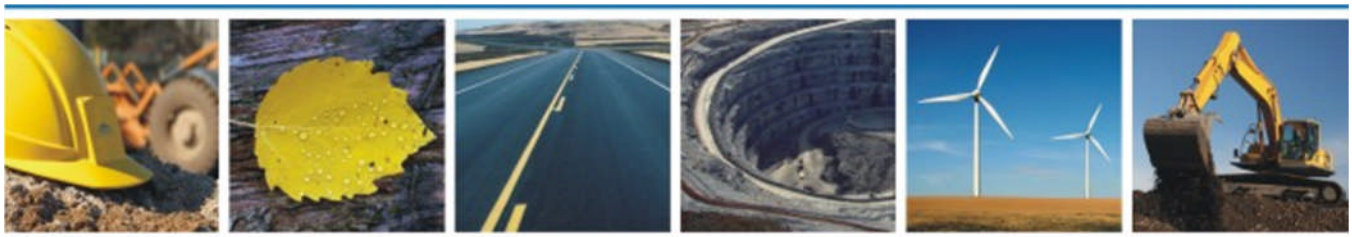
SHEAR DIAMONDS (NUNAVUT) CORP.

TECHNICAL MEMORANDUM K

PIT FILLING RATE ESTIMATION UPDATE FOR JERICHO DIAMOND MINE, NUNAVUT



REPORT

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EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company
14940 - 123 Avenue
Edmonton, AB T5V 1B4 CANADA
p. 780.451.2121 f. 780.454.5688

EXECUTIVE SUMMARY

The closure plan for the Jericho Mine includes refilling the open pit with fresh water. A 20-year pit filling time was estimated in 2004 under the previous ownership. EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA) was requested by Shear Diamonds Ltd. (Shear) to recalculate the time to refill the pit. The objectives of this technical memorandum are to update the post-closure pit filling rates under natural conditions, and to propose additional filling alternatives to achieve or reduce the previously estimated pit filling time.

Two scenarios of the pit volumes are considered: one being the current pit as of February 2008 with estimated 4.4 million m3 of volume, and the other one being the final pit as per the 2005 Updated Mine Plan with approximately 13.6 million m3 of volume.

The evaluated filling options include natural runoff and precipitation, redirecting Stream C1 Diversion into the open pit, and pumping from Carat Lake. The following tables summarize the estimated filling time under the two scenarios of the pit volumes:

Scenario 1: Estimated Rates to Fill Current Pit

Filling Option	Filling Options			Estimated Filling Period
	Natural Filling	Redirecting Stream C1 Diversion	Carat Pumping	
	≤ 100,238 m^3/yr	328,000 m^3/yr	350,000 m^3/yr	
1	x			52 years
2	x	x		11 years
3	x		x	11 years

Scenario 2: Estimated Rates to Fill Final Pit

Filling Option	Filling Options				Estimated Filling Period
	Natural Filling	Redirecting Stream C1 Diversion	Carat Pumping		
	≤ 100,238 m^3/yr	328,000 m^3/yr	350,000 m^3/yr	1,000,000 m^3/yr	
1	x				163 years
2	x	x			33 years
3	x		x		32 years
4	x	x	x		18 years
5	x			x	13 years

The feasibility of pit filling alternatives requires additional studies and agreements from the project stakeholders. These may include additional hydrological and aquatic biological studies at Stream C1, and the hydrological and aquatic biological studies at the outlet of Carat Lake.

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1.0 INTRODUCTION

1.1 General

The closure plan for the Jericho Mine includes refilling the open pit with fresh water. EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA) was requested by Shear Diamonds Ltd. (Shear) to calculate the time to refill the pit for various options. The Pit Filling Rate Estimation Update for Jericho Diamond Mine, described herein, has been prepared to:

- Revaluate the estimated time to fill the open pit after closure through natural precipitation and runoff;
- Propose other alternatives to facilitate the pit filling; and
- Fulfil Shear Diamonds (Nunavut) Corp. (Shear)'s commitment during the Water Licence Technical Meeting in Cambridge Bay, Nunavut on June 20, 2011.

