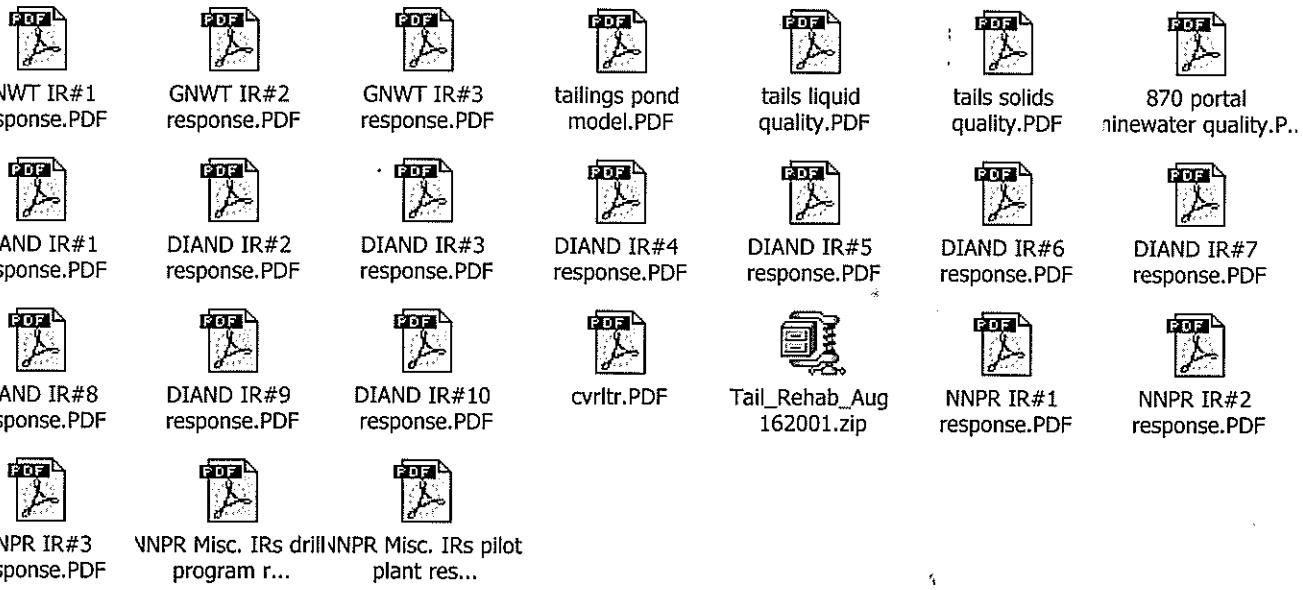
Louie Azzolini

From: Peter Campbell [peter@canadianzinc.com]
Sent: Friday, August 17, 2001 1:07 PM
To: Louie Azzolini (E-mail)
Subject: IR Response



Louie:

Please find attached CZN's responses to IR's from GNWT, DIAND & NNPR.

There should be 24 individual documents, totaling just under 1.5 Mb. I've grouped them by IR originator, hopefully for ease of reference.

Let me know if there are any problems on the receiving end.

Regards,

Peter

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CANADIAN ZINC
CORPORATION

August 17, 2001

Mr. Louie Azzolini
Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
PO Box 938, 200 Scotia Centre, 5102 – 50th Ave.
Yellowknife, NT
X1A 2N7

Dear Mr. Azzolini:

Re: Responses to Information Requests
Environmental Assessments - Prairie Creek Mine

- **Phase II Mineral Exploration Drilling Program**

(Land Use Application MV 2001C0022; MVEIRB File EA01-003)

- **Metallurgical Pilot Plant Program**

(Water Licence Application MV2001L2-0003; MVEIRB File EA01-002)

- **Underground Decline and Exploration Drilling**

(Land Use Application MV2001C0023; MVEIRB File EA01-002)

In accordance with the revised Work Plan for the above-noted assessments, please find appended electronic versions of CZN's responses to Information Requests from GNWT-RWED dated July 5, 2001, DIAND dated July 20, 2001 and NNPR dated July 25, 2001as forwarded to CZN by the MVEIRB.

All documents are provided in *.pdf format. The BGC submission has been forwarded as a .zip file due to its size.

We trust all will be in order with respect to these submissions. Should you have any questions or require any additional information please feel free to contact me at your convenience.

Yours very truly,

CANADIAN ZINC CORPORATION

Original Signed By

J. Peter Campbell
VP Project Affairs

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Pilot Plant Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #1 - Tailings Containment Area*

Objective: *To ensure integrity of the tailings pond. The tailings pond must be shown to be capable of containing the waste water that will be placed there*

Request: *An updated report by qualified geotechnical engineers is required which includes assessment of the integrity of the tailings containment area and any recommendations for rehabilitation of the impoundment dam and pond liners. Also requested is a schedule for implementation of any rehabilitation measures proposed for the impoundment dam and pond liners before the pond is used for the disposal of contaminated water. An update of this with data from the Prairie Creek gauge (1974 to 1990) is required to verify the ability of the dams to withstand expected storm events. Recent water level data for the tailings pond and adjacent Prairie Creek is also required in support of the above assessment.*

Response:

CZN commissioned Bruce Geotechnical, professional geotechnical engineers, to conduct a geotechnical assessment, evaluate the condition of the impoundment and recommend rehabilitation measures for the impoundment to accommodate full-scale mining operations and tailings disposal. A copy of their report "Prairie Creek Mine Tailings Facility – Summary of Past Work and Preliminary Recommendations for Rehabilitation" dated December 18, 2000 is attached, as well as a letter from BGC dated August 16, 2001 commenting on the suitability of the structure for the proposed uses. BGC considers the impoundment to be stable in its present form and suitable for the proposed uses.

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The BGC report outlines a program of geotechnical investigation to be undertaken prior to development of the final rehabilitation program and prior to use of the impoundment for tailings disposal associated with full-scale operations. This will be done in conjunction with other feasibility work prior to submission of the detailed environmental assessment reports in support of operating permits and licences. No rehabilitation measures are considered necessary in support of the proposed developments. During the proposed developments the impoundment will be inspected on a daily basis for any signs of instability. Any indication of instability will be reported to the geotechnical engineers immediately and a response plan developed. Canadian Zinc has sufficient heavy equipment on-site to effect such a response.

The impoundment dams were designed and constructed by Golder Associates to withstand the probable maximum flood calculated for Prairie Creek. These calculations were based on actual stream flow measurements generated from the Prairie Creek gauging station from 1975 to 1980. To achieve this, the toe of the embankment adjacent to Prairie Creek was lined with rip-rap armour to an elevation 3 feet above the calculated probable maximum flood level. The rip-rap armour rock extends from 15 to 20 feet vertically over the length of the embankment. The crest of the dam at 2875 feet, is a further 13 to 25 feet above the top of the rip-rap.

It is important to recognize that the pond has been in place and containing roughly the equivalent amount of water for the past 20 years without any indication of failure or deterioration of stability, and without incurring significant erosion of the rip-rap armour by Prairie Creek. As well, there have been no significant changes to the location or configuration of the Prairie Creek channel in the vicinity of the impoundment. It is also important to appreciate that the "probable maximum flood" which the dams are designed to withstand is not an expected storm event. Rather it is the maximum flood that can reasonably be predicted to occur based on the maximum precipitation event that can be predicted to occur over a given period of time over the drainage area of Prairie Creek. Given the nature of the proposed developments and that the tailings impoundment is an existing structure re-calculation of such design parameters is not considered warranted at this time.

The tailings impoundment, which covers approximately 10 ha, currently contains approximately 225,000 m^3 of water to an elevation of approximately 868m, leaving approximately 8m of freeboard to the crest of the embankment at 876.3m. The addition of 4000 m^3 of process effluent from the pilot plant will raise the pond level by approximately 4 cm, leaving approximately 7.96m of freeboard.

The pond is lined with an impervious clay layer on the bottom, the interior face of the dam, and up the backslope. Details of the state of the clay liners were provided in response the GNWT IR #3.

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The synthetic Hypalon liner has not been intact for a number of years and has been determined by BGC due to the presence of the underlying natural clay liner extending up the back slope to likely not be necessary. No seepage has been detected from the impoundment indicating that the integrity of the clay seal remains intact

Provision for use of the tailings pond for minewater disposal was proposed only as a contingency in the event that the minewater was determined not to be suitable for direct release to the environment. Most decline developments at advanced underground exploration properties do not have this option since tailings ponds do not typically exist at this stage. Minewater from such developments is typically discharged after settling, requiring little or no additional treatment. Given the nature of the dolostone/limestone rock in which the decline will be developed, and employing standard mitigation measures, CZN believes that minewater quality will be suitable for discharge following settling. Minewater quality was discussed in more detail in response to GNWT IR #2.

In the event that the option of discharge to the tailings pond is considered preferable, the additional 67,500 m^3, as predicted by DIAND, would increase the level in the pond by only 0.67 m, still leaving over 7m of freeboard below the crest of the dam.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Pilot Plant Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #2 - Groundwater flows in the decline and through the flood plain under the mine site.*

Objective: *To ensure that groundwater flows are understood and properly dealt with.*

Request: *A statement is required of intent to monitor and report the rate of groundwater flow encountered in the decline, and to commission pumps capable of handling the flow, with sufficient backup pumps in the event of pump failure(s). Also requested is an analysis of the hydraulic conductivity of the flood plain sands and gravels using draw-down and pumping-volume data from well and pump hose No. 1, and information on what treatment of the tailings impoundment will be undertaken to counteract this hydraulic conductivity.*

Response:

The chosen mining contractor will be responsible for all activity relating to decline development including dewatering. The mining contract will specify provision for supply of pumps of sufficient capacity to handle all minewater. This will include provision for back-up pumps as well. Information on anticipated pumping needs was originally supplied in conjunction with the Application under Section10 – Equipment.

Minewater discharge rates will be monitored on a daily basis based on pump operating times and pump discharge rates. All such data collected will be reported as required under the terms and conditions of the water licence as issued.

A further assessment of the hydraulic conductivity of flood plain sands and gravel is not considered relevant to use and operation of the tailings impoundment. The impoundment is underlain and sealed on the upstream dam faces with layer of impervious clay. The hydraulic

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conductivity of the clay has been estimated at 10^{-8} cm/sec essentially making the impoundment "watertight" and isolating its contents from the underlying floodplain aquifer.

The clay layer underlying the pond was investigated at the time of construction in 1980 and found to be between 22.5 and 31.5 feet in thickness. The clay liner installed on the upstream face of the dam at the time of construction also remains intact despite sloughing of the overlying gravel protection layer shortly after that time. In 1994, further work conducted by Bruce Geotechnical confirmed the existence of the natural clay layer rising up the backslope above the level of the water in the pond, leading them to conclude that the synthetic Hypalon liner originally installed on the backslope was likely not necessary. In fact, the synthetic liner has not been intact for a number of years and no seepage has been detected from the impoundment, indicating that the integrity of the clay seal remains intact.

Of note, information on the floodplain aquifer was supplied in the EA report of the metallurgical pilot plant on p. 38 as follows:

> "The aquifer was investigated and well pump tests conducted at the time the wells were developed in 1982. The aquifer is described as being confined in a sand and gravel layer 13 feet in thickness. The well is 66 feet deep and 8 inches in diameter and screened from 53 to 66 feet. The pump test was run continuously over a two month period in April and May of 1982 over which time the aquifer yielded approximately 140,000 m^3 at a pumping rate of about 2.0 m^3 per minute."

This aquifer is confined below the clay layer which underlies the impoundment and into which the clay liner on the dam face is keyed.

Golder estimated seepage from the pond when filled to capacity at 873m, based on the hydraulic conductivity of the clay, at somewhere in the order of only 7 to 14 m^3 per year. Given that the pond level, even after receiving inputs of all water from the proposed developments, would still remain 5m below this level, seepage would be expected to be even less than this amount.

In the preamble to this IR, some discussion is presented on groundwater flows experienced from the 870m level as compared to groundwater flows expected from the decline development. Further discussion of this issue is provided in response to DIAND IR #8.

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CANADIAN ZINC
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August 17, 2001

Canadian Zinc Corporation Pilot Plant Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #3 - Water quality in the Tailings Area*

Objective: *To better understand project impacts on downstream water quality*

Request: *CZN is asked to provide all current information which exists about the water quality of the existing liquid in the tailings area. CZN should also provide an assessment of the predicted quality of the effluent from the pilot plant and the expected performance of the tailings area in treating this effluent. CZN is asked to identify the water quality standards or guidelines that they have used in reaching their conclusions of negligible impact on water quality.*

Response:

The tailings impoundment currently contains approximately 225,000 m^3 of water. The pond was originally filled with water pumped from Prairie Creek. Since that time, contributions to the pond have been limited to direct precipitation, surface runoff and groundwater infiltration. The level of the pond has been observed over a number of years to fluctuate very little indicating that an equilibrium level has been established. There has been no analysis of the water contained within the impoundment because no effluent has been discharged into the impoundment and the quality of water should therefore closely reflect that of Prairie Creek and the local hydrologic regime from which the water originated.

The determination that no adverse effects will occur on water quality as a result of the pilot plant program was based primarily on the fact that there will be no direct discharge of effluent to the receiving environment, as opposed to a comparison of effluent quality to any specific receiving water quality objectives. Given that there will be no discharge, there is limited potential for any significant adverse impact n downstream water quality.

This was discussed in more detail in response to GNWT IR #3.

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CANADIAN ZINC
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August 17, 2001

Canadian Zinc Corporation Pilot Plant Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #4 - Test work to be performed in this phase and the utility of the resulting information.*

Objective: *To better understand project impacts on downstream water quality.*

Request: *The company should provide more detail as to which parameters will be examined in the examination of the effluent. CZN is asked to identify which specific ABA and Kinetic Tests will be used on the tailings solids, and the number of "representative" samples to be taken. The company is also asked if any further kinetic testing will be performed on waste rock or coarse ore with a NPR less than 4.*

Response:

As stated in the preamble to the IR, the testwork is intended to generate information representative of future conditions, should the mine proceed into production.

The testwork referred to is part of the information which will be generated by and part of the reason for conducting the pilot plant program. It will be carried out independently of and after the conclusion of the pilot plant program as part of the compilation of baseline and technical information in support of an application for full-scale mining operations. It is not relevant to an assessment of the potential impacts of the proposed development itself.

Accordingly, the nature of the testwork is considered beyond the scope of the current environmental assessment of the proposed development.

The testwork program will be developed in conjunction with a geochemical consultant who will oversee the ARD program. As with other baseline programs to be conducted in the future in support of full-scale mine operations, CZN will be pleased to review study plans as they are developed with the respective regulatory agencies in order to ensure their information needs will be satisfied.

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CANADIAN ZINC
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August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #5 - Minewater quality*

Objective: *To determine the quality of water that may be encountered in the decline.*

Request: *CZN is asked to provide water chemistry data from previous mine water discharges so that the chemistry of the expected discharge can be assessed. In addition, please provide additional information about the proposed minewater sampling program.*

Response:

A summary of water chemistry from samples collected from the 870 m adit is attached. CZN did not use this information in an attempt to predict the expected chemistry of the minewater from the decline development because there are fundamental differences between the two. The 870m discharge is not considered to be representative of the chemistry of the minewater expected to be encountered in the decline.

The 870 m level is a horizontal adit developed in the late 1960's early 1970's to access vein mineralization. The level is over 1000m in length with numerous crosscuts and draw points exposing vein ore. The vein structure is known to be a water conduit. As a result minewater discharging from the 870 portal has been closely associated with highly mineralized vein ore.

The decline will be developed almost entirely within the un-mineralized dolostone/limestone host rock. As a result, minewater quality is expected to be alkaline (pH ~ 8.0 – 8.5), relatively hard due to the dissolution of calcium and magnesium from the carbonate rock types and low in dissolved and total metals due to the absence of mineralization in the development rock.

Additional information on the proposed minewater sampling was provided in response to GNWT IR #2. As well, further discussion on expected groundwater flows from the decline are provided in response to DIAND IR #8.

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August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #6 - Waste rock and ore drainage management*

Objective: *To determine the consideration given to potential runoff and seepage from waste rock and ore piles.*

Request: *Please provide any historical water quality data for drainage from the surface ore stockpile and waste rock, as well as information regarding contingency plans for containment, monitoring and treatment should waste rock testing identify parameters that could cause deleterious surface runoff. Please include information on the design of containment sumps including that of the runoff settling pond and its control gates, what liners, sampling frequency and pumps are to be incorporated to contain, monitor and treat deleterious runoff.*

Response:

There is no ore stockpile planned as part of the proposed development and the application before the Board for review does not request approval of an ore stockpile.

There is an existing ore stockpile located adjacent to the mill which has been in place for 20 years. The only impact of the proposed development on this existing stockpile would be to possibly process some of it, thereby reducing the quantity of material as a source of potential contamination. Consideration of potential impacts associated with the existing stockpile are considered beyond the scope of the current EA.

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As noted in the EA report, waste rock is proposed to be stored in the plantsite area either adjacent to the existing ore stockpile or in the current laydown area along the toe of the impoundment dam. In either case the waste rock would be a perched rock pile on top of the rock fill base that makes up the plantsite area. As a result, there would be no standing water or surface flow through the waste rock pile, other than that resulting from direct precipitation. Consequently, drainage from the waste rock pile will be intermittent, only occurring as a result of snowmelt or precipitation events of sufficient size to exceed the holding or retention capacity of the rock pile. Such seepage will be intermittent and of relatively small volume. Drainage from the entire plantsite area, including any seepage from the waste rock pile, reports to the catchment pond prior to discharge to Harrison Creek.

There is no existing information on drainage from waste rock materials on site. The best and most relevant information consists of the acid base accounting information submitted with the EA report which indicates this material to have an overwhelming excess neutralizing capacity and very low levels of mineralization. The nature of the waste rock provides a strong indication that any seepage resulting from precipitation will be of good quality and present no potential for significant adverse impacts to water quality.

As mentioned above, all drainage from the plantsite area, including any seepage from the wasterock, will report to the catchment pond. Any seepage from the wasterock will form only a small fraction of the runoff from the 10 ha plantsite area.

Given the foregoing, the potential for seepage water contamination associated with the presence of the waste rock stockpile is considered to be minimal.

The catchment pond discharges to Harrison Creek via a culvert when inputs raise the level above the invert of the culvert. Given the limited potential for any impacts from the wasterock due to its nature there are no plans for control gates or treatment of the catchment pond.

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CANADIAN ZINC
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August 17, 2001

Canadian Zinc Corporation Drilling, Decline & Pilot Plant Environmental Assessments
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR # 7- South Nahanni water quality*

Objective: *To determine the applicability and relevance of the water quality data that CZN references in assessing the potential cumulative impacts to the South Nahanni River.*

Request: *Please provide:*

(a) Clarification regarding the operating schedules from 1986 to present at the Cantung Mine and Howard's Pass sites. Also include details regarding the activities undertaken;

(b) Water quality data acquired as part of the Cantung mine operations prior to 1986 if available;

(c) An analysis of the data limitations and uncertainties; (Substantiate why similar data would be expected when the Cantung Mine, Howard's Pass, and CZN projects are operating simultaneously.

Response:

The Cantung mine operated over 24 years from 1962 to 1986. From 1986 to present, the Cantung mine has been held on a care and maintenance basis with essentially all facilities, including tailings dams, in place. Three such tailings dams are located on the floodplain adjacent to the Flat River, a tributary of the South Nahanni River. CZN does not have ready access to water quality data from Cantung during operations prior to 1986. Such information would have been collected under the Surveillance Network Program issued pursuant to the Water Licence and submitted to DIAND. CZN requested DIAND on August 2, 2001 to supply such information as may be available in their files directly to the MVEIRB.

