Fisheries and Oceans | Pêches et Océans

Fish Habitat Management
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Oct 26th, 2001

Bruce Donald
Teck Cominco Ltd.
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RE: Polaris Mine - Decommissioning and Reclamation Plans

Dear Mr. Donald:

This letter is to advise that Department of Fisheries and Oceans staff have reviewed the above plans. Department of Fisheries and Oceans-Fish Habitat Management (DFO-FHM) concerns include decommissioning of the dock and adjacent shoreline, and removal of the Garrow Lake Dam. Additional information on the decommissioning plans will be required prior to issuance of a *Fisheries Act* authorisation:

Decommissioning of the Dock - Although plans to remove the dock with recontouring of the shoreline to approximate natural shoreline slope is considered the preferred alternative, additional detailed, finalized construction information and finalized blasting plans are required.

Removal of the Garrow Lake Dam - Information is also required regarding the timing and construction methods used to remove the dam. Teck Cominco Ltd. does not provide sufficient assessment of the more environmentally acceptable alternative of complete dam removal and site rehabilitation. Moreover, there is good reason to defer decommissioning actions on the dam until the natural surface water elevation of Garrow Lake has been restored and monitoring reveals that erosion of the halocline and mixing with the surface waters will not occur and contaminants will be retained at depth.

In addition to the above, DFO-FHM has yet to receive a “No Net Loss” plan from Teck Cominco Ltd. An acceptable “No Net Loss” plan, outlining compensation measures, will be required prior to issuance of a *Fisheries Act* Authorisation.

Canada

If you have any questions concerning the attached comments, please contact me at (867) 979-8007 or by fax at (867) 979-8039.

Sincerely,

Original Signed by:

Jordan DeGroot
Habitat Management Biologist
Fish Habitat Management
Department of Fisheries and Oceans- Eastern Arctic Area

Canada

Comments provided by Bruce Fallis on decommissioning of the dock, Garrow Lake Dam removal, and Garrow Lake water quality:

Dock Removal

"*Teck Cominco Ltd. Report for: Decommissioning of Dock Facilities at Polaris Mine Little Cornwallis Island, Nunavut*" Revision 1, October 2001, Westmar Consultants Inc.

The cover letter dated October 4, 2001 refers to "Revision 2 of our report" but the title page of the report states "Revision 1". If an updated version of the report is available, it should be provided.

The proposal to remove the refrigerant from the cells of the dock requires greater detail with respect to the nature of the refrigerant, the quantity of refrigerant to be recovered, the manner in which the refrigerant will be removed, and the ultimate method of disposal of the refrigerant. Plans for removal of the styrofoam used against the interior of the piles should also be provided.

The proposal to cut off the steel cell sheeting should be submitted to the Canadian Coast guard for review to ensure that the depth below the low tide level at which the cells will be cut, meets their specifications under the provisions of the ***Navigable Waters Protection Act***.

Details are needed with respect to the nature of the "rejects from the mine operation" that were disposed of in the dock cells and whether the level of excavation in the cells during decommissioning will leave such rejects exposed, causing leaching of contaminants into the ocean. If much of the dock fill to be left in place consists of "mine rejects" it should be removed and disposed of underground.

Pg. 1- The "detailed design work" advocated as being necessary prior to decommissioning is not a part of the report provided. Such information should be submitted IN ADVANCE of any approvals being granted to proceed. Mitigation methods to be employed to reduce sediment dispersion have not been detailed.

Pg. 3- The extent of the area of contaminated surface material to be deposited underground should be identified along with the techniques to be used to differentiate between contaminated and uncontaminated materials.

Materials associated with decommissioning of the temporary dock should also be disposed of underground, since the rock associated with this structure was originally identified as being well mineralized (Pb and Zn).

While alternative proposals may be appropriate, regulators will base approval on plans that are approved prior to commencement of work and any deviation from such plans should receive approval prior to implementation.

Pg. 12- It is indicated that rip rap of the dimensions required is not available in any quantity on Little Cornwallis Island, however no alternative source for such materials is suggested. The source for the materials needed should be specified.

Pg. 14- Once again, the contingency measures to be implemented to minimize sediment dispersal need to be specified along with the site(s) selected for disposal of excavated materials.

Pg. 15- The methods for distinguishing the materials that are contaminated with concentrate dusts should be specified.

The "detailed final blasting design" should be part of the proponent's application for a ***Fisheries Act*** Authorization and be evaluated and approved in advance of issuance of any Authorization.