1.2 Background Information

The Jericho Diamond Mine is located approximately 260 km southeast of Kugluktuk, NU, and 30 km north of Lupin Mine. It was constructed and operated between 2005 and 2008 by Tahera Diamond Corporation (TDC). The mining activities were suspended in February 2008 and the ore processing activities were suspended in April 2008. In August 2010, Shear purchased the Jericho Mine and its assets, and assumed the responsibility for the site.

The pit filling period was previously estimated and presented in the 2004 water licence application supporting documents (SRK 2004 and AEMC 2004). In the SRK 2004 report, the filling period was estimated for two options. The first option assumed that runoff from all site areas flows to the pit, and results in the pit filling about 20 years after closure. The second option assumed additional flows by diverting Stream C1 during freshet. The pit filling period would be reduced to approximately 15 years after closure under the second option.

Based on the 2005 Revised Mine Plan (TDC 2005), 13.6 million m^3 of water would be required to fill the final pit. In comparison, the original final pit volume used in the previous filling rate calculation was 7 million m^3 (AEMC 2004).

Shear started the site runoff monitoring during the freshet in 2011 and found that runoff and seepage from the north portion of the waste rock pile area directly flow towards Carat Lake; and runoff from the low grade ore stockpile area and the plant site area flows towards Lake C1, which further feeds into Carat Lake through C1 diversion channel and Stream C1. The only runoff that flows into the pit was from the south portion of the waste rock pile (See Figure 1).

During the Water Licence Renewal Technical Meeting in Cambridge Bay, Nunavut in June 2011, Shear proposed to update the pit filling rate in April 2012. This information will be used to develop the Interim Closure and Reclamation Plan in 2013.

1.3 Objective

The objectives of this technical memorandum are to update the post-closure pit filling rates under natural conditions, and to propose additional filling alternatives to achieve the previously estimated pit filling time. The specific tasks include:

- Redefining the catchment areas;
- Identifying the pit volume;
- Verifying the hydrological parameters;
- Proposing additional filling options; and
- Identifying data gaps and providing recommendations for further study.

2.0 BASIS OF CALCULATION

2.1 Catchment Areas

Based on the current site water management infrastructure at Jericho, the catchment areas that contribute to the pit filling are:

- **Pit Catchment:** including the open pit area and the south portion of the waste rock pile. Precipitation and runoff in this catchment will naturally flow into the pit. The approximate area of this catchment is 445,500 m^2.
- **C1 Catchment:** including the Low Grade Ore Stockpile area, plant site area, and Coarse Processed Kimberlite (CPK) area. Runoff from this area will flow into Lake C1 and further into Carat Lake through C1 Diversion Channel and Stream C1. The approximate area of this catchment is 1,457,000 m^2.

2.2 Pit Volumes

Two scenarios are considered: one being the current pit as of February 2008 and the other one being the final pit based on the 2005 Updated Mine Plan (TDC 2005):

- Current Open Pit Volume: approximately 4.4 million m^3 to 480.7 m overflow level
- Final Open Pit Volume: approximately 13.6 million m^3 to 480.7 m overflow level

Shear is currently evaluating the resource and mining methods and may update the mine plan. If the geometry of the final pit in the updated mine plan differs from the 2005 mine plan, the pit filling estimate and associated filling methods may need to be reviewed and revised in the subsequent interim closure and reclamation plan.

The stage storage curve of the two pit volume scenarios are shown in Figure 2 and 3.

