Fisheries and Oceans
Pêches et Océans

Fish Habitat Management
P.O. Box 358
Iqaluit, Nunavut
X0A 0H0

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Bob Carreau
CanZinco Ltd.
P.O. Box 225
Nanisivik, Nunavut
X0A 0H0
(867) 436-7351

RE: Nanisivik Abandonment and Reclamation Plans

Dear Mr. Carreau:

This letter is to advise that The Department of Fisheries and Oceans, Fish Habitat Management (DFO-FHM) has received Abandonment and Reclamation plans to decommission Nanisivik Mine on the Brodeur Peninsula, Nunavut. The plans were submitted by CanZinco Ltd. and are being reviewed in conjunction with other co-management partners, including the Nunavut Water Board and the Nunavut Impact Review Board.

DFO-FHM's assessment takes into consideration primarily fish and fish habitat related concerns. Those concerns are primarily related to potential effects of deleterious substances on the marine environment of Strathcona Sound as a result of the reclamation activities. Twin Creek and Chris Creek discharge directly into Strathcona Sound and are also included in the scope of DFO's assessment. The scope of DFO's assessment includes both short and long term effects of reclamation activities on fish and fish habitat in relation to the proposed abandonment and reclamation plans (hereafter referred to as the "plans").

A. Environmental Effects of Abandonment and Reclamation of Nanisivik on the Marine Environment in Strathcona Sound

DFO-FHM concerns regarding the Nanisivik abandonment and reclamation plans pertain to deposition of deleterious substances into the marine environment of Strathcona Sound. Metal contaminants enter the marine environment of Strathcona Sound by Twin Lakes Creek as a consequence of both natural acid drainage and man-made causes. During its operations the mine has exposed new metal rich surfaces to

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weathering at a much greater rate than under natural conditions. Changes in metal concentrations during the operation of the mine indicate the magnitude of mine-related inputs. Between 1995 and 2000, the average concentration in Twin Lakes Creek increased from 1.5-6 times except below the 02 South waste rock dump where it increased 37 times (Nanisivik 2000). Increases in lead concentrations were more localized, with increases 34 times below the 09 South Portal and waste dump and 18 times below the 02 South Portal and West Open Pitt (159-11). There was also a drastic increase (41 X) in cadmium below inputs below the 02 South waste rock dump (followed by a decrease to 4.5 times near the mouth of Twin creek). In 2000 average zinc concentrations below 02 waste rock dump exceeded the total maximum average permitted under the Canadian Environmental Quality Guidelines for aquatic life in freshwater (CCME 2001a). Cadmium concentrations were also elevated relative to decant guidelines (0.005 mg/L) and the guidelines for aquatic life in freshwater (0.017 μg/L) . This evidence suggests that past operation of Nanisivik mine negatively affects water quality in Twin Creek, and ultimately results in metal loading in Strathcona Sound.

Quantification of metal loading at each site, using past data collected under the water licence, is difficult to estimate as stream flow volume at each site is not collected where concentrations are measured. Stream flow data should be used to estimate total amounts of metals that each source contributes. If these estimates are available, this would provide information on the influence of reclamation activities on metal loading in Twin Creek, and ultimately metal loading in Strathcona Sound.

Additional sampling of marine sediments should be undertaken *by CanZinco Ltd.* to document metal concentrations in sediments. This sampling should be confirmed in the final Environmental Site Assessment submitted by CanZinco Ltd.. Knowledge of contaminants in the vicinity of the dock is particularly important. Sampling should be undertaken near the mouth of Twin Creek, the dock, and at greater distances from these points in Strathcona Sound.

Based on the above information, I suggest that two additional studies be conducted to document (1) metal loading due to different sources in Twin Creek and (2) metal concentrations in marine sediment adjacent to Twin Creek, the dock, and further from the shore in Strathcona Sound. Information from these two studies will be useful in documenting the success of the reclamation activities and be used to improve management decisions related to long-term effects of Nanisivik and other northern metal mines. These studies should be submitted to DFO prior to final abandonment of Nanisivik by CanZinco Ltd.

B. Concerns Pertaining to Different Reclamation Operations in the Abandonment and Reclamation Plans

1. Dock and Related Facilities

The dock at Nanisivik is on a lease administered by DFO. The plans indicate that the dock and adjacent marine foreshore area will be abandoned. Sampling of contaminated soils will be conducted in the vicinity of the dock and adjacent area and soils will be either covered with soil, or removed and stored underground in the mine. Plans also indicate the concentrate storage shed may be left in place or stored underground in the mine. The conveyor belt system used to load zinc concentrate onto ships will also be dismantled and stored underground. The plans indicate that the fuel tank farm will be removed and stored underground. DFO-HM has concerns with respect to the aforementioned plans.

