Indian and Northern Affairs Canada
www.inac.gc.ca

Affaires indiennes et du Nord Canada
www.ainc.gc.ca

Nunavut Regional Office
Box 100, Bldg. 918
Iqaluit, NU, X0A 0H0

Your file - Votre référence
NWB1JER
Our file - Notre référence
9545-1-1-JER-G

30 November 2004

Mr. Philippe di Pizzo
Executive Director,
Nunavut Water Board
PO Box 119
Gjoa Haven, NU X0B 1JO

Dear Mr. di Pizzo,

Re: INAC Intervention, Tahera Diamond Corporation Limited's Water Licence Application

Thank you for providing INAC with an opportunity to review and provide comments on the above-noted application.

The Department's review focused on those issues within INAC's mandate under the *Nunavut Waters and Nunavut Surface Rights Tribunals Act*; particularly surface and permafrost disturbance, water quality and quantity and abandonment and reclamation cost estimates.

Overall, INAC is satisfied with Tahera's licence application. INAC believes that those issues identified in our submission can easily be addressed through the terms and conditions of the water licence. INAC is also confident that the Tahera Diamond Corporation will be able to operate a diamond mine in an environmentally-sound manner. Please note, however, that INAC reserves the right to identify, during the final hearing, any omissions in the licence application that we may have overlooked in our review and/or additional questions that may arise as a result of ongoing discussions.

At this time, INAC requests that conference call facilities be made available at the hearing on Monday (December 6) evening so that those members of our contingent who are in Yellowknife, can participate. We also respectfully request that we be given 30 minutes on Tuesday, December 7, to submit our intervention.

INAC would like to take this opportunity to commend the Tahera Diamond Corporation and Mr. Greg Missal, for the honesty, integrity, forthrightness and cooperation which they have demonstrated throughout the environmental review and water licencing process. INAC was particularly pleased with the technical discussions

Canada

during which a significant number of outstanding issues were resolved in a professional and collegial manner.

In closing, INAC supports Tahera's water licence application and is pleased with the prospect of the ensuing economic opportunities that this operation will provide to Nunavut residents.

INAC looks forward to a continued and productive working relationship with Tahera, NWB and other relevant stakeholders.

Robert Eno
Water Resources Coordinator,
Kitikmeot/Kivalliq Regions

c. Greg Missal, Tahera Diamond Corporation
Derrik Moggy, Department of Fisheries and Oceans
Colette Meloche, Environment Canada
Mike Atkinson, DOE, Gov't of Nunavut

INAC Intervention

Jericho Diamond Mine,

Tahera Diamond Corporation Water Licence Application

Submitted:

November 30, 2004

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A. Jericho Diamond Mine Reclamation Cost Estimate

Executive Summary

Introduction

Project Description

The Jericho Diamond Project is located at the northwest end of Contwoyto Lake in Nunavut and is owned by Tahera Diamond Corporation. The mine has a predicted life of eight years. An open pit will be mined for the first few years, switching to underground mining in the later years of the project. Ore will be mined April to December and processed year round at an on site facility, at a rate of approximately 300,000 tonnes per year. Waste rock and coarse processed kimberlite will be deposited on surface, with fine tailings reporting to a processed kimberlite containment area (PKCA).

Indian and Northern Affairs - Roles and Responsibilities

The project lies partly on Inuit-owned Land administered by the Kitikmeot Inuit Association and partly on Crown Land administered by Indian and Northern Affairs Canada (INAC). If the project receives approval, INAC will negotiate issuance of, and enforce, instruments of land tenure for the portion of the project on land with surface rights held by the Crown.

Under the Nunavut Waters and Nunavut Surface Rights Tribunal Act, INAC will also be responsible for inspecting and monitoring compliance to the water licence issued by the Nunavut Water Board.

Environmental Assessment and Regulatory Review

INAC began its review of the proposed Jericho Diamond Project upon receipt of the initial project description and permit applications. INAC reviewed the Jericho Diamond Project Final Environmental Impact Statement and subsequent supplemental information provided by the company. INAC participated throughout the environmental impact review process and submitted its Technical Review of the Jericho Diamond Project to the Nunavut Impact Review Board (NIRB) November 10, 2003. Recommendations submitted to the Nunavut Impact Review Board focused on issues within INAC's mandate with particular regard to surface and permafrost disturbance, water quantity and quality, and socio-economic issues.

The NIRB Project Certificate was released in July 2004 and INAC provided input to the Nunavut Water Board (NWB) for the "Guidelines for Applicant" in July. These Guidelines were released early August 2004. Tahera Diamond Corporation submitted its water licence application to the NWB toward the end of August 2004. In preparation for the NWB regulatory process, INAC and its team of experts completed a site visit with Tahera representatives. On September 15, 2004 the NWB distributed the application and requested an assessment of the application and its conformity to the Guidelines. INAC provided its conformity assessment September 21, 2004. The NWB established the need for a technical meeting and pre-hearing that INAC attended October 28 - 29, 2004. At these meetings, the NWB directed all parties to work toward sharing information and resolving issues in preparation of the Final Hearing. INAC and its team of experts have actively engaged Tahera to meet this direction ending with the deadline of November 12, 2004.

Scope of Review of Water Licence Application

INAC's review has considered the Final Environmental Impact Statement (January 2003), and supplementary information, for the Jericho Project; the NWB Application (August 2004) and associated appendices; and information provided during the Technical meeting and up to November 12, 2004.

INAC's review focused on those issues within INAC's mandate, in particular: surface and permafrost disturbance; water quality and quantity; and abandonment and reclamation plan and cost estimates.

Although included in the NWB "Guidelines for Applicant", INAC did not review the compensation agreements (e.g., IIBA and No Net Loss Plan) between the Applicant and other parties. INAC also notes that the Applicant included a discussion of using a spray irrigation plan as a contingency for removing ammonia and other contaminants in the event that water quality in the PKCA exceeds water licence criteria. Condition #38 of the NIRB Certificate states that the Spray Irrigation Plan must be submitted to NIRB, under a separate application, for screening and approval. Therefore, INAC did not include the Spray Irrigation Plan in its review of the water licence application.

Concerns identified by INAC during the EA and initial steps in the regulatory phase have been addressed to some extent by information and commitments provided by Tahera Diamond Corporation. This intervention will highlight those issues that remain of concern to INAC, by providing rationale and context for the issue and recommended terms and conditions for the NWB's consideration.

INAC Recommendations

Hydrology and Surface Water Management

Management of recovery plant rejects are uncertain as reject material is not yet available to characterize. Therefore, the water licence should include a requirement for Tahera to submit a report after the first year of operation, identifying the characteristics of the recovery plant rejects, and the specifics of how they will be handled, including final location and rationale for appropriate blending ratio.

Water Quality

The permitted effluent discharge from the site should be limited to discharge from the PKCA. Proposed effluent discharges directly from the collections ditches should not be authorized at this time as insufficient details have been provided regarding discharge management, potential impacts and impact assessment monitoring. Direct discharges from the collection ditches should await submission of an amendment application that addresses operational monitoring data collected to that time, as well as details regarding effluent discharge management, discharge criteria, potential impacts and an impact assessment monitoring program.
Tahera has indicated the recycle from the PKCA to the process plant must be assessed as a viable alternative before it is applied at this site, although such recycle is generally considered "Best Management Practice". Therefore, the water licence should include a requirement for the

company to submit a report after the first year of operation identifying whether recycle will be implemented, and if not, providing a detailed rationale for why recycle is not considered a valid management practice at this site.

Tahera has indicated that careful management of the effluent discharge volumes relative to the receiving environment is required in order not to exceed predicted impacts, but has not provided a clear means of controlling effluent discharge rates to achieve this. Therefore the water licence should require Tahera to submit a management plan to the Water Board for review and approval 6 months prior to the first effluent discharge from the PKCA indicating in detail how effluent discharge rates will be managed to ensure a minimum 10:1 dilution at the edge of the mixing zone in Lake C3. This plan should not rely on estimating receiving environment outflow rates from changes in Carat Lake level unless monitoring data is provided that shows that the procedure will work as a means of calibrating effluent discharge rates.

Tahera has proposed aquatic thresholds to protect aquatic life and regulated discharge limits specific to the geochemistry of the bedrock and kimberlite of the Jericho site and to the receiving water environment of the Jericho watershed. INAC considers the methodology used as sound and the assumptions applied as conservative and reasonable.

INAC accepts the aquatic thresholds proposed for all but one parameter (aluminum) but recommends follow-up geochemistry work which may indeed confirm Tahera's assumptions and proposed aquatic threshold. In three other cases (cadmium, copper, and uranium) regular monitoring of fish flesh or zooplankton populations and species composition have been recommended to detect potential impacts on the most vulnerable aquatic ecosystem component for each parameter.

Discharge limits for six parameters (ammonia, nitrate, nitrite, chromium, zinc and aluminum) appear to be unnecessarily high. Recommendations have been presented for the Board's consideration, to minimize loadings to the Jericho River system, to encourage prudent explosives management and to attempt to keep regulated discharge limits in line with those for other diamond mines in the North.

