TMAC Resources Inc.

BOSTON ADVANCED EXPLORATION PROJECT

Review of Renewal Application for Type B Water Licence 2BB-BOS1217

Renewal Application for Water Licence #2BB-BOS1217: Indigenous and Northern Affairs Canada's Comments and TMAC Response

April 10, 2017

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BOSTON ADVANCED EXPLORATION PROJECT

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TABLE OF CONTENTS

BACKGROUND AND DOCUMENT OUTLINE

On February 10, 2017, the Nunavut Water Board (NWB or Board) provided notification of TMAC Resources Inc.'s (TMAC or the licensee) submission of a renewal application for Type B water licence 2BB-BOS1217 for the Boston Advanced Exploration Project.

The licence for the Boston Advanced Exploration Project has been amended and renewed since at least 1999. The latest licence, which expires on July 31, 2017, allows for the use of water up to 100 m^3 per day and the deposit of waste. The undertaking licensed includes the operation of a 65-person camp and exploration activities including drilling and bulk sampling. The site has been in care and maintenance since 2012 and TMAC proposes to re-open the site in April-May 2017.

The NWB requested interested parties review the application and make representations by March 10, 2017.

Comments were received by Indigenous and Northern Affairs Canada (INAC) on March 10th, 2017. Environment and Climate Change Canada (ECCC) indicated that they had no comments. The following outlines INAC's recommendations and TMAC's response.

In addition to responding to INAC recommendations, TMAC is also providing a revised closure cost estimate in Section 13 of this document. This estimate is described in Section 13 and Attachment A.

1. PROJECT RELATION WITH PHASE 2 WATER LICENCE APPLICATION

Reference

- Application for Water Licence Renewal – Boston Advanced Exploration Project, TMAC Resources Inc., January 2017
- Application for New Water Licence – Phase 2 of the Hope Bay Project, TMAC Resources Inc., December 2016, Executive Summary

Comment

In the application, we found no reference to a concurrent Type A application which TMAC submitted to the Board in December 2016, which involves mining at the Boston Site beginning in 2022. It appears that the infrastructure presently licensed under 2BB-BOS1217 would be used for the Type A licence when applicable.

Recommendation

The licensee should provide an explanation of how they see this licence in relation to the Type A application and if they plan to keep both.

TMAC Response:

The existing 2BB-BOS1217 supports exploration activities and existing infrastructure at Boston. The renewal application for 2BB-BOS1217 requests a continuation of these activities and use of infrastructure. The draft Type A application submitted with the DEIS for the Madrid-Boston proposal will aid in the issuance of a Type A Licence to support the construction, operation and closure of all infrastructure and related activities associated with the Phase 2 proposal. Exploration activities at Boston are anticipated to continue into the future, both before and during commercial mining operations, and therefore the proponent intends to maintain the exploration licence as indicated in the renewal request for 10 years. TMAC notes that it is standard practice for companies to maintain exploration licences in conjunction with Type A licences for commercial mining, and that the renewal for 2BB-BOS1217 is in line with existing licencing on the Hope Bay belt.

2. WINTER TRACK/ROAD

Reference

- Application for Water Licence Renewal – Boston Advanced Exploration Project, TMAC Resources Inc., January 2017, Attachment A – Summary of Activities

Comment

In their summary of activities, the licensee states "TMAC is planning to create overland access to the Boston site during April and May of 2017 by way of a winter track/road."

A winter road typically requires water use for flooding certain areas and would have to be incorporated into a renewed water licence. On the other hand, a winter track usually only involves overland passage with no impact to water.

Recommendation

The licensee should be required to specify whether they intend to create a winter road or winter track, and if it is the former, appropriate terms and conditions should be included in a renewed water licence.

TMAC Response:

TMAC wishes to maintain condition Part E, Item 3 of the existing licence which states "Winter lake and stream crossings, including ice bridges, shall be constructed entirely of water, ice or snow. The licensee should minimize disturbance by locating ice bridges in an area that requires the minimum approach grading and the shortest crossing route. Stream crossings shall be removed ore the ice notched prior to spring break up". No other terms or conditions should be required.

3. LEAD EFFLUENT DISCHARGE CONCENTRATION FOR LANDFARM AND BULK FUEL STORAGE FACILITY

Reference

- Water Licence 2BB-BOS1217 – Boston Advanced Exploration Project, Nunavut Water Board, August 2012, Part D, Item 19
- Application for Water Licence Renewal – Boston Advanced Exploration Project, TMAC Resources Inc., January 2017, Attachment C – Compliance Status

Comment

The August 18, 2015 Inspection report provided in Attachment C includes a letter from the Water Resources Officer authorizing TMAC to use 10 µg/L as discharge criteria for lead for the fuel storage area (BOS-5) and land farm (BOS-6) during the care and maintenance phase.

