



Giant Mine Environmental Assessment

IR Response

Round One: Information Request - Yellowknives Dene First Nation #09

June 17, 2011

INFORMATION REQUEST RESPONSE

EA No: 0809-001

Information Request No: YKDFN #09

Date Received

February 28, 2011

Linkage to Other IRs

Alternatives North IR #21
Environment Canada IR #01

Date of this Response

June 17, 2011

Request

Preamble:

It was proposed that the induced hydraulic capture zone created by the pumping of minewater will limit the release of contaminated groundwater to the surrounding environment. It was indicated that the mine water levels even during reflooding would be maintained in the underground workings sufficiently below static water table levels to promote an inward gradient of groundwater flow into the underground mine workings. It was indicated that historical groundwater data of the piezometric levels and geochemistry would be utilized to establish groundwater conditions and would be utilized to compare changes brought by the planned remedial activities. The collection of ground water data (piezometric and geochemistry) is outlined in the DAR, however it is not clear how the collected groundwater data would be to use to evaluate of the performance of the hydraulic capture system and its ability to maintain an inward hydraulic gradient. Additionally it is unclear in the DAR on what type of contingency measures and corresponding threshold values would be implemented if the hydraulic capture system is not working as intended.

Question:

It is requested that the proponent outline how the groundwater monitoring data (piezometric level and geochemistry) will be used to evaluate the hydraulic capture zone and its ability to maintain an inward hydraulic gradient into the underground mine workings. As part of describing the evaluation of the hydraulic capture system it is requested that the proponent identify threshold values for piezometric water levels and geochemistry, and detail corresponding contingency activities if the hydraulic system is deemed to be not working efficiently.





Giant Mine Environmental Assessment

IR Response

Round One: Information Request - Yellowknives Dene First Nation #09

June 17, 2011

Reference to DAR

- s. 6.1.2 Summary of Post-Remediation Conditions
- s. 6.8.3 Underground Water Management
- s. 7.2.3 Groundwater Flow
- s. 8.5 Geological and Hydrogeological Environment

Reference to the EA Terms of Reference

- s.3.2.4.9
- s.3.2.3.1
- s. 3.5.1.3 (b)

Summary

An extensive groundwater monitoring system, comprising over 120 monitoring points, is already in place and has been used to assess groundwater levels and water quality for over five years. The results clearly demonstrate the presence of a hydraulic trap, and the monitoring system will continue to be used in future.

Response

The Remediation Plan proposes that the mine water level, following full frozen block formation and verification, will be kept below the bottom of the deepest open (SRK 2007, section 5.7.3). This means that the local groundwater level would be at least as deep as the bottom of the A2 Pit, maintaining a hydraulic capture zone.

The monitoring system layout is presented in Figure 7.2.4 of the DAR. Groundwater levels have been monitored in the fifteen deep multilevel monitoring well systems, comprising 129 separate monitoring zones in total, every year during re-flooding. Water levels measured using the monitoring systems were first presented in the groundwater monitoring report (SRK, 2005) in Figures 3.7 and 3.8, as presented below.

Biannual monitoring has shown that piezometric levels have not reacted significantly to the re-flooding of the mine from the fully dewatered condition (approximately 600m below ground surface) to the current partially dewater condition (approximately 230m below ground surface). Therefore, the water contours in figures below are still representative of current conditions at the site and support the presence of a hydraulic trap surrounding the partially dewatered mine.