Surficial Geology/ Landforms/ Permafrost

In general, the major outstanding issue is with respect to the design and construction of the PKCA divider dike. The Applicant has not presented a fully engineered design for the Divider Dike. In response to INAC's request during the Technical Meeting, Tahera has submitted an outline of the proposed geotechnical site investigations, design criteria and design requirements that will be carried out to ensure that this structure meets the required operational and post closure requirements to contain the fine PK. INAC is satisfied that the Applicant will follow this up with the required engineered design plan.

In addition, the following recommendations were made by INAC, that should be resolved or included at the Water Licence stage:

- Preparation of a spillway rating curve for the West Dam spillway to determine the PKCA pond levels under various scenarios and to finalize the freeboard, top of core and crest of dam elevations, including allowance for dam settlement and wave run-up and setup.

- Assessment of the durability of the coarse PK as a filter and cover material. This will be done when coarse PK is available as a waste product from the processing plant.

- Assessment of the erosion protection requirements for stream C3.

- Monitoring of seepage from the waste stockpiles towards the Key Lake catchment.

- Installation and monitoring of thermistors in the final outer slopes of the waste stockpiles to confirm stability of the waste damp slopes.

- Preparation of a conceptual design for the landfill.

- Preparation of a landfarm management plan, incorporating the experience gained at Ekati.

- Monitoring of pit slope stability, as required by NWB guidelines, as part of the overall geotechnical monitoring program that includes all major earthwork retention structures, dams and diversion structures, stockpiles and berms. Copies of all operational geotechnical inspection reports for both open pit and underground should be sent to the NWB for review.

- Preparation of an overburden reclamation plan that addresses how the overburden will be reclaimed from the stockpiles, with particular reference to control of meltwater and suspended sediment discharge during stockpile farming and harvesting.

- Post-closure demolition debris to be placed into a designated disposal area.

Monitoring

The geochemistry and associated water quality monitoring proposed by Tahera in Appendix I (Monitoring Summary Report) is considered incomplete and/or insufficient in some aspects to adequately characterize waste solids and associated water quality. The monitoring program specified in the Water Licence should incorporate the recommendations and/or clarifications identified in Section 4.0 of this submission.

Closure and Reclamation A&R Summary

- The mine development and closure plan prepared by the company is substantially acceptable. The outstanding issues - as described in Section 5 -- are expected to be addressed in the Terms and Conditions of the Water Licence.

- The estimated total cost for reclamation of the Jericho Diamond Mine, including provision for post-closure monitoring, is $8.6 million at the end of year one and rises to the maximum anticipated liability of $9.02 million by the end of the second year of operation.

- At this stage, no post-closure water management is expected. Nevertheless, there is an uncertainty with respect to the potential effects of uranium leaching, and possibly other metals such as copper. It is recommended that laboratory and field testing of this concern be conducted as soon as material is available. Furthermore, should such testing show that

leaching could occur, then the closure plan and security cost should be reassessed.

- It is highly recommended that this estimate be reviewed 12 months after the start of operations to ensure that INAC and land owners are not exposed to unsecured liability. The Water Licence and land leases should include provision for annual adjustments to the reclamation security.

- An updated A&R Plan should be submitted in Year 3 to the Water Board for review and approval. The updated plan should incorporate revisions based on all monitoring data collected to that time, and should include an updated prediction of pit fill rate and water quality effluent discharge after closure.

1. Introduction

1.1 Project Description

The Jericho Diamond Project is located at the northwest end of Contwoyto Lake in Nunavut and is owned by Tahera Diamond Corporation. The mine has a predicted life of eight years. An open pit will be mined for the first few years, switching to underground mining in the later years of the project. Ore will be mined April to December and processed year round at an on site facility, at a rate of approximately 300,000 tonnes per year. Waste rock and coarse processed kimberlite will be deposited on surface, with fine tailings reporting to a processed kimberlite containment area (PKCA).

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The project lies partly on Inuit-owned Land administered by the Kitikmeot Inuit Association and partly on Crown Land administered by Indian and Northern Affairs Canada (INAC). If the project receives approval INAC will negotiate issuance of, and enforce, instruments of land tenure for the portion of the project on land with surface rights held by the Crown.

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Concerns identified by INAC during the EA and initial steps in the regulatory phase have been addressed to some extent by information and commitments provided by Tahera Diamond Corporation. This intervention will highlight those issues that remain a concern to INAC, by providing rationale and context for the issue and recommended terms and conditions for the NWB's consideration.

2. Conditions for Construction Phase

2.1 Processed Kimberlite Containment Area (PKCA)

2.1.1 PKCA Divider Dike

Issue Statement

The Applicant has not provided an engineered concept for the divider dike.

Context/Rationale of the Issue

The PKCA divider dike will be used to retain the fine PK within the eastern half of Long Lake. The purpose of the dike is to filter the fine PK so that the amount of suspended fines reaching the west half of Long Lake is minimized. This will minimize the amount of water treatment that may be necessary prior to release of water into Stream C3 from the PKCA.

The water level in the west half of Long Lake will be retained by the West Dam, with water level being controlled by a spillway excavated through bedrock in the north abutment. At closure, the Applicant intends to lower the level of the spillway so that natural flow from Long Lake is

restored. When this occurs, the Divider Dike will become the only structure retaining the fine PK.

Recommendations

As part of the Water Licence Technical Meetings, as requested by INAC, the Applicant has prepared a summary outlining the proposed geotechnical site investigations, design criteria and design requirements for the Divider Dike to ensure that this structure will be engineered to provide operational as well as long-term post closure containment of the fine PK.

The Applicant should provide a copy of the final construction drawings for the PKCA, including the Divider dike, signed and sealed by an engineer registered to practice in Nunavut, as a condition in the Water Licence.

2.1.2 PKCA Pond Storage Water Levels

Issue Statement

Water retention structures should have adequate freeboard above the maximum water level that occurs under the design flood condition. The pond water levels shown on the drawings are inconsistent with the text.

Context/Rationale of the Issue

The drawings show a "Maximum Operating Water Level" at elevation 523 m. Nevertheless, this is the elevation of the spillway invert. This should be labeled "Full Supply Level". The word "Maximum" implies water levels during flood conditions. During the design flood, the spillway will pass water and the PKCA pond water level will rise. It is not clear from the text how much the water level will rise during the design flood. During the technical meeting, Tahera explained that the maximum water level would be elevation 523.7 m, assuming the spillway was completely blocked, with an initial pond elevation at 523.0 m. This would mean there is 0.3 m of freeboard on the West Dam, as the top of the water retention element is at elevation 524. If normal operations are assumed, the design flood will raise the pond level to 523.2 m, assuming unobstructed flow through the spillway.

Water retention structures should have adequate freeboard above the maximum water level that occurs under the design flood condition. The drawings suggest that the dam will have zero freeboard under flood conditions. The information provided by Tahera during the technical meeting indicates that there is in fact a minimum of 0.3 m of freeboard, assuming a blocked spillway condition and 0.8 m of freeboard assuming a free-flowing spillway. This information has not been clearly presented in the water licence submission. Tahera should provide the rating curve for the spillway and the design criteria used to establish the freeboard requirements, which should also include allowances for settlement, wave run-up and set up.

Recommendations

Tahera should prepare a spillway rating curve to show what the maximum water level is in the PKCA pond during the design flood. The amount of freeboard should be determined based on

the difference in elevation between the maximum flood level and the top of the water retention element of the dam. The amount of freeboard required should be verified to account for considerations of wave height and runup as well as potential settlement of the dam.

2.1.3 Coarse PK Construction Material Test Program

Issue Statement

The durability of the coarse PK has not been assessed.

Context/Rationale of the Issue

Coarse PK is proposed as a construction material for dams (filter) as well as a cover for the fine PK in the PKCA. No testing has been presented to show the durability of this material when exposed to wetting-drying cycles (slaking) or freeze-thaw cycles. The shear strength of this material may become reduced over time if it breaks down to finer grain sizes (silts and clays) within a dam embankment fill. As a filter, the change in grain size as a result of degradation will impair performance due to decreased hydraulic conductivity and the potential for the migration of fines under a hydraulic gradient.

Slake durability and freeze thaw durability tests are required to confirm the suitability of the coarse PK as a construction material. At the present time, Tahera does not have any of this material to test, as it is a waste product from the process plant.

Recommendations

Coarse PK is a waste product from the diamond processing plant and as such, representative samples are currently unavailable for testing. Tahera should develop a testing program to evaluate the durability of the coarse PK, as soon as this product is available and incorporate the results into the design of the structures for which it will be used. Final plans for construction using this material should be submitted not less than 6 months prior to the intended start of construction.

2.2 Erosion Protection for Stream C3

Issue Statement

Potential erosion of Stream C3 during operational discharges.

Context/Rationale of the Issue

The discharge scenario proposed by Tahera will increase flows in Stream C3 by about 5-6 times pre-mining flows and may be as much as 44 times greater (with respect to pre-mining flows on a month by month basis) if water is released after two years of storage.

