

CLOSED

B. F. ON 11/97 R*
FOR DISPOSAL
OF THIS VOLUME

File Number - Dossier numéro	Volume No. - Volume n°	
N-9545-N1L3-0040	3	
Subject - Sujet	From - De	To - A
	9/76	10/77

LICENCES - NORTHERN INLAND WATERS - COMINCO MINES LTD. - CON MINES MINING YELLOWKNIFE

10-350C (8-82) 7690-21-023-9348

0400/37-17/54562

CROSS REFERENCE - RENVOI

FILE NO. - N° DE DOSSIER	SUBJECT - SUJET
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- 2 - Shows the reason for the routing or the date and identification number of the letter on file requiring your attention.
- 3 - Shows the date on which the file is routed to the user.
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CLOSED VOLUME VOLUME COMPLET

DATED FROM
À COMPTER DU

9/76

TO
JUSQU'AU

10/77

AFFIX TO TOP OF FILE - À METTRE SUR LE DOSSIER

DO NOT ADD ANY MORE PAPERS - NE PAS AJOUTER DE DOCUMENTS

FOR SUBSEQUENT CORRESPONDENCE SEE - POUR CORRESPONDANCE ULTÉRIEURE VOIR

FILE NO. - DOSSIER N°

N-9545-N1L3-0040


VOLUME

4

P.O. Box 1500,
Yellowknife, N.W.T.
X1A 2R3.

October 28, 1977.

Mr. J.K. Gowans,
Mill Superintendent,
Cominco Limited, Con Mine,
Yellowknife, N.W.T.

N1L3-0040 
WATER REGISTER

Dear Mr. Gowans:

Re: Second Yearly Bioassay Sample For Acute Toxicity
of Tailings Pond Effluent

In confirmation of the telephone conversation between Bruce Doulton and Arthur Franchi yesterday, Con will not be required to collect the second bioassay sample this year. This is due to a shortage of sampling containers and overloading of the lab facilities of the Department of Environment in Edmonton. It appears that in the future, other arrangements will have to be made. We will keep you informed as to what arrangements are made for next year.

Yours truly,



Lorne P. Cooper
Head, Southern Area
Water Resources

LPC:jr
c.c. Arthur Franchi
Con Mine

P.O. Box 1500
Yellowknife
Northwest Territories

October 26, 1977

N1L3-0040

Members
NWT Water Board

Gentlemen:

Re: Inspection Report - Cominco, Con Mine
Water Register #N1L3-0040

Enclosed is a copy of a letter Mr. Redshaw received from Mr. J.K. Gowans of Cominco Limited in reference to the Inspection Report prepared by Mr. B. Doulton last August.

A copy of this inspection report was mailed to you at an earlier date.

Yours sincerely,



Sheila Herman
Secretary to
Manager, Water Resources

sh:

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

October 24, 1977

REGISTERED

N1L3-0040 ←
Water Register

Mr. J. Gowans
Acting Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine, Yellowknife
Water Licence #N1L3-0040
Part C Items 7 & 8

This will acknowledge the receipt of your letter of October 7, 1977 regarding Mr. Cooper's inspection report dated October 5, 1977.

I would like to suggest that you review again the water licence issued to your Company and in particular Part C, Item 7 which states:

7. "All waste discharged from lower Pud Lake shall be directed to Meg Lake. No waste discharge, seepage or other flow shall be permitted at any time from the Pud Lake tailings area or lower Pud Lake to Kam Lake."

Considering the facts as presented, in that the seepage from lower Pud Lake down the channel to Kam Lake, only occurs when waste water is being released from your Pud Lake Tailings Area, there can be little doubt that this seepage is caused by your release from the tailings area. This being the case, I must state that the above clause applies to this seepage and if such an occurrence takes place in the future I will have no alternative but to consider this as a contravention of your water licence and take appropriate action.

Mr. J. Gowans . . . Page 2 . .

To avoid such action, I must request that you file with this office by December 30, 1977, a detailed plan of what action you propose to take to prevent such seepage reaching Kam Lake in the future, and be prepared to implement this plan should such seepage occur again.

Please note also Part C, Item 8, which requires that the office of the Board be advised immediately should an unauthorized discharge of waste occur. Again I am of the opinion that the above seepage falls under this clause and so must be reported whenever it occurs.

I would recommend that if you or the officers of your Company disagree with either of the above, you make your concerns known in writing to the Chairman of the Water Board.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW

A. G. Redshaw
Manager
Water Resources Division

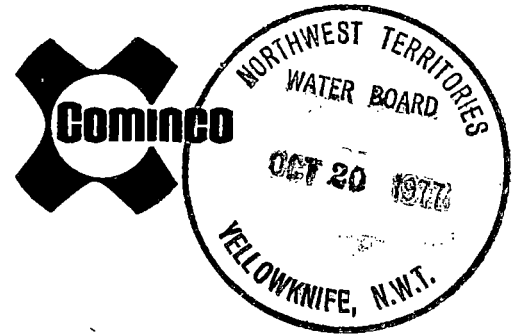
cc: Members, NWT Water Board

Mr. D. McPhail, Con Mine

AGR:sh

FILE N1L3-0040
WATER REGISTER

REGISTERED



Con Operations

Mr. A. Redshaw
Manager Water Resources
N.W.T. Region
P.O. Box 1500
Yellowknife,
N.W.T.

October 18, 1977

Dear Mr. Redshaw:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Inspection Report of August 15, 16, 17, 1977

Cominco Ltd., Con Mine, acknowledges receiving a copy of the Inspection Report, by B. Doulton, dated August 23, 1977. With regard to signing the acknowledgement of receipt, it is felt there is no reason to sign a report not written by our hand.

In the Inspection Report, and in your attached letter, it was stated that daily readings of the Yellowknife Water Supply were not being recorded on the weekends. On weekends, there are no men working at the Con Pumphouse. To obtain daily measurements at this location, Cominco must pay a man "4 hours callout" each day of the weekend (approximately \$100 per weekend). The flow through this line is quite steady; the increase in information does not justify the cost of obtaining it.

On page 6 of the Inspection Report, it is stated that the Monthly Analysis results for Station 40.1, June 1977, were not received. A copy of these results has been enclosed with this letter. It would be appreciated if sampling results from the Inspection Tours could be provided for reference in our files.

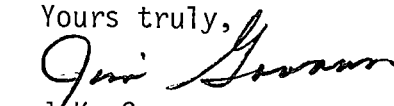
On October 2, 1977, the 6 inch Rockwell flowmeter was installed on the Lake Water line. This installation completes the metering requirements as stated in Part C, Item 12 of our Water Licence.

...../2

Mr. A. Redshaw
October 18, 1977

The flowmeter is located in the Pipe Shop at the east end of the Concentrator. Records for this meter are kept in the Mill Shifter's Office.

Yours truly,


J.K. Gowans
Acting Mill Supt.

JKG:gpw

Encl.

P.O. Box 1500
Yellowknife

October 14, 1977

N1L3-0040 ←


Members
NWT Water Board

Gentlemen:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Inspection Report

Enclosed please find a copy of the above mentioned
Inspection Report dated October 6 and 7, 1977, which
was prepared by Mr. L.P. Cooper. Also attached is a
copy of the covering letter to the Mill Superintendent
at Con Mine.

Sincerely,


Sheila Herman
Secretary to the Manager
Water Resources

sh:

P.O. Box 1500,
Yellowknife, N.W.T.
X1A 2R3.

October 12, 1977.

REGISTERED

Mr. J. Gowans,
Mill Superintendent,
Cominco Limited, Con Mine,
Yellowknife, N.W.T.

N1L3-0040
Water Register

Dear Mr. Gowans,

Re: Northern Inland Waters Act
Water Licence No. N1L3-0040
Inspection Report - October 6 & 7, 1977

Attached is the original plus one copy of the above report. Please acknowledge receipt of this report by signing the last page of the original and returning the report to this office. The copy is for your retention. Please forward any comments you may have regarding this report.

We are presently reviewing this situation and the points raised by you in your letter of October 7, 1977, and will be contacting you shortly.

With regards to Mr. Cooper's report dated October 5, 1977, you are correct in assuming that the date stated in the first line of the report is wrong. This is a typographical error and the date should read October 4, 1977 and not September 4, 1977 as stated in the report.

Yours truly,

ORIGINAL SIGNED BY
A. G. REDSHAW

A.G. Redshaw
Manager, Water Resources
NWT Region

ATS:jr
Encl.

NORTHWEST TERRITORIES WATER BOARD

YELLOWKNIFE, N. W. T.

INSPECTION REPORT

ON

COMINCO LIMITED - CON MINE

OCTOBER 6 & 7, 1977

BY

LORNE P. COOPER

INSPECTOR UNDER THE NORTHERN INLAND WATERS ACT

WATER RESOURCES

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

YELLOWKNIFE, N. W. T.

DATED: OCTOBER 12, 1977

WATER REGISTER: N1L3-0040

COMINCO LIMITED - CON MINE

INSPECTION REPORT

INTRODUCTION

On the afternoon of October 6, 1977, Lorne P. Cooper, Inspector under the Northern Inland Waters Act, drove to Cominco Limited - Con Mine, to determine if the seepage to Kam Lake from below the Lower Pud Lake retainment dam, first observed on October 4th, 1977, and again on October 5, 1977 was still occurring. The mine had been informed that daily monitoring would be carried out until the seepage ceased.

OBSERVATIONS AND DISCUSSION

At approximately 1400 hours, I arrived at the site where seepage had been occurring, and noted that a sump had been constructed to contain the seepage. Jim Gowans, the Mill Superintendent, had notified the Water Resources office that the sump had been constructed early that morning.

The sump was constructed in the center of the drainage channel from Lower Pud Lake to Kam Lake. The dimensions were about 10' x 12' x 4' deep, with about 3' to 3.5' of useable depth. This is equivalent to about 2200 imperial gallons. About one foot of porous, black, muskeg material rested on top of a clay base. The clay appeared to be tight, offering little possibility for seepage out of the sump. Flow into the sump was occurring in the form of trickles from the porous upper layer. There was no flow visible downstream of this sump, which was doing an effective job of containing all seepage.

Con Mine personnel were in the process of priming a pump to empty the sump at the time of the inspection. After obtaining photographs, I drove to the point where the ditch is located that drains Lower Pud Lake to Meg Lake, and observed three mine personnel cleaning the ditch out to increase the flow from Lower Pud, and thus decrease the water level.

I noted from a staff gauge in Lower Pud that the water level had dropped about 0.75" since the previous day. I then met with Jim Gowans, who explained the three steps

- 2 -

they had taken to stop all seepage below the Lower Pud Lake dyke.

- These were:
- 1) Construct the sump as previously described.
 - 2) Clean out the ditch to Meg Lake, thus lowering the Lower Pud Lake water level and, in time, decreasing seepage which might be caused by a high hydrostatic head on Lower Pud.
 - 3) Decrease out flow from the tailings pond to facilitate lowering of the water level in Lower Pud Lake.

I informed Mr. Gowans that the action taken, while not a permanent solution, was satisfactory for the time being. Mr. Gowans expressed concern over the large expenditure which might be required to permanently prevent future seepage.

On Friday, October 7, I again inspected the site where the seepage had occurred, and noted no seepage downstream of the sump, which was being pumped out at the time of the inspection. I requested that the sump be pumped out daily during the weekend, as the sump had nearly filled in 24 hours, and Jim Gowans agreed to have this done.

The analyses from samples taken on October 4 and 5 were completed on October 7, by the Yellowknife Water Laboratory. These results are attached along with a Surveillance Network Map showing the special sample locations. These results show the quality of the seepage water to be generally worse than the tailings effluent in Lower Pud Lake, although the quality is improved, probably by dilution, before it has reached Kam Lake.



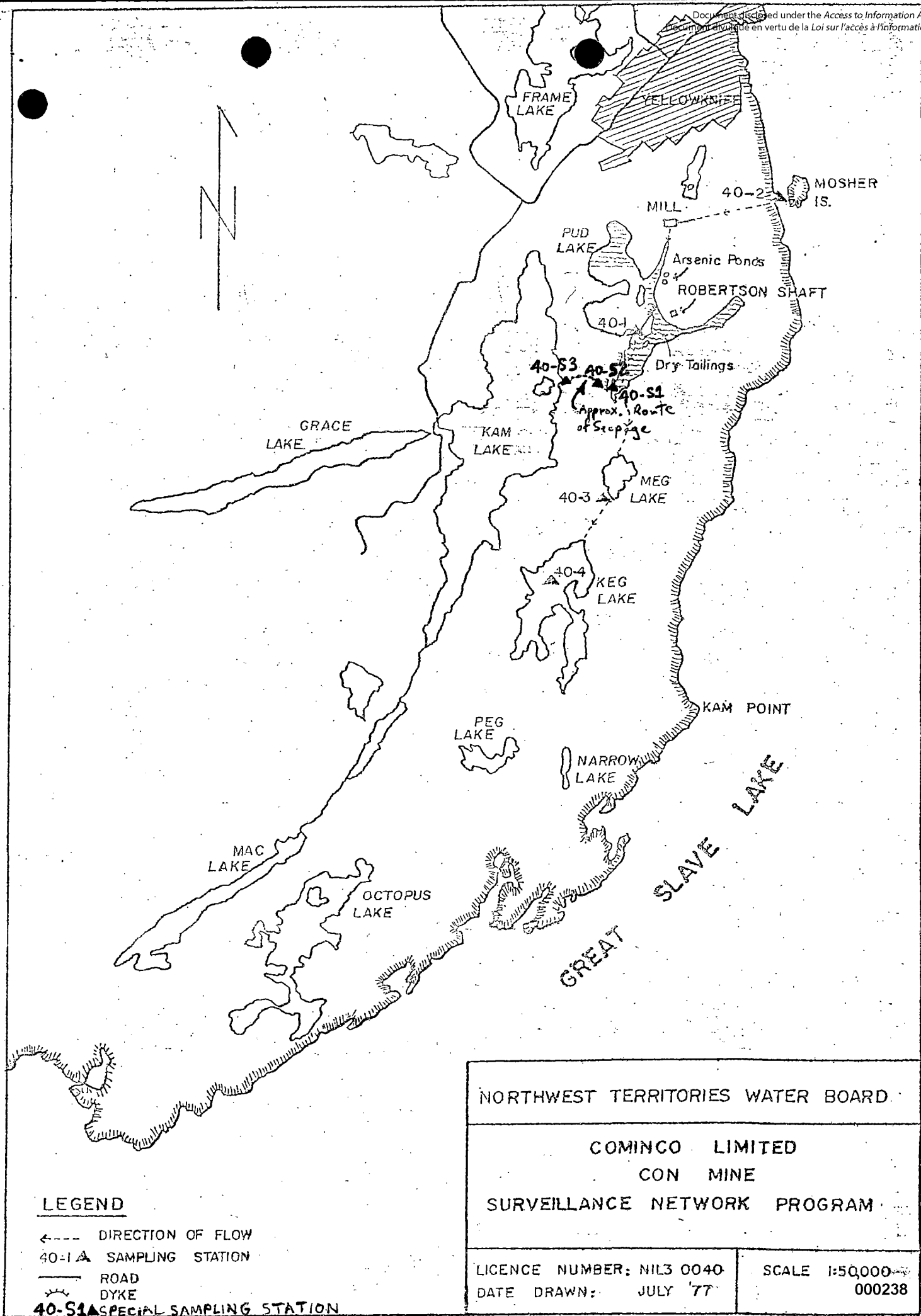
Lorne P. Cooper
Lorne P. Cooper
Inspector Under the
Northern Inland Waters Act

Acknowledgment of receipt of a copy of this report

Signature

Title

Date



LEGEND

- DIRECTION OF FLOW
- 40-1 ▲ SAMPLING STATION
- ROAD
- DYKE
- 40-S1 ▲ SPECIAL SAMPLING STATION

NORTHWEST TERRITORIES WATER BOARD

COMINCO LIMITED
CON MINE
SURVEILLANCE NETWORK PROGRAM

LICENCE NUMBER: NIL3 0040
DATE DRAWN: JULY '77

SCALE 1:50,000
000238

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS

WATER MANAGEMENT -- NORTHWEST TERRITORIES

SURVEILLANCE NETWORK PROGRAM

LICENSEE: Cominco Ltd. Con MineDATE SAMPLED: October 5, 1977LICENCE NUMBER: N113-0040SAMPLED BY: L.P. CooperLOCATION: Yellowknife, N.W.T.ANALYSED BY: Yellowknife Water Laboratory

Note: All measurements in mg/litre except pH, Temperature (°C), Specific Conductivity (us/cm), and Rate of Flow (cfs)

PARAMETERS	STATION NUMBER						REMARKS
	S#2						
FIELD CONDITIONS							S#2 - First point of visible seepage below Lower Pond La Kadan
pH							
Specific Conductivity	4440						
Temperature	4.0°						
Rate of Flow	Est. 1 gpm						
LABORATORY ANALYSIS							
pH	6.8						
Temperature							
Specific Conductivity							
Suspended Solids (Turb)	10.2						
Colour	40						
Total Alkalinity							
Total Hardness							
Oil and Grease							
Calcium							
Potassium							
Sodium							
Chloride	1780						
Silica Reactive							
Sulphate							
Nitrate-Nitrite							
Ammonia (as N)							
Total Phosphate							
Total Arsenic	1.88						
Total Cyanide							
Total Cadmium	<0.01						
Total Cobalt							
Total Copper	0.08						
Total Iron							
Total Lead	0.07						
Total Nickel	0.17						
Total Zinc	0.30						

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS
WATER MANAGEMENT -- NORTHWEST TERRITORIES

SURVEILLANCE NETWORK PROGRAM

LICENSEE: Cominco Ltd.-Con Mine DATE SAMPLED: October 4, 1977

LICENCE NUMBER: N123.0040 SAMPLED BY: L.P. Cooper

LOCATION: Yellowknife ANALYSED BY: Yellowknife Water Laboratory

Note: All measurements in mg/litre except pH, Temperature (°C), Specific Conductivity (us/cm), and Rate of Flow (cfs)

PARAMETERS	STATION NUMBER						REMARKS
	S#1	S#2	S#3				
FIELD CONDITIONS							
pH	6.9	5.2	5.5				S#1 - Upstream side of dam on water course to Kam Lake from Lower Pond Lake
Specific Conductivity	4450	4350	4150				
Temperature	4.2°	7.6°	7.5°				
Rate of Flow		2gpm	2gpm				
LABORATORY ANALYSIS							S#2 - Below dam at first point of visible seepage
pH	6.3	6.6	6.9				S#3 At Mouth of the water course from Lower Pond to Kam Lake
Temperature							
Specific Conductivity							
Suspended Solids (Turb.)	2.7	53.	10.2				
Colour	5	>100	40.				
Total Alkalinity							
Total Hardness							
Oil and Grease							
Calcium							
Potassium							
Sodium							
Chloride	1780	1660	1620				
Silica Reactive							
Sulphate							
Nitrate-Nitrite							
Ammonia (as N)							
Total Phosphate							
Total Arsenic	1.10	1.71	0.86				
Total Cyanide							
Total Cadmium	<.01	<.01	<.01				
Total Cobalt							
Total Copper	0.13	0.17	0.04				
Total Iron							
Total Lead	0.07	1.0	0.08				
Total Nickel	0.20	0.22	0.07				
Total Zinc	0.09	0.42	0.04				
TDS, Residue 105°C	11.5	200.	9.0				

—7 N1L3-0040
Water Register

October 12, 1977

Mr. J. K. Gowans
Acting Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Con Mine Water Licence #N1L3-0040
Part C, Item 19

Your letter dated October 3, 1977 addressed to Mr. A.G. Redshaw regarding the above item was tabled at the Water Board meeting on October 5, 1977.

After due consideration it appeared to the Board that while Item 19 of the Licence requests only the submission of "detailed proposals for the containment and reclamation of all arsenic oxide storage areas. . . .", your letter suggests that you have progressed some way beyond this point.

While we are ready to allow the additional time requested i.e. until our December 1977 meeting, the Board wishes to receive immediately from you, a short statement which clearly indicates each alternative which your consultant, Reid, Crowthers and Partners, have investigated and your reasons why each has been dismissed. This statement should contain sufficient details to clearly show the level of work that has been carried out. I would also request that you supply details on the current alternatives now under consideration.

. . . 2 . .

Mr. J. K. Gowans . . . Page 2

The Water Board meets again on November 17, 1977 and I would ask that the submission be filed at least one week prior to this date, so we can review it at our meeting.

Yours sincerely,

A. G. Gordon
Chairman
NWT Water Board

AGR:sh

FILE NIL3-0040
WATER REGISTER



Con Operations

Mr. A. Redshaw
Manager, Water Resources
N.W.T. Region
P.O. Box 1500
Yellowknife, N.W.T.

October 7, 1977

Dear Mr. Redshaw:

Re: Your letter, dated October 6, 1977 and the
Inspection Report by L. Cooper, dated October 5, 1977.

With regard to the alleged seepage of water flowing from Lower Pud Lake to Kam Lake on October 4th, 1977, it is Cominco's position that it did not, willingly or unknowingly, contravene our Water Licence No. NIL3-0040 Part C, Item 7.

In order that Part C, Item 7 of our Water Licence be violated effluents from the Pud Lake tailings area must discharge to Kam Lake. This was not the case, as implied in the Inspection Report, dated October 5, 1977. There has always been small pools of water at the location of the alleged seepage. For our own background information, these pools were sampled weekly during the effluent discharge period in June 1977. As well, the water contained on the Lower Pud Lake side of the dyke was sampled to ascertain if there was effluent seepage. Samples were assayed for arsenic and cyanide.

Results from these tests showed that the two water sources bore no relationship. The downstream sample contained approximately 60% more arsenic (1.61 mg/l As compared to 1.03 mg/l As) yet had only 15% as much cyanide (0.07 mg/l CN compared to 0.45 mg/l CN). (No results, Both from Trail Labs or Water Management, have been received from samples

...../2

Mr. A. Redshaw
Manager, Water Resources
October 7, 1977
Page two (2)

taken on October 4, 1977.) Thus, it is felt the water in these small pools, and the water seeping from these same ponds on October 4, 1977 is from the groundwater system. The higher arsenic levels are probably due to arsenic picked up from "blooms" left from previous discharge streams (prior to 1973). The cyanide content of the previous discharges has possibly since decomposed or been adsorbed in the soil, hence, the low cyanide content of the groundwater found in these small pools.

A possible explanation for the flow from these pools occurring during the time when the decant structure is open is that the hydrostatic head is increased on the Lower Pud Lake side of the Kam Lake dykes. The groundwater in the muskeg under and around the area then migrates to the place of least resistance, notably the location referred to in the Inspection Report.

Cominco has acted on the "seepage occurrence" not as an admission of contravention of its W.L. but in the spirit of cooperation with Water Management. Reaction to the problem has been a three-pronged operation:

1. The flow from the Pud Lake decant was reduced from approximately 2,500,000 gallons per day to just over 900,000 gallons per day. This is a temporary adjustment to allow for work to be done in the ditch from Lower Pud Lake to Meg Lake.
2. A crew of men were dispatched to Meg Lake ditch to clean out and widen this ditch. This action will lower the level of the water in Lower Pud Lake. The work was completed on October 6th and 7th, 1977.
3. By 8:30 a.m., October 6th, 1977, a retaining sump was excavated at the source of the seepage, approximately fifty (50) feet west of the Kam Lake dyke. This action almost immediately stopped the flow in the direction of Kam Lake. Water was pumped from the retaining sump later the same day. The pump will be operated on an "as needed" schedule.

