

**Attachment # 1**

**Submission to Nunavut Water Board by BGC Engineering Inc.**

**Holgar Hartmaier, dated October 1, 2001**

October 1, 2001

Project #: 0308-001-03

Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NT  
X0E 1J0

Attention: Mr. Phillipe diPizzo, Executive Director

Dear Mr. DiPizzo,

**Re: Polaris Mine- Review of Final Decommissioning and Restoration Plan**

This letter summarizes comments by BGC Engineering Inc. (BGC) with respect to the review of the four volume set of documents prepared by Gartner Lee Limited (GLL) for Cominco Ltd. (Cominco) for the decommissioning and reclamation of the Polaris Mine, dated March, 2001.

Comments were passed on verbally to Mr. John Knapp of Cominco in a technical meeting held in Resolute Bay on September 20, 2001.

**General Comments**

The overall decommissioning and reclamation plan prepared by GLL is comprehensive in scope and addresses the main areas of concern identified in the 1999 Environmental Site Assessment prepared by GLL (June 2000). In addition, specialized review by sub-consultants was undertaken in key areas such as the stability of Garrow Lake (Axys Environmental Consulting Ltd.), the removal of the Garrow Lake dam (EBA Engineering Consultants Ltd.), the options for the removal of the process barge and decommissioning of the dock (Westmar Consultants Inc.), and the geothermal stability of the landfill and underground waste disposal sites (BGC Engineering Inc.). A human health and ecological risk assessment was carried out by Cantox Environmental Inc., which derived soil quality remediation objectives.

**Specific Comments**

**Landfilling of Waste in Subsidence Zone and LRD Quarry:**

Cominco has been using the zone of subsidence above the existing mine workings (Reclamation Landfill) to dispose of obsolete heavy equipment and other materials such as dump truck boxes, sea containers, tires, wooden crates, vehicles, etc. Vehicles and other decommissioned equipment are cleaned of all oils, fuels and fluids prior to disposal. Cominco proposes that the Reclamation Landfill will not require an engineered cover design to maintain frozen conditions and intend on covering the landfill with a minimum 1.5 metre cover of locally available soil and rock.

The Little Red Dog (LRD) quarry is proposed as the landfill for the disposal of demolition waste from the mine facilities, such as concrete foundations, decommissioned pipelines and steel tanks. The design of the quarry cover will be consistent with that developed for the Operational Landfill, which comprises 1.8 m of locally available quarried shale, graded to fit the adjacent contours to prevent ponding over the quarry.

**It is recommended that Cominco establish a protocol for the placement of the waste materials and backfill in a controlled manner to eliminate the creation of voids and areas of low compaction in all areas of proposed landfill activity. To ensure long term stability of the landfill, especially the cover materials, it is important that soils cannot settle or migrate into voids or cavities within the waste, especially during the period that is required for permafrost to aggrade into the landfill. Saturation of the waste and backfill materials with water could result in the formation of ice lenses and subsequent frost jacking of waste materials above the landfill surface, leading to a progressive deterioration of the landfill surface. An engineered cover of sufficient thickness to ensure that the waste material lies well below the seasonal active zone is therefore recommended for the reclamation landfill, similar to that proposed for the LRD quarry**

Cominco has indicated that it will use the same practices as currently adopted for the Operational Landfill, which has not experienced any stability problems to date. The Board and DIAND have also requested BGC to conduct a literature review of past practices of waste disposal in permafrost, including the issues with respect to underground disposal in the mine. BGC will provide comments/guidelines based on current and precedent practice under separate cover to the Board in response to this request.

#### **TeckCominco Response**

- *The landfill debris will be cut into sizes and shapes that minimize voids spaces as fill material is placed over the debris.*
- *Equipment will be used to crush debris where practical to minimize voids.*
- *Debris placed into the landfill will be placed in lifts and covered with fill material prior to being covered by the next lift of debris.*
- *Portions of the landfill will be constructed during winter(s) and during those periods materials placed will already be in a frozen state.*
- *Moisture from precipitation and run-off during the summer periods of landfill construction will aid in strengthening the fill as it freezes to minimize settling of the landfill.*  
*If there are any differential movements within the landfill, any cracks or voids formed will be sealed off by downward percolation and freezing of the surface water from precipitation*
- *Landfill operators will be given a technical briefing and instructions (with checks) on the protocol that will be used for the placement of debris in the landfill as well as closure specifications for the landfill.*
- *A field supervisor will have the responsibility to ensure that the protocol(s) for placing debris as well as geotechnical specifications for the closure of the landfill are followed.*

