TECHNICAL MEMORANDUM

DATE September 14, 2012

PROJECT No. 11-1427-0030/1000

TO Adrian Paradis
Aboriginal Affairs and Northern Development Canada

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FROM Nathan Schmidt and John Hull

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COMPARISON OF DIFFUSERS AND MIXING ZONES, NWT

As requested, we have prepared a short summary of diffusers that are operating or are proposed for mine sites in NWT. Table 1 provides the information requested by the Mackenzie Valley Environmental Impact Review Board on September 11, 2012, regarding the size of mixing zones at other projects similar to the Giant Mine project. It also includes, for context, additional information on physical characteristics of the diffusers at these projects. All of this information was obtained from public sources, as referenced in the table.

Table 1: Mixing Zone Characteristics at Northern Diffusers

Project	Water Body	Mixing Zone Size (m)	Diffuser Characteristics				
			No. of Ports	Port Diameter (m)	Length (m)	Port Depth [e] (m)	Maximum Discharge (m^3/d)
AANDC Giant Mine Project [a]	Great Slave Lake	16	28	0.013	81	8	2,940
Diavik Diamond Mine Project [b]	Lac de Gras	60	7 + 11	0.125	72 + 120	~20	90,000
De Beers Snap Lake Project [c]	Snap Lake	200	5	0.136	66	13.29	35,000
Fortune Minerals NICO Project [d]	Peanut Lake	8.5 13.9	1	0.059	n/a	7.75	380 1,920

(a) Golder (2011a).

(b) Diavik (2008); Diavik (2010).

(c) De Beers (2008), Golder (2011b).

(d) Fortune (2011).

(e) Nominal depth below open water surface.

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It must be noted that:

- The diffusers at the Diavik and De Beers Snap Lake projects have ports that are aimed upwards, and the mixing zone length is expressed as a radius from each port. The area of influence of each port extends radially from each port (i.e., a diameter of 120 m for Diavik and 400 m for Snap Lake).
- The proposed single-port diffuser at the Fortune Minerals NICO project is oriented 30 degrees above horizontal and towards the lake outlet, and the 8.5 m mixing zone corresponds to the lowest operational discharge of 380 m^3/d. At the maximum discharge of 1,920 m^3/d, the mixing zone will extend 13.9 m downstream of the diffuser port.
- The proposed multi-port diffuser at the AANDC Giant Mine project will have ports oriented at 30 degrees (subject to optimization during detailed design) above horizontal, with alternating ports aimed in opposite directions (e.g., north and south). The mixing zone length for each port is 8 m based on a dilution ratio of 100:1, therefore the total width of the mixing zone is 16 m. We note that the preliminary mixing zone width of 30 m as referenced by Golder (2011a) was based on a 150:1 dilution ratio. Subsequent work indicated that the lower width satisfies mixing requirements at the project.

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