The Howard's Pass property was actively explored between 1972 to 1981 and again in 2000 with limited activity in between.

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The Prairie Creek property experienced active advanced exploration from the late 1960's through the 1970's with mine development occurring in 1980-82 and further exploration from 1992 to 1995, and again in 2001.

The purpose of the comparison of the results of the Environment Canada/Parks Canada water sampling program to the various levels of mining activity at Cantung, Howard's Pass and Prairie Creek was to show that despite all of this historical mining activity within the watershed, including 24 years of mining operations at Cantung, the water quality in the South Nahanni River remained pristine. To our knowledge, there has been no data collected which has shown any impacts of this mining activity on the South Nahanni River.

Environmental regulation, mining practices and environmental control technology have advanced to a point where mining operations are commonly conducted throughout the world without significant impact on adjacent water bodies. The absence of demonstrated significant adverse impacts on the South Nahanni River, the Flat River and Prairie Creek are therefore not unexpected.

The mining industry in Canada is heavily regulated in terms of what impact it can have on water quality. As an example, the Fisheries Act restricts the deposition of any deleterious substance into any waters inhabited by fish. As a result, a mining operation such as the Prairie Creek mine would not be permitted to engage in activity that had significant adverse effects on the water quality of Prairie Creek downstream of the mine, let alone the South Nahanni River 48 km downstream with an average flow of 75 times that of Prairie Creek.

The need to protect the waters of Prairie Creek and the South Nahanni River were well recognized when the Prairie Creek mine was originally permitted for full-scale mining and milling operations in 1982. Water Licence N3L3-0932 issued by the Northwest Territories Water Board July 1, 1982, following comprehensive public review, set terms and condition for operations at Prairie Creek specifically stating its purpose as being "to ensure the quality of Prairie Creek water entering Nahanni National Park is unaltered".

The likelihood of Cantung, Howard's Pass and Prairie Creek all operating at the same time is considered slight. Cantung reportedly has only some three years of reserves left. Prairie Creek with all the necessary infrastructure in place to support operations is likely at least two years away from commencing operations. Development at Howard's Pass is not as advanced, likely requiring additional time to move towards the operational stage.

In any event, given the state of environmental regulation, mining practices and environmental control technology, the cumulative effect on water quality of the South Nahanni River of all three operations being conducted simultaneously within the upper reaches of the expansive 37,000 km^2 South Nahanni watershed, each so as not to have significant adverse effects downstream water, would be expected to be negligible.

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CANADIAN ZINC CORPORATION

August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR #8 - Water Quality and Quantity Assessment.*

Objective: *Obtain clarification of water usage and discharge rates, and the projected water quality resulting from the decline and underground drilling programs.*

Request: *Please provide:*

(a) Estimated discharge rates during underground decline development and exploration drilling;
(b) Estimated chemical and physical characteristics of discharge water (consider impacts from drilling operations and nitrogen loading from blasting operations);
(c) Estimated water usage rates during underground decline development and exploration drilling.

Response:

Estimates of de-watering volumes are very difficult to make in advance of underground development. Experience on the property to date has shown the dolostone/limestone formations in which the decline will be developed to be very watertight. The mineralized quartz vein however is known to be a conduit for water flow. The existing 930 and 970 m levels are relatively dry with no portal discharge. The 870 m level is wetter, with a seasonally variable portal discharge ranging from around 2 – 10 lps.

The discharge from the 870m level has not been used to estimate de-watering volumes from the decline because of fundamental differences between the two developments. The 870m level is over 1000m in length, intersecting the vein on a number of occasions. The 870m level is also interconnected to the 930m level through a series of ore passes, manways and vent raises which could allow drainage from the upper level to report to the lower 870m level.

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The decline, at 600m in length, will be driven almost in its entirety through the dolostone/limestone host rock, only intersecting the vein near its terminus at the 825m elevation. As a result, the decline is expected to produce significantly less water than the 870m level.

It is possible however that the decline development could intersect water filled cavities in the limestone/dolostone formation. In such a case, mine water flows would be expected to increase substantially, although such increase would be of a short duration as such cavities would be expected to drain fairly quickly.

Similarly, CZN did not use minewater chemistry data from the 870m level in an attempt to predict the expected chemistry of the minewater from the decline development for the same reasons as mentioned above, as a result of which the 870m discharge is not considered to be representative of the chemistry of the minewater expected to be encountered in the decline.

Water usage during decline development and exploration drilling will be restricted to that used by the drills as a circulation fluid for cooling and lubrication. It is estimated that water use by the air jumbo in driving the decline will be in the order of approximately 2 ipgm while the drill is operating, which will generally be only a few hours per day. Water use during underground exploration core drilling is estimated at up to 5 ipgm during active drilling.

In the absence of any other influences on its quality, minewater will reflect the nature of the local groundwater regime from which it originates. As the decline will be developed almost entirely within the un-mineralized dolostone/limestone host rock, minewater quality is expected to be alkaline (pH ~ 8.0 – 8.5), relatively hard due to the natural dissolution of calcium and magnesium from the carbonate rock types and low in dissolved and total metals due to the absence of mineralization in the development rock.

Typical influences on minewater quality as a result of decline development include: sedimentation due to the physical impact of vehicle and equipment activity, hydrocarbons due to the use of fuels and lubricants in vehicles and equipment and nitrogen compounds due to the use of explosives.

Minewater from such underground exploration activity is typically discharged to a sump prior to release to the environment. Sedimentation is removed in the sump by settling, which is a function of particle settling velocity and residence time, which is in turn a function of sump capacity versus minewater flow. Any hydrocarbons contained in the minewater, being lighter than water, float on the surface and are therefore amenable to skimming off using absorbant pads or booms.

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Nitrogen compounds, such as nitrate and nitrite, enter minewater through flushing of blasting residue from broken rock. At lower concentrations, nitrogen compounds are a nutrient while at higher concentrations they can be toxic to aquatic life. Nitrogen loadings in minewater are a function of the powder factor used in blasting which is in turn a function of the nature of the rock, contact of broken rock with water and the volume of minewater flow. Minimizing explosive use and proper handling procedures underground constitute the most practicable mitigation measures and typically are capable of reducing nitrogen loadings to acceptable levels. Treatment can be effected by dilution, increased residence times to allow for biological uptake and oxidation of the more toxic nitrite form to the less toxic nitrate, and/or by discharging minewater through organic systems, such a wetland areas, to allow for biological uptake prior to release to receiving waters.

It is expected that suitable treatment will be afforded by settling in the final sump and minewater will be acceptable for discharge at that point. The provision for discharging minewater either to the tailings pond or plantsite catchment pond constitute alternate treatment options should minewater at the sump be determined not to be suitable for direct discharge.

Further discussion of minewater quality was provided in response to GNWT IR #2.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Drilling, Decline & Pilot Plant Environmental Assessments
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR # 9 - Cumulative Effects Assessment.*

Objective: *Include consideration of all current and foreseeable CZN applications in the cumulative effects assessment.*

Request: *Please provide:*
(a) A revised cumulative impact assessment including consideration of all current and forseeable CZN applications.

Response:

EA reports have been submitted to and have been considered or are under consideration by the MVEIRB for all current and foreseeable activity at the Prairie Creek mine. Recognition of other activities planned to be carried out on the property was implicit in the discussions of impacts where such commonalities existed.

Each of the EA reports contains a Cumulative Effects Assessment, each of which states that the cumulative effects assessment covers all activities that have taken (or will take) place at Prairie Creek from the late 1920s to the year 2020. Each also stated that any impact must be demonstrated to operate cumulatively, additively or synergistically, either within the context of Canadian Zinc's development activity at the Prairie Creek mine, or with impacts from other projects or activities. In the case of the Phase II exploration program, for example, the CEA clearly detailed the cumulative effects of the combined disturbances to vegetation and wildlife habitat as a result of the Phase I and Phase II programs. Where such effects are not detailed is not a reflection that they were not considered, but rather that they do not exist.

As each of the CEA's also pointed out, where adverse environmental effects are predicted to be negligible, as was the case with each of the proposed developments, there is little point in carrying out a conventional cumulative impact assessment

Based on the fact that all current and foreseeable CZN activities have been considered, a revised cumulative impact assessment is not considered warranted.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Drilling, Decline & Pilot Plant Environmental Assessments
Response to Information Request

Information Request:

Date: *July 20, 2001*

From: *Ranjit Soniassy, Environmental Scientist*
Department of Indian Affairs & Northern Development (DIAND

Subject: *IR # 10 - Cumulative Effects Assessment*

Objective: *To determine the applicability and relevance of the water quality data that CZN references in assessing the potential cumulative impacts to the South Nahanni River.*

Request: *Please provide:*

(a) Clarification regarding the operating schedules from 1986 to present at the Cantung Mine and Howard's Pass sites. Also include details regarding the activities undertaken;

(b) Water quality data acquired as part of the Cantung mine operations prior to 1986 if available; and

(c) An analysis of the data limitations and uncertainties; (Substantiate why similar data would be expected when the Cantung Mine, Howard's Pass, and CZN projects are operating simultaneously.

Response:

DIAND IR#10 is a duplicate of DIAND IR#7.

Please refer to the response to DIAND IR#7.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Pilot Plant Environmental Assessment
Response to Information Request

Information Request:

Date: *July 5, 2001*

From: *Lionel Marcinkoski,*
Government of the Northwest Territories, RWED
Environmental Protection Services

Subject: *IR #1 - Alternatives to the proposed insitu pilot plant operation*

Objective: *To permit a thorough assessment of the available alternatives to the proposed project*

Request: *In the Environmental Assessment documents submitted, no evaluation was conducted on the following alternatives:*

1. *A pilot plant operation based on a DRY milling process, which would create dry tailings that, could be disposed of underground, and should be investigated.*
2. *Bulk testing occurring at a similar mining operation such as the Cantung Mine or alternates in Canada. Note: on page 20 the reader does not understand the significance of this statement " Test work would not generate as representative results due to the inability to duplicate site conditions (ie. Use of site water); for these reasons this is not a viable alternative." This raises the concern is their some special characteristics of the Prairie Creek groundwater and process water, that we have not been advised of.*
3. *Stabilization of complete tailings streams liquids and solids as backfill in the underground mine.*

Please provide an expanded discussion of these alternatives that demonstrates why they are not feasible from the perspective of Canadian Zinc.

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Response:

1. The standard accepted technology for recovery of lead/zinc concentrates from mineralization of the type encountered at Prairie Creek is by a wet flotation separation process. No technology has been developed for a "dry milling" process that would produce a dry tailings product.

   The proposed pilot plant program will be used to evaluate the potential for tailings to be returned underground during operations in a semi-dried form such as paste backfill, thickened or filtered tailings.

   For the purposes of the pilot plant program itself, the tailings solids will be settled out and retained in the mill thickeners. The liquid portion will be decanted off and pumped to the tailings pond, leaving the solids in a semi-dried state. There is no practical means of using the existing underground workings for disposal of tailings from the pilot plant as the workings have not as yet been developed sufficiently to allow sectioning off of mined out areas for backfill. As well, the underground has not been actively used or maintained for a number of years and considerable rehabilitation would have to be undertaken to ensure the workings were safe enough to permit such work to be carried out.

2. Conducting bulk testing of the type proposed in the pilot plant application at a similar mining operation such as Cantung or other alternative sites in Canada would have the same drawbacks as those referred to in respect of the alternative of having the testing done at an off-site commercial facility. Specifically, it remains impractical to transport such a necessarily large bulk sample off-site without road access and the inability to utilize site specific water would reduce the representativeness of the testwork.

   Metallurgical processing is a complex series of mineralogical separation steps the efficiency of which is controlled by a variety of chemical and physical variables. Metallurgical testing seeks to eliminate the variables in order to establish optimal conditions in which to achieve maximum recoveries of the minerals of interest, while at the same time minimizing recovery of unwanted minerals.

   One of the key variables is the quality of water to be used in the mill process. The referenced statement was simply made as a means of identifying one of the considerations in selecting an on-site pilot plant program as the preferred alternative.

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Water in the Prairie Creek area is typically high in pH, alkalinity and hardness due to the presence of limestone and dolomite formations in the area. By comparison, potable water available to a commercial lab in Vancouver would be more acidic, less alkaline and softer, not to mention having elevated levels of copper, lead and chlorine from water distribution systems. Such differences could have subtle effects on metallurgical performance which would make testwork using off-site water less representative.

3. CZN is not aware of any practical means by which the complete tailings streams liquid and solids from the pilot plant could be stabilized and placed underground as backfill.

   The tailings produced from the pilot plant will be in the form of a slurry of ground up rock the consistency of sand mixed with water. The slurry will typically be about 40% solids by weight, with the remainder being water.

   A typical backfill operation at an operating mine involves sectioning off a mined out portion of the underground with a bulkhead and then pumping semi-dewatered tailings solids mixed with cement behind the bulkhead. The liquid portion is pumped to the tailings pond for reclaim to the mill.

   The current workings at Prairie Creek are horizontal adits. If the tailings slurry were simply pumped directly underground it would just flow back out unless dams or bulkheads were constructed underground to hold it back. As stated above, the workings have not as yet been developed sufficiently to allow sectioning off of mined out areas for backfill. As well, the underground has not been actively used or maintained for a number of years and considerable rehabilitation would have to be undertaken to ensure the workings were safe enough to permit such work to be carried out.

   For these reasons, using the underground workings for disposal of tailings generated from the pilot plant is not considered feasible.

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Prairie Creek Mine
Tailings Effluent Characterization - Liquid Fraction

DATE	Sample ID	TOTAL METALS (mg/l)																															
		T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
1994	474-1	< 0.20	< 0.20	< 0.20	0.026	< 0.005	< 0.10	< 0.10	0.051	106	< 0.015	< 0.015	0.117	0.038	0.108	0.168	< 0.015	8.77	0.19	< 0.030	< 0.020	< 0.30	2.8	< 0.20	0.61	0.069	44.9	0.201	< 0.10	< 0.30	< 0.010	< 0.10	< 0.030	0.861
1994	474-2	< 0.20	< 0.20	< 0.20	0.049	< 0.005	< 0.10	< 0.10	< 0.010	296	< 0.015	< 0.015	< 0.010	< 0.030	0.001	0.507	< 0.015	0.07	< 0.005	0.043	< 0.020	< 0.30	4.1	< 0.20	0.27	< 0.015	11.8	0.284	< 0.10	< 0.30	< 0.10	< 0.10	< 0.030	0.164
1994	474-5	< 0.20	< 0.20	< 0.20	0.033	< 0.005	< 0.10	< 0.10	0.012	233	< 0.015	< 0.015	0.026	< 0.030	0.010	0.120	0.017	5.95	0.008	< 0.030	< 0.020	< 0.30	4.4	< 0.20	< 0.05	< 0.015	174	0.397	< 0.10	< 0.30	< 0.10	< 0.10	< 0.030	0.159
MAXIMUM		0.20	0.20	0.2000	0.049	0.005	0.10	0.10	0.051	296	0.015	0.015	0.117	0.038	0.108	0.507	0.017	8.77	0.190	0.043	0.020	0.30	4.4	0.2000	0.61	0.069	174	0.397	0.10	0.30	0.100	0.10	0.030	0.881
MINIMUM		0.20	0.20	0.2000	0.026	0.005	0.10	0.10	0.010	106	0.015	0.015	0.010	0.030	0.001	0.120	0.015	0.07	0.005	0.030	0.020	0.30	2.8	0.2000	0.05	0.015	11.8	0.201	0.10	0.30	0.010	0.10	0.030	0.159
AVERAGE		0.20	0.20	0.2000	0.036	0.005	0.10	0.10	0.024	212	0.015	0.015	0.051	0.033	0.040	0.265	0.016	4.93	0.068	0.034	0.020	0.30	3.8	0.2000	0.31	0.033	76.9	0.294	0.10	0.30	0.070	0.10	0.030	0.401
STD.DEV.		0.00	0.00	0.0000	0.012	0.000	0.00	0.00	0.023	97	0.000	0.000	0.058	0.005	0.059	0.211	0.001	4.44	0.106	0.008	0.000	0.00	0.9	0.0000	0.28	0.031	85.7	0.098	0.00	0.00	0.052	0.00	0.000	0.415
VARIANCE		0.00	0.00	0.0000	0.000	0.000	0.00	0.00	0.001	9366	0.000	0.000	0.003	0.000	0.004	0.044	0.000	19.7	0.011	0.000	0.000	0.00	0.72	0.0000	0.08	0.001	7345	0.010	0.00	0.00	0.003	0.00	0.000	0.173

Analyses conducted on decant from locked cycle tests - 474-1 Vein; 474-2 Stratabound; 474-5 Vein

Surface Water Quality - Prairie Creek upstream at airstrip- Stn. 932-7

DATE	Sample ID	TOTAL METALS																															
		T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
05/27/75	diand			< 0.01					< 0.001	33	< 0.01	0.003	< 0.001	0.115		< 0.004			0.014	< 0.05	< 0.002	0.04	0.3		2.3		0.6							0.007
07/05/75	diand								< 0.01	47	< 0.01	< 0.01	< 0.001	< 0.05		< 0.005			< 0.01	< 0.05	< 0.005	< 0.005	0.41		3.3		1.4							0.012
08/06/75	diand			< 0.010					< 0.001	40	< 0.010	< 0.001	0.002	1.640		< 0.005			0.05	< 0.050	0.005	0.01	0.4		3.20		1.2							0.020
07/22/80	beak			< 0.005					< 0.005	47	< 0.010		0.006	0.030	< 0.00025	0.039		17.0		0.002	0.011													0.024
04/18/80	beak			< 0.005					< 0.005	36	< 0.01		0.005	0.065		< 0.0100		26.0		< 0.050	0.015		0.7			1.7							< 0.005
08/23/83	diand			0.015					< 0.00005	57	0.0009		< 0.0005	0.0052	0.00002	< 0.0001		18.7			0.0022						1.0							< 0.005
06/30/92	diand			< 0.0002					< 0.0002	48	0.002	0.005	0.002	0.037		< 0.001		18.7			< 0.001													0.006
09/15/93	diand			< 0.0003					< 0.0002	55	0.001	< 0.0020	0.0010	0.003		0.0023		24.1			0.0010													0.004
06/15/95	diand			< 0.0003					0.0001	50	0.0042	< 0.000	< 0.0001	0.003		0.0002		19.2	0.0003		0.0015		0.6				2.1							< 0.005
08/18/99	diand			< 0.0002					< 0.0003		< 0.003	< 0.001	< 0.002	< 0.030	< 0.00001	< 0.0010			< 0.001		0.002													< 0.010
MAXIMUM				0.0150					0.0100	57	0.010	0.010	0.006	1.640		0.039		26.00	0.050	0.050	0.015	0.04	0.7		3.30		2							0.02
MINIMUM				0.0002					0.0001	33	0.001	0.000	0.000	0.003		0.000		17.00	0.000	0.002	0.001	0.01	0.3		2.30		0.6							0.004
AVERAGE				0.0051					0.0023	46	0.008	0.003	0.002	0.198	0.00009	0.007		20.62	0.015	0.040	0.005	0.02	0.5		2.93		1.3							0.010
STD.DEV.				0.0055					0.0033	8	0.004	0.003	0.002	0.508		0.012		3.57	0.020	0.021	0.005	0.02	0.2		0.55		0.5							0.01
VARIANCE				0.0000					0.0000	65	0.000	0.000	0.000	0.258		0.000		12.7	0.000	0.000	0.000	0.00	0.03		0.30		0							0.00

Tailings Pond Water Chemistry at 50 parts Prairie Creek water to 1 part Tailings effluent

	Sample ID	TOTAL METALS (mg/l)																															
		T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
	Average			0.009					0.0027	49	0.0053	0.0034	0.00302	0.195	0.00087	0.0118		20.31	0.0161	0.04	0.005	0.02	0.55		2.88		2.82							0.017
	Minimum			0.004					0.0002	34	0.0012	0.0004	0.00029	0.004	0.00001	0.0025		16.67	0.0004	0.003	0.001	0.01	0.35		2.26		0.82							0.007
	Maximum			0.019					0.0108	61	0.010	0.0101	0.00818	1.609	0.00212	0.0482		25.66	0.0527	0.05	0.015	0.04	0.78		3.25		5.48							0.041
Comparison to Discharge Limits and Guidelines																																	
N3L3-0932	average			0.15					0.015		0.15		0.075		0.0015	0.150					0.20													
	maximum			0.30					0.03		0.30		0.15		0.0030	0.300					0.40													0.30
MMLER				1.0									0.60			0.400					1.00													0.60
CWQG-FAL				0.05					0.0018		0.02		0.004	0.30		0.007					0.15													1.00
																																	0.03

N3L3-0932 = Prairie Creek Water Licence issued July 1, 1982
MMLER = Metal Mining Liquid Effluent Regulations
CWQG-FAL = Canadian Water Quality Guidelines - Fresh Water Aquatic Life

BGC [redacted]
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Project No. 0059-002-04

August 16, 2001

Canadian Zinc Corporation
Suite 1202, 700 West Pender Street
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Attention: Mr. J. Peter Campbell, Vice President – Project Affairs

Re: Prairie Creek Mine Tailings Impoundment Facility, NT
GNWT-RWED and DIAND Information Requests

Dear Sir:

From the information in your e-mail of August 14, 2001, I understand that Canadian Zinc Corp. (CZN) has applied for permits to conduct additional surface exploration, operate a metallurgical pilot plant, develop an underground decline and conduct underground exploration at the Prairie Creek Mine in western Northwest Territories. These activities, which are referred to here as "the proposed use", will be carried out over a 5 to 6 month period in 2002. CZN has received requests from the Government of Northwest Territories and the Department of Indian Affairs and Northern Development for additional information, some of which pertains to the tailings facility.