The maximum allowable grab sample concentration for lead is 1 µg/L for discharge from the land farm and bulk fuel storage facility in the 2BB-BOS1217 licence under review. Maximum allowable grab sample concentrations for lead at equivalent facilities differ across different water licences. It is 10 µg/L in 2AM-DOH1323, 1 µg/L in 2AM-MRY1325 and 100 µg/L in 2AM-MEL1525.

The Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guideline (CWQG) for the Protection of Aquatic Life (PAL) for lead is related to water hardness. It is 1 µg/L for water hardness below 60 mg/L (as $CaCO_3$), dependant on a formula for water hardness between 60 and 180 mg/L, and 7 µg/L at hardness above 180 mg/L. Water chemistry results from BOS-5 are included in annual reports between 2012 and 2015. Water hardness ranges from 371 to 753 mg/L (as $CaCO_3$), with an average of 533 mg/L.

Recommendation

Given the typical hardness of the water collected in the fuel storage facility, a maximum allowable grab sample concentration of 7µg/L for lead would follow the CWQG for PAL. Since there is no site-specific information available, this would be an appropriate standard to use.

TMAC Response:

TMAC disagrees. As noted in the application, and by INAC's inspector, the criteria for lead in the existing licence appears to be a typographical error and should be corrected from 0.001 mg/L to 0.01mg/L in the renewed licence. This would be consistent with equivalent criteria for the Doris licence and proximal projects. The recommendation from INAC for this correction was provided in Attachment C of the application. There is no

credible rationale for a more stringent lead discharge criteria for this effluent, and it is inappropriate to apply a the CCME Guideline for the protection of aquatic life to a tundra discharge.

4. DRILL SITE RECLAMATION

Reference

- Hope Bay Project Boston Camp Interim Closure Plan, SRK Consulting (Canada) Inc., January 2017
- 2BB-BOS1217 Water Licence Inspection Form, Aboriginal Affairs and Northern Development Canada, August 18, 2015
- Review of interim reclamation measures for addressing ponding at Legacy Drill Sites and Cutting Sumps under 2BB-BOS1217, TMAC Resources Inc., September 2, 2016
- Drill hole remediation inventory (Excel file), TMAC Resources Inc., August 29, 2014

Comment

Drill site reclamation is described in Section 3.12 of the Interim Closure Plan: "For drill hole reclamation, above ground casing will be cut at grade, and a cap will be hammered in place to seal the hole. Areas of permafrost degradation around boreholes, if present, will be covered with a 1 m thick thermal blanket and graded to ensure positive ponding." The scheduling of these activities is described in Section 5.2: "Closure of the Boston Camp will occur upon closure of the entire Hope Bay Project."

The August 2015 inspection report brings to light that though "current drilling practises have been excellent, there is a legacy of badly managed drill holes (Orbit 25 spill being the extreme case). Wetlands are forming where past drilling practises impacted the permafrost and caused subsidence (visible along the airstrip), as well as from the cutting sump adjacent to the airstrip."

At the time of the 2015 inspection, TMAC committed to investigating interim remediation measures and provided their findings in a letter dated September 2, 2016. They concluded that there were no effective and realistically applicable remediation measures, and that long term stability had to be ensured by full remedial measures.

The "Boston Camp Cluster-Historic" tab in the drill hole remediation inventory specifies there are 112 drill holes for which the "Required Action" is "intervention required" and 51 drill holes for which the "Primary Remediation Required" is "complex remediation". Forty-seven of the drill holes requiring complex remediation are also in the intervention required category.

As the site has been in care and maintenance, no equipment has been available to carry out the interventions (interim or permanent) to reduce the propagation of thermokarsting around problematic historical drill holes. With the licensee's proposal to re-open the site in Spring 2017, it seems likely this situation should be changing shortly.

Recommendation

Thermokarsting has a feedback mechanism which causes the impacted area to get progressively worse. Prompt permanent remediation will prevent further degradation so the licensee should provide a proposed schedule for reclamation of the drill holes they have inventoried as requiring intervention.

TMAC Response:

TMAC understands and has discussed this matter with INAC in the past. TMAC has been in discussion with the Inspector on the matter of the thermokarsts at Boston, and has undertaken literature research on possible solutions to the problem. From this work it is clear that once thermokarsting has commenced the best solution is to backfill the area to preclude the accumulation of water that would result in enlarging the thermokarsts. The thermokarsts in the vicinity of the Boston camp require substantial fill material and equipment to successfully complete a backfilling operation. TMAC has indicated to the Inspector that thermokarsts will be backfilled when there is sufficient earth moving equipment and available fill material to do so. TMAC does not propose to harvest fill from the existing site for this purpose until the site is permanently closed, or when the plan is subject to renewed development as contemplated in the draft Water Licence Application for the Phase 2 development submitted on December 28, 2017.

