ENVIRONMENTAL ASSESSMENT WORKSHEET

This Environmental Assessment Worksheet (EAW) form and EAW Guidelines are available at the Environmental Quality Board's website at: http://www.eqb.state.mn.us/EnvRevGuidanceDocuments.htm. The EAW form provides information about a project that may have the potential for significant environmental effects. The EAW Guidelines provide additional detail and resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item, or can be addresses collectively under EAW Item 19.

Note to reviewers: Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. **Project title:** Northshore Mining Company Progression of the Ultimate Pit Limit

2. **Proposer:** Northshore Mining Company
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3. **RGU:** MN Department of Natural Resources
   Contact person: Ronald Wieland
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4. **Reason for EAW Preparation:** (check one)

   Required:
   ☐ EIS Scoping
   ☐ Mandatory EAW

   Discretionary:
   ☐ Citizen petition
   ☐ RGU discretion
   ☒ Proposer initiated

   If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s): NA

5. **Project Location:**
   County: St. Louis
   City/Township: Babbitt

PLS Location:

NE ¼	NW ¼	Section 30	Township	60N	Range 12W
NW ¼	NE ¼	Section 30	Township	60N	Range 12W
NE ¼	NE ¼	Section 30	Township	60N	Range 12W
SW ¼	SE ¼	Section 19	Township	60N	Range 12W
SE ¼	SE ¼	Section 19	Township	60N	Range 12W
SE ¼	SW ¼	Section 19	Township	60N	Range 12W
SW ¼	SW ¼	Section 20	Township	60N	Range 12W
NW ¼	SW ¼	Section 20	Township	60N	Range 12W
NE ¼	SW ¼	Section 20	Township	60N	Range 12W
SE ¼	NW ¼	Section 20	Township	60N	Range 12W
SW ¼	NE ¼	Section 20	Township	60N	Range 12W

Watershed (Major watershed 72, Rainy River Headwaters): Langley Creek reporting to the Dunka River. The Dunka River flows to Birch Lake, and eventually to Rainy Lake. Rainy River flows generally west-northwest from Rainy Lake, ultimately draining through the Winnipeg River, Lake Winnipeg and the Nelson River into Hudson Bay.

GPS Coordinates (at project center): 5279036.393 North, 582207.271 East (UTM NAD83, Zone 15 North)

Tax Parcel Numbers: 105-0060-04700; 105-0060-04660; 105-0060-03020; 105-0060-03140; 105-0060-03100; 105-0060-03060, 105-0060-03010

At a minimum attach each of the following to the EAW:

- County map showing the general location of the project (attached as Figure 5-1);
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (attached as Figure 5-2); and
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan (attached as Figure 5-3).

6. Project Description:

a. Provide the brief project summary to be published in the EQB Monitor, (approximately 50 words).

Northshore Mining Company proposes to progress the Ultimate Pit Limit within its Permit to Mine at its Peter Mitchell Mine to access additional economic taconite ore, consistent with Northshore’s long-term development plan for the mine. In this 108 acre progression, the taconite ore is overlain by Type II Virginia Formation (VF) rock that will be mined and stockpiled to access the ore. Northshore will permanently stockpile Type II VF rock from the progression on-site following a stockpile plan that minimizes contact of groundwater and runoff with stockpiled rock.

b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities.

Background

Northshore Mining Company (Northshore) owns and operates the Peter Mitchell Mine, an open pit taconite mine near Babbitt, Minnesota. Lean ore, rock and surface material are stripped and stockpiled on-site to access the valuable underlying ore. The mined iron ore is loaded into rail cars and transported to Northshore's processing plant located at Silver Bay, Minnesota for the production of taconite pellets and management of tailings. The mine has all the facilities required to meet the processing plant's ore demands at full plant capacity.

The mine has been in operation since the 1950's and has decades of iron ore reserves available for continued mining. The mine is being developed and operates in accordance with the MNDNR Permit to Mine and associated approvals. The Permit to Mine is based on a conceptual long term development plan and includes a process for approval of incremental development plans for the mine in accordance with Minnesota statutes and rules. The proposed project which is the subject of this EAW is an incremental development that would extend mining consistent with the conceptual long term development plan.

The proposed Project, which is the subject of this EAW, involves the mining of two metamorphic rock formations at the Peter Mitchell Mine. These are the Virginia Formation (VF) and the Biwabik Iron Formation (BIF). These formations are discussed in detail in Item 10, Geology, under the Bedrock Geology section.

The VF is further classified into Type I VF and Type II VF. These are defined in the Virginia Formation Development Plan[1] (Northshore 2004) as follows:

- Type I VF – Blast patterns containing Virginia Formation rock with whole rock sulfur content of less than 0.20 weight percent and NPR[2] greater than or equal to 3 for the pattern averages.
- Type II VF – Blast patterns containing Virginia Formation rock with whole rock sulfur content of greater than or equal to 0.2 weight percent and less than 1.0 weight percent sulfur, or with a NPR of less than 3.

Northshore is currently permitted to remove and stockpile Type I VF material following the Virginia Formation Development Plan, which has been utilized and referenced by the Minnesota Department of Natural Resources (MNDNR) and Minnesota Pollution Control Agency (MPCA) in previous permit amendments. The proposed Project will mark the first time Northshore has encountered in situ Type II VF material at the Peter Mitchell Mine. Northshore has developed and submitted to the MNDNR a Type II VF Stockpile Plan. The Stockpile Plan was completed in May 2013, and was made available to the public as part of Northshore's Permit to Mine amendment application.

[1] Northshore. 2004. Virginia Formation Development Plan. Cliffs Natural Resources, Northshore Mining, June 15, 2004.
[2] Neutralization potential ratio (NPR) is defined as the ratio of the acid neutralizing potential to the acid generating potential (ANP/AGP).

Major activities at the Peter Mitchell Mine typify current northeastern Minnesota taconite mining operations. Equipment employed at the mine is also typical of standard iron ore mining operations, and includes drill rigs, mechanized shovels, haul trucks, loaders, bulldozers and support vehicles. Typical proposed activities include the following:

- Removal of vegetation;
- Removal of surface overburden, stockpiling, and progressive reclamation;
- Removal of rock overburden, including VF and BIF, rock drilling, blasting, loading and hauling, stockpiling, and progressive reclamation of materials overlying the ore;
- Mining of BIF ore, including drilling, blasting (with standard mining blasting materials), removal, loading and hauling, crushing, storage, and rail loading for shipment;
- Management of water by transferring between sumps within mining areas, design and reclamation of stockpiles to minimize erosion, drainage of water to sumps for storage and water quality improvement, and pumping water from the sumps to two different treatment streams;
- Maintenance and support of mining and rail operations, maintenance shops and storage, and office buildings, etc.

The Proposed Project

The Peter Mitchell Mine operates under a Permit to Mine issued by the MNDNR Division of Land and Minerals. The current Ultimate Pit Limit (UPL) identified in the MNDNR Permit to Mine is proposed to be adjusted to allow the continued progression of mining in the Main Pit (area of the pit extending approximately 2 miles to the west of the permanent facilities; see Figure 6-1 and Figure 5-4). The principal components of the proposed Project include mining in the proposed UPL progression area, which includes the removal of Type II VF rock, and developing and implementing an engineered stockpile for Type II VF rock.

In this document, the term “the proposed Project” comprises all aspects of the proposed work, including the UPL progression into Type II VF rock and the Type II VF stockpile. When the project components are indicated separately, they are referred to as “the UPL progression” and “the Type II VF stockpile”, respectively.

<u>UPL Progression</u>

The UPL progression footprint includes 108.33 acres to the south of the current UPL (see Figure 6-1). This would extend the pit approximately 250 to 750 feet southward from the current UPL for a distance of about 1.5 miles directly west of the permanent Peter Mitchell Mine facilities. The boundary of the proposed UPL progression generally follows the southern limit of existing permitted wetland impacts across much of the area. Wetlands and wetland permitting are discussed in detail in Item 11*b* (*iv)*(*a*) and Figure 11-1.

Removal and stockpiling of overburden Type I VF rock and BIF rock would follow current mining practices and would be placed in permitted stockpile locations. Haul roads and stockpile locations are shown on Figure 6-2.

The estimated quantity and sulfur content of the materials to be removed during mining within the proposed Project area are detailed in Item 10, Geology, Table 10-1. The UPL progression would result in approximately 94 million long tons of total stripping, including overburden, VF and BIF rock. The UPL progression would not result in the mining or uncovering of any Duluth Complex rock, or VF bedded phyrrhotite rock.

<u>Type II VF Stockpile Design</u>

Mining and stockpiling of Type II VF material will include design, operation and reclamation practices that limit stockpiled Type II VF rock's exposure to water. Mining practices would include:

- Planning mine development to avoid exposing more Type II VF material than what is required to sustain the processing demands of the downstream operation.
- Designing benches along the UPL to minimize horizontal surface exposure of Type II VF material while maintaining safe operating conditions.
- Utilizing appropriate blasting techniques to limit generation of Type II VF fines, and to minimize the damaged rock zones at the ultimate pit boundary.
- Moving blasted Type II VF rock to the Type II VF stockpile in an efficient and timely manner.

Prior to mining, the sulfur content of the VF rock to be blasted will be estimated based on exploration drill core samples. If the average content of the material meets the criteria to be classified as Type II VF, it will be segregated and stockpiled on an engineered stockpile within mined-out areas on the north side of the pit.

During operations, seepage from the Type II VF stockpile will report to the pit sumps where it will mix with general pit stormwater runoff, groundwater inflows, and seepage from other stockpiles and ultimately discharge from the pit through the designated National Pollutant Discharge Elimination System (NPDES) discharge points. The mixture of runoff, groundwater and seeps currently collected in the sumps tends to be mildly alkaline due to its interaction with in-situ and stockpiled Type I VF and BIF rock already existing in the pit. The mildly alkaline nature of this mixture is expected to offset any low pH Type II VF stockpile seepage. The Type II VF stockpile is planned to be approximately 153 acres, located entirely within the existing UPL. The specific stockpile location is shown on Figure 6-3.

The design concepts for the Type II VF Stockpile Plan were developed by Golder Associates, Inc. (Golder), and are engineered to provide isolation of stockpiled Type II VF rock and minimize its contact with groundwater and surface runoff. The conceptual model for the Type II VF stockpile during operations is shown in Figure 6-4, and at closure in Figure 6-5. The minimum elevation for all stockpiled Type II VF material will be 1,600 feet above mean sea level (AMSL). The maximum predicted pit lake level upon mine closure under any current plan is approximately 1,500 feet AMSL, which is the current approximate minimum elevation at the east end of the pit, based on topography, at which the outfall would discharge to the Dunka River via the Unnamed Creek[3] tributary.

The design concepts for the Type II VF Stockpile Plan are:

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[3] In this document, "Unnamed Creek" refers to two different water courses. For discussions of post-closure, "Unnamed Creek" refers to a water course originating at the extreme northeast end of the pit and reporting to Dunka River. This is the outfall of the post-closure pit lake. For discussion of operations, "Unnamed Creek" refers to a water course originating at SD-002 and reporting to Dunka River via a series of wetlands. This is the operational SD-002 outfall.

- All Type II VF material will be stockpiled above the maximum pit lake water elevation at closure to prevent contact of ponded water with the stockpiled material.
- Type II VF material will be placed on top of and adjacent to a minimum 5-foot-thick layer of blasted rock, primarily BIF rock, with lesser amounts of Type I VF rock, which will act as a water conveyance layer to minimize or eliminate contact of groundwater and stormwater with Type II VF material.
- The BIF will contribute alkalinity, which would provide some undefined offset to low pH water associated with the Type II VF material.
- Stockpile configuration and height will be flexible such that a stable stockpile design is provided while: 1) minimizing the surface area and footprint of the Type II VF materials subjected to precipitation during construction, 2) minimizing net infiltration following reclamation , and 3) minimizing duration of exposure of the Type II VF materials to precipitation prior to placement of a final cover.
- The outer slope of the stockpile will be covered with Type I VF or BIF rock, with the crest of the covering rock extending a minimum of 20 feet beyond the Type II VF footprint, to prevent direct precipitation and runoff from contacting Type II VF rock.
- Final cover, including a geomembrane-backed geosynthetic clay liner (GCL), will be progressively placed on stockpile areas at the final elevation. Figure 6-6 shows a detailed cross-section of the proposed Type II VF stockpile cover. The cover system will provide a suitable growth medium to establish vegetation. The basal material below the cover will be compacted prior to construction of the bedding layer. The bedding layers and GCL will be installed using standard construction industry practices. The bedding layers will meet manufacturer's recommendations. The GCL will be manufacturer certified to meet a $5x10^{-10}$ cm/sec hydraulic conductivity or less. The cover will be inspected and surveyed during construction. Following construction, annual observations will be made to verify cover performance and DNR-approved control test plots will be monitored to assess GCL performance.
- The final cover will be reclaimed with an approved grass mix to control erosion and provide an area that is conducive to other post-closure uses.
- Final stockpile exterior slope lift height and bench width will be constructed using Type I VF or BIF rock to satisfy applicable reclamation requirements, as follows:
    - Final lift height for Type I VF or BIF rock on the outer slope will be limited to 30 feet (MNDNR Reclamation Standards, Minn. R. 6130.2400 A(1));
    - The minimum bench width will be limited to no less than 30 feet measured from the crest of the lower lift to the toe of the next lift (MNDNR Reclamation Standards, Minn. R. 6130.2400 A(2));
    - The sloped area between benches will be no steeper than the angle of repose (MNDNR Reclamation Standards, Minn. R. 6130.2400 A(3)); and
    - Benches shall be designed and constructed to control runoff (MNDNR Reclamation Standards, Minn. R. 6130.2400 A(4)).