BGC Engineering Inc. (BGC) undertook geotechnical engineering studies on the tailings facility in 1994 and 1995 under contract to San Andreas Resources Ltd. Although constructed in 1982, the facility had not been operated and the purpose of our work was to assess possible rehabilitation needs arising from lack of use over the intervening 12 years. We undertook drilling, sampling and instrumentation at the site and follow-up geothermal and slope stability analyses leading to conceptual design modifications. A draft report was issued.

Last year CZN retained BGC to update and clarify details presented in our earlier draft report. The 2000 studies were documented in a BGC report dated 18 December 2000. As requested, I have had the text and figures of this report put on a compact disk, which is being sent to you under separate cover.

In your e-mail you indicated that the tailings facility would receive between 4,000m^3 and slightly more than 70,000m^3 of combined process and mine water under the proposed use. You further indicated that this would raise the current level of the tailings pond by between 4cm and slightly more than 70cm, respectively. You asked BGC to comment on whether the tailings facility in the form we last saw it is suited to the proposed use.

During a 1994 inspection I noted evidence of natural fluctuations in the tailings pond level of approximately 1m. Assuming that the level in the facility is still at the approximate 1994 level, then my response to your question is that the tailings pond has already experienced

natural fluctuations greater than those contemplated under the proposed use. To be more specific, I am satisfied that the tailings facility is geotechnically stable in its present configuration and that the geotechnical stability of the tailings pond containment structures is adequate for the proposed use provided levels do not rise more than about 1m above the 1994 level under the proposed use. As a cautionary note, I point out that the facility should not be pumped down to create the planned storage without additional geotechnical assessment. This is because of potentially adverse uplift pressures on the basal clay liner.

As far as hydrotechnical stability is concerned, BGC found no field or anecdotal evidence of seepage loss from the containment structures during our previous studies. Damage to the hypalon liner along the cut backslope (i.e. northeastern side) of the facility may have some potential to create a seepage path. This will be of limited cross-sectional extent, however, given the height to which we determined the low permeability glacial lake clay rises beneath the cut backslope. The potential seepage path available is north and south at shallow depth in the cut backslope, however, the vast majority of such seepage would be expected to report to the south.

Given the nature of the proposed developments and limited increase anticipated in pond water level, such seepage, if it were to occur at all, is expected to be minor. Given the shallow nature of the potential seepage path, the majority of such seepage, if it were to occur, would be expected to be picked up in the site catchment pond.

I trust the foregoing comments and the CD sent under separate cover are adequate for you at this time. If BGC can be of any further assistance in this matter, please do not hesitate to contact me.

Yours truly,
BGC ENGINEERING INC.

per: Dr. K. Wayne Savigny, P.Eng., P.Geol.
Principal

Enc: CD of December 18, 2001 BGC report under separate cover

KWS/ph

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Project No. 0059-002-04
December 18, 2000

Mr. Alan Taylor, Vice President – Exploration
Canadian Zinc Corporation
Suite 1202, 700 West Pender Street
Vancouver, B.C. V6C 1G8

Attention: Mr. J. Peter Campbell, Vice President – Project Affairs

Re: Prairie Creek Mine Tailings Facility
Summary of Past Work and Preliminary Recommendations for Rehabilitation

Dear Mr. Campbell:

Following your requests at our meetings of 29 August, 3 November and 5 December 2000, we are pleased to provide this overview of geotechnical issues pertaining to rehabilitation of the Prairie Creek Mine tailings facility.

1. INTRODUCTION

1.1 Background

The Prairie Creek Mine is located approximately 100km northwest of Nahanni Butte in Northwest Territories. At the brink of production in the early 1980's, it was placed on care and maintenance status. Although exploration has been ongoing, there has been no mining activity and neither the plant site nor the tailings facility has been operated.

The tailings facility was designed in 1980 and constructed in 1981. Localised geotechnical problems were assessed in 1983 and 1984 but no remedial work was initiated. At the request of Canadian Zinc Corporation (Canadian Zinc, formerly San Andreas Resources Corp.), BGC Engineering Inc. (BGC, formerly Bruce Geotechnical Consultants Inc.), undertook studies in 1994 and 1995 to improve understanding of the earlier problems and provide conceptual-level recommendations for rehabilitation. This work was not completed due to a lack of funding for the project at that time.

1.2 Scope-of-Work

In September 2000, Canadian Zinc requested that BGC carry out the following tasks related to the tailings facility:

- review the1994 and 1995 BGC work and prepare an executive summary; and,
- provide an estimate of the engineering effort to prepare a pre-feasibility-level rehabilitation design for the tailings facility.

In keeping with instructions from Canadian Zinc, no new design effort was undertaken within the present scope-of-work and all technical considerations were limited to geotechnical issues. Geo-chemistry, river engineering and operational aspects of the facility, for example, were not part of the current scope-of-work.

BGC understands that this letter report will be used by Canadian Zinc as part of a larger scoping study of possible production levels, capital requirements and operating costs for the Prairie Creek Mine Project.

2. EXECUTIVE SUMMARY OF BACKGROUND INFORMATION

2.1 Documents Reviewed

Key documents reviewed by BGC in compiling this executive summary are as follows:

- BGC. 1994. Reconnaissance Geotechnical Assessment, Tailings Facility and Winter Road, Prairie Creek Mine, NT., File No. 0059-001-01, dated June 22, 1994.
- BGC. 1995a. Memorandum to File: Background Summary, Prairie Creek Mine, Tailings Retention Pond Rehabilitation, File No. 0059-001-01, dated January 30, 1995.
- Nixon Geotech. Ltd. 1995. Geothermal/Stability Analysis for Prairie Creek Mine. February 7, 1995. Report prepared for BGC.
- BGC. 1995b. Prairie Creek Project, NT. Summary of Geotechnical Aspects, Tailings Facility and Access Road, File No. 0059-001-01, dated July 20, 1995.

2.2 Generalised Background to 1985

Initial geotechnical investigation and design for the tailings facility were carried out in the early 1980's. Two areas were selected for detailed investigation: T2 and T3. T2 is the present location. T3 is situated on the left side of Prairie Creek, approximately 1 km downstream.

T2 was chosen as the better location for a number of reasons. One of the most important was the apparent continuity of an impervious clay stratum at shallow depth over most of the pond area. It was extensive enough to provide a basal seal and also for utilization as an impervious component of containment structures.

Construction of the T2 tailings pond involved expanding existing river dykes to form the perimeter embankment. Material was excavated from the north valley wall (referred to as the backslope) for embankment construction. This also increased the pond volume. To mitigate possible seepage loss through materials comprising the backslope excavation, a synthetic liner and drainage system were installed in March 1982.

A performance summary for the embankment dam and engineered backslope is given in the following subsections. BGC has prepared a number of reference drawings to supplement the written summaries. Drawing 01 shows a plan view of the tailings facility. A typical cross-section of the embankment dam, Section A, is shown in Drawing 02. A surveyed cross-section of the backslope, Section B, is shown in Drawing 03. BGC has used available information in preparing these drawings, however, the as-built detail was limited and many assumptions have been made. BGC emphasizes that these drawings were prepared to facilitate discussion only and they should not be used for detailed design or construction purposes.

Embankment - Downstream Face

Localized erosion affected the downstream face of the embankment along the left bank of Prairie Creek. The most significant erosion occurred immediately downstream of the tailings pond embankment where little or no riprap protection had been placed to protect the embankment or original dyke (see Drawing 01).

Embankment - Upstream Face

Tension cracks were noted along the crest of the embankment during construction. Shallow movements affected the upstream face in June 1982 in association with a period of heavy rain. By 1985, gravel covering the impervious clay core had almost completely sloughed into the pond (Section A, Drawing 02).

Engineered Backslope

Movements ranging from shallow to moderately deep-seated and causing distortion and local tearing of the synthetic liner and underlying bedding and drain materials began during the late construction period and continued for several years. Permafrost degradation was believed to have been a contributing factor to these ground movements. Drawing 03 shows a profile along Section B derived from a field survey made at BGC's request in 1994.

Integrity of Tailings Facility

Despite the movements noted above, no breach of the embankment occurred. It is reported that no seepage from the pond was detected in observations made as late as 1985, however, no specific records describing the monitoring effort or the results are available[1].

1 Report "Geotechnical rehabilitation of the tailings pond, Prairie Creek Mine, NWT, Sept. 1985", p.2".

2.3 BGC Site Investigations

BGC undertook a site reconnaissance on 12 June 1994. Three possible movement mechanisms were identified:

1. shallow and affecting the upstream face of the perimeter embankment dyke;
2. shallow to moderately deep-seated and affecting the backslope; and
3. deep-seated translational and affecting the backslope.

Site investigations comprising drilling, sampling and instrumentation activities were carried out by BGC between 18 October and 4 November 1994. The program, which was planned on the basis of the June 1994 site reconnaissance, comprised eight drillholes in the backslope area. An additional one was drilled in an undisturbed region of the T3 area for the purpose of establishing base-line ground temperatures and permafrost conditions. Three piezometers, five slope inclinometer casings and four thermistor strings were installed. Four test pits were excavated into the upstream face of the perimeter embankment dyke. Site visits to obtain follow-up instrument readings were made on 15 December 1994 and 17 May 1995.

2.4 Laboratory Testing

Laboratory testing was conducted on samples obtained during the 1994 detailed site investigation, and the results were incorporated into the borehole and test pit logs.

2.5 Slope Indicator Monitoring over the period 1994-1995

Slope indicator monitoring indicated that movement in the backslope corresponded to locations where a grey, laminated, high plastic clay was encountered in the boreholes (typically 12m to 16m deep). By the time of the 17 May 1995 site visit, all slope indicator casings were rendered inoperable due to excessive movements.

2.6 Permafrost and Ground Ice

The main concern about the presence of permafrost is its common association with ground ice. Volumetric strains and excess pore pressures are generated as ground ice melts in fine-grained permafrost soils.

Ground surface observations and thermistor monitoring indicated the presence of permafrost beneath the T3 site. Although virtually undetected at the time of design and construction, permafrost and excess ground ice were also present beneath the T2 site, particularly the backslope. Extensive clearing, the southwest aspect, the moderate to dark colour of the exposed synthetic liner, and the presence of a pond in the tailings facility likely contributed to deep permafrost degradation between the time of construction and the 1994 BGC site investigations. Limited permafrost and excess ground ice may remain at depth in the backslope but the rate of thaw front penetration, hence the excess pore pressures generated by thaw, can be expected to be small in comparison to the post construction period.

2.7 Interpretation of Movement Mechanisms

Information obtained to date for the embankment and engineered backslope suggests the following movement mechanisms.

Embankment - Downstream Face

The in situ clay was partially excavated for clay core fill but a laterally continuous section remains in the embankment foundation, according to the original design documents. We find no compelling reason to believe that clay comprising the embankment foundation experienced failure in the geological past. Moreover, there is no evidence that translational movements toward Prairie Creek affected the original dyke or embankment dam. For this reason, we believe peak rather than residual shear strengths are appropriate for design of the structure against translational sliding toward Prairie Creek.

Embankment - Upstream Face

Movements affecting the upstream face of the embankment involved shallow planar slippage along the pond-side contact between the upstream high plastic core and the sand and gravel cover separating it from the tailings pond (see Drawing 02). The tension cracks observed along the top of the embankment before slippage occurred are interpreted here as the precursor to these planar movements. Visual examination of the upstream clay core in the four test pits excavated in 1994 - 1995 indicated that the core was essentially intact. Hand measurement of shear strength by field vane and pocket penetrometer indicated that the main body of the clay core fill had high strength and it appeared stable. Seasonal freeze-thaw had caused slight overconsolidation and development of a faint fissure structure.

During construction, it is considered likely that the outside edge of the clay core (about 200 to 500mm wide) received little or no compaction during placement due to physical limitations of the compaction equipment. A steel drum or rubber tire soil roller compacting in lifts cannot compact fully to the edge of the lift. This loose edge zone of poorly compacted clay is believed to have had insufficient strength to support the thin sand and gravel cover and collapsed on wetting. Substantial slumping of the sand and gravel core cover took place following heavy rain in the period prior to 1985 and left the embankment structure in its assumed present configuration (Drawing 02).

Engineered Backslope

Information obtained to date for the pond backslope indicates a combination of thaw subsidence and deep-seated translational movements have occurred.

Thaw subsidence was significant and a major contributor to the very visible liner deformations; however, the high magnitude and rate of thaw-induced movements were short-lived for the reasons discussed below.

The depths of movements in BGC boreholes and the interpreted configuration of a contiguous

failure surface are shown in Section B, Drawing 03. The surface is seated in a high plastic clay that may have been pre-sheared as a result of prior movements along the left valley slope of Prairie Creek. This mechanistic interpretation means that the mobilized strength of the clay beneath the backslope at the time movements began was somewhere below peak and approaching the residual value. A pervasive surface of sliding has developed, however, hence strengths used in re-design must be residual values.

The backslope movements were almost certainly exacerbated by development of excess pore pressures due to ground ice melting. Thaw-generated excess pore pressures can be expected to be significantly lower than when movements began because of deep permafrost degradation and significant attenuation in the rate of thaw in the intervening almost twenty years since backslope grading.

Poor performance of diversion ditches and water accumulation below the synthetic liner may have also been contributing factors to backslope instability. Pore pressures below the clay layer may also have been a contributing factor.

Further geotechnical investigations will be required to confirm the relative significance of the foregoing factors.

3. FACILITY REHABILITATION DESIGN CONCEPTS

3.1 Introduction

In order to bring the tailings facility into operation, one and possibly two steps will have to be followed: First, sufficient geotechnical investigation effort and follow-up analyses will be needed to confirm the factors of safety of the various movement mechanisms described in Section 2.7. Second, where the calculated factors of safety are lower than required, rehabilitation effort will be needed. Additional rehabilitation considerations, for example, seepage through microstructures in the impervious clay core and riprap armour on the downstream face of the embankment dam, will also be required. BGC recommends, however, that all further geotechnical considerations be deferred until rehabilitation efforts can be considered in conjunction with optimization of operational alternatives.

Three factors must be considered in the geotechnical optimization of rehabilitation designs: First, how to best accommodate the existing impervious, high plastic clay core in the embankment dam and its foundation; second, the presence of Prairie Creek limits rehabilitation design options to upstream construction unless authorization to re-direct the flow of Prairie Creek to the south side of the floodplain is pursued; and third, the current distribution of permafrost and ground ice in the backslope area and their influences on stability.

3.2 Embankment

Two rehabilitation scenarios for the embankment dam, "most likely" and "worst case", are discussed below.

Embankment - "Most Likely Scenario"

The "most likely" scenario for remediation of the embankment structure is to simply adopt its current configuration as shown in Drawings 05 and 02, plan and cross-section views, respectively.

The results of preliminary stability analyses support this configuration as shown in Drawing 04. This is reinforced by the fact that the embankment has remained essentially unchanged since the early post-construction period when the sand and gravel cover sloughed off and into the pond. Drawing 04 shows the factor of safety is calculated to be about 1.6, based on our best estimate of in situ soil properties, which are also listed on Drawing 04. Similar factors of safety can be expected for the downstream slope. As both embankment slopes are unchanged under the "most likely" scenario, there is no loss to the tailings pond volume due to the embankment dam rehabilitation.

A considerable amount of sand and gravel is present at the upstream toe of the embankment as illustrated schematically in Drawing 02. Whether this needs to be added to, in whole or in part, before operations commence will depend upon how initial waste disposal operations are planned. The sequencing of sand and gravel cover replacement above the current pond elevation of approximately 869.5m, if necessary, should be considered during the next phase of study in conjunction with optimization of operational alternatives. Additionally, the thickness uniformity and integrity of the impervious clay core will also have to be investigated further during the next phase of study. For the time being, we recommend that Canadian Zinc allow for a $150,000 up front cost to deal with these issues under the "most likely" scenario.

The next phase of geotechnical investigations should be planned to focus on the potential extent of the embankment and foundation movements and, if necessary, a means of managing the movements to achieve acceptable factors of safety over the long-term. Management should involve minimizing pre-development capital costs in favour of achieving the desired factors of safety using alternative operational means of placing materials.

Embankment - "Worst Case"

For the purpose of estimating a "worst-case" construction cost, a conceptual re-designed configuration of the embankment structure is shown in Drawings 06 and 07, plan and cross-section views, respectively.

The "worst case" scenario adopts the very conservative assumption that residual strengths are operative across the entire embankment foundation and must be used for both the upstream and downstream slope designs. The use of residual strength gives the

unreasonably[2] low factor of safety shown in Drawing 04, indicating the upstream and downstream slopes must be re-configured to achieve an acceptable factor of safety. The slopes shown in Drawing 07 provide the following minimum factors of safety based on a preliminary analysis:

- Downstream slope - factor of safety about 1.2 for a slope of 3H:1V (see Drawing 07).
- Upstream slope - factor of safety about 1.1 for a slope of 3.6H:1V (See Drawing 07).