5. FILL MATERIAL FOR RECLAMATION OF DRILL HOLES

Reference

- Hope Bay Project Boston Camp Interim Closure Plan, SRK Consulting (Canada) Inc., January 2017, Section 3.12 & Appendix A
- Water Licence 2BB-BOS1217 – Boston Advanced Exploration Project, Nunavut Water Board, August 2012

Comment

Throughout the reclamation plan, fill material is specified as being waste rock. The only place where this is not done is for reclamation of drill holes. In the cost estimate the volume of fill required for drill hole sites is estimated at 9,000 m^3.

The currently licensed activities do not include quarries or borrow sources, and the licensee has not requested any change to this effect in the scope of work.

Recommendation

The licensee should specify what material they propose to use as fill for drill hole sites, and if it is not waste rock available on site, where they intend to source this material.

TMAC Response:

The initial cost estimate associated with the Interim Closure Plan was completed in 2012, prior to completion of the detailed drill hole remediation methods quoted in IR#4. At the time of the cost update in 2017 the unit rates were updated but the cost assumptions were left unchanged in error.

In the 2012 estimate the volume of required backfill for drill hole remediation was conservatively estimated to be 9,000 m^3. Following a thorough review of all drill holes (Drillhole remediation inventory (Excel file), TMAC Resources Inc., August 29, 2014), 51 drill holes were identified as needing intervention in the form of a thermal cover. On average, each drill hole will require about 10 m^2 surface area to be covered with 1 m thick thermal blanket, for a total fill requirement of 510 m^3 (Section 3.12, Interim Closure Plan).

The backfill material will be waste rock sourced during closure from the decommissioned camp pads, and airstrip in areas where the minimum fill thickness exceeds 1 m. The total footprint of the camp pads well exceeds 3 Hectares (without the airstrip), and therefore the required waste rock should be available from the camp pad.

The cost implication is a reduction in direct cost of drill hole remediation task of about $181,000 and a further reduction in associated indirect costs of about $58,000.

6. CAPACITY OF DORIS LANDFILL FOR ACCEPTING RECLAMATION DEBRIS

Reference

- Hope Bay Project Boston Camp Interim Closure Plan, SRK Consulting (Canada) Inc., January 2017, Appendix A

Comment

The cost reclamation estimate is calculated on the basis of all debris from site, including the accommodation complex, maintenance shop complex, crusher enclosure, water treatment facilities, tank farm and vent raise, being hauled to the Doris Landfill for permanent disposal.

Recommendation

The licensee should confirm the Doris Landfill has the capacity to accept all debris from reclamation of the Boston Site, as well as material from the Doris Site.

TMAC Response:

TMAC can confirm that the Doris Landfill has the capacity to accept all debris from reclamation of the Boston Site, as well as material from the Doris Site. The total estimated quantity of Boston debris that will be placed in the Doris Quarry 3 non-hazardous landfill is about 1,950 m^3. The total estimated quantity of Doris debris that will be placed in the Doris Quarry 3 non-hazardous landfill is about 27,400 m^3. The approximate Doris Quarry 3 capacity is 133,000 m^3, well in excess of the expected non-hazardous waste volumes from Doris and Boston.

7. INTERIM CARE AND MAINTENANCE IN INTERIM CLOSURE PLAN COST ESTIMATE

Reference

- Hope Bay Project Boston Camp Interim Closure Plan, SRK Consulting (Canada) Inc., January 2017, Appendix A, Section 2.4.1
- Nunavut Water Regulations, 10(1)c

Comment

The licensee "considered that an Interim Care and Maintenance cost category as recommended by the RECLAIM model is not warranted", because "Boston Camp has no ongoing water management requirements or structures requiring continuous maintenance."

Site inspections and monitoring will be required during an interim care and maintenance period, as demonstrated by the fact that TMAC and SRK have been conducting regular site inspections since 2012 when the Boston camp was put in care and maintenance.

The Nunavut Water Regulations state that the cost of ongoing measures that may remain to be taken after the abandonment of the undertaking should be considered in fixing the amount of security required. It is therefore relevant to add these costs to the estimate.

Recommendation

The licensee should revise the reclamation cost estimated provided to include an 18 month period of interim care and maintenance. This new estimate should be used when setting security requirements for any renewed licence.

TMAC Response:

TMAC will revise the reclamation cost estimated provided to include an 18 month period of interim care and maintenance. This new estimate will be used when setting security requirements for any renewed licence. The care and maintenance activities which will be included will be the same as those currently undertaken. This consists of annual seepage and ephemeral stream monitoring and a geotechnical inspection. For an 18 month period of interim care and maintenance, one annual seepage and ephemeral stream monitoring report and one geotechnical inspection report will be developed, but for cost estimating purposes two seasons of monitoring has been assumed. The total cost estimate for these activities based on current costs for these activities is $80,000.

