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NU-03-0180

January 30, 2004

Stephanie Briscoe
Executive Director
Nunavut Impact Review Board
P.O. Box 2379
Cambridge Bay, NU
X0B 0C0

Dear Ms. Briscoe:

RE: Doris North Pre-Hearing Conformity Analysis and Adequacy Review, Miramar Hope Bay Ltd. Final EIS

This letter is to advise that Fisheries and Oceans Canada, Fish Habitat Management (DFO-FHM) has reviewed the documentation submitted by Miramar Hope Bay Ltd. entitled *Final Environmental Impact Statement (FEIS) – Doris North Project*, dated November 2003. DFO-FHM has examined the aforementioned document to determine whether all the information required by DFO-FHM for a technical review as per our legislation, specifically the *Fisheries Act*, *Oceans Act* and *Navigable Waters protection Act* is present. DFO-FHM has also reviewed the FEIS for its conformity to the information deficiencies outlined in the Pre Hearing Decision Document, dated June 12, 2003, submitted by the Nunavut Impact Review Board (NIRB).

Based on our conformity and adequacy review, DFO-FHM feels that the FEIS provides enough information to allow DFO-FHM to make a preliminary assessment pertaining to our regulatory triggers and legislation. However, there are numerous project components described within the FEIS, which in order to fulfill DFO-FHM's mandate of *no net loss*, need to be redesigned, mitigated, compensated for or otherwise addressed by the proponent.

Based on the additional information requested by DFO-FHM in the Pre-hearing Decision Document the following requests/information requirements were satisfactorily presented in the FEIS:

- Data on fish habitat use at the north end of Doris Lake;
- A study to assess numbers of arctic char migrating upstream to Roberts Lake;
- Rational for selecting Tail Lake as the best sub-aqueous disposal location as per comparisons of species composition/diversity, habitat characteristics, watershed isolation and overall containment.

DFO-FHM feels that there are still several inadequacies in the Doris North FEIS. More site specific information, major redesign and mitigation or additional compensation for a harmful alteration, disruption or destruction (HADD) of fish habitat are required in the following three main areas:

- **Tail Lake Tailings Impoundment Area**

- Roberts Bay Jetty
- Doris Outflow Clear-span Bridge

Concerns with Tail Lake Tailings Impoundment Area (TIA)

As proposed, the Tail Lake Impoundment would require complete destruction of Tail Lake and make the waterbody devoid of all life for an extended period of time. Based on the Habitat Units (HU) rational provided within the FEIS and factoring the proposed compensation, taken at face value a HU increase of 1:3.8 would be an acceptable ratio of compensation. However, while it is the opinion of DFO-FHM that improving access to already existing productive habitat does have value, it is by no means adequate compensation for the complete destruction of an entire lake system (~80Ha - containing a key fish species such as Lake Trout (*Salvelinus namaycush*)). Furthermore, based on Tail Lake having a ~8yr mine tailings capacity, the entire lake is not needed for the proposed 2-3 year Doris North project.

A more adequate compensation plan for the proposed use of Tail Lake will be required and freely discussed with the proponent at a scheduled meeting on February 3, 2004.

MHBL comment:

As discussed at the meeting on February 3, 2004, additional habitat compensation options will be incorporated into the No Net Loss Plan (including conceptual design drawings) and will be available on March 22, 2004 in preparation for the technical sessions. The potential additional habitat compensation options that will be addressed include creating rearing habitat areas in Ogama, Patch, Glenn and/or Windy lakes, as well as creating rearing habitat at the mouth of small tributaries.

Similar to the rearing habitat areas in Doris Lake which was proposed in the 2003 No Net Loss Plan (Supporting Document F5), these enhancement areas would be approximately 25m x 25m in area and located in shallow bays. Rock will be placed on the ice and allowed to break through the ice during the spring melt period. Since the proposed enhancement areas will be in areas where the lake bottom is level and are not located in areas where the littoral zone is sloping, the rocks will remain in place once they have fallen through the ice. The selected sizing of the rock (5-25cm diameter) will create interstitial space for young fish to use as cover. This conceptual plan for creating rearing habitat was accepted by DFO for the Diavik Project in 1998 (Golder 1998).