Re-construction of the embankment as shown in Drawings 06 and 07 results in an estimated loss in the tailings pond volume[3] in the amount of 210,000 m^3, which is approximately 35% of the available original volume. At an estimated cost of $ 3.00[4] per m^3, the construction cost of this worst-case scenario template for the embankments is estimated to be $630,000.

We emphasize that the foregoing estimate is what we believe to be a "worst-case" or upper bound scenario for the embankment. If subsequent geotechnical investigations and/or operational monitoring indicate less than peak strengths are mobilized in the foundation clay, Drawings 06 and 07 show that further re-design flexibility is available and could be implemented, as needed. This could apply on a local basis even after the "most likely" scenario has been adopted and operations are underway.

Embankment - Next Phases of Geotechnical Study

Pre-feasibility level geotechnical investigation and design will involve the following steps:

1. Site investigation, sampling and laboratory testing of in situ clay foundation soils.
2. Site investigation, sampling and laboratory testing of the impervious clay core properties and its thickness uniformity in the embankment.
3. Assess the implications of freeze-thaw cycles on the permeability of the upstream clay core.
4. Re-starting the slope stability analyses to confirm stable upstream and downstream slope designs.
5. Re-designing the upstream slope angle in response to 1. through 4., above, and, to the greatest extent possible, in a way that makes use of the existing upstream clay core as the main water retention element.
6. Assessing the need for cover replacement on the upstream slope; and, if necessary, alternative ways of doing so in whole or in part through operations.
7. Calculation of a new volume-elevation curve once the final design cross-section is

[2] Factors of safety less than unity are an analytical reality only because a limit equilibrium analysis is only valid until a factor of safety of unity is reached. Thereafter the forces simulated are no longer in equilibrium.

[3] BGC estimates the existing volume of the tailings facility is 600,000 m^3 between elevations 864m and 875m.

[4] The unit rate of $1.50 per tonne (or say$3.00 per m^3) to supply and place rockfill is based on the recommendation of Canadian Zinc Corporation.

determined and the extent to which tailings might be used as a stabilizing and/or cover material can be assessed, if needed.

8. Consideration of construction approach; in particular, the means of controlling possible uplift pressures during and after the existing pond is pumped down, if needed.
9. Preparation of a field drilling, sampling and instrumentation program, and laboratory testing requirements for feasibility-level design.
10. Re-assessment of armour requirements on the portion of the tailings embankment facing Prairie Creek.

3.3 Engineered Backslope

As stated in Section 2.6, we believe permafrost and ground ice were important factors contributing to engineered backslope instability. The 1994-95 geothermal analyses suggested extensive degradation of permafrost and ground ice had already occurred. Geothermal analyses completed in 1995 indicated that the rate of thaw penetration at depth had attenuated to levels that are unlikely to produce excess pore pressures. This means that some of the factors contributing to backslope instability (viz. ground ice, rapid rate of thaw and attendant excess pore pressures) may no longer be significant design impediments.

The backslope will require re-design, but we believe a more routine, "thawed soil mechanics" approach is appropriate. Of particular importance in the re-design is that available strengths on the deep-seated failure surface are limited to residual rather than peak values.

A variety of stabilization measures can be considered as part of re-building the backslope and/or initial placement of tailings at its toe. In our preliminary stability analyses and related cost estimation, we have limited our consideration to placement of a 40m wide stabilizing rock berm across the toe of the backslope where movements have occurred (see Drawings 06 and 08). This increased the factor of safety to about 1.1. The configuration shown involves an estimated 80,000 m^3 (13% of existing tailings pond capacity) and at a construction cost of $3.00 per m^3, this amounts to a total cost of $240,000.

A range of other rehabilitation designs is available. For example:

- Further detailed investigations may show that permafrost and ground ice have degraded to the extent that no stabilization effort is needed. In this case, rehabilitation might be limited to minor re-grading and repair / replacement of the synthetic liner.
- In the event that investigations show stabilization is needed, the toe buttress might be rejected in favour of unloading the top of the with no loss of capacity inside the existing facility.
- Pumped drawdown might be used to relieve groundwater pressures until the rockfill toe buttress discussed above can be replaced by tailings.

Based on our discovery of the impervious clay high beneath the backslope as shown in

Drawings 03 and 08, we believe the synthetic liner does not have to be replaced under the rock berm. It may, however, still be needed at the margins of the berm. This will be a key focus of the next phase of geotechnical studies. For the time being, we recommend that Canadian Zinc allow for a $150,000 cost related to the synthetic liner.

The requirement for and location of diversion ditches will also need to be assessed after the synthetic liner issue is clarified. For the time being, we recommend that Canadian Zinc allow for a $50,000 cost related to the diversion ditches.

Backslope - Next Phases of Geotechnical Study

Pre-feasibility level geotechnical investigation and re-design will involve the following steps:

1. Site investigation, sampling, installation of slope indicators and thermistors, and laboratory testing to confirm the extent of impervious clay and permafrost beneath the backslope.
2. Two-dimensional geothermal analyses of the backslope to simulate the thaw progression as a function of time. The period studied will span the time from original clearing and construction through to the anticipated re-construction timing and on through facility operation and abandonment.
3. Coupled geothermal and slope stability analyses to evaluate stable backslope configurations.
4. Re-assessment of the requirement for and, if necessary, the configuration of the synthetic liner (includes preliminary three-dimensional seepage analysis).
5. Optimization of the method of achieving a stable backslope configuration taking 1. through 4., above, into account.
6. Calculation of a new volume-elevation curve once the new design cross-section is determined (same as 7. in Sec. 3.2).
7. Preparation of a field drilling, sampling and instrumentation program, and laboratory testing requirements for feasibility-level design.

4. PRELIMINARY COST ESTIMATE FOR THE SECTION 3 ENGINEERING WORK SCOPE

ITEM	PERSON HOURS	COST
Meetings with client	100	8,500.
Site visit and instrument monitoring / data reduction	125	10,600.
Geotechnical drilling and test pitting on site	500	35,000.
Drill and test pit rigs supplied by Canadian Zinc	---	nil
Geotechnical instrumentation for installation at site	---	14,000.
Engineering supervision of field investigations	40	4,000.
Laboratory testing of soil samples from the field	---	4,000.
Terrestrial surveys completed by others after field work	---	7,000.
Slope stability analysis	140	11,200.
Geothermal analyses	100	9,000.
Coupled slope stability and geothermal analyses	90	8,100.
Hydrotechnical armour designs by others	50	4,400.
Volume-elevation curves	100	7,000.
Geothermal analyses (operation and abandonment)	120	10,800.
Drafting	80	5,200.
Report writing	130	10,400.
Report preparation	30	2,000.
Travel expenses	---	10,000.
Miscellaneous - Courier, telephone, printing, photos, etc.	---	1,500.
Estimated totals	**1,605**	**$ 162,700**

5. REHABILITATION SUMMARY

"Most likely" and "worst case" scenarios are outlined for rehabilitation of the embankment dam portion of the tailings facility. We estimate the costs are $150,000 and $630,000, respectively. Under the "most likely" scenario, we believe the structure can be used in its present configuration, however, the estimated cost of $150,000 is suggested because of the possible need for improvements to the cover and impervious clay core. We believe there is no justification for adopting the "worst case" scenario, which would reduce the available storage capacity by 210,000 m^3 or about 35%. It is highly conservative and can reasonably be replaced by monitoring as part of the "most likely" scenario. If local movements are detected as part of monitoring, the "worst case" re-designed template can be implemented over affected portions of the embankment structure, as required.

A variety of techniques can be considered for rehabilitation of the engineered backslope portion of the tailings facility. We have considered a stabilizing rock fill berm. This 40m wide

structure would reduce the pond volume by 80,000 m^3 (13% of the existing tailings pond capacity) and cost about $240,000. An additional amount of $200,000 is estimated for the synthetic liner along the flanks of the berm and improvements to drainage ditches.

The next phase of geotechnical investigations and engineering design at the pre-feasibility level are estimated to cost in the order of $160,000.

For convenience, the foregoing costs are summarized in Table 1.

6. LIMITATIONS

This report was prepared by BGC for the account of Canadian Zinc. The material in it reflects the judgement of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be based on it, are the responsibility of such Third Parties. BGC accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

As a mutual protection to our client, the public, and ourselves, all reports, tables and drawings are submitted for the confidential information of our client for a specific project. Authorization for use and/or publication of data, statements, conclusions or abstracts from or regarding our reports, tables and drawings is reserved pending our written approval.

7. CLOSURE

We trust the foregoing is adequate for your current overall scoping study. Please feel free to contact the undersigned if you have any questions or comments, or if we may be of further assistance.

Sincerely,
BGC Engineering Inc.
per: Robert Toombs, P.Eng.
Geotechnical Engineer

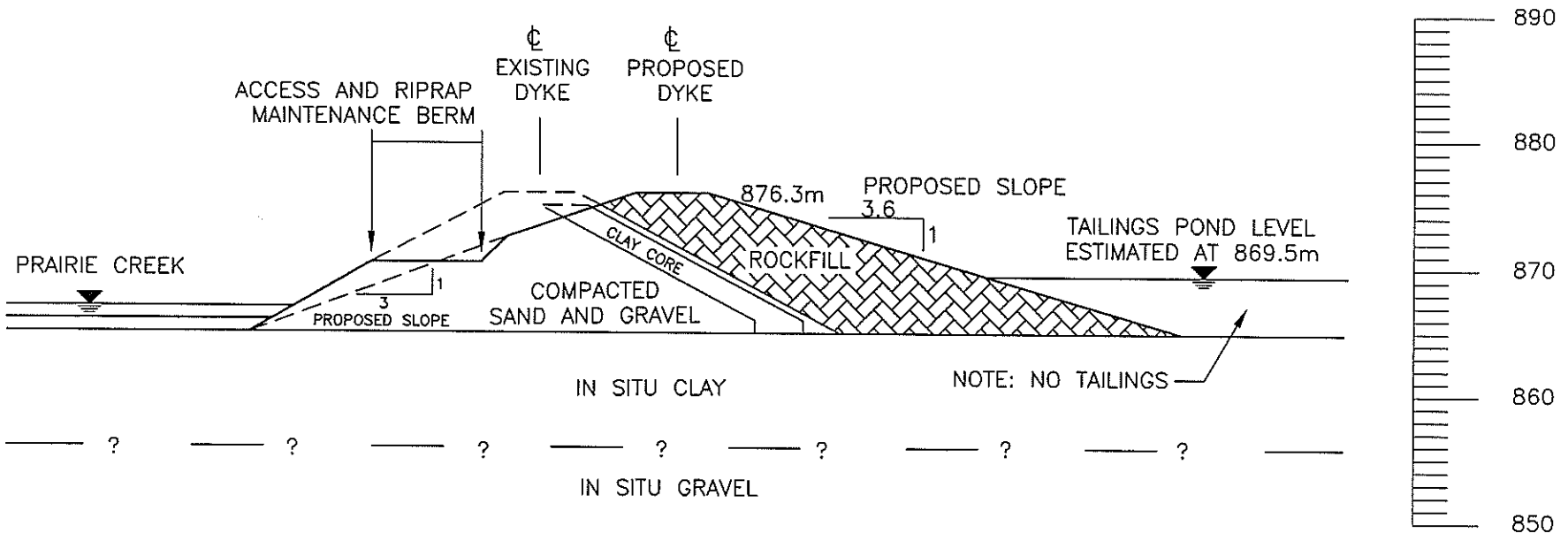
Dr. K. Wayne Savigny, P.Eng., P.Geol.
Principal

KWS/rgt
Attachments

Table 1 Taillings Facility Rehabilitation
Pre-Feasibility Level Cost Estimation

Cost Component	Most Like Scenario	Worst Case Scenario
Embankment	$150,000	$630,000
Engineered Backslope	$240,000	$240,000
Synthetic Liner	$150,000	$250,000
Diversion Ditch	$50,000	$50,000
Pre-Feasibility Engineering and Investigations	$160,000	$160,000
Totals	$750,000	$1,230,000

EMBANKMENT RE-CONFIGURATION
WORST CASE



SECTION C-06

5 0 5 10 15 20 METRES

NOTE: NOT SUITABLE FOR DETAILED DESIGN OR CONSTRUCTION

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AN APPLIED EARTH SCIENCES COMPANY
Vancouver, B.C. Phone: (604) 684 5900

PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS EMBANKMENT REHABILITATION
SECTION C - WORST CASE SCENARIO

CLIENT: CANADIAN ZINC CORPORATION

PROJECT No.	DWG. No.	REV.
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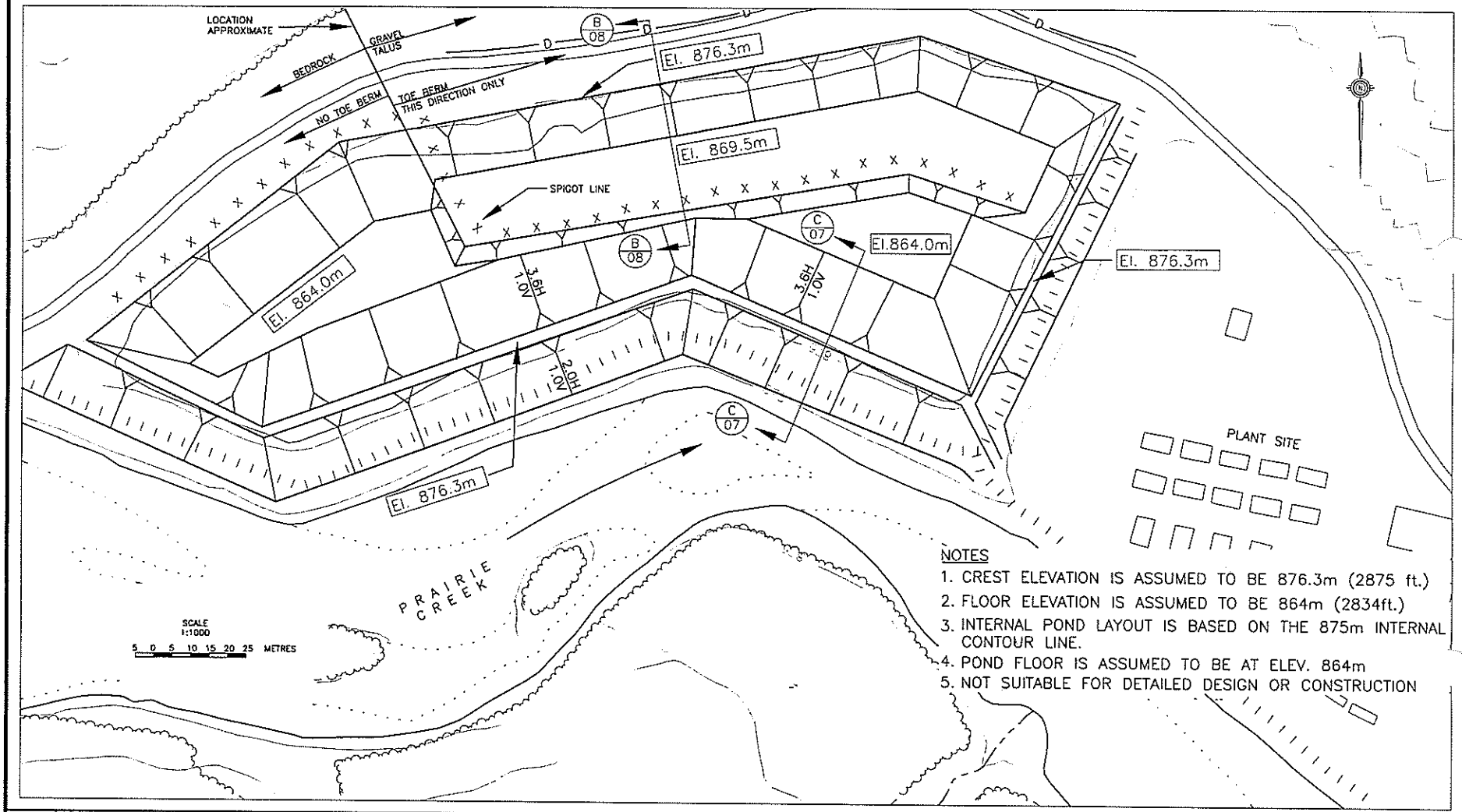

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PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS DAM REHABILITATION
PLAN VIEW – WORST CASE SCENARIO

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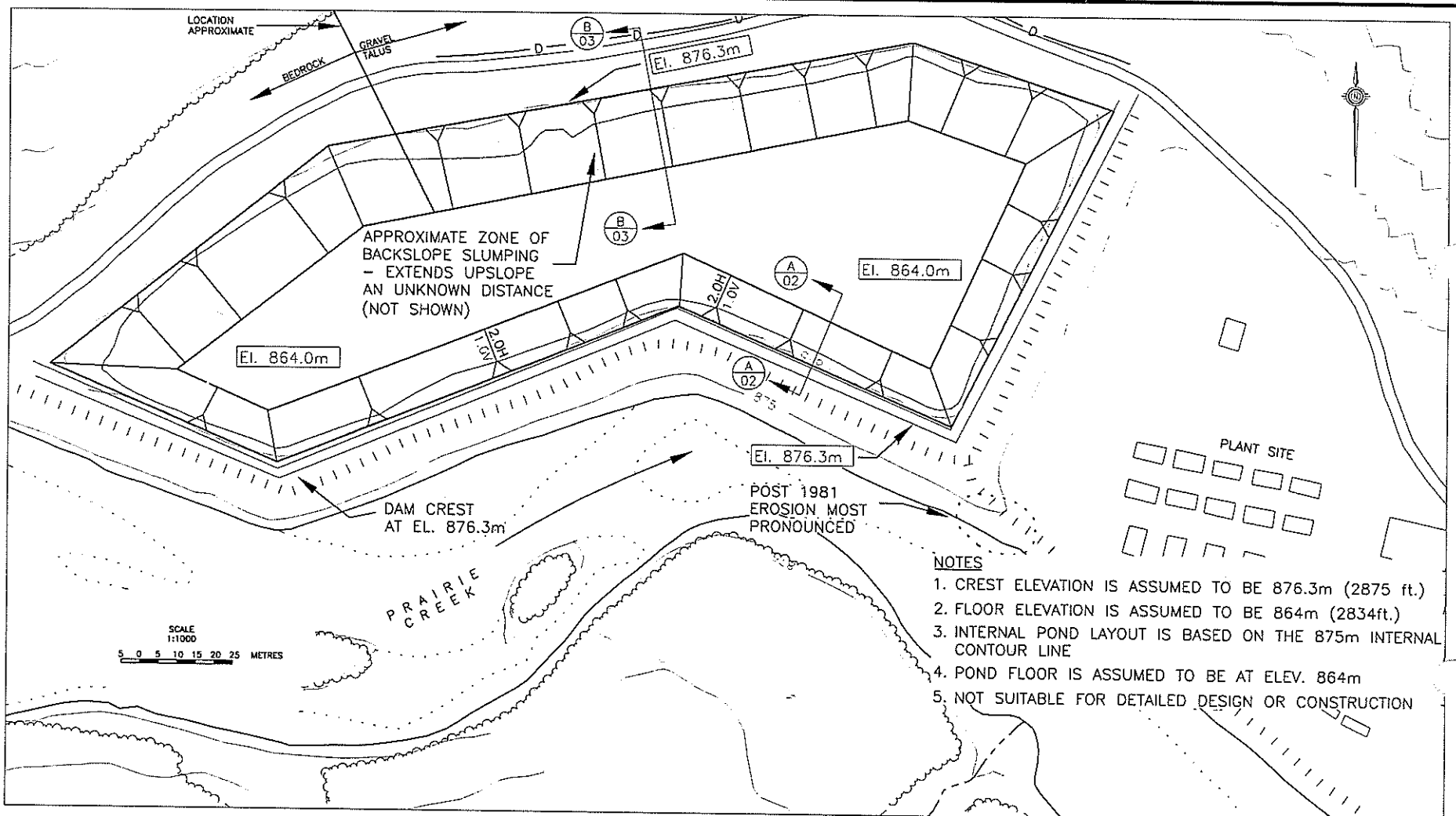