Given the expected mine plan and mining sequence, the stockpile will be constructed over a period of approximately seven to ten years. The stockpile is expected to grow progressively each year as Type II VF is mined to access underlying ore; Type II VF rock will not be mined continuously or all at one time. A progressive reclamation plan will be implemented during stockpile construction so that exposure of the Type II VF rock is limited. This will reduce the potential for the onset of low pH drainage and metals leaching. The reclamation plan will also result in progressive growth of the stockpile and subsequent progressive placement of the cover before the stockpile reaches its final configuration and size.

The reclamation design criteria that have been developed provide for placement of a cover system over Type II VF rock within 30 months of placement in a stockpile. The 30-month criterion is based on the observed lag time before exposed Type II VF rock begins to create low pH conditions or leach metals. The Research and Productivity Council (RPC) conducted laboratory tests using humidity cells to determine that the lag time before development of low pH (drainage with pH less than 5.5) and metal leaching was at least 30 months (Golder 2012). The methods for humidity cell testing generally followed ASTM standards (ASTM D5744-96)[4], which tend to accelerate metal-mine rock weathering rates. As a result, actual time before commencement of low pH conditions or metals leaching from the Type II VF rock would likely be longer than the 30-month lag time estimated by the humidity cell testing. Nevertheless, placement of the cover over the stockpile will begin prior to 30 months to avoid conditions that could result in generation of low pH conditions or the leaching of metals.

<u>Time Frame</u>

The proposed Project is expected to meet the Peter Mitchell Mine's Main Pit area ore requirements for five to ten years. These requirements are consistent with the development plan for an orderly progression of mining iron ore over the life of the mine. Mining activities are scheduled to begin in the proposed Project area as soon as possible in 2014 upon receipt of required permits. Due to the progressive nature of mining activities, surface material must be removed first followed by removal of VF rock and BIF rock prior to accessing the underlying ore horizons. Typical mining schedules will include 1-1.5 million long tons of surface overburden stripping per year in the UPL progression. The Peter Mitchell Mine has sufficient stockpile capacity to handle the surface overburden.

<u>Reclamation</u>

Overall mine reclamation will be ongoing and will follow reclamation regulatory obligations described in the current Permit to Mine. Moreover, Northshore will consult with the Laurentian Vision Partnership, a regional coalition of mining, governmental, business and community interests that promotes the development of productive post-mining landscapes on the Mesabi Iron Range, for additional input on reclamation goals. Final reclamation plans will comply with MNDNR reclamation regulations.

Proposed Project BIF and Type I VF rock will be stockpiled in mined-out areas of the active pit. Proposed Project lean ores and rock will be stockpiled in mined-out areas of the active pit. Stockpiles will not disturb any new lands outside of the footprint of the proposed Project UPL. Specific considerations for the Type II VF stockpile have already been discussed above.

Surface stripping material will be placed on final stockpiles, which will be benched and reclaimed in accordance with current MNDNR reclamation standards. The Type II VF stockpile will be reclaimed using shallow-rooted grass species, to avoid root penetration into the stockpile cover. Other non-Type II VF stockpiles will be reclaimed to develop mixed habitats of hardwood and coniferous wooded areas, and open grasslands. Northshore, as an active member of the Laurentian Vision Partnership, has been and will continue to work with the Partnership to design and meet the reclamation goals for the site.

[4] Details on the deviations from the humidity cell testing method ASTM D5744-96 can be found in Appendices D and E of Golder, 2012.

<u>Wetland Mitigation</u>

The proposed Project would impact wetlands beyond the limits of currently permitted wetland mitigation. Northshore will address these additional wetland impacts through amendments to its existing Wetland Replacement Plan (dated March 2004 and approved by the MNDNR on August 10, 2006) and through amendments to its Clean Water Act 404 Permit #2005-1500-TWP, including CWA Section 401 certification requirements. See Item 11 for details on wetlands.

<u>Existing Watersheds</u>

Northshore's Peter Mitchell Mine resides on the south slope of the Giants Range, and straddles two major watershed divides, at approximately the mid-point of the current pit. The southwest half of the mine drains to the Lake Superior Basin, via the St. Louis River watershed. The northeast half of the mine drains to the Rainy River Basin, via the Rainy River Headwaters watershed. Figure 5-1 shows the major watershed divides in the region. Note that the major watershed divide bisecting the center of the pit as shown in Figure 5-1 is based on the approximate areas of the pit dewatered to each watershed. The watershed pillar that historically separated the two watersheds was removed under a MNDNR permit, and the divide is currently maintained by the placement and operations of the pit sumps. After closure, when dewatering ceases, the entire pit footprint will be within the Rainy River Headwaters watershed (Barr 2008).

The specific area in which the proposed UPL Progression and Type II VF Stockpile lie is entirely within the Rainy River Basin. No part of the proposed Project drains to the Partridge River or other parts of the St. Louis River watershed or Lake Superior Basin. Historically, the land on which the proposed Project lies was part of the Langley Creek watershed. Therefore, during active mining, water from the local subwatersheds of the proposed Project will drain to existing sumps and be pumped to Langley Creek, which reports to the Dunka River, and eventually to the Rainy River Headwaters watershed. Because of water quality management practices that require transfers within the pit, occasionally runoff and seepage may be moved to a sump that discharges to Unnamed Creek or SD-002, both of which also report to the Dunka River. Figure 6-7 shows the local subwatersheds draining to the pit in the immediate vicinity of the proposed Project, as delineated for the purpose of estimated inflow to the pit. These were mapped and labeled by Golder as subwatersheds A, B, and C, with subwatershed A the largest of the three. Runoff from the Type II VF stockpile will flow into an existing sump in subwatershed A. Water pumped from the sumps will continue to be subject to NPDES permitted outfall limits, to help meet water quality standards. The existing NPDES limits would not be exceeded as a result of the project.

Figure 6-7 also presents the subwatershed area tributary to Langley Creek that does not drain to the pit under existing conditions and for the proposed project (based on the current pit extent and data included in Barr 2008). The project reduces the surface area tributary to Langley Creek by approximately 2.6 to 5 percent of the existing surface watershed. The area removed from the Langley Creek watershed becomes tributary to the pit sumps, which are dewatered to Langley Creek and to the Unnamed Creek associated with SD-002 (not the same Unnamed Creek as the pit lake outfall). With the exception of occasional water management practices, the project is entirely contained within the Langley Creek watershed; no substantial hydrologic impacts to the pit lake outfall Unnamed Creek are anticipated until final pit closure. Note that the surface watersheds for the proposed Project differ from the watersheds anticipated at pit closure, which is presented in the *Long Range Hydrology Study* (Barr 2008). However, the southern edge of the proposed UPL is consistent with the final pit footprint that was the subject of the 2008 Barr study. In final closure, the pit lake will become tributary to Unnamed Creek, resulting in hydrologic impacts to

Unnamed Creek at that time. Figure 6-8 presents the watersheds to Langley Creek and Unnamed Creek in final pit closure. Note that the project area is entirely contained within the footprint of the pit lake in final closure.

<u>Watershed Reclamation</u>

Long term watershed reclamation concepts for the mine have been established and approved by the MNDNR (MNDNR 2011). The concepts involve alteration of the Langley Creek, Partridge River and Dunka River watersheds and mitigation including development of a pit lake with aquatic habitat enhancement. Aquatic habitat enhancement would be accomplished through strategic in-pit placement of overburden and waste rock. The long term watershed reclamation concepts are intended to meet MNDNR and Great Lakes Basin Compact agreement for developments that preceded the Compact.

Northshore Mining's reclamation plan is a result of a MNDNR permit that allowed the removal of an in-pit watershed pillar. That permit was contingent on a watershed mitigation plan that requires the pit to be reclaimed to a higher standard than those mandated by the MNDNR Taconite Mineland Reclamation rules with an emphasis on creating aquatic habitat. Foremost among these new requirements is the stipulation that a minimum 20% of the final pit lake area comprises littoral zones. These are the shallow portions of a lake that support a disproportionally large amount of plant and animal life compared to the deeper sections of a lake. Northshore is able to deposit part of its mined material back into the pit after the ore has been mined out. This allows a degree of control over the shape and depth of the final shoreline and by extension enables the mine to build large littoral zones into the final reclamation plan (Figure 6-9). Other parts of the reclamation plan include but are not limited to: the construction of islands for bird habitat, areas for fish spawning, public access to the lake (post-closure) and flooding organic debris to aid in the initiation of biological productivity.

The concept for the watershed reclamation plan was initially proposed in a 2008 *Long Range Hydrology Study* prepared for Northshore by Barr Engineering (Barr 2008). The plan has further evolved through Northshore's engagement of the Laurentian Vision Partnership involving the MNDNR University of Minnesota Landscape and Design Department and others with the focus on pit lake aquatic enhancement. Further details of the concepts are provided below as well as the watershed changes associated with the proposed project.

After mine closure, water from the entire mine, including the proposed Project, will flow into the pit lake, creating a deep aquatic habitat with at least of the pit lake area having 20% littoral zones. The pit will be flooded to approximately 1,500 feet above mean sea level, and ultimately discharge to the Dunka River via the Unnamed Creek tributary located on the east end of the mine pit. These actions are consistent with the watershed mitigation plan approved by MNDNR on February 11, 2011 (MNDNR 2011).

After mine closure, the current stream characteristics of Langley Creek are likely to change, because discharge from the pit sump to the creek will end. The channel may widen, and there may be loss of fish habitat. The changes to the current stream characteristics of Langley Creek estimated in closure include the incremental impact of the proposed Project, which is a small step in pit progression relative to what is presented in the *Long Range Hydrology Study*. Hydrologic impacts in post-closure are presented in the *Long Range Hydrology Study* (Barr 2008) and include an overall reduction in the Langley Creek watershed area of 46 percent and on overall increase in the Unnamed Creek watershed area of 450 percent, relative to existing conditions. The impact of the proposed project on the Langley Creek watershed is approximately six percent of the total Langley Creek watershed impact estimated in the *Long*

Range Hydrology Study (Barr 2008), and approximately three percent of the total impact to the Unnamed Creek watershed, relative to current conditions. Moreover, the proposed Project will not augment or magnify the expected changes to Langley Creek or Unnamed Creek stream characteristics post-closure beyond what is presented in the *Long Range Hydrology Study*, as the area of the proposed UPL progression is included in what is assumed will be the pit lake in closure (see Figure 6-8).

c. *Project magnitude:*

Area	**Acreage**
Mine Area:	~108.33 Acres
Stockpile Area:	~153 Acres*
Linear project length	NA ǂ
Number and type of residential units	0
Commercial building area (in square feet)	0
Total Proposed Project Acreage	***~261.33 Acres****

*Note: The UPL progression is 108.33 acres, representing new, currently un-mined area. The 153-acre Type II VF stockpile will be located within the existing mine pit. As a result, the total proposed Project acreage is 261.33 acres. However, only the UPL progression acreage will be new mining area outside of the existing pit.

ǂ This is a non-linear project.

d. *Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.*

The purpose of the UPL progression is to access additional ore reserves. Current economic evaluation of the ore reserves requires the progression of the current UPL, consistent with Northshore's development plan for orderly progression of mining ore within the Peter Mitchell Mine.

The purpose of the proposed Project's Type II VF stockpile is to segregate rock types and minimize contact of groundwater and runoff with the stockpiled Type II VF rock.

e. *Are future stages of this development including development on any other property planned or likely to happen?* ☒*Yes* ☐*No*
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

The box for Item 6e has been checked "yes," but only with regard to the UPL progression aspect of the proposed Project. The UPL progression is a stand-alone project that is expected to satisfy the Peter Mitchell Mine Main Pit mining requirements for five to ten years, depending on production requirements. There are no other stages planned that are directly related to achieving the objectives of the UPL progression. Nevertheless, the proposed Project is located on an active mining site. Part of the long-term plan for the Peter Mitchell Mine is to continue to develop the mine to the south and west. However, no specific plans have been developed for potential future progression of the ultimate pit boundary. Therefore, although additional progressions within the Mine are expected in the future, there will be no "future stages" of the Project proposed here.

There will also be no future stages of the Type II VF stockpile aspect of the proposed Project. The Type II VF stockpile is only designed and intended to address Type II VF materials associated with this particular pit progression. There will be no future additions made to the Type II VF stockpile. Northshore will address separately the presence of any Type II VF materials encountered in any future pit progressions. The need for environmental review of such efforts also will be evaluated when and if such materials are identified in future proposed progressions.

f. Is this project a subsequent stage of an earlier project? ☒ *Yes* ☐ *No*
If yes, briefly describe the past development, timeline and any past environmental review.

The box for 6f has been checked "yes," but again only with regard to the UPL progression aspect of the proposed Project. As its name implies, the UPL progression will be an extension of mining efforts that have existed for decades at the Peter Mitchell Mine.

The Stockpile aspect of the proposed Project, however, is not a "subsequent stage of an earlier project". In 2006, Northshore stockpiled materials blasted during the Reserve Mining bankruptcy period through an approved amendment to Northshore's Permit to Mine. This blasted rock included some Type II VF materials. The Proposed project will mark the first time Northshore has encountered in situ Type II VF materials as part of its own mining activities at the Peter Mitchell Mine, which is why Northshore has developed and submitted its Type II VF Stockpile Plan. Stockpiles created pursuant to that Plan for Type II VF material encountered during the proposed Project will be separate and distinct from the previous stockpiling of Reserve Mining blasted material and will not be "subsequent stages" of that previous stockpile.