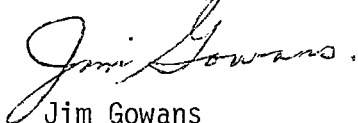
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Mr. A. Redshaw
Manager, Water Resources
October 7, 1977
Page three (3)

Cominco, Con Mine, acknowledges receiving a copy of the Inspection Report, by Lorne P. Cooper, dated October 5th, 1977. It must be noted that, in the first sentence, the date stated is September 4th, 1977. This is interpreted as being a typographical error, i.e., the date should have been stated as October 4th, 1977.

Enclosed is original copy of the Inspection Report for your files.

Yours truly,



Jim Gowans
Acting Mill Superintendent
Con Operations

JKG/1g1

C.C. MEMBERS, N.W.T. WATER BOARD

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

N1L3-0040 ←

October 6, 1977

Members
NWT Water Board
and
Technical Committee

Gentlemen:

Re: Cominco, Con Mine
Progress Reports

Enclosed find copies of the 1974 and 1976 Progress Reports submitted by Cominco, Con Mine for their Mined-Land Research Program. Also enclosed is a copy of their File Noted dated September 8, 1977, outlining their progress for part of 1977.

Sincerely,

Sheila Herman
Sheila Herman
Secretary to the
Manager, Water Resources

sh:

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

N1L3-0040



October 6, 1977

Members
NWT Water Board

Gentlemen:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Inspection Report

Enclosed please find a copy of the inspection report prepared by Mr. L.P. Cooper on his inspection of Cominco, Con Mine held on October 4 and 5, 1977.

Sincerely,

Sheila Herman
Secretary to the
Manager, Water Resources

sh:

Memo to File

File No: N1L3-0040

October 6, 1977.

Subject: Telephone Conversation with J. Gowans of
Cominco - Con Mine

I returned Mr. Gowans call on October 6, 1977 at approximately 11:00 a.m. We discussed the seepage into Kam Lake.

Con apparently don't think that the seepage into Kam Lake is a serious issue. They are considering applying to the Board to amend this condition of the Licence. I explained the procedures they would have to follow and emphasized the need for a Public Hearing and the times involved (months).

I said that until the Licence is amended, if ever, I have to enforce the existing conditions, and therefore asked them to terminate the flow into Kam Lake, and to present a long range plan for preventing this from happening in the future.

I said that an Inspector would be on site every day until the flow was terminated, and probably for some time after, and that he would monitor the flow and collect the samples.

Special arrangements may have to be made to have someone open the gates or leave them open for the weekend.



A.T. Swarbrick
Supervisor
Licencing and Approvals.

ATS:jr

c.c. A.G. Redshaw
L.P. Cooper

P.O. Box 1500,
Yellowknife, N.W.T.
X1A 2R3.

October 6, 1977.

Hand Delivered

Mr. J. Gowans,
Mill Superintendent,
Cominco Limited, Con Mine,
Yellowknife, N.W.T. N1L3-0040 ←
Water Register

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence No. N1L3-0040
Inspection Report of October 4 and 5, 1977

Attached is the original and one copy of the above report. The original should be signed by you on the last page and returned to the office, with any comments you may have.

With regards to the seepage into Kam Lake which was noted by Mr. Cooper, as this is in contravention of your Water Licence, I request that you take immediate action to terminate this flow, into Kam Lake, and then to carry out whatever action is necessary to ensure such a seepage will not occur again.

A written report of the seepage occurrence and action taken to curtail the seepage and proposals to ensure it does not occur again is required in this office by October 11, 1977, in compliance with Part C, Item 9 of your Water Licence.

One of my staff will be on site daily to inspect the area and take samples of the seepage until it ceases.

As the protection and rehabilitation of Kam Lake is the matter at hand, I sincerely hope to receive your full cooperation.

Yours truly,
ORIGINAL SIGNED BY
A. G. REDSHAW

A.G. Redshaw
Manager, Water Resources
NWT Region

LPC:jr
Encl.

NORTHWEST TERRITORIES WATER BOARD

YELLOWKNIFE, N. W. T.

INSPECTION REPORT

ON

COMINCO LIMITED - CON MINE

OCTOBER 4, 1977

BY

LORNE P. COOPER

INSPECTOR UNDER THE NORTHERN INLAND WATERS ACT

WATER RESOURCES

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

YELLOWKNIFE, N. W. T.

DATED: OCTOBER 5, 1977

WATER REGISTER: N1L3-0040 ←

COMINCO LIMITED - CON MINE

INSPECTION REPORT

INTRODUCTION

On the morning of September 4, 1977, A.T. Swarbrick, and Lorne P. Cooper, inspectors under the Northern Inland Waters Act, drove to Cominco - Con Mine, to inspect the Pud Lake decant, and water course to Meg Lake. The tailings pond is presently being lowered to allow for full retention of the mill tailings over winter. At this time, seepage was observed below the Lower Pud Lake dam which is supposed to prevent any tailings effluent from flowing into Kam Lake. Jim Gowans, the Mill Superintendent was notified of the seepage at this time, and in the afternoon, A. Rothwell and Lorne Cooper conducted a more thorough investigation of the seepage, and were accompanied by Don White, of Con Mine.

OBSERVATIONS AND DISCUSSION

When we inspected the dam which was constructed to prevent flow from Lower Pud Lake to Kam Lake, a seepage was noted coming from the ground approximately fifty (50) feet below the dam, in the old stream bed to Kam Lake.

Water samples for analyses of metals, arsenic, and chloride in the water were obtained to determine the quality of the seepage water. Samples were obtained from Lower Pud Lake, above the dam; at the point of seepage below the dam; and at the mouth of the stream bed on Kam Lake. Mr. White took duplicate samples for analyses in the Con Mine laboratory. The rate of seepage was estimated to be one gallon per minute at the point of seepage, with perhaps some loss of surface flow by the time the seepage reached Kam Lake. Due to the low volume in flow, it was felt that a Bioassay sample would not be possible to collect.

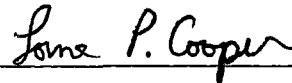
To stop the seepage, it was felt at the time that a seepage pond should be constructed below the dam to collect seepage, which could be pumped back into Lower Pud Lake. At approximately 1700 hours, I phoned the mine, and spoke with Mr. A.D. McPhail, the Manager of Con Operations, and informed him of the seepage problem. I recommended that he take the above action immediately,

- 2 -

and that a long term solution be found after that. He stated that someone would look at it in the morning to see what should be done.

As a long term solution, either constructing a wooden trough or launder through lower Pud Lake from the decant structure, or lowering of the existing ditch to Meg Lake may be the most likely solutions, but immediate containment of the seepage is the most pressing problem, as any flow into Kam Lake from lower Pud Lake is in violation of Part C, Item 7 of the Cominco - Con Water Licence.

The area will be closely monitored until all seepage has ceased.



Lorne P. Cooper
Inspector Under the
Northern Inland Waters Act

Acknowledgement of receipt of a copy of this report

Signature

Title

Date

ADDENDUM TO OCTOBER 4, 1977 INSPECTION REPORT

ON COMINCO LIMITED - CON MINE

OCTOBER 5, 1977

At 0900 I spoke with Jim Gowans, the Mine Superintendent, and reiterated what I had told Mr. McPhail the previous day. He again stated that they would assess the situation on site before concluding what to do.

At 1430 I drove to Con, and obtained a water sample at the point where seepage is first visible below the lower Pud Lake dam. I then met with Jim Gowans and Dave Whittall. Mr. Gowans had been meeting with Mr. McPhail, to determine what they should do.

Mr. Gowans and Mr. Whittall stated they felt the seepage may be only groundwater flow from the muskeg underneath lower Pud Lake, caused by the hydrostatic head created by the ponding of tailings effluent in the lower Pud Lake area. I stated that if this is so, the analyses will show a high quality water at the point of seepage. However, in any case, the water is likely to pick up arsenic and metals as it proceeds to Kam Lake, as the stream bed contains tailings from the years when Con's effluent flowed into Kam Lake via that channel.

I was told that rather than construct a sump in the porous muskeg which would not contain the seepage anyway, the mine would rather attempt a permanent solution by lowering the water level in Pud Lake. This will be done by cleaning and deepening the ditch to Meg Lake, providing an easier flow path.

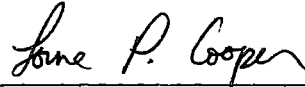
It was also suggested that eliminating the visible seepage by constructing a sump would not really solve the problem of flow from lower Pud Lake into Kam Lake, as subsurface flow will still occur, and probably in much larger volume than the surface flow. In all probability this last statement is a reasonable one.

Mr. Gowans then stated that they had already decreased outflow from Pud Lake decant to 900,000 gpd from 2,500,000 gpd, and would commence cleaning out and deepening the ditch to Meg Lake tomorrow morning. These two actions will decrease the ponding in lower Pud, and will hopefully allow the seepage to cease. However, I

- 2 -

would expect some lag time in this respect.

I told Mr. Gowans I would be out tomorrow to see how the operation was progressing.



Lorne P. Cooper
Inspector Under the
Northern Inland Waters Act

Cominco Ltd./Cominco Mine/Yellowknife, Northwest Territories, Canada XOE 1H0/Tel. (403) 873-2783

N1L3-0040
W. REGISTER



Con Operations

Mr. A. Redshaw
Controller
NWT Water Board
P.O. Box 1500
Yellowknife,
N.W.T.

October 3, 1977

Dear Mr. Redshaw:

Re: Water Licence #N1L3-0040, Part C, Item 19

It is with regret that, at this time, we can not submit detailed proposals for the containment and reclamation of the two arsenic oxide storage ponds located on the property.

Cominco Limited, in conjunction with the consulting firm, Reid, Crowther and Partners have investigated several alternatives in terms of chemical fixation methods, physical processing methods, resource recovery methods and covering methods. Success has been quite limited. Alternatives were dismissed as being either economically and/or environmentally unfeasible.

Cominco Limited is currently developing another alternative. More work is required for laboratory testing and method analysis.

The arsenic pond problem is a very complex one and decisions must be made carefully with a high degree of confidence. More time is required to produce a lasting solution.

Cominco Limited would like to make a formal presentation to the Water Board in their December meeting. At this time, we will present what work has been done and what work we intend to proceed with.

Yours truly,

James K. Gowans
J.K. Gowans
Acting Mill Supt.

JKG:gpw

cc: W.B. MEMBERS

000255



Indian and
Northern Affairs

Affaires indiennes
et du Nord

To file.

October 3, 1977.

Your file Votre référence

Our file Notre référence

N113-0040

Memo to File

From: Lorne P. Cooper
 Area Head

Re: Cominco - Con Mine - Restoration and Rehabilitation
 of Arsenic Ponds

I called Jim Gowans, the Mill Superintendent for Con this a.m. to determine why the report on the restoration proposal has not been submitted. He stated that the results from testing were not yet back, and that he could not provide a date for the report to be submitted. I requested that he submit a written explanation of why it has still not been submitted, by tomorrow a.m. He stated that would be done.

Lorne P. Cooper

LPC:jr
c.c. A.T. Swarbrick
 A.G. Redshaw

N1C3-0040 ←

Con Operations

Mr. A. Redshaw
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife, N.W.T.



September 30, 1977

Dear Mr. Redshaw:

Enclosed are copies of the 1974 and 1976 Progress Reports for our Mined - Land Research Program. Also included is a File Note, dated September 8, 1977, outlining progress made during the summer of 1977. The detailed Progress Report for 1977 will be available in early 1978.

The 1976 Progress Report is submitted as fulfillment of the requirement in Part C, Item 21 of our Water Licence.

I trust you will find this information of interest.

Yours truly,

A handwritten signature in black ink, appearing to read "Jim Gowans".

Jim Gowans
Acting Mill Superintendent
Con Operations

JKG/lgl

Enclosures: 3

W.B. members
T.C. members
A.H. Jones

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

September 26, 1977

N1L3-0040

Mr. W.J. Bryant
District Manager
Environmental Protection Service
Department of Fisheries & Environment
P.O. Box 2310
Yellowknife, Northwest Territories
XOE 1H0

Dear Mr. Bryant:

Re: Cominco Limited, Con Mine
Water Licence #N1L3-0040
Part C, Item 19

Your letter of September 22, 1977 concerning the above item is acknowledged and I thank you for bringing this matter to my attention.

Due to an oversight on my part, the request from Con Mine dated August 11, 1977 (copy attached) was not distributed to Board members and was therefore not brought before the Water Board at its meeting on August 25, 1977 for consideration.

By copy of this letter I am informing Board members of the request by Cominco Limited for a delay in the filing of the above report and also including a copy of your letter for their information.

I have asked the Secretary to place this item on the agenda for the next Board meeting.

. . . 2 . .

Mr. W.J. BryantPage 2

In conclusion I would like to say that I take great objection to the last paragraph of your letter, namely your suggestion of "the" continued non-compliance of water licence holders". My staff and I are endeavouring to do the best job possible with the resources available to us and I would suggest that if you feel that we are not doing an adequate job in administering our responsibilities you (1) formally write Mr. R. Hornal my Regional Director informing him of your concerns; and (2) bring the matter before the next meeting of the Water Board so that they can consider your concerns, and if found justified, can inform my Minister accordingly.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW

A. G. Redshaw
Manager, Water Resources
NWT Region

AGR:sh

cc: Members, NWT Water Board
Mr. R. Hornal, Regional Director, DIAND
Mr. J. Mar, Regional Director General, DFE

File N143-0040

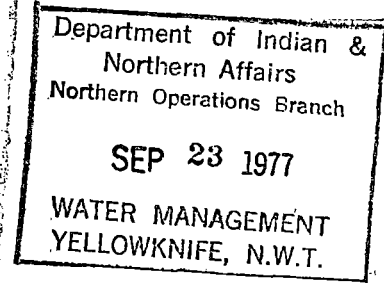


Environment
Canada

Environnement
Canada

Environmental
Protection Protection de
l'Environnement

P.O. Box 2310,
Yellowknife, N.W.T.
X1A 2P7
(403) 873-3456



September 22, 1977

Your file Votre référence

Our file Notre référence

4705-37/Con

Mr. A. Redshaw,
Controller,
N.W.T. Water Board,
P.O. Box 1500,
Yellowknife, N.W.T.

Dear Mr. Redshaw:

Re: Cominco CON Mine Water License

I have just received your office's inspection report of August 15, 16, 17, 1977 on Cominco Limited, Con Mine. The EPS and I as a Board Member are highly disturbed to learn that Part C, Item 19 of the CON license is being blatantly violated. The company was to submit specific plans on procedures for the containment and reclamation of the arsenic oxide storage areas by September 1, 1977. As related in the inspection report, a company official has casually mentioned that their plans cannot be submitted until October because of difficulty. I find this sort of attitude inexcusable and demonstrates once again a licensee's lack of respect to the conditions of a license which have been set to protect the citizens of the NWT and their environment. The company has had a number of years to correct this very significant and visible problem, yet we get another delay. Cominco could have easily submitted their plans months ago and with the Board's approval, commenced the necessary corrective action this summer. Now because of winter fast approaching, another year of no action will be passed.

Furthermore, you should be aware that a strong recommendation was made by the CPHA Task Force in their May, 1977 report to have these storage areas properly contained and sealed. This recommendation compounds the need for this license condition to be promptly acted upon.

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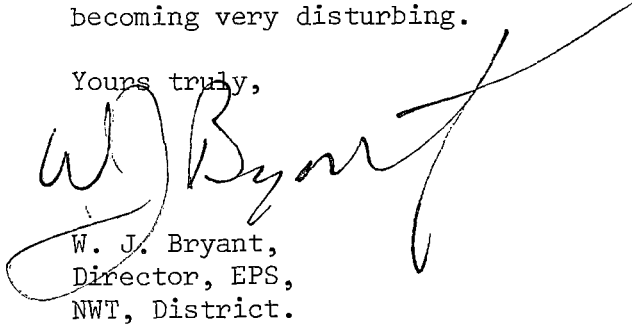
- 2 -

I am further dismayed to find that in your covering letter of September 15, 1977, to the company regarding the Inspection Report, you have totally ignored the violation of Part C, Item 19. Instead your letter addresses, in my view, only an incipient aspect of the license - - daily readings of water meters.

I request that you advise Cominco to immediately submit their plans regarding Part C, Item 19 in time for the Board to review and decide upon a course of action at our next scheduled meeting on October 5, 1977.

The continued non-compliance of water license holders in the NWT is becoming very disturbing.

Yours truly,

A handwritten signature in dark ink, appearing to read 'W. J. Bryant', is written over the typed name and title. The signature is fluid and cursive.

W. J. Bryant,
Director, EPS,
NWT, District.

c.c. A. Gordon

C.C. MEMBERS, N.W.T. Water Board

P.O. Box 1500
Yellowknife
Northwest Territories
X2A 2R3

September 19, 1977

NIL3-0040
Water Register

Mr. J. Gowans
A/Mill Superintendent
Con Operations
Cominco Limited, Con Mine
Box 2000
Yellowknife, Northwest Territories
XOE 1H0

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Register #NIL3-0040
Your letters dated March 18 & August 31, 1977

I have reviewed your replies to our Laboratory Methods Questionnaire and have the following comments:

Metals: the method of sample preservations is acceptable.

Arsenic: the method of analysis is acceptable.

Cyanide: the method of sample preservation and the method of analysis are acceptable.

Residue: the method of analysis is acceptable.

Mercury: the method of analysis is acceptable, the attached diagram shows that you are using an "open system" whereby the mercury vapour, after passage through the cell, is absorbed onto activated charcoal. The diagram does not indicate the length of the carbon filter and, I would presume that, since a small residual amount of mercury would still be present in this air stream, it would be discharged through an exhaust system, such as a fume cupboard.

Thank you for your cooperation.

Yours truly,



A. G. Redshaw
Manager, Water Resources
NWT Region

RNS:sh

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

September 16, 1977

N1L3-0040 ←


Members
NWT Water Board

Gentlemen:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Inspection Report of August 1977

Attached please find copies of the inspection report on
Cominco Limited, Con Mine prepared by Mr. B. Doulton,
and the covering letter to the Company.

Sincerely,



Sheila Herman
Secretary to
Manager, Water Resources

sh:

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

September 15, 1977

N1L3-0040 ←
Water Register

Mr. J. Gowans
A/Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1H0

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Cominco Limited, Con Mine
Amendment to Part C Item 21

This will provide written confirmation that the Water Board at its meeting on June 8, 1977 gave approval to Mr. MacPhail's written request of May 6, 1977 that the reporting date for the Restoration and Reclamation progress report be changed from eighteen months to a report prior to twelve and twenty-four months with the final report due after thirty-six months instead of the required thirty months.

The Board agreed that a formal amendment to the Licence would not be required since it would end up being better informed of the progress of your work.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW

A. G. Redshaw
Manager, Water Resources
NWT Region

AGR:sh

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

September 15, 1977

N1L3-0040 ←
Water Register

Mr. J. Gowans
A/Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1H0

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Cominco Limited, Con Mine
Approval under Part C Items 4, 11 & 21

I would like to express my thanks for your presentation before the Water Board's Technical Committee on July 25, 1977, of your Company's proposals submitted by letter on June 1, 1977, to meet the above requirements.

This is to confirm that the Water Board at its meeting on August 25, 1977 gave final consideration to these proposals and has found each satisfactory and has given its approval in accordance with the requirements of the Licence.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW

A. G. Redshaw
Manager, Water Resources
NWT Region

AGR:sh

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

September 15, 1977

REGISTERED

Mr. J. Gowans
A/Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1H0

N1L3-0040 ←
Water Register

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence #N1L3-0040
Inspection Report of August 15, 16 & 17, 1977

Attached please find the original and one copy of the above report. The original should be signed by you on the last page and returned to this office. Comments on the report are requested.

From the report I note everything appears to be in good order. The point noted by Mr. Doulton on Page 3 regarding the taking of daily readings of water meters has been considered and I must insist that every effort be made to obtain these readings since it is a requirement of the Licence. Our reasons for this requirement is to allow us to get an accurate picture of your daily water use, since as you are well aware, this information is not currently available. Once a firm handle on this has been obtained consideration will be given to amending the reporting requirements. I would ask that the hour of doing the reading is taken be recorded allowing adjustments to be made to the reported data as required. Also where you find it necessary to report estimated values this should also be noted.

. . . 2 . .

Mr. J. Gowans . . . Page 2

In regards to your proposed fall release from the tailings pond, Mr. Cooper will contact you to work out a program whereby we can collect additional data which will increase our knowledge of how the pond is operating. Your cooperation is appreciated.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW
A. G. Redshaw
Manager, Water Resources
NWT Region

AGR:sh

NORTHWEST TERRITORIES WATER BOARD

YELLOWKNIFE, N. W. T.

INSPECTION REPORT

ON

COMINCO LIMITED
CON MINE

AUGUST 15, 16 and 17, 1977

BY

B. DOULTON

INSPECTOR UNDER THE NORTHERN INLAND WATERS ACT

WATER MANAGEMENT

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

YELLOWKNIFE, N. W. T.

DATED: AUGUST 23, 1977

WATER REGISTER: NIL3-0040

COMINCO LIMITED - CON MINE

INSPECTION REPORT

INTRODUCTION

An inspection of Con Mine was carried out on August 15, 16 and 17, 1977 by Mr. B. Doulton and Mr. L. Cooper, Inspectors under the Northern Inland Waters Act and Mr. W. Starling, Water Management. A general overview of the site was conducted including a tour of the mill directed by Mr. J. Gowans, Acting Mill Superintendent, Con Mine. Water samples were collected for routine chemical analysis.

1. Measurement of Water Use and Waste Disposal

- see Figure #1 for the location of the water meters

The Company proposals for the methods to be used for the measurement of water use and waste disposal dated March 24, 1977 have been approved by the Board except as modified by the submission from Mr. D. Whittall dated July 13, 1977. The latter submission concerning the installation of a continuous flow recorder at the Pud Lake decant structure plus details of monitoring of the level of Upper Pud Lake has also been approved by the Board.

The following meters were installed in accordance with the above Company submissions (see Figure #1 for the location of these meters):

Meter #1

Yellowknife Water Supply (this water was taken from the Yellowknife River)

3" Buffalo-Niagara digital flow meter. This meter measured in tons and the values were converted to imperial gallons. The meter was located in the Con pumphouse close to the lake pumps. The records book was also located in the Con pumphouse.

Meter #2

Freshwater pumped underground

3" Buffalo-Niagara digital flow meter, measured in tons

- 2 -

of water. The measurement was converted to imperial gallons. This meter and its records book were located in the powerhouse.

Meter #3

Backfill to underground

The total backfill flow, as a slurry, was measured using a 4" Foxboro magnetic flow meter measured in U.S. gallons per minute. The percent solids was measured manually using a Marcy gauge. The water flow was calculated from these measurements in imperial gallons. The meter and Marcy gauge were located in the backfill building. The records book was located in the technician's office in the mill.

Meter #4

Water pumped from underground

6" Rockwell digital flow meter, measured in imperial gallons. The meter was located at the surface near the mill beside the lift from underground. The records book was kept in the powerhouse (this was the same book that was used for the collection of the readings for the "Freshwater pumped underground" meter).

Meter #5

Barren bleed to Tailings

3" Rockwell digital meter, measured in imperial gallons. This meter was located in the mill. The records book was located in the shifter's office in the mill.

The records from all the above meters are compiled in one book every two to three weeks. This book was located in the mill laboratory.

As noted in the above March 24, 1977 submission, the Company was planning on installing a 6" Rockwell digital flow meter in the mill to measure the water pumped from Great Slave Lake. The meter had only just been delivered to the site at the time of the inspection. Mr. Gowans said he expected to have it installed hopefully within one month.

The Company measured the levels of Upper Pud Lake at the decant structure using a staff gauge (the staff

. . . 3 . . .

- 3 -

gauge is not permanently installed but rather the gauge is taken down to the decant structure for each reading). Flow through the decant structure was being measured using a V-notch weir. This weir was located in the downstream end of the decant structure. Mr. Dave Whittall, Development Engineer, Con mine, said he hoped to have a continuous flow recorder installed here next spring.