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CLIENT: CANADIAN ZINC CORPORATION

PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS DAM REHABILITATION
PLAN VIEW OF EXISTING POND

PROJECT No.	DWG. No.	REV.
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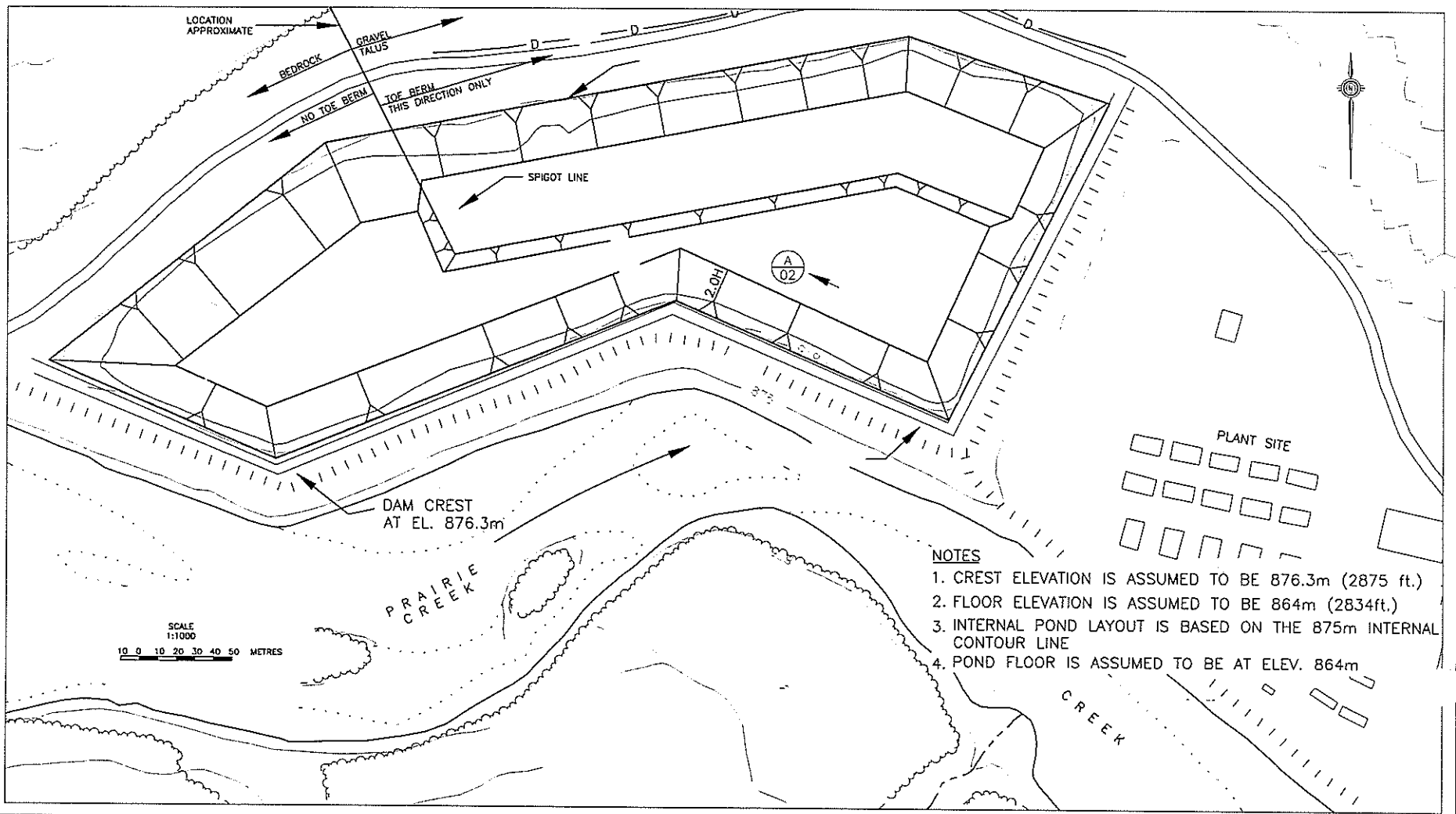

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CLIENT: CANADIAN ZINC CORPORATION

PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS DAM REHABILITATION
PLAN VIEW – MOST LIKELY SCENARIO

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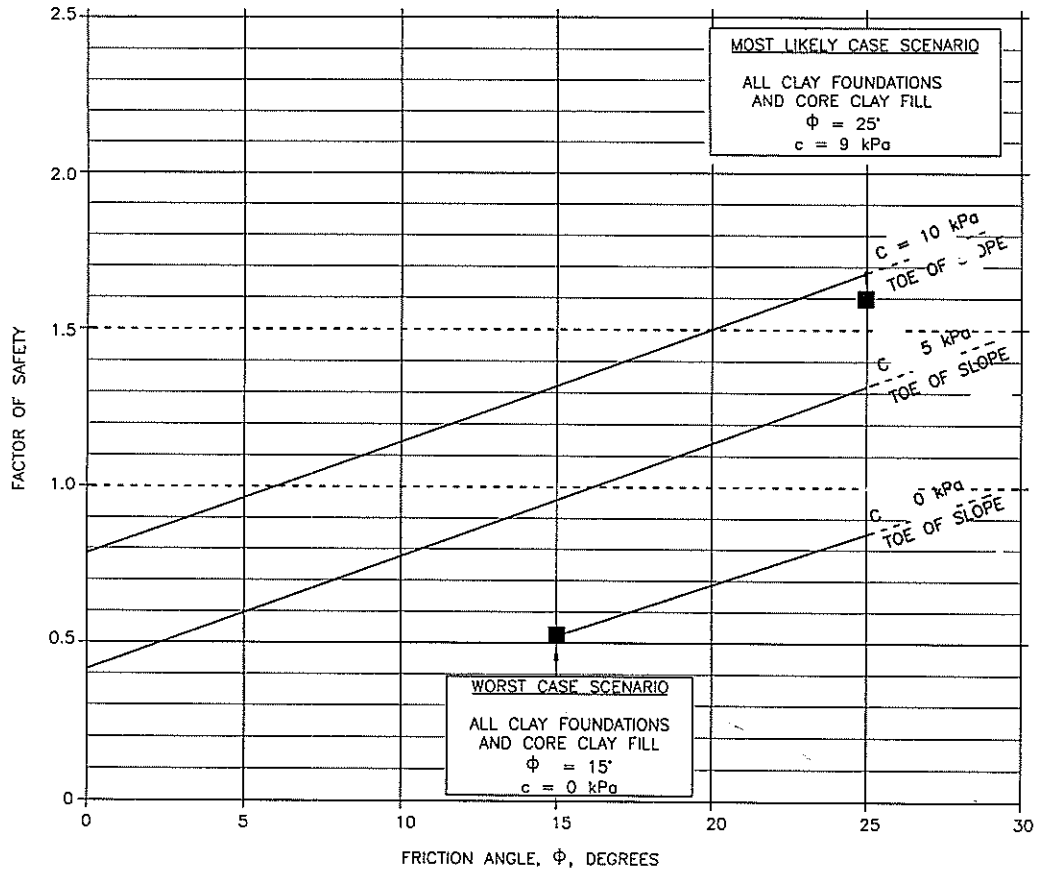
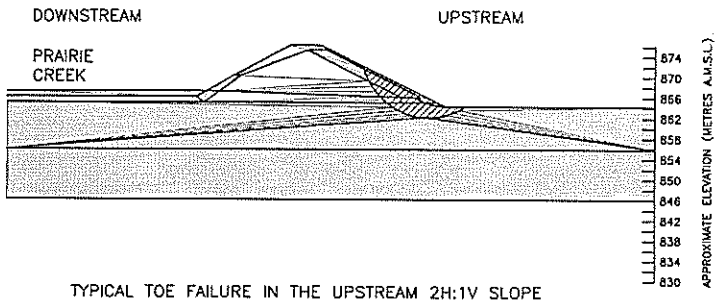
0059-002-04	05	C





TYPICAL TOE FAILURE IN THE UPSTREAM 2H:1V SLOPE OF THE EXISTING EMBANKMENT DAM

NOTE: NOT SUITABLE FOR DETAILED DESIGN OR CONSTRUCTION

REV.	DATE	REVISION	DRAWN	CHECKED	APPROVED
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DESIGNED:	RGT
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APPROVED:	

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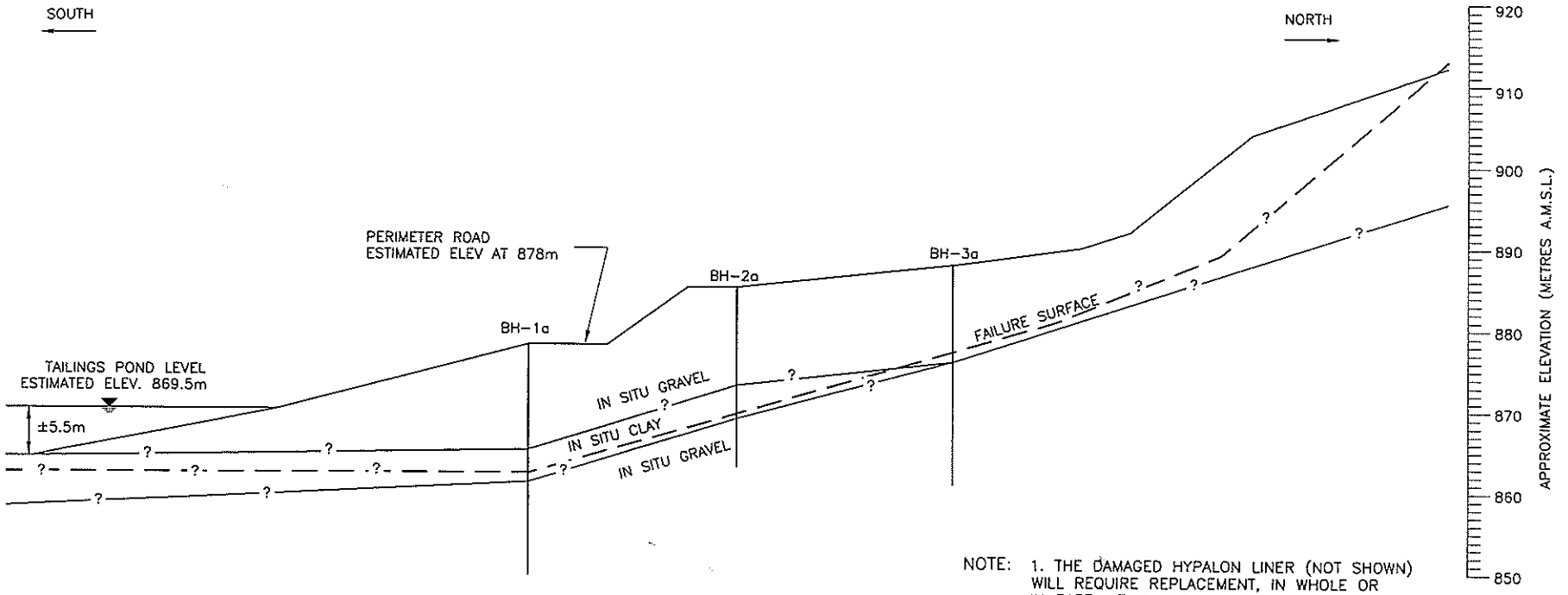
CLIENT: CANADIAN ZINC CORPORATION

PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS EMBANKMENT REHABILITATION
PRELIMINARY STABILITY ANALYSIS, UPSTREAM SLOPE 2H:1V

PROJECT No.	DWG. No.	REV.
0059-002-04	04	C



SECTION B 01

5 0 5 10 15 20 METRES

NOTE: 1. THE DAMAGED HYPALON LINER (NOT SHOWN) WILL REQUIRE REPLACEMENT, IN WHOLE OR IN PART. THIS DETAIL IS NOT SHOWN HERE.

2. NOT SUITABLE FOR DETAILED DESIGN OR CONSTRUCTION.

REV.	DATE	REVISION	DRAWN	CHECKED	APPROVED
		ISSUED FOR DISCUSSION			

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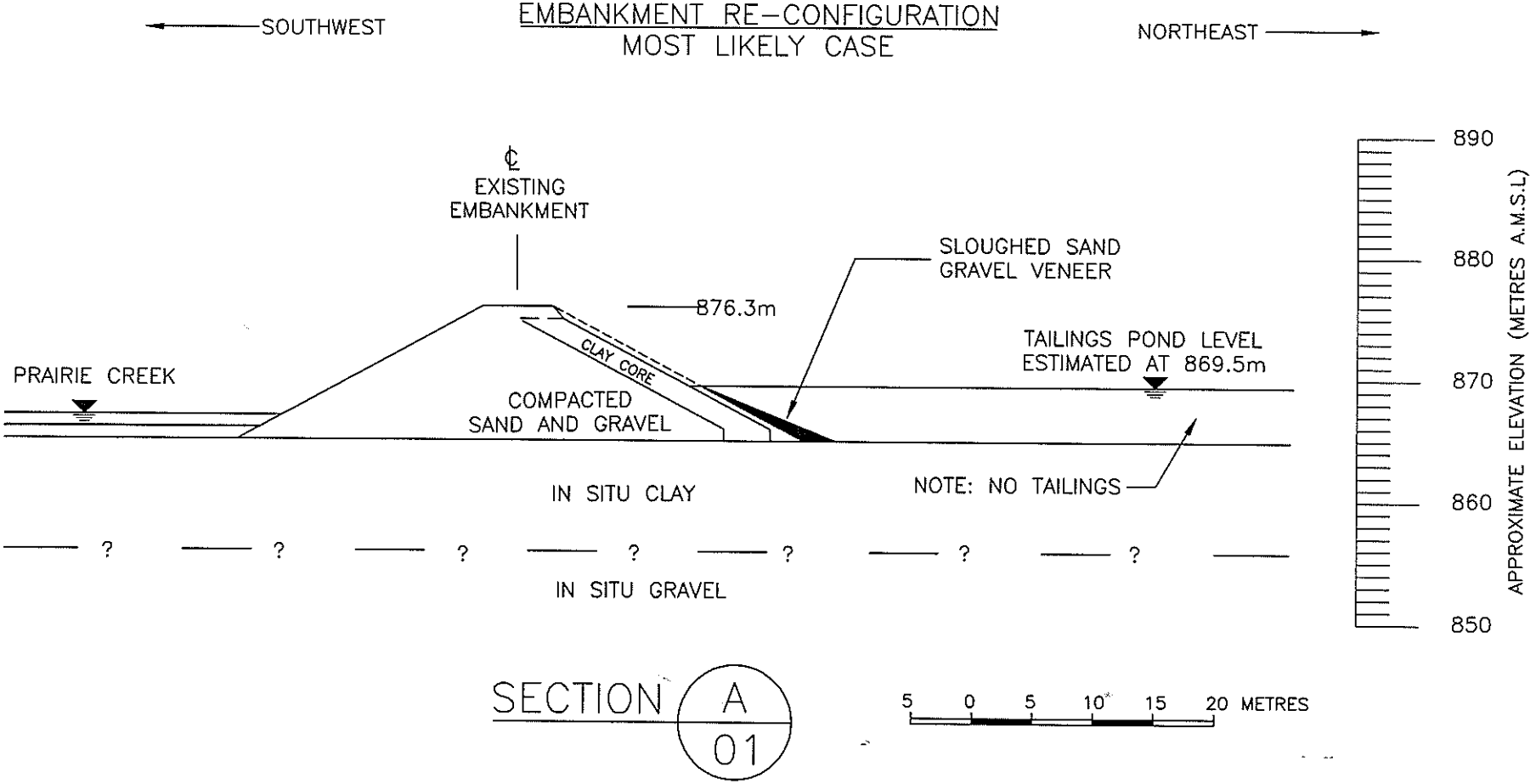
CLIENT: CANADIAN ZINC CORPORATION

PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS DAM REHABILITATION
SECTION B – SLOPE STABILITY

PROJECT No.	DWG. No.	REV.
0059-002-04	03	C

EMBANKMENT RE-CONFIGURATION
MOST LIKELY CASE



SECTION A 01

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Vancouver, B.C. Phone: (604) 684 5900

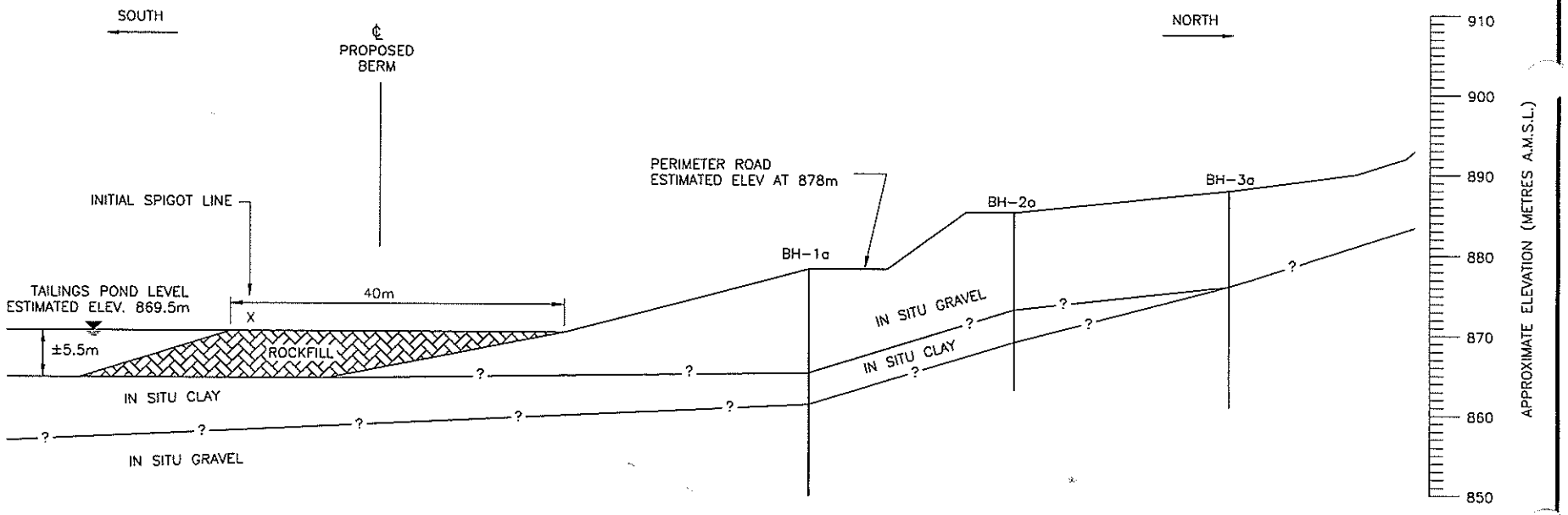
PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS EMBANKMENT REHABILITATION
SECTION A – EXISTING EMBANKMENT

CLIENT: CANADIAN ZINC CORPORATION

PROJECT No.	DWG. No.	REV.
0059-002-04	02	C

NOTE: THE DAMAGED HYPALON LINER MAY REQUIRE REPLACEMENT, IN WHOLE OR IN PART. THIS DETAIL IS NOT SHOWN HERE.