7. Cover types: *Estimate the acreage of the site with each of the following cover types before and after development:*

Cover type	Acres Before	Acres After	Cover type	Acres Before	Acres After
Wetlands	62.83	0	Lawn/landscaping	0	0
Deep water/streams	0	0	Impervious surface	0	0
Wooded/forest	7.62	0	Stormwater Pond	-	-
Brush/Grassland	29.12	0	Barren Land	8.76	0
Cropland	-	-	Other (Mined)	153.00[a]	261.33[b]
			TOTAL	**261.33**	**261.33**

[a] Represents the 153-acre footprint of the proposed Type II VF stockpile. This area is in the mine pit.
[b] Represents the proposed Type II VF stockpile (153.0 acres), plus the UPL progression (108.33 acres)

Land cover within the UPL progression is primarily wetland with minor amounts of forest, grassland, and barren land (i.e. roads). See Figure 7-1 for the National Land Cover Database (NLCD) mapping of land cover in the vicinity of the proposed Project. The proposed Project would convert all land cover types within the 108.33-acre UPL progression to use as an active mine. Northshore has an existing U.S. Army Corps of Engineers (USACE) Section 404 permit and Wetland Conservation Act (WCA) approval that allow the removal of most of the wetlands, with mitigation for replacement of the lost wetland area. Northshore has filed a separate joint Section 404/WCA permit application with USACE and with the MNDNR to allow for the removal of additional wetland acreage not covered under the existing permit. Wetlands are discussed in detail in Item 11.

Land use within the Type II VF stockpile location is currently active mine land.

8. Permits and approvals required: *List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.*

Unit of government	Type of application	Status
MNDNR	Permit to Mine	Current Permit /Amendment Pending
USACE	Clean Water Act Sec. 404	Current Permit /Addendum Pending
MNDNR	Wetland Conservation Act	Current Permit /Addendum Pending
MNDNR	Water Appropriations	Current Permit Sufficient
MPCA	NPDES	Current Permit Sufficient
MPCA	Clean Water Act Sec. 401	Certification Pending for Project

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 9-18, or the RGU can address all cumulative potential effects in response to EAW Item No. 19. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 19

9. Land use:

a. *Describe:*

i. *Existing land use of the site as well as areas adjacent to and near the site, including parks, trails, prime or unique farmlands.*

The proposed Project and surrounding lands are designated for mining use within Northshore's existing Permit to Mine. There are no parks, trails, or prime or unique farmlands within or adjacent to the proposed Project.

ii. *Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.*

Lands within the proposed Project will be used for mining purposes.

iii. *Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.*

The proposed Project is entirely within the City Limits of the City of Babbitt and is zoned as “Minerals Mining”.

b. *Discuss the project’s compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.*

The proposed Project would result in the conversion of approximately 108 acres of undeveloped land to mine use. The conversion is compatible with surrounding land uses, which include mining and associated access roads and is zoned accordingly.

c. *Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.*

There are no land use incompatibilities resulting from the proposed Project, and mitigation would not be required.

10. Geology, soils and topography/land forms:

a. *Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.*

b. *Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 11.b.ii.*

Bedrock Geology

Bedrock geology at the Peter Mitchell Mine can be viewed as a relatively simple set of rock layers. Giants Range granite forms the base and is exposed on the north side of the Peter Mitchell Mine. The Biwabik Iron Formation (BIF) and Virginia Formation (VF) lie unconformably on top of the Giants Range granite and generally dip to the southeast at 5 to 10 degrees, except in the eastern end of the formations where they are in close proximity to the overlying Duluth Complex. In those eastern areas, the BIF and VF dip as steeply as 30 degrees. Due to glacial erosion, the BIF is exposed under glacial till for a width of 0.5 to 2 miles to the south of the Giants Range granite, and a band of VF is exposed farther south for a width of 200 feet to several miles. The upper bedrock is Duluth Complex, which approaches the BIF at an oblique angle in the vicinity of the Peter Mitchell Mine, eventually cutting the BIF off a few miles to the east of the mine. Figure 10-1 and Figure 10-2 show the cross-section of these geological relationships and the location of the cross-section extending across the UPL and south of the proposed pit progression. The UPL progression will impact only the BIF and the VF, which are described below:

- BIF: Including the ore to be mined and overlying lean ore, the BIF rock is between 225 to 350 feet thick within the UPL progression and is a thick-bedded, layered, sedimentary sequence. The gross mineralogy in the Eastern Mesabi Range (in which the Peter Mitchell Mine is located) largely consists of magnetite, quartz and iron-rich silicates. (Gunderson and Schwartz 1962 p.7). Iron content in the BIF ranges from 0% to greater than 30%. Analysis of iron content grades and processing characteristics are measured on a grid of exploration drillholes to determine which portions of the BIF can be economically mined as ore and sent to the Silver Bay plant for processing. BIF with low iron grades, or other poor processing characteristics, are stripped and placed in on-site stockpiles to allow access to underlying ore material.
- VF: The southward progression of the Peter Mitchell Mine requires the stripping and stockpiling of VF rock to access underlying BIF ore. In general, the VF comprises a sequence of argillite, siltstone, and greywacke, and contains trace amounts of sulfides. Pyrrhotite is the dominant sulfide within the VF with minor pyrite and chalcopyrite (Lucente and Morey, 1983; Severson and Hauck, 2008). In the vicinity of the Peter Mitchell Mine, the VF can generally be described as a somewhat laminated, fine-grained, light gray quartzose hornfels that is locally rich in biotite (Gunderson and Schwartz, 1962 p. 68). The VF exposed in the southern high wall of the Peter Mitchell Mine Main Pit, and as intersected by exploratory drilling, includes diabase sills, metasediments, and bedded VF (Golder, 2012). The term metasediments is used by Northshore to describe a variety of metamorphic textures that occur within VF rock in close proximity to the Duluth Complex. These textures are generally not continuous from drillhole to drillhole, but define rock of similar quartz / biotite composition. In the vicinity of the Peter Mitchell Mine, a variety of VF referred to as “bedded pyrrhotite” occurs which has a significantly higher sulfur content than other VF rock units. No occurrences of bedded pyrrhotite have been identified by exploratory drilling in the project area. Diabase sills appear locally within the Peter Mitchell Mine pit as basal sills of highly variable thickness (Grout and Broderick, 1919; Severson and Hauck, 2008; Severson, 1991) and consist of mafic amphibolites and metabasalts that are primarily fine- to medium-grained in texture, with minimal local coarse-grained texture.

Northshore has completed extensive characterization of potential VF rock stockpiling effects in cooperation with state regulatory agencies and following industry best practices. In 2004, a classification system, based on characterization results, was proposed to and later utilized by MNDNR for identifying and distinguishing VF rock at the Peter Mitchell Mine site, according to sulfur content and neutralizing potential (Golder, 2013). MNDNR has not formally approved the classification criteria, but has acknowledged the classification system by referencing it in permit amendments that MNDNR has granted to Northshore[5]. The VF classification, as defined in the Virginia Formation Development Plan (Northshore, 2004), is as follows:

[5] An example of MNDNR utilization of the VF classification is in a March 24, 2006 letter approving a PTM UPL amendment from Steve Dewar, MNDNR Mineland Reclamation Field Supervisor (at the time), to Doug Halverson at Northshore.

- Type I VF: Blast patterns containing Virginia Formation rock with whole rock sulfur content of less than 0.20 weight percent and NPR[6] greater than or equal to 3 for the pattern averages.
- Type II VF: Blast patterns containing Virginia Formation rock with whole rock sulfur content of greater than or equal to 0.2 weight percent and less than 1.0 weight percent sulfur, or with a NPR of less than 3.
- Type III VF: Blast patterns containing Virginia Formation rock with sulfur content of greater than 1 weight percent. Type III VF will not be uncovered during this proposed project.

Type I VF generally occurs at the base of the VF, directly above the BIF, and is composed of a mixture of VF rock, including the diabase sills. Type II VF generally overlies the basal VF sills and is predominantly made up of VF metasediments. A histogram showing the percent sulfur in the VF materials is available in Figure 3-16 of the May 2013 Golder Report.

Type II VF is expected to have significantly less potential to generate mineral fibers than Type I VF or BIF, because amphibole minerals present in the Virginia Formation are primarily associated with the diabase sills (Golder, 2012), which are generally categorized as Type I VF. In addition, the Virginia Formation is non-ore grade, so it would not be crushed and processed. Avoiding the crushing of Virginia Formation rock would result in a low potential for generation of mineral fibers.

Surficial Geology

Surficial materials are variable and include peats, glacial tills, water eroded glacial tills, and lake deposits (Jennings and Reynolds, 2005) associated with the Rainy Lobe glaciation. Peat lands are the primary surficial geology within the proposed UPL progression, especially within the western portion where they are interspersed with small bodies of open water. Glacial till within the UPL progression is generally clast-poor, variable in color, and consists of sand (21% to 38%), silt (29% to 38%), and clay (31% to 41%). The clay within the glacial till is interpreted to be localized incorporation of lake sediment from ponded water along Giants Ridge. Some water eroded till within the UPL progression has a smoother surface expression with coarser grain clasts at the surface. Lacustrine sediments are also present and include a mix of silts, clays, and organic matter. These lacustrine sediments are interpreted to have been deposited by Glacial Lake Dunka, which likely also formed the smooth, wave-washed surfaces, and which drained to the north along the current location of the Dunka River (Stark, 1977).

The thickness of surficial materials is highly variable and depends on local bedrock topography, the morphology of glacial landforms, and the associated deposit. In areas where peat is the predominant surficial geology overburden thickness can extend greater than 50 feet (Jennings and Reynolds, 2005), whereas glacial till tends to extend to approximately 20 feet below the surface (Minnesota County Well Index).

Groundwater

Groundwater is present in surficial deposits under generally unconfined conditions with surface waters in the western portion of the Proposed UPL. Water also occurs in bedrock, primarily within fractures or weathered zones, and typically near the upper surface of the bedrock. The bedrock generally has

[6] Neutralization potential ratio (NPR) is defined as the ratio of the acid neutralizing potential to the acid generating potential (ANP/AGP).

extremely low primary hydraulic conductivity and there is little to no yield of water unless secondary openings exist (Ericson et al., 1976; and Siegel and Ericson, 1980).

Currently, unconfined groundwater drainage generally mimics surface water drainage, and within unconsolidated deposits is locally directed along relatively short flow paths toward the nearby surface water features in the surficial peat deposits. Mine features, bedrock, low permeability till, and lake deposits disrupt flow through the surficial deposits in some areas (Siegel and Ericson, 1980). Locally, groundwater from the UPL progression and the area immediately to the south flows into the pit, where it is mixed with runoff and seepage and pumped through collection sumps for discharge to Langley Creek. Refer to Item 11*a(ii)* for further information regarding groundwater resources. Because of water quality management practices that require transfers within the pit, occasionally runoff and seepage may be moved to a sump that discharges to Unnamed Creek or SD 002.

Impacted Geologic Resources
In order to access the underlying ore, the proposed Project will require the removal of 1 to 1.5 million long tons of surface materials and 7.9 to 8.4 million long tons of bedrock each year within the 108.33 acre UPL progression, for a total of 9.9 million long tons of surface materials and bedrock removed annually over a ten-year period. Impacts related to the removal of this material will occur immediately adjacent to the existing mine, thus these activities are effectively an extension of current mining activities. Mining activities and the subsequent stockpiling of lean ore and rock are described in Item 6.b. The total estimated quantities of bedrock that will be impacted and are required to be excavated as part of operational activities are included in Table 10-1.

Surficial Materials
Surficial impacts will include the removal of surface materials within the 108.33 acre UPL progression. Past removal of surface materials, including similar soil, peat and wetland soils during Peter Mitchell Mine operations, has not resulted in exceedances of NPDES permit limitations, other than for pH, which are being managed. Therefore, additional permit exceedances are not expected to occur with the UPL progression. The contribution of surface materials to pH is negligible; surface materials are segregated and stockpiled in order to manage and monitor runoff. All types of surface materials excavated from the UPL progression will be available for use in reclamation, with most material to be placed on final stockpiles, which will be benched and reclaimed in accordance with current MNDNR reclamation standards. Surface materials on lands outside the UPL progression will not be used or disturbed as part of the project.

Bedrock
Excavated bedrock not used for processing will be stockpiled and managed in a similar manner to that described in Item 6.b.

Because stockpiles will be placed in previously mined areas, they will not disturb any new lands outside of the UPL progression. As such, impacts to additional geological resources are negligible because no ore resources are present within or under the proposed stockpile areas.

Given the site stratigraphy and pit configuration, BIF, Type I VF, and Type II VF formations will all be exposed along the pit's southern high wall. At the conclusion of mining, Northshore estimates from block model and geologic configuration that an exposure of approximately 10.9 acres of Type II VF, corresponding to an approximately 55-foot thick layer running the length the southern pit wall (approximately 8,600 feet), will be exposed above the elevation of the pit lake.

VF was previously mined in the early 1980s by Northshore's predecessor. The exposure of several VF outcrops allowed for the opportunity in 2002 and 2003 to observe weathering characteristics under natural conditions and to collect water quality samples from drainage impacted by VF exposures. The VF exposures had areas where precipitation would collect in ponds or sumps, providing locations to collect drainage samples for the investigation. If sampling locations that are within Northshore's mining areas and that could flow to Langley Creek had been directly discharged offsite at the time of the investigation (2002-2003), the discharges would have consistently met the most stringent water quality standards applicable to Langley Creek (NPDES permit issued June 27, 2002). An exception is exceedances of total aluminum and total copper, which were limited to isolated, discrete events occurring at certain specific sampling locations and were not representative of overall typical conditions. Because wild rice has not been found to be present during recent wild rice surveys, the surface water quality sulfate standard for wild rice is not applied. The study's detailed sampling location maps and collected water quality data are available in the Virginia Formation Development Plan (2004; revised 2008) submitted by Northshore to the MNDNR.

