spruce Swamp. Any mitigation under this option will be at a 1:1 ratio.

iii. Permanently protect FPn62 – Northern Rich Spruce Swamp through placement of a conservation easement or deed restriction over presently unprotected lands with this community type. Any mitigation under this option will be at a 2:1 ratio.

The guidance states that compensatory mitigation may result in "no permanent adverse effect" if it restores a comparable community or permanently protects an at-risk community. The first alternative for the PolyMet permit does neither. It does not require that the community that is included in the land exchange be at-risk. And given that the communities that will be destroyed are currently on U.S. Forest Service land, it is clear that putting these communities in the hands of the Forest Service does not permanently protect them. Friends thus objects to the first alternative as a mitigation option.

The third option is similar; it requires a deed restriction over lands that are "unprotected" as opposed to "at-risk." Given the statement in the guidance that "the standard for replacing impacts to a rare natural community is quite high," we submit that the definition of "at-risk" should be the same as it is when allowing preservation as mitigation for ordinary wetland loss.

Friends also objects to the mitigation ratios. Restoration of a community this specific is dependent on a limited range of hydrological conditions, pH, and other factors, some of which may not be clearly understood. The chances of successful restoration are not high. A higher ratio is needed to ensure that net acreage of this community type is not lost.

[29] *See* footnote 27.

Transfer of land to the Forest Service at a 1:1 ration or preservation at a 2:1 ratio are both completely unacceptable; at that rate, we could end up losing one-third to one-half of all acreage of a community that is vulnerable to extirpation in the state. Preservation should require an 8:1 ratio as it does for ordinary wetland mitigation.

Finally, Friends objects to the lack of specificity as to location for all three options. The guidance indicates that restored wetlands should be in the same watershed or ecological section; the same should hold true for preservation. PolyMet must look for opportunities for restoration of this community close to the mine site before using acreage at the wetland bank.

b. The project as proposed would have a significant adverse effect on a wildlife travel corridor

Pursuant to Minnesota Rule 8420.0515, subpart 4, "A replacement plan for activities that would have a significant adverse effect on a special or locally significant fish and wildlife resource that cannot be functionally replaced must be denied. These resources include . . . e. wildlife travel corridors."

According to the FEIS, two wildlife corridors would be affected by PolyMet mine operations. These corridors are numbered 16 and 17 in the Barr Wildlife Corridor Study,[30] and 11 and 12 in the EOR Study.[31] Regarding corridor 17/12, the FEIS states that the NorthMet project and activities at the Northshore Mine would result in "Direct loss and fragmentation; the NorthMet Project Proposed Action would reduce habitat to southeast of the corridor. The NorthMet Project Proposed Action would not physically encroach into the corridor, but noise and activities at the NorthMet and Northshore mine operations could discourage use during mine operations." FEIS 6-78.

The Barr report sums up the foreseeable cumulative impacts to travel corridors as a whole across the Mesabi Range, indicating that additional impairment of any corridor will be a significant adverse impact:

> In summary, of the 18 currently existing corridors, four will likely become completely impassable within the next 30 years as a result of planned mining activities. An additional five corridors will retain some functionality, but will be significantly degraded by future mining plans. . . . . Corridor cumulative effects may be greater than estimated here due to other future land uses not covered in this report.
>
> A total of 14 corridors will be left in the reasonably foreseeable future. As more corridors are lost, wildlife are forced to use increasingly marginal-quality corridors, which may also be partially impacted by future projects. As wildlife are increasingly

[30] Barr Engineering, Cumulative Effects Analysis of Wildlife Habitat and Threatened and Endangered Wildlife Species: Keetac Expansion Project (February 2009) (FEIS Ref. Barr 2009a).

[31] Emmons & Olivier Resources, Cumulative Effects Analysis on Wildlife Habitat and Travel Corridors in the Mesabi Iron Range and Arrowhead Regions of Minnesota (May 1, 2006) (FEIS Ref. Emmons & Olivier Resources, Inc. 2006).

> exposed to mining activity, roads, and urban centers due to the degradation of available corridors, the incidence of wildlife mortality within the corridors is likely to increase. Impacts to corridors in the middle of the Iron Range particularly limit wildlife options, since many species will not be able to migrate around the Iron Range at either end. Wide-ranging mammals such as wolves and lynx are not likely to be affected by these cumulative effects. Birds in many cases will fly over open pits (though many species are naturally averse to flying across large, open areas). The smaller species will be the most heavily impacted by the cumulative effects of corridor impacts and losses. Corridor dwellers and habitat specialists will be sensitive to habitat degradation in corridors scheduled for impacts. Individuals may be unable to migrate to the nearest remaining corridor. Genetic exchange may still occur, albeit more slowly, in species with a contiguous distribution on both sides and around the Iron Range; otherwise, populations north of the Iron Range may become genetically isolated from populations south of the Iron Range. In addition, these cumulative effects to corridors leave fewer options for escape during a catastrophic event, and hinder wildlife geographical shifts that may be necessitated by climate change.

Although mitigation was suggested in scoping and in the EIS, the draft permit to mine includes no mitigation measures for wildlife movement. The FEIS describes potential wildlife crossing measures, concluding, "Mitigation measures for wildlife species would be considered during the Endangered Species Act Section 7 consultation process." This statement is ironic in light of the conclusion in the Barr report that wolves and lynx are not as likely to be affected by the loss of corridors as smaller mammals. In any event, the Biological Assessment includes no consideration of mitigation for impacts to wildlife corridors.

The permit to mine application dismisses this issue, stating, "There are three wildlife corridors in the vicinity of the Project. All three are well outside of proposed Project activities, and none of them will be reduced, restricted, or otherwise altered from their current conditions. Therefore, no existing wildlife corridors will be affected by the Project."

Friends disagrees with this statement, and with PolyMet's apparent interpretation of the regulation. The conclusion that "no existing wildlife corridors will be affected" does not follow from the proposition that the corridors will not be physically altered. A wildlife corridor is no longer a corridor if there is no accessible habitat on the other side. As the Barr report, EOR report, and FEIS all recognize, fragmentation and isolation are significant adverse effects on wildlife corridors.

In the language of the regulation, the proposed wetland replacement plan is for mining activities that would have a significant adverse effect on a wildlife travel corridor. If that corridor cannot be functionally replaced through mitigation identified and required by the permit, the permit must be denied.

For all of the above reasons and for reasons explained in the Petition for Contested Case Hearing, Friends of the Boundary Waters Wilderness objects to the proposed PolyMet mining operations and to the issuance of a permit to mine.

Sincerely,

Jane Reyer
Advocacy Director