Pg. 17- The timing of the detailed topographic survey needed to finalize the cross-sections and volumes for detailed design, tendering and construction should be indicated. Review of the finalized construction plans is a prerequisite to the issuance of any ***Fisheries Act*** Authorization. The timing of the detailed topographic survey is critical in this regard.

Pg. 18 4th bullet - Uncertainty is expressed here with respect to how the sheet piles will be decommissioned. Clarification is needed so that the proposal may be assessed by the Canadian Coast Guard with respect to the need for permitting under the ***Navigable Waters Protection Act***.

In summary, removal of the dock with recontouring of the shoreline to approximate natural shoreline slope is considered the preferred alternative, pending the provision of additional detailed, finalized construction information and finalized blasting plans.

Garrow Lake Dam Removal

"*Garrow Lake Dam Decommissioning, Polaris Mine Operations, Nunavut*", Project No. 0101-94-11552.002. Prepared by EBA Engineering Consultants Ltd. Edmonton, Alberta. March 2001

This report needs to be reviewed in the context of the history of the Polaris operation, taking into consideration that Garrow Lake was designated as a tailings impoundment area for use in depositing tailings at depth below the natural halocline in Garrow Lake. Failure of Cominco's tailings line resulted in the discharges of tailings into the surface waters of Garrow Lake and the elevation of lead and zinc concentrations. In order to meet the discharge limits at the outflow of Garrow Lake, the dam on Garrow Creek was constructed. It is this very dam that is the subject of the report. The report advocates the formation of a cut through the dam to restore the Garrow Creek flow path. The report does not present a cost-benefit analysis associated with total removal of the dam vs.

making a cut through the dam to reinstate flow to Garrow Creek. Such a cost benefit analysis should be provided. In the absence of such an analysis, the entire dam should be removed and the affected area decommissioned to its pre-construction state. If the tailings system had been operated as intended, there would have been no need to construct the dam. If it is decided to leave the dam in place, Teck Cominco Ltd. should post an irrevocable letter of credit to cover the cost of the removal of the dam. Any liability for the dam should not be passed on to future generations. Since the amount of material to be removed for the cut through the dam is more than a third of the total volume of material in the dam, removal of the entire dam would appear to be both logical and cost effective.

Timing of the decommissioning actions is critical to the success of the undertaking. It is suggested that the work be conducted in early spring prior to the thaw to optimize vehicle traffic under frozen conditions.

Drilling and blasting is proposed for the removal of materials but there is no assessment of the effects of blasting on the integrity of the remaining structure if the entire dam is not removed. Such an assessment should be part of the suggested cost-benefit analysis.

There is good reason to defer decommissioning actions on the dam until the natural surface water elevation of Garrow Lake has been restored and monitoring reveals that erosion of the halocline and mixing with the surface waters will not occur and contaminants will be retained at depth. Once the dam is removed, there is no contingency identified to restrict movement of surface waters enriched with lead and zinc out of Garrow Lake. The target discharge concentrations at the outflow of Garrow Lake at decommissioning should be based on the ALARA principle and preferably comparable to pre-development concentrations. Designation of Garrow Lake as a tailings impoundment area was based on the understanding that "Cominco Ltd. has undertaken to dispose of tailings in such a manner … that the surface layer of Garrow Lake remain substantially unaltered." The fact that the surface waters of Garrow Lake have been substantially altered, necessitates that a plan be provided identifying the strategies to minimize contaminant discharges upon decommissioning. No forecast of the total loadings of contaminants that will be discharged from Garrow Lake subsequent to cessation of tailings disposal has been provided. Such an estimate should be part of the decommissioning plan.

Appendix B

Section 1000 pg. 1 item 3 - It is indicated here that "tailings were deposited in the reservoir upstream of the dam". The fate of these tailings as part of the decommissioning process needs to be detailed. Clarification is needed as to whether tailings are present in the area between the historic outlet of Garrow Lake and the upstream dam face.

Section 1001 pg. 1 3.0 - In addition to a coffer dam, discharge during construction should be managed with a small diameter siphon that enables work in the vicinity of the dam to be conducted under dry conditions.

Section 1002 2.0.2 b - Excavation plans require finalization and approval prior to implementation.

Section 1002 3.0 - "non-conventional excavation" methods should be submitted for approval at least five business days prior to proposed implementation.

Garrow Lake Water Quality

"*Garrow Lake Dam, Effect of Removal on Lake Stability and Outflow Water Quality*", Prepared by AXYS Environmental Consulting Ltd. and Applied Ocean Sciences, March 2001.