Table 10-1. Mining Material Estimates[1]

Formation	Excavated Quantities (long tons)	Sulfur Content	Neutralization Potential[2]	Total Excavated Quantity (long tons)
Biwabik Iron Formation (BIF) Ore	81,000,000	NA	NA	81,000,000
Lean Biwabik Iron Formation (BIF) Rock	55,000,000	<0.2%	NA	94,000,000
Type I Virginia Formation (Type I VF)	13,703,000	<0.2%	≥ 3:1	
Type II Virginia Formation (Type II VF)	16,297,000[3]	≥0.2% but <1%	< 3:1	
Surface Overburden	9,000,000	NA	NA	

1. Quantities of excavated units are from Northshore's Permit to Mine Amendment application to the MNDNR dated April 12, 2013.
2. For VF material to be classified as Type I, the material must have a sulfur content AND neutralization potential that meets the restrictions in the above table. For VF material to be classified as Type II, the material can have either a sulfur content OR neutralization potential that meets the restrictions in the above table.
3. The quantity of Type II VF includes the excavation of sills (6,571,000 long tons) and metasediments (9,727,000 long tons)

Soils and Topography

Natural Resources Conservation Service's (NRCS) Soils Survey Geographic Database SSURGO has identified soils within the UPL progression as Udorthents identified in soils mapping unit 1003B(Figure 10-3). Specifically, the Udorthent soils are loamy and consist of cut and fill material from previous mining and development operations. In uplands soils may typically be derived from glacial till and contain rock fragments. Upper soil profiles are relatively coarse stony loams or sandy loams. The loamy soils have moderate permeability and erodibility. Wetland soils and soils associated with peat lands may also be present in low areas and include peat, muck, and mucky loam.

Topography of the UPL progression is flat with little variability (<1% slope), especially in the western portion of the UPL progression where peat land areas occur within topographic depressions and contain small ponds of surface waters (Hobbs and Goebel, 1982).

11. Water resources:

a. *Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.*

i. *Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.*

Surface water resources in the vicinity of the proposed Project include lakes, streams, and wetlands as identified in Figure 11-1. The surface water resources, and their classifications per Minnesota Rules Ch. 7050.0140, are outlined in Table 11-1.

Table 11-1. Surface Water Resources in the Proposed Project Area

Surface Water	Public Waters Inventory # (Kittle Numbers)	Classification
Argo Lake	69-53	Class 2B, Class 3C, Class 4A, Class 4B, Class 5 and Class 6
Iron Lake	69-152	
Langley Creek	NA (H-1-92-14-5; H-192-14-5-1)	
Dunka River	NA (H-1-92-14)	
Unnamed Creek	NA (H-1-92-14-1)	
Partridge River	NA (S-2-57)	

Argo Lake and Iron Lake are listed as MNDNR Protected (i.e. Public) Waters. There are no other MNDNR Protected Waters within the vicinity of the proposed Project. Argo Lake and Iron Lake are north-northwest of the northern edge of the Peter Mitchell Mine. Argo Lake is a 83-acre basin ~1,600 feet from the pit edge, and Iron Lake is a 172-acre basin ~ 750 feet from the pit edge. The University of Minnesota Lake Browser tool (U Minn 2013) shows that both Argo and Iron Lakes have clarity depths ranging from ~2 to 3 meters. MNDNR has not assessed either lake for aquatic recreation or fish consumption. Neither lake will be affected by the proposed Project.

Dunka River is a 17.4-mile long small river that at its closest approach is ~0.25 mile northeast of the east end of the Peter Mitchell Mine. Most of the Dunka River is about one mile east of the mine. Partridge River is an 11-mile long small river that at its closest approach is ~1.1 mile south of the south edge of the Peter Mitchell Mine. Both rivers are warm-water streams, with generally broad, open channels, and occasional narrow riffles and scattered boulder fields. The proposed Project will have no impact on the Partridge River, as all operations discharges will be primarily to Langley Creek. No discharges from the proposed Project will flow to Partridge River.

Langley Creek is a 3.9-mile long small-medium creek that at its closest approach is ~0.85 mile southeast of the south edge of the Peter Mitchell Mine (Figure 11-2). Langley Creek flows into Dunka River. Over most of its length, it is a well-defined, warm-water open channel, becoming shallow and narrow further west. Finally, “Unnamed Creek” refers to two different water courses. Post-closure, “Unnamed Creek” refers to a water course originating at the extreme northeast end of the pit and reporting to Dunka River. This is the outfall of the post-closure pit lake, and all post-closure discharge will report to this “Unnamed Creek”. During operations, “Unnamed Creek” refers to a water course near the southeast end of the pit, originating at SD-002 and reporting to Dunka River via a series of wetlands. This is the operational SD-002 outfall.

No impaired waters or special designations listed on the current MPCA 303(d) Impaired Waters List are located within 1 mile of the proposed Project. The proposed Project is located within the Langley Creek watershed as defined by current permitted discharges but is part of an overall pit expansion that will ultimately also impact the watershed of Unnamed Creek to the Dunka River, as described in the *Long Range Hydrology Study* (Barr 2008).

There are a total of 62.83 acres of wetlands within the proposed project area. These wetlands are primarily forested/scrub-shrub types partitioned by internal mine roads (Table 11-2). Of these wetlands, approximately 50.74 acres are currently permitted for impacts under Section 404 through USACE. An additional 12.09 acres of wetland--shallow marsh (10.15 ac), alder thicket (1.21 ac), and shrub-carr (0.73 ac--are not covered under the existing permit. Northshore will apply for a Section 404 permit for these impacts pending EAW approval. The removal of the additional wetland acreage will also require a permit amendment under the State Wetland Conservation Act (WCA). The approving authority for WCA permitting for these wetlands is the MNDNR Division of Lands and Minerals.

Table 11-2. Wetland Types within the Proposed Project Area

Wetland Types Following Major Classification Systems[1]					
Eggers & Reed		**USFWS Circular 39**		**Cowardin et al.**	
Classification	Area (ac.)	Classification	Area (ac.)	Classification	Area (ac.)
Shallow marsh	20.40	Type 3	20.40	Palustrine emergent	20.40
Alder thicket	1.21	Type 6	20.90	Palustrine scrub-shrub	20.90
Shrub-carr	19.69				
Coniferous swamp	21.53	Type 7	21.53	Palustrine forested	21.53
Total	62.83	Total	62.83	Total	62.83
[1] Included in the total are 50.74 acres of wetlands that are currently permitted under Section 404 and WCA permits. The remaining 12.09 acres of the total will require Section 404 and WCA permits for their removal.					

Northshore contracted with Barr Engineering to conduct wild rice surveys in Dunka River, Langley Creek and Unnamed Creek during 2013, and no wild rice was found. A report on the wild rice surveys was prepared and submitted to the MPCA[7]. Wild rice was previously found in Dunka Bay of Birch Lake.

ii. Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.

Groundwater resources in the immediate vicinity of the proposed Project area include the following:

[7] Barr Engineering Company (Barr). 2013. Wild Rice Literature Review and 2013 Field Survey for the Peter Mitchell Mine. Technical Memorandum to Nathaniel Schroeder, Northshore Mining Company. December 11, 2013. p. 8-11.
Barr Engineering Company (Barr). 2011. Wild Rice Literature Review and 2011 Field Survey for the Dunka Mining Area. Technical Memorandum to Craig Hartmann, Cliffs Erie. December 20, 2011. p. 6-13.

- Surficial aquifers – These are present in the various unconsolidated glacial deposits above the rock surface. The depth to groundwater (i.e., water table elevation) in these aquifers generally mimics surface water drainage patterns, and groundwater flow is locally directed along relatively short flow paths toward the nearby surface water features and wetlands shown in Figure 11-1. Groundwater in the surficial aquifer immediately south of the proposed Project area flows into the mine pit, with the flow being constrained by the hydraulic conductivity of the materials. Groundwater will continue to flow toward the pit post-closure. Refer to "Discuss Effects to Surface Water and Groundwater from the Mine Water Discharge" in Item 11.b.i below for details.
- Bedrock aquifers – The BIF is considered a usable groundwater resource along the Iron Range primarily because abandoned mine pits provide a storage reservoir adequate for municipal water supply. In addition, there is sufficient fracturing in some locations for individual residential well water supply. The VF is generally not considered an aquifer due to its low storage capacity. However, on a localized basis, there is groundwater within fractures or weathered zones, typically near the upper surface of bedrock.

Figure 11-3 shows wells recorded in the Minnesota County Well Index. All identified wells within the immediate vicinity of the proposed Project area are exploration or monitoring wells. As indicated on Figure 11-3, there are no residential wells identified in the Minnesota County Well Index in the immediate vicinity of the proposed Project. The proposed Project is not within a Minnesota Department of Health (MDH) wellhead protection area.

The bedrock groundwater level in the UPL progression is influenced by the elevation of water in the mine sumps, and the fact that the mine is actively dewatering those sumps. Groundwater in the bedrock adjacent to the mine flows into the mine pit because the sumps depress the static water level in the immediate vicinity of the mine. The nearest BIF well identified in the Minnesota County Well Index is approximately 15 miles from the UPL progression.

b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.

2) If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.

3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges.

The Peter Mitchell Mine produces sanitary wastewater, stormwater, miscellaneous industrial wastewaters and mine water. Each of these has treatment systems that are addressed under the existing NPDES/SDS permit.

There will be no change to the sources, quantities or composition of the sanitary or industrial wastewater produced at the mine. The proposed Project will result in some changes to mine water produced at the proposed Project location. The proposed project will only affect mine water; therefore, the rest of this section describes mine water sources, quantity, composition, treatment methods, discharge points, and effluent limitations to mitigate impacts. It also discusses effects to surface and groundwater from the mine water.

Mine Water Management Overview

During the operational life of the mine, the sources of mine water are precipitation runoff and groundwater inflows, which drain to the mine pit sumps. The sump water is discharged to receiving streams in accordance with the MNDNR water appropriation permit requirements to maintain base stream flow and NPDES permit discharge limits. These mine water sources would exist regardless of the implementation of the proposed Project.

After the mine closes, sump pumping will stop and the pit water will fill to its runout elevation. The resulting pit lake will eventually overflow to Unnamed Creek and discharge to the Dunka River. Similar to the case of sump water, this pit lake overflow will occur regardless of whether the proposed Project is implemented. The specific nature of the pit lake design and overflow is subject to the closure and post-closure requirements of the Permit to Mine.

Also, with the cessation of sump pumping, the flow to the receiving streams will be decreased because the loss of watershed from mining activities would no longer be mitigated by pumping. The flow of Unnamed Creek will initially decrease at closure, once pumping stops and the pit lake fills. Once the pit lake level reaches the outfall at Unnamed Creek, flow to the creek will increase, and will reach Dunka River via Unnamed Creek. An evaluation of the anticipated effect of the proposed Project on the quantity and quality of mine water is contained in the sections below for the operations and closure scenarios.

Finally, the mine employs ongoing progressive reclamation practices in conjunction with sump water management to meet water quality discharge limits. The proposed Project will continue to employ these systems and practices, and will further supplement the current mine water management practices with the addition of the Type II VF stockpile design, management of a DNR-approved test plot program, supplemental sump water monitoring, and a contingency plan that would provide additional sump water management practices if necessary. Water quality is projected to meet applicable standards.

Quantity of Mine Water

During operations, the mine water to be discharged from the proposed Project would flow to the Block 9 Bn7 sump and the Block 15 Bn5 sump, shown on Figure 11-2. The quantity of water received at these sumps due to the proposed Project would primarily be from increased precipitation and runoff to the sumps as a result of mined watershed draining to the sumps, and secondarily from an increase in groundwater flowing into the proposed Project mine area. A minimal increase in runoff and groundwater inflow is expected due to the Project and is discussed further below. The size of the proposed Project is small relative to the size of the overall mine pit and therefore would contribute a relatively small change in the sump discharge.

Most of the groundwater inflow into the existing pit is from the unconsolidated surficial deposits that lie on top of bedrock. This is similar to other pits in the area, such as the Dunka pit, where analyses of pumping records and pit water levels has demonstrated that nearly all of the groundwater inflows into the pit are from the surficial deposits. Lowering the dewatering level in the pit is not expected to cause substantial increases in groundwater inflows because the deeper portions of the Biwabik Iron Formation are less fractured and therefore less permeable than the shallow portions. Furthermore, contributions of groundwater inflows from the Pokegama quartzite (to the north) and the Virginia Formation (to the south) will be negligible because these units have a substantially lower permeability than the Biwabik Iron Formation.

The amount of the water currently discharged from the Block 9 Bn7 and Block 15 Bn5 mine pit sumps was calculated as part of the water quality evaluation study for the Type II VF Stockpile. The study used mine pumping records to estimate annual average discharge at 2629 gpm (Golder 2013). Modeling was then completed to estimate contributions from various sources, as shown in Table 11-3.

In addition, as part of the water quality evaluations for the Type II VF stockpile design, upper and lower bound water balance conditions were developed to bracket possible water quality changes. However, these water balances were developed to assess the stockpile cover design and not the expected discharge rates from the sumps to Langley Creek during mining of the proposed Project. Therefore, in order to calculate the expected changes in water received by the sumps due to the proposed Project, the method employed in the 2008 Long-term Hydrology Study (Barr 2008) was used. This method approximates water yield change due to both surface water drainage changes and groundwater flow as a result of the pit development, based on actual flow monitoring of Langley Creek while mine discharges were occurring. The results of this calculation estimate the increase in annual average flow at the sumps to be on the order of 200 gpm, which would be added to the 2629 gpm under current conditions, or an approximately 8% increase in pumping rates. However, this increase is offset by reduction of the natural flow to Langley Creek as a result of the mining of the proposed UPL progression. Accounting for the elimination of the natural watershed area, the net change in flow to Langley Creek is estimated to be an average annual increase of 80 gpm, or a 2% increase in total flow in Langley Creek during operations.