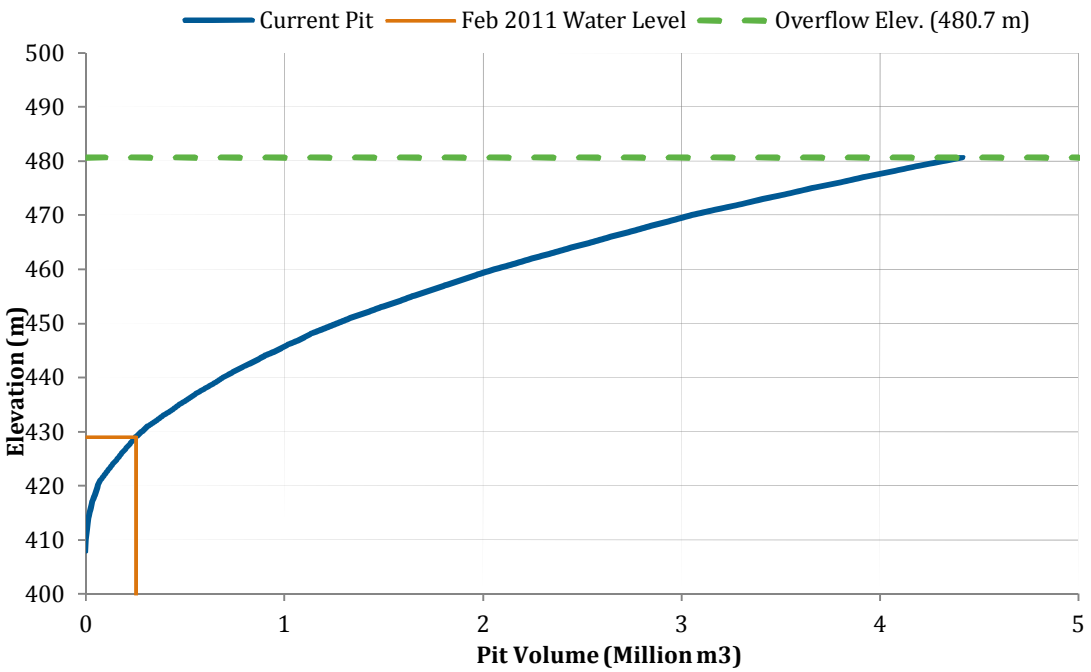

Figure 2: Current Pit (2012) Stage Storage Curve

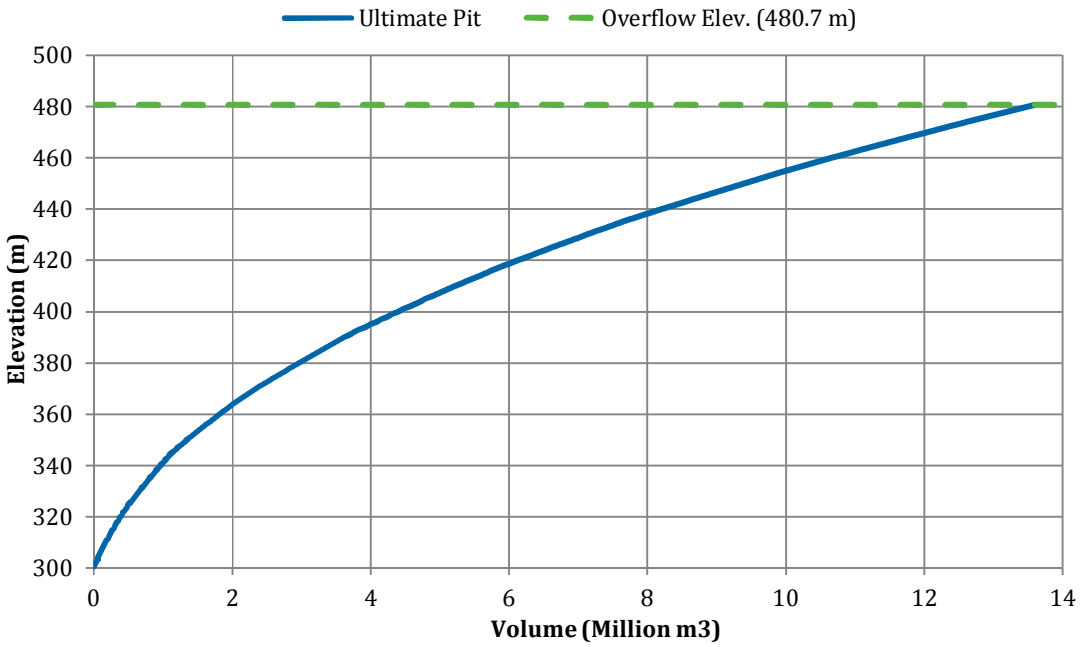

Figure 3: Final Pit (2005 Mine Plan) Stage Storage Curve

2.3 Precipitation and Runoff

The regional and local precipitation and runoff rates for the current pit filling estimates are based on *Technical Memorandum C – Supplemental Climate and Hydrology* (SRK 2003):

- Average Annual Precipitation: 330 mm
- Estimated Runoff in Vicinity of Jericho Kimberlite Pipe: 225 mm
- Estimated Open Water Evaporation: 270 mm

It appears that no additional hydrology studies were conducted after the mine started the operation in 2005 based on the records that Shear recovered from the previous ownership.

Two methods were used to verify the validity of the assumed local precipitation and runoff data:

- Based on TDC's monthly monitoring reports, approximately 104,000 m^3 of water was pumped from the pit sump in 2006. This reflects the amount of water that entered the pit through surface runoff and precipitation in 2006. In comparison, the calculated annual pit water accumulation based on the estimated runoff and pit catchment area is 100,238 m^3, assuming average precipitation and runoff values. The calculated accumulation is close to the pumped volume.
- There was no pit dewatering between 2008 and 2010 after the suspension of the mining operation in 2008. The volume of the accumulated water in the pit in the three-year period was approximately 251,000 m^3. In comparison, the calculated amount of accumulated pit water assuming the average precipitation, runoff and evaporation is 294,000 m^3. The actual water accumulation between 2008 and 2010 was approximately 85% of the calculated accumulation. It is unclear if the period between 2008 and 2010 were dry or wet years since no reliable precipitation is available from the Jericho site during these years and there is missing precipitation data from the nearby Lupin Weather Station,

Based on the above comparisons, the runoff and precipitation rates presented in the 2003 SRK report are deemed to be adequate for the current study.

2.4 Pit Filling Options