In accordance with Part C, Item 5 of the Surveillance Network Program, the Company submitted on July 12, 1977, records of water used to the end of June, 1977. Estimates were used for the periods where it was not possible to obtain an actual reading because the meter was not yet installed. There were some actual readings missing for the "Yellowknife water supply" meter even though the meter was installed at the time. Mr. Gowans said that this was because there is usually no one at the pumphouse on the weekends. Mr. Doulton said that the Company should write the Board concerning this since the Licence requires that the meter readings be obtained here everyday.

Mr. Doulton checked the water use records for the period after June 30, 1977 and found them to be satisfactory except that there were some actual readings missing for the "Yellowknife water supply" meter.

2. Waste Disposal - General

- see the attached map for the location of discharge points and of waste disposal areas

i) Tailings discharge to Upper Pud Lake

The tailings discharge point was just behind the mill. The tailings discharge line was a wooden trough (launder).

ii) Sewage discharge to Upper Pud Lake

Sewage from the mill was discharged with the mill tailings. The sewage discharge point to the mill tailings launder was about 40 feet behind the mill.

Sewage from the camp and mine buildings was pumped to a collection tank in the Con pumphouse. The sewage was then pumped to Upper Pud Lake (the discharge point was close to the new lab - see map).

. . . 4 . .

- 4 -

iii) Arsenic oxide storage area near the mill

No water flow was seen coming from this storage area.

Part C, Item 19 of the Con water Licence requires that the Company file with the office of the Board proposals for the containment and reclamation of the arsenic oxide areas by September 1, 1977. Mr. Gowans said that there has been some difficulty in obtaining test results so that the proposals would not be ready until early October, 1977. He said that he had written the Board on August 11, 1977 for approval for this delay in submitting the reclamation proposals.

iv) Decant structure dam

No cracks or any other evidence of dam stability problems were seen.

There was no flow through the decant structure at the time of the inspection except for a small amount of seepage (there has been flow through the structure this year only for the period of early June to July 8). The freeboard was approximately four feet. The Company was planning on opening the decant structure in early September and on closing it off just before freeze-up. Mr. Gowans said that the Company wanted to draw down Upper Pud Lake as much as possible so that there would be enough storage capacity to handle the tailings discharge over the winter and the spring runoff.

Mr. Gowans said that the stop-logs would be properly sealed before freeze-up to minimize the possibility of seepage through the logs next spring.

v) Dam on the South East corner of Upper Pud Lake

No problems were seen here.

vi) Dykes on Lower Pud Lake

There was no water seen on the creek side of the dykes.

3. Water Sampling

- see the attached map for the location of the water sampling points

. . . 5 . .

One sample was collected at each of the following points except where otherwise noted:

Licence Stations

- 40-1 - Pud Lake tailings area discharge at the decant structure.

There was no flow through the decant structure except for a small amount of seepage. No sample was collected here.

- 40-2 - Mill freshwater intake at the Yellowknife Bay pumphouse.

The sample was collected from a "bleeder" on the #3 lake pump.

- 40-3 - Meg Lake discharge to Keg Lake

A surface sample was taken in some ponding at the inlet of the creek leading to Keg Lake. There was no flow seen at the Meg Lake end of this creek.

- 40-4 - Keg Lake at its centre

Due to transportation problems, it was not possible to collect a water sample from here during the time of the inspection. It was planned to have the sample collected during the following week.

Additional Sampling Sites

- a) The make-up tank in the mill
- see Figure #1 for the location of this tank in the water flow circuit.

The sample was collected about one foot below the surface, immediately below the freshwater make-up discharge point.

- b) Discharge to Upper Pud Lake

The mill was not operating at the time of the inspection but it was still possible to collect a sample from here because water flow is continued through the mill circuit even during shut down.

Analysis results for the water sampling were not yet available at the time of writing.

- 6 -

The Company has been submitting sample analysis results regularly in accordance with the Surveillance Network Program except that the June, 1977 analysis results which are required by Part B, Item 2 of the Program for Station 40-1 were not submitted.

Bruce Doulton

B. Doulton
Inspector Under the
Northern Inland Waters Act

Acknowledgement of receipt of a copy of this report

Signature

Title

Date

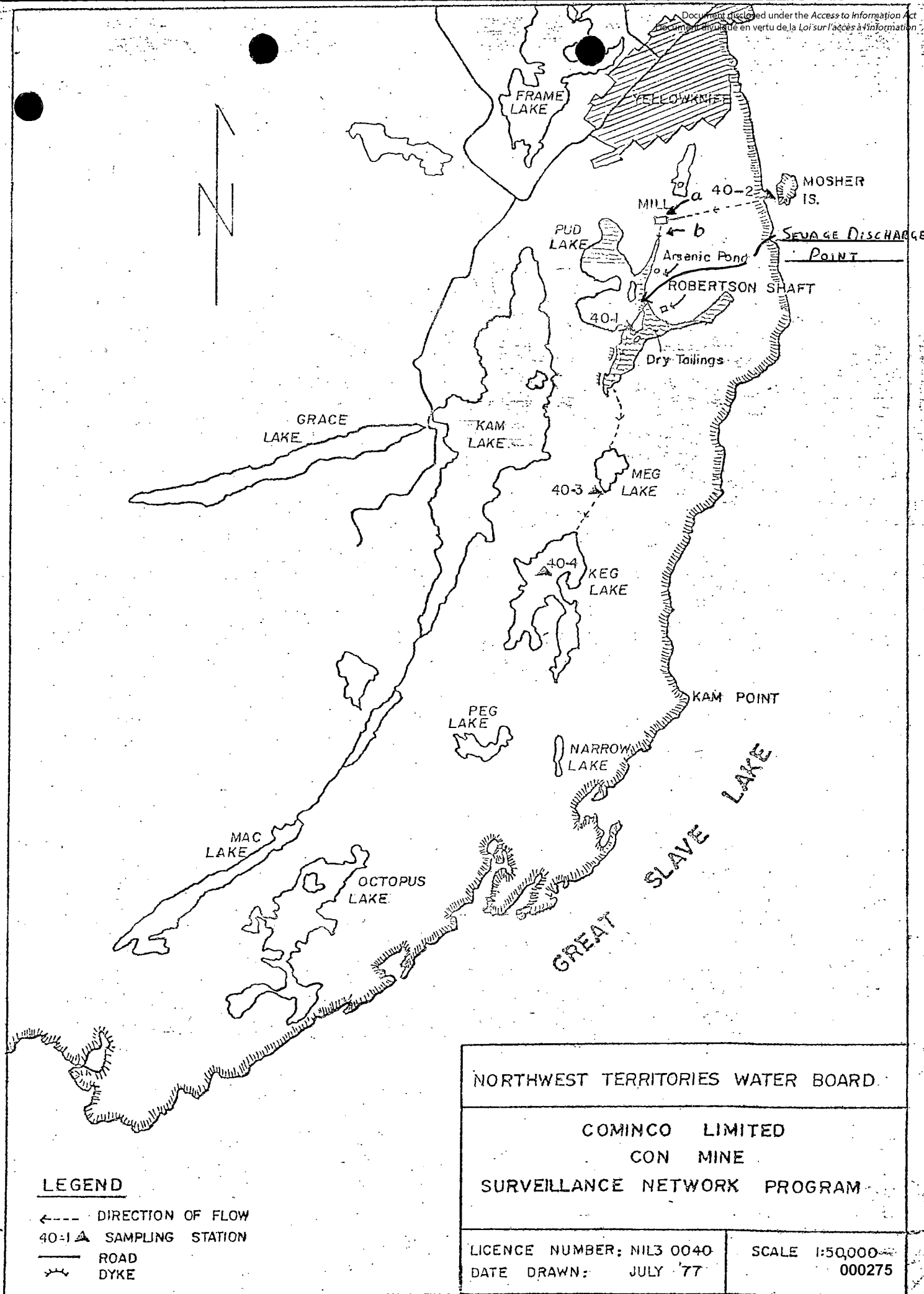


FIGURE 1

WATER REGISTER # NIL3-0040

Based on 650 TPCD

(1,342,400 I.G.P.D. Max)

(936,000 I.G.P.D. Max)

992,000 I.G.P.D.

TO TAILINGS

720,000 I.G.P.D. METER WILL BE INSTALLED HERE 678,000 I.G.P.D.

CON LAKE PUMPS

COMPRESSOR COOLING

CONTINUOUS FLOW METER WILL BE INSTALLED HERE

30,000

603,000 I.G.P.D. O/F

75,000 I.G.P.D.

TANK

TANK O/F

TO PROCESS

37,000 I.G.P.D. FILTER WASH

METER #5
38,000 I.G.P.D. BARREN BLEED

0-50,000 I.G.P.D. TO RECLAIM CYCLONES

20,000 I.G.P.D.

MILL TOILETS ETC.

X- WATER METERS

22,000 IGP.D. SPRAYS

198,000 I.G.P.D.

WITH SLIMES

BACKFILL CYCLONES

22,000 I.G.P.D. DECANT

14,000 I.G.P.D. WITH FILL TO MINE

205,000 I.G.P.D.

(137,200 I.G.P.D. Max)

81,000 I.G.P.D. FROM YELLOWKNIFE WATER SUPPLY

3,300 MAKE UP TANK

686,000 I.G.P.D.

OVERFLOW

METER #1

15,000

O/F TO MAKE UP TANK

METER #3

METER #4

TANK

288,000 I.G.P.D. Total pumped from mine

(90,000 I.G.P.D. Max)

16,000 I.G.P.D. IN BACKFILL

207,000 I.G.P.D.

53,000 I.G.P.D. TO MINE DRILLING & DRINKING

28,000 I.G.P.D. BACKFILL DRAINAGE

GROUND WATER (285,200 I.G.P.D. MAX.)

28,000 I.G.P.D. DOMESTIC WATER

METER #2

D.H.E

000276

Memo to File

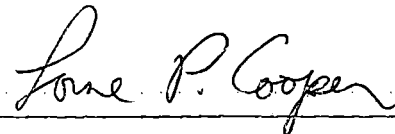
File No: N1L3-0040

September 14, 1977.

From: L.P. Cooper
Head, Southern Area

Re: Cominco-Con Mine, Discharge from Tailings Pond

At approximately 0800 hours on September 12, 1977, Con opened up the decant structure at the tailings pond, to draw the level in the pond down sufficiently to provide storage over winter behind the dam. The intent is to decant at 2.5 million imperial gallons per day until freeze up, or until full drawdown is attained. There may be up to 160 million gallons to decant, although evaporation would have removed a portion of this volume. A water sample was obtained at 0940 hours on September 12. Hach kit analyses for copper and cyanide indicated 0.55 mg/l, and 0.64 mg/l, respectively. A bioassay sample was obtained between 0850 and 0920 hours on September 13, with the aid of Arthur Franchi, of Con, who I instructed on how to take a bioassay sample. The sample was shipped to Edmonton via PWA during this afternoon, and the bioassay Lab was contacted previously. Water samples were obtained for chemical analysis at 0930 hours on September 13. When drawdown is completed, I will try to have a staff gauge permanently installed on the pond side of the decant structure.



L.P. Cooper
Inspector under the
Northern Inland Waters Act

LPC:jrr

FILE NOTE

COMINCO LTD.
Reclamation Research

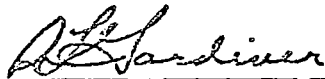
REVEGETATION OF SALINE CON TAILINGS

Use of saline tolerant species capable of sustained growth under climatic conditions prevailing in the Yellowknife area, incorporation of large amounts of peat moss and leaching salts with excess water are techniques currently under evaluation on saline Con tailings.

Short-term growth of tall wheatgrass, arctared creeping red fescue and native foxtail barley on strongly saline tailings treated with peat moss is encouraging. However, salt concentrations remain extremely high in peat-treated tailings, and I am not confident the grass species presently growing on the site will sustain life indefinitely. In addition, peat moss will decompose in time and salt concentrations may reach extremely toxic concentrations.

Leaching and removal of salts from the tailings mass may be the only method of creating a permanently suitable material for sustained plant life. If salts cannot be leached out of the tailings mass per se then a subsurface drainage system may be required. Because tailings is medium to coarse textured and the climate of Yellowknife semi-arid, addition of peat moss to leached tailings may be necessary to improve water storage and nutrient retention capacities.

At the present time, we do not know if application of large quantities of peat will maintain a suitable tailings growth medium, we do not know how much water is required to leach salts from the tailings mass, we do not know how effectively tailings will leach and we do not know if species presently growing on tailings will persist. For these reasons, it is not considered advisable to attempt large scale revegetation on tailings at this time. Investigations to find suitable plant species and answer questions related to leaching and use of peat moss must be continued. Due to time constraints of the Con water licence present investigations may require intensification.



R.T. Gardiner
Reclamation Agronomist
Reclamation Research

RTG:jf

September 8, 1977



FILE NOTE

COMINCO LTD.
Reclamation Research

CON OPERATIONS
(August 28-31, 1977)


Evaluation of field experiments was completed as planned. Soil samples were collected from all projects (1976 and 1977) for analysis of pH and ECe. In addition newly established plots were sampled prior to incorporation of peat.

Projects C-3-77 (1978) were established at six sites as outlined. Project C-10-77 was established on the site outlined, however, the plot size proved to be 15' x 600'. Application and spreading of peat by means of front-end loader proved effective and efficient. The peat strip was applied and spread in three hours. Multiple passes by the front-end loader resulted in ruts and variable depth of peat in some areas. Peat quality appeared satisfactory with exception of a few boulders deposited on tailings with peat. Peat was frozen below 3 feet depth. Project C-9-77 was established with modification as planned.

Leaching of Project C-8-77 was initiated. A hose with flow rate of 10 l/gpm is currently running in Site 3. D. White was informed of water requirements for each site and will attempt to provide uniform application of water. A. Franchi will collect and analyze 6 water samples including: leaching water, leachate from Sites 1, 2 and 3, and tailings discharge before and after leaching. Water quality assays supplied to the Water Board on a routine basis will be utilized.

Vegetation was sampled for arsenic content from old, new and Negus and Yellowknife soil. Species were sampled individually and replicated within sites to determine variation within sites and with number of growing seasons following establishment. Species collected included tall wheatgrass, creeping red fescue, Kentucky bluegrass, foxtail barley, meadow foxtail, ticklegrass, red top, aster, horsetail and shaggy mane mushrooms.

Some of the agricultural species appeared to be flowering but may not have set viable seed during the short northern growing season. Seed was collected from research plots for germination tests.



J. Eric Stathers
Asst. Reclamation Agronomist
Reclamation Research

JES:jf

September 6, 1977

FILE NOTE

COMINCO LTD.
Reclamation Research

INSPECTION OF REVEGETATION EXPERIMENTS ON CON AND NEGUS TAILINGS
AUGUST 22, 1977

Grass growth on Negus and Con tailings reflects the cool, dry weather conditions experienced at Yellowknife this year. Salt concentrations would be expected to increase at the tailings surface under climatic conditions prevailing this year. Salt encrustations were observed on the surface in many areas.

1. Recently Abandoned Con Tailings

a) 1977 Seeded Plots

Establishment and growth of grass species seeded on saline tailings varied with source of peat moss and rate of peat moss applied. Germination and growth of a grass-legume mixture composed of tall wheatgrass, western wheatgrass, creeping red fescue (Boreal) and birdsfoot trefoil was best on tailings mixed with native peat. Poor germination on tailings amended with commercial peat was due, in our opinion, to a dry seedbed resulting from application of such large quantities of dry organic matter. Native peat was wet and the seedbed did not dry out. Best growth was at site 3. Tailings from this site had E_{ce} of 9 mmhos/cm prior to peat addition. E_{ce} of sites 1, 2 and 4 were 20, 24 and 36 mmhos/cm, respectively (C-3-77).

Seedling populations on tailings not treated with peat moss were satisfactory and in some cases greater than on peat-treated tailings. Growth of seedlings was however poor when compared to growth on tailings mixed with either commercial or native peats. Seedlings were severely chlorotic and necrotic without peat. Conversely, only minor chlorosis was observed on peat treated tailings. Little difference in grass growth was observed among 88, 132 and 176 t/ha peat rates.

Germination of domestic and native saline tolerant species seeded on tailings treated with commercial peat moss was generally poor. Poor germination may have been the result of the dry seedbed caused by mixing in large quantities of dry peat (C-4-77). E_{ce} at seeding and prior to mixing with peat was 19 mmhos/cm.

Seedling establishment on tailings leached in 1976 during infiltration rate studies was poor and seedling populations were lower than on unleached tailings. Leaching in this instance was not effective in reducing salt concentrations, having E_{ce} of 20 mmhos/cm prior to seeding. E_{ce} of unleached tailings was 28 mmhos/cm (C-5-77).

Foxtail barley seeded on tailings treated with both commercial and native peat did germinate.

Tailings sites planned for leaching experiments were prepared on August 22 and 23. Perimeter ditches and berms were constructed using a back-hoe.

continued.....2

1. Recently Abandoned Con Tailings (cont'd)

b) 1976 Seeded Plots

Arctared creeping red fescue and tall wheatgrass were the only species growing on saline tailings areas seeded in 1976 (C-1-76). Distribution of the two grass species was influenced by tailings variability and not peat moss rate. Excellent growth occurred on grey tailings but was poor on brownish-grey tailings ridges. Peat rates applied in 1976 did not affect salt content. ECe values for 0, 55, 11, 22 and 44 mt/ha rates were 28, 30, 34, 28 and 36 mmhos/cm, respectively when sampled on May 31, 1977.

Both grass species were heading out. Tall wheatgrass was in the flowering stage and will not likely set viable seed. Creeping red fescue heads appeared ripe however seeds were small. Seed viability is unknown. Foxtail barley has not invaded these plots to any significant extent.

Only creeping red fescue survived winter and was growing satisfactorily on the summer seeded plot.

Satisfactory foxtail barley growth occurred on peat treated tailings (22 and 44 mt/ha rates only) seeded to foxtail barley in spring of 1976.

c) 1974 and 1975 Seeded Plots

Only the occasional foxtail barley plant was growing on these plots. Grass plants appeared dried out and dormant. In addition to high salt concentrations, maintenance fertilizer has not been applied to these areas for two years.

2. Long Abandoned Con Tailings

Foxtail barley was dominant grass specie on all plots seeded in 1974 and 1975. Creeping red fescue was the only seeded specie observed.

Vegetative cover and growth of foxtail barley were reduced relative to 1976 due to discontinuance of maintenance fertilizer and the dry cool growing season. Plants appeared dried up and had set seed.

3. Long Abandoned Negus Tailings

a) 1977 Seeded Area

Seedling populations and growth on the three acre area of Negus tailings seeded in late May 1977 reflected the variability in tailings texture, colour, surface structure and salt content as well as the effect of pre-seeding tillage and sprinkler irrigation (C-6-77).

Seedling populations were low to non-existent on unseeded areas and on seeded but untilled areas. Ungerminated seed was observed on the untilled tailings surface and may germinate next spring. Sprinkler irrigation improved germination on untilled areas.

continued.....3

3. ²²³~~Land~~ Abandoned Negus Tailings (cont'd)

a) 1977 Seeded Area (cont'd)

Germination was generally satisfactory on pre-tilled tailings. Seedling growth varied from poor to good. Tailings west of the irrigation plot had satisfactory seedling populations but seedlings were severely chlorotic and necrotic. *Fertilizer was not applied on this area.*

Light grey tailings, characterized by salt encrustations, was devoid of seedlings.

Leaching in 1976 reduced salt concentrations resulting in improved seedling growth relative to unleached areas. ECe values for adjacent leached and unleached tailings on date of seeding were 2.3 and 9.0 mmhos/cm, respectively. Grass plants on unleached tailings were chlorotic (C-5-77).

b) 1976 Seeded Plots

Tall wheatgrass, arctared creeping red fescue and the occasional meadow foxtail were the only seeded species growing on spring and summer seeded areas. Numerous clumps of foxtail barley had invaded the plot areas (C-3-76). Seeded species appeared vigorous and were in the early heading stage. Seeding date ECe for the plot areas were 7.9, 5.2 and 9.0 mmhos/cm for spring-seeded, summer-seeded and sprinkler irrigated areas, respectively.

c) 1975 Seeded Plots

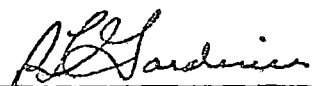
Foxtail barley has invaded experimental plots to varying degrees dependent in part on density and survival of seeded species, seeding rate and maintenance fertilizer program. On areas seeded at high rates to grass-legume mixtures containing creeping red fescue, meadow foxtail, hard fescue and crested wheatgrass, grass cover is dominated by the seeded species and foxtail barley is present as a significant component of the sward. Vegetative cover achieves maximum values on tailings seeded at high rates and maintained annually with fertilizer.

Although seeded species have formed heads, very few seeds have formed this year and there is no evidence of self-seeding taking place. Nuggett Kentucky bluegrass and red top, seeded individually, may be exceptions.

Growth was not as good as in 1976 due to the dry, cool growing season.

d) 1974 Seeded Plot

Vegetative cover dominated by foxtail barley. Growth poor relative to 1976 due to discontinuance of maintenance fertilizer and cool, dry season. Seeded species still surviving include creeping red fescue, hard fescue and meadow foxtail.


R.T. Gardiner
Reclamation Agronomist
Reclamation Research

RTG:jf
September 8, 1977

0 1 8 6 4 1

RECEIVED
NORTHERN OPERATIONS
BRANCH D.T.A.N.D.
YELLOWKNIFE

SEP 9 10 27 '77



Con Operations

Mr. A.T. Swarbrick
Asst. Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife,
N.W.T.

August 31, 1977

*File NIL3-0040
WATER REGISTER*

Dear Mr. Swarbrick:

Ré: Water Licence #NIL-0040
Your letter dated July 13, 1977

Preservation of samples to be assayed for oil and grease in accordance with Item 6, Part B of the Surveillance Network Program. As per your suggestion we will proceed to treat samples to be assayed for oil and grease with acidification by the addition of 5 mls. of 1+1 H₂SO₄.

Further to Item 6, Part B we are pleased to submit the following procedure for the collection of samples.

1. General Procedure

Four - 32 oz. bottles are used for each individual sample. Each bottle is filled approximately $\frac{1}{2}$ full, the cap replaced and then vigorously shaken to insure that all of the interior is rinsed. This procedure is repeated three times for each bottle with the rinse water always being poured out downstream from the sampling point to ensure that no contamination occurs when the sample is cut. Wherever possible the sample bottles are completely submerged, with the mouth of the bottle approximately 2 inches below the surface of the water. Presently new sample bottles are used with each sample, as the samples are sent to Trail for analysis. When a sample bottle is reused it is washed in hot 1+1 Nitric Acid, rinsed twice with tap water and twice with distilled water.

The set of 4 bottles is marked as follows:

- (1) Sampling Station number (40-1, 40-2, 40-3, 40-4)
- (2) Date on which the sample is taken.
- (3) Laboratory reference number.
- (4) Pretreatment, if any. (1 bottle marked NaOH for CN, 1 bottle marked HNO₃ for heavy metals, 2 bottles unmarked for ph, susp. solids etc.)

Water Licence #N1L-0040
August 31, 1977
Page Two

Note: When an oil and grease assay is required, an additional bottle is used and duly labelled H_2SO_4 .