These rearing habitat enhancements in lakes would benefit multispecies, although lake trout are the target species. The dominant fish species in Ogama, Patch and Windy lakes are lake trout, cisco, and lake whitefish. Although fish sampling has not been conducted in Glenn Lake, lake trout and Arctic char have been documented in Glenn inflow and outflow.

Additional rearing habitat could also be created in the lower portions of small tributaries entering lakes, thereby providing cover for small fish to take refuge. The proposed enhancement would be to create pools within the first 30m of a stream from the lake. Small fish, including Arctic char, were often captured in the lower sections of intermittent streams to Roberts Lake during the 2003 field program.

As proposed, the decant material to be siphoned out of the tailings impoundment will meet the MMER water quality standard. This standard will be attained through the dilution of the decanted material by the Doris Lake outflow. It is the opinion of DFO-FHM that any material released from the TIA will have to meet the MMER water quality standard prior to being introduced into the Doris Lake outflow.

DFO-FHM will require details on how the proponent plans to ensure that decant released from the TIA will meet the MMER standard. If unable to guarantee adherence to water quality standards the proponent

will be required to include this loss of fish habitat in their No Net Loss Plan since any decant material added to Doris Lake outflow will adversely impact fish and fish habitat in the area.

MHBL comment:

Miramar is committed to meeting the MMER water quality guidelines before decant water is released from Tail Lake. Miramar is also committed to meeting the CCME guidelines below the waterfall on Doris Outflow. The Final EIS stated that the siphon release point is located approximately 250 m above the waterfall; however, that distance has now been re-considered. The discharge pipe will be located as close to the falls as possible, subject to final engineering and design.

The FEIS stated on page 5-38 that “Tail Lake water quality will be monitored prior to release to ensure that the decant waters will meet the MMER requirements. If it is determined that the decant waters likely would not meet regulatory requirements, the water would be held and/or treated until the water quality meets the requirements.” The FEIS also states on page 5-39 that “An aquatic life risk assessment (Golder 2003, Supporting Document F2) confirmed that the planned mitigation is predicted to be effective at reducing risk to downstream aquatic life. The results of the aquatic life risk assessment indicated that there will be no incremental increase in risk to fish in Doris Outflow and Little Roberts Outflow (and therefore Little Roberts Lake proper) as a result of the proposed Doris North Project.”

Furthermore, to ensure that decant water released from the Tailings Impoundment Area (TIA) will meet the MMER water quality standard, Miramar will follow the procedures outlined by MMER, which are stated on page 3 of the FEIS Supporting Document F3 – Effluent and Aquatic Monitoring Study Design for Doris North Project:

“Effluent monitoring requires the mine to undertake the following activities:

- weekly testing of effluent for the deleterious substances and pH as specified in Schedule 3 - Analytical Requirements for Metal Mining Effluent of the MMER;
- weekly or continuous measurement of flow rates; and,
- monthly testing of acute lethality of effluent to rainbow trout and *Daphnia magna*.”

Water quality samples will be collected in Tail Lake near the siphon/pump intake and analyzed prior to the release. As well, samples will be collected at the end-of-the-pipe location. In Tail Lake, samples will be collected within the immediate vicinity of the withdrawal valve, which is located approximately 1 m below the surface. Before the decant process begins, the deepest portion of the lake will be sampled to determine if the lake has thermally stratified or not. If Tail Lake is thermally stratified then water quality sampling will also occur at 20 m intervals to a range of 100 m from the withdrawal valve. Water samples would also be collected at several locations within the water column (e.g., near surface, mid-depth, near bottom). If the lake is not thermally stratified then a single water sample will be taken near the withdrawal valve.

Before the decant period begins, water samples will be collected at least one week before any water release from Tail Lake. This will allow sufficient time for the laboratory to analyze the samples and determine if the water to be released would meet the MMER guideline values in Schedule 3.