- *Landfill operators will be required to note the type, placement and depth of debris emplacement to ensure there is an adequate record of the protocol used to place material in the landfill. Photographic documentation will be maintained.*
- *The design of the engineered cover for the landfill has the specific objective of being thick enough to ensure that the landfill remains frozen by being buried below the active layer.*
- *The landfill will be visually inspected as part of the post-closure monitoring plan to confirm geotechnical performance as specified in the Closure Plan.*

### **Backfilling of Mine Portals**

Cominco is proposing to seal all entrances to the underground mining operations. The proposed method involves a 0.5 m thick bulkhead consisting of steel plate supporting a reinforced concrete wall. The concrete will be pumped into the steel bulkheads from the ground surface through holes drilled into the tunnel. A grid of reinforcing bars tied into the rock surrounding the tunnel and supported by rock bolts will stabilize the bulkhead. Backfill will be placed within the tunnel openings between the bulkhead and the portal. At the ground surface, the backfilled material will be graded to conform to the adjacent slopes.

***The sketches provided in the submitted documents do not indicate complete filling of the tunnel with backfill between the bulkhead seal and the ground surface. Presumably, the purpose of the bulkhead is to prevent the loss of backfill material down the tunnel decline. It is recommended that the final construction specifications require that the backfill be placed up to tunnel crown level to prevent long term settlement of the rock mass around the tunnel as well as the fill around the exterior face of the portal. The entire tunnel void should be completely backfilled. No design criteria were available for the bulkhead itself, and it is not clear if consideration was given to potential loads associated with water or backfill (saturated) which may be present upon completion of the closure procedures.***

The bulkhead should be constructed to conform to a certain set of design criteria and specifications, which may require approval by WCB and/or the local mine inspector.

### **TeckCominco Response**

- *The tunnel from the collar of the portal to the bulkhead seal will be completely filled as suggested.*
- *The purpose of the bulkhead is to provide an 'engineered' seal with a known minimum strength to prevent future access to the mine. We would have proposed fill by itself as a method of sealing the openings but did not feel it would be acceptable to Regulators. As stated in the Closure Plan, the design of the seal will be submitted to the local Mines Inspector for approval prior to construction.*

### **Dock Area Decommissioning and Barge Reclamation**

The decommissioning and reclamation plan assessed various options for the dock area decommissioning and barge reclamation. Cominco has indicated that the preferred option will be to dismantle the barge on-site and dispose of it into the LRD quarry. The dock area will be cleaned of contaminated soils and the sheet pile cells will be cut off underwater below low water

level. The shoreline will be reinstated back to the original location, with a sloping beach, with an underwater slope of 17.5 Horizontal: 1 Vertical.

***We concur with Cominco that this is the best option from both technical and environmental standpoints.***

*Closure*

***The decommissioning and reclamation philosophy proposed by Cominco involves utilization of the existing footprint of surface and underground disturbances to get rid of the inert wastes generated during closure. In addition, surface facilities such as the dock area and Garrow Lake are being restored to their pre-mine conditions as much as possible. In disposing of the wastes on site, Cominco will reinstate the surfaces of the LRD quarry and existing reclamation landfill to a stable, drained condition, through the long term aggradation of permafrost. Hydrocarbon and metals contaminated soils will be placed deep underground within the permafrost, ensuring secure long term disposal and isolation from receiving bodies of water. No free phase liquids will be placed underground or into the surface landfills.***

***Cominco has stated that in proceeding with this work, it will be in their best interest to ensure that it is done properly from the outset, as the costs for re-mobilizing contractors to carry out follow-up work will be prohibitively expensive.***

***Assuming that Cominco will address the above comments, we have no further technical concerns with the proposed decommissioning and reclamation plan at this time.***

***We trust that this meets with your requirements at this time. If you have any questions or require additional information, please do not hesitate to contact the undersigned. Thank you.***

***Respectfully submitted,***  
***Per BGC Engineering Inc.***

***Holger Hartmaier, P.Eng., M.Eng.***  
***Senior Geotechnical Engineer***

***HHH/sf***