This report assesses the possibility of halocline erosion and tilting in Garrow Lake subsequent to the return of the lake to its historic elevation (1005.7 m?). While the model predictions indicate that it is unlikely that the waters below the halocline will mix into the surface layer there appears to be no monitoring program to assess the validity of the model predictions subsequent to restoration of the lake to its historic level. Vertical profiles of water chemistry within the lake should be undertaken annually in order to verify that the modeled predictions are correct. In this regard, removal of the dam or opening of a cut through the dam, should be deferred. Once the dam is removed there is no contingency presented to address elevated contaminant levels that may arise in the surface waters of Garrow Lake. Deferred removal of the dam would provide a contingency plan should it be needed. During the monitoring period, siphoning over the dam at a rate comparable to the historic Garrow Creek flow could be undertaken.

The extent to which the area between the historic Garrow Lake outlet and the east face of the dam have been contaminated since construction of the dam has not been addressed. The potential for mobilization of contaminants from this area subsequent to restoration of the historic level of Garrow Lake should be addressed.

The extent to which the inundated shoreline of Garrow Lake is likely to erode due to meltback of the permafrost has not been addressed. In the early 1970's Kuhulu Lake east of the Nanisivik Mine suffered this fate after a dam at the outlet of the lake was removed and the water level was lowered. Increased erosion around the perimeter of the lake does not appear to have been factored into the Garrow Lake stability modeling (increased TSS and TDS, increased settling of particles, etc.)

The original Garrow Lake discharge permit limit (pg. 1) for zinc was 0.1ppm. During operations this limit was increased to 0.5 ppm, yet it now appears that a discharge of 0.3 ppm Zn will be permitted after decommissioning. The post

decommissioning zinc concentration in the outflow from Garrow Lake should be comparable to the historic concentration in the surface waters of Garrow Lake rather than merely "below 0.3 ppm". To permit an ongoing discharge above the original permit level of 0.1 ppm would be irresponsible given the associated excess loading to Garrow Bay that would result from a higher limit. The water license limits for the post-decommissioning period should be revised accordingly.

Pg. 5 The fact that wind speeds sufficient to mix the top metre of the halocline with the surface water within an hour have occurred on site indicates the future possibility of such an event. The analysis does not examine sequential mixing, one year to another, that could result in progressive cumulative erosion of the halocline, especially if global warming results in gradual extension of the open water period on Garrow Lake thereby increasing the period for wind mixing events to occur. In theory it appears that progressive erosion of the halocline is a distinct possibility.

Pg. 6 - Annual monitoring of the structure of the lake (DO, Temperature, salinity/conductivity, lead and zinc) at 2 m intervals in the surface layer, 1 m intervals in the halocline, and 2 m intervals beneath the halocline should be undertaken to document post-decommissioning changes. A post-decommissioning assessment of the presence of aquatic biota in the surface waters of Garrow Lake should be undertaken.

Engineering Comments provided by Rick Gervais and Chris Katopodis are detailed below:

Polaris Mine Decommissioning

Cominco Ltd. plans to decommission the Polaris Mine at the southwest end of Little Cornwallis Island, Nunavut, in 2002. The mine, which produces and ships lead and zinc concentrates, is nearing the end of its life. There are two components to the proposed decommissioning plan: The Garrow Lake Dam and the Dock Facilities. Cominco Ltd. retained EBA Engineering Consultants Ltd. (EBA) to develop a closure design for the Garrow Lake Dam and Westmar to examine concepts for decommissioning the Dock Facilities and adjacent shoreline. The following comments are based on the review of the EBA (March 2001) and Westmar (October 2001) reports submitted to DFO by Cominco Ltd.

Garrow Lake Dam

The EBA report provides a fairly detailed examination of one alternative for decommissioning the Garrow Lake Dam. This alternative involves the partial removal of the dam and is heavily dependent on modelling predictions for the geothermal stability of the remaining dam embankments. Cominco Ltd., through this report, does not provide sufficient assessment of the more environmentally acceptable alternative of complete dam removal and site rehabilitation. In our

opinion, the total removal of the dam and rehabilitation of the site would be the better choice for the following reasons:

- It minimizes or eliminates potential downstream sediment problems that may result from the gradual or sudden failure of the remaining dam embankments. Such failure may occur given long-term uncertainties with regards to temperature (global warming), modeling limitations, which may prove insufficient for accurate predictions, and the channeling of flow and erosion potential of Garrow Creek through the remaining embankments.
- According to the EBA report, removing the central portion of the dam would involve the removal of approximately 12,750 m^3 of material with an additional 6,200 m^3 of material to be over-excavated and then back-filled. Removal of the entire dam would involve approximately 49,000 m^3 of material. A cost benefit analysis is needed to compare the alternatives of partial or complete dam removal, especially considering additional costs associated with correcting potential problems, which may result from partial dam removal.
- The objective of the mine decommissioning plan, which was part of the original agreement, should be to rehabilitate the site to as close to it's natural state as possible.