8. LANDFARM AT CAPACITY

Reference

- Landfarm Management and Monitoring Plan, TMAC Resources Inc., January 2017
- 2014 NWB Annual Report for water licence 2BB-BOS1217, TMAC Resources Inc., March 2015

Comment

The Boston land treatment area (LTA) has a capacity of 450 m^3 of material and a 600 m^2 footprint. In its 2014 Annual Report, the licensee "confirms that the Boston Landfarm is full to capacity and that no further additions are allowed."

This does not come across in the Landfarm Management Plan. In it, "new hydrocarbon contaminated materials should when possible be transported directly to the Doris Mine", and if this is not possible, "the material must be transported to, and temporally stored in the Boston LTA." It is only in the contingency section where the possibility of capacity exceedance is discussed and "a temporary lined facility may be required to store the excess material."

Though the plan refers to transport of contaminated material from Boston to the Doris Site several times, we did not find a description of how this would be done.

Recommendation

The licensee should be required to explain how they will move material from the Boston landfarm to Doris and to provide more detail on the temporary lined facility they propose to use until they have removed the material presently in the landfarm.

TMAC Response:

The approximately 450 m^3 of material within the Boston landfarm will be bagged (1 m^3 bags) and transported by vehicle during winter/spring access to Doris for treatment in the Doris landfarm.

A temporary lined facility will only be required as an emergency contingency measure. This contingency measure will be implemented only if a volume of hydrocarbon contaminated material is generated at Boston that exceeds the Boston land treatment area capacity and the material cannot be transported to Doris. This is considered highly unlikely.

The temporary lined facility would be constructed within the existing pad area and be sized based on the required temporary storage volume. The lining would be HDPE as per the existing lined facilities on site.

9. LANDFARM WATER MANAGEMENT

Reference

- Landfarm Management and Monitoring Plan, TMAC Resources Inc., January 2017, Section 2.2
- Water and Ore/Waste Rock Management Plan for the Boston Site, SRK Consulting (Canada) Inc., January 2017, Table 2.4

Comment

The Landfarm Management Plan describes that the landfarm does not have a sump and precipitation collects in the lowest areas. It continues by stating: "This pooled water will be removed to a temporary holding tank or the containment pond, if required, for treatment through the oil adsorption treatment system."

The two containment ponds on site are described in Table 2.4 of the Water and Ore/ Waste Rock Management Plan; one is unlined and the other is lined, however the liner is described as needing repair.

Recommendation

The licensee should be required to repair the lined containment pond before using it to store pooled landfarm water that does not meet discharge criteria.

TMAC Response:

TMAC has stated in the application that the existing containment pond (sampling location BOS-2) will be upgraded to ensure its integrity and capacity. This work may include repairing or replacing the existing liner.

10. CURRENT WATER MANAGEMENT PROCEDURES

Reference

- Water and Ore/Waste Rock Management Plan for the Boston Site, SRK Consulting (Canada) Inc., January 2017, Section 3.2.
- Application for Water Licence Renewal – Boston Advanced Exploration Project, TMAC Resources Inc., January 2017, Attachment A – Summary of Activities
- Water Licence 2BB-BOS1217 – Boston Advanced Exploration Project, Nunavut Water Board, August 2012, Part J, Item 3

Comment

The Water and Ore/Waste Rock Management Plan describes current water management procedures. They are minimal given that the site is currently under care and maintenance and consist of infrequent pumping for discharge onto the tundra at several locations where water accumulates. "Water accumulating in these areas is typically monitored prior to discharge."

The licensee plans to re-open this site and anticipates "expanding on past underground and surface drilling programs at Boston." The Plan does not describe what water management will be necessary for these renewed activities. To continue underground drilling, mine water will likely have to be dealt with, as suggested by the licence requirement to measure its volume and the possibility of underground workings in a talik area because of the site's proximity to a large lake.

The only lined containment facility on site has a damaged liner, as mentioned in comment 9, and there does not appear to be anywhere on site to store non-compliant water.

Recommendation

The licensee should be required to provide an updated Water and Ore/Waste Rock Management Plan within 60 days of licence issuance that describes how water will be managed on site for the proposed and licensed activities. It should include an estimate of the quantity of mine water that could be pumped, an estimate of the mine water quality and how that water will be managed on the surface. Any information relevant to water management for the surface drilling should also be included.

Wording regarding the monitoring of accumulated water in the fuel storage area and landfarm should be modified to reflect licence requirement for sampling prior to discharge.

TMAC Response:

TMAC notes that the existing licence provides for underground advanced exploration activities and TMAC requests that this ability be maintained in the renewed licence. At the present time TMAC does not plan to open the portal for entry, inspection or additional exploration in the near term. Accordingly, water management at the site will be a combination of care and maintenance type surface runoff management, plus potable water supply and wastewater treatment for resident staff. These activities would be substantially similar to those carried out at the site in previous active periods and these activities are supported by the existing licence.