Tahera has indicated that prior to the start of discharge in Stream C3, the stream bed will be assessed by a hydrologist who would determine the need for erosion protection. If erosion protection was required, it would be installed.

Recommendations

Stream C3 channel should be assessed by a hydrologist and, if required, erosion protection measures should be in place prior to release from PKCA

2.3 Waste Dump and Stock Piles

Seepage from Waste Dumps

Issue Statement

Waste dumps 1 and 2 are located close to the edge of the catchment boundary for Key Lake. The construction of the waste dumps on the height of land may result in a small amount of seepage flow towards the Key Lake catchment.

Context/Rationale of the Issue

Both waste dumps straddle northwest-southeast trending valleys that drain towards Key Lake. The valleys are in-filled to an unknown depth with overburden materials. The potential exists for seepage from the waste piles having sufficient hydraulic head to flow towards Key Lake through the valley fill deposits. Tahera believes that permafrost will aggrade through the foundation soils, into the waste piles. Therefore, the permafrost in the foundation should prevent this seepage from occurring. Tahera acknowledges that some seepage may occur through the seasonal active zone within the waste piles. This seepage may flow over the divide into the adjacent catchment. Tahera intends to capture any seepage that occurs along the toe of the waste dumps. Tahera expects that the quantity of this seepage water will be small and it is not expected to require treatment.

Recommendations

Tahera should monitor the seepage from the waste dumps to determine quantity and quality and determine best management options to be implemented.

Waste Dump Slope Stability

Issue Statement

The stability analysis for the waste dumps has assumed relatively low groundwater conditions within the waste dump. The stability of the waste dump slopes after a core of frozen material has developed has not been assessed.

Context/Rationale of the Issue

In the long term, permafrost will aggrade into the waste rock dumps. As a result, water infiltrating the void spaces within waste dump will freeze. Eventually the waste dump will contain a core of frozen rock, which has all the void space filled with ice. Seasonal active zone conditions will exist in the slopes and surface of the waste dumps. The concern is that any meltwater or infiltrating water may become perched on top of the frozen core zone, depending

on local drainage characteristics. These perched water tables may result in local pore water pressure conditions that are greater than assumed in the current stability analyses. Shallow failures along the active zone boundary may be possible due to locally perched water table conditions within the waste dump.

Based on experience at the Ekati Diamond Mine, Tahera believes that the outer margin of the waste rock dumps will become supercooled due to convective cooling. The cold temperatures expected at the exterior of the waste dumps will therefore cause water to freeze immediately and therefore no excess pore water pressures are expected to develop.

The stability of the waste dumps will be enhanced by the presence of permafrost within the interior of the pile and by convective cooling along the exterior slope margins.

Recommendations

Tahera should install thermistors to monitor temperatures within the waste dumps, including the interior as well as the exterior slope margins to confirm that sub-zero temperatures are being maintained year-round.

2.4 Landfill and Landfarm

Landfill Design

Issue Statement

The drawings provided by Tahera for the landfill show only the base footprint details. There are no details regarding the final configuration of the landfill, such as height, cover materials and thickness.

Context/Rationale of the Issue

No information is provided regarding the final closure configuration of the landfill. Tahera have stated only that in general the landfill operations will follow the practices outlined in "Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT" (Ferguson, Simek, Clark, April 2003). The depth of cover remains to be determined, but Tahera is prepared to place any thickness required, using waste rock as a cover.

The industrial landfill will be in operation throughout the life of the mine. The intent is to use permafrost as a means for permanently encapsulating the waste, however, no details are included as to how this will be accomplished.

Recommendations

Tahera should prepare a conceptual design for the landfill for approval as part of the water licence. The design should include design criteria and material specifications as well as estimates of cover thickness requirements to ensure permafrost encapsulation, with consideration for global warming.

Landfarm Design and Operation

Issue Statement

Details are lacking with regards to the proposed landfarm. A more comprehensive review of the Ekati Diamond Mine landfarm experience with bioremediation is required.

Context/Rationale of the Issue

The experience at Ekati may be relevant to designing the landfarm at Jericho, however local climatic conditions and other controlling factors may impose modifications to design and/or operations. Tahera's consultant (EBA Engineering) is currently responsible for the design of the Ekati landfarm. Therefore it should be possible to transfer the experience to Tahera.

Recommendations

As part of the water licence conditions, Tahera should prepare a review of the Ekati landfarm experience and assess the controlling factors that may impose design and/or operational modifications. It is recognized that landfarming will continue to be a trial and error process. Therefore, Tahera should be requested to prepare a landfarm management plan as a water licence condition.

2.5 Roads and Winter Road

Issue Statement

Site roads may result in interruption of natural drainage, erosion, or sedimentation. This may potentially result in ponding of water, which may in turn impact underlying permafrost.

Context/Rationale of the Issue

The winter road from Lupin to Jericho, via Contwoyto Lake and Lynne Lake is to be used in the first winter to bring equipment and supplies to the site. In the first year of mine construction, an all weather spur road is proposed to be constructed from the mine to Contwoyto Lake to reduce the risks associated with the winter road via Lynne Lake. The proposed all-weather spur road is to be a 1.5 km extension to the existing road to the powder and caps magazine to Contwoyto Lake along the north side of Lynne Lake.

The spur road and all other mine roads are planned to be constructed on top of the tundra with a depth of fill to prevent permafrost melting. Culverts are to be placed in the road where intermittent streams cross the right-of-way. The spur road beyond the magazines is only to be used during the winter haul and to minimize any incidental disturbance to raptors.

The implications of permafrost on the engineering design of roads and drainage ditches were discussed in SRK Tech Memo B, Section 5.1. Massive ice lenses were found in the esker north of Carat Lake. Little or no ice was encountered in tills around the site; except in the immediate vicinity of C1 Stream.

The routes were selected to avoid areas of thick soil deposits and to minimize interruptions of the natural drainage system. Additional fill will be placed in areas where it is necessary to preserve the permafrost. These areas will be monitored and appropriate modifications to structures will be made as necessary.

Tahera proposes to construct roads that will be mostly on bedrock or thin soil cover, the impacts on permafrost and drainage are expected to be minimal.

Recommendations

Tahera should provide their estimated minimum thickness of fill for various anticipated types of ground cover and relate this estimated volume to the estimated borrow quantities and locations. It is recognized that performance of the roadway with respect to design can only be judged by site-specific observation.

2.6 Borrow Pits And Quarry Sites

Issue Statement

Tahera's EIS submission did not adequately deal with assessment and mitigation of potential environmental impacts associated with borrow area development in ice rich granular soils and the feasibility of obtaining the required construction materials from the proposed esker borrow area based on the available data.

Context/Rationale of the Issue

Tahera submitted the Borrow Management Plan (Appendix D, prepared by AMEC Earth and Environmental, April 2004) as part of their water licence submission. The Plan outlines the location and estimated volume of granular resources, schedule for use, environmental management, reclamation measures and environmental monitoring during operations and post closure. The Plan addresses the initial concerns expressed by INAC at the EIS level.

In addition, Tahera have indicated at the technical meetings that the esker material would be used in the following areas:

- core for the West Dam;
- bedding material in the tank farm; and
- crushed material for access road surfacing.

Tahera expects that the overall requirements for esker materials during the project life will be far below the approximately 245,000 m3 volume of material available, as estimated by BGC, based on the drawings presented in Appendix D.

Tahera has provided sufficient information with respect to borrow area management to indicate that potential impacts will be mitigated and that there are sufficient exploitable resources to meet their construction and operational requirements.

Recommendations

The Borrow Area Management Plan prepared by Tahera should be used as a basis for formulating specific water licence conditions and requirements. This would include the specific environmental management measures outlined for drainage and erosion control, occurrences of massive ground ice, air quality management, wildlife management, reclamation measures and operational and post-closure monitoring.

INAC recommends including the Borrow Management Plan in the environmental measures section of the water licence.

3. Conditions for Operation Phase

3.1 Management and Mitigation Plans

3.1.1 Surface Water Management Plan

Water Balance, PKCA

Issue Statement

The water balance model (Base Case) results presented by the Applicant assumes that all surface water collected, plus a minor amount of groundwater collected in the pit, will report to the PKCA facility. For this case, water collected in ponds A, B and C, as well as the pit sump would be pumped to the PKCA - average annual precipitation has been adopted. Water containment structures and operational strategies that have been proposed have been based on the outcome of this modeling. It is argued by the Applicant that the approach provides conservative results. However, an alternative case could be made that would significantly alter the ultimate fate of sediment deposited within the PKCA.