As described in Section 1.2, the amount of runoff that naturally flows into the open pit is lower than the assumed pit filling inputs in the 2004 estimate. In addition, the final pit volume in the 2005 updated mine plan is approximately twice the pit volume assumed in the 2004 filling estimates. Therefore, additional pit filling alternatives are evaluated to achieve or reduce the originally estimated pit filling time of 20 years. The following options were considered in the current study:

- **Natural Runoff and Precipitation:**

  This option assumes no additional water diversion or pumping will take place after the closure of the mine. The pit filling only relies on the natural runoff from the south portion of the waste rock and the direct precipitation into the pit.

- **Redirecting Stream C1 Diversion into the open pit:**

  This option assumes Stream C1 Diversion will be fully or partially redirected towards the pit. With 1,457,000 m^2 of catchment area, the amount of water that can be redirected to the pit is up to 328,000 m^3 per year.

- **Pumping from Carat Lake:**

  The water licence allows a withdrawal up to 350,400 m^3 of freshwater from Carat Lake per year for ore processing and camp usage. This option assumes the freshwater withdraw of 350,000 m^3 continues after the closure of the mine to fill the pit. Higher withdraw rates are also evaluated.

3.0 METHOD

Under each scenario and filling method, the pit filling rate is calculated using the time-depth-step method. The unit pit volume and surface area is modelled based on 1 m interval. The annual pit filling is based on the natural surface runoff, external input from C1 Diversion and/or active pumping, direct precipitation onto accumulated pit water and surface water evaporation. Below is the basic equation of the filling rate calculation:

$$V_{OP} = \sum_{0}^{n} [R \cdot (A_{PC} - A_{WS}) + (P - E) \cdot A_{WS} + R \cdot A_{C1} \cdot \%_{C1} + CL]$$

Where,

V_{OP} = Volume of Open Pit;
n = Number of years to fill the pit;
R = Runoff;
P = Precipitation;
E = Evaporation;
A_{PC} = Area of pit catchment;
A_{WS} = Area of water surface in the pit;
A_{C1} = Area of C1 Catchment;
$\%_{C1}$ = Portion of Stream C1 being diverted to the open pit;
CL = Quantity of water pumped from Carat Lake.