Water samples will also be collected on the same schedule at the end-of-the-pipe location. Sampling at the end-of-the-pipe will be conducted immediately at the release point and downstream of the waterfall. The study design for the EEM program is provided in Supporting Document F3, which includes near and far field sampling locations.

Outstanding information required for DFO-FHM to complete a thorough technical review of the Tail Lake TIA proposal includes:

- *A detailed cost analysis that compares the cost of dry land disposal options with the sub-aqueous option of Tail Lake containment and justifies the rejection of the dry land impoundment options.*

MHLB comment:

A revised and updated "Table 1: Summary of Hope Bay Doris North Tailings Disposal Alternatives" originally presented in SD B5, will be prepared and presented prior to the Technical Meetings Scheduled for March 29 – April 2, 2004.

- *A more adequate No Net Loss Plan that fully compensates for the destruction of Tail Lake.*

MHLB comment:

This will be provided for the Technical Workshop as discussed above.

- *A redesign option for Tail Lake that minimizes the area needed for tailings disposal based on the 2-3yr volume required.*

MHLB comment:

The proponent did consider using only a portion of Tail Lake to deposit tailings. Under this scenario a 250m long dam would be constructed approximately 1.5km north of the current South Dam location across Tail Lake. The volume of water behind Tail Lake would be pumped out and tailings would be dumped sub-aerially into the impoundment. Runoff diversion structures would be constructed around the impoundment to minimize contamination of clean catchment runoff. The impoundment would be sized such that after the 2-year mine life the final tailings elevation would be above the original lake level, such that a dry cover could be established with positive drainage away from the covered tailings. Under this scenario the North Dam would still have to be constructed, albeit to a lower elevation. The remainder of Tail Lake will thus act as a polishing pond. This tailings disposal alternative would involve a capital outlay similar to the alternative proposed in the FEIS, and there would be no environmental benefit, since the entire lake would still be impacted.

- *A detailed plan demonstrating how the proponent will ensure that, in the event that the Tail Lake is utilized as a TIA, all decant material will meet the proposed MMER water quality standards.*

MHLB comment:

Please see comments re TIA above.

Concerns with the Roberts Bay Jetty

It is the intent of DFO-FHM to have the proponent re-design the proposed jetty such that the jetty footprint is reduced and coastal/shoreline processes such as sediment transport, water circulation and fish migration are not affected.

Alternative designs intended to remedy the above mentioned concerns will be requested at the scheduled meeting on February 3, 2004.

MHLB comment:

The proponent has reconsidered the Jetty design and has come up with a possible alternative design that may reduce potential impacts on the bay, by reducing the volume of rockfill that would obstruct natural flow of water. The alternative design consists of one, two or three 30.5m long clear span bridge decks. These bridge decks would be supported by rockfill buttresses. Consideration was given to making use of piles; however this was not given further consideration due to the prohibitive cost of providing specialized piling equipment for construction. A detailed drawing of this proposed alternative Jetty design will be presented at the Technical Meetings scheduled for the week of March 29 – April 2, 2004. The final jetty configuration will be confirmed during the detailed engineering phase.

Outstanding information required for DFO-FHM to complete a thorough technical review of the Roberts Bay Jetty proposal includes:

- *Alternative design plans for the proposed structure that minimize the physical destruction of fish habitat and that reduce coastal sediment transportation by wave/tidal action, impacts of water circulation changes and the impediment of fish passage.*

MHBL comment:

Please see conceptual alternate jetty design above.

Shoreline Processes:

The main potential impact of the jetty on the shoreline of Roberts Bay is the interruption of longshore sediment movement. Where there is no predominant direction of longshore transport, jetties may have little to no effect. At sites where the longshore sediment transport is large, the amount of sediment available to downdrift shores can be reduced; at least until a new equilibrium shoreline is formed at the jetties. Where longshore transport predominates in one direction, an accretionary fillet will occur on the updrift side of the jetty and erosion will occur on the downdrift side.