The dock and adjacent marine foreshore area (including the soils adjacent to the high tide water mark) is likely contaminated with zinc, lead, cadmium, hydrocarbons and other deleterious substances. Soil sampling should be conducted to sufficiently delineate the full extent (depth and area) of contamination in the marine foreshore area and across the lease administered by the DFO. Adequate sampling is required to guide clean-up operations to remove all contaminated materials from the lease area administered by the DFO. Removal of contaminated soils and storage underground in the mine may be selected as the preferred reclamation option so as to ensure that erosion does not result in deposition of deleterious sediments in the marine environment. Follow-up sampling should also be conducted following removal of contaminated soils from the dock and marine foreshore area (this report should be submitted to the DFO prior to final abandonment of the site).

The plans indicate that the conveyor belt and concentrate storage shed will be removed from the dock area and stored underground in the mine. Plans to dismantle and remove the conveyor belt and concentrate storage shed should include provisions (i.e., storage at adequate distance from the ocean) to ensure parts of the conveyor belt and shed do not fall into the ocean. The concrete pad under the concentrate storage shed should also be removed. Unless otherwise indicated by the DFO all buildings, equipment, and materials not owned by the DFO should be removed from the dock and marine foreshore area and stored underground. Abandonment and reclamation plans should also provide information to ensure the long-term stability and maintenance of the marine foreshore area (i.e., annual replacement of rip-rap armour rock of sufficient size adjacent to the dock).

Appropriate mitigation measures should be implemented (e.g., use of trenches, berms, and silt fences) to prevent sedimentation and entrance of deleterious substances into the ocean. A photographic report of the lease area administered by DFO should be submitted to DFO-FHM for approval prior to final abandonment of the site by CanZinco Ltd.

Although the fuel tank farm is not on a lease administered by the DFO, it should also be assumed that CanZinco Ltd. must remove the fuel tank farm, unless otherwise indicated by the Canadian Coast Guard. Appropriate mitigation measures should be undertaken to ensure there are no hydrocarbon spills during decommissioning activities.

2. Twin Creek and Adjacent Reclamation Operations

Reclamation of mine facilities adjacent to Twin Creek is of concern to DFO-FHM due to the potential deposition of contaminants into Twin Creek and release into Strathcona Sound. Although many of these adjacent land-based operations are under the jurisdiction of other government departments, DFO-FHM has concerns related to potential effects of these upland activities on fish and fish habitat.

Twin Creek- Previous studies have indicated that large quantities of lead and other deleterious substances are released into Twin Creek from the West Twin Disposal Area. Asmund *et al.* (1991) suggested approximately 70.2 kg/yr of lead is released into Twin Creek from the West Twin Disposal Area. Although over half of this lead is thought to remain in the streambed, there may be potential for additional metal inputs into Strathcona Sound following reclamation. The probable effects levels of lead in freshwater sediment are 91.3 mg/kg, 3.5 mg/kg for cadmium (CCME 2001b). Sampling of stream sediments should be conducted prior to closure to determine if there is localised reservoir of lead rich sediment in the creek. If sampling indicates there is then plans should be submitted prior to removal of sediment to underground storage.

Waste Rock Piles Adjacent to Twin Creek- As indicated in the plans the waste rock piles should be removed and stored underground. Mitigation measures should be implemented to prevent release of deleterious substances during excavation operations. DFO-FHM requires specific plans as to mitigation measures, timing and extent of excavation operations near Twin Creek.

West Open Pit and adjacent Roadway- Mitigation measures should be implemented to ensure the West Open Pit and roadway adjacent to Twin Creek do not wash-out. If mitigation is not feasible, CanZinco Ltd. should consider complete removal of the Pitt and storage underground. The roadway and pitt area should be contoured re-establish natural slopes adjacent to Twin Creek.

West Twin Disposal Area- DFO-FHM concerns pertaining to the decommissioning of the WTDA are related to the potential release of mine tailings into Twin Creek. A control structure (such as the concrete decant station) may be required to ensure water level in the reservoir is sufficient to provide aqueous cover for tailings and/or control the decant if water quality deteriorates. Modelling studies conducted to ensure the long-term stability of the dike under various settings (i.e., global warming) should reflect recent calculations to include moisture conditions in the test cell area. Long-term monitoring plans for the 18 m high dike in the WTDA should be submitted to the DFO-FHM prior to final abandonment by CanZinco Ltd..

Other Abandonment and Reclamation Operations- Chris Creek directly discharges into Strathcona Sound and metal loading is also of concern due to inputs from this drainage basin. Appropriate mitigation measures should be implemented to prevent wash-outs and migration of mine metals into Chris Creek. In addition, the solid waste disposal site (Smith 1993) contains approximately 2000 used waste oil drums. The waste oil should be reclaimed and disposed of to prevent future migration of hydrocarbons and other contaminants into Strathcona Sound or tributaries.

If you have any questions concerning the above there be any changes to the proposed work, please contact me at (867) 979-8007 or by fax at (867) 979-8039.

Sincerely,

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

c.c. -Nunavut Impact Review Board
Nunavut Water Board