4.0 RESULTS AND DISCUSSIONS

4.1 Scenario 1: Current Pit

The pit filling options include 1) natural filling only, 2) natural filling and Stream C1 diversion redirected to the pit, and 3) natural filling and pumping from Carat Lake. The estimated pit water elevations over time are shown in Figure 4 and estimated times to fill the current pit are listed in Table 1.

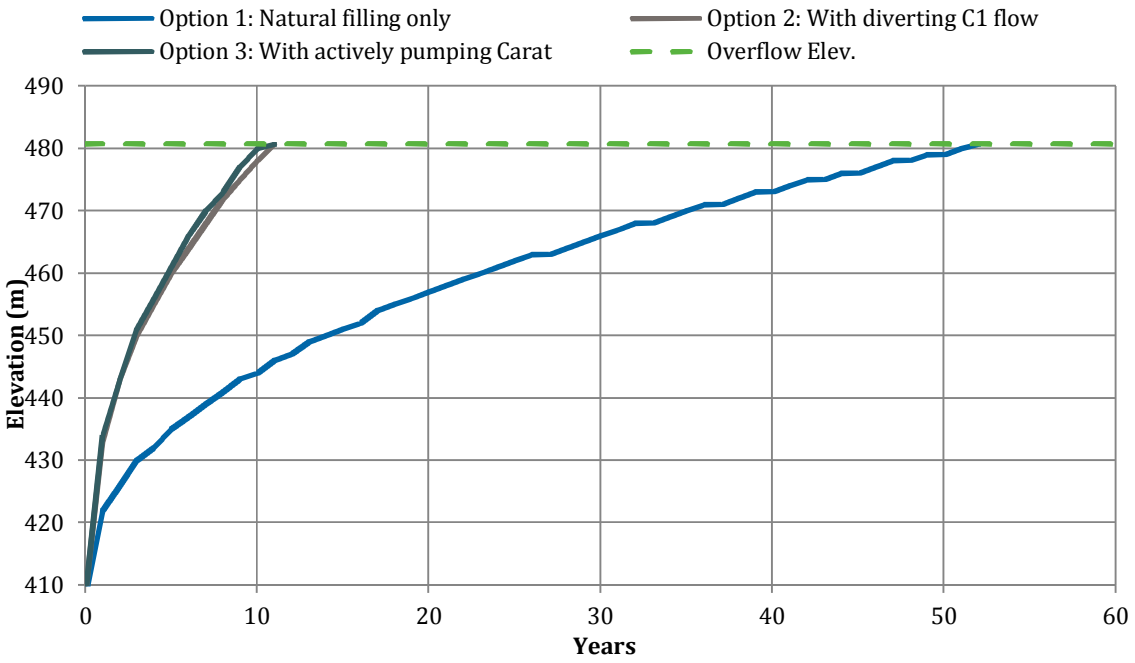

Figure 4: Filling Rates for Current Pit

Table 1: Estimated Rates to Fill Current Pit

Filling Option	Filling Options			Estimated Filling Period
	Natural Filling	Redirecting Stream C1 Diversion	Carat Pumping	
	≤ 100,238 m^3/yr	328,000 m^3/yr	350,000 m^3/yr	
1	x			52 years
2	x	x		11 years
3	x		x	11 years

The estimated time to fill the current pit is longer than the previously estimated filling period of 20 years. This is due to the smaller catchment area of the current pit. The time to fill the pit could be reduced by redirecting Stream C1 diversion to the pit or pumping from Carat Lake. The estimated pit filling period is 11 years assuming natural filling and redirecting Stream C1 diversion or pumping from Carat Lake.