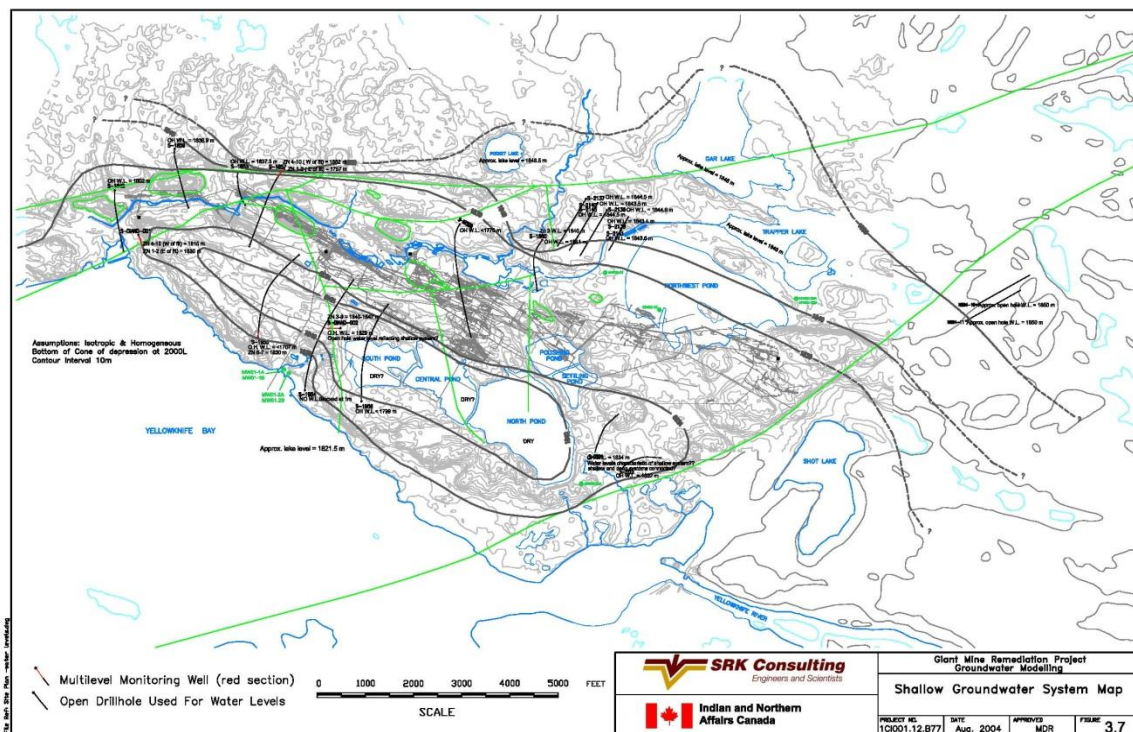
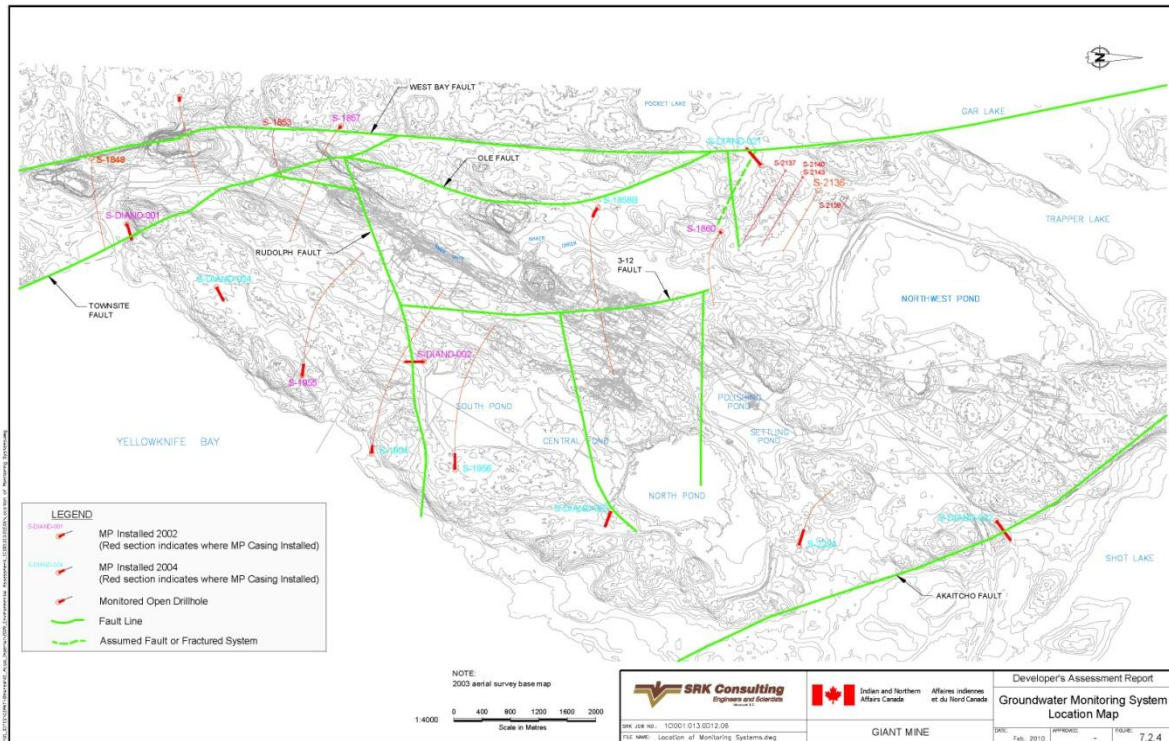