Specific procedures for individual sampling Stations:

- (1) 40-1 Pud Lake tailings area discharge at the decant structure. This sample is collected at the downstream end of the decant structure, at the lip of the V-notch of the secondary weir.
- (2) 40-2 Mill freshwater intake at the Yellowknife Bay pumphouse. The bleed valve on the lake pump is opened and the water is allowed to run for at least 3 minutes prior to rinsing bottles and collecting samples. The number on the lake pump from which the sample is taken is always noted on the bottle.
- (3) 40-3 Meg Lake discharge to Keg Lake. This sample is taken from the centre of the discharge channel at the extreme upstream end of the channel.
- (4) 40-4 Keg Lake at its centre. In periods of freewater the sample bottle is placed in a weighted crib and allowed to fill as it is lowered to approximately mid-depth. In periods of ice and snow cover the following procedure is employed:
 1. An area of approximately 1 square yard of snow is cleared to expose the ice surface.
 2. A hole is then drilled in the centre of this area.
 3. Subsequently the auger bit is pumped up and down to flush water through the hole.
 4. The bottle, again placed in a weighted crib, is allowed to fill as it is lowered into the hole. After rinsing 3 times, the same procedure is used to collect the sample.

With regard to Item 7 Part B of the Surveillance Network Program we had submitted a letter to your department, dated March 18, 1977. Attached to this letter was the questionnaire on analytical methods, as requested by your department, and a copy of the methods, used by our labs, which differed from the "Standard Methods for the Examination of Waters and Wastewaters". Please advise us as to what further information you require for the fulfillment of this item.

Yours truly,

Jim Swans
for A. Franchi

AF:pw

000284

Memo to File:

NIL3-0040

August 19, 1977

Telecon with Tim Gowans, Acting Mill Super
August 19, 1977

- there is one As storage area beside Upper Pud Lake near the con mill and one area located at Negan
- all their sampling results are 'TOTALS' (rather than extractable)

B. Daulton
Head, Western Area

Memo to File

Aug. 17/77
N123-0040

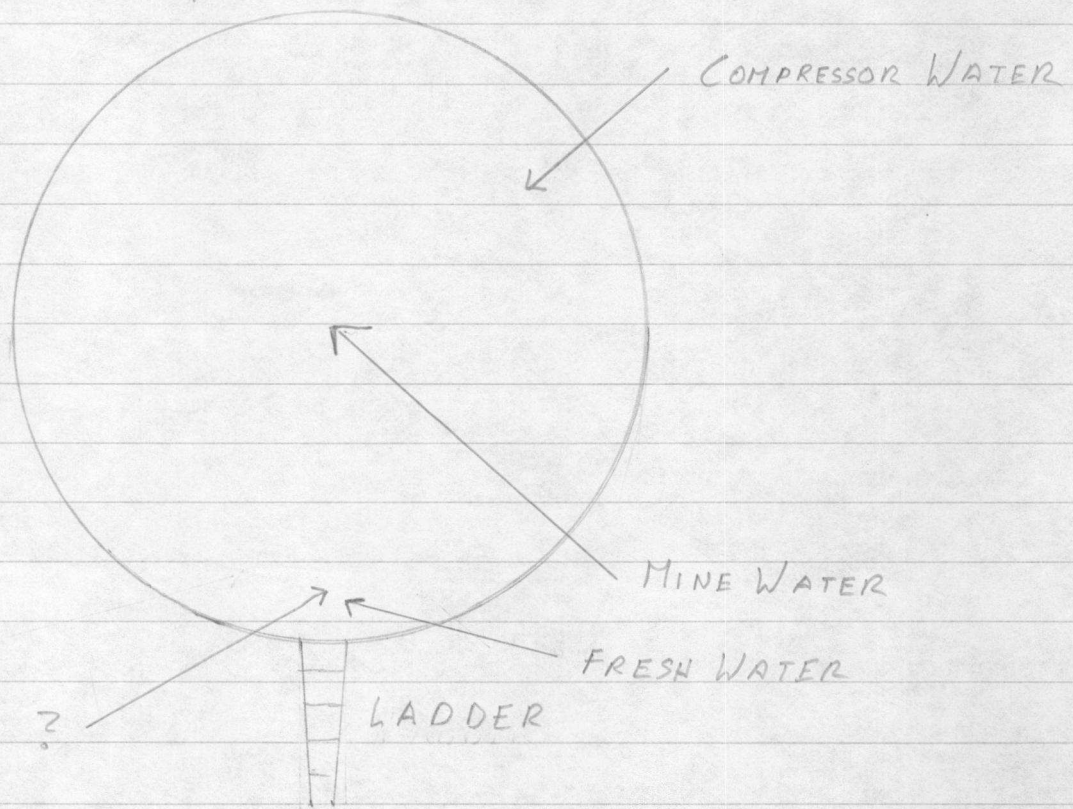
COMINCO LIMITED

CON MINE

HOLDING TANK in the mill

The Following is a diagram identifying the discharges to the holding tank in the mill :

Looking from the top of the tank :



B. Doullor
Head, Western Area

N1L3-0040 ←

WATER REGISTER

August 12, 1977.

Mr. J. Gowans,
A/Mill Superintendent,
Cominco Limited, Con Mine,
Yellowknife, Northwest Territories.
XOE 1H0.

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence No. N1L3-0040
Cominco Limited, Con Mine
Surveillance Network Program, Part B

In accordance with Part B, Item 4 of the Surveillance Network program, the Licensee shall sample the Meg Lake discharge to Keg Lake at Station 40-3 during the following periods: late August, 1977, late September, 1977 and late October, 1977.

In accordance with Part B, Item 5 of the Surveillance Network Program, the Licensee shall sample the Pud Lake discharge to Meg Lake at Station 40-1 for acute fish toxicity testing during the following periods: early September, 1977 and early November, 1977.

Enclosed are the following attachments concerning the Surveillance Network program: 'Sampling Station Details', 'Notes on Water Sampling', a map of the Con mine area showing the sampling locations and the sheet to be used for submitting the sampling analysis results.

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- 2 -

If you have any questions, please contact L. Cooper
at this office.

Yours truly,

A.G. Redshaw
Controller

BD:jr
Encl.

N1L3-0040 ←

WATER REGISTER

August 12, 1977.

Mr. J. Gowans,
A/Mill Superintendent,
Cominco Limited, Con Mine,
Yellowknife, Northwest Territories.
XOE 1H0.

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Cominco Limited
Water Licence No. N1L3-0040
Measurement of Water Use and Waste Discharge
Part C, Item 12
Recording of Data Required by Part C of the
Surveillance Network Program

Your March 24, 1977 submission concerning measurement of water use and waste discharge, referred to in Part C, Item 12 of your Water Licence, is approved except as modified by the July 13, 1977 letter from Mr. Whittall. The proposals for installation of the continuous flow meter at the decant structure plus the details of monitoring the elevation of Upper Pud Lake contained in this July 13, 1977 letter are also approved. I am very satisfied with your progress towards meeting the requirements of Part C, Item 12.

The July 12, 1977 submission of water use data from Mr. Whittall as required by Part C, Item 5 of the Surveillance Network Program has been reviewed. I found the method of presentation of the data to be good as it was very easy to read. However, I noted that several of the readings for

. . . 2 . .

- 2 -

the Yellowknife water supply line were estimates rather than actual recordings. Part C, Item 2 of the Surveillance Network Program requires that daily readings from this meter be collected. Would you please write to the office of the Board to explain why actual recordings were not taken.

Yours truly,

A.G. Redshaw
Controller

BD:jr

Cominco Ltd./Cominco Mine/Yellowknife, Northwest Territories, Canada XOE 1H0/Tel. (403) 873-2783

FILE NIL3-0046
WATER REGISTER



Con Operations

Mr. A. Redshaw
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife, N.W.T.

August 11, 1977

Dear Mr. Redshaw:

As you are aware, Cominco Limited has retained Reid Crowther and Partners Limited as consultants to aid us in determining the best solution for eliminating the Arsenic Pond problem.

During the course of investigation, it has been realized that a complete report could not be submitted before the deadline of September 1, 1977. This is because some important laboratory testwork results will not be forthcoming for another two weeks. As a consequence there would not be sufficient time to analyze the results and write a report.

A lot of work has gone into preparing this proposal and we would like to have the opportunity to present the complete proposal. Thus, we request that you extend the deadline for the detailed proposal until October 1, 1977.

Yours truly,

A handwritten signature in cursive script, appearing to read "W.A. Case".

W.A. Case
Acting Manager
Con Operations

WAC/lgl

0 1 2 3 2 0

RECEIVED
NORTHERN OPERATIONS
BRANCH D.I.A.N.D.
YELLOWKNIFE

Aug 15 10 54 '77

N1L3-0040

August 9, 1977.

Mr. D. Whittall,
Development Engineer,
Cominco Limited, Con Mine,
Yellowknife, Northwest Territories.
XOE 1H0.

Dear Mr. Whittall:

Re: Northern Inland Waters Act
Water Licence No. N1L3-0040
Cominco Limited, Con Mine
Total Cyanide and Available Cyanide Analysis

Further to our telephone conversation of August 8, 1977,
the following is the information you requested:

Available Cyanide - this includes free cyanide (HCN and
CN) as well as cyanides weakly complexed with cadmium and
zinc and medium strength complexes with nickel and copper.

An acceptable step-by-step analysis procedure for
available cyanide is:

- 1) simple distillation using sulfuric acid (H_2SO_4)
to obtain free cyanide
- 2) absorption of the cyanide in sodium hydroxide
(Na OH) to yield sodium cyanide
- 3) use of the pyridine - pyrazolone method to
develop the colour
- 4) measurement of the colour using a spectrophotometer

. . . 2 . .

- 2 -

Total Cyanide - this includes free cyanide, weak complexes, medium strength complexes and strong cyanide complexes with iron and cobalt.

An acceptable step-by-step analysis procedure for total cyanide is:

- 1) modified Serfass distillation to obtain free cyanide
- 2) use of the pyridine - pyrazolone method to develop the colour
- 3) measurement of the colour using a spectrophotometer

These analysis procedures are applicable when no interfering substances are present. If sulfide is present, it has to be removed prior to the distillation step.

If you or your lab personnel wish further information concerning this, please contact Mr. Ranjit Soniassy of our office at 403-873-4421.

Yours truly,

B. D.

B. Doulton
Head, Western Area

BD:jr

July 28, 1977

Memorandum to the files

NIL3-0040

Cou Mine Sampling Programme

A sampling programme was carried out at the Cou mine final decant to Wegg Lake. Samples were taken on May 30 (one sample), June 3 (3 samples at two hour intervals), June 6 (3 samples), June 8 (two samples) and June 10 (one sample).

Field tests were performed to determine pH, water temperature, ^{and} Conductivity.

~~It was hoped that the sampled pH~~ remained consistent ~~at~~ between 8.3 and 8.6 (field), and 7.7 to 7.9 (lab). ~~Throughout the entire period.~~ Lab conductivity readings were extremely high, (in the 4000 to 5000 $\mu\text{Mols/l}$ range) but the reason for this remains unclear.

No ^{daily} patterns were evident from the sampling. It should be noted that ^{the levels of} total copper were at all times higher than the proposed max. conc. of any grab sample in the Cou water Use Licence.

~~Thus~~ a program of this type should be repeated at Cou, with samples taken regularly at 3 or 4 hour intervals throughout the entire day.

T. SAUNDERS

M I N U T E S

Meeting #70a

Cominco Limited, Con Mine
Water Register #N1L3-0040

July 25, 1977

5th Floor Boardroom, Bellanca Building

Yellowknife, NWT

PRESENT

A. G. Redshaw, Chairman	NWT Water Board, Yellowknife
P. Lofthouse, Member	GNWT, Yellowknife
J. Mackenzie, Member	GNWT, Yellowknife
D. Egli, Member	Cominco, Yellowknife
W. Maksylewich, Alternate	DFE, Yellowknife
(arrived at 10:30)	
R.N. Soniassy	DINA, Yellowknife
L.P. Cooper **	DINA, Yellowknife
B. Doulton **	DINA, Yellowknife
A. Rothwell *	DINA, Yellowknife
H. Wilson *	DINA, Yellowknife
S. Herman, Secretary	DINA, Yellowknife
J. Gowans	A/Mill Superintendent, Cominco Con Mine, Yellowknife

* Attended Nanisivik portion only

** Attended Cominco portion only

The Chairman convened the meeting at 9:00 a.m. welcoming Mr. Dave Egli, newly appointed Technical Committee member. Mr. Egli was appointed by Water Board member Mr. Gibney to the Technical Committee.

The Chairman introduced Mr. Jim Gowans, A/Mill Superintendent at Con Mine and requested that he outline the proposals submitted by Con Mine on June 1, 1977 as required by Water Licence #N1L3-0040 under Part C, Items 4, 11 and 21. He further explained that after this briefing the Technical Committee will formulate their recommendations to the Water Board on each proposal.

Mr. Gowans proceeded to outline the three proposals.

1. Proposal for Studies for Achievement of Water Licence
Effluent Quality Requirements, dated May 1977

The Company has come up with two proposed processes. The first process consists of modified alkaline-chlorination method for the treatment of cyanide and the ferric hydroxide precipitation technique for arsenic removal. Mr. Gowans reports that their lab and plant tests have been completed with good success and he feels this procedure will work. The estimated capital cost by an engineering firm is \$330,000.00 with an operation cost of \$400.00 per day.

The second method proposed consists of a process including the co-precipitation of ferric hydroxide with arsenic for arsenic removal and the conversion of all free and weakly complexed cyanide to ferrocyanide. Mr. Gowans stated some plant tests had been completed and were successful, however there was a problem with slaking. More tests have recently been conducted in Trail B.C. No estimated cost figures were available.

2. Proposal for Studies for Reduction of Water Use
dated May 1977

Mr. Gowans explained that not much work had been done to date since these studies were not started until Cominco received their water licence. Now that the Company have been required to measure the flow, they can determine the areas where water use can be reduced. Mr. Gowans related one area where the Company has reduced water use in their diamond drilling operation. Diamond drilling requires a great deal of water and the operators were simply leaving the hose running continuously. However, after briefing the operators, the practise has now ceased, saving many gallons a day.

When asked if the minewater could be used for diamond drilling, Mr. Gowans replied that it was contaminated water and since the miners automatically drink from the hose, this would be unsafe, unless a separate line was installed for drinking purposes.

Mr. Gowans stated the water consumption is approximately 110,000 gallons per day with half of that underground in the mine and the other half used in the townsite.

Mr. Redshaw explained that any water consumed by the townsite will be under the City of Yellowknife's water licence and should not be included in the Cominco licence.

Mr. Gowans brought to the attention of the assembly that flow meters have been ordered since March 1977, but as yet have not been received. Once these meters are received and installed, it will still require some time to compile data.

3. Proposal for Studies for Restoration & Reclamation
of Abandoned and Existing Tailings Area, dated May 1977

Mr. Gowans reported that it has always been Cominco's policy to carry out ongoing research and studies in restoration and reclamation of their worksites.

The Chairman stated the Technical Committee would contact someone in the agriculture field to assist with the Committee's evaluation, with any feedback going to Cominco.

When asked if revegetation has been successful, Mr. Gowans explained for comparison purposes that since the program commenced in 1974, foxtail barley was going extremely well. He also reported they were experimenting with peat however, since they must wait for summer growth, evaluation won't be available until late August.

Mr. Gowans stated that Cominco's agronomist, Bob Gardner, would be at Con Mine around the third week of August at which time a tour could be arranged.

When some concern was raised about heavy metals contaminating plant life and therefore being consumed by wildlife, John Mackenzie did agree that there is potential danger, however not as great as down south. Mr. Mackenzie also explained that there is not a great deal of available information on wildlife in this particular area.

Mr. Redshaw thanked Mr. Gowans for his address to the Technical Committee.

RECOMMENDATIONS

Meeting #70a

Cominco Limited, Con Mine

July 25, 1977

After due deliberation, the Technical Committee find the proposals as submitted by Cominco, Con Mine dated June 1, 1977 as required by Water Licence #N1L3-0040 under Part C Items 4, 11 and 21 in keeping with the Licence requirements and recommends to the Water Board that they be approved.

file 0040



Con Operations

N.W.T. Water Board
Box 1500
Yellowknife,
N.W.T.

Attn: Mr. Bruce Dalton

July 13, 1977

Dear Bruce:

As you are probably aware, we are considering the installation of an automatic flow recorder at the Pud Lake discharge structure. The wording of our present water licence does however deter from the practicality of such an installation.

Our Licence requires the water elevation behind the "stop-log decant" be recorded daily. This we do although this elevation is not used for the actual flow estimation, its purpose is to ensure that we do not overflow the present Pud Lake boundaries during periods of high effluent accumulation behind the decant. As a result we are required to take elevations at Pud Lake manually whether we use a continuous flow recorder or not, thus defeating the incentive for us to use a flow recorder.

As a modification to our water licence data requirements I would suggest that we be required to take Pud Lake water elevations on a weekly basis during normal periods of effluent accumulation. However at times during which the effluent elevation is within 2.0 feet of the top of the dyke (elevation 5574.0') we would monitor the level on a daily basis. This would minimize the possibility of flooding the lower ground surrounding Pud Lake while providing us with a partial economic justification for the purchase of a continuous flow recorder.

Please consider my request and if you approve, provide the necessary permission. Thank you.

Yours truly,

D.R. Whittall
Development Engineer

DRW:gpw

005367

RECEIVED
NORTHERN OPERATIONS
BRANCH D.I.A.N.D.
YELLOWKNIFE

JUL 14 10 54 '77

—7N1L3-0040

July 13, 1977

Mr. J. Gowans
A/Mill SUPERintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. Gowans:

Re: Water Licence #N1L3-0040
Cominco Limited, Con Mine
Surveillance Network Program
Items 6, 7 and 8, Part B

Thank you for your letter of April 13, 1977. The sample preservation methods submitted to Ms. Brackett on March 18, 1977 are approved.

This partially meets the requirements of Item 6, Part B. You must still submit the methods of sampling and the methods of preservation of samples to be analyzed for oil and grease. Regarding the latter, an acceptable method is described in "Standard Methods for the Examination of Water and Wastewater" and I quote: "stored samples should be acidified with 5 ml of 1 + 1 H₂SO₄ per litre to inhibit bacterial activity".

This information was due on May 1, 1977 as per the March 17, 1977 letter from the Chairman of the Board to Mr. A.D. McPhail. The requirements of Item 6 will be met once all your sampling and sample preservation methods have been approved by the Board.

The sample analysis methods for total metals, As, CN and residue which were also a part of the Marfhh18, 1977 submission to Ms. Brackett are approved. This partially meets the requirement of Item 7, Part B of the Surveillance Network Program which deal with Board approval of your analysis methods.

. . . 2 . . .

Mr. Gowans . . . Page 2 . .

It is still necessary for you to inform the Board of all your licence parameter analysis methods which are different from those prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater". This information was also due on May 1, 1977 as per the above mentioned letter to the Chairman of the Board. The requirement of Item 7 will be met once this information has been approved by the Board.

The use of your laboratory facilities in Trail, B.C. is hereby approved in accordance with Item 8, Part B of the Surveillance Network Program. The Board is not prepared to approve your proposed on-site Con laboratory at this time even though you are planning on using the same analytical methods as the Trail Laboratory. Please continue your contact with Mr. Allan Rothwell of my Water Management section as your plans for this laboratory develop. He will advise the Board of its acceptability. You will be written at a later date the Board's decision regarding approval of the proposed laboratory.

Yours truly,

A. T. Swarbrick
A/Controller

BD:RNS/sh

file 0040.



Con Operations

Mr. A. Redshaw
N.W.T. Water Board
P.O. Box 1500
Yellowknife,
N.W.T.

July 12, 1977



Dear Mr. Redshaw:

Re: Water Licence # NIL3-0040
Cominco Ltd., Con Mine

In compliance with the data requirements (Part 5) of our Water Licence, I am enclosing all of the water flow data accumulated since March 1977 and a highlights summary.

Please note that as of June 30, 1977 all flow measurements required by our Licence were being recorded except the flow from Cominco's Great Slave Lake pumps. The flowmeter for this location has been ordered and was shipped from Vancouver on June 27th. We expect installation by July 31, 1977. Upon installation the only major water flow at Con Mine which will not be continuously monitored will be the Pud Lake discharge flow. A daily measurement of this flow will continue to be made until a suitable flowmeter is installed.

I hope that our progress in setting up a complete water use surveillance network is satisfactory to yourself and the Water Board.

Yours truly,

David R. Whittall
Development Engineer

DRW:gpw

cc: Manager Con Operations (ADM)

Memo to File

File No: N1L3-0040

June 28, 1977.

Inspection of Con Mine

April 6, 7, 14 and 15, 1977

Attached is a report on an inspection of Con Mine carried out by B. Doulton on the above dates.

The seepage from the decant structure noted on page 5 of the report will probably occur again next spring unless the structure is modified. The decant structure should once again be monitored closely next spring.

BD:jr
c.c. A.G. Redshaw
R. Soniassy

B. Doulton
B. Doulton
Head, ~~Central~~ Region
WESTERN

COMINCO LIMITED

CON MINE

INSPECTION REPORT

INTRODUCTION

An inspection of Con Mine was carried out on April 6, 7, 14 and 15, 1977. On April 6, Mr. B. Doulton and Mr. A. Swarbrick, Inspectors under the Northern Inland Waters Act met with Company officials to discuss the Con Water Licence (the minutes of this meeting are attached). The Inspectors and Mr. J. Gowans, Acting Mill Superintendent, later toured the mine site. On April 7, 14 and 15, Mr. Doulton and Mr. A. Franchi of Con collected water samples from around the mine site.

1. Water Use

i) Quantity of Water Used

Part C, Item 3 of the Con water licence states that the maximum rate of use of water from Great Slave Lake plus the rate of groundwater pumped to the surface to permit mining shall not exceed 1,300,000 imperial gallons per day. Part C, Item 3 also states that the average daily use of this water over the year shall not exceed 340,000,000 imperial gallons divided by the number of days in the given year. (For a 365 day year, the average daily use must not exceed 931,507 imperial gallons).

Mr. J. Gowans said that the mill production rate will increase from the present 500 tons of concentrate per day (T.C.P.D.) to 650 T.C.P.D. when the new Robertson shaft begins operation which will be about December 1977. According to the "Con Mine Water Flows Sheet" (attached as Figure 1), which is based on the 650 T.C.P.D. figure, this means that the maximum rate of use of water from Great Slave Lake plus the rate of groundwater pumped to the surface to permit mining will increase to 1,221,200 imperial gallons per day (936,000 imperial gallons plus 285,200 imperial gallons = 1,221,200 imperial gallons). This "Con Mine Water Flows Sheet" also shows that the average daily use of this water will increase to about 927,000 imperial gallons (720,000 imperial gallons plus 207,000 imperial gallons = 927,000 imperial gallons).

Mr. Gowans said that the quantity of water presently being used in the mill will be difficult to reduce.

ii) Measurement of Water Used

The Company proposals for the methods and procedures to be used

in the measurement of water use and waste discharge are included in a letter from Mr. Gowans to Mr. Redshaw dated March 24, 1977. Four of the water meters proposed in this letter have already been installed. Figure 1 shows the location of these meters. Details on these meters are as follows:

Meter #1:

Yellowknife Water Supply

3" Buffalo-Niagara digital flowmeter. This meter measures in tons and the values are converted to imperial gallons. This meter is located in the Con pumphouse close to the lakepumps.

Meter #2:

Freshwater pumped underground

3" Buffalo-Niagara digital flowmeter, measuring in tons of water. The measurement is converted to imperial gallons. This meter is located in the powerhouse.

Meter #3:

Backfill to underground

The total backfill flow, as a slurry, is measured using a 4" Foxboro magnetic flowmeter measuring in U.S. gallons per minute. The percent solids is measured manually using a Marcy guage. The water flow is calculated from these measurements in imperial gallons. The meter and Marcy guage are located in the backfill building.

Meter #4:

Barren bleed to tailings

3" digital (Rockwell) meter, measuring imperial gallons. This meter is located in the mill.