TMAC does not plan to reopen the Boston portal until at least 2018 and therefore will not be carrying out underground drilling until at least that time. Accordingly, in the event that new waste rock/ore were to be brought to surface, that an updated Water and Ore/Waste Rock Management Plan could be submitted to the NWB 60 days prior to that activity being initiated.

11. MONITORING SEEPS AND EPHEMERAL STREAMS

Reference

- Water and Ore/Waste Rock Management Plan for the Boston Site, SRK Consulting (Canada) Inc., January 2017, Section 3.2.
- Water Licence 2BB-BOS1217 – Boston Advanced Exploration Project, Nunavut Water Board, August 2012, Part J, Item 12

Comment

Waste rock was used to construct the roadways, the airstrip and the pads on site. Prior to 2008, ore extracted during the 1996-1997 bulk sample program was used for repairs to site. An estimated 13,400 tonnes of ore was used as surface dressing over the majority of the site including the airstrip.

Historical field and laboratory tests showed that the majority of the waste rock and ore are non-acid generating, however seepage monitoring indicates that metal leaching is a concern. "Concentrations of arsenic, and to a lesser extent, nickel and selenium may be somewhat elevated in comparison to CCME guidelines for aquatic life."

Presently, the licence requires sampling of seepage and runoff from the existing waste rock/ore storage locations, identified as monitoring station BOS-8. The Waste Rock and Ore/Waste Rock Management Plan describe that the licensee is also sampling ephemeral streams identified as EPH A2, EPH B2, EPH C2, EPH D2, and EPH E2.

Section 5.2.1 of the Water and Ore/Waste Rock Management Plan mentions seep surveys including at the south end of the airstrip, however the location is not shown on Figure 2.4 with other water quality monitoring sites, nor is the site mentioned in Table 2.4 with the list of sampling sites. Monitoring water quality of seepage and/or ephemeral runoff around the airstrip would help determine the effects of metal leaching from airstrip materials. The discussion on potential effects focuses on the impact of runoff from the camp pad into East Bay of Aimaokatalok Lake and it might be relevant to look at the impact of runoff from the airstrip into Stickleback Lake.

Recommendation

A renewed licence should include additional Surveillance Network Program stations at ephemeral streams around the camp pad and seeps or ephemeral streams along the airstrip to monitor metal concentrations in the water since part of the construction materials used in infrastructure construction is leaching metal.

TMAC Response:

As documented in Section 5.2.1 of the Water and Ore/Waste Rock Management Plan, the seepage monitoring program already includes the south end of the airstrip. This monitoring will be included in Table 2.4 and Figure 2.4 of this plan.

In reference to the matter raised regarding metal leaching, INAC is referred to the following statement included in the current Water and Ore/Waste Rock Management Plan:

> *Predicted concentrations of nitrate, nitrite, arsenic, copper, iron, nickel and selenium exceeded the CCME water quality guidelines for the protection of aquatic life in the ephemeral streams. However, due to limited flows and lack of channel characteristics in these small catchments, these ephemeral streams are not considered to be aquatic habitats and the CCME guidelines are not applicable*.

The ephemeral streams monitoring is currently documented in the Water and Ore/Waste Rock Management Plan which is referenced in the license and is a separate monitoring program to the Surveillance Network Program (SNP). It is therefore not considered appropriate to include the ephemeral stream monitoring program in the SNP.

As part of the water licence and Water and Ore/Waste Rock Management Plan, seepage and runoff from the camp area are monitored annually to validate the water management strategy. Specifically, seepage from the ore stockpiles is monitored at water license water quality station BOS-8 to monitor runoff from the existing waste rock/ore stockpile to the tundra.

Results from the ephemeral streams monitoring program are interpreted annually in the context of the water and load balance (SRK 2009) and submitted by TMAC to the NWB. The water and load balance was developed to assess the potential impacts of seepage from the ore and waste rock at key locations downstream of the site, including ephemeral streams down gradient of the stockpile area, the East Bay of Aimaokatalok Lake, and the main part of Aimaokatalok Lake. Section 3.2.2 of the water and load balance (Supporting Document B of SRK 2009) addresses the potential for impacts from airstrip runoff to Stickleback Lake as follows:

> *"It is noted that some of the seepage and runoff from the airstrip is expected to report to Stickleback Lake before reaching East Bay. However, Stickleback Lake is not included in this assessment. Separate calculations to assess the ratios of source flows to receiving water flows in Stickleback Lake (which only receives water from part of the airstrip) and East Bay (which receives water from both the camp pad and the airstrip)*

indicate that there is relatively more dilution in Stickleback Lake than in East Bay. Therefore, concentrations in Stickleback Lake would be expected to be lower than those predicted for East Bay."

Therefore, in the context of the findings of the water and load balance (SRK 2009), monitoring of ephemeral streams flowing to Stickleback Lake is not warranted at this time.