At closure, once mining ceases, all of the mine pit sumps will stop operating. All of the current and future Peter Mitchell Pit will drain to the pit lake and outflow to Unnamed Creek and then to Dunka River. The amount of water discharged through the pit lake at full development was estimated to be a maximum of 21.4 cfs in the 2008 Hydrology Report. The proposed Project will not change this discharge estimate. The proposed pit expansion is approximately 3 percent of the total increase in drainage area to Unnamed Creek, relative to existing conditions.

In addition, as part of the Type II VF Stockpile Design Study (Golder 2013), water quality evaluations, upper and lower bound water balance conditions were included in the design evaluations for the closed mine. These water balances assumed a pit lake watershed area on the order of one half the total pit area planned at closure, which approximates the current state of mine development without any further development. It also assumed that only a fraction of the water in the assumed pit lake would mix with the Type II VF stockpile seepage. Therefore the water quality evaluations assume a minimum amount of pit lake water available for dilution in the Type II VF stockpile design evaluation.

Tables 11-3 and 11-4 show the water balances used in the Type II VF stockpile design evaluations that result in highest water quality impacts due to minimal mixing volume at the sumps and pit lake. Comparing these tables to the actual anticipated discharge estimated from the 2008 Long Term Hydrology Study shows that the flow values used in the water quality impact evaluations represent a lower than expected amount of water available for dilution, thereby representing an upper bound condition in the water quality impacts analysis discussed further below in this section.

Table 11-3. Summary of Water Balance Model Predictions for Conditions during Operations, Compared with Existing Water Balance (All Flows shown as Average Flow over a Year)

Modeling Scenario	Groundwater Inflow (gpm)	Disturbed Pit Subbasin Runoff (gpm)	Open Water Subbasin Runoff (gpm)	Upland Vegetation Subbasin Runoff (gpm)	Change in FRZ* Storage (gpm)	Predicted Stockpile Seepage (gpm)	Total (gpm)
"Current Conditions"; Calibration to 1999-2007	760	1452	375	47	-5	n/a	2629
Prediction of future water balance, assuming constant groundwater inflow	760	1412	350	31	0	0.46	2553

***Fractured Rock Zone – the rock immediately adjacent to the mine pit boundaries that has been cracked as a result of standard mining activities, primarily blasting. Data summarized from Tables 3-5 and 3-6 in "Type II Virginia Formation Stockpile Plan" (Golder, 2013; tables revised in March 2014).

Table 11-4. Summary of Water Balance Model Predictions for Conditions Post-Closure (Following Full Pit Lake Development) (All Flows shown as Average Flow over a Year)

Groundwater Inflow	Disturbed Pit Subbasin Runoff (gpm)	Open Water Subbasin Runoff (gpm)	Upland Vegetation Subbasin Runoff (gpm)	Change in FRZ* Storage (gpm)	Predicted Stockpile Seepage (gpm)	Direct Pit Lake Precip. (gpm)	Direct Pit Lake Evap. (gpm)	Total (gpm)
1779	1606	351	53	0	0.46	602	-497	3894

*Fractured Rock Zone – see definition above. Data summarized from Table 3-7 in "Type II Virginia Formation Stockpile Plan" (Golder, 2013; tables revised March 2014).

Composition of Mine Water

A chemical mass balance model was constructed to predict a range of constituent concentrations in water reporting to a conceptual pit sump (during operations) and of the pit lake water (post-closure, following full development of the pit lake) after the proposed Project is implemented (Golder, 2013). As stated in the report:

> *The purpose of the model was to provide a tool to bracket viable engineering designs for the stockpile plan that will satisfy water quality criteria. The model was not intended to represent all physical and chemical processes nor provide precise predictions of water chemistry.*

Inputs to the model were defined on the basis of an experimental test program (Golder, 2012), data from existing surface water chemistry, and established geochemical principles. Model assumptions were selected to bracket a range of potential conditions. The model runs for during-operation conditions were performed under two sets of scenarios, one in which groundwater inflow into the pit is assumed to be the same as current conditions, and a second set of scenarios where the groundwater inflow is assumed to increase due to deepening of the pit in the future. All three scenarios (two during-operation scenarios and one post-closure scenario) are executed using six different sets of assumptions, resulting in 18 different model runs. The six sets of assumptions are outlined in Table 11-5.

Table 11-5. Sets of Assumptions Used in Model Scenarios

Scenario	Humidity cell(s) used to determine stockpile concentration limits[1]	Seepage % of Annual Precipitation
1	NSM-HC10 Scaled, 0.15%S	0.21%
2	NSM-HC10 Scaled, 0.15%S	0.45%
3	Composite Scaled, 0.24%S (weighted avg)	0.21%
4	Composite Scaled, 0.24%S (weighted avg)	0.45%
5	NSM-HC17 Scaled, 0.42%S	0.21%
6	NSM-HC17 Scaled, 0.42%S	0.45%

[1] The approach used in this evaluation included developing a range of stockpile seepage concentrations through geochemical modeling of the humidity cell effluent chemistries to establish more reasonable stockpile seepage concentrations. Humidity cell effluent chemistries were scaled upward to account for the relatively high water to rock ratio and flushing rate in the laboratory conditions relative to field conditions. Scaling was performed using a computer based geochemical thermodynamic equilibrium model (Golder 2013).

Of these, the scenario that would predict the greatest potential impact from the proposed Project is the during-operations scenario, which assumes that the volume of water flowing into the pit in the future is the same as current conditions, using the set of assumptions listed as #4 in Table 11.5. This represents an “upper bound” on the potential impact from the proposed Project, because it brackets a condition with the highest concentration limits predicted for the stockpile drainage along with the highest infiltration rates. This upper bounds scenario (along with the other scenarios run for conditions during operations with constant groundwater inflow) does not reflect the dilution that would result from additional water flowing into the pit if groundwater inflow increases because of pit deepening.

The numeric water quality predictions at the sump are not directly representative of water quality at a current or future discharge location (either with or without the Proposed Project), because:

1) The surface water quality data that were used to define inputs into the chemical mass balance were derived from water samples collected around the mine site during the time period 2004-2008, and do not precisely match all constituent concentrations from the most recent surface water quality data set. The 2004-2008 surface water quality data was used for the chemical mass balance model and not the most recent data because this is the data that was available at the time that the chemical mass balance was developed. The process of developing the stockpile plan was initiated in early 2008.
2) It is current practice to transfer mine sump water between sumps and/or retain mine sump water prior to discharge for the purpose of mitigating potential impacts of discharge. Pumping and/or retention of mine sump water can be performed to promote particulate settling and clarification, lower unionized ammonia concentrations, and/or moderate pH of the water. The potential transfer and/or retention of mine sump water was not included in the chemical mass balance.

This practice represents an additional level of mitigation that could be applied after the inflows report to the first sump.

While the methodology used in the chemical mass balance model remains sound, given the factors listed above, the modeled water quality at the sump does not directly indicate the future quality of water being discharged from the site as a result of the proposed Project. A comparison of the quality of water discharged with and without the proposed Project is made by using the results of this chemical mass balance model (Golder, 2012) to identify the percent change in constituent concentrations attributed to the Project (as indicated by the chemical mass balance results). This percent change is applied to the most current water quality measurements observed at the active permitted discharge location (SD005) (See Figure 19-1). Table 11.6 summarizes the predicted water quality at a future pit sump location both with and without the contribution from the Type II VF stock pile drainage (as indicated from the upper bounds scenario of the chemical mass balance model), as well as the percent change in constituent concentrations that results from this drainage. Water quality observed at discharge location SD005 during 2013 is summarized in Table 11.7, along with projected percent change due to the proposed Project, and the resulting projected water quality at SD005. To calculate the minimum, maximum, and average from the SD005 water quality monitoring results, data that were below the reporting limit were substituted with half of the reporting limit for that parameter. This results in values above zero for all calculations, even if concentrations were below the reporting limit for all sampling events for the period used in this analysis. Potentially applicable water quality standards are shown in Table 11-8.

Table 11-6. Predicted Water Quality at In-Pit Sump Location, With and Without Proposed Project, Based on 2013 Golder Report[1]

Parameter	Units		Without the Proposed Project	With the Proposed Project[2]	Projected % change due to Proposed Project
Aluminum, Total	µg/L	Minimum	43	44	2%
		Maximum	93	110	18%
		Average	72	80	11%
Arsenic, Total	µg/L	Minimum	4.6	4.6	0%
		Maximum	10	10	0%
		Average	8.8	8.9	1%
Cobalt, Total	µg/L	Minimum	0.56	0.72	29%
		Maximum	1.6	4.7	194%
		Average	1	2.4	140%
Copper, Total	µg/L	Minimum	1.1	1.2	9%
		Maximum	2.5	4.5	80%
		Average	1.8	2.7	50%
Hardness, Total	mg/L	Minimum	112	113	1%
		Maximum	137	138	1%
		Average	132	133	1%
Iron, Dissolved	mg/L	Minimum	0.44	0.46	5%
		Maximum	0.88	1.1	25%
		Average	0.79	0.89	13%

Parameter	Units		Without the Proposed Project	With the Proposed Project[2]	Projected % change due to Proposed Project
Nickel, Total	µg/L	Minimum	1.3	2.5	92%
		Maximum	7	29	314%
		Average	3.8	14	268%
Sulfate, Total	mg/L	Minimum	31	31	0%
		Maximum	43	45	5%
		Average	42	43	2%
Zinc, Total	µg/L	Minimum	5.2	5.9	13%
		Maximum	10	22	120%
		Average	7	13	86%

[1]Predicted water quality, both with and without proposed Project, are taken from the modeled scenario that indicates the largest change due to the proposed Project. This scenario represents conditions during operations, assuming low pH stockpile drainage, constant groundwater inflow to the pit, and that 0.45% of annual precipitation infiltrates the stockpile cover.
[2]Water quality predictions for "with proposed Project" conditions are summarized from Table A-3A in "Type II Virginia Formation Stockpile Plan" (Golder, 2013). Water quality predictions for "without Proposed Project" are taken from Table A-3A Supplement; provided by Golder on March, 2014 (Golder 2014b).

Table 11-7. Comparison of 2013 SD 005 Monitoring Results and Projected Future Water Quality Based on 2013 Golder Report

Parameter	Units		Existing NPDES Permit Limit[1]	SD 005 Monitoring Results[1]	Projected % Change due to Proposed Project	Projected Future Water Quality at SD005
Aluminum, Total	µg/L	Minimum	None	10	2%	10.2
		Maximum		48.1	18%	56.9
		Average		21.6	11%	24.0
Arsenic, Total	µg/L	Minimum	None	7.2	0%	7.2
		Maximum		27.7	0%	27.7
		Average		14.9	1%	15.1
Cobalt, Total	µg/L	Minimum	None	1	29%	1.3
		Maximum		1	194%	2.9
		Average		1	140%	2.4
Copper, Total	µg/L	Minimum	Monitor Only	2.5	9%	2.7
		Maximum		2.5	80%	4.5
		Average		2.5	50%	3.8
Hardness, Total	mg/L	Minimum	None	151	1%	152.3
		Maximum		279	1%	281.0
		Average		198	1%	199.5
Iron, Dissolved	mg/L	Minimum	None	0.025	5%	0.03
		Maximum	2.0	0.025	25%	0.03
		Average	1.0	0.025	13%	0.03
Nickel, Total	µg/L	Minimum	Monitor Only	2.5	92%	4.8
		Maximum		2.5	314%	10.4
		Average		2.5	268%	9.2
Sulfate, Total	mg/L	Minimum	Monitor Only	66.3	0%	66.3
		Maximum		150	5%	157.0
		Average		90.4	2%	92.6
Zinc, Total	µg/L	Minimum	None	5	13%	5.7

Parameter	Units	Existing NPDES Permit Limit[1]	SD 005 Monitoring Results[1]	Projected % Change due to Proposed Project	Projected Future Water Quality at SD005
	Maximum		5	120%	11.0
	Average		5	86%	9.3

[1]For potentially applicable future water quality standards refer to Table 11-8
[2]To calculate the minimum, maximum, and average from the SD005 monitoring results, data that were below the reporting limit were substituted with half of the reporting limit for that parameter. This results in values above zero for all calculations, even if concentrations were below the reporting limit for all sampling events for the period used in this analysis.

Identification of Mine Water Treatment Methods

Potential treatment methods include physical treatment systems and management strategies. While the direct seepage from the Type II stockpile will not be collected or monitored, there are six components to the strategy to mitigate possible but unlikely impacts from the proposed Project:

- The Type II VF stockpile design will limit infiltration and thus water contact with Type II VF material, thereby limiting potential for seepage.
- A DNR-approved pilot test plot program will be implemented to demonstrate the hydrologic performance of the cover system. The goal of the DNR-approved test plot program is to replicate the Type II cover system on a field scale to evaluate whether it can meet performance specifications under site conditions. The preliminary results of the test plot program are currently under review by MNDNR (Golder 2014a).
- All proposed Project mine water will flow to mine sumps for treatment by settling.
- Type II VF contact mine water will mix with other water at the sumps (or within the pit lake).
- Supplemental water quality monitoring consisting of increased frequency and/or water quality parameters will be performed at locations SD004 and SD005 and at the in-pit sumps that could potentially be affected by the stockpile seepage, as well as any surface discharge locations receiving transfer water containing stockpile seepage. Water quality results for in-pit sumps will be reported with those from SD004 and SD005. Figure 11-2 provides the locations and nomenclature (150 sump, Blk9 Bn7 sump and SD004 and SD005) for the sumps affected by the Type II stockpile seepage.
- A mine water management contingency plan will be developed to respond to existing and supplemental water quality monitoring results and address conditions that may have the potential to affect effluent quality. This plan would include water transfers between sumps, sampling and, if necessary, treatment for specific parameters.