Stream C1 is up-gradient from the open pit. Water from C1 diversion could be returned to its natural flow direction which flowed into the pit area. Using Stream C1 water to fill the pit instead of pumping from Carat Lake will reduce the operation and maintenance costs, reduce the project's carbon footprint and reduce the risk of fuel spills. However, the downstream portion of Stream C1 diversion was identified as a fish habitat. Directing the Stream C1 flow to the pit will result in the fish habitat disruption during the pit filling period. When the pit water reaches its overflow elevation, excess water from the pit will flow through the downstream portion of Stream C1 into Carat Lake; and the fish habitat will be re-established.

The current water licence allows Jericho to withdraw up to 350,400 m^3 freshwater from Carat Lake per year. The benefit of pumping water from Carat Lake is that the rate of water input can be controlled; thus,

the time that are required to complete the pit filling and to conduct the associated monitoring tasks can be better planned.

4.2 Scenario 2: Final Pit

The evaluated pit filling options include 1) natural filling only, 2) natural filling and redirecting Stream C1 to the pit, 3) natural filling and pumping 350,000 m^3/yr water from Carat Lake, 4) natural filling and both redirecting Stream C1 and pumping 350,000 m^3/yr water from Carat Lake, and 5) natural filling with a higher pumping rate from Carat Lake. The estimated water levels in the final pit are shown in Figure 5 and total times to fill the final pit are summarized in Table 2.