Sediment transport in the foreshore zone in Roberts Bay is most likely due to wind waves and tidal processes. Wave-generated currents tend to dominate water movement in the nearshore zone and are the most important natural force in the movement of sediment. When waves break with their crests at an angle to the shoreline, a current is generated parallel to the shoreline that is able to move sediment alongshore. In the vicinity of structures, diffraction may produce substantial changes in breaking wave height.

The information currently available at the jetty location includes:

- Bathymetry contours;
- Sediment samples, and
- Photographs

The jetty site, located at the south end of Roberts Bay, appears to be located on a shoreline which has a low net longshore sediment movement (due to shoreline orientation, fetch and the nature of the shoreline sediments). However to confirm this hypothesis the following tasks will be undertaken prior to the Technical Sessions to be held at the end of March:

- Review existing site information – Review of the sediment data collected at the project area is important to establish the baseline condition and site characteristics.

- Review of historical aerial photos – Available aerial photos can be used to assess the long term evolution of the shoreline.
- Wind wave hindcasting – A wave hindcasting analysis to establish the wave conditions at Roberts Bay.
- Wave refraction/diffraction analysis – The construction of the jetty may alter the nearshore wave conditions due to diffraction and refraction processes. The diffraction and refraction modeling will provide the nearshore wave conditions at the site.

This information, along with the design and cost analyses of the alternate jetty designs (e.g., rockfill with open span sections) will provide a basis for discussion at the Technical Sessions.

- *A detailed cost analysis that compares the proposed jetty to alternatives such as: a pile based structure or an alternating segmented solid rock/clear span design (to be discussed at the scheduled meeting on February 3, 2004).*

MHBL comment:

A cost estimate of this design alternative will be presented at the Technical Meetings scheduled for the week of March 29 – April 2, 2004.

Concerns with the Doris Outflow Clear-span Bridge

Within the FEIS, the design and rationale for a clear span bridge crossing the Doris lake outflow is reasonable; however, a more specific design showing exact dimensions will be required.

Outstanding information required for DFO-FHM to complete a thorough technical review of the Doris Outflow Clear-Span Bridge proposal includes:

- *Site photos of the crossing location showing the river banks.*
- *Technical design of the proposed clear-span bridge including, but not limited to, the following:*
 - *exact dimensions of the bridge structure;*
 - *dimensions of the Doris Lake outflow - water depth, river width, high water mark, etc.;*
 - *bank full distances;*
 - *distance from the bank full location to the toe of the slope of the embankment supporting the clear span bridge.*

MHBL comment:

Complete details of the preliminary bridge design have been presented in Figure 5.8 SD A4. The bridge deck will be a minimum distance of 2.5m above the stream centerline, and the toes of the bridge abutments will be a minimum distance of 10m apart. The average stream width used for design purposes is 4m, which allows a minimum distance of 3m on either side. The exact dimensions of the bridge structure and abutments will be confirmed during the detailed design stage. Exact dimensions of the Doris Lake outflow water depth, river width, high water mark etc. have not been measured; however these will be confirmed prior to proceeding with the detailed design.

Figures 1 to 3 are photographs (below) of Doris Outflow taken during the field visit between 30 June and 1 July 2003 and provide an overview of the morphology of the outlet channel. Figure 1 shows the crossing location including the river banks. A stream discharge measurement was also undertaken on 30 June and a channel cross-section (below the water surface elevation) is provided in Figure 4.

The following stream habitat characteristics from the vicinity of the proposed crossing were requested by DFO:

- **Water depth:** During discharge transect measurements in August and September 2003, the maximum recorded depth was 0.38 m, with a mean depth of 0.26 m.
- **River width** in June was approximately 12 m. During discharge transects in August and September 2003, river width ranged from 2.8 to 4.7 m.
- The **high water mark** during the June site visit was approximately 1 m above existing conditions.
- The **bank full distance** during the June site visit approximately 14 m across the river channel.
- Distance from the bank full location to the toe of the slope of the embankment supporting the clean span bridge.



Figure 1: Doris Lake outlet gauging station, looking south (upstream) from right downstream bank (DSC31).



Figure 2: Doris Lake outlet gauging station, looking north (downstream) from right downstream bank (DSC33).