SECTION B
06 & 05

NOTE: NOT SUITABLE FOR DETAILED DESIGN OR CONSTRUCTION

REV.	DATE	REVISION	DRAWN	CHECKED	APPROVED
		ISSUED FOR DISCUSSION			

SCALE:	AS SHOWN
DATE:	30NOV00
DRAWN:	KB
DESIGNED:	RGT
CHECKED:	KWS
APPROVED:	

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
Vancouver, B.C. Phone: (604) 684 5900

CLIENT: CANADIAN ZINC CORPORATION

PROJECT: PRAIRIE CREEK MINE

TITLE: TAILINGS DAM REHABILITATION
SECTION B – BERM ADDED

PROJECT No.	DWG. No.	REV.
0059-002-04	08	C

CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date:	*July 5, 2001*
From:	*Lionel Marcinkoski,* *Government of the Northwest Territories, RWED* *Environmental Protection Services*
Subject:	*IR #2 - Water Quality*
Objective:	*To obtain further information regarding the management of mine water during and after the development of the proposed decline.*
Request:	*RWED requests information on the water quality monitoring program that is proposed for CZN, including sample frequency, parameters of interest, and QA/QC program. Details of the drainage collection systems for the underground development and surface waste rock piles are also requested.*

Response:

In the environmental management plan presented in the EA Report, CZN proposed monthly sampling of the minewater discharge during decline development and underground exploration drilling (p. 46).

Flow would be calculated on a daily basis based on pump operating time and discharge rate.

Specific parameters of interest would include:
pH, Alk, Cond, Hardness, TSS, SO4, NO2/NO3-N, T-As ,T-Cd, T-Ca, T-Cu, T-Hg, T-Mg, T-Pb, T-Ni, T-Zn.

A total metals scan would likely be employed to determine the total metal of particular interest as noted above which would also include elements such as:
T-Al, T-Sb, T-Ba, T-Be, T-Bi, T-B, T-Cr, T-Co, T-Fe, T-Li, T-Mn, T-Mo, T-P, T-K, T-Se, T-Si, T-Ag, T-Na, T-Sr, T-Tl, T-Sn, T-Ti, T-U, T-V.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Pilot Plant Environmental Assessment
Response to Information Request

Information Request:

Date: *July 5, 2001*

From: *Lionel Marcinkoski,*
Government of the Northwest Territories, RWED
Environmental Protection Services

Subject: *IR #3 - Predicted water quality in the tailings containment facility and for discharge to the environment*

Objective: *To permit a thorough assessment of the expected water quality impacts of the proposed development.*

Requests: *RWED requests information on the following water quality issues:*

1. *CNZ is asked to provide a discussion of the predicted geochemical characteristics of both the effluent water and tailings solids that will be produced as a result of the pilot plant process.*
2. *The proponent is asked to research and provide information on effluent quality from other lead zinc mines with similar operating conditions, eg, Cantung, Polaris, Nanisivik, Pine Point.*
3. *CZN is asked to discuss the water quality standards that they have used in reaching their determination that no adverse effects will occur as a result of the pilot plant development for the water volumes discussed on page 23 of the EAR. (e.g. Metal Mining Effluent Regulations, Canadian Council of Ministers of the Environment standards)*
4. *Has proponent conducted acute toxicity testing for water in tailings pond? Can the proponent predict toxicity results accounting for addition of effluent inflow from milling?*
5. *The proponent is asked to describe the current quality of the 225,000 m^3 of water in the present tailings facility and the geochemical characteristics of any tailings or other solids that are already in the tailings containment area.*
6. *RWED requests the proponent to submit evidence that the tailings containment area is competent to contain the current volumes and the proposed additional volumes of effluent over time. This could be accomplished through the conduct of a geotechnical assessment of the containment facility and an assessment of the integrity of the high density membrane by a Professional Engineer.*
7. *The proponent is asked to provide contingency plans for tailings containment facility failure, including a remediation plan.*
8. *CZN is asked to discuss any programs planned to monitor groundwater in the vicinity of the tailings containment area*

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CANADIAN ZINC CORPORATION

Response:

1. Results of analyses of tailings liquid effluent and solids generated from bench scale metallurgical testwork are attached.

2. CZN does not have ready access to effluent quality results from other lead zinc mines. Such information would have been submitted to DIAND from Surveillance Network Program data collected pursuant to the respective Water Licences. CZN requested DIAND on August 2, 2001 to supply such information from Polaris, Nanisivik and Pine Point, if available, directly to the MVEIRB. Cantung is a tungsten mine and therefore not a relevant comparison.

   It should be noted, however, that effluent characteristics are typically very site-specific and may vary considerably from one operation to another depending on the mineralogy of the ore body, metallurgical process, etc. Results from the bench scale testwork provided under response #1 above are therefore considered to be the most representative of effluent quality expected to be produced from the pilot plant program.

3. The determination that no adverse effects will occur on water quality as a result of the pilot plant program was based primarily on the fact that there will be no direct discharge of effluent to the receiving environment, as opposed to a comparison of effluent quality to any specific receiving water quality objectives. Given that there will be no discharge, there is limited potential for any significant adverse impact on downstream water quality.

   The tailings impoundment currently contains approximately 225,000 m^3 of water. The pond was originally filled with water pumped from Prairie Creek. Since that time, contributions to the pond have been limited to direct precipitation, surface runoff and groundwater infiltration. The level of the pond has been observed over a number of years to fluctuate very little indicating that an equilibrium level has been established. There has been no analysis of the water contained within the impoundment because no effluent has been discharged into the impoundment and the quality of water should therefore closely reflect that of Prairie Creek and the local hydrologic regime from which the water originated.

   The pond is lined with an impervious clay layer on the bottom, the interior face of the dam, and up the backslope. The clay layer underlying the pond was investigated at the time of construction in 1980 and found to be between 22.5 and 31.5 feet in thickness. The clay liner installed on the upstream face of the dam at the time of construction also remains intact despite sloughing of the overlying gravel protection layer shortly after that time. The extent of the natural clay liner rising up the backslope above the level of

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the water in the pond was documented in rehabilitation work conducted by Bruce Geotechnical in 1994, suggesting that the synthetic Hypalon liner originally installed was likely not necessary. In fact, the synthetic liner has not been intact for a number of years and no seepage has been detected from the impoundment indicating that the integrity of the clay seal remains intact.

The hydraulic conductivity of the clay has been estimated at 10^{-8} cm/sec, essentially making the impoundment "watertight" and isolating its contents from the underlying floodplain aquifer. Golder estimated seepage from the pond when filled to capacity at 873m, based on the hydraulic conductivity of the clay, at somewhere in the order of only 7 to 14 m^3 per year. Given that the pond level, even after receiving inputs of all water from the proposed developments, would still remain 5m below this level, seepage would be expected to be even less than this amount.

The attached pond water chemistry model compares the water quality characteristics of the tailings effluent to that of Prairie Creek, which is assumed to be representative of the pond water. Based on the respective volumes of each, the available 50 to 1 dilution achieved within the tailings impoundment will reduce the contaminant concentrations to levels lower than discharge standards as set in the original Prairie Creek water licence and the MMLER.

4. No toxicity tests have been conducted on water within the tailings impoundment, since as stated above, the water originated from Prairie Creek and inputs since have been all natural precipitation and runoff. As discussed above, the 50 to 1 dilution available in the impoundment will lower the effluent levels to a point below discharge standards. Based on comparison to Canadian Water Quality Guidelines for protection of Freshwater Aquatic Life the model would indicate that the contained pond water would be non-toxic.

5. As discussed above, the quality of the water in the tailings impoundment has not been tested but is expected to be similar to that of Prairie Creek. The tailings impoundment has never been used for tailings disposal. As a result, it contains no tailings solids. The impoundment was constructed of in-situ materials excavated locally.

6. CZN commissioned Bruce Geotechnical, professional geotechnical engineers, to conduct a geotechnical assessment, evaluate the condition of the impoundment and recommend rehabilitation measures for the impoundment to accommodate full-scale mining operations and tailings disposal. A copy of their report "Prairie Creek Mine Tailings Facility – Summary of Past Work and Preliminary Recommendations for Rehabilitation" dated December 18, 2000 is attached, as well as a letter from BGC dated August 16, 2001 commenting on the suitability of the structure for the proposed uses. BGC considers the impoundment to be stable in its present form and suitable for

the proposed uses. As stated above, the synthetic Hypalon liner has not been intact for a number of years and has been determined by BGC due to the presence of the underlying natural clay liner extending up the back slope to likely not be necessary.

7. The BGC report outlines a program of geotechnical investigation to be undertaken prior to development of the final rehabilitation program and prior to use of the impoundment for tailings disposal associated with full-scale operations. This will be done in conjunction with other feasibility work prior to submission of the detailed environmental assessment reports in support of operating permits and licences.

   During the proposed developments the impoundment will be inspected on a daily basis for any signs of instability. Any indication of instability will be reported to the geotechnical engineers immediately and a response plan developed. Canadian Zinc has sufficient heavy equipment on-site to effect such a response. CZN has developed a Safety and Procedures Manual, which has been filed with DIAND and with the MVEIRB in support of these assessments, which details responsibilities and the process for implementing remediation in the case of spills or other emergency situations.

   It is important to recognize that the pond has been in place and containing roughly the equivalent amount of water for the past 20 years without any indication of failure or deterioration of stability.

8. CZN does not have any plans to monitor groundwater specifically in conjunction with the pilot plant operation, as this is considered to be unwarranted given the magnitude of the proposed development, including the relatively sort duration of the program, small volume of process water involved relative to the existing volume of water in the tailings facility, low contaminant levels predicted to be present in the pond and the absence of any detectable seepage from the pond to date, all of which combined result in a very limited potential for significant impacts to groundwater quality as a result of the proposed development.

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Prairie Creek Mine

Tailings Effluent Characterization - Liquid Fraction

DATE	Sample ID	TOTAL METALS (mg/l) T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
1994	474-1	< 0.20	< 0.20	< 0.20	0.028	< 0.005	< 0.10	< 0.10	0.051	106	< 0.015	< 0.015	0.117	0.038	0.108	0.168	< 0.015	8.77	0.19	< 0.030	< 0.020	< 0.30	2.8	< 0.20	0.61	0.069	44.9	0.201	< 0.10	< 0.30	< 0.010	< 0.10	< 0.030	0.881
1994	474-2	< 0.20	< 0.20	< 0.20	0.049	< 0.005	< 0.10	< 0.10	< 0.010	296	< 0.015	< 0.015	< 0.010	< 0.030	0.001	0.507	< 0.015	0.07	< 0.005	0.043	< 0.020	< 0.30	4.1	< 0.20	0.27	< 0.015	11.8	0.284	< 0.10	< 0.30	< 0.10	< 0.10	< 0.030	0.164
1994	474-5	< 0.20	< 0.20	< 0.20	0.033	< 0.005	< 0.10	< 0.10	0.012	233	< 0.015	< 0.015	0.026	< 0.030	0.010	0.120	0.017	5.95	0.008	< 0.030	< 0.020	< 0.30	4.4	< 0.20	< 0.05	< 0.015	174	0.397	< 0.10	< 0.30	< 0.10	< 0.10	< 0.030	0.159
MAXIMUM		0.20	0.20	0.2000	0.049	0.005	0.10	0.10	0.051	296	0.015	0.015	0.117	0.038	0.108	0.507	0.017	8.77	0.190	0.043	0.020	0.30	4.4	0.2000	0.61	0.069	174	0.397	0.10	0.30	0.100	0.10	0.030	0.881
MINIMUM		0.20	0.20	0.2000	0.026	0.005	0.10	0.10	0.010	106	0.015	0.015	0.010	0.030	0.001	0.120	0.015	0.07	0.005	0.030	0.020	0.30	2.8	0.2000	0.05	0.015	11.8	0.201	0.10	0.30	0.010	0.10	0.030	0.159
AVERAGE		0.20	0.20	0.2000	0.036	0.005	0.10	0.10	0.024	212	0.015	0.015	0.051	0.033	0.040	0.265	0.016	4.93	0.068	0.034	0.020	0.30	3.8	0.2000	0.31	0.033	76.9	0.294	0.10	0.30	0.070	0.10	0.030	0.401
STD DEV		0.00	0.00	0.0000	0.012	0.000	0.00	0.00	0.023	97	0.000	0.000	0.058	0.005	0.059	0.211	0.001	4.44	0.106	0.008	0.000	0.00	0.9	0.0000	0.28	0.031	85.7	0.098	0.00	0.00	0.052	0.00	0.000	0.415
VARIANCE		0.00	0.00	0.0000	0.000	0.000	0.00	0.00	0.001	9366	0.000	0.000	0.003	0.000	0.004	0.044	0.000	19.7	0.011	0.000	0.000	0.00	0.72	0.0000	0.08	0.001	7345	0.010	0.00	0.00	0.003	0.00	0.000	0.173

Analyses conducted on decant from locked cycle tests - 474-1 Vein; 474-2 Stratabound; 474-5 Vein

Surface Water Quality - Prairie Creek upstream at airstrip- Stn. 932-7

DATE	Sample ID	TOTAL METALS T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
05/27/75	diand			< 0.01					< 0.001	33	< 0.01	0.003	< 0.001	0.115		< 0.004			0.014	< 0.05	< 0.002	0.04	0.3		2.3		0.6							0.007
07/05/75	diand								< 0.01	47	< 0.01	< 0.01	< 0.001	< 0.05		< 0.005			< 0.01	< 0.05	< 0.005	< 0.005	0.41		3.3		1.4							0.012
08/06/75	diand			< 0.010					< 0.001	40	< 0.010	< 0.001	0.002	1.640		< 0.005			0.05	< 0.050	0.005	0.01	0.4		3.20		1.2							0.020
07/22/80	beak			< 0.005					< 0.005	47	< 0.010		0.006	0.030	< 0.00025	0.039		17.0		0.002	0.011													0.024
04/18/80	beak			< 0.005					< 0.005	36	< 0.01		0.005	0.065		< 0.0100		26.0		< 0.050	0.015		0.7				1.7							< 0.005
08/23/83	diand			0.015					< 0.00005	57	0.0009		< 0.0005	0.0052	0.00002	< 0.0001		18.7			0.0022						1.0							< 0.005
06/30/92	diand			< 0.0002					< 0.0002	48	0.002	0.005	0.002	0.037		< 0.001		18.7			< 0.001													0.006
09/15/93	diand			< 0.0003					< 0.0002	55	0.001	< 0.0020	0.0010	0.003		0.0023		24.1			0.0010													0.004
06/15/95	diand			< 0.0003					0.0001	50	0.0042	< 0.000	< 0.0001	0.003		0.0002		19.2	0.0003		0.0015		0.6				2.1							< 0.005
08/18/99	diand			< 0.0002					< 0.0003		< 0.003	< 0.001	< 0.002	< 0.030	< 0.00001	< 0.0010			< 0.001		0.002													< 0.010
MAXIMUM				0.0150					0.0100	57	0.010	0.010	0.006	1.640		0.039		26.00	0.050	0.050	0.015	0.04	0.7		3.30		2							0.02
MINIMUM				0.0002					0.0001	33	0.001	0.000	0.000	0.003		0.000		17.00	0.000	0.002	0.001	0.01	0.3		2.30		0.6							0.004
AVERAGE				0.0051					0.0023	46	0.006	0.003	0.002	0.198	0.00009	0.007		20.62	0.015	0.040	0.005	0.02	0.5		2.93		1.3							0.010
STD DEV.				0.0055					0.0033	8	0.004	0.003	0.002	0.506		0.012		3.57	0.020	0.021	0.005	0.02	0.2		0.55		0.5							0.01
VARIANCE				0.0000					0.0000	65	0.000	0.000	0.000	0.258		0.000		12.7	0.000	0.000	0.000	0.00	0.03		0.30		0							0.00

Tailings Pond Water Chemistry at 50 parts Prairie Creek water to 1 part Tailings effluent

	Sample ID	TOTAL METALS (mg/l) T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
	Average			0.009					0.0027	49	0.0063	0.0034	0.00302	0.195	0.00087	0.0118		20.31	0.0161	0.04	0.005	0.02	0.55		2.88		2.82							0.017
	Minimum			0.004					0.0002	34	0.0012	0.0004	0.00029	0.004	0.00001	0.0025		16.67	0.0004	0.003	0.001	0.01	0.35		2.26		0.82							0.007
	Maximum			0.019					0.0108	61	0.010	0.0101	0.00818	1.609	0.00212	0.0482		25.66	0.0527	0.05	0.015	0.04	0.78		3.25		5.48							0.041
Comparison to Discharge Limits and Guidelines																																		
N3L3-0932	average			0.15					0.015		0.15		0.075		0.0015	0.150					0.20													0.30
	maximum			0.30					0.03		0.30		0.15		0.0030	0.300					0.40													0.60
MMLER				1.0									0.60			0.400					1.00													1.00
CWQG-FAL				0.05					0.0018		0.02		0.004	0.30		0.007					0.15													0.03

N3L3-0932 = Prairie Creek Water Licence issued July 1, 1982
MMLER = Metal Mining Liquid Effluent Regulations
CWQG-FAL = Canadian Water Quality Guidelines - Fresh Water Aquatic Life

Prairie Creek Mine
Tailings Effluent Characterization - Liquid Fraction

DATE	Sample ID	TOTAL METALS (mg/l)																																
		T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Ti	T-Sn	T-Ti	T-W	T-V	T-Zn
1994	474-1	< 0.20	< 0.20	< 0.20	0.026	< 0.005	< 0.10	< 0.10	0.051	106	< 0.015	< 0.015	0.117	0.038	0.108	0.168	< 0.015	8.77	0.19	< 0.030	< 0.020	< 0.30	2.8	< 0.20	0.61	0.069	44.9	0.201	< 0.10	< 0.30	< 0.010	< 0.10	< 0.030	0.881
1994	474-2	< 0.20	< 0.20	< 0.20	0.049	< 0.005	< 0.10	< 0.10	< 0.010	296	< 0.015	< 0.015	< 0.010	< 0.030	0.001	0.507	< 0.015	0.07	< 0.005	0.043	< 0.020	< 0.30	4.1	< 0.20	0.27	< 0.015	11.8	0.284	< 0.10	< 0.30	< 0.10	< 0.10	< 0.030	0.164
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MAXIMUM		0.20	0.20	0.2000	0.049	0.005	0.10	0.10	0.051	296	0.015	0.015	0.117	0.038	0.108	0.507	0.017	8.77	0.190	0.043	0.020	0.30	4.4	0.2000	0.61	0.069	174	0.397	0.10	0.30	0.100	0.10	0.030	0.881
MINIMUM		0.20	0.20	0.2000	0.026	0.005	0.10	0.10	0.010	106	0.015	0.015	0.010	0.030	0.001	0.120	0.015	0.07	0.005	0.030	0.020	0.30	2.8	0.2000	0.05	0.015	11.8	0.201	0.10	0.30	0.010	0.10	0.030	0.159
AVERAGE		0.20	0.20	0.2000	0.036	0.005	0.10	0.10	0.024	212	0.015	0.015	0.051	0.033	0.040	0.265	0.016	4.93	0.068	0.034	0.020	0.30	3.8	0.2000	0.31	0.033	76.9	0.294	0.10	0.30	0.070	0.10	0.030	0.401
STD.DEV.		0.00	0.00	0.0000	0.012	0.000	0.00	0.00	0.023	97	0.000	0.000	0.058	0.005	0.059	0.211	0.001	4.44	0.106	0.008	0.000	0.00	0.9	0.0000	0.26	0.031	85.7	0.098	0.00	0.00	0.052	0.00	0.000	0.415
VARIANCE		0.00	0.00	0.0000	0.000	0.000	0.00	0.00	0.001	9366	0.000	0.000	0.003	0.000	0.004	0.044	0.000	19.7	0.011	0.000	0.000	0.00	0.72	0.0000	0.06	0.001	7345	0.010	0.00	0.00	0.003	0.00	0.000	0.1