Context/Rationale of the Issue

It was acknowledged by the Applicant at the technical meeting that collected water could end up meeting water quality standards, so direct return to Carat Lake could be permissible. As well, significant runoff from waste and ore piles may not materialize if water becomes absorbed within the voids and retained as progressive back-freezing occurs. This water represents 73 percent of the PKCA net annual inflow of 487,818 m3 used in the water balance model for an average runoff year. That is, only about 131,000 m3 would inflow annually. As volume capacity within the PKCA would be 1.7x106 m3 at the beginning of mine operation, total inflow over eight years of mine operation would be about 1.0x106 m3 at mine completion, or about 60 percent of original capacity. The implications of this would be as follows:

- At the beginning of mine operation, the PK spigot may have to be placed in closer proximity to the West Dam than originally thought.

- The ultimate disposition of the tailings within the PKCA may result in there being no need to construct an intermediate rock flow-through dam.

- Given that there would remain about 3 m of depth between PKCA and spillway levels at the end of mine life, and that a PMP rainfall event of 160 mm over the PKCA drainage boundary would result in a potential rise in water level of perhaps 0.3 m, it is possible that a lowered spillway crest would be possible. And further, is it possible that smaller dams and therefore potentially smaller footprints should be considered as part of the water management planning process.

This issue was discussed with SRK (Cam Scott) Tahera's geotechnical consultants in early November 2004. It was agreed that even though the proposed PKCA system would be ultra-conservative in terms of storage capacity should only local and slurry inflows have to be contended with, there are no potential water or sediment management concerns that are apparent at this time. Having a large amount of storage available in the PKCA, combined with the short mine life and lower inflows than what was considered in the water balance analysis, will allow considerable lead time to deal with water quality issues that might arise and whether there will in fact be a need for an emergency spillway at the West Dam.

Recommendations

In general, the current water management plan is:

- pump fine PK slurry to the PKCA from Day 1 of mine operation; in the first two years,

- direct site and pile runoff into the pit and small storage areas that would more or less be located where Ponds A, B and C would ultimately be located;

- sample and monitor water quality of the pit and pond water to establish whether collected runoff can be sent directly back to the natural environment; and

- ultimately develop formal A, B and C ponds if water quality is found to be not acceptable.

With respect to surface water monitoring, a system-wide monitoring plan stipulated in the water licence should include the following:

PKCA

- continuous water level recording;

- measured inflows from the slurry line and ponds/pit;

- annual bottom soundings and ground surveys to measure accumulations;

- ice thickness in the pond area (as opposed to beach area) measured every month through winter period;

- water samples at mid-length and downstream end of lake (to measure TSS)on a weekly basis;
- samples of deposited material downstream of spigot (densities and ice content); and
- measure outflows (continuous): recycle and pumped (Stream C3) water.

Ponds and Pit Sump, Ditches

- continuous measurement of pond and sump levels and ditch flows;
- annual bottom sounding of permanent ponds (monitor sediment accumulation);
- monitor snow accumulation depths in ditches and ponds; and
- monitor condition of ditches (erosion or sediment accumulation).

C1 Diversion

- monitor condition of diversion ditch (is the erosion and thermal control working);
- measure flows to establish a rating curve for the channel at point nearest to pit boundary; and
- record water levels in channel at nearest point to pit boundary.

Stream C3

- monitor condition of channels occupied by flow released from PKCA; and
- record water levels and discharges near outlet of Lake C3.

Carat Lake

- continuous record of lake levels during open water period; twice per month during ice cover condition;
- measure ice thickness near causeway; once per winter month; and
- record lake outflow; there is no ideal location for a gauge immediately downstream, so locate it at some downstream point where the flow is confined to one or two channels (not in favour of estimating outflows from changes in lake level during the summer until it is shown that the procedure works).

Effluent Discharges from Collection Ditches

Issue Statement

The Applicant proposes that effluent be directly discharged to the receiving environment from collection ditches located around the plant site, kimberlite low grade ore and waste piles, and the waste rock and overburden stockpiles if the effluents prove to be of 'acceptable quality'. However, insufficient details have been provided in Tahera's water licence application to permit these potential discharges.

Context/Rationale of the Issue

The water licence application indicates that for the first two years of operation, seepage and runoff collected in temporary ditches, which will flow via gravity to the Pit, and then to the PKCA. Monthly monitoring of water quality in the three temporary ditches is proposed during this time.

It is understood from the technical meeting that, as the waste rock/overburden dumps and stockpile expand, the collection ditches will be relocated such that collected water will flow to low areas (located in the general vicinity of Ponds A, B and C). Proposed management strategies are as follows:

- If the collection ditch water is determined not to be acceptable during the first two years of monitoring, Pond A, B and/or C will be constructed, and collected water will continue to be directed to the PKCA.

- If water quality is acceptable, water will be discharged from the low lying areas in the vicinity of pond sites, but ponds will not be constructed.

At the technical meeting, the company clarified that their proposed discharge criteria from the collection ditches were Aquatic Threshold Values (ATV) (Appendix V, Table 2.1, with the addition that pH would be between 6 and 9). They also indicated that any discharge would be controlled (i.e., pumped to the receiving environment) and that monitoring of any discharged effluent would be weekly.

Pathways over which the discharges would flow to reach Carat Lake have not been described, nor is it clear how water discharging from Pond C would avoid impacting Stream C1. No impact assessments have been provided for these proposed effluent discharges, although the company indicated at the technical meeting that if ATV were met by effluent quality, no impacts were anticipated.

Recommendations

- the permitted discharge to the receiving environment should be limited to the single discharge from the PKCA at this time;

- seepage and runoff reporting to the collection ditches should be directed to the pit and/or the PKCA;

- should Tahera wish to discharge effluent from sources other than the PKCA, they should apply for a licence amendment. The application may or may not require screening by NIRB.

The Aquatic Effects Monitoring Program (AEMP) must include sites that allow collection of appropriate baseline data during operations such that impact assessment can be implemented should these proposed effluent discharges become permitted.

Process Water Recycle from PKCA

Issue Statement

Reclamation of water from the PKCA to the mill has been presented as a tentative alternative at this site. Recycle from a tailings pond is considered best management practice at mine sites, in order to minimize effluent discharge volumes. Recycle from the PKCA to the process mill may not be applied at this mine.

Context/Rationale of the Issue

Section 2.3 of the Summary Report indicates that the process mill is to be commissioned in the 4th quarter of 2005, but the reclaim pipeline is to be installed later, in the 3rd quarter of 2007. Clarification at the technical meeting indicated that no recycle was to be implemented in the first year to allow monitoring and observation of the PKCA. This monitoring would determine whether recycle from the PKCA was a viable option.

The current water balance includes the assumption of recycle from the PKCA to the mill. At the technical meeting, the Applicant's team noted that the recycle volume is small, and that elimination of recycle would not significantly affect predicted effluent discharge volumes or concentrations.

Recommendations

The water licence should include the following provision:

- A report should be submitted to the Water Board after the first summer season of operation, identifying whether recycle will be implemented at the PKCA for the remaining years of operation, and if not, providing a detailed rationale for why recycle is not considered a valid management practice at this site.

Management of PKCA Discharge Volumes

Issue Statement

To ensure that the predicted impacts in Lake C3 are not exceeded, the Applicant has indicated the careful management of the effluent discharge volumes relative to receiving environment flows is required.

It is not clear how the effluent pump rates would be managed relative to Jericho River flows

and/or Carat Lake levels to ensure a minimum 10:1 dilution at the edge of the 200 m mix zone. Moreover, as Lake C3 appears to break up earlier than Carat Lake (by about 10 days), it is not clear how ice impacted Carat Lake levels will be valid as a management tool during this critical period.

Context/Rationale of the Issue

The projected impacts are tied to the dilution ratios in Lake C3. The critical period has been identified as the two week plus period when the ice is breaking up, and dilution is at a minimum. During this period, dilution in Lake C3 at the edge of a 200 m plume could be as little as 10:1. This has been used by the Applicant as the basis for setting suitable effluent discharge criteria. But, in order to not exceed project impacts, the effluent to receiving water link must be carefully regulated during this period. Most (up to 60%) of effluent is projected to be discharged during the month of June, concurrent with the critical period of ice breakup. So it will be important to maximize the release of effluent during this period, while ensuring that the dilution ratio is not compromised.

Linking receiving water flows to the effluent discharge was discussed during the technical meeting. The Applicant indicated that a continuous reading staff gauge would be located in Carat Lake and a stage-discharge curve would be established linking Carat Lake level to Jericho River flows. Control of the pump at the effluent discharge from the PKCA would allow discharge rates to be controlled relative to Carat Lake measurements.

It is not currently clear how control of effluent discharge relative to Carat Lake measurements will ensure a minimum 10:1 dilution ratio at the edge of the 200 m mixing zone. Also, INAC is not in favour of estimating outflows from changes in lake level during the summer until it is shown that the procedure works (see Section 3.1.1).

Since projected impacts are linked to the careful management of effluent discharge rates relative to receiving environment flows, the water licence should include a requirement in this regard.

Recommendations

The water licence should include the following condition:

- Submit a management plan to the Water Board for review and approval six months prior to the first effluent discharge from the PKCA indicating in detail how effluent discharge rates will be managed to ensure a minimum 10:1 dilution at the edge of the mixing zone in Lake C3. This plan should not rely on estimating receiving environment outflow rates from changes in Carat Lake level unless monitoring data is provided that shows that the procedure will work as a means of calibrating effluent discharge rates.