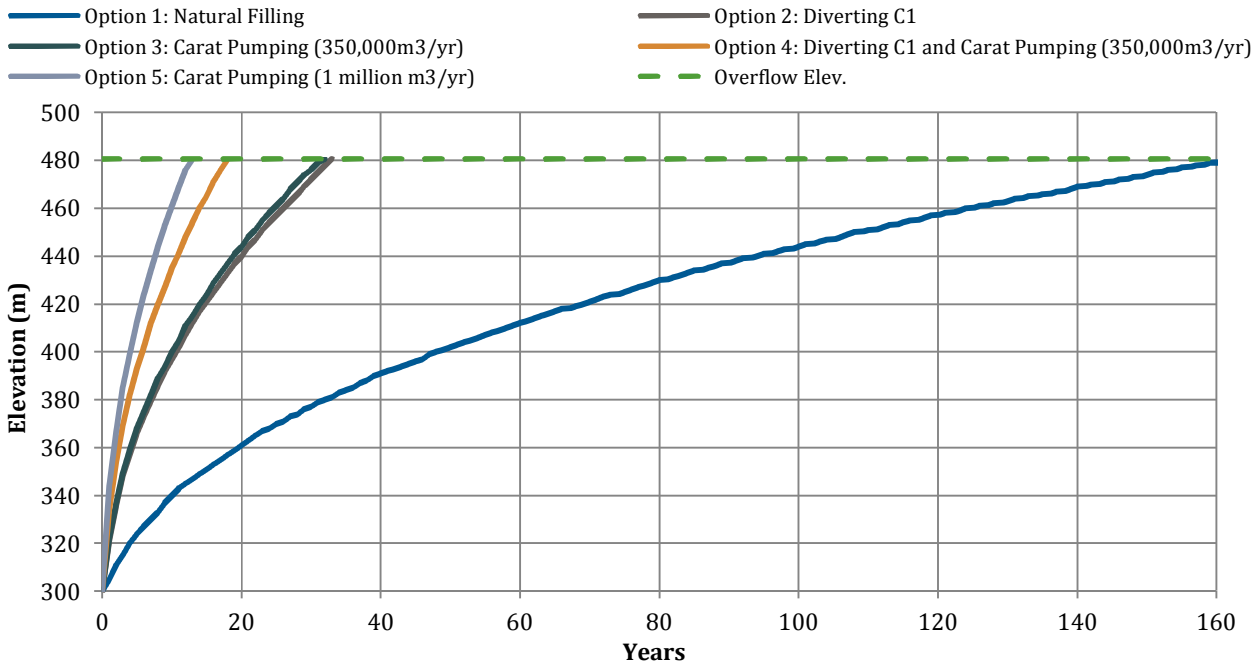

Figure 5: Filling Rates for Final Pit

Table 2: Estimated Rates to Fill Final Pit

Filling Option	Filling Options				Estimated Filling Period
	Natural Filling	Redirecting Stream C1 Diversion	Carat Pumping		
	≤ 100,238 m^3/yr	328,000 m^3/yr	350,000 m^3/yr	1,000,000 m^3/yr	
1	x				163 years
2	x	x			33 years
3	x		x		32 years
4	x	x	x		18 years
5	x			x	13 years

The estimated pit fill period is much longer than the previous pit filling estimate in the 2004 SRK report. This is due to the larger final pit volume and the smaller catchment. The two additional pit filling options proposed (redirecting Stream C1 Diversion or pumping from Carat Lake under the water licence limit), have estimated filling times are 33 and 32 years which are longer than the previously estimated filling period of 20 years. The following two options in Scenario 2 would achieve the previous 20-year pit filling estimate:

- Option 4, which combines redirecting Stream C1 Diversion and pumping water from Carat Lake under the current water licence limit of 350,400 m^3/yr. The resulting pit filling period is 18 years. As discussed in Section 4.1, the drawback of this option is that the fish habitat in Stream C1 Diversion downstream of the pit will be temporarily disrupted during the pit filling period.
- Option 5, which considers increasing the pumping rate from Carat Lake to 1 million m^3/yr. The estimated pit filling time will be reduced to 13 years. The hydrology of Carat Lake needs to be evaluated further to determine if the increased pumping rate will affect the fish habitat and fish migration route at the outlet of Carat Lake. Based on the Carat Lake outflow hydrograph, presented in the *Technical Memorandum C – Supplemental Climate and Hydrology* (SRK 2003), the low flow seasons are between July and August, and the estimated flow was approximately 0.6 m^3/sec. The proposed annual pumping rate of 1 million m^3/yr is equivalent to 0.09 m^3/sec during the summer season (from June to September). This is approximately 15% of Carat outlet flow during the low flow season.

4.3 Further Studies

The feasibility of pit filling alternatives requires additional studies and agreements from the project stakeholders.

Option of Diverting Stream C1

The current hydrograph of Stream C1 was based on two years of monitoring during the baseline study (SRK 2003). No stream flow monitoring was conducted after the current C1 Diversion was completed. When the mining operation resumes, multi-year stream flow and water quality monitoring should be conducted at Stream C1. In addition, fish habitat assessments should be conducted at the downstream portion of Steam C1 to estimate the potential loss of fish habitat during the pit filling period. A benefit-and-loss analysis should be conducted to compare temporarily losing the fish habitat and the benefit of a reduced pit filling period.

Option of Pumping Carat Lake with a Higher Rate

The current hydrograph of Carat Lake outlet was based on one year of monitoring during the baseline study (SRK 2003). When the mining operation resumes, the Carat Lake water level and Carat Lake outlet flow rate should be monitored. A fish habitat assessment should also be conducted at the Carat Lake outlet. A threshold lake water elevation, above which the fish habitat at Carat Lake outlet will not be altered, should be established. This could be used to determine the allowable pumping rate from Carat Lake to the pit.

5.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

EBA Engineering Consultants Ltd.

REGISTERED W.T. HORNE LICENSEE N.W.T. ENGINEER

April 17, 2012

William Liu, M.Eng., E.I.T.
Project Engineer, Arctic Region
Direct Line: 780.451.2130 x257
wxliu@eba.ca

Bill Horne, P.Eng.
Principal Consultant, Arctic Region
Direct Line: 780.451.2130 x276
bhorne@eba.ca

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EBA ENGINEERING CONSULTANTS LTD.
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Reviewed by Shear Diamonds Ltd.

April 18, 2012

Julie Lassonde
Executive Chairman and Chief Executive Officer

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