Each meter has a separate records book. These books are located in the vicinity of each meter. A records book, which includes summary results from all these meters, is located in Mr. Gowan's office. The data for the latter book is collected once per month.

The Company is going to install a staff guage to measure the water levels just upstream of the decant structure. The water flows through the decant structure are calculated from the staff guage readings. Mr. Swarbrick requested copies of the assumptions, formulae and charts to be used in the calculation of these water flows.

2. Waste Disposal

See the attached map for the location of discharge points and of waste disposal areas.

i) Tailings discharge to Upper Pud Lake

The tailings discharge point is just behind the mill. The tailings discharge line is a wooden trough (launder).

A flow of water was noted from the mill close to the road behind the mill. This water is cooling water from the boiler.

ii) Sewage Discharge to Upper Pud Lake

Sewage from the mill is discharged with the mill tailings. The sewage discharge point to the tailings launder is about 40 feet behind the mill.

Sewage from the camp and mine buildings is pumped to a collection tank in the Con pumphouse. The sewage is then pumped to Upper Pud Lake (the discharge point is close to the new lab - see map).

iii) Arsenic Oxide Storage Areas

No water flows were seen coming from these storage areas.

iv) Upper Pud Lake

Approximately one-half of the lake surface was ice covered.

v) Decant Structure Dam

There was no flow through the decant structure at the time of the inspection except for a small amount of seepage (see sampling site 'b' below for an explanation of this seepage).

No cracks or any other evidence of dam stability problems were seen. The freeboard was approximately six feet.

vi) Dam on the South East Corner of Upper Pud Lake

No problems were seen here.

vii) Downstream of the Decant Structure

Keg Lake, Meg Lake and the ditch between Lower Pud Lake and Meg Lake were frozen at the time of the inspection.

- 4 -

3. Water Sampling (see the attached map for the locations)

One sample was collected at each of the following sites except where otherwise noted:

Licence Stations

40-1 Pud Lake Tailings Area Discharge at the Decant Structure

At the time of the inspection, there was no discharge except for a small amount of seepage through the stop-logs. (see sampling site (b) below for more details on this seepage)
No sample of flow was collected.

40-2 Mill Freshwater Intake at the Yellowknife Bay Pumphouse

The sample was collected from a "bleeder" on the #3 lakepump. The intake points for all the lakepumps are all within a few feet of each other in the Bay.

40-3 Meg Lake Discharge to Keg Lake

It was not possible to collect a sample here because the lake was frozen to the bottom. The ice was about 2 1/2 feet thick.

Sampling of Meg Lake was attempted at other points but the lake was frozen to the bottom at each site.

40-4 Keg Lake at its Centre

The sample was collected just below the ice surface. The ice thickness was approximately 3 1/2 feet and there was a 4" snow cover (sample collected on April 14, 1977).

The trip from Meg Lake to Keg Lake was done by snowshoe along the Meg Lake discharge channel. The snowshoeing took about 30 minutes.

Additional Sampling Sites

a) Pud Lake just upstream of the decant structure

The sample was collected 15 feet upstream of the decant structure. The sample was collected from surface waters above the ice.

b) Lower Pud Lake just downstream of the decant structure

The sample was collected 15 feet downstream of the decant structure. The sample was collected from surface waters above the ice.

. . . 5 . .

- 5 -

Some of the water just downstream of the decant structure was from seepage through the stop-logs of the decant structure. An explanation of how this seepage occurred and of how this problem was dealt with is as follows:

The decant structure was closely monitored after the beginning of snowmelt by Company personnel (approximately April 7). On April 11, Mr. A. Franchi noted that ice jamming against the structure had resulted in the logs being slightly lifted. Some effluent then passed under and between the stop logs. Mr. Franchi succeeded in stopping most of this seepage on April 11 by placing a piece of plywood covered in burlap against the upstream side of the stop logs. He then threw in some sawdust upstream of the structure which was forced into the cracks and therefore, plugging them. He put okum into the cracks on the downstream side of the stop logs. A very small amount of seepage was noted on April 14.

4. Water Quality Results

- see the attached sheet for the data

- i) Mr. A. Franchi collected samples at station 40-2 and 40-4 at the same time as Mr. Doulton. Mr. Franchi's results are reported in the attached sheet for comparison purposes.

B. Doulton

B. Doulton
Inspector Under the
Northern Inland Waters Act

(1,342,400 I.G.P.D. Max)

992,000 I.G.P.D.

TO TAILINGS

678,000 I.G.P.D.



Water Licence No: N1L3-0040

COMINCO LIMITED, CON MINEWater Quality Results

- Samples were collected on April 14 and 15, 1977 by B. Doulton. His results are reported below under the 'W.M.' (Water Management) column heading.
- A. Franchi of Con Mine also collected samples at this time. His results are reported below for comparison purposes under the 'Con' column heading.

STATION

Parameter		40-2 W.M.	40-2 CON	40-4 W.M.	40-4 CON	a W.M.	b W.M.
pH (units)		7.5	8.2	7.0	7.0	8.1	8.1
Sp. Conductance (Umho/cm)		105	125	8608	8700	5723	4956
Turbidity		4.9		6.4		8.5	11.0
Colour		10		2.0		30	20
Calcium		12.4	10	926	1000	645	581
Total Hardness CaCO ₃		45.7	48	2888	2900	1898	1712
Total Alkalinity CaCO ₃		34.9	36	109	128	68.2	40.1
Sodium		4.0	3.8	800	775	500	300
Potassium		1.2		23.5		12.0	15.0
Chloride		4.0	4.5	2850	2850	1700	1550
Total Cyanide		L0.005	.03	0.011	0.08	4.4	4.1
ARSENIC	T	0.0093	.014	4.3	1.55	2.1	2.1
CADMIUM	T						
	E	L0.01		0.01		0.01	0.10
COPPER	T		.005		0.05		
	E	L0.01		0.05		0.65	0.57
IRON	T						
	E	L0.04		0.26		0.47	0.71
LEAD	T		L0.01		0.01		
	E	L0.05		0.14		0.07	0.10
NICKEL	T		L0.01		0.17		
	E	L0.05		0.13		0.19	0.16
ZINC	T		0.01		0.07		
	E	L0.01		0.05		0.11	0.05

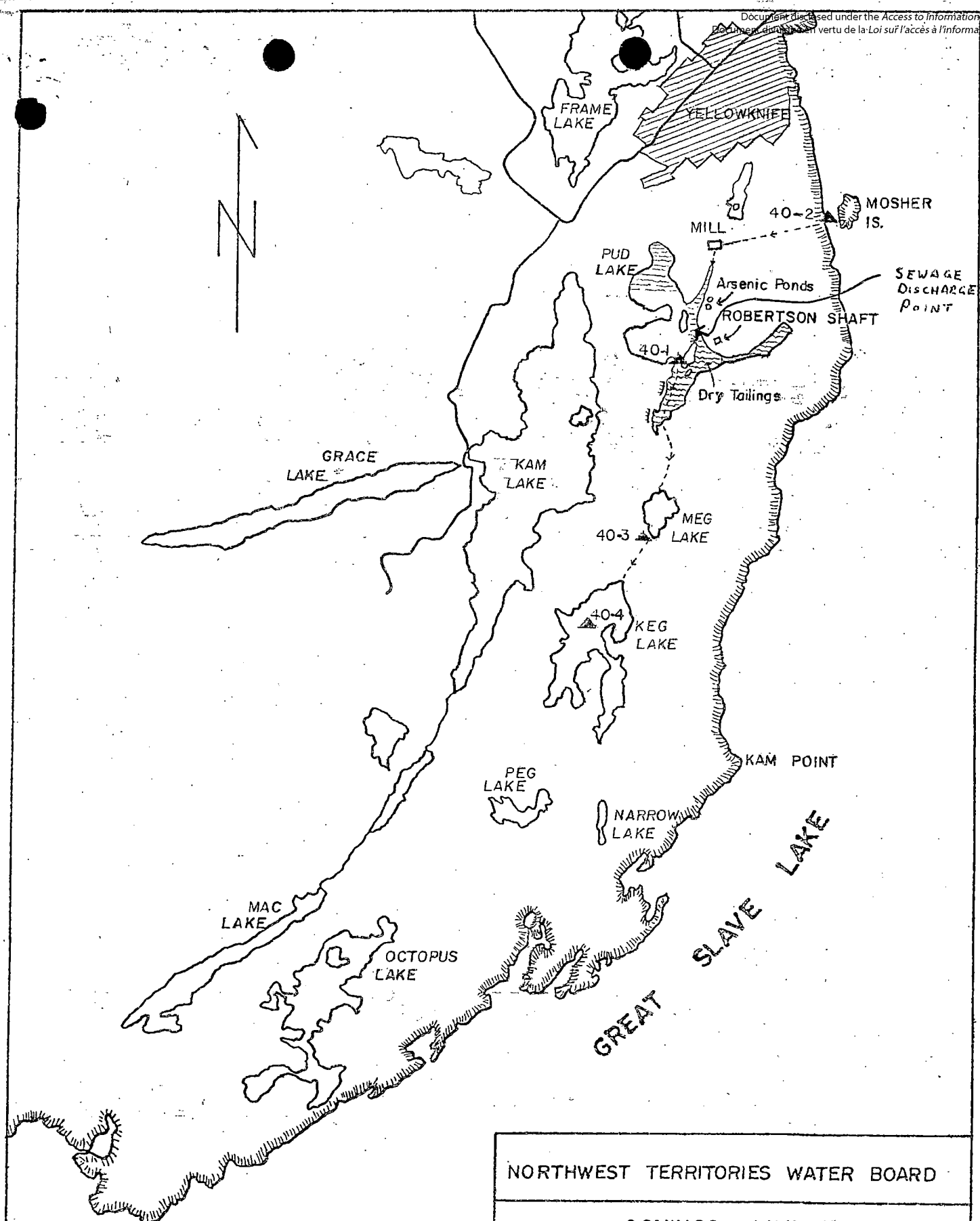
40-2 - Pud Lake tailings area discharge at the decant structure

40-4 - Keg Lake at its centre

a - Pud Lake just upstream of the decant structure

b - Lower Pud Lake just downstream of the decant structure

All results are expressed in mg/l except as indicated in brackets (). T = TOTAL E = EXTRACTABLE



LEGEND

- ←--- DIRECTION OF FLOW
- 40-1 ▲ SAMPLING STATION
- ROAD
- DYKE

NORTHWEST TERRITORIES WATER BOARD

COMINCO LIMITED
CON MINE
SURVEILLANCE NETWORK PROGRAM

LICENCE NUMBER: NIL3 0040
DATE DRAWN: JULY '77

SCALE 1:50,000

000313

Memo to File

June 14, 1977.

N1L3-0040

Cominco Limited, Con Mine

V-Notch Weir

Attached is the flow curve supplied by Dave Whittall, Con Operations for the V-notch weir which was recently installed at the decant structure. *Curve was made using a formula (not from actual data)*

The x-axis reading for this graph is obtained by measuring from the bottom of the flow channel (not the bottom of the V-notch) to the water level.

The flow chart was checked by Water Management and it is o.k.

Bruce Doulton

Bruce Doulton
Project Technologist

BD:jr

46 5490

SEMI-LOGARITHMIC CYCLES & 20 DIVISIONS
KIEHL & LORER CO. MADE IN U.S.A.

SEMI-LOGARITHMIC
KIEHL & LORER CO.

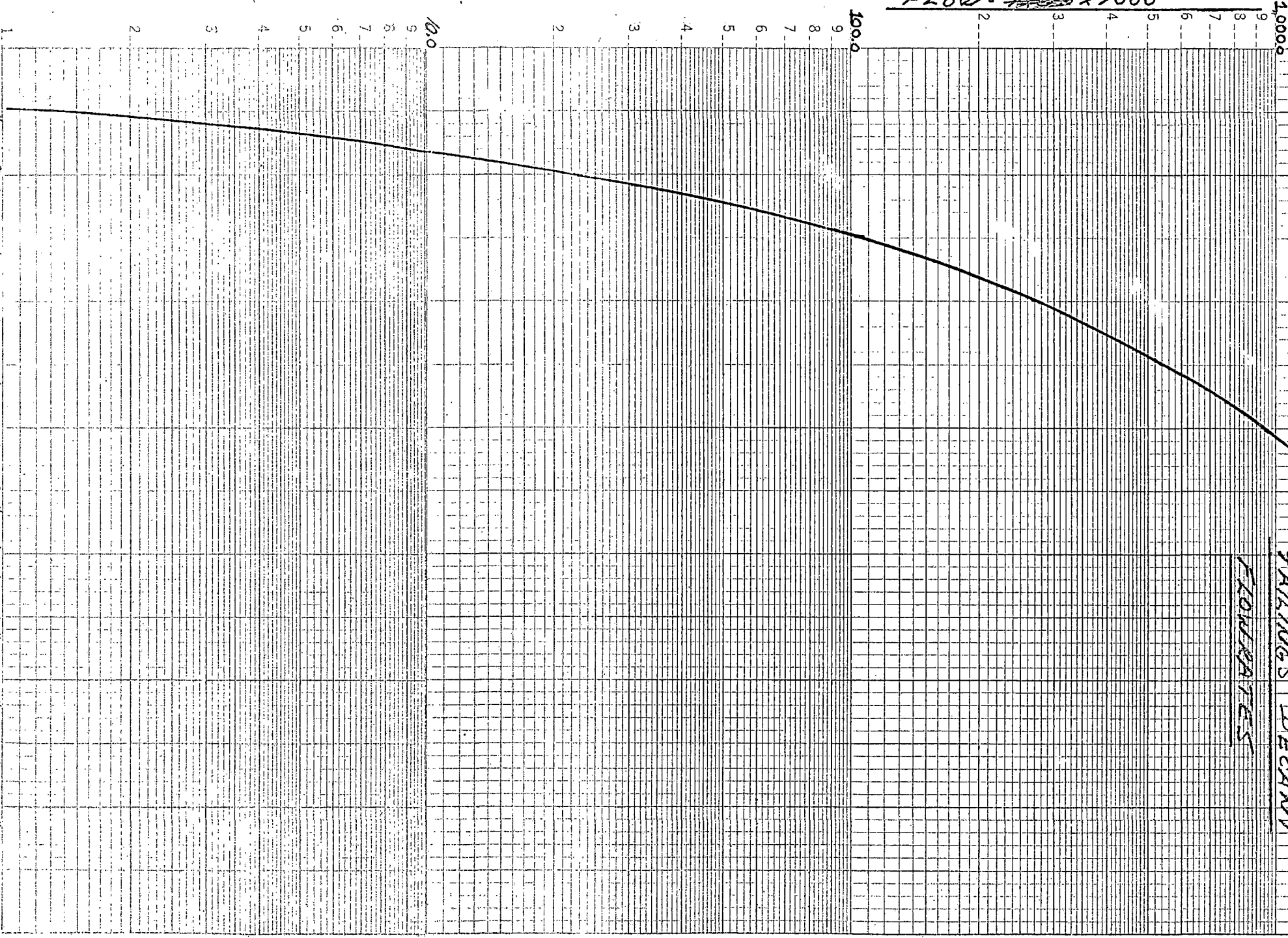
FLOW - ~~1000~~ ^{GPD} x 1000

COHLE LIMESTONE
CON MINE

Flow Line for the
V-Notch weir at the
adacent structure

TAILINGS DECANT

FLOW RATES



(from bottom of the weir to water level)
DETERMINED BY WEIR

June 3, 1977

NORTHWEST TERRITORIES
WATER BOARD

OFFICE DES EAUX DES
TERRITOIRES DU NORD-OUEST

Your file Votre référence

Our file Notre référence

4530-9

June 13, 1977

Members
NWT Water Board
Technical Committee

Gentlemen:

Re: Meeting with Cominco, Con Mine
Water Licence #N113-0040

The meeting originally arranged between Technical Committee members and Cominco officials for July 21, 1977 has been altered and will now take place in the 5th Floor Boardroom, Bellanca Building at 9:00 a.m. on Monday, July 25, 1977.

Yours sincerely,

Sheila Herman

Sheila Herman
Secretary to the Controller

sh:

OK

MAILING ADDRESS P.O. BOX 1500

OFFICE: BELLANCA BUILDING

YELLOWKNIFE, N.W.T. XOE 1H0

PHONE (403) 873-4421

TELEX 034-4-5519

000316

Memo to File

File No: NIL3-0040
June 9, 1977.

Cominco Limited, Con Mine

Conversation with J. Gowans, Acting Mill Superintendent

June 1, 1977

Mr. Gowans said a 6" meter has been installed to measure the quantity of water pumped from underground.

A V-notch weir has been put in by Con on the downstream side of the decant structure. Possibility that turbulence could give unreliable readings. The staff gauge on the upstream side of the decant structure will be left in.

Mr. Gowans said that the Company is considering (very preliminary) building a wooden launder from the decant structure, across Lower Pud to the Meg Lake ditch (a Venturi meter could be installed along here). This would result in lowering the risk of flow to Kam Lake. Also, Lower Pud would get a better change to dry out.

Mr. Gowans said that Con owns only 1/2 of the Negus tailings area. He said that this could cause some problems with respect to restoration required by the licence. Mr. Swarbrick said that Mr. Gowans should write the Board concerning this.



B. Doulton
Project Technologist

BD:jr



Government
of Canada

Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
À **Mr. M. Brown**
Regional Mining Engineer

FROM
DE **A.G. Redshaw**
Controller, Water Management

SUBJECT
OBJET **Cominco Limited, Con Mine**
Yellowknife
Water Register N1L3-0040

SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE - N/RÉFÉRENCE N1L3-0040 ←
YOUR FILE - V/RÉFÉRENCE
DATE June 8, 1977

Attached for your review is a copy of the submission made by the above Licensee in support of Part C Items 4, 11 and 21 of Water Licence #N1L3-0040.

I have arranged a meeting with the Company for 9:00 a.m. on July 21, 1977 to take place in the 5th Floor Boardroom, Bellanca Building. You are welcomed to attend.

for Stella Herman
A. G. Redshaw

sh:

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

June 8, 1977

Mr. A.H. Jones
Chief, Water Resources Division
Northern Environmental Protection
and Renewable Resources Branch
400 Laurier Avenue West
Ottawa, Ontario
K1A 0H4

N1L3-0040

Dear Mr. Jones:

Re: Cominco Limited, Con Mine
Yellowknife
Water Register #N1L3-0040

Attached for your review is a copy of the submission made
by the above Licensee in support of Part C Items 4, 11 and
21 of Water Licence #N1L3-0040.

Yours sincerely,



A. G. Redshaw
Controller
Water Management

sh:

NORTHWEST TERRITORIES
WATER BOARD

OFFICE DES EAUX DES
TERRITOIRES DU NORD-OUEST

Your file Votre référence

Our file Notre référence

4530-9

June 8, 1977

Members
NWT Water Board
Technical Committee

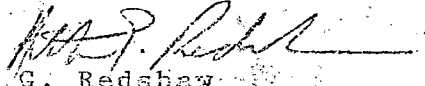
Gentlemen:

Re: Cominco Limited, Com Mine
Yellowknife
Water Register #N1L3-0040

Attached for your review is a copy of the submission made by the above Licensee in support of Part C Items 4, 11 and 21 of Water Licence #N1L3-0040. Please advise your Board Member of this submission.

I have arranged a meeting with the Company for 9:00 a.m. on July 21, 1977 to review the submissions and would request your attendance.

Yours sincerely,


A. G. Redshaw
Controller

AGR:sh

MAILING ADDRESS P.O. BOX 1500

OFFICE: BELLANCA BUILDING

YELLOWKNIFE, N.W.T., XOE 1H0

000320

PHONE (403) 873-4421

TELEX 034-4-5519

N1L3-0040 ←
Water Register

June 6, 1977

Mr. J. K. Gowans
Acting Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine, Yellowknife
Water Register #N1L3-0040

This will acknowledge your letter of June 1, 1977 with submissions in regards to meeting the requirements of the following items in your Water Licence:

1. Part C Item 4 - Studies related to reduction in water use
2. Part C Item 11- Studies related to effluent lquality requirements
3. Part C Item 21- Studies related to restoration and reclamation of abandoned and existing tailings areas

Copies of this document will be circulated to Water Board members for review and approval. I have scheduled a meeting of the Board's Technical Committee for 9:00 a.n. on July 21, 1977 and would appreciate your attendance. Once the Board has given approval, you will be duly advised.

Yours sincerely,

A. G. Redshaw
Controller

AGR:sh

Cominco Ltd./Cominco Mine/Yellowknife, Northwest Territories, Canada XOE 1H0/Tel. (403) 873-2783

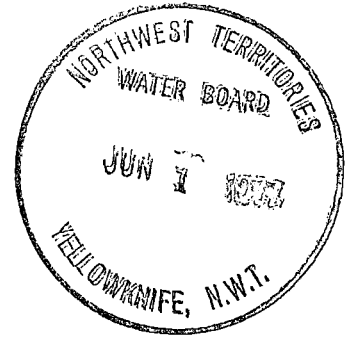
N123-0040



Con Operations

Mr. A. Redshaw
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife,
N.W.T.

June 1, 1977



Dear Mr. Redshaw:

Attached are the three (3) proposals to be submitted by Con Operations. These proposals are:

1. "Studies for Restoration and Reclamation of Abandoned and Existing Tailings Area"
2. "Studies for Achievement of Water Licence Effluent Quality Requirements"
3. "Studies for Reduction of Water Use."

I believe these proposals will fulfill the requirements as established in our Water Licence.

If there are any questions, please don't hesitate to contact me.

Yours truly,

James Gowans

J.K. Gowans
Acting Mill Superintendent

JKG:gpw

Attach.

Letter & attachments to

TC Members

Jones A

Soniasy

Brown M

*8 June 77
SH.*

N1L3-0040 ←
Water Register

May 30, 1977

Mr. A. D. MacPhail
Manager Con Operations
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE lHO

Dear Mr. MacPhail:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine
Water Licence #N1L3-0040

Your letter of May 6, 1977 regarding the reporting dates for reports required under Part C Item 21 of your Licence, Restoration and Reclamation of Abandoned and Existing Tailings Areas is acknowledged.

I will bring this request before the next meeting of the Water Board and will duly advise you of their ruling.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW
A. G. Redshaw
Controller

AGR:sh

MEMO TO FILE

May 11, 1977.

N3 L3-~~0004~~

5040


Conversation with Jim Gowans, May 11, 1977

1. Reminded him of the following due dates:

- i) Item 21, Part C June 1, 1977
- ii) Item 4, Part C June 1, 1977
I told him to be as specific as possible on this item

Proposals for Studies to improve H₂O quality will be in by June 1, 1977 as required by Item 11, Part C.

They haven't yet started any of these studies but are planning CN/As studies by May 18, 1977 (N.B. we haven't yet approved their proposals for these studies).


B. Doulton
Project Technologist

BD:jr

NIL3-0040 ←
Water REgister
May 9, 1977

Mr. J. Gowans
Acting Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence #NIL3-0040
Cominco Limited, Con Mine

The security deposit required under Item 3, Part A of your Water Licence #NIL3-0040, in the amount of \$100,000.00 was received prior to the deadline of April 15, 1977. The requirements of Item 3, Part A of Water Licence #NIL3-0040 are, therefore, met.

Yours truly,

ORIGINAL SIGNED BY
A. G. REDSHAW
A. G. Redshaw
Controller

BD:sh

FILE N1C3-0090 ←
WATER REGISTER



Con Operations

Mr. Art Redshaw
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife,
N.W.T.

May 6, 1977

Dear Mr. Redshaw:

Concern has been expressed by our Reclamation Agronomist, Bob Gardiner, with regards to the dates for submitting interim and final reports on studies related to reclamation of abandoned and existing tailings areas i.e. the September 1st date.