Polaris Mine Dock Facilities

We agree that based on the 3 conceptual options for decommissioning the Polaris Mine Dock facilities presented in the Westmar report, the preferred option (Option 1) is the best choice to be investigated further. This option involves removing the dock 2 to 3 m below low tide (excavate or cut-off sheet piles underwater) and re-grading the beach to a low slope of 17.5H:1V for erosion control.

In reviewing the drawings in Appendix D, a significant drop off (approx. 10 m) between the proposed ground-line and the existing ground-line will still exist where the dock sheet piles are presently located (see appendix D - sections sheet 3). The report states…"regardless of whether the sheet piles are cut-off or are extracted, the frozen fill will erode very slowly, and is not expected to have an impact on seabed habitat." However, because of vertical face of the drop off at this location and since the material in this face (probably) contains fill used in the sheet pile cells, justification as to why this vertical face will experience gradual erosion while other areas are being re-graded to a 17.5V:1H slope should be provided.

Prior to decommissioning, the results from the required detailed design work identified in the report (and restated below) should be supplied to DFO for review before any work is undertaken.

- Prepare accurate hydrographic surveys of the surrounding site.
- Incorporate the remedial excavation proposed in "Polaris Mine Decommissioning and Reclamation Plan" by Gartner Lee Ltd.
- Finalize the excavation plane through the dock to minimize the cut and fill volumes, within the ranges discussed in this report and based on remedial excavation requirements, while protecting the aquatic environment by minimizing erosion and sedimentation.

- Develop detailed procedures for the excavation process of the dock area to ensure protection of the aquatic environment during the process.
- Determine the gradations of the natural beach and fill materials to evaluate their rates of erosion.
- Assess the need to perform a thermodynamic analysis on the natural beach and fill materials, to determine the suitability of the proposed beach material to resist erosion based on the beneficial effect of permafrost.

Comments provided by Dennis Wright on blasting proposal:

Review of Blasting Proposal – Decommissioning of Dock Facilities at Polaris Mine, Little Cornwallis Island

As requested, I have reviewed the blasting plan for the decommissioning of the dock facilities at the Polaris Mine site on Little Cornwallis Island. My comments are as follows:

The document is extremely deficient in terms of information concerning the project and therefore I am unable to render any decisions or provide the proponent with any recommendations. The proponent has gone to considerable effort to calculate the weight of charge to could be used at certain distances from the sheet piling in order to meet the DFO Explosives Guidelines overpressure maximum of 100 kPa. However, basic information such as timing of the project is missing from the project description. Without this basic information, I am unable to determine if the minimum requirements outlined in the guidelines will suffice with respect to the protection of fish and marine mammals from the harmful effects of explosives.

The proponent has also failed to provide any description of the existing biological environment. If the project is undertaken during the spring when there is still full ice cover in the area, then, marine mammals concerns will be minimized. However, if the project is to be undertaken during the open water period, the noise produced by the detonations may be disturbing to marine mammals, perhaps as far away as the walrus haul-out on Brooman Point on Bathurst Island. Similarly if pelagic fish eggs are present at the time of the blasting, the shock waves produced may be detrimental to the eggs. The DFO Explosives Guidelines provides a guideline of $13mm \bullet sec^{-2}$ as to the maximum peak particle velocity permitted where eggs are incubating in the substrate. However, we do not know the overpressure required to damage pelagic eggs, and so we would implement the precautionary principle if pelagic eggs were present and require the proponent to delay blasting until the eggs had hatched and the fry had developed.

The proponent states that it will be necessary to use an air-curtain to reduce the overpressure for certain shot configurations. However, no specifications for the construction, installation and operation of the air-curtain are provided. Similarly, the proponent gives no details as to mitigation techniques to be utilized should shaped linear charges be used to sever the sheet piling used in the dock cells.

As a minimum the proponent needs to complete the application forms (Appendices IV and V) provided in the DFO Explosives Guidelines, Canadian Technical Report of Fisheries and Aquatic Sciences 2107.