NorthMet Project – Wild Rice Mitigation – Sensitive Period Aspects

Prepared by PolyMet Mining Inc July 27, 2011 Version 1

Minnesota Rules pertaining to the 10 mg/L sulfate limit at waters used for the production of wild rice include language to the effect that the limit applies during the period that the rice is sensitive to sulfate. The current MPCA staff recommendation is that the sensitive period for the Embarrass and Partridge Rivers is from April 1 to August 31 and that residence time between sulfate source and waters used for production of wild rice must be accounted for.

PolyMet will not ask for application of the sensitive period aspect of the Rules for waters used for production of wild rice in the Embarrass River system (Embarrass Lake).

There is no surface discharge at the Mine Site during operations or while the West Pit is flooding after mine closure. There is a surface discharge once the West Pit is completely flooded and overflows to the Upper Partridge River. Based on DEIS modeling, the waters used for protection of wild rice in the Upper Partridge will require application of the sensitive period aspect of the Rules. PolyMet's current plan is to control the overflow of the West Pit and store water in the West Pit during the period that the MPCA staff has defined as being the sensitive period for wild rice.

Table 1 summarizes the information about wild rice in the Upper Partridge River. For 2009 and 2010, the most upstream wild rice was found between SW-004a and SW-005. This is located downstream of Northshore Mining Company's Peter Mitchell Pit mine dewatering flow that potentially has sulfate concentrations above 10 mg/L. This load was accounted for in the DEIS modeling (results shown below).

Table 1 – Upper Partridge River Wild Rice Survey Information

Year	Location of Wild Rice closest to West Pit Overflow	Sulfate mg/L at Time Rice Found	Peter Mitchell Pit Discharging	DEIS modeled Sulfate mg/L SW-004a to SW-005 during West Pit overflow		
				Low Flow	Avg Flow	High Flow
2009	about 2 miles downstream of SW-004a	4.60 to 5.74	Likely*	33.1 to 26.3	20.7 to 15.6	12.2 to 11.9
2010	Just upstream of SW-005	21.3	Likely*			

* Based on publically available information

The modeling for the SDEIS differs from the DEIS modeling as follows:

1. A probabilistic approach is being used, which may reduce the range of outcomes and will assign expected probabilities to those outcomes.
2. The Category 1 Stockpile was modeled in the DEIS with a liner (some liner leakage flowed via groundwater to Partridge River and the rest to the West Pit in closure) and will be modeled in the SDEIS with a groundwater containment system (all water to West Pit in closure).
3. Geochemical modeling assumptions refined – some driving sulfate release up and some driving sulfate release down.

The potential impact of the NorthMet Project on sulfate concentrations at the wild rice in the Upper Partridge River will not be known until the SDEIS modeling is completed.

If SDEIS modeling shows that sulfate concentration at the wild rice will be over 10 mg/L with the current engineering controls, there are additional engineering controls that can be applied:

1. A Permeable Reactive Barrier (passive treatment system) could be installed between the East and West Pit.
2. A Permeable Reactive Barrier could be installed in the water conveyance for the Category 1 Stockpile Groundwater Containment System before the water enters the West Pit.
3. A Permeable Reactive Barrier could be installed at the West Pit outlet.
4. The Category 1 Stockpile Cover System could be designed to be more effective (requires reduction of infiltration to the point that solubility limits take effect).
5. Cover systems could be applied to the East and West Pit mine walls.
6. Discharges from the West Pit (gated) and Peter Mitchel Pit (pumped) could be managed to not coincide.

These engineering controls can be modeled to assess their potential to achieve the required results. The cumulative costs of engineering controls could be significant. Modeling will determine whether current or the current plus additional engineering controls will result in enough reduction to achieve the required results should the sensitive period aspect of the Rules not be applied.. If the current or current plus additional engineering controls are insufficient, other more costly solutions such as long term active water treatment using RO technology may have to be considered.

At this time, it is not possible to determine if the sensitive period aspect of the Rules would have to be applied, if additional engineering controls would nullify the need for application of the sensitive period aspect or if the additional engineering controls and/or long term active treatment would impact project economics to the point where the controls are not economically feasible.