3.1.2 Aquatic Thresholds and Discharge Limits

Issue Statement

Aquatic thresholds and/or related discharge limits proposed by Tahera are acceptable for some parameters but not all.

The parameters for which the proposed aquatic thresholds and discharge limits are acceptable include; TDS, chlorides, TSS, phosphorous and arsenic. Regarding TDS, it should be noted that Table 4.1 (Appendix V) of the water licence application incorrectly references the 350 mg/L concentration in the Snap Lake water licence. TDS in Snap Lake was based on a whole lake maximum concentration of 350 mg/L - not an ambient concentration at the edge of the mixing zone. In the case of Snap Lake, the water license dealt with loadings of TDS.

Context/Rationale

Aquatic thresholds are designed to protect aquatic life in the receiving water body, in this case at the edge of a mixing zone extending from the mouth of Creek C3, 200m into Lake C3.

CCME guidelines to protect aquatic life are predicted to be met for nine parameters while an additional parameter was set according to BC ambient guidelines. The remaining thresholds were calculated to reflect site-specific conditions.

Recommendations

Discharge limits designed to ensure achievement of receiving water guidelines to protect aquatic life and other important water uses are regulated at the point of discharge by the water license. These limits should be achievable and, where applicable, should reflect limits set for other similar mines, at the same time, recognizing site-specific differences.

3.1.2.1 Parameters with High Discharge Limits and Acceptable Aquatic Thresholds

The parameters with acceptable aquatic thresholds but with questionable discharge limits are NH3, NO2, NO3, Cr and Zn. Tahera proposes discharge limits which greatly exceed the predictive average concentrations for these parameters in the PKCA prior to mixing with Lake C3.

Ammonia

The prediction of PKCA water quality indicates that ammonia levels are expected to average 1.8 mg/L with a maximum concentration to be 2.9 mg/L. In spite of this, Tahera proposes an average discharge limit of 6 mg/L and a maximum level of 12 mg/L. These proposed limits are far higher than those for Diavik and Ekati (both 4 mg/L max. and 2 mg/L average) but lower than Snap Lake's 20 mg/L max.

Recommendation for Ammonia

INAC recommends discharge limits of 6 mg/L (max. grab sample) and 3 mg/L (average) which appears easily achievable and encourages economy and care in explosives management in mine operations. With the minimum (short-lived) assumed 10:1 dilution after mixing in Lake C3, both maximum and average levels are expected to achieve the 0.59 mg/L CCME aquatic threshold.

Nitrate

As with ammonia, expected NO3 maximum and average concentrations (7.4 mg/L and 5 mg/L respectively) in the PKCA are expected to be far lower than proposed discharge limits (56 mg/L and 28 mg/L).

Recommendation for Nitrate

While the proposed limits are the same as those for Snap Lake, INAC recommends discharge limits of 28 mg/L and 14 mg/L, which with 10:1 dilution will achieve the 3 mg/L threshold for both maximum (grab) and average concentrations and will again encourage prudent explosives management.

Nitrite

Levels of maximum and average nitrite (0.23 mg/L and 0.16 mg/L) in the PKCA are both predicted to be less than the recommended aquatic threshold of 0.25 mg/L. In spite of this, the grab and average discharge limits proposed for Tahera are 5.0 mg/L and 2.5 mg/L which are more than twice the levels (2 mg/L, and 1 mg/L respectively) set for Diavik, Ekati and Snap Lake licences.

Recommendation for Nitrite

INAC recommends adoption of the 2 mg/L (max. grab) and 1 mg/L (average) discharge limits assigned to the other diamond mine licences in the North.

Chromium

Average PKCA waters are predicted to contain chromium at levels below the CCME receiving water guideline for aquatic life (0.0089 mg/L) and maximum source concentration marginally above it (0.0099mg/L). Tahera has proposed discharge limits of 0.17 mg/L (grab) and 0.087 mg/L (average). These levels exceed discharge limits in licenses of each of the other three mines by factors of four to over 50 times.

Recommendation for Chromium

INAC recommends that lower limits of 0.04 mg/L (max grab) and 0.02 mg/L (average) be applied, consistent with those set for Diavik and Snap Lake. With the short-lived minimum 10:1 dilution at the edge of the 200 m mixing zone, these levels will still provide a four times margin of safety below the CCME guideline.

Zinc

Predicted average levels of Zn in PKCA waters are half the CCME aquatic threshold of 0.03 mg/L and predicted maximum source concentrations are slightly above it (0.034mg/L). After worst-case dilution at the edge of the 200m mixing zone in Lake C3, maximum levels are reduced to the aquatic threshold. Tahera has proposed discharge limits of 0.56 mg/L (max grab) and 0.28 mg/L (average) which are well above those for all other diamond mine discharge limits.

Recommendation for Zinc

Consistent with the other diamond mine water licenses in the North, INAC recommends discharge limits of 0.02 mg/L (max grab) and 0.01 mg/L (average) for Tahera.

3.1.2.2 Parameters with Site-Specific Aquatic Thresholds

The parameters for aluminum, cadmium, copper and uranium, for which Tahera has proposed site specific aquatic thresholds are addressed below.

Aluminum

Tahera's consultants have proposed an aquatic threshold of 0.16 mg/L instead of applying the CCME guideline of 0.10 mg/L for the protection of aquatic life. This, in part reflects predictions that levels will likely exceed the 0.10 mg/L guideline at the edge of the 200 m mixing zone for the two operations scenarios involving release of stored flows from the PKCA. This change represents a reduction of CCME's 3-fold safety factor to 2. As well, justification for this change reflects Tahera's belief that aluminum discharged from the PKCA will most likely be in particulate form and bound to silicates. While this may be indeed true, no proof of this assumption has been provided. No mention was made of Ontario's recent receiving water guideline of 0.075mg/L total aluminum based on a "clay-free" (filtered) sample.

Discharge limits were proposed at 3 mg/L (max grab) and 1.5 mg/L (average) which are the same as those set for Ekati and Diavik but higher than the 2 mg/L (max grab) and 1 mg/L (average) set at Snap Lake. This is in spite of the fact that the predicted average and maximum PKCA source concentrations (0.49 mg/L and 0.90 mg/L respectively) will be below the CCME aquatic threshold of 0.1 mg/L after the short-term, worst case dilution ratio assumption of 10:1.

Recommendation for Aluminum

INAC recommends the following:

- The application of the 0.10 mg/L CCME aquatic threshold and discharge limits of 2 mg/L (max grab) and 1 mg/L (average) for total aluminum. This will maintain a three-fold safety factor for the most sensitive aquatic toxicity result for species found in Lake C3 waters.
- Should Tahera provide further information to prove their assumptions that aluminum is in particulate form and bound to silicates and thereby in a less toxic form, the Water Board

should consider this information in the context of changing discharge limits and possibly the aquatic threshold.

Cadmium

The cadmium aquatic threshold is based solely on aquatic toxicity data even though cadmium, like some other metals, is known to bioaccumulate in aquatic life. Bioaccumulation of cadmium in fish flesh can pose a health risk to humans and wildlife feeding on these fish.

Recommendation for Cadmium

In the absence of addressing uptake in the derivation of the site-specific aquatic threshold, we recommend the following:

- That Tahera monitor levels of cadmium in sculpin flesh from specimens taken from Lake C3, Carat Lake and one background reference lake prior to construction and once every 2-3 years. The same should be done using lake trout and whitefish prior to construction and at the end of operations or after eight years, whichever comes first.

Copper

The proposed site-specific aquatic threshold for copper is 0.004 mg/L which is twice the CCME guideline for aquatic life. This is equivalent to the 0.0039 mg/L chronic toxicity level for early life stages of brook trout (same genus as lake trout which are found in Lake C3 and Carat Lake) and higher than a short-term LC50 value of 0.0014 mg/L for the zooplankton Bosmina, found in Lake C3. This value was for a "low food" condition bioassay, likely similar to the unproductive conditions found in Arctic lakes. The proposed site-specific threshold level of 0.004 mg/L may not be protective of species present in Lake C3.

Since background levels of copper in Lake C3 and Carat Lake appeared to be higher than usual (0.002 mg/L) and equivalent to the CCME guideline for aquatic life, Tahera was asked at the October technical meeting to undertake a review of the background data base that resulted in the 0.002 mg/L background level. That review resulted in a downward revision of average background levels to 0.0011 mg/L (ranging from 0.0008 to 0.0016 mg/L). Subsequent review by Tahera's team resulted in a proposed aquatic threshold of 0.003 mg/L but maintenance of discharge limits of 0.04 mg/L maximum grab and 0.02 mg/L average concentration at the point of discharge.

INAC agrees with the revised aquatic threshold and the corresponding discharge limits for the following reasons:

- the revised background level of 0.0011 mg/L copper is relatively high and it is likely that organisms in Lake C3 and Carat Lake have acclimated to elevated copper levels;
- the revised background level of 0.0011 mg/L provides a greater level of assurance that conditions will be acceptable to aquatic life; and
- associated hardness of the PKCA discharge will serve to reduce copper toxicity.