From their experience at Con, the most suitable time to evaluate the field growth studies is the latter two weeks of August. Consequently, insufficient time would be available between evaluation date and reporting date to compile, interpret and report data.

Mr. Gardiner feels more appropriate filing dates would be twelve (12) and twenty-four (24) months after date of issue of licence for interim progress reports and thirty-six (36) months after date of issue for the final report. Corresponding dates are March 1, 1978, 1979, and 1980.

We are requesting that the proposed dates be considered instead of the original dates set out in our Water Licence. We would then be able to better fulfill our obligations.

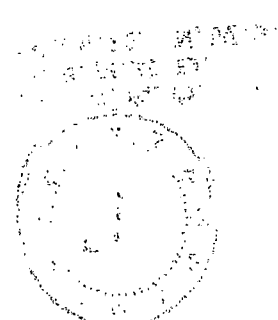
Yours truly,

A.D. MacPhail

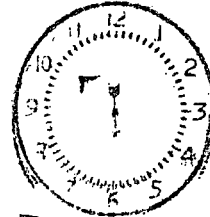
A.D. MacPhail
Manager Con Operations

ADM:gpw

C.C. MEMBERS, N.W.T. WATER BOARD



MAY 10 '77 AM



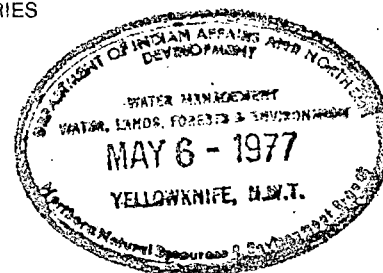
D.I.A.N.D.
N.N.R.E.B.
YELLOWKNIFE, N.W.T.



GOVERNMENT OF THE NORTHWEST TERRITORIES
CANADA

PLEASE QUOTE

FILE 105



Yellowknife, N.W.T.
3 May 1977

Ms. Sheila Herman,
Water Board Office,
P.O. Box 1500,
YELLOWKNIFE, N.W.T.
XOA 1H0

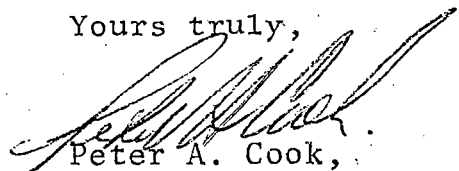
Dear Ms. Herman:

Lease N.W.T. 940,
Con Mine,
Yellowknife, N.W.T.

Lease N.W.T. 920,
Giant Yellowknife Mines Ltd.,
Yellowknife, N.W.T.

Please find enclosed a copy of the above captioned
leases as per your request.

Yours truly,


Peter A. Cook,
for A.T. Cronk,
A/Chief,
Town Planning & Lands
Department of Local
Government

Enclosure

Lease No. 940

File No. 9-3-964-0-56

Con N/K 3-0040

1962

THIS LEASE made this 6th day of March

BETWEEN

Her Majesty the Queen in right of Canada, hereinafter called "Her Majesty"

OF THE FIRST PART

AND The Consolidated Mining and Smelting Company of Canada Limited,
of Trail in the Province of British Columbia,

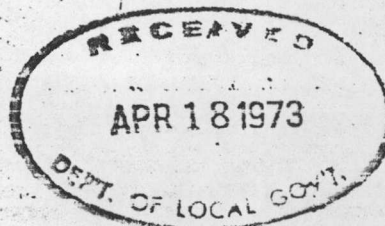
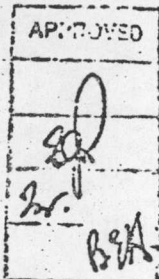
hereinafter called "the lessee"

OF THE SECOND PART.

WITNESSETH that in consideration of the rents, covenants and agreements herein reserved and contained on the part of the lessee to be paid, observed and performed, and subject to the *Territorial Lands Act* and the *Territorial Lands Regulations*, Her Majesty demises and leases unto the lessee all ⁶⁵³ certain parcel(s) or tract(s) of land situate, lying and being composed of in the Northwest Territories; in Group 964, in the vicinity of Yellowknife Settlement; all that parcel more particularly described as follows:


the whole of Lots 191, 193 and 194 according to a plan attached to field book 22321 in the Canada Lands Surveys Records at Ottawa; the whole of Lots 12, 13, 16 and 17 according to a plan attached to field book 22102 in said Records; the whole of Lots 18, 19 and 24 and all that portion of Lot 25 lying westerly of the westerly ordinary high water mark of Yellowknife Bay, according to a plan attached to field book 22103 in said Records; the whole of Lots 6, 10 and 11 and all that portion of Lot 7 lying easterly of a straight line joining the southwesterly corner of said Lot 7 and a point on the northerly boundary of said Lot 7, distant 800.0 ft. westerly from the north-easterly corner of said Lot 7, according to a plan attached to field book 22101 in said Records; all that portion of Lot 5 lying southeasterly of a straight line joining a point on the southerly boundary of said Lot 5 distant 700.0 ft. westerly from the southeasterly corner of said Lot 5, and a point on the easterly boundary of said Lot 5 distant 1020.0 ft. northerly from said southeasterly corner, according to a plan attached to field book 22100 in said Records; the whole of Armstrong Island and Lot 22, all that portion of Lot 23 lying westerly of the westerly ordinary high water mark of Yellowknife Bay and all that portion of Lot 20 lying southeasterly of a straight line joining the last aforesaid point and a point on the easterly boundary of said Lot 20 distant 1500.0 ft. northerly from the southeasterly corner of said Lot 20, according to a plan attached to field book 22104 in said Records; all that portion of Lot 34 lying westerly of a line passing through a point on the northerly boundary of said Lot 34 distant 270.0 ft. westerly from the northeasterly corner of said Lot 34 and having a bearing of 130°00', premising that the northerly boundary of said Lot 34 has a bearing of 89°02', according to a plan of said Lot 34 attached to field book 22107 in said Records; said parcel being intended to include the beds of any lakes or streams lying therein and containing 1077.4 acres, more or less,

hereinafter called "the land".



TO HAVE AND TO HOLD for and during the term of thirty
years, commencing on the 1st day of August, 19 61 ;
YIELDING AND PAYING THEREFOR yearly and every year in advance a
rental of four hundred and fifty dollars (\$450.00).

THE PARTIES COVENANT AND AGREE AS FOLLOWS:

1. The lessee will comply with the said Act and Regulations.
 2. The lessee will during the said term, pay the said rental and all taxes, rates, and assessments charged upon the land or upon the lessee in respect thereof.
 3. The lessee will use the land for commercial purposes only.
 4. The lessee may not sublet the land or assign or transfer this lease without the consent of the Minister in writing.
- 

5. Where any portion of the rental herein reserved is unpaid for more than thirty days after it becomes due or where the lessee fails to perform or observe any of the covenants or agreements herein contained, the Minister may by notice in writing cancel this lease, and on the day following the mailing of the notice this lease is terminated.

6. Cancellation of this lease will not prejudice Her Majesty's right to unpaid rental or any other right with respect to a breach of any covenant or agreement herein contained.

7. Unless given in writing by the Minister, Her Majesty will not be deemed to have waived any breach by the lessee of any of the covenants or agreements herein contained, and a waiver relates only to the specific breach to which it refers.

8. On the termination of this lease the lessee may sever and remove from the land all structures, fixtures and improvements which, during the said term, were affixed or placed at his expense on the land.

9. No implied covenant or implied liability on the part of Her Majesty is created by the use of the words "demise and lease" herein.

10. On the termination of this lease the lessee will deliver up possession of the land in a condition satisfactory to the Minister.

11. This lease enures to the benefit of and is binding upon Her Majesty, Her Heirs and Successors and the lessee, its successors and assigns.

12. In this lease "Minister" means the Minister of Northern Affairs and National Resources and any person authorized to act for or on his behalf.

IN WITNESS WHEREOF T. D. Skelly, Head, Lands & Forests Section, Resources Division, Northern Administration Branch, Department of Northern Affairs and National Resources, has hereunto set his hand and seal on behalf of Her Majesty the Queen in right of Canada, and The Consolidated Mining and Smelting Company of Canada Limited has hereunto affixed its corporate seal attested to by its proper officers duly authorized in that behalf.

SIGNED, SEALED AND DELIVERED on behalf of Her Majesty by T. D. Skelly, Head, Lands & Forests Section, Resources Division, Northern Administration Branch, Department of Northern Affairs and National Resources, in the presence of

R. E. Cochrane

SEALED, ATTESTED TO AND DELIVERED by the Vice President and General Manager and the Assistant Comptroller

of The Consolidated Mining and Smelting Company of Canada Limited

In the Presence of

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED

[Signature]
Vice President and General Manager

[Signature]
Assistant Comptroller

Northwest Territories

CANADA

TO WIT:

I Ian William Workman

of Trail

in the Province of British Columbia

make oath and say:

1. THAT I was personally present and did see the within instrument duly
executed by Ralph Donald Perry and Eric Gurney Randall
on behalf of one of the parties hereto;

2. THAT I know the said Ralph Donald Perry and Eric Gurney Randall
and am satisfied that he is (they are each) of the full age of twenty-one years;

3. THAT the said instrument was duly executed at Trail

in the Province of British Columbia

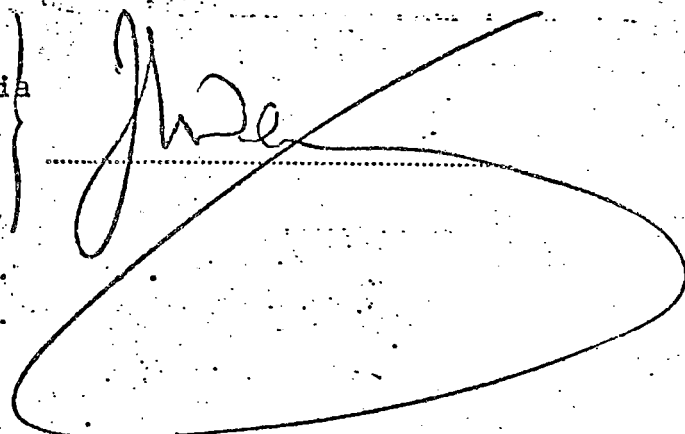
4. THAT I am a subscribing witness to the said instrument.

SWORN before me at Trail

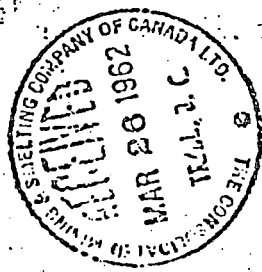
in the Province of British Columbia

this 4th day of January

A.D. 1962.



JMS Oendne
A Notary Public or Commissioner
for Oaths, in and for the
Province of British Columbia



Government
of CanadaGouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
ÀBruce Donlton
Project TechnologistFROM
DEAl Rothwell
Water Quality OfficerSUBJECT
OBJETCon Mine licence

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE - N/RÉFÉRENCE

NIL3-0040

YOUR FILE - V/RÉFÉRENCE

DATE

APRIL 20, 1977

Methods of analysis submitted by J. Howans on March 18, 1977 are completely satisfactory.

Total metals, total arsenic, cyanide by classical distillation and susp. solids as residue at 105 °C are all acceptable analyses. Methods outlined appear to be satisfactory.

N.B. Have we received details on water meters as per Part C, Item 12. If not you should write & ask. At the same time you might remind them of the June 1, 1977 deadline in Part C, Items 4, 11 and 21.

Al

000333

FILE NIL3-0040
WATER REGISTER



Con Operations

Mr. Art Redshaw
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife, N.W.T.

April 13, 1977

Dear Art:

In compliance with 'Surveillance Network Program' attached to Cominco Limited, Con Mine Licence NIL3-0040, this letter is submitted to state that a questionnaire on our preparation and analyses methods were submitted to D.S. Brackett for consideration. In the enclosing letter to Ms. Brackett, it was stated that Trail Analytical Labs would be doing our analyses until our own laboratory commenced operation this summer. The methods used by our lab will be identical to methods submitted by Trail Analytical Labs.

I trust we shall be hearing from you concerning approval of our labs and their methods.

Yours truly,

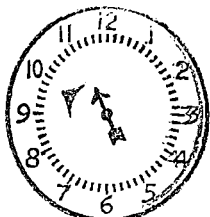
James K. Gowans.

James K. Gowans
Acting Mill Superintendent
Con Operations

JKG:lg1

cc: File

APR 15 '77 AM

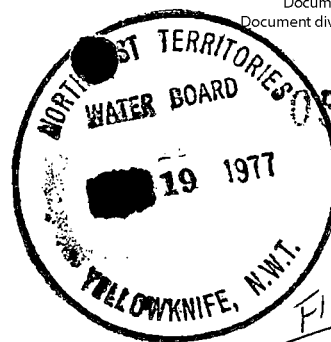


D.I.A.N.D.
N.N.R.E.B.
YELLOWKNIFE, N.W.T.



Indian and
Northern Affairs

Affaires indiennes
et du Nord



05216

FILE NIL3-0040
WATER REGISTER

OTTAWA, Ontario K1A 0H4
April 7, 1977

Your file Votre référence

Our file Notre référence N-9545-105

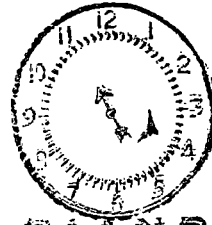
Mr. G.T. Glazier,
Vice-Chairman,
Northwest Territories Water Board,
P.O. Box 1500,
Yellowknife, Northwest Territories
X1A 2R3

Water Licence No. NIL3-0040
Cominco Limited Con Mine

A security deposit in the amount of \$100,000.00 as required under the general conditions for the above licence has been received and deposited.

Allan H. Jones,
Chief,
Water Resources Division,
Northern Environmental Protection
and Renewable Resources Branch.

APR 15 '77 PM



D.I.A.N.D.
N.N.R.E.B.
YELLOWKNIFE, N.W.T.

File NIL3-0040

Meeting of April 6, 1977

Cominco Limited, Con Mine

Water Licence No. NIL3-0040

PRESENT

- J. Gowans - Acting Mill Superintendent, Con
- D. Whittall - Development Engineer, Con
- A. Franchi - Environmental Technician, Con

- A. Swarbrick - Inspector under the Northern Inland Waters Act
- B. Doulton - Inspector under the Northern Inland Waters Act

The meeting was held in Mr. Gowan's office starting at 1:30 p.m.

Water Licence #NIL3-0040

Part A General Conditions

Item 3

Mr. Gowans said that the security deposit was being delivered to Ottawa on the date of this meeting. (The security deposit was received by the Board as of April 7, 1977)

Part C Conditions Applying to Operation

Item 4

The Company officials said that the "Terms of Reference for Studies Related to the Reduction of Water Use" were vague. Mr. Swarbrick said that the "Terms of Reference" were intended to be a guideline for the Company. They were intended to give the Company relative freedom in determining the best methods for the reduction of water use.

Item 10 and 11

Mr. Whittall said that the increase in suspended solids at the decant structure in the spring may not be attributable to tails but to runoff. He also said that any high oil and grease levels could be attributable to water being taken from Great Slave Lake.

The Company officials asked whether effluent quality limits as stated in the licence could be appealed. Mr. Swarbrick said such a

. . . 2 . .

case would require an amendment to the licence with perhaps a public hearing and documentation would be required to support their case.

Mr. Gowans said that some of their effluent quality studies required by Part C, Item 11 would be completed during May, 1977.

Item 13

The Company officials asked if there was any problem with the fact that the Annual Report for 1977 would only be for March 1, 1977 to December 31, 1977. Mr. Swarbrick replied that, since the effective date of the licence was not until March 1, 1977, there was not a problem.

Item 19

Mr. Gowans said that Reid, Crowther and Partners Limited had been hired by Cominco to develop proposals for the containment and reclamation of the arsenic oxide storage areas. Mr. Gowans hoped to have detailed studies completed by mid-July, 1977.

Item 21

Mr. Gowans pointed out that reclamation studies have been undergoing since 1974. Company reports are compiled each year on these studies. Mr. Gowans asked if these yearly reports could be submitted for the reporting system required by Part C, Item 21 of the licence. Mr. Swarbrick said that they could be submitted as part of this reporting system but more information may be required by the licence reporting system.

Mr. Whittall asked what the water quality objectives were for surface run-off or seepage from tailings areas and waste rock piles. (The collection and treatment of this surface run-off or seepage is referred to in 2.2(c) of the "Terms of Reference for Studies Related to Restoration and Reclamation of Abandoned and Existing Tailings Areas"). Mr. Swarbrick said in his opinion, the objectives were the same as the levels stated in Part C, Item 11 of the licence.

Surveillance Network Program

B-5

Mr. Gowans asked when the acute fish toxicity testing will be required. Mr. Swarbrick answered that the testing would probably be in the spring and fall. A letter will be coming from the Board specifying the dates of sampling.

B-6,7 and 8

Mr. Gowans said that a submission to Denise Brackett, Water Management dated March 18, 1977 deals with the requirements of 6 and 7 with respect to sample preservation and analysis methods. Mr.

- 3 -

Swarbrick suggested that Mr. Gowans write the Board stating that this March 18, 1977 submission is intended to satisfy the requirements of 6 and 7 with respect to sample preservation and analysis methods.

Mr. Gowans said that the proposed on-site Con lab will use similar techniques as the lab is presently using in Trail, British Columbia.

Mr. Swarbrick said that a tour of the lab used by the Board could be arranged for the Company officials if the Company wishes.

C

Mr. Swarbrick said that when the term daily is used here it means that the actual amount of water used each day must be measured. The term daily does not mean average daily.

Mr. Gowans said that there will not be any problem with daily recordings except for the recordings from the Con pumphouse on the weekend. Mr. Gowans said that there will not be anyone at this pumphouse during the weekend. Mr. Swarbrick said that the Company should write the Board stating the problem and the Board will then inform the Company of its decision. Mr. Gowans noted that some daily recordings will not be available until the meters are installed. Mr. Swarbrick said that the Annual report and the submissions required by C-5 of the Surveillance Network Program should include the installation dates of the meters and estimates of water quantities should be given where it is not possible to record actual values because the meters were not yet installed.

Mr. Doulton informed the Company personnel of the general procedure for water inspections.

→ FILE N1L3-0040
WATER REGISTER



Con Operations

Mr. Art Redshaw
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife, N.W.T.

March 24, 1977

Dear Art:

Attached is the Report detailing Con Water Flow Data Requirements as fulfillment of Part C Item 12 of the Con Mine Water Licence N1L3-0040. I hope these methods will meet with your approval.

In terms of progress towards implementation of the various measurement locations, we are well under way. Currently, the Yellowknife water supply, the Barren Bleed flow and the Fresh water to Underground flow have meters installed and recording will commence on April 1, 1977. Daily records of the outflow from Pud Lake decant have already been kept since September 11, 1975.

The backfill flowmeter will be installed today. The two Rockwell flowmeters have been ordered and hopefully will be installed in the next three months.

You noted by phone conversation that the summary of our Assay Methods were received. I trust these methods are satisfactory.

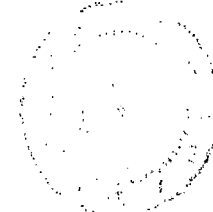
If there are any questions, please contact me.

Yours truly,

James K. Gowans
James K. Gowans
Acting Mill Superintendent
Con Operations

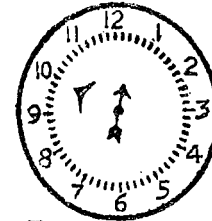
JKG:lg1

ASSAY METHOD SUMMARY
WATER REGISTER
N1L3-0040



MAR 29 1977

MAR 29 '77 AM



D. I. A. N. D.
N. N. R. E. B.
YELLOWKNIFE, N.W.T.

10:10

10:10 AM
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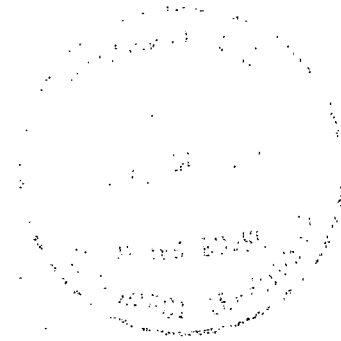
10:10 AM

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Con Mine Water Licence

Water Flow Data Requirements

1. The quantity of surface water pumped from Great Slave Lake will be measured using a 6" Rockwell digital flowmeter, measuring in Imperial gallons.
2. The quantity of ground water will be calculated as the difference between the total water flow from the mine and the total flow into the mine.
 - a) The fresh water pumped underground will be measured by a 3" Buffalo-Niagara digital flowmeter, measuring in tons of water. This measurement will also be converted into Imperial gallons.
 - b) The total backfill flow, as a slurry, will be measured using a 4" Foxboro magnetic flowmeter measuring in U.S. gallons per minute. The percent solids will be measured manually using a Marcy gauge. The water flow will subsequently be calculated and converted into Imperial gallons.
 - c) The total flow of mine water pumped from the mine will be measured using a 6" Rockwell digital meter measuring in Imperial gallons.
3. The quantity of water discharged from the Pud Lake tailings area will be measured using the closed ends weir calculation for our decant structure. The number of stop logs removed, and the time of removal, will be recorded. The record will be kept in Imperial gallons.
4. The daily tonnage of ore milled will be measured and recorded as per Con Mill metallurgical data. The tonnage flow is measured using a calibrated tonnage box.

Summary: The various flows to be measured, and the methods employed, are as follows:

1. Water Pumped from Great Slave Lake
- 6" digital (Rockwell) meter, measuring Imperial gallons.
2. Water pumped from Underground
- 6" digital (Rockwell) meter, measuring Imperial gallons.
3. Yellowknife water supply
- 3" digital (Buffalo-Niagara) meter, measuring tons; converted to Imperial gallons.

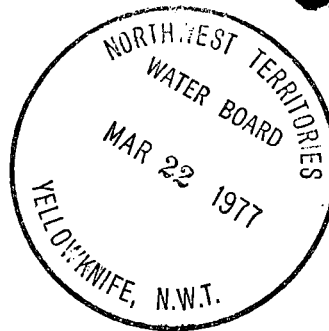
...../2

- 2 -

4. Barren Bleed to tailings
- 3" digital (Rockwell) meter, measuring Imperial gallons.
5. Fresh water (YK supply) to Underground
- 3" digital (Buffalo-Niagara) meter, measuring tons; converted to Imperial gallons.
6. Backfill to Underground
- 4" magnetic (Foxboro) meter, measuring U.S. gallons per minute; converted to Imperial gallons.
7. Pud Lake Discharge
- weir calculation using height of water measured behind the weir; calibrated by formula to Imperial gallons.

James K. Gowans:lg1
Acting Mill Superintendent
March 22, 1977





FILE N1C4-0040
WATER REGISTER



Con Operations

D.S. Brackett
Water Quality Technologist
N.W.T. Water Board
P.O. Box 1500
Yellowknife,
N.W.T.

March 18, 1977

Dear Miss Brackett:

As requested in your letter, dated February 11, 1977, I have enclosed the questionnaire on analytical methods.

The questionnaire was filled out by our Development Technician at Con Operations and by the Chief Chemist of our Analytical Labs in Trail, B.C.

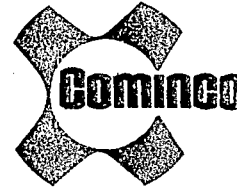
At present, the Analytical Labs in Trail perform all our water analyses. When our lab is completed in early summer, we will be doing our own analyses, using the methods set out by Trail.

Yours truly,

James Gowans
James Gowans
Acting Mill Superintendent

JKG:gpw

Encl.



Mr. Don White
Development Technician
Con Operations
Cominco Ltd.
Box 2000
Yellowknife, N.W.T.

March 2, 1977

Dear Don:

I am enclosing a completed Laboratory Methods Questionnaire which you forwarded from the Northwest Territories Water Board on February 21, 1977.