Analyses conducted on decant from locked cycle tests - 474-1 Vein, 474-2 Stratabound, 474-5 Vein

Prairie Creek Mine
Tailings Effluent Characterization - Solids Fraction

DATE	Sample	TOTAL METALS (ug/g)																	
	ID	T-Al	T-As	T-Ba	T-Cd	T-Ca	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Mg	T-Mn	T-Ni	T-Sr	T-Th	T-Ti	T-U	T-V	T-Zn
09/09/80	Final Tails Composite KN 019	30000	292	500	253	20000	30	1300	30000	73	18500	20000	626	13	73	<2	900	3.2	49	33000

Prairie Creek Mine
Mine Water Quality - 870m (2850') Portal - Stn. 932-9

DATE	Sample ID	flow	pH	Alk	Cond	Hardness	TSS	SO4	NO2/NO3	TOTAL METALS (mg/l) T-Al	T-Sb	T-As	T-Ba	T-Be	T-Bi	T-B	T-Cd	T-Cl	T-Ca	T-CN	T-Cr	T-Co	T-Cu	T-Fe	T-Hg	T-Pb	T-Li	T-Mg	T-Mn	T-Mo	T-Ni	T-P	T-K	T-Se	T-Si	T-Ag	T-Na	T-Sr	T-Tl	T-Sn	T-Ti	T-W	T-V	T-Zn
4/19/60	beak**		8.3	262	752		4	160				0.024					< 0.005		65		< 0.01		0.005	< 0.01		< 0.01		43.0		< 0.05	0.007		1.2				0.38							0.15
7/22/60	beak*		8.0	262	831		386	220	1.9			0.002					0.031		88		< 0.01		0.086	4.2	0.0035	0.27		44		< 0.02	0.057		1.87				2.1							7.7
6/27/83	diand		8.0		850		< 5		0.16			0.0025					0.020				< 0.0005		0.050	< 0.005		0.0075					0.001												6.9
8/23/83	diand		7.8		900		< 5		0.07			0.0063					0.009				0.0015		0.061	0.051	0.0001	0.013					0.012												10.0
2/25/84	diand																																										
9/13/84	diand		8.8	310	1000	373	5	240				0.0042					0.0068	1.1	66.6				0.0166	0.02		0.08		50.2			0.094		< 0.5				81.3							3.2
06/30/92	diand		7.5	248	950	557	< 3					0.0008					0.075		12.7		0.010	< 0.01	0.098	0.045		0.027		58.3			0.017													15.2
09/15/93	diand		7.7	254	936	540	< 3					< 0.0003					0.0169		121		0.0001	< 0.0002	0.047	0.028		0.0253		58.0			0.017													9.1
7/7/94	sarc/ast									< 0.20	< 0.20	< 0.20	0.033	< 0.005	< 0.10	< 0.10	0.043		110		< 0.015	< 0.015	0.012	< 0.030		< 0.050	< 0.015	54.3	0.028	< 0.030	< 0.20	< 0.30	< 2.0	< 0.20	1.82	< 0.015	3.9	0.310	< 0.10	< 0.30	< 0.010	< 0.10	< 0.030	1.9
7/7/94	sarc/ast									< 0.20	< 0.20	< 0.20	0.029	< 0.005	< 0.10	< 0.10	0.041		109		< 0.015	< 0.015	0.010	< 0.030		< 0.050	< 0.015	56.0	0.028	< 0.030	< 0.20	< 0.30	< 2.0	< 0.20	1.76	< 0.015	6.3	0.315	< 0.10	< 0.30	< 0.010	< 0.10	< 0.030	1
07/31/94	morin	10 l/s	7.7	250	1100	390	5	240	0.03	0.00	0.09	0.00	0.035	2E-04		0.00	0.064	0.500	154		0.0003	0.0003	0.052	0.005	0.00004	0.040		74.2	0.009	0.002	0.02	0.00	1.2	0.00		0.000005	1.0				0.00	0.001	1
06/15/95	diand		7.7	275	1010	567		320				0.0011					0.0416	0.80	134		< 0.0002	0.0002	0.0250	0.019		0.0213		56.5	0.0048		0.0169	0.65					0.9							L
08/16/99	diand		7.9	271	1110		12		0.19			0.0013					0.0538			< 0.003	< 0.003	< 0.001	0.0345	< 0.030	< 0.00001	0.0254			0.0061		0.0147												9.8
MAXIMUM			8.8	310	1110	567	386	320	1.90	0.20	0.20	0.2000	0.035	0.005	0.10	0.10	0.0637		164		0.015	0.015	0.098	4.200	0.004	0.270	0.015	74.20	0.028	0.050	0.200	0.65	2.0	0.2000	1.82	0.015	51	0.315	0.10	0.30	0.010	0.10	0.030	15.60
MINIMUM			7.5	248	752	373	3	160	0.03	0.00	0.09	0.0003	0.029	0.005	0.10	0.00	0.0050		13		0.000	0.000	0.005	0.005	0.000	0.008	0.015	43.00	0.005	0.002	0.001	0.00	0.5	0.0030	1.76	0.000	0.4	0.310	0.10	0.30	0.010	0.00	0.001	0.15
AVERAGE			7.8	270	944	465	48	240	0.47	0.13	0.16	0.0371	0.032	0.003	0.10	0.07	0.0366		97		0.006	0.006	0.042	0.373	0.001	0.052	0.015	54.94	0.011	0.026	0.054	0.36	1.5	0.1343	1.79	0.010	13.7	0.313	0.10	0.30	0.010	0.07	0.020	7.44
STD.DEV.			0.4	19	115	96	127	51	0.80	0.12	0.06	0.0763	0.003	0.003	0.00	0.06	0.0265		45		0.005	0.007	0.031	1.205	0.002	0.072	0.000	9.22	0.010	0.017	0.073	0.35	0.6	0.1137	0.04	0.009	29.9	0.004	0.00	0.00	0.000	0.06	0.017	5.11
VARIANCE			0.1	371	13321	9131	16115	2600	0.64	0.01	0.00	0.0058	0.000	0.000	0.00	0.00	0.0007		1982		0.000	0.000	0.001	1.453	0.000	0.005	0.000	85.0	0.000	0.000	0.005	0.13	0.36	0.0129	0.00	0.000	693	0.000	0.00	0.00	0.000	0.00	0.000	26.14

** April 18, 1960 minewater sample identified as from 3050' level (930m)

CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date: *July 25, 2001*

From: *Chuck Blyth, Nahanni National Park Reserve, Parks Canada Agency*

Subject: *IR #1 - Accidental Releases and Malfunctions*

Objective: *To permit a thorough assessment of the procedures and mitigation to be implemented by CZN to ensure that the accidental release of petroleum products does not result in the contamination of Prairie Creek and significant adverse effects to the ecological integrity of the South Nahanni River and Nahanni National Park Reserve.*

Request: *Parks Canada requests information on the following fuel storage issues:*

- *CNZ is asked to provide an indication as to whether or not these tanks comply with existing regulations for the storage of petroleum products both above-ground and below-ground. This is of particular concern to Nahanni NPR since our records indicate that inadequate fuel storage tanks were used in the past and resulted in the accidental release of 24,000 gallons of diesel fuel. The tanks in use were 15-year old bolted style fuel tanks which would not meet current approvals.*
- *The proponent is asked to provide information on the existing volume of petroleum product in each of the storage tanks (both above and below ground).*
- *CZN is asked to provide evidence that the berm around the fuel farm meets existing regulatory requirements for petroleum product storage (including confirmation of impermeability, a fully functional recovery pumping system and containment sump).*
- *Although Canadian Zinc currently has a fuel contingency plan, the items contained in the spill kit would be totally inadequate in the event of the accidental release of one of the larger tanks. CZN is asked to provide evidence of immediate response capability in the event of a significant release of petroleum product.*

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Response:

This information request pertains to existing facilities currently in place at the Prairie Creek minesite and that have been so for the past 20 years. The applications before the Board for assessment requests no authorization for changes or additions to these facilities as part of the proposed developments. The applications are for activities not directly related to these facilities.

In carrying out the proposed developments CZN will make beneficial use of the contents of the fuel storage facilities, thereby lowering the stored volume and reducing the potential risks associated with accidents and malfunctions. The facilities in question will remain in place regardless of whether or not the proposed developments proceed.

As a result of the foregoing, this IR is considered to be beyond the scope of the current assessment of the potential impacts of the developments as proposed.

CZN appreciates NNPR's concerns with respect to the potential for accidents and malfunctions relating to the existing fuel storage facilities, and in the interests of cooperative information exchange and as a courtesy to reviewers offer the following comments for information purposes.

We note that much of the information being requested by NNPR was previously provided by CZN in our response of February 26, 2001 to an IR from GNWT-RWED dated February 9, 2001 concerning the proposed Cat Camp Fuel Recovery Program. The text of this response is provided once again as follows:

> "The fuel storage tank systems at the Prairie Creek minesite were registered on May 21, 1998 in accordance with the Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands Regulations promulgated pursuant to the Canadian Environmental Protection Act.
>
> The CCME Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products was published in August, 1994. The fuel storage tank systems at the Prairie Creek minesite, constructed in 1981, constitute an Aboveground Storage Tank System in existence before the date the Code was adopted by the authority having jurisdiction. At this time the Prairie Creek fuel storage systems have not been upgraded to conform to the requirements for the Design and Installation of New Aboveground Storage Tank Systems under Part 3 of the CCME Code of Practice. The Code allows 15 years from the date the authority having jurisdiction adopts the Code, to upgrade existing systems to meet the requirements for new systems. In the NWT, the authority having jurisdiction for the Code is the Office of the Fire Marshall under the Department of Municipal and Community Affairs.

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The most recent edition of the National Fire Code of Canada was published in 1995. The NFC has been adopted and is in force under the Fire Prevention Regulations issued pursuant to the Fire Prevention Act of the NWT. At this time the Prairie Creek fuel storage systems have not been upgraded to conform with any applicable requirements of the NFC.

The tank farm consists of 4 heavy gauge welded steel tanks each approximately 49 feet in diameter by 32 feet high. Each tank has a capacity of 1.7 million litres for a total capacity of 6.8 million litres. The tanks currently contain a total of approximately 1.726 million litres of diesel, leaving a residual capacity of over 5.0 million litres.

The proposed Cat Camp fuel recovery program would only result in an addition of approximately 170,000 litres added to the tank farm. This equates to about a 10% increase in the contained volume of the farm, for a total of 1.896 million litres, leaving a residual capacity of about 4.9 million litres.

The tank farm is contained within a berm lined with impermeable clay. The berm was designed to contain a minimum of the entire capacity of one tank (1.7 million litres), plus 10% of the capacity of the remaining tanks (510,000 litres), for a total of 2.2 million litres.

The fuel tank farm is routinely inspected by CZN personnel as part of ongoing care and maintenance activity on the property. The tanks exhibit no signs of leakage and appear to be structurally sound.

An Inspection Audit report by a Geotechnical Engineer and Mechanical Engineer of the tankage, hardware and containment areas has not been conducted and is therefore not available. No non-destructive testing of the fuel tank storage system has been conducted to date. No non-destructive testing is currently planned in advance of the proposed fuel recovery program.

The current program involves the addition of only a small proportion (10%) of the existing contained volume of the tank farm and therefore does not in itself warrant comprehensive testing and upgrading of the storage tank systems. The main tank farm at Prairie Creek is a much more secure and structurally sound containment system than that currently in place at Cat Camp.

As part of its redevelopment plans and prior to recommencement of operations at the Prairie Creek Mine, CZN will engage the services of a qualified engineering firm to conduct the necessary non-destructive testing and upgrade the storage tank system to meet current requirements. At the present time the remote location, lack of road access

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and limited availability of equipment make undertaking such upgrades logistically difficult and very expensive. In the meantime, CZN will continue to monitor the condition of the tank farm as part of its ongoing care and maintenance programs, and undertake such mitigative and preventive measures as necessary to ensure the integrity of the system.

A copy of the Prairie Creek Emergency Spill Response Plan as submitted to DIAND and recently updated for 2000 – 2001 is appended."

In regards to the question of "immediate response capability", with its large inventory of heavy equipment and other industrial equipment and supplies available on site, the Prairie Creek mine is likely in a better position to respond to an emergency situation than most small communities. In fact, it is not unusual for mining operations to be called upon to assist nearby communities in such cases for this very reason.

As noted above, the tank farm berm is designed to retain in excess of the capacity of the largest tank. The fact that water is retained behind the berm demonstrates its impermeable nature. Water that collects inside the berm from snowmelt and precipitation is routinely pumped out by care and maintenance personnel. As a result, any significant release should be contained within the berm, as provided for in the design of the facilities, making for relatively easy recovery for which the Prairie Creek Mine has the capability.

CZN will continue to work closely with the GNWT to ensure the fuel storage facilities conform with the requirements.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date: *July 25, 2001*

From: *Chuck Blyth, Nahanni National Park Reserve, Parks Canada Agency*

Subject: *IR #2 - Cumulative Effects of Infrastructure Use*

Objective: *To permit a thorough assessment of the cumulative effects of increasing number of staff using the same facilities for accommodation, and the use of ancillary facilities including the landing strip*

Request: *Parks Canada requests information on the following fuel storage issues:*

1. *CNZ is asked to provide an indication that the wastewater facilities meet current environmental standards.*

2. *CZN is requested to provide a description of solid waste management practices, including need for storage and nuisance animal control.*

3. *CZN should provide a of human/wildlife interactions, particularly with increasing numbers of staff on site, as well as increased hunting/poaching opportunities, and the mitigation that will be applied.*

4. *Canadian Zinc is requested to provide an estimate of air traffic volume using the airstrip and to describe any impact that this activity may have on wildlife and on the wilderness experience of visitors to Nahanni National Park Reserve.*

5. *CZN is requested to provide a description of any upgrading, if required, to the airstrip and to describe fuel storage methods, volumes, and associated mitigation measures.*

6. *Canadian Zinc should provide an estimate of the loading to the South Nahanni watershed from the combined operations of the*

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Cantung mine, the Prairie Creek mine and the Howard's Pass prospect. Since the information gathered on the water quality of the South Nahanni River provides good baseline information for any future inputs that could adversely affect water quality in the future, CZN should describe the monitoring program that they will implement to ensure that the water quality of the South Nahanni River is not adversely impacted by the operation of its mine.

7. *CZN is requested to discuss mitigation measures for the control of atmospheric emissions from multiple sources.*

8. *CZN is asked to include a discussion of the cumulative impact from increased industrial development to the ecological integrity of Nahanni NPR and to the status of Nahanni NPR as a World Heritage Site.*

Response:

1. The current waste water facilities have been in place and used in support of site activity for about 10 years. Over this period levels of activity have fluctuated, reaching up to at least 27 people on site at one time, similar to levels anticipated in support of the proposed developments. Annual site inspections conducted by DIAND over this period consistently report the waste water facilities to be functioning satisfactorily. The applications before the MVEIRB for assessment request no changes or additions to these facilities.

   We note that details of the waste water treatment facilities were previously provided by CZN in our response of February 26, 2001 to an IR from GNWT-RWED dated February 10, 2001 concerning the EA's of the proposed Phase I Mineral Exploration and Cat Camp Fuel Recovery Programs. The text of this response is provided once again as follows:

   "Each of the Cat Camp Fuel Cache Recovery and the Mineral Exploration Drilling programs are expected to require the services of 8 people. A number of the people required are common to both programs. As a result, the maximum number of people expected to be in camp at any one time to carry out the proposed programs is 12.

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Several other programs of activity, including operation of a pilot plant, development of an underground decline and an underground exploration drilling program, and a further surface exploration drilling program are currently being contemplated. It is anticipated that applications for these programs will be forthcoming in the near future. Subject to receiving the necessary approvals all of these programs could be undertaken during the coming summer season from May through October.

The total number of people estimated to be required if all of the proposed programs were to be carried out independently is 60. However, the programs will be conducted somewhat sequentially and a number of positions are common to separate programs. If all of the programs were to be carried out at the same time, the maximum number of people on site would be expected to be about 35. Given the anticipated sequential nature of the programs it is expected that the actual maximum number of people in camp at any one time will be 20 – 25.

The sewage exfiltration sump was constructed in 1991-92 to support the levels of activity associated with ongoing care and maintenance and exploration activity on the property. The sump has been utilized successfully since that time. Typically, the maximum number of personnel on-site during the peak periods of exploration activity from 1991- 1995 was 20 – 25.

The sump is approximately 4–5 m in diameter and 3-4 m in depth. It is constructed within the coarse rock fill and natural riverine gravel deposits which underlay the plantsite area. All raw sewage and greywater reports to the sump and exfiltrates through the porous gravel deposits to groundwater. The sump is covered by a constructed wooden boardwalk with an inspection trap door. No surface water flows report through this area and the sump bottoms out below the water table.

The sump is located adjacent to the westernmost corner of the service and administration building. It is approximately 35 m from the in-service accommodation trailers and approximately 115 m from the crest of the dike separating the plantsite from Prairie Creek.

No sampling programs for sewage effluent discharges have been conducted in the past and none are currently planned. Annual Lease Inspections by DIAND have consistently reported the sump to be performing satisfactorily and of sufficient capacity to handle all sewage and greywater."

CZN will continue to work closely with GNWT and DIAND to ensure its waste water practices conform with the requirements.

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2. The current solid waste management facilities have been in place and used in support of site activity for about 10 years. Over this period levels of activity have fluctuated, reaching up to at least 27 people on site at one time, similar to levels anticipated in support of the proposed developments. Annual site inspections conducted by DIAND over this period consistently report the solid waste handling practices to be satisfactory. The applications before the Board for assessment request no changes or additions to these facilities or practices.

   As stated in the EA reports, "care is taken in the handling and disposal of refuse, with all kitchen and food wastes incinerated prior to disposal, in order to avoid attracting bears or other animals to the campsite. No incidents relating to problem bears in the camp have occurred in recent years as a result of these precautions."

   Details of solid waste management practices were previously provided by CZN as well in our response of February 26, 2001 to an IR from GNWT-RWED dated February 10, 2001 concerning the EA's of the proposed Phase I Mineral Exploration and Cat Camp Fuel Recovery Programs. The text of this response is provided once again as follows:

   > "Petruscible refuse from the kitchen and other combustible refuse is incinerated in a diesel fired incinerator. Refuse is typically incinerated daily during active programs and incinerator residue removed to the landfill site weekly or as required.
   >
   > Non-combustible solid waste is disposed of in a landfill site located to the south of the minesite established under Surface Lease 95-F-10-5-3. Annual Lease Inspections by DIAND have consistently reported the solid waste disposal site as being operated satisfactorily."

   Past experience has shown these practices to be very effective in discouraging the attraction of animals to the refuse disposal facilities. As a result, nuisance animal control has not been an issue.