Recommendation for Copper

Owing to the potential sensitivity to copper of Bosmina longirostris, a zooplankton resident of Lake C3 and the caution advised by the Applicant's technical team "...in applying a criterion in which the effects range overlaps...the sensitivity exhibited by taxa present in the system...", we provide the following recommendations:

- Zooplankton populations and species composition should be monitored annually near the edge of the 200m mixing zone and results compared to zooplankton samples collected at the same time from unaffected background lakes. Results should be considered in conjunction with temporal and spatial trends of copper concentrations in the water column.

- If there appears to be a correlation of detectable effect on zooplankton abundance and/or community structure with increasing copper concentrations, Tahera should implement a contingency plan to reduce copper releases to the receiving water environment.

Uranium

The aquatic threshold of 0.02 mg/L for uranium is a human health guideline established by CCME for waters used for consumption on a regular and sustained frequency. No CCME guideline for aquatic life is published nor is one published by the USEPA. However, an interim aquatic life guideline of 0.005 mg/L is applied in Ontario and bioassay testing has been conducted by the Saskatchewan government. It would appear the application of the 0.02 mg/L aquatic threshold could result in impairment of aquatic life based on the Ontario interim guideline for protection of aquatic life.

As requested in the technical meeting in October, Tahera's consultants researched the basis of the 0.005 mg/L interim guideline from Ontario and the possible availability of bioassay results from Saskatchewan. Although the consultants found the rationale for the Ontario interim guideline confusing and the Saskatchewan bioassay work incomplete, they discovered a joint Environment Canada / Health Canada Priority Substances List Assessment Report entitled "Releases of Radionuclides from Nuclear Facilities (Impact on Non-human Biota)", May 2003.

Acute and chronic toxicity data summarized in this document indicate Estimated No Effects Values (ENEV) of 0.280 mg/L for fish and 0.011 mg/L for planktonic organisms. Included is chronic toxicity information for Daphnia magna reproduction (0.520 mg/L Lowest Observed Adverse Effect Level [LOAEL]) and for Ceriodaphnia dubia reproduction (0.035 mg/L LOAEL and a No Observed Adverse Effect Level of 0.010 mg/L).

It should be noted that safety factors which normally apply to the derivation of CCME guidelines have not been applied to the chronic toxicity results which culminated in the 0.011 mg/L figure.

Applying the most restrictive ENEV of 0.011 mg/L (for plankton) as an aquatic threshold, to predicted concentrations at the edge of the 200 m mixing zone in Lake C3 (and the 40-80 m mixing zone in Carat Lake on closure), it appears that this lowest level can be achieved or closely approximated in three of the five scenarios modeled. The two exceptions apply to the two maximum source concentration scenarios for both typical (average discharge flows) and contingency (release of stored flows) operating conditions.

The proposed aquatic threshold of 0.02 mg/L for protection of human health is satisfactory in Carat Lake where potable water will be withdrawn but it will not be achieved in Lake C3 at the edge of the 200 m mixing zone under the two "maximum source" scenarios. The table on Page 15 of Appendix U of the water licence application predicts a concentration of 0.034 mg/L uranium at the edge of the 200 m mixing zone, assuming maximum source discharge concentrations and average discharge flows. This level is below the LOAEC of 0.035 mg/L for the zooplankton Ceriodaphnia dubia and of 0.52 mg/L for the more ubiquitous Daphnia magna. Under this operating scenario, effects of uranium on reproduction of these species of zooplankton beyond the edge of the mixing zone would not be expected. For the operating scenario of maximum source discharge concentration and release of stored flows, a maximum concentration of 0.069 mg/L is predicted at the edge of the 200 m mixing zone which would be expected to affect Ceriodaphnia reproduction but not Daphnia magna reproduction. This operating and minimum dilution ratio scenario would be short-lived (10 days) and would not be expected to result in long-term effects on zooplankton associations in Lake C3, even if resident species were not as sensitive as Ceriodaphnia dubia.

This highlights the potential vulnerability of the Lake C3 zooplankton community to aquatic effects from predicted maximum uranium concentrations under both typical operating conditions and during contingency release of stored flows.

Recommendations for Uranium

In light of potential effects of uranium to zooplankton populations in Lake C3 under maximum source concentration assumptions, we recommend the following:

- That Tahera revisit its discharge limits of 1 mg/L (max grab) and 0.5 mg/L (average) to ensure that aquatic life at the edge of the 200 m mixing zone in Lake C3 will protect aquatic life, with specific attention given to zooplankton and to chronic toxicity data contained in the above-referenced Environment Canada / Health Canada report.
- That Tahera include annual monitoring of zooplankton population and species composition in Lake C3 at a location near the edge of the 200 m mixing zone.
- During the period of discharge, a 24-hour composite sample of undiluted effluent be collected monthly, bioassays be conducted on Ceriodaphnia dubia and Daphnia magna and results evaluated in the context of potential chronic effects at the edge of the 200 m mixing zone.

Depending upon the results of this work, contingency plans should be implemented to deal with potential negative impacts or following two years of monitoring operations discharge experience, the need for monthly bioassay testing be reviewed and adjusted, if justified.

3.1.3 Impacts on Lake C3 and Carat Lake

Carat Lake Causeway

Issue Statement

During the NIRB review process INAC raised the issue of the potential impact on Carat Lake water quality if the company were to discharge water from the pipeline situated on the

causeway into Carat Lake and into a known spawning ground for fish.

Tahera has since changed their plans with regard to discharging water via the causeway pipeline into Carat Lake. This was further clarified at the technical meeting. INAC's issue of the potential impact on water quality has been resolved.

3.1.4 Management of Recovery Plant Rejects

Issue Statement

Since the characteristics of the Recovery Plant Rejects are not currently known, management of the Recovery Plant Rejects has not been specified in the water licence application, although valid alternatives have been identified. The specific alternative is to be determined on the basis of monitoring.

Context/Rationale of the Issue

Appendix T of Tahera's water licence application indicates that, due to the lack of material, the characteristics of the Recovery Plan Rejects have not been defined. Section 2.6 of the Summary Report indicates the rejects are to be conservatively handled in that they will either be placed on a lined facility or placed in a location that drains to the PKCA. The water licence application is not clear on which alternative is to be selected. The application appears to indicate a lined facility that is located adjacent to the PKCA, but in an adjacent watershed such that pumping may be required to direct any seepage and/or runoff to the PKCA. The size of the facility is insufficient for the entire anticipated volume of recovery rejects, so that rejects must be moved and placed in an appropriate final location, as determined by the monitored characteristics. This may include blending the rejects in the coarse kimberlite stockpile at a ratio to be determined by acid-base account monitoring.

An annual seepage survey has been proposed (Section 4, Appendix X), but this may not be sufficient to determine the characteristics of the recovery plant rejects in time to select the appropriate alternative.

Recommendations

The water licence should include the following conditions:

- A report should be submitted to the Nunavut Water Board after the first year of operation, identifying the characteristics of the recovery plant rejects, and the specifics of how they will be handled, including final location, and rationale for appropriate blending ratio. Adjustments to the A&R plan and reclamation security may be required.
- An annual seepage survey from the toe of the recovery plant rejects stockpile should be submitted to the Nunavut Water Board, along with the annual seepage survey results for all other waste and low grade ore stockpiles.
- Monitoring should include sampling of rejects solids once every month, with full acid-base accounting analyses including solids metals scan and total inorganic carbon. Any effluent pumped to the PKCA should be sampled and analyzed as per other water quality sites.

4. Surveillance Network Program

4.1 Tailing PKCA/Geotechnical Monitoring

Issue Statement

There is no information provided regarding the scope of geotechnical monitoring of the open pit slopes and the underground mining operation.

***Context/Rationale* of the Issue**

Pit slope monitoring is required to assess the safety and stability of the excavated overburden and bedrock slopes around the open pit during operations. This may involve the installation of survey monuments and instrumentation around the pit as well as the establishment of trigger levels for action and remediation. Similarly, monitoring of the underground operations is required as well. Tahera has indicated that in general, pit slope and underground stability monitoring will be carried out as part of the normal mine operations as required by the Mines Inspector and Occupational Health and Safety. Under Nunavut Water Board Guideline 4.5.b) for the Tahera project, geotechnical monitoring and mitigation is required for open pit slopes.

Pit slope and underground excavation monitoring should be included as part of the overall geotechnical monitoring program due to the potential water quality impacts associated with failing slopes and caving ground.

Recommendations

As part of the water licence conditions, the geotechnical monitoring plan should include: all major earthworks retention structures, dams and diversion structures, stockpiles, dumps, berms as well as open pit slopes. Tahera should also be requested to forward copies of all operational inspection reports for the open pit and underground mine being prepared for others (eg: Mines Inspector and Occupational Health and Safety) to the Nunavut Water Board for their reference.