Supplemental monitoring of water quality will be conducted prior to Type II VF stockpile development, as well as following reclamation, at the established NPDES outfalls. Future supplemental monitoring will complement current monitoring performed by Northshore in accordance with the Type II VF Stockpile Plan and the existing NPDES/SDS Permit MN0046981 and any future permits. Supplemental monitoring will occur monthly prior to stockpile construction to establish baseline chemistry, monthly during stockpile development, and monthly thereafter during operations. This supplemental monitoring will provide the basis for the mine water management strategy to ensure compliance with the NPDES effluent limits.

Identify Discharge Points

During operations, the primary discharge point for the proposed Project mine water is from mine pit sumps to Langley Creek via NPDES permitted outfalls SD004 and SD005. Because of water quality management practices, mine water is occasionally routed from the main sump to a sump that discharges via a permitted NPDES outfall to Unnamed Creek. The frequency of this movement and the volume of the re-routed mine water varies. However, the discharge of proposed Project mine water would be minor, and the primary discharge point would be via the permitted NPDES outfall at SD-004. During the post-closure period, after full development of the mine pit lake, the primary discharge point would be the location of pit overflow into Unnamed Creek, which discharges to the Dunka River.

Identify Proposed Effluent Limitations to Mitigate Impacts

If necessary, to meet current and future NPDES effluent limitations, a mine water management contingency plan will be developed to address conditions that may have the potential to affect effluent quality. The contingency plan will be based on existing and supplemental water quality monitoring results. The strategy will use the existing and supplemental monitoring results (as identified above) to develop this plan, which would include water transfers between the sumps and possible treatment for specific parameters. Such a strategy is currently employed to meet existing effluent limits.

Discuss Effects to Surface Water and Groundwater from the Proposed Project Mine Water Discharge

The water and chemical mass balance models indicate that the mine water discharged to Langley Creek from the proposed Project is predicted to increase some chemical constituents but will have minimal impact in most cases. For constituents where the predicted percent increase is substantial, as with cobalt and nickel, the modeling nonetheless predicts that the water concentrations will likely be below applicable standards. The chemical mass balance from Golder (2012) indicates that constituent concentrations in discharge to Unnamed Creek after closure are predicted to be less than their concentrations during operations.

The Proposed project will reduce the surface watershed area tributary to Langley Creek by approximately 2.6 to 5 percent of the current surface watershed area (see Figure 6-8). The area reduced from the surface watershed will become tributary to the pit sumps, which are then discharged to Langley Creek. The net change in total tributary area to Langley Creek, when dewatering is considered, is zero during mine operation. Changes in the land surface may result in a net increase in total flow to Langley Creek during operations, as the decrease in surface runoff will be offset by increased pit dewatering.

Using the hydrologic methods for Langley Creek described in the *Long Range Hydrology Study* (Barr 2008), this land use change results in an estimated increase in flow in Langley Creek of approximately 100 gpm (0.2 cfs). The change in Langley Creek flow estimated using the methods from the *Long Range Hydrology Study* (Barr 2008) is similar to the change in total water balance estimated by Golder and presented in Table 11-3 (+100 gpm versus -80 gpm). The estimated change in flow due to the Project corresponds to approximately 2 percent of the average annual flow in Langley Creek (Barr 2008). In general, there are no anticipated hydrologic impacts to Unnamed Creek; however, due to existing mine water quality management practices that require transfers within the pit, water that would normally discharge to Langley Creek may on occasion be partially routed to a sump that discharges to Unnamed Creek. The limited degree of transfer of water between the sumps, combined with a minimal change in sump inflow would have a negligible impact on the sump discharge volume. By extension, there would be a negligible effect on flow in Unnamed Creek.

Hydrologic impacts to Langley Creek and Unnamed Creek at closure are presented in the *Long Range Hydrology Study* (Barr 2008), but do not address the specific, incremental impacts of the proposed Project on that final condition. At closure, dewatering to Langley Creek will cease, resulting in a 46 percent decrease in watershed area relative to the current condition, and a decrease in average annual flow relative to the current condition and to the Project condition of approximately 60 percent (i.e., the majority of existing flow originates from pit dewatering). The proposed project accounts for approximately 6 percent of the cumulative reduction in watershed area estimated in final closure (and by extension, a similar reduction in flow) relative to existing conditions.

The watershed tributary to Unnamed Creek will increase by approximately 450 percent in final pit closure, relative to existing conditions. Flow in Unnamed Creek will increase at closure to six to seven times the current flow, as the entire pit lake will drain to the Dunka River via Unnamed Creek (Barr 2008). The proposed project accounts for approximately 3 percent of the change in watershed (and by extension, a similar increase in flow) relative to the current condition.

At closure, the average annual flow in the Dunka River will increase by approximately 11 cfs, a 30 percent increase over the existing condition (Barr, 2008). These impacts are described in greater detail in the *Long Range Hydrology Study* (Barr 2008), as approved by the MNDNR. Flow impacts at closure will be mitigated with development of pit-lake littoral habitat area (as described in the Peter Mitchell Pit Mitigation Plan).

During operations, the proposed Project will not affect groundwater quality. Because of the depression of the local water table caused by dewatering, all groundwater flows during operations will be towards the mine pit and will be collected in the sumps, as shown conceptually on Figure 6-4 and in Figure 11-2. There will be no post-closure effects to groundwater quality. Based on elevations of existing wetlands, lakes, and streams, the entire post-closure pit lake will be surrounded by surface-water features with elevations greater than the proposed pit lake elevation, and the pit lake will act as a groundwater sink, as shown conceptually on Figure 6-5. The locations of lakes, streams, and wetlands are shown on Figure 11-1. The pre-mining topography in the region is shown on Figure 11-4. With the exception of the Dunka River north-northeast of the pit (to which the pit lake surface outlet will flow), the regional surface water features surrounding the pit are all at elevations greater than the proposed pit lake elevation. These waters are approximately 100 feet higher than the proposed pit lake elevation in the immediate vicinity of the proposed Project and are likely perched above the regional potentiometric surface by low-permeability bottom sediments and low-permeability bedrock.

The zone of influence (i.e., “cone of depression” of the water table) created by the mine pit during mining and post-mining will undergo a southward shift associated with the proposed Project. This change will be limited to the immediate vicinity of the proposed Project and the change in location in the zone of influence will be approximately equivalent to the horizontal distance between the current pit wall and the future pit wall location associated with the proposed Project. In general, the cone of depression will be limited to the area of the Biwabik Iron Formation and will not extend substantially into the much lower permeability bedrock of the Virginia Formation (to the south) and the Pokegama quartzite (to the north). Wetlands are located near the current southern pit wall in the area of the proposed Project (Figure 11-1) and are at elevations similar to pre-mining conditions (Figure 11-4), indicating that either the zone of influence does not extend a significant distance from the pit or the surficial aquifer system is perched above the bedrock aquifer system by low-permeability sediments and/or low-permeability bedrock and is not adversely affected by pit dewatering.

For sulfate, arsenic and hardness, the maximum potential increase in concentration resulting from the proposed Project is less than 5%. Comparison of these potential standards to the projected water quality at SD005 after the proposed Project (Table 11-7) indicates that for aluminum, iron, nickel, cobalt, copper, and zinc, even though the proposed Project does contribute to the projected concentrations, the resulting concentrations remain substantially below any potentially applicable water quality standards (Table 11-8). This evaluation of potential effects due to the proposed Project is based on the chemical mass balance scenario designed to provide an upper bound on Project impacts by compounding multiple assumptions, each representing upper bound conditions. This is a during-operations scenario that assigned the highest concentration limits (derived from the highest %S humidity cell #17), infiltration of 0.45% of annual precipitation, and a constant volume of groundwater flowing into the pit. Under this scenario, the assumed %S, infiltration and groundwater flow are all upper bound conditions. The maximum concentration for this scenario would correspond to a period in winter when precipitation is at a minimum.

Table 11-8. Potentially Applicable Water Quality Standards (for hardness-dependent metals hardness is 100 mg/L)

Potentially Applicable Water Quality Standards					
Parameter	NPDES Permit[1] Limits		Dunka River[2] Water Quality Standards[3]		
	Average	Maximum	CS[4]	MS[5]	FAV[6]
Iron, ug/L (Dissolved)	1,000 [7]	2,000 [7]	None		
Aluminum, ug/L	To be assessed[8]		125	1,072	2,145
Copper, ug/L	To be assessed[8]		9.8 [9]	18 [9]	35 [9]
Cobalt, ug/L	To be assessed[8]		5.0	436	872
Zinc, ug/L	To be assessed[8]		106 [10]	117 [10]	234 [10]
Nickel, ug/L	To be assessed[8]		158 [11]	1,418 [11]	2,836 [11]
Arsenic, ug/L	To be assessed[8]		53	360	720
Sulfate[12], mg/L	To be assessed[8]		N/A [11]		

<u>NOTES:</u>
[1] NPDES/SDS Permit MN0046981, Surface Discharge Stations SD001, SD002, SD003, SD004, and SD005.
[2] Where Dunka River is a Class 2B, 3C, 4A, 4B, 5, and 6 water. Both Unnamed Creeks and Langley Creek flow to the Dunka River and are also Class 2B, 3C, 4A, 4B, 5, and 6 waters.
[3] The most stringent of the Class 2B, 3C, 4A, 4B, 5, and 6 water quality standards are shown as applicable.[4] Chronic Standard (CS); "the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity" (Minn. R. 7050.0218, Subp.3, I).
[5] Maximum Standard (MS); "the highest concentration of a toxicant in water to which aquatic organisms can be exposed for a brief time with zero to slight mortality. The MS equals the FAV divided by 2." (Minn. R. 7050.0218, Subp.3, T).
[6] Final Acute Value (FAV); "an estimate of the concentration of a pollutant corresponding to the cumulatively probability of 0.05 in the distribution of all the acute toxicity values for the genera or species from the acceptable acute toxicity tests conducted on a pollutant. The FAV is the acute toxicity limitation applied to mixing zones in part Minn. R. 7050.0210, subpart 5; and to discharges in parts Minn. R. 7053.0215, subpart 1; 7053.0225, subpart 6; and 7053.0245, subpart 1." (Minn. R. 7050.0218, Subp.3, O).
[7] Dissolved concentration.
[8] NPDES permit limits to be assessed next permit cycle.
[9] The water quality standards represented here for copper, a hardness-dependent metal, assumes a total hardness of 100 mg/L. The applicable equations for hardness-dependent metals are found in Minn. R. 7050.0222, subpart 4.

[10] The water quality standards represented here for zinc, a hardness-dependent metal, assumes a total hardness of100 mg/L. The applicable equations for hardness-dependent metals are found in Minn. R. 7050.0222, subpart 4.
[11] The water quality standards represented here for nickel, a hardness-dependent metal, assumes a total hardness of 100 mg/L. The applicable equations for hardness-dependent metals are found in Minn. R. 7050.0222, subpart 4.
[12] As of the date of this EAW the Dunka River has not been designated as a water used for the production of wild rice.

ii. Stormwater - Describe the quantity and quality of stormwater runoff at the site prior to and post construction. Include the routes and receiving water bodies for runoff from the site (major downstream water bodies as well as the immediate receiving waters). Discuss any environmental effects from stormwater discharges. Describe stormwater pollution prevention plans including temporary and permanent runoff controls and potential BMP site locations to manage or treat stormwater runoff. Identify specific erosion control, sedimentation control or stabilization measures to address soil limitations during and after project construction.

All stormwater runoff from the proposed Project would continue to flow to the mine pit sumps, where it would then be discharged through established NPDES permit outfalls. Therefore, the proposed Project would not result in any changes to stormwater management practices at the Peter Mitchell Mine. Current stormwater management practices are detailed in the existing Stormwater Pollution Prevention Plan (SWPPP).

iii. Water appropriation - Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a MNDNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation.

Dewatering from the mine pit is currently permitted under MNDNR water appropriations permit #1982-2097. The increase in additional volume appropriated would be roughly proportional to the size of the proposed 108-acre UPL progression relative to the existing 4,642-acre UPL, or approximately 2% additional volume. This increase would be in compliance with the amount of water authorized for appropriation under the existing permit.

iv. Surface Waters

a) Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed, and identify those probable locations.

Approximately 62.83 acres of wetlands present within the proposed Project area will be directly affected by the proposed Project. Existing USACE Section 404 and State WCA permits allow the removal of 50.74 acres of those wetlands with mitigation for replacement of the lost wetland area. The remaining 12.09 acres of wetlands that will be affected include areas of shallow marsh (10.15 acres), alder thicket (1.21 acres), and shrub-carr (0.73 acre). These impacts will require coordination with USACE for permitting under Section 404 of the Clean Water Act, as well as MPCA water quality certification under Section 401 of the CWA. The wetland impacts will also require WCA permitting. As noted above, the MNDNR Division of Lands and Minerals is the approving authority for WCA permitting for these wetlands. Northshore has filed a joint Section 404/WCA permit application with USACE and with the MNDNR to allow for the removal of the 12.09 acres. Wetland mitigation credits for the 12.09 acres of impacts will be obtained from the Cliffs Erie Embarrass Wetland Bank. The Embarrass Wetland Bank was approved in 1997 by the USACE and MNDNR for use on Cliffs projects, including the Peter Mitchell Mine, on a 1:1 basis. Northshore recently purchased from Cliffs Erie all remaining credits from the Embarrass Wetland Bank for its use.