You will notice that in several instances we cannot reference a method to Standards Methods; a description of Cominco's methods covering these procedures is therefore enclosed.

This information may be released to the Northwest Territories Water Board.

Yours very truly,

A handwritten signature in dark ink, appearing to read 'D.A. Crow', with a long horizontal flourish extending to the right.

D.A. Crow
Chief Chemist
Analytical Services

DAC:sr
cc: GDTikkanen

Enclosure

MINE: CON MINE, Yellowknife, N.W.T.ANALYTICAL SERVICES PERFORMED BY: Cominco Ltd., Trail, B.C.QUESTIONNAIRE COMPLETED BY: (Name) Pat Creighton (Title) Technician

Please reference all methods to Standard Methods number, i.e. state which Edition (13th or 14th). If you cannot reference a method to Standard Methods, please supply a detailed account of methods in use.

		<u>Standard Methods</u>	
		<u>Number</u>	<u>Edition</u>
A. <u>METALS</u> - Total only.			
Pretreatment (please indicate which)			
<u> </u> None			
<u> ✓ </u> Preserved: What Acid <u>HNO₃</u>			
How Much per litre <u>5</u> mls			
<u>Not</u> Filtered: When (before, after preserving <u> </u>)			
What type of filter <u> </u>			
<u> ✓ </u> Total (Acid digestion on hotplate to methods enclosed dryness)			
<u> </u> Extractable with HNO ₃			
<u> </u> Dissolved (filtered, then acidified)			
B. <u>ARSENIC</u>			
Pretreatment of water samples - as above			
<u> </u> None			
<u> </u> Filtered: What type of filter <u> </u>			
<u> ✓ </u> Any predigestion of sample <u>method enclosed</u>			
Method is use for water samples:			
<u> ✓ </u> Silver Diethyldithiocarbamate			
Detection Limit <u> </u>			
<u> </u> Guzeit (Mercuric Bromide Stain)			
Detection Limit <u> </u>			
<u> </u> Atomic Absorption			
Detection Limit <u> </u>			
C. <u>CYANIDE</u>			
Pretreatment of water samples			
<u> ✓ </u> Preserved: Chemical Used <u>NaOH</u> <u>ASTM</u> <u>1976 Part 31 Water.</u>			
How much per litre: <u>15</u> grams			
<u>not</u> Filtered: When <u> </u>			
What type of filter <u> </u>			
Method in use for water samples			
<u> ✓ </u> Predigestion: UV: <u> </u>			
Distillation: <u> ✓ </u> <u>ASTM</u> <u>as above</u>			
Reagents: <u> </u>			

C. CYANIDE (cont'd)

Number

Edition

✓ Colourimetry: Detection Limit .001 mg/L ASTM 1976 Part 31 Water.
Titration: Detection Limit _____
Specific Ion Electrode: Detection Limit _____

D. RESIDUE

Pretreatment

✓ Samples well shakenTime before analysis 5 days

Method

Filter Paper Used Millipore (.45 μ L)Temperature of Drying 105°CTotal 224A Filterable 224E Non-Filterable 224C 13th Edition.

Completed By: Pat Creighton
Pat Creighton
Technician

Approved by: Al Defeo
Al Defeo
Supervisor,
Special Chemistry

1. APPARATUS:

1. Beckman Mercury Vapor Detector Model K-23 with 8 3/4" cell.
2. Beckman Strip Chart Recorder.
3. All glass Aeration Assembly. The lower flask is a digestion-distillation flask, Fisher Cat. No. 21-151. The upper portion is like a modified nitrogen distillation apparatus as described under Fisher Cat. No. 21-150.
4. Flow Meter with a minimum of 1.5 liters per minute flow rate.
5. Activated charcoal filters.

Digestion - Waters

2
Transfer 50 mls or suitable sized aliquot of sample into a 250 ml erlenmeyer flask (quick-fit with 24/29 outer joint) Add 5 ml of concentrated hydrochloric acid and 2 ml of concentrated nitric acid and connect to reflux condensers (quick-fit, 200 mm long 24/29 joint size) situated on top of variable heat adjusted hot plates. Adjust heat so sample just boils (100°C) and allow to reflux for 25 minutes. Cool without disconnecting condensers - dilute to volume - continue as per procedure.

Solutions Containing SO₂ or H₂S

Transfer 50 mls or a suitable sized aliquot to a 250 ml erlenmeyer flask, add 5 ml concentrated hydrochloric acid and connect to reflux condenser. Adjust heat so sample just boils - 100° C - and allow to reflux for 20 - 30 min. (to eliminate the SO₂). Then add 2 ml concentrated nitric acid, and continue to reflux for an additional 15-20 min. Cool, bulk to volume. Continue as outlined under (3) procedure.

3. PROCEDURE:

After sample has been digested and diluted to a definite volume, an aliquot is transferred to the aeration flask and diluted to 50 ml with double distilled water. Replace the flask to the assembly. The flow meter is set at 1.5 liters per minute by-passing.

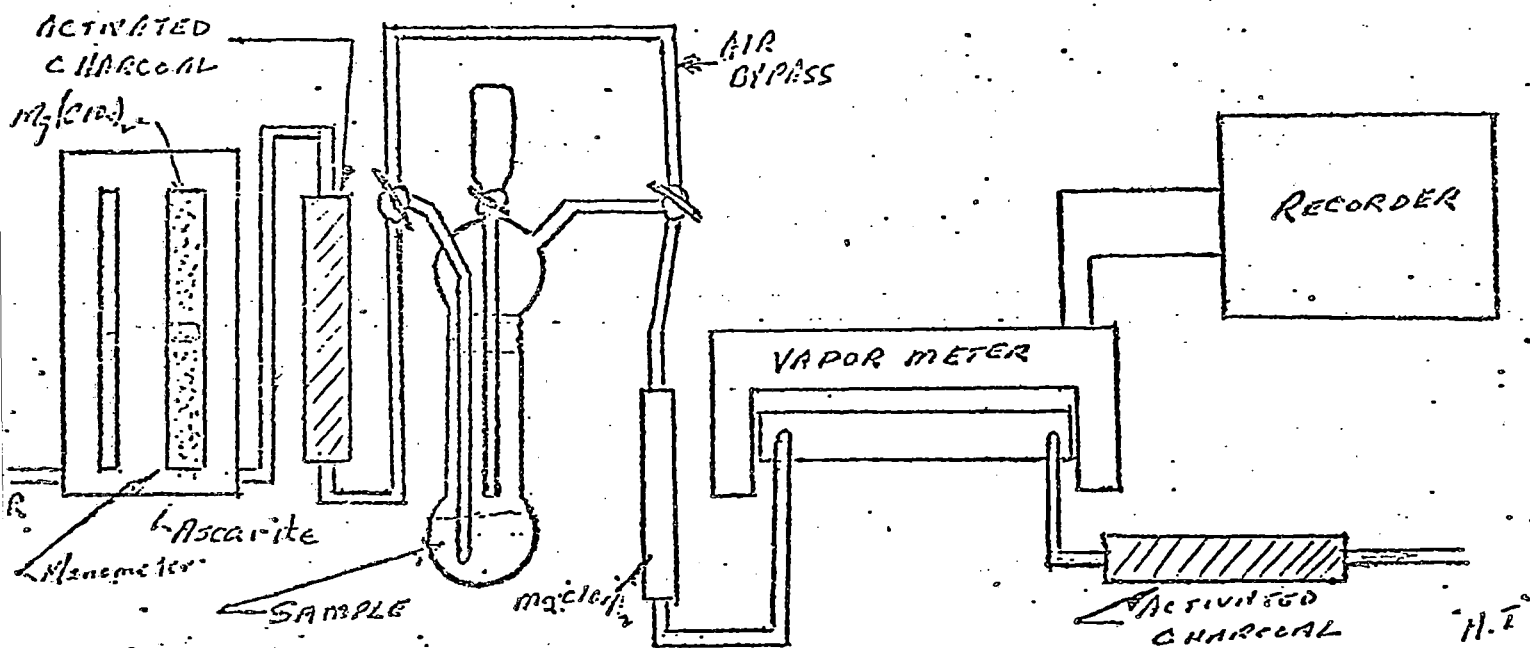
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(2)

3. PROCEDURE:.....Cont'd

the generator. 3 ml of 10% SnCl_2 in 20% HCl is introduced through the opening at the top of the generator and the sample aerated until a peak is observed on the recorder.

Results are tabulated measuring peak height from strip chart recorder. The recorder is calibrated to give full scale deflection for 0.1 micrograms of mercury.



H. Teindl
Tadenac Analytical Labs
May 25, 1973

DETERMINATION OF ZINC, COPPER, NICKEL AND IRON ON CON MINE WATERS

BY ATOMIC ABSORPTION

PROCEDURE:

Transfer 100 ml or suitable aliquot of water samples to 150 ml beaker. A blank assay is started with a 100 mls of double distilled water and is carried through the entire procedure. Add 5 mls HCl and 5 mls HNO₃ plus 3 mls HClO₄ and evaporate to dryness on a hot plate. Remove and cool. Add 2 mls of HCl and 10 cls double distilled water and warm on hot plate to dissolve salts. Cool and bulk to 20 mls with double distilled water. Complete assay by atomic absorption and calculate concentration of the element sought by comparing with a calibration curve constructed from standards. Results are expressed in milligrams per liter.

STANDARDS:

A set of standards with all the required elements is prepared in the same acid concentration as the samples - 10% HCl. The normal ranges of standards for each element 0.1, 0.25, 0.5, 1.0, 2.5, 5.0, 10.0, micrograms per ml.

Analytical Services
February 28, 1977

Photometric Determination of Lead in Water

METHOD

Reagents:

1. Hydrochloric Acid - reagent grade
 2. Nitric Acid - reagent grade
 3. Ammonium Hydroxide - reagent grade
 4. Sulphuric Acid - reagent grade
 5. Perchloric Acid - reagent grade
 6. Carbon tetrachloride - reagent grade
 7. Chloroform - reagent grade
 8. Chloroform-dithizone - 0.010% - dissolve 0.020 grams of diphenylthiocarbazone in 200 ml of chloroform.
 9. Carbon Tetrachloride-dithizone
 - 1) 0.01% - dissolve 0.025 grams diphenylthiocarbazone in 250 ml of carbon tetrachloride.
 - 2) 0.001% - dilute 25 ml of 0.01 dithizone to 250 ml with carbon tetrachloride.
 10. Hydroxylamine hydrochloride - 10% - dissolve 10 grams of hydroxylamine hydrochloride in water and dilute to 100 ml with water.
 11. Ammonium citrate - 50% - dissolve 50 grams of ammonium citrate and dilute to 100 ml with water.
 12. Potassium cyanide - 20% - dissolve 20 grams of potassium cyanide in water and dilute to 100 ml with water.
- CAUTION** Potassium Cyanide is extremely poisonous - use care when handling this reagent.
13. Meta-Cresol purple - dissolve 0.1 grams of M Cresolsulfonaphthalein in 10 ml of water plus 1 pellet of NaOH. Dilute to 100 ml with water.
 14. Dilute Hydrochloric Acid - 1% - dilute 10 ml of CP HCl to 1000 ml with water.

NOTE All water used for making up reagents as well as for the actual determination must be lead free or double distilled water. Also all glass ware such as funnels and beakers should be rinsed with hydrochloric acid followed by a rinse with double distilled water.

PREPARATION:

Transfer 100 ml or suitable aliquots of water samples to 150 ml beakers. A blank assay is started with 100 ml of double-distilled water (Pb free) and is carried through the entire procedure. Add 1 ml concentrated HNO_3 and 1 ml concentrated H_2SO_4 and evaporate samples to H_2SO_4 fumes. Cool, add 2 ml concentrated HCl and 15 ml of distilled water and warm on hot plate to dissolve salts.

PROCEDURE A - To be used when water has low iron content.

Transfer sample to a 60 ml separatory funnel and add 3 ml of 10% hydroxylamine hydrochloride, 2 ml of 50% ammonium citrate plus 1 drop of metacresol purple. Swirl after each addition. Add ammonium hydroxide until purple. Then add 1 ml of 20% potassium cyanide. Add 10 ml of 0.001% dithizone in carbon tetrachloride, stopper and shake for 1 minute. Allow layers to separate and drain the dithizone carbontetrachloride layer into a second 60 ml separatory funnel containing 10 ml of water plus 2 drops of concentrated ammonium hydroxide plus 2 drops of 20% potassium cyanide.

Shake the second 60 ml funnel for 20 seconds. Allow the layers to separate and drain the dithizone carbon tetrachloride layer into a 2 cm test tube supplied with the Evelyn Colorimeter. Read at 515 millimicrons using the reference solution started up at the beginning of the color development to set the machine to 100% transmission. Subtract the value of the reagent blank from the analysis and determine the lead present by reference to a prepared calibration curve.

PROCEDURE B - To be used when water has a high iron content.

Transfer sample to a 125 ml separatory funnel and add in succession 3 ml of 10% hydroxylamine hydrochloride, 1 ml of 50% ammonium citrate, one drop of meta cresol purple. Swirl after each addition. Add ammonium hydroxide dropwise until the sample turns purple (pH 9). Add 10 ml of 0.010% dithizone in chloroform, stopper and shake for one minute. Transfer the dithizone layer to a 60 ml separatory funnel containing 25 ml of 1% HNO_3 . Wash the original aqueous phase with 2-5 ml of chloroform, shake for 20 seconds and combine the chloroform layer with the original dithizone extract in the 1% nitric acid solution.

Shake the combined extracts for 2 minutes. Allow the layers to separate and discard the dithizone chloroform layer. Add 2-5 ml of chloroform to the 1% HNO_3 solution, shake for 20 seconds and again discard the chloroform layer. (a very close separation must be made at this stage to ensure that no droplets of chloroform remain.)

To the 60 ml funnel containing the 1% HNO_3 solution add in succession 1 ml of 10% hydroxylamine hydrochloride, 1 ml of 50% ammonium citrate plus 1 drop of metacresol purple. Swirl after each addition. Add ammonium hydroxide dropwise until purple. Then add 1 ml of 20% potassium cyanide. Add 10.0 ml of 0.001% dithizone in carbon tetrachloride, stopper and shake for 1 minute. Allow to layer to separate and drain the dithizone carbontetrachloride layer into a second 60 ml separatory funnel containing 10 ml of water plus 2 drops of ammonium hydroxide plus 2 drops of 20% potassium cyanide.

Shake the second 60 ml funnel for 20 seconds. Allow the layer to separate and drain the dithizone carbontetrachloride layer into a 2 centimeter test tube supplied with the Evelyn Colorimeter. Read at 515 millimicrons using the reference solution started up at the beginning of the color development to set the machine up to 100% transmission. Subtract the value of the reagent blank from the analysis and determine the lead present by reference to a prepared calibration curve.

Preparation of Calibration Curve

1. Standard lead solution (1 ml = 0.0001 grams lead)

Dissolve 0.0250 grams of freshly cut lead sawings in dilute nitric acid. Dilute to 250 ml in a volumetric flask and mix.

2. Working solution (1 ml = 2 micrograms lead)

Dilute 2.0 ml of the above solution to 100 ml in a volumetric flask and mix.

Prepare a calibration curve by adding 0.0, 2.0, 4.0, 6.0, 8.0, and 10.0 micrograms of lead to 125 ml separatory funnel; dilute to 25 ml with double distilled water and follow the procedure for the determination of lead in water.

FILE NOTE

Decomposition of Soil, Plant Tissue, and Water Samples for Arsenic Analysis

To accompany Lab Section 3 Report 16

- 1) Soil Samples: Weigh suitable sample (.25 - 1.0 grams) into a 150 ml beaker. Add .5 g Potassium Chlorate ($KClO_3$) and 15 ml CP HNO_3 . Take to dryness on padded plate. Cool, add 10 ml CP HCl - take to dryness. Cool, add 10 ml HCl and take to dryness again. Cool, add 10 ml CP HCl and 10 ml H_2O , warm to digest. Filter into 100 ml volumetric flask and make to volume. Pipette suitable aliquot into flasks used for the micro distillation of Arsenic. Start a reagent blank with the samples and carry through the same procedure.
- 2) Plant tissue: Weigh suitable sample (.25 - 1.0 grams) into a 150 ml beaker. Add 10 ml CP HNO_3 , place on a padded hot plate and allow sample to digest. Cool, add .1 grams Potassium Chlorate followed by 10 ml 1-1 Sulphuric Acid and take sample to Sulphuric fumes. If sample chars clarify with drop-wise addition of CP HNO_3 . Cool, add 10 ml of water and filter off the Silica catching the filtrate in the flasks used for the micro distillation of Arsenic. Start a reagent blank with the samples and carry through the same procedure.
- 3) Water samples: Measure suitable aliquot (1 - 100 ml) into a 150 ml beaker. Add 1 ml CP HNO_3 and 1 ml CP H_2SO_4 and evaporate to Sulphuric fumes on a padded hot plate. Cool, add 10 ml water and warm to digest. Cool, wash samples into the flasks used for the micro distillation of Arsenic. Start a reagent blank with the samples and carry through the same procedure.

PROCEDURE: Adjust the volume of the sample in the distillation flask to approximately 20 ml with water. Add .1 gram Sodium Bromide and .5 gram Hydrazine Sulphate to each sample swirling between each addition. Continue with the procedure as outlined in Lab Section 3, Report 16 beginning with the phrase, "Add 20 ml concentrated Hydrochloric Acid".

February 18, 1976

Photometric Determination of Arsenic

DETAILS

A. Reagents

- 1) Hydrobromic acid - bromine mixture -

Add 25 ml of bromine to 225 ml of hydrobromic Acid (48%) and mix well.

- 2) Hydrochloric acid - reagent grade.

- 3) Redistilled Nitric acid -

Distill 1 liter of nitric acid in an all-glass system, discarding the first and last 50 ml portions of the acid. Store in a glass-stoppered bottle.

- 4) Sodium sulphate solution - (10%)

Dissolve 10 grams of anhydrous sodium sulphate in distilled water and dilute to 100 ml.

- 5) Perchloric acid - Reagent grade 70% perchloric acid.

- 6) Methyl red solution -

Dissolve 0.020 gram of methyl red sodium salt in 100 ml of distilled water.

- 7) Ammonium hydroxide - Reagent grade ammonium hydroxide.

- 8) Potassium bromate solution -

Dissolve 0.030 gram of potassium bromate in 100 ml of distilled water.

- 9) Ammonium Molybdate solution -

Dissolve 1.000 gram of ammonium molybdate, $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$ in 50 ml of distilled water. Dilute to 100 ml and mix. Store in a polyethylene bottle. Do not store in a glass bottle since the solution tends to turn yellow as silica is dissolved and high blanks for arsenic will be obtained.

- 10) Hydrazine sulphate solution -

Dissolve 0.160 gram of hydrazine sulphate, $(\text{NH}_2)_2\text{H}_2\text{SO}_4$ in distilled water, dilute to 100 ml and mix.

- 11) Standard arsenic solution -

Transfer 0.0660 gram of pure arsenious oxide to a 20 ml platinum crucible. Add 10 ml of distilled water followed by 2 pellets of sodium hydroxide. Warm gently to dissolve. Cool, add 5 ml of 1:1 sulphuric acid then transfer to a 500 ml volumetric flask, dilute to the mark and mix. (1 ml = 0.0001 gram arsenic).

To make a dilute solution for use in the preparation of a calibration curve, transfer 4.0 ml of the above solution to a 100 ml volumetric flask. Add 5 ml of 1:1 sulphuric acid, dilute to the mark and mix. (1 ml = 4 micrograms arsenic).

All water used for the preparation of reagents and for dilution of assays should preferably be double distilled or of equivalent purity.

B. Apparatus

An all-glass distillation apparatus is used in the procedure. A 50 ml Erlenmeyer flask with ground glass standard taper neck is equipped with a distillation head carrying an inlet tube for bubbling with nitrogen. The outlet tube of the head is joined to a small condenser by means of a ball and socket joint connector tube. The body of the condenser is approximately 6 inches long and the inner condensing tube has a socket joint at the top and a ball joint at the bottom. A delivery tube may be connected to the latter joint for insertion into the distillation receiver. A 30 ml centrifuge tube placed inside a 150 ml beaker is used as a receiver. All ball and socket connections are held together by means of a spring clamp.

An Evelyn Photoelectric Colorimeter with accessory filters is used for the photometric measurements.

- 3 -

C. Procedure

U Add 20 ml of concentrated hydrochloric acid. Insert the distillation head, place the assay on a hot plate and connect to the condenser. Distill for 20 minutes, catching the distillate in a 30 ml centrifuge tube containing 5 ml of 1:4 nitric acid (Dilute 1 volume of re-distilled nitric with 4 volumes of distilled water). During the distillation, nitrogen is bubbled through the apparatus at a rate sufficient to counteract any bumping or back-pressure.

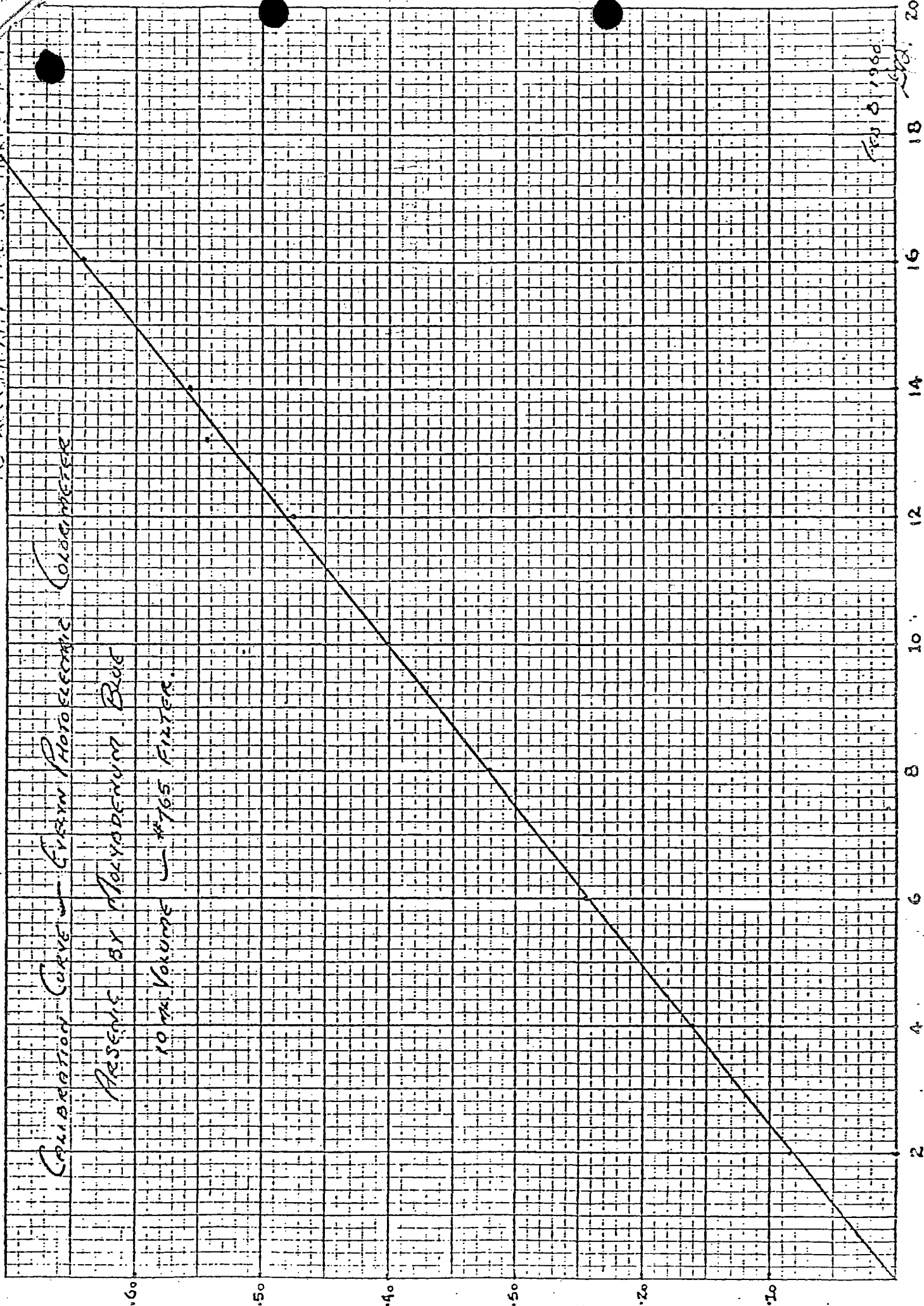
W When the distillation is complete disconnect the flask and connecting tube and rinse down the condenser into the receiver with a small quantity of distilled water. Transfer the distillate containing the arsenic to a 100 ml beaker to which 0.5 ml of 10% sodium sulphate has been added. Rinse out the centrifuge tube into the beaker with a small quantity of water.