Giant Mine Environmental Assessment IR Response

Round One: Information Request - Yellowknives Dene First Nation #09

June 17, 2011

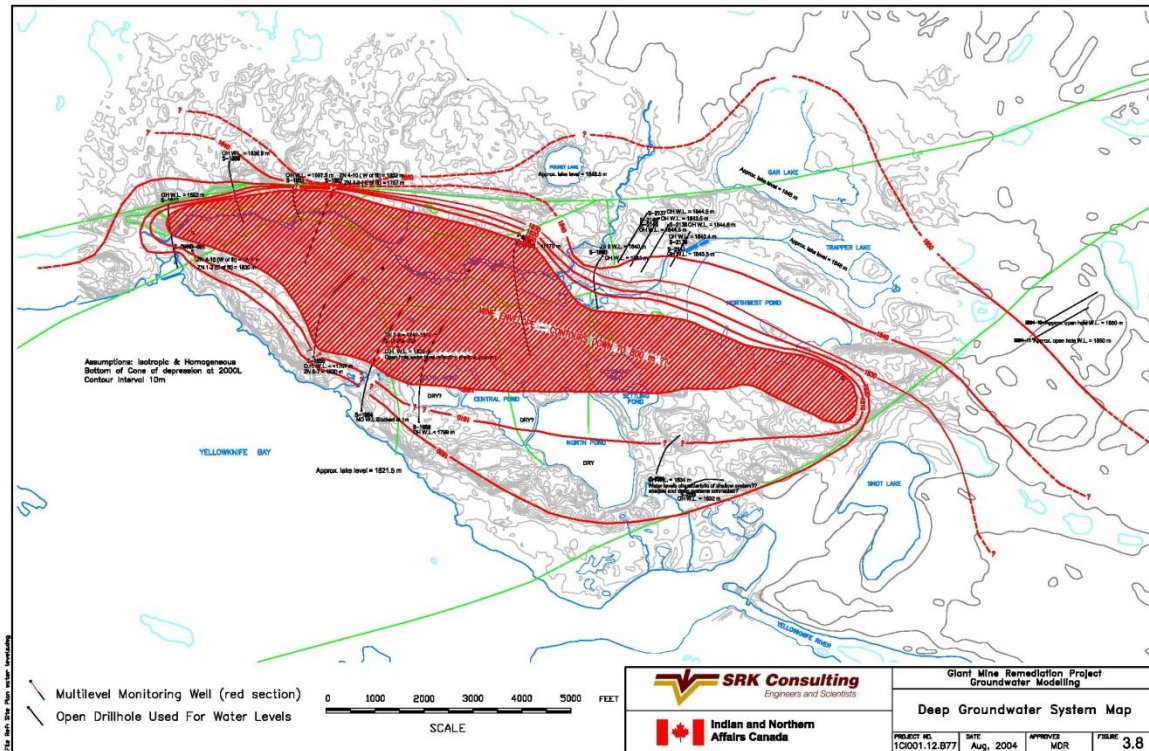




Giant Mine Environmental Assessment IR Response

Round One: Information Request - Yellowknives Dene First Nation #09

June 17, 2011



Groundwater chemistry has been monitored using the same deep monitoring system and reported annually. Approximately 40 selected zones have been sampled for water quality during the re-flooding of the mine to the current level. No significant changes have been noted in the monitoring data, indicating that groundwater conditions are relatively stable over the monitoring period. The groundwater intercepted by these monitoring systems consists of water that is flowing towards the mine in the “hydraulic trap” generated by the dewatered tunnel system.

Existing shallow standpipes located around the mill area, the tailings impoundments, and at the historic tailings deposition area below the South Pond have also been sampled annually during the same period. These are generally located above the dewatered mine; therefore, groundwater flow would be downwards (i.e.: infiltrating directly into the underlying tunnel system).