References:

SRK Consulting (Canada) Inc. 2009. Water and Ore/Waste Rock Management Plan for the Boston Site Hope Bay Project, Nunavut. Prepared for Hope Bay Mining Ltd. 1CH008.022. July 2009.

12. MONITORING WATER USE

Reference

- Quality Assurance and Quality Control Plan, TMAC Resources Inc., January 2017, Module C, Table C1

Comment

Table C1 of the Quality Assurance and Quality Control Plan describes the sample stations, sampling frequency and analytical parameters for the Surveillance Network Program (SNP) set out in the water licence. In this table, the sampling frequency for measuring water intake from all sources at drill sites is "daily during periods of discharge".

Additionally, monthly quantities of mine water pumped from the underground are not included in the Table C1 list, though it is required in Part J, Item 3 of the licence. While it is understood that there would be no mine water pumped during care and maintenance, as the licensee proposes to re-open the camp to initiate further work, it may become necessary to pump mine water.

Recommendation

Table C1 of the Quality Assurance and Quality Control Plan should be modified to indicate water intake from drill sites is measured daily during pumping and mine water pumping should be monitored monthly.

TMAC Response:

In accordance with the current water management plan, TMAC currently removes accumulated water from the portal area in the spring or early summer. This is routinely tested prior to discharge and the volumes are reported in the SNP reports and this practice is expected to continue under the renewed licence. As noted by the reviewer the current underground workings at Boston are located entirely in the permafrost zone and as such mine water is not anticipated to require pumping from the mine once the portal is reopened and accessed. Should mine water be encountered, TMAC will include the monitoring of mine water pumped from the underground mine, on a monthly frequency during periods of pumping after the mine portal is opened, as noted in Table C1 of the Quality Assurance and Quality Control Plan.

13. REVISED CLOSURE ESTIMATE

As part of the Water Licence Renewal application, in January 2017 TMAC Resources Inc. submitted a revised Boston Camp Interim Closure Plan (SRK 2017. Hope Bay Project Boston Camp Revised Interim Closure Plan. Report prepared for TMAC resources Inc. SRK Project #1CT022.006 January 2017), including an updated Closure Cost Estimate of $6,381,000.

After further review and with direct experience with constructing access to the Boston site in March of 2017, TMAC and SRK recognized that there were inconsistencies in the Closure Cost Estimate. Attachment A of this document documents the changes associated with correcting these inconsistencies, and the resulting revised reclamation cost estimate of $3,605,000. All cost differentials are compared in Attachment A to the original cost estimate. The Table 1 below has been extracted from Attachment A for the reader's convenience. Yellow highlighting indicates that values which have been updated.

Table 1: Closure Cost Comparison (Rounded to Nearest Thousand)

Work Task	January 2017	April 2017
Direct Cost Items		
1. Underground Mine	**$23,000**	**$23,000**
Portal/Decline	$8,000	$8,000
Vent Raise	$15,000	$15,000
2.Rock Pile	**$475,000**	**$475,000**
Ore Stockpiles	$434,000	$434,000
Contaminated Soil Implementation Plan	$41,000	$41,000
3. Buildings and Equipment	**$1,050,000**	**$489,000**
Facilities Demolition		
Accommodation Complex/Buildings	$106,000	$106,000
Maintenance Shop Complex	$29,000	$29,000
Crusher Enclosure	$7,000	$7,000
Water Treatment Facilities	$69,000	$69,000
Incinerator	$3,000	$3,000
Mobile Equipment	$8,000	$8,000
Other Structures	$39,000	$39,000
Primary Tank Farm	$430,000	$67,000
Power Plant Fuel Containment	$3,000	$3,000
Jet Fuel Containment System	$4,000	$4,000
Soil Treatment Facility	$27,000	$27,000
Camp Complex Foundation Pad	$15,000	$15,000
Transportation Infrastructure		
Helipads	$6,000	$6,000
Road to Aimaokatalok Lake	$3,000	$3,000
Road to Airstrip	$5,000	$5,000
Airstrip	$15,000	$15,000
Core Storage Road	$3,000	$3,000
Drill Road	$3,000	$3,000
Permafrost Remediation and Revegetation	$41,000	$41,000
Drill Sites/Drill Hole Abandonment		
Drill Sites/Drill Hole Abandonment	$214,000	$16,000
Non-Process Ponds & Reservoirs		
Settling Pond #1	$4,000	$4,000
Settling Pond #2	$3,000	$3,000
Diamond Drill Cuttings Settling Pond	$4,000	$4,000
Off-Site Shipping for Disposal	$3,000	$3,000
Off-Site Disposal Fees	$6,000	$6,000
Total Direct Costs	**$1,548,000**	**$987,000**
4. Interim Care and Maintenance	n/a	$80,000
5. Mobilization & Demobilization	$3,405,000	$1,249,000
6. Post-closure Monitoring	$200,000	$200,000
7. Engineering and Consultants Services	$150,000	$150,000
8. Project Management	$740,000	$723,000
9. Health & Safety Plans/Monitoring and QA/QC	$15,000	$10,000
10. Bonding / Insurance	$15,000	$10,000
11. Contingency	$308,000	$202,000
Total Indirect Costs	**$4,833,000**	**$2,624,000**
Total Closure Cost	**$6,381,000**	**$3,611,000**

