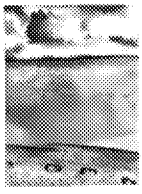

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June 2, 2011

Simon Manoyan
United States Environmental Protection Agency – Region 5
77 West Jackson Boulevard
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Chicago, IL 60604-3507
Manoyan.Simon@epa.gov

RE: PolyMet NorthMet Project – Potential Impacts of Brackish Water or Brines

Dear Mr. Manoyan:

This letter follows up a phone conference of May 26, 2011 between U.S. EPA staff and non-profit representatives, including WaterLegacy, the environmental group that I represent in connection with the PolyMet NorthMet Project.

In our phone conference, we asked EPA staff whether the supplemental draft environmental impact statement ("SDEIS") for the PolyMet Project was investigating the presence of brackish waters, sometimes referred to as "brines," in the Duluth Complex. This concern was raised by WaterLegacy's volunteer consulting chemist.

Here is a brief summary of the issue:

- Intrusions of brackish waters or brines may be found within the Duluth Complex.

- The Minnamax project drilling in the Duluth Complex in the late 1970's encountered saline water, with chlorides up to 11,000 mg/L in a drill hole (far above the water quality standard of 230 mg/L). Later, when constructing their test mine, Minnamax encountered highly saline mine dewatering wastewater. Chlorides can disrupt osmotic balances, and acres of wetlands were impacted by the saline discharge at Minnamax.

- Research published in 1991 pertaining to the Minnamax site identified drill cores from the Duluth Complex containing high chloride (up to 3200 ppm) and fluoride (up to 760 ppm) concentrations. The report noted that these levels came from drill holes located in troctolitic rocks in the area of the Maturi, Minnamax, Water Hen, Dunka Road, and Dunka Pit formations of copper-nickel sulfide occurrences.[1]

- Geological research suggests that troctolitic rock formations in which high chloride levels can be found may be prevalent in Minnesota's Duluth Complex where fractures are

[1] Eduard H. Dahlberg & Bernhardt Saini-Eidukat, *A Chlorine-bearing Phase in Drill Core of Serpentinized Troctolitic Rocks of the Duluth Complex, Minnesota*, Canadian Mineralogist Vol. 29, 1991, pp. 239-244 (attached)

present and may coincide with higher levels of concentrations of various metals.[2]

- PolyMet has drilled in at least 66 permitted drill holes at 65 sites.[3] The PolyMet DEIS provided no information as to whether any of PolyMet's drill core samples found chlorides or other markers for intrusions of brackish waters or brines.

- The U.S. Forest Service has recently recognized that minerals prospecting in the Duluth Complex may result in the introduction of salty or brackish water into groundwater.[4]

- U.S. EPA has determined chloride is acutely toxic to freshwater aquatic life at 860 mg/L and chronically toxic at 230 mg/L. National and Minnesota surface water quality standards are set at these levels. *See* Minn. R. 7050.0220, Subp. 4a. Many of the streams potentially impacted by PolyMet discharge have low enough flow (7Q10) so that the 230 mg/L level would operate as the in-stream as well as the discharge standard for chlorides.

- There are no federal or state surface water quality standards for fluorides, but fluoride has a maximum contaminant level ("MCL") in groundwater of 4.0 mg/L. 40 CFR §141.51(b) The federal secondary MCL for fluoride drinking water standard is 2.0 mg/L. 40 CFR §143.3.

- Should mine pit waters contain high levels of chloride and fluoride, Minnesota's Copper-Nickel Study suggests there is substantial risk that this brackish water will move into both shallow groundwater and into deeper groundwater through fractured surface rock since "the entire area underlain by the Duluth Complex is extensively faulted and that this faulting may have played an important role in the localization of the copper nickel sulfide mineralization. Faults and joints contribute to the permeability of the bedrock for water movement."[5]

- Minnesota's Copper-Nickel Study also recognized that the spatial distribution of salts in the copper-nickel mining area was unknown and could present water quality and water treatment concerns: "Highly saline water has been encountered in some bedrock areas in the Study Area (AMAX Drill Hole 303). The source and spatial distribution of this water in the Study Area is unknown. Its occurrence in significant quantities (if encountered during mining) could present significant water quality, mineral processing, and water treatment problems."[6]

- The water treatment methods suggested in the PolyMet DEIS – lime and filtration – are not recommended for brackish waters. Reverse osmosis and electrodialysis have been identified as the most competitive of potentially available treatments[7]; they are not

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[2] Mark Severson & Randal Barnes, Geology, *Mineralization, and Geostatics of the Minnamax/Babbitt Cu-Ni Deposit (Local BoyArea), Minnesota Part II: Mineralization and Geostatics*, Natural Resources Research Institute, Technical Report TR-90-13b (1991) see e.g. pp. 24, 56, 59, 62 (attached).

[3] Draft Environmental Impact Statement, Federal Hardrock Mineral Prospecting Permits, Superior National Forest (March 2011), "Prospecting DEIS," Appendix C, p. 257 http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/31175_FSPLT2_035632.pdf (last visited May 27, 2011)

[4] Prospecting DEIS, *supra*, p. 131.

[5] Stevenson, Kreisman, Sather, Minnesota Regional Copper-Nickel Study, MEQB - Vol 3 - CH1 Geology and Minerology, (TN443.M6M56xv.3ch1)

[6] Daryle Thingvold, Nancy Sather, Peter Ashbrook, *Water Quality Characterization of the Copper Nickel Water Quality Research Area*, Minnesota Regional Copper-Nickel Study, MEQB (Dec 1979).

[7] U.S. Congress, Office of Technology Assessment, *Using Desalination Technologies for Water Treatment*, OTA-BP-O-46 (Washington, DC: U.S. Government Printing Office, March 1988), p.1, http://www.fas.org/ota/reports/8842.pdf (last visited May 27, 2011).

discussed in the PolyMet DEIS.

Based on the above information and the attached publications pertaining to salts and Duluth Complex rock, WaterLegacy believes that the investigation of the PolyMet site and analysis of potential impacts to groundwater, surface water and wetlands should include a review of the risk of intrusions upon brackish waters or brines. The following actions are suggested:

1. Regulators should be provided information from PolyMet's investigations, including the 66 drill cores described above, to assist in evaluating the magnitude of the risk of brackish water intrusions or brines on the PolyMet mine site;

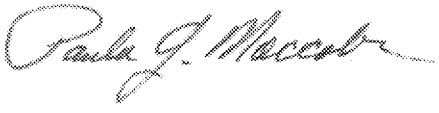
2. Estimates of wetlands impacts in the PolyMet SDEIS should include the potential risk of impairment from brackish water or brine intrusions;

3. Specific measures should be developed and analyzed in the SDEIS to minimize and mitigate the short and long term impacts should brackish waters or brines be encountered at the PolyMet mine site, including appropriate water treatment technologies.

We would appreciate if you would present these concerns to the interagency working groups pertaining to water quality, wetlands and geochemistry and provide us with a response as to how the potential risk of brackish water or brine intrusions has been and is being investigated and addressed.

Please feel free to contact me at 651-646-8890 if you have any questions or if you would like to discuss these issues with our consulting chemist.

Sincerely yours,



Paula Goodman Maccabee
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Enclosure

cc: Kenneth Westlake (Westlake.Kenneth@epa.gov)
Melanie Haveman (Haveman.Melanie@epa.gov)