4.2 Stream Data

Issue Statement

Site staff gauge data is limited. Continued monitoring of stream flow data is required to add to the data base to confirm regional predictions.

Context/Rationale of the Issue

Tahera established seven (7) stream flow gauging stations on streams within the Jericho River watershed area - these were operated for various periods during the years 1995-1997 and 1999-2002. The amount of hydrometric data collected was relatively small and were utilized to the degree possible to confirm predictions based on regional data. Potential extremes of runoff from small streams draining into the PKCA have been adequately characterized with respect to average and extreme conditions.

To enhance the ability of using the relatively small amount of site data to characterize the local hydrology, Tahera undertook a regional analysis using a total of 35 Water Survey of Canada hydrometric station records. As well, data collected in conjunction with development of the Ekati mine was used to help characterize small watershed streams. Despite this, the stage versus discharge relationship for the Carat Lake outlet has not been adequately established.

Recommendations

- The continued operation of several of the stream flow gauging stations on small streams in the Jericho watershed or addition of some stations during the life of the mine. This data will be necessary to confirm impact predictions regarding local watersheds.

- A recording water level station should be established and maintained at the outlet of Carat Lake at least to the end of mine life; operation of this station should also include discharge measurements and development of a rating curve. This will assist in the characterization of the stage versus discharge relationship for Carat Lake.

4.3 Climate Stations

Issue Statement

Based on INAC's recommendations, the Applicant has characterized the regional AES data available for Lupin Airport, but not Contwoyto Lake nor was use made of the Ekati and Diavik mine site data. The Applicant correlated Lupin rainfall with Yellowknife Airport and used these two records to predict average annual, seasonal and extreme precipitation regimes for the Jericho site. Likely, because of instrumentation problems at the Jericho site, it appears that the available Jericho data were not considered of value in characterizing local precipitation. Lupin Airport and Jericho site climate data were, however, compared and utilized in establishing the temperature regime at the Jericho site.

Recommendations

It is recommended that Tahera continue to operate the two Jericho climate stations to enable a better correlation between the Lupin Airport and site precipitation data. This will confirm that the Lupin record is in fact a good predictor of the long term precipitation regime at the Jericho site.

4.4 Geochemistry Monitoring

Issue Statement

The geochemistry and associated water quality monitoring proposed in Appendix I (Monitoring Summary Report) is considered incomplete and/or insufficient in some aspects to adequately characterize waste solids and associated water quality.

Context/Rationale of the Issue

Appendix I has been noted as being inconsistent with the monitoring proposed in Appendix M dealing with geochemistry, and to include limited sampling of waste solids, particularly waste rock when waste rock will be used as major construction material throughout the site.

At the Technical Meeting, Tahera confirmed the Appendix I was not consistent with the supporting appendices (covering both geochemistry and water quality), but that the detailed appendices would take precedence over Appendix I. Tahera was requested to provide a corrected Appendix I or summary monitoring program for review, but has not provided this to date. In the absence of a corrected proposal for monitoring on which to make comment, comments on apparent inconsistencies and/or insufficient monitoring have been compiled by INAC.

Recommendations

The monitoring program specified in the Water Licence should incorporate the following recommendations and/or clarifications:

Waste Rock Leachate and Solids

- Tahera's proposal is to sample solids from daily blast analyzed for special items:
  - S The proposed parameters are appropriate, with the exception of copper. Copper analysis of the waste rock solids from the daily blast should be added for the first period when rock is being used for construction. Copper analysis on the waste rock solids could be reduced to every other week after initial construction is completed, and the database has been built up.
  - S Tahera's proposal is to sample solids every ten weeks for full ABA and ICP analysis for each rock type.
  - S This would mean that no more than five sample/year would be collected. The recommendation is to increase this to once each month, at least for first two years.
- The annual seep survey around the waste rock piles is appropriate as proposed.
- It is recommended that geochemical mapping of the pit boundaries/wall be conducted once each year. The objective is to look for areas of potentially increased Copper/chalcopyrite content.

Overburden

- Tahera's proposal is to sample solids every ten weeks for full ABA and ICP analysis. It is recommended that the frequency be increased slightly and simplify to included sampling once every two month. Sampling based on a monthly cycle would be more consistent with other recommendations for solids sampling and would be consistent with proposed frequency of water quality monitoring.

- Inclusion of the waste rock and overburden stockpile in the proposed annual seep survey is considered appropriate.

Low Grade and Coarse Kimberlite Stockpiles

- Tahera's proposal is to sample solids every ten weeks for full ABA and ICP for each rock type.

- This means no more than five samples per year would be collected. The recommendation is to increase this to once each month for at least for first two years. The annual seep survey around the low grade and coarse kimberlite stockpiles is appropriate as proposed.

Recovery Rejects

The water licence application was not clear that solids sampling was included but the Applicant is relying on solids analysis to determine appropriate management methods. Therefore it is recommended that recovery plant rejects solids should be sampled once a month for full ABA with ICP metal scan of the solids and total inorganic carbon analyses, so that characteristics are determined rapidly, and proper management method can be chosen early in mine life

- The annual seep survey is appropriate as proposed, with the recommended addition that any effluent pumped to the PKCA through the year should be analysed for typical water quality parameters, and the pumped volumes measured. This will allow more rapid assessment of characteristics to determine whether the rejects require special handling, and will allow this input to the PKCA to be characterized.

PKCA Inflow Quality and Volumes

The proposed monitoring of inflows (Appendix I) generally appears appropriate in that each inflow and its flow are considered (an exception is any pumped flow from the recovery plant rejects solids temporary storage facility, as noted above). Nevertheless, it is not clear whether the proposed monitoring station in the mill will sample tailings sampling slurry alone or as a mixture in process tailings box (which might include flows from the pit sump and collected ditch water).

It is recommended that the slurry flow and quality prior to mixing be specified, as the other inputs (from the pit and collection ditches) appear to be monitored for flows and quality at other locations.

4.5 Aquatic Effects Monitoring Program

Issue Statement

No sampling of benthos is proposed in Stream C3 (SNP 2), the south basin of Lake C3 or the central basin of Carat Lake.

Context / Rationale of the Issue

Organisms such as clams, insect larvae, and other invertebrates associated with bottom sediments of lakes and streams (benthos) are unable to avoid exposure to potentially contaminated discharges. They have varying tolerances to different contaminants; therefore, sensitive species can disappear from the benthic community while more tolerant forms flourish. Thus, a study of benthic invertebrate populations and species composition is a good indicator of water (and sediment) effects.

Sampling of benthos as close to the source (PKCA discharge) as possible increases the possibility of early detection of water quality effects that may otherwise go undetected by relying on conventional water chemistry monitoring results.

Recommendation

INAC recommends the addition of benthos to the list of indicators to be monitored at stations SNP2, SNP3 and SNP10 as summarized in Table 3.4 of Appendix N.

5. Conditions Applying to Abandonment and Restoration

5.1 Closure and Reclamation

5.1.1 A & R Plan

Issue Statement

It is critical that an acceptable (conceptual) A&R plan exists before allowing mine development to proceed.

Conclusions

In general, the mine development and closure plan prepared by the company are substantially acceptable, recognizing that an A&R plan evolves over the life of the mine.

Recommendation

INAC recommends that the A&R plan should be updated on a regular basis to include required contingency measures to be implemented. This update should be reflected in total reclamation estimates as well.

5.1.2 Revegetation

Issue Statement

Objectives for revegetation are evolving in Nunavut. No clear objectives exist at this time. Tahera has proposed a program of partial revegetation in some parts of the mine, if reclamation

research indicates that successful results can be achieved.

Context/Rationale of the Issue

Post-closure revegetation at Arctic sites is an emerging technology. Since the completion of the NIRB review, encouraging results on revegetation have been achieved in research on kimberlite tailings at Ekati.

The kimberlite appears to have properties suitable as a soil substrate or growth media. A revegetated kimberlite surface, with appropriate erosion control where runoff is concentrated, may yield a superior post closure habitat than the proposed soil cover on the PKCA. It may also be possible to use the kimberlite to aid in the establishment of vegetation on the dumps, stockpiles and other disturbed areas. Revegetation of overburden (till) may also be feasible. The current proposal regarding re-vegetation is acceptable.

Research at Ekati suggests that there is a more rapid invasion and spreading of natural species in areas where some vegetation (whether it be non-native or native) has been established, suggesting that a phased approach to revegetation is practical.

Recommendations

Revegetation issues can be resolved through abandonment and restoration planning conducted in accordance with regulatory instruments, with consideration to the following terms:

- It is recommended that Tahera be required to conduct re-vegetation research on the kimberlite to determine if the post-closure conditions can be improved.
- Recognizing the difficulty in achieving vegetation in an Arctic setting, Tahera should consider a progressive re-vegetation program. Revegetation should commence on an area as soon as possible once it is no longer utilized by the project.
- Tahera must commit to reclaim the land to a stable condition which would facilitate, and if possible, accelerate the return of the land to a condition that is functionally similar to the way it was prior to development.