Attachment A – Revised Boston Exploration Camp Closure Cost Estimate for Licence 2BB-BOS1217 Renewal Application

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Memo

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Reviewed By:	Maritz Rykaart, PhD, PEng	**Date:**	April 10, 2017
Subject:	Revised Boston Exploration Camp Closure Cost Estimate for Licence 2BB-BOS1217 Renewal Application		

1 Introduction

As part of the Water Licence Renewal application, in January 2017 TMAC Resources Inc. submitted a revised Boston Camp Interim Closure Plan (*SRK 2017. Hope Bay Project Boston Camp Revised Interim Closure Plan. Report prepared for TMAC resources Inc. SRK Project #1CT022.006 January 2017*), including an updated Closure Cost Estimate of $6,381,000.

After further review and with direct experience with constructing access to the Boston site in March of 2017, TMAC and SRK recognized that there were inconsistencies in the Closure Cost Estimate. This memo documents the changes associated with correcting these inconsistencies, and the resulting revised reclamation cost estimate of $3,605,000. All cost differentials are compared in the memo to the original cost estimate.

2 Changes

2.1 Facilities Demolition

The Boston fuel storage facility has 8 steel fuel tanks, each of 60,000 Liter capacity. Decommissioning of these tanks requires complete dismantling by cutting the tanks down into transportable pieces which can be disposed of at the Doris non-hazardous landfill site.

The cost of dismantling each tank was $50,000 which was in fact an error, as that was the cost of dismantling the much larger 1 million Liter tanks at Doris site. In actual fact, the cost of dismantling each tank at Boston is $4,629, calculated based on productivity of required manpower and equipment. This reduces the overall cost of this closure activity from $430,000 to $67,000.

2.2 Drill Site & Drill Hole Abandonment

As noted in TMAC's response to INAC IR#4, active drill hole reclamation activities are required for 112 of the over 500 inventoried drill holes at Boston. Updating the number of drill holes requiring active reclamation halved the direct costs for this activity from $32,830 to $16,305.

Furthermore, reducing the number of drill holes significantly reduced the required helicopter support from 21 days to 7 days. The cost implication is a reduction from $198,861 to $66,287 under the "Project Management" cost category (Section 2.5).

2.3 Interim Care and Maintenance

One of the IR requests, INAC IR#7, was inclusion of 18 months of Interim Care and Maintenance (ICM) costs in the closure cost estimate.

The care and maintenance activities which will be included will be the same as those currently undertaken. This consists of annual seepage and ephemeral stream monitoring and geotechnical inspections. However, the 18 month duration of ICM exceeds the single season of the planned monitoring activities. It was therefore concluded that two seasons of monitoring and inspections will be included, with the total cost for these activities based on current estimates of $80,000.

2.4 Winter Track

The Interim Closure Plan submitted for review included construction and maintenance of a winter road to support the closure activities. This winter road would allow continuous travel of wheeled vehicles between Boston and Doris camps.

In reality, since early days in the exploration of the Hope Bay belt, a winter track accessible to tracked vehicles was constructed regularly between Boston and Doris. Although this track will not allow continuous travel of wheeled vehicles, it has proven to be adequate for mobilizing heavy equipment and hauling materials using skids towed by tracked vehicles. The updated cost assumption includes construction and subsequent by-weekly maintenance runs for the duration of the closure activities (4 months).

Coincidentally, the unit rates in the submitted closure plan developed for hauling the waste from Boston to Doris always assumed a Challanger tracked vehicle towing two skids for calculating productivity, and therefore the calculated unit rates for hauling waste remain unchanged. Replacing the full winter road with the winter track reduced the cost from $2,218,187 to $62,373. This change reflects TMAC's site specific knowledge of building the Doris to Boston access in 2017.

2.5 Project Management

Project management is one of the most important indirect owner's cost (second only to Mob/Demob). This cost item is comprised of several elements like camp costs (rental, administration, operation), field support and supervision, equipment maintenance, and helicopter support. While the overall cost of this category did not change significantly (increase from

$721,660 to $722,974) the revised assumptions and estimated costs significantly changed the weight of each element. These changes are discussed below.