Figure 3: Doris Lake outlet gauging station, looking north (downstream) from air (DSC7).

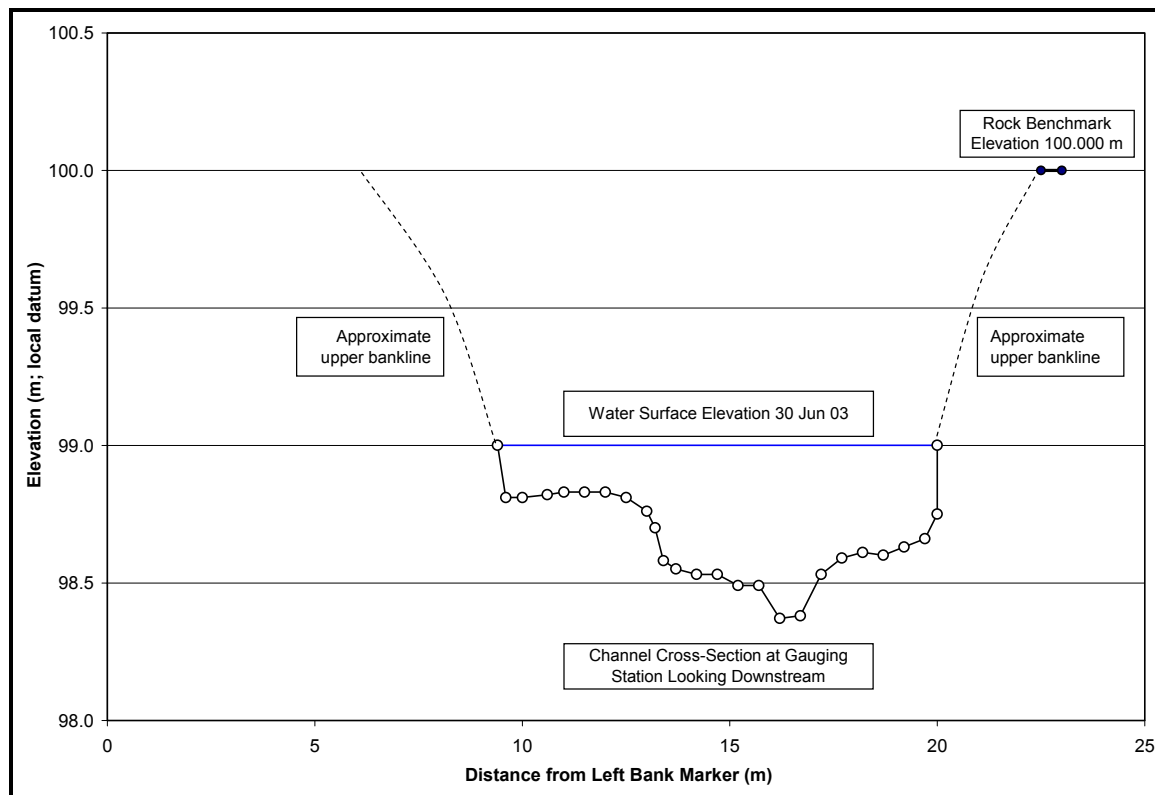


Figure 4 – Cross-Section and Water Surface Elevation at Doris Lake outlet gauging station, looking downstream. Upper banklines are approximate; lower cross-section and benchmark elevation were measured.

During the meeting between Miramar, Golder and DFO in Iqaluit on February 3-4, 2004, DFO indicated that they will need more specific information on culverts to ensure that the culverts would be sized properly to prevent upstream ponding or possible loss of the road if the culvert is sized improperly.

MHBL comment:

The proposed Tailings Service Road will cross one unnamed tributary to Doris Lake and another unnamed tributary to Tail Lake. These two streams are intermittent and do not show up on the 1:50 000 NTS map. Near the proposed crossings, both streams have steep gradients (2 to 4%), which would hinder fish passage beyond 20 m from Doris Lake and 40 m from Tail Lake. Figure 5 provides an overview of the topography in the vicinity of the unnamed stream to Doris Lake.