   CZN will continue to work closely with GNWT and DIAND to ensure its solid wate handling practices conform with the requirements.

3. As stated in the EA report, "all personnel undergo safety orientation training prior to commencing work at the minesite, as set out in CZN's safety procedures and guidelines manual, which includes provision for animal attack prevention training." As a result of these precautions, human/wildlife interactions have been kept to a minimum and no incidents have been reported in recent years.

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CZN sees no potential for increased hunting/poaching opportunities as a result of the proposed developments. CZN enforces a no hunting policy in the vicinity of the minesite and personal firearms are not allowed on site.

4. Aircraft will be used to transport personnel and supplies to site on an as needed basis. CZN estimates an average of 1 fight per week will be required during periods of significant activity.

   No significant impacts on wildlife are expected as a result of this activity. As stated in the EA reports, "The principal wildlife species in the vicinity of the minesite are Dall Sheep. Varying numbers, including rams, ewes and lambs frequent the airstrip, mill and campsite areas. Dall Sheep are generally observed daily in these areas by site personnel in the course of carrying out their duties. These groups have been routinely observed to be unperturbed by ongoing site activity, showing little avoidance behavior in response to aircraft landing or taking off, vehicle traffic or other human activity typically being conducted on a day to day basis around the minesite."

   Similarly, no significant impacts are expected on the wilderness experience of visitors to Nahanni National Park Reserve are expected. The majority of visitors gain access to the Park Reserve by float plane or helicopter and presumably accept this as a form of access to such remote areas. As well, take-offs and landings at the minesite would not visible or audible from the Park Reserve, and fight paths to Fort Simpson or Yellowknife would not cross the Park Reserve boundary. Only the fight path south to Fort Nelson would cross the Park Reserve, although still at a fairly high altitude.

   With 7281 person visits to the Park Reserve recorded in 1999-00 and 6918 in 2000-01, not to mention the additional fixed wing and helicopter usage for Park Reserve management purposes and external programming activities, it is apparent that flights into the minesite represent only a small component of air traffic in the area and bring removed from the immediate vicinity of Park Reserve use would have little incremental impact on the wilderness experience of visitors.

5. No upgrading of the airstrip is anticipated to be required.

   Fuel storage typically consists of varying numbers of 205 litre barrels of avgas and Jet B fuel. Fuel caches have commonly been maintained at the airstrip by a number of government agencies and commercial airplane companies, including DIAND, Renewable Resources, Great Slave and Canadian Helicopters, as well as by Canadian Zinc. The fuel storage area is located on a clay-lined pad. Annual site inspections conducted by DIAND have consistently reported use of these facilities to be satisfactory.

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6. The request to provide "an estimate of the loading to the South Nahanni Watershed from the combined operations of the Cantung mine, Prairie Creek mine and the Howard's Pass prospect" is considered impractical and beyond the scope of the EA Report or the Cumulative Effects Assessment.

   The applications before the Board for review are for short term advance exploration programs and do not carry with them the presumption that operations at Prairie Creek will automatically follow. A separate application for full-scale mining and milling operations will be required and subject to review at that time.

   As stated in the CEA of the EA report, there must be an identifiable environmental, biophysical, social or cultural impact related to the proposed development and the impact must be demonstrated to operate cumulatively, additively or synergistically, either within the context of Canadian Zinc's development activity at the Prairie Creek mine, or with impacts from other projects or activities.

   To CZN's knowledge, this has not been the case and no significant adverse impacts on the South Nahanni River have been identified as a result of 24 years of operation of the Cantung Mine, 30 years of exploration activity at Prairie Creek or 10 years of exploration activity at Howard's Pass. Similarly the EA report has predicted no significant adverse impacts associated with the proposed developments.

   A monitoring program will not of itself "ensure that the water quality of the South Nahanni River is not adversely impacted by the operation of [the] mine". A monitoring program will only confirm that the operating practices and mitigation measures employed by the mine, and the terms and conditions of the necessary approvals granted to undertake the activity are sufficient to achieve this purpose. CZN will undertake its activities in the manner stated, employing the proposed mitigation measures, and will comply with the terms and conditions of permits and licences issued in support of the proposed activities, including such monitoring as may be required.

7. Mitigation measures for atmospheric emissions associated with the proposed developments were discussed in each of the EA Reports in the sections on Air Quality. In each case, such emissions were determined to have no significant adverse environmental effects. As a result, further discussion in the section on cumulative impacts was not warranted.

8. The cumulative impacts of the various foreseeable developments in the South Nahanni watershed on the Park Reserve was discussed in the CEA section of the EA report, and has been discussed above. No impacts on the Park Reserve have been identified from past activity and none are predicted from potential future activity. As a result, such developments are not expected to impact on the ecological integrity of NNPR.

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The effect of proposed developments outside the Park Reserve boundary on the World Heritage Site status of the Park Reserve is considered beyond the scope of the current environmental assessment.

However, it should be pointed out that the Cantung Mine had been in operation for 16 years and the Prairie Creek Mine had been undergoing significant advance exploration, including underground development on three levels, over some 15 years prior to the time that the Park Reserve was nominated for and added to the World Heritage list in 1978. In addition, the Prairie Creek mine was constructed and fully permitted for operations following a comprehensive environmental review before the Northwest Territories in 1982, 4 years after such designation. It would seem therefore that the continuation of such pre-existing mining activity should not adversely affect the Park Reserves World Heritage status.

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Underground Decline Environmental Assessment
Response to Information Request

Information Request:

Date: *July 25, 2001*

From: *Chuck Blyth, Nahanni National Park Reserve, Parks Canada Agency*

Subject: *IR #3 - Wastewater Quality*

Objective: *To permit a thorough assessment of the procedures and mitigation to be implemented by CZN to ensure that the quality of wastewater discharged to sumps and/or to Harrison Creek does not result in the contamination of Harrison Creek, Prairie Creek and cause significant adverse effects to the ecological integrity of the South Nahanni River and Nahanni National Park Reserve.*

Request: *Parks Canada requests information on the following water quality issues:*

- *Canadian Zinc is asked to provide descriptions of their procedures for establishing and locating the sump including the capacity of the sump, location, measures to prevent flooding and overflowing.*
- *CZN is requested to describe the monitoring program for the sump (responsible staff, frequency, aspects to be monitored) and include information respecting the water quality sampling program, acceptable levels for various parameters, frequency of discharge and decommissioning activities for the sump.*

Response:

The final minewater sump will be established adjacent to the portal entrance by excavating into surficial materials or fill. The sump will be lined if necessary to prevent seepage and sized to accommodate the encountered minewater flow to ensure adequate settling and retention time. At the conclusion of the program the sump will be backfilled with material excavated during its construction.

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Underground development, including de-watering and construction and operation of the sumps, will be the responsibility of an experienced and professional mining contractor hired by CZN. The contractor will operate under the supervision of a CZN representative, Mr. Alan Taylor, VP Exploration or, in his absence, his alternate.

CZN will undertake monitoring in compliance with the terms and conditions of its Water Licence, which is expected to set location, frequency and parameters to be sampled. CZN will conduct its activities to ensure that such discharges comply with discharge limits as set in the Water Licence or under applicable legislation, such as the Metal Mining Liquid Effluent Regulations established pursuant to the Fisheries Act.

Additional information on minewater monitoring was contained in CZN's response to GNWT's IR#2.

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CANADIAN ZINC
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August 17, 2001

Canadian Zinc Corporation Phase II Drilling Program Environmental Assessment Response to Information Request

Information Request:

Date: *July 25, 2001*

From: *Chuck Blyth, Nahanni National Park Reserve, Parks Canada Agency*

Subject: *Phase II Exploration Drilling Program - Miscellaneous IR's*

Objective: *None Stated*

Request:

1. *Canadian Zinc procedures for establishing and locating sumps*
2. *Description of monitoring program for sumps (Responsible staff, frequency, aspects to be monitored)*
3. *Canadian Zinc procedures for drill rig operation / description of monitoring program / process for implementing remediation*
4. *Canadian Zinc procedures for water pumps and distribution systems / description of monitoring program / process for implementing remediation*
5. *Canadian Zinc procedures for stabilizing drill pad terrain / description of monitoring program / process for implementing remediation*
6. *Canadian Zinc procedures for building exploration roads / description of monitoring program / process for implementing remediation*
7. *Canadian Zinc procedures for managing drain structures/ description of monitoring program / process for implementing remediation*
8. *Canadian Zinc procedures for fuel transfer/ description of monitoring program / process for implementing remediation*
9. *Evidence of compliance with current standards for above and below ground petroleum product storage*
10. *Existing volume of petroleum product in each of the storage tanks (both above and below ground)*
11. *Evidence that the berm around the fuel farm meets existing regulatory requirements for petroleum product storage (including confirmation of impermeability, a fully functional recovery pumping system and containment sump)*

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12. *Confirmation that the wastewater facilities meet current environmental standards*
13. *Description of solid waste management practices, including need for storage and nuisance animal control*
14. *Estimate of air traffic volume using airstrip*
15. *Description of impact to wildlife and visitors from air traffic and mitigation*
16. *Description of upgrading, if required, to airstrip*
17. *Description of fuel storage methods, volumes, etc. if appropriate*
18. *Description of habitat fragmentation and cumulative impact to wildlife from road network*
19. *Description of potential for debris flows, possible mitigation and cumulative impact to streams and aquatic life*
20. *Description of potential human/wildlife interactions, mitigation*
21. *Description of potential increased hunting and poaching and mitigation*
22. *Description of mitigation to minimize atmospheric emissions from various sources*
23. *Discussion of the cumulative impact to ecological integrity of Nahanni NPR*
24. *Discussion of cumulative impact to the status of Nahanni NPR's World Heritage Site Status*

Response:

1. The EA on the Phase I mineral exploration drilling program determined that such development would not have significant adverse environmental effects.

   In developing the terms of reference for the Phase II program the Review Board determined that the information available from the Phase I program on potential impacts and mitigation measures was acceptable, and further consideration of these matters not required in the scope of the assessment of the Phase II program.

   In view of the foregoing, the development of additional written procedures for each and every aspect of day to day operations is considered beyond the scope of this EA and unwarranted. Each operation, whether it be diamond drilling, decline development or pilot plant operation, will be conducted by or under the direction of experienced professionals whose job it is to undertake their work in a professional and workmanlike fashion and in so doing to comply with all applicable legislation and accepted management practices.

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As well, CZN has developed a Safety and Procedures Manual which has been filed with DIAND and with the MVEIRB is support of these assessments, which details responsibilities and the process for implementing remediation in the case of spills or other emergency situations.

2. See Response #1 above.
3. See Response #1 above.
4. See Response #1 above.
5. See Response #1 above.
6. See Response #1 above.
7. See Response #1 above.
8. See Response #1 above.
9. This is a duplicate request and was addressed in response to NNPR IR #1
10. This is a duplicate request and was addressed in response to NNPR IR #1
11. This is a duplicate request and was addressed in response to NNPR IR #1
12. This is a duplicate request and was addressed in response to NNPR IR #2
13. This is a duplicate request and was addressed in response to NNPR IR #2
14. This is a duplicate request and was addressed in response to NNPR IR #2
15. This is a duplicate request and was addressed in response to NNPR IR #2
16. This is a duplicate request and was addressed in response to NNPR IR #2
17. This is a duplicate request and was addressed in response to NNPR IR #2

18. As with the Phase I drilling program, the Phase II program proposes to use the existing network of exploration roads to access drill sites. Drill pads will be established adjacent to existing roads and where this is not practical only short extensions will be required off existing roads.

    The EA on the Phase I program determined that such development would not have significant adverse affects on wildlife.

    In developing the terms of reference for the Phase II program the Review Board determined that the information available from the Phase I program on potential impacts to wildlife and wildlife habitat was acceptable, and further consideration of these matters not required in the scope of the assessment of the Phase II program.

    Given the foregoing and the fact that this IR relates primarily to the potential effects of the already existing road network, this IR is considered to be beyond the scope of the assessment. The facilities in question are existing and will remain in place regardless of whether or not the proposed developments proceed.

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19. As above, this IR relates to potential impacts associated with the existing road network and is considered beyond the scope of the current EA.

    The existing roads have been in place for many years without any incidents of debris flows. Standard practices for controlling surface runoff including ditching, culverts, water bars and backsloping are utilized in road construction and maintenance to ensure the integrity of the roads is maintained.

20. This is a duplicate request and was addressed in response to NNPR IR #2
21. This is a duplicate request and was addressed in response to NNPR IR #2
22. This is a duplicate request and was addressed in response to NNPR IR #2
23. This is a duplicate request and was addressed in response to NNPR IR #2
24. This is a duplicate request and was addressed in response to NNPR IR #2

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CANADIAN ZINC
CORPORATION

August 17, 2001

Canadian Zinc Corporation Metallurgical Pilot Plant Environmental Assessment Response to Information Request

Information Request:

Date: *July 25, 2001*

From: *Chuck Blyth, Nahanni National Park Reserve, Parks Canada Agency*

Subject: *Metallurgical Pilot Plant Project - Miscellaneous IR's*

Objective: *None Stated*

Request:

1. *Parameters to be tested for the process water and acceptable limits for discharge to the tailings pond.*
2. *Remediation for process water if limits are exceeded.*
3. *Baseline information on the existing water quality of the tailings pond.*
4. *Description on how the tailing solids will eventually be disposed of if the mine proceeds to development and if not.*
5. *Procedures for responding to accidental spills of reagents to ensure that materials are recovered and do not migrate off-site.*
6. *Evidence of compliance with current standards for above and below ground petroleum product storage*
7. *Existing volume of petroleum product in each of the storage tanks (both above and below ground)*
8. *Evidence that the berm around the fuel farm meets existing regulatory requirements for petroleum product storage (including confirmation of impermeability, a fully functional recovery pumping system and containment sump)*
9. *Description of emissions, if any, and how they will be controlled.*
10. *Information regarding precipitation events in Prairie Creek and predictions / modelling of flood frequency.*
11. *Evidence that the tailings impoundment dam has been constructed to an appropriate elevation, or alternately, a commitment by Canadian Zinc to undertake remediation of the dam. Evidence that the tailing dikes have been inspected to ensure that breaches of dikes will not occur.*

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12. *Procedures and commitment from Canadian Zinc that they will implement to clean-up debris transported downstream of their site in the event of flooding.*
13. *Evidence that as an impervious liner been installed in the tailings pond to prevent seepage into Prairie Creek*
14. *Confirmation that the wastewater facilities meet current environmental standards*
15. *Description of solid waste management practices, including need for storage and nuisance animal control*
16. *Estimate of air traffic volume using airstrip*
17. *Description of impact to wildlife and visitors from air traffic and mitigation*
18. *Description of upgrading, if required, to airstrip*
19. *Description of fuel storage methods, volumes, etc. if appropriate*
20. *Description of potential human/wildlife interactions, mitigation*
21. *Description of potential increased hunting and poaching and mitigation*
22. *Description of mitigation to minimize atmospheric emissions from various sources*
23. *Discussion of the cumulative impact to ecological integrity of Nahanni NPR*
24. *Discussion of cumulative impact to the status of Nahanni NPR's World Heritage Site Status*
25. *Information on how the tailings pond will be decommissioned.*
26. *Canadian Zinc procedures for each of the aspects to be monitored / a description of monitoring program / the process for implementing remediation*

Response:

1. As stated on p. 47 of the EA report, samples will be shipped to a qualified laboratory and analyzed by standard acceptable methodology for applicable physical and chemical water quality parameters. Such parameters would include pH, conductivity, alkalinity, hardness and total metals ICP scan.

   As the tailings pond is a contained facility, setting of discharge limits for process effluent to be discharged to the pond is not considered appropriate. The proposed development involves no direct discharge from the pond to the receiving environment.

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2. Typical effluent quality and a tailings pond water chemistry model were supplied in response to GNWT IR #3. The provision for process water treatment was contemplated as a contingency in the event effluent quality was found to be unusually elevated to a point where the 50:1 dilution afforded by the existing water in the tailings pond would result in the pond water exceeding MMLER discharge standards. It should be pointed out that this is not expected to be the case and treatment is not expected to be necessary as demonstrated by the tailings pond chemistry model submitted in support of the response to GNWT IR#3.

   The most likely candidates for requiring treatment, if necessary, would be elevated dissolved metals concentrations. In this case, standard treatment technology would involve lime addition to raise pH and precipitate dissolved metals with the tailings solids in the thickeners.

3. This information was provided in response to GNWT IR #3.

4. This was addressed on p. 44 of the EA report as follows:
   "The tailings solids produced from the operation of the pilot plant, which are comprised of ground up rock the consistency of sand, will be stored in the mill thickeners. Upon commencement of operations, these solids will be combined with the mill tailings for disposal underground as paste backfill or in the tailings pond. In the event that operations do not recommence the tailings can remain in the thickeners, or be disposed in an acceptable manner underground, in the tailings pond or landfilled."

5. This was addressed on p. 18 of the EA report as follows:
   "The pilot plant is to be located and operated totally within the confines of the existing mill building. The concrete floor slab is sloped inward to collection sumps allowing for containment and easy recovery of any spills."

   As well, CZN has an Safety and Procedures Manual which has been filed with DIAND and with the MVEIRB is support of these assessments, which details responsibilities and the process for implementing remediation in the case of spills or other emergency situations.

6. This is a duplicate request and was addressed in response to NNPR IR #1
7. This is a duplicate request and was addressed in response to NNPR IR #1
8. This is a duplicate request and was addressed in response to NNPR IR #1

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9. As stated in the EA report, the pilot plant will be located and operated totally within the confines of the existing mill building. Any dust emissions from the operation will therefore be confined within the building. As this is a scaled-down pilot plant with a very low processing rate, such emissions will be correspondingly minor. As a result, issues pertaining to dust emissions are primarily health and safety related as opposed to environmental impact related.

   The small jaw crusher will typically be sprayed with water from a hose by the operator to control ambient dust. Grinding will take place in the ball mill in a wet environment and as a result will not generate dust.

10. This was addressed in response to DIAND IR #1
11. This was addressed in response to DIAND IR #1

12. In addition to the tailings dam which was constructed to withstand the Probable Maximum Flood in Prairie Creek, the entire plantsite area has been isolated from Prairie and Harrison Creeks by Flood Protection Dykes designed to withstand the 100 year flood. These were constructed in 1981 and have remained in place since that time without any signs of failure or significant erosion. CZN will take all reasonable precautions to ensure that no foreign debris enters Prairie Creek as a result of its activities and will undertake to recover any such foreign debris transported downstream as a result of flood events.

    It should be noted that CZN has a large inventory of heavy equipment at the minesite and is capable of rapid response to flood events.

    CZN would like to clarify that no milling has been conducted on site, therefore no tailings could have been deposited in Prairie Creek in the 1970's as stated in the preamble to this request. Presumably such material as reported to have been transported downstream to the Prairie Creek alluvial fan was of natural origin.

13. This was addressed in response to DIAND IR #1
14. This is a duplicate request and was addressed in response to NNPR IR #2
15. This is a duplicate request and was addressed in response to NNPR IR #2
16. This is a duplicate request and was addressed in response to NNPR IR #2
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22. This is a duplicate request and was addressed in response to NNPR IR #2
23. This is a duplicate request and was addressed in response to NNPR IR #2
24. This is a duplicate request and was addressed in response to NNPR IR #2
25. CZN was directed by the MVEIRB not to respond to this request as it is outside the scope of the EA
26. This IR is a duplicate request and was addressed under IR #1 of the Phase II Mineral Exploration Drilling Program

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