Potential indirect impacts, if any, will be evaluated as part of the permitting process. However, there are no indirect impacts anticipated. This is because there is a shallow depth to bedrock in the vicinity of the wetlands potentially affected by the proposed Project, and the bedrock surface is tilted away from the pit. Moreover, no notable indirect impacts have been observed in the existing wetlands that extend up to the current pit edge.

b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

There are no anticipated impacts resulting from the proposed Project activities toother surface waters aside from Langley Creek during pit operation, including MNDNR Protected Waters, in the vicinity of the proposed Project. Cutoff of the headwatershed of Langley Creek will be offset by increased pit runout (dewatering). Hydrologic impacts to Langley Creek during mine operations are estimated to be small (approximately 2 percent), resulting in negligible impacts on water levels and associated riparian wetlands. Hydrologic impacts to Langley Creek and Unnamed Creek at closure are presented in the *Long Range Hydrology Study* (Barr 2008). At closure, estimated impacts to average annual flows will include a 60 percent reduction in Langley Creek, a 600-700 percent increase for Unnamed Creek, and a 30% increase for Dunka River (Barr, 2008). Based on watershed area (and measured relative to existing conditions), the proposed Project accounts for approximately 6 percent of the reduction in Langley Creek flow and approximately 3 percent of the increase in Unnamed Creek flow. The project has no net effect on flow in the Dunka River, as the footprint of the Project is ultimately tributary to the Dunka River under current conditions, with Project conditions, and after final pit closure.

A December 11, 2013 Barr Engineering technical memorandum reporting results of 2013 wild rice surveys to Northshore (Barr 2013) stated that no wild rice was found in the Dunka River. A December 20, 2011 Barr Engineering technical memorandum reporting results of 2011 wild rice surveys to Cliffs Erie (Barr 2011) identified wild rice in Dunka Bay, after the point where the Dunka River reports to Birch Lake. As of the date of this EAW, wild rice has not been identified in recent surveys of the Dunka River, and as such the Dunka River has not been designated as a water used for the production of wild rice. Therefore the Class 4B wild rice sulfate standard of 10 mg/l does not apply.

12. Contamination/Hazardous Materials/Wastes:

a. *Pre-project site conditions - Describe existing contamination or potential environmental hazards on or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.*

There are no known existing sources of contamination within the proposed Project.

b. *Project related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.*

There will be no new types of state-defined solid waste generated as part of the proposed Project.

c. *Project related use/storage of hazardous materials - Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any above or below ground tanks to store petroleum or other materials. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.*

There are no hazardous materials directly associated with the proposed Project. Current operations include maintenance of mining-related equipment that requires certain hazardous materials to be used and stored at the Peter Mitchell Mine equipment maintenance facility. In addition, fuel spills that could occur during refueling and maintenance of mining equipment would be handled in accordance with Northshore's Spill Prevention Control and Countermeasure Plan (SPCC). Fuel tanks and oil barrels stored on site would also be managed according to the SPCC. The proposed Project will not cause any changes to these current practices.

d. *Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.*

There will be no hazardous waste generated by the proposed Project.

13. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):

a. Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.

Based on the MNDNR/USFS Ecological Classification System (ECS), the proposed Project lies within the Laurentian Uplands Subsection of the Northern Superior Uplands (NSU) Section. The NSU Section is characterized by vegetative cover that is relatively uniform, comprising fire-dependent forests and woodlands. Much of the coniferous forest in the NSU Section was logged in the late 1800s and early 1900s (MNDNR 2003). Most of the area of the proposed Project is in an actively mined area, and is either not vegetated or recently disturbed. The dominant vegetation type in the proposed Project area is forested wetland and emergent wetland. The composition of vegetation communities adjacent to the proposed Project is typical of the NSU Section, with mixed coniferous-hardwood mixed second-growth forest and occasional small wetland areas.

The proposed Project is located in an actively-mined area that has limited habitat value for large wildlife species. Potential wildlife habitat within and near the UPL progression boundary is fragmented by mine access roads. Common wildlife that may use habitat in the proposed Project vicinity include pine marten (*Martes americana*), fisher (*Martes pennanti*), mink (*Mustela vison*), red squirrel (*Tamiasciurus hudsonicus*), red fox (*Vulpes vulpes*), bats, snowshoe hare (*Lepus americanus*), and other small mammals. Bird species in the vicinity may include bald eagles, cormorants, osprey, and hawks, as well as waterfowl, wading birds and perching birds. Wetlands may provide habitat for amphibians, great blue heron (*Ardea herodias*), common snipe (*Gallinago gallinago*), and swamp sparrow (*Melospiza georgiana*).

The MNDNR Comprehensive Wildlife Conservation Strategy (CWCS) lists 58 Species of Greatest Conservation Need (SGCN) in the Laurentian Uplands Subsection (MNDNR, 2006). SGCN species tend to be sensitive to disturbance and habitat degradation (MNDNR, 2006). It is unlikely, however, that most of the SGCN species listed for the subsection are present within the project area on a regular basis. This is because most of the project is within or immediately adjacent to an active mining area. Adjacent habitats are either young second-growth forest, areas disturbed by mining-related activities or roadway corridor. Moreover, non-SGCN species (e.g., raccoons, opossums, brown-headed cowbirds and crows) are better able to utilize edge and disturbed habitats, and likely displace SGCN species in those areas. SGCN species may utilize the wetland areas near the proposed Project; however, the wetlands are also near human disturbance, which tends to reduce SGCN presence. Many of the SGCN species may be active nearby, further from the road and disturbed areas, and may occasionally utilize parts of the project area.

Barr Engineering prepared a *Cumulative Effects Analysis of Wildlife Habitat and Threatened and Endangered Wildlife Species* in 2009 for U.S. Steel as part of the Keetac Expansion Project (Barr, 2009). The report was reviewed and approved by MNDNR. It evaluated opportunities for wildlife movement back and forth across the Iron Range from near Grand Rapids to Babbitt. The Barr study identified 18 wildlife corridors that provide opportunities along the length of the Iron Range for long-distance wildlife movement. The proposed Project area does not lie within or intersect any of the identified wildlife corridors. The nearest identified wildlife corridors are 5.5 miles to the southwest, and 2.2 miles to the northeast. Both of these corridors were rated of “moderate quality” in the Barr report, meaning that both corridors are currently degraded by existing human-related activities (i.e., logging and road construction). Wildlife attempting to make northwest-southeast movements through the general Project can continue to use the two nearest corridors without interference from the proposed Project. Moreover, the northeast extent of the Iron Range, and the barriers to wildlife movement that it presents, end approximately 5.3 miles north-northeast of the proposed Project, at the northeast end of the Dunka Pit.

The Dunka River and Langley Creek are the only fisheries resources in the project area. The MNDNR Fish Mapper Mapping Tool (MNDNR 2014) indicates that fish surveys were conducted at three locations on Langley Creek, including two locations in 1975 and one (at the confluence with Dunka River) in 2005. The results of these surveys are as follows:

- Dunka River. MNDNR conducted fish surveys on Dunka River in 1975 at two locations downstream of the confluence with Langley Creek and one location ~2 stream miles upstream of the confluence with Langley Creek. More recent surveys have not been conducted. In the three survey locations, a range of two to eleven fish species were found, including seven species of cyprinids (minnows, shiners and daces), two species of percids (darters and perch) and one species each from four other families of fish. The total number of fish species found in Dunka River, based on these studies, is thirteen. Some of the species from the 1975 fish surveys are disturbance-sensitive, including mottled sculpin, Johnny darter and Iowa darter. Dunka River has suitable habitat for gamefish species particularly in the lower reaches including good spawning habitat for walleye and northern pike. Upper reaches support primarily sucker non-game species based on the limited fisheries assessment data. Although MNDNR Fisheries staff indicate angler reports of brook trout being present, there are no documented occurrences of game fish in Dunka River. It is unlikely that Dunka River supports a substantial game fish population and is subject to light angling pressure.

- Langley Creek. Fish surveys were conducted on Langley Creek at two locations in 1975 by DNR and twice in 2005 by MPCA near the point where Langley Creek joins the Dunka River. Fourteen species of fish were found. Of these nine species were cyprinids, with one species each from five other families of fish. When the 2005 data was compared within Langley Creek's low gradient stream class, sampling indicated a high diversity of species and included at least one intolerant species. The two fish Index of Biotic Integrity (IBI) scores (65 and 73 out of 100) indicate Langley Creek is a healthy stream. Invertebrate IBI score was 39.

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The hydrologic impacts estimated for Langley Creek are approximately 2 percent of the existing flow, resulting in minimal impacts to water levels and associated riparian habitats. Hydrologic impacts are diminished further downstream, as tributary watershed area increases. At closure, impacts to average annual flows will increase: a reduction of 60 percent, an increase of 600-700 percent, and an increase of 30% are estimated for Langley Creek, Unnamed Creek, and Dunka River, respectively (Barr, 2008). Approximately 6 percent of the estimated reduction in Langley Creek flow in final pit closure is due to the Project (as estimated by watershed area). Similarly, about 3 percent of the increase in flow to Unnamed Creek is due to the Project. The estimated impact to the Dunka River in pit closure is independent of the Project, as the Project area is tributary to the Dunka River under current conditions, with Project conditions, and in final pit closure. The flow impacts at closure will be mitigated with development of pit-lake littoral habitat area (as described in the Peter Mitchell Pit Mitigation Plan).

b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA- 674) and/or correspondence number (ERDB 20140036-0003) from which the data were obtained and attach the Natural Heritage letter from the MNDNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

According to the MNDNR Natural Heritage Information System (NHIS) database (license agreement number LA-674), no state-listed species have been recorded within one mile of the proposed Project area. Barr Engineering contacted MNDNR on October 22, 2013, to report the results of the NHIS search, and to get MNDNR concurrence on a finding that the proposed Project will have little or no impact on state-listed species. MDNR concurs with this finding (Attachment A).

The United States Fish and Wildlife Service (USFWS) lists two federally-threatened species in St. Louis County, and has designated critical habitats for each (USFWS 2013). They are the Canada lynx (*Lynx canadensis*) and the piping plover (*Charadrius melodus*). In addition, the USFWS proposed the northern long-eared bat (*Myotis septentrionalis*) for listing as federally-endangered on October 2, 2013. Though designated critical habitat for both the Canada lynx and piping plover has been established in St. Louis County, none is located within one mile of the proposed Project area (Figure 13-1).

Several extensive surveys for lynx have been conducted in association with other mining projects on lands within 20 miles of the proposed Project, dating back to 2005 (ENSR 2006). As part of a lynx survey conducted for the Birch Lake Project and Maturi Project for Franconia Minerals Corporation, a lynx was snow tracked in Townships 60 and 61 North, Range 12 West, including along survey routes immediately adjacent to the south side of Northshore's East Pit. Tracking occurred on approximately 11 miles of lynx trail over a 10-day period. The wildlife biologist conducting the survey determined that all trail segments tracked in these two townships were made by one lynx. Scat collections from lynx have also been made north and south of the Proposed project. Snowshoe hare (*Lepus canadensis*) and red squirrel (*Tamiasciurus hudsonicus*) sign, both prey species of lynx, have been observed during spring wildlife surveys in the vicinity of the proposed Project. Because the home range of the lynx is generally about 30 square miles (78 square kilometers), it is possible that one or more lynx could use habitat in the vicinity of the proposed Project.

The Canada lynx is a solitary species with a large range, preferring mature coniferous forest habitat and tending to avoid areas of human activity. Small quantities of marginal Canada lynx habitat may be found near the proposed Project; however, the areas receive frequent disturbance and are not anticipated to be preferred habitat. While land cover in the vicinity of the proposed Project lacks high quality Canada lynx habitat, several sightings of lynx have been reported near the Peter Mitchell Mine, most recently in February 2011. Documentation of lynx sightings by Northshore employees is part of a reporting policy implemented by Northshore in July 2006. It is also required by the USACE wetland permit for the site. The Peter Mitchell Mine's current lynx policy fulfills Northshore's Section 404 permit requirement to document and report all lynx sightings.

In Minnesota, the piping plover tends to nest on sparsely vegetated, sandy or gravely beaches. There is no suitable piping plover habitat at or near the Peter Mitchell Mine.

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

The proposed Project would result in minor adverse impacts to common wildlife species due to the loss of approximately 108.33 acres of already fragmented wildlife habitat. For common wildlife species, this loss is considered minor because there is abundant similar habitat adjacent to the proposed Project. Furthermore, most common species are habitat generalists with a relatively high tolerance of disturbance and human presence.

The receiving waters are representative of healthy streams that exhibit a diversity of non-game species in the samples taken. These small stream resources play an important role in providing spawning habitat and prey animals to the greater gamefish populations in interconnected waters. The proposed UPL progression will cause minimal changes to the watersheds, flows, and temperatures of the receiving waters. It is anticipated that the native populations of resident fish will experience minor adverse effects. Discharges from the proposed Project are projected to meet applicable permit limits and water quality standards.

The proposed Project would not contribute notably to mercury concentrations downstream of the discharge points during operations or during post-closure. This is because 2013 mercury monitoring results for the Peter Mitchell Mine showed very low mercury in the pit discharges (<1 ng/L). Because the 2013 mercury monitoring results are significantly less than the 6.9 ng/L standard for the Rainy River Basin, mercury discharges from the project will not have an impact on a mercury total maximum daily load (TMDL).

The proposed project also does not have high potential to contribute to mercury methylation downstream of the discharge points. Increases in mercury methylation require increased amounts of mercury. As discussed above, 2013 monitoring shows that the Peter Mitchell Pit does not discharge mercury above the applicable standard. As the proposed Project is not anticipated to increase the amount of mercury in receiving waters, the proposed Project is also not anticipated to increase the amount of methyl mercury in receiving waters. Additionally, Berndt and Bavin (2009) Figure 22 shows that sulfate and methyl mercury are not correlated in the St. Louis watershed. As the St. Louis watershed is heavily impacted by mining, this indicates that increased sulfate may not be a direct cause of increased mercury methylation.

The proposed Project is located in an actively-mined setting, and it has been determined that it would not impact state-listed species. As noted above in Item 11*b*, the Environmental Review Coordinator MNDNR Natural Heritage and Nongame Research Program has reviewed and concurred with the finding that the proposed Project will have little or no impact on state-listed species.

Based on a lack of preferred, suitable habitat for the piping plover and Canada lynx at the Peter Mitchell Mine, the proposed Project would have no effect on these federally-listed species. The risk of vehicle collisions with these species would remain similar to the existing conditions.

d. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to fish, wildlife, plant communities, and sensitive ecological resources.