Detailed design drawings of all culverts will be completed during the permitting phase of the project and each culvert will be designed with the input of a stream engineer to ensure proper stream drainage and to ensure fish passage (where appropriate).



Figure 5 – Overview of the topography in the vicinity of the proposed culvert along the unnamed tributary to Doris Lake. Note the steep stream gradient.

Explosives

MHBL comment:

During the meeting in Iqaluit on 3-4 February 2003 with Miramar, Golder, and DFO, the issue of explosives was addressed.

Miramar is committed to meeting the federal “Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters” (Wright and Hopky1998). These guidelines outline setback distances from a explosive detonation point to fish habitat. The guideline sets out to achieve a pressure of less than 100 kPa for various substrate types to minimize harmful effects on fish and fish eggs. To achieve the goal of 100 kPa, the most conservative setback distance in the guideline is 50.3 m using a 100 kg weight of explosive charge in rock substrate. However, DFO-Iqaluit has indicated that the Doris North Project will use an even more conservative overpressure value of 50 kPa. The calculated setback distance in rock substrate using 50 kPa criteria is 77.6 m. In areas where spawning habitat is present, the federal guideline also stipulates that setback distances must achieve a $13 \text{ mm} \cdot \text{sec}^{-1}$ criteria for all types of substrate. The guideline indicates that the most conservative setback distance from spawning habitat is 150.9 m (using a 100 kg weight of explosive charge).

The Doris North Project has proposed three quarries, which include west of the camp/mill site, near the peninsula that extends out into Roberts Bay, and on the east side of Tail Lake. With the exception of the Roberts Bay quarry, distances from the edge of proposed quarries to the nearest waterbody were within the federal guidelines of 77.6 m for 100 kg charges during non-spawning seasons. The project will also

meet the guidelines of 150.9 m during spawning and egg incubation periods, with the exception of Roberts Bay during the open-water period (Table 1). Blasting will not occur during known spawning activities that occur during the open-water. This period includes two weeks during early summer (mid-July) when capelin are known to spawn along the Arctic coast. As well, no blasting will occur within 500 m of a marine mammal, as indicated in the federal explosives guidelines. An application with detailed explosive specifications will be submitted during the permitting phase of the project. If blasting is necessary closer than 77.6 m from the water (e.g., possibly at Roberts Bay quarry), smaller charge sizes will be used to remain within blasting guidelines as outlined in Wright and Hopky (1998) as modified by DFO-Iqaluit for application in the Arctic. Also, during final design of the Roberts Bay quarry, it may be possible to increase the setback distance from the edge of the quarry to the shoreline, thereby reducing potential impacts on the aquatic resources.

Table 1. Distance of proposed quarries to the nearest waterbody during the open-water period and during ice conditions.

Quarry	Nearest Waterbody	Distance (m) to Nearest Waterbody during Open-water Period	Distance (m) to Nearest Habitat Available for Egg Incubation
Quarry #1	Roberts Bay	14	165 ^a
Quarry #2	Unnamed lake to Glenn L.	293	295
Quarry #3	Unnamed lake to Pelvic L.	157	159

^a It was assumed that fish would not spawn in <2m water depth, as the eggs would become frozen in ice, therefore, based on the 2003 bathymetry map of Roberts Bay, the shortest distance from shore (nearest the quarry) to the 2 m contour interval was 151 m. (Note: the distances are based on preliminary design and may be changed during detailed design).

DFO-FHM reserves the right to request additional information and discuss mitigation and redesign options with the proponent such that the requirements necessary to meet our legislation, specifically the *Fisheries Act*, *Oceans Act* and *Navigable Waters protection Acts* are met.

DFO-FHM looks forward to continuing to work with Miramar Hope Bay Ltd., NIRB, NWB, other federal agencies, and all other stakeholders. If you have any questions concerning the above, please contact me at (867) 979-8011 or by fax at (867) 979-8039.

Sincerely

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c.c. Jeff Stein – Director, Habitat Management, DFO-FHM