5.1.3 PKCA

Issue Statement

After closure and construction of the cover on the PKCA, there will be runoff which drains onto the covered area. Reclaimed areas should be stable and erosion resistant.

Context/Rationale of the Issue

INAC previously recommended that:

- erosion resistant channels along permanent drainage routes in the PKCA be provided;

- the water management features which remain after closure be composed of erosion resistant materials so that they can be expected to function without maintenance; and
- this standard be applied to all post-closure water management elements in the PKCA (polishing pond dam, west dam and runoff ditches).

Supplemental information to address the solifluction and spillway design issues was presented in Tech Memo E. The issue regarding potential solifluction lobes on the south side of the PKCA has been addressed, and the proposed 24 hour Probably Maximum Precipitation [PMP] (which is greater than 200 year return period flood) for the closure spillways is acceptable. Details regarding the final landforms remain outstanding, pending the results of reclamation research.

Recommendations

PKCA reclamation issues can be resolved through abandonment and restoration requirements in regulatory instruments, with consideration to the following terms:

- Conceptual plans for erosion control on the tailings cover should be included in the interim closure plan(s).

5.1.4 Post-closure Monitoring

Issue Statement

No details on the scope of post-closure monitoring are provided.

Context/Rationale of the Issue

The seven sites included in the proposed closure monitoring program on page 33, A&R Plan does not appear to include any site monitoring such as continued discharge from PKCA, collection ditch discharge, or pit water quality as it fills. Post-closure geotechnical monitoring will be required to demonstrate that the land forms are stable and tailings containment structures will not require maintenance.

Recommendations

The A&R plan should be updated to include the scope of post-closure monitoring.

5.1.5 Overburden Stockpiles

Issue Statement

Overburden is required to reclaim portions of the mine disturbed area upon closure. The stockpiled overburden materials will be frozen. If these materials are proposed to be used for reclamation, a plan is required to describe how they will be recovered.

Context/Rationale of the Issue

Permafrost will aggrade in the overburden stockpile over the life of the mine. To reclaim this material will require the stripping of the thawed material in the active zone, on a seasonal basis. This process may have to be repeated over several seasons, depending on the depth of thaw and amount of material required for reclamation. Water quality issues may be associated with meltwater runoff during this reclamation process. Tahera has indicated that stripping will be done by continually working the stockpile slopes with a bulldozer equipped with a ripper, however no details have been prepared as to how this would be managed.

Recommendations

As part of the overall mine closure plan, to be developed as a water licence condition, Tahera should include details of the proposed methodology for recovering the stockpiled overburden materials for reclamation purposes. The plan must address how meltwater from the stockpile is managed to prevent release of suspended sediment.

5.1.6 Post Closure Water Quality

Issue Statement

Water quality in the filled pit may overflow and adversely impact water quality in Stream C1 and/or Carat Lake.

Context/Rationale of the Issue

Appendix B of the Abandonment and Restoration Plan (Appendix A of the Application) predicts that water that will flow from the filled pit will exceed CCME water quality guidelines for the protection of aquatic life. Total uranium values are predicted to exceed Canadian drinking water guidelines of 0.02 mg/L, and interim guidelines for the protection of aquatic life (Ontario).

The predictions are stated as being preliminary and will require operational monitoring of pit water and collection ditch water quality and flows before predictions can be refined.

Contingencies include directing pit overflow to a separate channel so that water quality in Stream C1 is not impacted, and/or treating the overflow. An alternative is to apply in-pit biological treatment. Appendix C of Appendix A of the Application proposed a phased study of this contingency measure, after several years of data from the pit sump and collection ditches have been collected.

Discussion of the contingency treatment method specifically addressed cadmium and copper, which are predicted to exceed CCME criteria for the protection of aquatic life, and draw on experience at the Island Copper Mine. The discussion does not address the potential to reduce uranium values, which are predicted to exceed interim Ontario guidelines for the protection of aquatic life (0.005 mg/L) by an order of magnitude.

Contingency measures may not address the potentially elevated uranium concentrations

predicted in the overflow from the filled pit 15 to 20 years after cessation of mining.

Recommendation

The water licence should include the following condition:

- An updated A&R Plan will be submitted in Year 3 to the Water Board for review and approval. The updated plan will incorporate revisions based on all monitoring data collected to that time, and will include an updated prediction of pit fill rate and effluent discharge quality after closure.

5.1.7 Site Infrastructure

Issue Statement

One option, proposed by Tahera for disposing of building demolition waste was to cover it with the waste rock when the waste rock dump slopes were being recontoured. The other option was to backhaul the waste debris for offsite disposal.

Context/Rationale of the Issue

It is necessary to control where waste is being disposed of on site. The preferred option, if the waste is not being back hauled offsite, is to place it into a designated landfill disposal area. The waste rock dumps should contain only waste rock.

Waste must be disposed of in controlled areas so that regulatory authorities are aware of the location and contents. A protocol for ensuring only inert waste (steel, wood, plastic, rubber) is placed in the landfill should be established. A design for closure of the landfill should be prepared to show that the waste will be securely contained. It would be unacceptable to allow disposal of the demolition debris within the waste rock dumps as there would be no control on the location, distribution and content of the material

Recommendations

Tahera should be required to dispose of all reclamation demolition waste into a designated landfill facility, with properly engineered controls. A protocol for waste disposal, and a design for landfill closure should be submitted for approval.

5.1.8 Reclamation Costs

The estimated total cost for reclamation of the proposed Jericho Diamond Mine, including provision for post-closure monitoring, is estimated to be $8.6 million at the end of year 1 of operations and rises to the maximum anticipated liability of $9.02 million by the end of the second year of operation. The following table presents a break-down of the ultimate reclamation liability.

Component	Cost
Open Pit	$59,960
Underground	$8,013
PKCA	$540,975
Waste Dumps	$511,605
Buildings & Equipment	$2,426,576
Chemicals & Contaminated Soil	$179,695
Water Management	$131,576
Mobilization./Demobilization	$2,549,840
Monitoring & Maintenance	$531,500
Post-Closure Maintenance (Water treatment)	$0
Sub-total	**$6,939,740**
Project Management at 5%	$346,987
Engineering at 5%	$346,987
Contingency at 20%	$1,387,948
Grand Total	**$9,021,662**

The company has posted security for the existing liability associated with the exploration activities to date. The estimated amount of $9,021,662 does not include reclamation of the existing camp and portal area facilities. It is assumed that the existing security does not include measures to address soil contamination associated with the old tank farm, and that cost has been included in the estimate shown above.

Recommendations

Annual monitoring of the mine development and reclamation liability is recommended to ensure that INAC and land owners are not exposed to unsecured liability. The Water Licence and land leases should include provision for annual adjustments to the reclamation security.

Issue Statement

Segregating the estimated total cost of reclamation between land and water.

Context/Rationale

The Nunavut Mine Reclamation Policy stipulates that any new operation must be in a position to support the cost of reclamation over the life of the project. The total security for the final reclamation required at any time during the life of the mine should be equal to the total outstanding reclamation liability for land and water combined. Estimates of reclamation costs, for the purpose of financial security, should be based on the cost of having the necessary reclamation work done by a third-party contractor if the Applicant defaults.

To date, NWB practice has been to set the security estimate, taking into account both land and water reclamation costs. The current situation is unique in that the operation will take place on both crown and Inuit-owned land, therefore in addition to INAC, the Kitikmeot Inuit Association has a vested interest in the security held.

Of the $9,021,662 that INAC has calculated as being the total reclamation cost, (approximately) 18% or $1,633,998 is the water-related liability, while (approximately) 82% or $7,387,663 is the land-related liability.

Of the estimated $7,387,663 for the land-related liability, INAC has calculated that crown land accounts for 71.8% or $6,673,693, of the total, while KIA land accounts for 8.2% or $713,970, of the total.

INAC & KIA have been actively engaged in discussions relating security since the technical hearing at the end of October, 2004. Unfortunately, there are a few issues which have yet to be resolved and are unlikely to be resolved before the final hearings.

Recommendation

- INAC strongly recommends that NWB, in determining reclamation security to be held under the water licence, include the water-related liabilities only. Land-related liability should be negotiated between INAC Lands and KIA as a part of the land tenure process.
- If NWB accepts INAC's recommendation, the water-related liability will amount to $1,633,998. In this case, the remainder of the total estimated security cost would be included as a component of the land tenure instruments.
- While INAC is, at this time, requesting that land and water liability be split, any revisions to the A&R Plan should trigger a security review under both the water licence and the land leases. The terms and conditions under these documents should reflect this.

6. INAC Conclusions

Overall, INAC is pleased with Tahera's application. INAC commends Tahera for their cooperation, professionalism and integrity during the course of the environmental review and water licencing process. INAC is confident that Tahera will be able to operate a diamond mine in an environmentally-sound fashion and at the same time, will provide meaningful and rewarding employment opportunities for Nunavummiut.

INAC looks forward to a continued and productive working relationship with Tahera, NWB and other relevant stakeholders.