Potential impacts to sensitive ecological resources are expected to be minimal. There are no major habitat impacts, and as noted above, the hydrologic impacts estimated for Langley Creek are approximately 2 percent of the existing flow during mining operations. There are no anticipated impacts to Unnamed Creek hydrology during mining operations. Nevertheless, mitigation of potential impacts to fish and wildlife habitat, native plant communities and other sensitive ecological resources would be achieved via the implementation of Northshore's reclamation plan for the Peter Mitchell Pit. The reclamation plan includes among its features the creation of littoral zones within the pit lake. Littoral zones are the shallow portions of a lake that support most of the plant and animal life in a lake. The plan stipulates that a minimum 20% cover of the final pit lake comprises littoral zones. Littoral zones will be created by depositing part of the waste rock back into the pit after the ore has been mined out, thereby controlling the shape and depth of the final shoreline , including the near-shore areas. The proposed locations of littoral zones in the pit lake are shown on Figure 6-9.

14. Historic properties:

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

A cultural resources data request was made to SHPO on October 21, 2013. The request encompassed all land within the proposed Project, and a one-section buffer in all directions. SHPO responded on November 12, 2013 with information reporting two archaeological sites documented in Township 60 North, Range 12 West, Section 20. One of the two recorded sites is in the southeast ¼ of the northwest quarter section, which would place it within the same ¼ quarter as the UPL progression. However, this site no longer exists because the entire area was previously mined by Reserve Mining Company prior to 1986. The other archaeological site is outside of the proposed Project. The SHPO report also included one historical site, a demolished crusher building, off County Highway 70, in Township 60 North, Range 12 West, Section 18. This is also outside of the proposed Project (Attachment B).

15. Visual:

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The proposed Type II VF stockpile would be constructed north of the ultimate pit limit progression area within the existing mine area. The Type II VF stockpile would be created following the current MNDNR Mineland Reclamation rules. It is designed to have a maximum upper elevation of 1,720 feet above mean sea level (AMSL). The natural ridge located between the proposed Type II VF stockpile and the City of Babbitt rises to an elevation of 1,850 feet AMSL. Because the elevations around the City of Babbitt are approximately 1,500 feet MSL, the proposed Type II VF stockpile would not be visible from populated areas.

Mining activities within the UPL progression would include lighting during nighttime operations, consistent with current ongoing mining activities. Therefore, there will be no increase in visual effects associated with lighting.

16. Air:

a. *Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants, and any greenhouse gases. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.*

The Peter Mitchell Mine is a stationary source of air emissions. The proposed Project would involve activities that produce fugitive particulate matter. The emissions generated by the proposed Project activities are associated with blasting, loading, hauling, dumping of mined materials, and wind erosion from active stockpiles. Particulate emissions also occur from ore crushing and loading of rail cars.

Mine-related fugitive emissions are controlled by measures identified in the Peter Mitchell Mine's existing Fugitive Emissions Control Plan (FECP), summarized in Table 16-1 below.

Table 16-1. Summary of Northshore Fugitive Emissions Control Plan

Potential Dust Source	Measures to Mitigate Adverse Impacts
Handling of overburden and other rock prior to and during mining (e.g., truck loading/unloading and stockpiling)	Compaction, good stockpiling practices to minimize wind erosion
Handling of ore during mining (e.g., truck loading/unloading and stockpiling)	Compaction, good stockpiling practices to minimize wind erosion
Fugitive dust from unpaved roads	Dust suppressant application

Emissions from crushing operations are controlled by a bag house at the crushing facility. Emissions from the loading of ore into the railcars are mitigated during non-freezing months by spraying water onto the ore before it enters the bins. Emissions from these sources will not change as a result of the proposed project.

The proposed Project will not cause any increase over historical quantities of materials being processed. Further, because the proposed expansion area is located closer to the crushing plant and the rock stockpiles than areas mined historically, there will be no increase in the distances for hauling rock to the stockpile(s) and for hauling ore to the crushing plant.

b. Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

Vehicle (exhaust) emissions from the proposed Project can be separated into three vehicle categories:

1. Haul trucks hauling ore from the pit to the crusher and hauling rock and overburden to stockpiles. Because the proposed Project will not cause any increase over historical levels in the quantity of materials being processed and because the UPL progression is located closer

to the crushing plant and the rock stockpiles than areas mined historically, no increase in exhaust emissions is anticipated from the haul trucks beyond historical levels.

2. Other vehicles operating at the mine include, but are not limited to, shovels, front-end loaders, backhoes, water trucks, dozers, fuel trucks, various maintenance vehicles, and pickup trucks. Because the proposed Project will not cause any increase over historical levels in the quantity of materials being processed, no increase in exhaust emissions is anticipated from these vehicles beyond historical levels.

3. Personal vehicles of employees, contractors and visitors. The proposed Project does not involve any change in staffing and no additional parking spaces. Therefore, there will be no change in the current air emissions from the personal vehicles of employees, contractors, and visitors.

Air emissions from these sources consist of emissions associated with the firing of #2 fuel oil and/or gasoline, and include:

- carbon monoxide (CO),
- nitrogen oxides (NOx),
- particulate matter (PM),
- particulate matter with a diameter of 10 micrometers or less (PM_{10}),
- particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$),
- sulfur dioxide (SO_2),
- volatile organic compounds (VOC),
- greenhouse gases (GHGs) and
- hazardous air pollutants (HAPs).

c. Dust and odors - *Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 16a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.*

Dust

Dust sources are detailed in section 16a. Moreover, the activities within the proposed UPL area would be along the south edge of the mine and will therefore be further away from the City of Babbitt, the nearest sensitive receptor.

Odors

The only odors anticipated from the proposed Project will be those associated with diesel exhaust from equipment for mining-related operations. The proposed Project will not involve any increase in such odors above those associated with the existing mining activities. There are no noticeable off-site odor impacts from these activities.

17. Noise

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

The proposed Project will not result in an increase in existing noise levels at the site. This is because proposed activities within the progression area and at the Type II VF stockpile are similar to ongoing, existing mining-related activities at the mine facility. The proposed Project will result in a continuation, not an increase, in existing mining-related activities. Moreover, the activities within the UPL progression will be along the south edge of the mine and will therefore be further away from the City of Babbitt, the nearest receptor.

18. Transportation

a. *Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.*

There will be no additional parking spaces required for the construction or operation of the proposed Project. Estimated total average traffic and estimated maximum peak hour traffic and time of occurrence will remain at current levels.

In addition, the proposed Project will not result in an increase in the rate of ore generated. Therefore, the proposed Project will not result in increased railroad traffic between the Peter Mitchell Mine and Silver Bay Processing Facility.

Construction and operation of the proposed Project will not require additional specialized equipment or supplies.

b. *Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW. Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 (available at: http://www.dot.state.mn.us/accessmanagement/resources.html) or a similar local guidance.*

The proposed Project will not generate increases above existing levels in employee or vendor traffic to and from the site. This is because the proposed Project will not result in an increase in the work force, nor will it result in increased vendor visits to the site. The proposed Project will require no improvements to existing traffic controls.

c. *Identify measures that will be taken to minimize or mitigate project related transportation effects.*

The proposed Project will not result in a change in existing transportation conditions. Therefore, there is no need to develop measures to minimize or mitigate proposed Project related transportation effects.

19. Cumulative potential effects: (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

The geographic scale of the primary environmentally relevant area is the subwatershed within the Rainy River Basin that drains to Birch Lake. This is the watershed in which the UPL progression and Type II VF stockpile are located. The environmentally relevant area is defined in this way because the principal potential effects of the project would be on water quality, and the principal concern with the project is whether its effects will result in exceedances of water-quality standards within the subwatershed or otherwise be important. This subwatershed discharges to the Dunka River via Langley Creek and Unnamed Creek during operations, and would discharge directly to Dunka River at mine closure. Figure 19 -1 identifies the NPDES discharge locations associated with the Peter Mitchell Mine.

The timeframe of the proposed Project is five to ten years. This is projected as part of development plans for an orderly progression of mining iron ore over the life of the mine. Mining activities are scheduled to begin in the proposed Project area as soon as possible in 2014 upon receipt of required permits. The greater Peter Mitchell Mine is expected to operate for another 70 years, at which time permanent closure and final reclamation will occur. This will include development of the pit lake at the time of closure.

b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

Figure 19-2 shows two reasonably foreseeable future projects in the environmentally relevant area with the potential to interact with impacts resulting from the proposed Project.

- The first is the current ongoing activity at the Dunka Mine. Dunka Mine pit water is pumped to the Dunka River. The water pumped to the Dunka River undergoes treatment in passive wetland cells and is in compliance with the effluent limits contained within the NPDES permit for the Dunka Mine. It is anticipated that water quality impacts from future uses of this site would be managed through project-specific permitting when a project has been identified and advanced by a proponent.

- The second project is the proposed Twin Metals Minnesota LLC (Twin Metals) Bulk Sample Project located approximately 11.5 miles northeast of the proposed project. The Twin Metals Bulk Sample Project would collect a 1,000-ton bulk sample containing copper, nickel, and platinum group metals from the Maturi Deposit through the former INCO shaft southeast of Ely, Minnesota. Twin Metals submitted a draft Project Definition for the bulk sample to MNDNR on June 28, 2013. Since then MDNR has been notified that the project is not currently being pursued. There is however enough detail and likelihood for future activity for this EAW to consider it as a reasonably foreseeable action in considering potential cumulative effects for the Peter Mitchell Pit progression project.

Under the draft Project Definition, Twin Metals proposes to collect all water coming into contact with mineralized rock from the bulk sample process, and transport it to Publicly Owned Treatment Works (POTW) in Hibbing and/or Virginia. The Twin Metals project is not projected to any direct discharge of potentially-contaminated water to local surface waters. Indirect impacts to surface water and groundwater resources are expected to be marginal because the subsurface rock mass at the bulk sample site has relatively low hydraulic conductivity, and no major structural features were intersected by the INCO Shaft. If pursued the project would require mandatory preparation of an EAW.

Another project considered as a potential reasonably foreseeable action for water quality effects is PolyMet Mining's proposed NorthMet copper-nickel-precious metals project. The NorthMet Mine Site is approximately 1.8 miles south-southwest of Northshore's proposed Project.

For potential surface- and groundwater quality impacts it is typical for watershed boundaries to be the basis for establishing the environmentally relevant area used in consideration of cumulative potential effects. Although geographically close to the Northshore Peter Mitchell Pit, the PolyMet project's Mine and Plant Sites collectively drain to the Partridge and Embarrass River watersheds, and ultimately to the Lake Superior Basin via the St. Louis River. This is different than the proposed project, whose discharges report to Langley Creek during operations and the Dunka River in closure, both in turn discharging within the Rainy River watershed. Because the proposed Project and the PolyMet project are not in the same subwatershed or major basin, they are also not in the same environmentally relevant area for water quality effects.

Although not relevant for water quality effects, given its proximity to the proposed project the PolyMet project is potentially in the same environmentally relevant area for visual, noise and wildlife corridor impacts. This is because components of the PolyMet project could conceivably be seen and heard from the proposed Project, and vice versa. Moreover, wildlife in the area could potentially attempt to traverse both projects.

No other project within the environmentally relevant area for water quality impacts meets the EQB criteria for establishing a basis of expectation. These criteria include applications for permits, preparation of detailed plans, inclusion within comprehensive plans, historic or forecasted development trends, or other factors that definitively establish that the project is reasonably likely to occur.

c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

Cumulative potential effects associated with the proposed Project are primarily related to potential impacts on surface water and groundwater quality. Secondary considerations include visual, noise, and wildlife corridor effects.

- <u>Surface Water Quality</u>. The proposed Project has the potential to make an incremental contribution to cumulative surface water quality in the environmentally relevant area. However, as discussed in Section 11, with implementation of mine water management practices, the proposed Project would be subject to applicable water quality standards. Moreover, the other contributing projects in the environmentally relevant area would also be subject to applicable water quality standards. Therefore, any potential cumulative effects would occur within prescribed limits as a function of specific permit conditions for all three (3) actions.

- Groundwater Quality. Under the proposed Project groundwater would flow into the existing pit, both during operations and post-closure. Under this circumstance it is not anticipated that the project's effects on groundwater would interact with either reasonably foreseeable action, specifically the Dunka Mine or Twin Metals bulk sample. No cumulative effects to groundwater quality are anticipated resulting from the projects for which a basis of expectation has been laid within the environmentally relevant area.

- Visual Effects. As noted in Item 15, the proposed Project's activities will not be visible to the nearest residential community in Babbitt, MN, or from any other residences in the area. From the south, the top of the proposed Type II VF stockpile will be visible only from the internal road system at the Peter Mitchell Mine. With regard to other projects in the area, the Twin Metals Bulk Sample project is well outside of the visual range of the proposed Project. The PolyMet project is visible from the Project site, but minimally so. In concert the proposed Project, and the Twin Metals and PolyMet projects, have little or no additive cumulative effect on visual aesthetics in the area.

- Noise. Item 17 details that the proposed Project's activities are further away from the nearest noise receptor than current activities. Noise impacts from the PolyMet and Twin Metals projects would be too far away from the proposed Project to generate cumulative potential effects.

- Wildlife Corridors. The proposed project does not affect identified wildlife corridors as detailed in Item 13. Cumulative effects to these resources are not anticipated.

These are the only potential types of cumulative effects identified from the interaction of the proposed Project with other projects for which a basis of expectation has been laid within the environmentally relevant area.

20. Other potential environmental effects: *If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.*

There are no additional environmental effects that are not discussed in items 1 to 19.

RGU CERTIFICATION. *(The Environmental Quality Board will only accept* ***SIGNED*** *Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature ____________________ Date Sept. 2, 2014

Title Environmental Review Planner