Currently no groundwater criteria apply to the Giant Mine site. However, detection limits were recommended in the Remediation Plan to allow for assessment of changes in the hydro-geochemistry due to remedial works or natural flushing due to groundwater movement over time. These were presented in Table 7.1 of the Giant Mine Remediation Plan (SRK, 2007).



Giant Mine Environmental Assessment

IR Response

Round One: Information Request - Yellowknives Dene First Nation #09

June 17, 2011

Table 7.1: Proposed Analyte List for Surface and Groundwater Samples

Parameter Name (Units)	Parameter Type	Detection Limit		Preparation Method		Test Method
Alkalinity (mgCaCO ₃ eq/L)	physical	0.1		none		SM2320:B
Conductivity, Specific (S/cm)	physical	0.4		none		SM2510:B
pH	physical	0.05		none		SM4500-H:B
Solids, Total Dissolved (mg/L)	physical	10		GF/C Filt.		SM2540:C
Solids, Total Suspended (mg/L)	physical	3		GF/C Filt.		SM2540:D
Calcium (mg/L)	major ion	0.1		none		SM4110:B
Cation/Anion Balance (mg/L)	major ion	na		Major Ion Detection		Calculated
Chloride (mg/L)	major ion	0.7		none		SM4110:B
Electroneutrality (mg/L)	major ion	na		Major Ion Detection		Calculated
Magnesium (mg/L)	major ion	0.1		none		SM4110:B
Nitrate as Nitrogen (mg/L)	major ion	0.01		none		SM4110:B
Nitrite as Nitrogen (mg/L)	major ion	0.01		none		SM4110:B
Potassium (mg/L)	major ion	0.1		none		SM4110:B
Sodium (mg/L)	major ion	0.1		none		SM4110:B
Sulphate (mg/L)	major ion	1		none		SM4110:B
Ammonia as N (mg/L)	nutrient	0.005		none		SM4500-NH3:G
Nitrate + Nitrite as Nitrogen (mg/L)	nutrient	0.01		none		SM4110:B
Arsenate (µg/L)	other	5		none		SM3113:B
Arsenite (µg/L)	other	5		none		SM3113:B
Inorganic Carbon, Dissolved (mg/L)	other	0.5		GF/C Filtration		EPA415.1
Organic Carbon, Dissolved (mg/L)	other	0.5		GF/C Filtration		SM5310:B
Metals		Total	Dissolved	Total	Dissolved	
Aluminum (mg/L)	metals	0.03	0.0006	Acid Digest	(0.45 µm filt.)	EPA200.8
Antimony (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Arsenic (mg/L)	metals	0.0002	0.0002	Acid Digest	(0.45 µm filt.)	EPA200.8
Barium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Beryllium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Cadmium (mg/L)	metals	0.0001	0.00005	Acid Digest	(0.45 µm filt.)	EPA200.8
Caesium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Chromium (mg/L)	metals	0.0003	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Cobalt (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Copper (mg/L)	metals	0.0003	0.0003	Acid Digest	(0.45 µm filt.)	EPA200.8
Iron (mg/L)	metals	0.05	0.05	Acid Digest	(0.45 µm filt.)	EPA200.8
Lead (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Lithium (mg/L)	metals	0.0003	0.0002	Acid Digest	(0.45 µm filt.)	EPA200.8
Manganese (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Molybdenum (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Nickel (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Rubidium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Selenium (mg/L)	metals	0.001	0.0003	Acid Digest	(0.45 µm filt.)	EPA200.8
Silver (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Strontium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Thallium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8





Giant Mine Environmental Assessment

IR Response

Round One: Information Request - Yellowknives Dene First Nation #09

June 17, 2011

Titanium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Uranium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Vanadium (mg/L)	metals	0.0001	0.0001	Acid Digest	(0.45 µm filt.)	EPA200.8
Zinc (mg/L)	metals	0.01	0.0004	Acid Digest	(0.45 µm filt.)	EPA200.8

References:

SRK Consulting Inc., 2005. *Groundwater Modeling: Model Design and Simulation Results*. Prepared for Indian and Northern Affairs Canada. (Giant Mine Remediation Plan, Supporting Document C5)

SRK Consulting Inc., 2007. *Giant Mine Remediation Plan*. Prepared for Indian and Northern Affairs Canada.