- **Camp Rental**. In the submitted Interim Closure Plan this element was assumed to represent a 25-man camp rented for one year and operated for the duration of closure and reclamation works. This assumption was revised to now include a smaller, 16-person winter camp, rented for the winter season only (4 months). This reflects the reality of only winter construction activity to close the site. This reduced the camp rental costs from $450,000 to $121,000 (including camp setup and removal cost).
- **Camp Management and Operation**. The camp operation period was also updated, resulting in an increase from 17 days to 119 days to reflect the small crew. The smaller camp includes a lower management cost than previously assumed, while the daily camp operations (food, supplies, food preparation, crew travel) cost was maintained unchanged. The cost of camp management and operations increased from $46,793 to $302,909.
- **Field Supervision**. The increase in the duration of closure activities from 17 days to 119 days resulted in the requirement for increasing the owner's allowance for site supervision, with the associated cost increase from $23,063 to $162,064.
- **Equipment Maintenance**. The requirement for equipment maintenance during closure and reclamation work was increased to 50% of the actual closure duration from the original 10%. This resulted in a cost increase from just over $2,000 to $70,714.
- **Helicopter Support**. A reduction in the duration of drill site reclamation task resulted in a lowering of the helicopter support requirements. The resulting changes in cost were discussed in Section 2.2.

2.6 Health & Safety Plans/Monitoring and QA/QC

This cost is a constant 1% of the direct cost and the reduction from $14,000 to $10,000 is a result of the reduced direct cost from $1,367,000 to $987,000.

2.7 Bonding Insurance

This cost is a constant 1% of the direct cost and the reduction from $14,000 to $10,000 is a result of the reduced direct cost from $1,367,000 to $987,000.

2.8 Contingency

This cost is a constant 20% of the direct cost and the reduction from $272,000 to $202,000 is a result of the reduced direct cost from $1,367,000 to $987,000.

3 Overall Costs Comparison

Table 1 provides a comparative summary of the Interim Closure and Reclamation Cost estimates since the initial submission submitted in January 2017. Please note that Table 1 includes costs

rounded to the nearest thousand, and therefore the detailed costs provided in the preceding sections may not be reflected exactly. Cost items that have changed are highlighted in yellow.

Table 1: Closure Cost Comparison (Rounded to Nearest Thousand)

Work Task	January 2017	April 2017
Direct Cost Items		
1. Underground Mine	**$23,000**	**$23,000**
Portal/Decline	$8,000	$8,000
Vent Raise	$15,000	$15,000
2.Rock Pile	**$475,000**	**$475,000**
Ore Stockpiles	$434,000	$434,000
Contaminated Soil Implementation Plan	$41,000	$41,000
3. Buildings and Equipment	**$1,050,000**	**$489,000**
Facilities Demolition		
Accommodation Complex/Buildings	$106,000	$106,000
Maintenance Shop Complex	$29,000	$29,000
Crusher Enclosure	$7,000	$7,000
Water Treatment Facilities	$69,000	$69,000
Incinerator	$3,000	$3,000
Mobile Equipment	$8,000	$8,000
Other Structures	$39,000	$39,000
Primary Tank Farm	$430,000	$67,000
Power Plant Fuel Containment	$3,000	$3,000
Jet Fuel Containment System	$4,000	$4,000
Soil Treatment Facility	$27,000	$27,000
Camp Complex Foundation Pad	$15,000	$15,000
Transportation Infrastructure		
Helipads	$6,000	$6,000
Road to Aimaokatalok Lake	$3,000	$3,000
Road to Airstrip	$5,000	$5,000
Airstrip	$15,000	$15,000
Core Storage Road	$3,000	$3,000
Drill Road	$3,000	$3,000
Permafrost Remediation and Revegetation	$41,000	$41,000
Drill Sites/Drill Hole Abandonment		
Drill Sites/Drill Hole Abandonment	$214,000	$16,000
Non-Process Ponds & Reservoirs		
Settling Pond #1	$4,000	$4,000
Settling Pond #2	$3,000	$3,000
Diamond Drill Cuttings Settling Pond	$4,000	$4,000
Off-Site Shipping for Disposal	$3,000	$3,000
Off-Site Disposal Fees	$6,000	$6,000
Total Direct Costs	**$1,548,000**	**$987,000**
4. Interim Care and Maintenance	n/a	$80,000
5. Mobilization & Demobilization	$3,405,000	$1,249,000
6. Post-closure Monitoring	$200,000	$200,000
7. Engineering and Consultants Services	$150,000	$150,000
8. Project Management	$740,000	$723,000
9. Health & Safety Plans/Monitoring and QA/QC	$15,000	$10,000
10. Bonding / Insurance	$15,000	$10,000
11. Contingency	$308,000	$202,000
Total Indirect Costs	**$4,833,000**	**$2,624,000**
Total Closure Cost	**$6,381,000**	**$3,611,000**

4 Conclusion

This memo documents TMAC's revised closure and reclamation cost estimate for the Boston site to be considered for the renewal application 2BB-BOS1217. These changes do not reflect a change in the closure and reclamation plan, but rather corrects inconsistencies in the cost estimating effort.