(Place the beaker on a low temperature hot plate and take the assay to dryness. When the assay is dry, bake at approximately 150°C for 30 minutes to remove nitrates. Remove from the hot plate, cool, then add 2 to 3 ml of distilled water and 0.2 ml of perchloric acid and swirl to dissolve. Transfer the assay to a 10 ml volumetric flask, rinsing out the beaker with a small quantity of water. Add 1 drop of methyl red indicator solution to the flask, then neutralize the assay by dropwise addition of concentrated ammonium hydroxide. Blow out the ammonia fumes, then add diluted hydrochloric acid solution (4 volumes of concentrated hydrochloric acid diluted with 6 volumes of distilled water) dropwise to bring back the red color then add 0.5 ml excess. Add 0.2 ml of KBrO₃ solution, and swirl to decolorize the assay, warming the assay slightly if necessary. Cool, add 0.5 ml of ammonium molybdate solution and mix. Add 0.5 ml of hydrazine solution, dilute to the mark and mix. Place the flask unstoppered in vigorously boiling water in a 150 ml beaker and allow to remain exactly 5 minutes. Cool and then transfer the contents of the flask to a colorimeter tube as supplied with the Evelyn colorimeter. Determine the absorbance of the assay and the blank with the No. 765 filter in place using distilled water as the reference solution. Subtract the value of the blank from that of the assay and determine the amount of arsenic present by reference to a calibration curve.

Preparation of Calibration Curve

Transfer 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5 and 5.0 ml of the dilute standard arsenic solution (1 ml = 4.0 micrograms of arsenic) to a series of 10 ml volumetric flasks. Add 0.2 ml of perchloric acid and dilute to 5 ml with distilled water. Add 1 drop of methyl red solution and neutralize carefully with concentrated ammonium hydroxide added dropwise. Blow out the ammonia fumes then add diluted hydrochloric acid solution and carry out the reagent addition and color development as outlined in the method. Determine the absorbance of the blank and the standards and subtract the value of the blank from that of each of the standards. From the data so obtained construct a calibration curve relating absorbance with arsenic concentration. A typical calibration curve as established for the Evelyn colorimeter is attached.

TO ACCURACY THE SECTION



and 1 ml concentrated H_2SO_4 with 4 ml H_2O
add 2 ml concentrated HCl and 15 ml of distilled water and warm on hot plate to dissolve salts.

NORTHWEST TERRITORIES
WATER BOARD

OFFICE DES EAUX DES
TERRITOIRES DU NORD-OUEST

Your file Votre référence

Our file Notre référence

N1L3-0040 ←
Water Register

March 17, 1977

Members
NWT Water Board

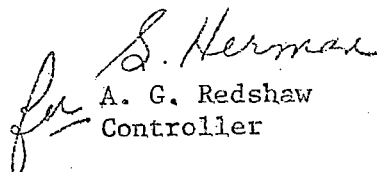
Gentlemen:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine
Water Licence #N1L3-0040

Attached please find:

- (1) Licence for Cominco Limited, Con Mine
- (2) Covering letter - Allmand to Bergasse
- (3) Covering letter - Bergasse to McPhail

Yours truly,


A. G. Redshaw
Controller

AGR:sh

MAILING ADDRESS P.O. BOX 1500

OFFICE: BELLANCA BUILDING

YELLOWKNIFE, N.W.T., XOE 1HO

PHONE (403) 873-4421

TELEX 034-4-5519

000358

NIL3-0040 ←
Water Register

MAR 17

BY HAND

Mr. A.D. McPhail
Manager, Con Operations
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. McPhail:

Re: Northern Inland Waters Act
Water Licence #NIL3-0040
Cominco Limited, Con Mine

Attached please find a carbon copy of the Water Licence granted by the Northwest Territories Water Board and approved by the Minister of Indian and Northern Affairs in accordance with Section 10 of the Northern Inland Waters Act. The original copy of this licence is held at the Board's Office in Yellowknife.

In order to avoid any future misunderstandings that might arise, I will in this letter, point out certain key points in the licence. I would suggest you review this licence carefully since if any requirements are not met, you could be considered in contravention of the Northern Inland Waters Act.

To start off, I wish to make clear, the manner in which Water Licences issued by the Board are administered.

1. Once a licence has been granted by the Water Board and approved by the Minister of Indian and Northern Affairs, it is placed in the Water Register at the Board's Office in Yellowknife and is available to the general public.

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Mr. McPhail . . . Page 2 . .

2. The administration of the Water Licences rests with the Department of Indian and Northern Affairs through the Water Management Section in Yellowknife, of which Mr. Redshaw is in charge. To enforce the terms and conditions as required in the licence, the Minister of Indian and Northern Affairs appoints Inspectors in accordance with Section 29 of the Northern Inland Waters Act. The inspections carried out by these designated Inspectors are coordinated through Mr. Redshaw.
3. To keep the Members of the Water Board, and the general public informed of the manner in which the licence conditions are being met, the Inspector on each visit to an operation, prepares an inspection report, which details his observations on how each item in the licence is being met. This report is forwarded to the Licensee with a covering letter from Mr. Redshaw indicating what action he requires to be taken. The report and Mr. Redshaw's covering letter, is placed on the public register, as is the response from the Company on the inspection report. In addition, Mr. Redshaw reports directly to the Board on the administration of all licences and the Board reacts directly to the Minister, if in their opinion a licence is not adequately administered. It is therefore of prime importance then, that you react to all inspection reports, allowing any outstanding points to be clarified. Copies of your comments are likewise filed in the Public Register and with the Water Board.
4. At least three or four months prior to the expiry date of a licence, it is the responsibility of the Licensee, if a renewal of the licence is contemplated, to apply to the Water Board for a new licence. The decision on this new licence rests with the Water Board and is based in part on the performance of the Licensee during the time of the previous licence and the views of the public at the public hearing, which must be held prior to the granting of a new licence. This licence once granted by the Board and approved by the Minister, will contain the terms and conditions that are required for operation during the next term of the licence. Please note that if one licence expires and another one is not issued, then the use of water must cease until a new licence is granted.

. . . 3 . .

Mr. McPhail . . . Page 3 . .

Addressing now the licence attached, I would like to say that during the period prior to the issue of this licence, your company was given every opportunity to comment on the terms and conditions included therein. I feel it is safe to say that you were fully aware of the requirements of the licence well ahead of this date, therefore even though this licence has been issued to you after its effective date of March 1, 1977, I will still require that the effective date remain as stated and all time requirements in the licence will be calculated from March 1, 1977. The expiry date on the licence is for February 29, 1980, therefore as stated above, you will be required to submit an application for a new licence by at least November 1, 1979.

Under Part A:

1. The annual report required under this item shall be filed with the office of the Board in Yellowknife by February 1 of each year and shall contain the information required and in the order specified under Part C Item 13. The Board will advise you of what additional items are required under Part C Item 13(f) by November of each year.
2. You will be duly advised by the office of the Board of the water use fee required.
3. Attached (Appendix 1) is an outline of the methods by which this security bond may be paid, and the location to which it must be sent. You are required to submit to the office of the Board a statement that this Bond has been furnished. As is stated in Section 13(1) of the Northern Inland Waters Regulations, this Bond should have been required prior to the issue of the licence, however under the present circumstances I am requesting it be furnished by April 15, 1977.
4. The question of reclamation is addressed further under Part C Item 21.
5. The Board will advise you well ahead of time of any changes in legislation covered under this item, and ensure that these changes are in keeping with the requirements of this licence.
- 6 & 7. The 'Surveillance Network Program' is attached to the licence and I would recommend you review it carefully to ensure that you are fully aware of its requirements. Mr. Redshaw will discuss it in more detail with you on request. Under Part B Items 6, 7 and 8 of this program, I understand that you have already been contacted in regards to these matters, however would you please submit to the office of the Board by May 1, 1977 a letter detailing all requirements so that they can be approved as required.

Mr. McPhail . . . Page 4 . .

The Board considers that this program should provide the information required to fully assess your operation and as such can be modified with Board approval. I would therefore request that if at any time you see a need for any modifications, you address this in writing to the Board so it can be considered.

Under Part C 'Data Requirements' we require that actual daily figures be submitted and in accordance with Part C Item 12 of the licence you are required to submit measurement details by April 1, 1977 and have all equipment installed and operational by December 1, 1977. In the interim the Board will accept your best estimates of daily quantities.

Under Part B of the licence, the Board considers that this section applies to new operations coming on line, therefore no clauses are required. However, please note that new construction as related to the licence must be reported and these requirements are covered under Part C Items 24 to 20 inclusive.

Under Part C, I will only cover those items that I feel require some clarification:

4. As related to the "Terms of Reference for Studies Related to the Reduction of Water Use", as attached to the licence, please note that your proposal must be filed by June 1, 1977 and that progress reports must be submitted by March 1, 1978 and September 1, 1978 with the final report due on March 1, 1979. It is the intention of the Board that this shall be an on-going implementation program with Board approvals being made as required, however prior to an issue of a new licence all possible changes must have been implemented.
5. On a point of clarity, all waste water from the mine/mill operation must be discharged to the area of Pud Lake behind the control dam and containment dykes. Board approval is required prior to any discharge of any waste waters to any other point, and these waters must meet the effluent quality requirements stated under Part C Item 10 before they will be considered by the Board.
10. The Board is very concerned about the quality of effluent being discharged from the designated Pud Lake tailings area, and the effluent quality requirements stated in this item have been established so as to allow you to continue operation during the study period established under Item 11 and it is therefore of prime importance that the requirements under Item 11 be adhered to very closely.

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Mr. McPhail . . . Page 5 . .

11. This item deals with the work the Board requires must be undertaken by your company to meet the proposed effluent quality requirements stated. As indicated above, we have placed great importance on this item and I shall require that by May 1, 1977 you file the detailed proposals on the studies you propose to undertake; that by March 1, 1978 and by September 1, 1978 you file the detailed progress reports; and the final report be filed by March 1, 1979. I have instructed Mr. Redshaw that during the next twenty-four months he and the Board's Technical Committee meet regularly with you and your advisors to ensure that work is progressing satisfactorily. Mr. Redshaw will report to the Board on each of these meetings. As related to implementation, I expect that this shall be an on-going program, and that as measures are developed, they will receive Board approval and be implemented. However as clearly stated in the licence, the Board requires that prior to your application for a new licence, the approved measures will be implemented and your company will meet the requirements stated in this item.

I hope that as a result of this letter you will have clearly established the Board's requirements which must be met if you are to use water and dispose of waste under the licence attached. I would recommend that if you require clarification of any technical points, you contact Mr. Redshaw directly, however on matters related to this licence you address the Board directly in writing.

In conclusion, I must stress, that the Water Licence and all inspection reports and correspondence related thereto, are part of the public Water Register and are intended to keep everyone informed of the manner in which the Board's Licence requirements are being met. This will form a part of the material considered when the licence comes up for renewal and as such the licence requirements must be met. I know I can count on you and your company for your full cooperation.

Yours truly,

ORIGINAL SIGNED BY
J. A. BERGASSE

J. A. Bergasse
Chairman
NWT Water Board

NORTHWEST TERRITORIES WATER BOARD



Indian and Northern Affairs Affaires indiennes et du Nord

WATER LICENCE

issued pursuant to
Northern Inland Waters Act and Regulations

COMINCO LIMITED, CON MINE

(Licensee)

Licence Number N1L3-0040 issued on MARCH 1 19 77

Location YELLOWKNIFE, NORTHWEST TERRITORIES



Indian and Northern Affairs Affaires indiennes et du Nord

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the Northern Inland Waters Act and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

COMINCO LIMITED, CON MINE

(Licensee)

of P.O. BOX 2000, YELLOWKNIFE, NORTHWEST TERRITORIES
(Mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence:

Licence Number NIL3-0040
Water Management Area NORTHWEST TERRITORIES 01
Location YELLOWKNIFE, NORTHWEST TERRITORIES
Purpose TO OBTAIN WATER AND RETURN A FLOW OF WATER
Description INDUSTRIAL USE IN MINING AND MILLING PROCESSES
Quantity of Water Not to be Exceeded SEE PART C, ITEM 2
Rate of Use of Water Not to be Exceeded SEE PART C, ITEM 3
Effective Date of Licence MARCH 1, 1977
Expiry Date of Licence FEBRUARY 29, 1980

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

Northwest Territories Water Board

Arthur G. Redman
Witness

[Signature]
Chairman

Approved by

[Signature]
Minister of Indian Affairs
and Northern Development

PART A

GENERAL CONDITIONS

1. The Licensee shall file reports pursuant to section 15 of the Regulations not later than February 1st of the year next following the year reported.
2. The annual water use rental fee shall be payable quarterly in advance.
3. The Licensee shall furnish the Board with a security deposit in the amount of \$100,000. If the Licensee fails to live up to any condition of this licence, the Board may retain such part of the security, as in the opinion of the Board, the circumstances justify to satisfy the Licensee's responsibility hereunder.
4. The Licensee shall carry out a reclamation program in a manner that is satisfactory to the Board upon the termination of the licence or renewals thereof, on abandonment of the operation, or if during the period of the licence or renewals thereof an unauthorized deposit of waste occurs. The security called for shall not limit the legal or fiscal responsibility of the Licensee to clean-up and restore adversely affected property as aforesaid.
5. This licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, in accordance with Section 10(3) of the Northern Inland Waters Act, whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Northern Inland Waters Act, or other statute imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited that this licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations.
6. The Licensee shall comply with the "Surveillance Network Program" as is annexed to this licence.
7. The "Surveillance Network Program" as annexed may be modified at the discretion of the Board.

PART B CONDITIONS APPLYING TO CONSTRUCTION

N11

PART C CONDITIONS APPLYING TO OPERATION

1. The Licensee shall obtain all surface water from Great Slave Lake by using existing intakes, piping and pumping facilities.
2. The annual quantity of surface water obtained from Great Slave Lake plus the quantity of groundwater pumped to the surface to permit mining shall not exceed 340,000,000 Imperial gallons per year.
3. The maximum rate of use of surface water from Great Slave Lake plus the rate of groundwater pumped to the surface to permit mining shall not exceed 1,300,000 Imperial gallons on any day, with the average daily use over the year not exceeding the quantity stated in Part C Item 2 divided by the number of days in the given year.
4. The Licensee shall, within three (3) months of the date of issue of this Licence, file with the office of the Board proposals which adequately satisfy the "Terms of Reference for Studies Related to the Reduction of Water Use" appended to this Licence, and shall receive a letter of approval from the Board prior to the start of the studies. The Licensee shall file progress reports on this work within twelve (12) months and eighteen (18) months of the date of issue, and shall submit a final report within twenty-four (24) months of the date of issue of this Licence. Prior to the expiry date of this Licence and subject to the written approval of the Board, the Licensee shall implement the changes required to reduce water use.
5. The Licensee shall discharge all mine and mill process water to the Pud Lake tailings area unless a letter of approval to discharge these waters at other locations is received in advance from the Board.
6. The Licensee shall maintain and operate the Pud Lake tailings area as outlined on the attached map according to the following conditions:
 - (a) Adequate freeboard of at least one (1) foot shall be maintained at all times;
 - (b) No uncontaminated surface water or ground water except that occurring from precipitation and natural runoff shall enter the tailings area; and
 - (c) All waste discharges from the Pud Lake tailings area shall pass through the decant structure into lower Pud Lake.
7. All wastes discharged from lower Pud Lake shall be directed to Meg Lake. No waste discharge, seepage or other flow shall be permitted at any time from the Pud Lake tailings area or lower Pud Lake to Kam Lake.
8. The Licensee will advise the office of the Board by the fastest means possible should a failure of the waste treatment system, including tailings area dykes, occur, which results in or is likely to result in an unauthorized discharge of waste.

. . . 3 . . .

9. The Licensee shall submit a detailed written report on each failure of the waste treatment system referred to in Item 8 Part C, to the office of the Board not later than seven (7) days after the failure.
10. All waste discharged by the Licensee from Pud Lake tailings area through the decant structure, or at such other locations as approved under Part C, Item 5, shall meet the following effluent quality requirements:

PARAMETER	MAXIMUM MONTHLY AVERAGE CONCENTRATION	MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE
Total Arsenic	7.50 mg/litre	15.0 mg/litre
Total Copper	1.0 mg/litre	2.0 mg/litre
Total Cyanide	3.0 mg/litre	10.0 mg/litre
Total Lead	0.20 mg/litre	0.40 mg/litre
Total Nickel	0.50 mg/litre	1.0 mg/litre
Total Zinc	0.50 mg/litre	1.0 mg/litre
Suspended Solids	15.0 mg/litre	30.0 mg/litre
Oil & Grease	- -	5.0 mg/litre

The waste shall have a pH between 6.0 and 9.5

11. The Licensee shall, within three (3) months of the date of issue of this licence, file with the office of the Board detailed proposals for studies to be undertaken to achieve the effluent quality requirements stated below:

PARAMETER	MAXIMUM MONTHLY AVERAGE CONCENTRATION	MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE
Total Arsenic	0.50 mg/litre	1.0 mg/litre
Total Copper	0.30 mg/litre	0.60 mg/litre
Available Cyanide	0.10 mg/litre	0.20 mg/litre
Total Cyanide	1.50 mg/litre	3.0 mg/litre
Total Lead	0.20 mg/litre	0.40 mg/litre
Total Nickel	0.50 mg/litre	1.0 mg/litre
Total Zinc	0.50 mg/litre	1.0 mg/litre
Suspended Solids	15.0 mg/litre	30.0 mg/litre
Oil & Grease	- -	5.0 mg/litre

The waste shall have a pH between 6.0 and 9.5

The Licensee shall receive a letter from the Board that the proposal is satisfactory and shall file progress reports on this work within twelve (12) months and within eighteen (18) months of the date of issue of this licence. A final report shall be submitted to the Board within twenty-four (24) months of the date of issue of this licence.

The Licensee shall implement such measures as are required by the Board based on the results obtained from the above studies. These measures shall be implemented within thirty-six (36) months of the date of issue of this Licence or within such other time as is approved by the Board.

12. The Licensee shall file with the office of the Board within one month of date of issue of the licence details on the methods and procedures used for the measurement of water use and waste discharge and ensure that these methods and procedures are acceptable to the Board. The Licensee shall install and operate all the equipment necessary to implement these methods and procedures within nine (9) months from the date of issue of the licence.
13. The Annual Report for the preceding year as required under Part A, Item 1, shall contain the following information:
 - (a) The total annual quantity of surface water pumped from Great Slave Lake in Imperial gallons;
 - (b) The total annual quantity of groundwater pumped from the mine in Imperial gallons;
 - (c) The total annual quantity of effluent discharged from the Pud Lake tailings area through the decant structure in Imperial gallons;
 - (d) Both tabular and graphical summaries of the water quality data from the water quality surveillance network. The yearly totals of all quantities measured shall be reported;
 - (e) A detailed record of major maintenance work carried out on the Pud Lake tailings area and the related structures; and
 - (f) Any other details on water use or waste disposal as requested by the Board.
14. The Licensee shall file with the office of the Board, the final design and construction plans and specifications for a new or any additions to the existing pumping plant and associated facilities, the tailings dykes and related structures and other waste treatment facilities and related structures at least two (2) months prior to the start of any construction or work or such other period of time as approved by the Board, and receive a letter of approval from the Board prior to the start of any construction work.
15. The Licensee shall file with the office of the Board at least ten (10) days prior to any construction work referred to in Item 14 Part C a detailed construction schedule.
16. The Licensee shall construct each structure and carry out work in accordance with the plans and specifications approved by the Board.
17. All design alterations from those approved by the Board, shall be submitted to the office of the Board, and the Licensee shall receive a letter of approval from the Board prior to any alterations being made.
18. The Licensee shall provide as-constructed plans and drawings of the works referred to in Item 14, Part C, within three (3) months of completion of the construction. These plans and drawings shall be submitted on transparencies that will reproduce with the use of a standard printer.

19. The Licensee shall file with the office of the Board within six (6) months of the date of issue of the licence detailed proposals for the containment and reclamation of all arsenic oxide storage areas located on the property, and shall receive a letter of approval from the Board prior to the start of any such work.
20. The Licensee shall complete the work referred to in Item 19, Part C, prior to the expiry date of the licence.
21. The Licensee shall submit within three (3) months of the date of issue of the licence, detailed proposals which satisfy the "Terms and Reference for Studies Related to Restoration and Reclamation of Abandoned and Existing Tailings Areas" and shall receive a letter of approval from the Board prior to these studies being commenced. An interim progress report shall be filed within eighteen (18) months of the date of issue of the licence, and a final report shall be filed with the office of the Board not later than thirty (30) months after the date of issue of the licence.

NORTHWEST TERRITORIES WATER BOARD


CHAIRMAN

NORTHWEST TERRITORIES WATER BOARD

LICENSEE: COMINCO LIMITED CON MINE
WATER LICENCE NUMBER: N1L3-0040
EFFECTIVE DATE OF LICENCE: 3 JANUARY, 1977

STUDIES FOR RESTORATION AND RECLAMATION
OF ABANDONED AND EXISTING TAILINGS AREA

"TERMS OF REFERENCE"

1. Objective

The purpose of these studies is to develop a plan for the reclamation and rehabilitation of all tailings disposal areas on the site in order to prevent the pollution of the environment by residual wastes and contaminants.

2. Study Requirements

2.1 Abandoned Tailings Areas

The Licensee shall carry out studies directed towards the reclamation of all lands outside the Pud Lake tailings area which are covered by tails. These studies shall include, but not be limited to, the following:

- (a) A description of the physical and chemical properties of the tails;
- (b) An evaluation of the potential contamination of adjacent watercourses by run-off from these tails;
- (c) An assessment of methods for the stabilization of these tails, including revegetation and covering.

2.2 Pud Lake Tailings Area and Waste Rock Piles

The Licensee shall undertake studies which are directed towards the ultimate reclamation of the Pud Lake tailings area, and these studies shall address, but not be limited to, the following:

- (a) Methods for the stabilization and revegetation of lands covered by tails and waste rock piles;
- (b) Integrity and permanency of dams, dykes and other structures surrounding the Pud Lake tailings area;
- (c) Methods for the collection and treatment of contaminated surface run-off or seepage from tailings areas and waste rock piles.

Full details of the proposed methods and techniques shall be presented, together with an estimate of the cost per acre per year, the total cost, and a map of the disturbed areas.

NORTHWEST TERRITORIES WATER BOARD

LICENSEE: COMINCO LIMITED CON MINE
WATER LICENCE NUMBER: N1L3-0040
EFFECTIVE DATE OF LICENCE: 3 JANUARY, 1977

STUDIES FOR REDUCTION OF WATER USE

"TERMS OF REFERENCE"

1. Objective

The purpose of this study is to identify methods by which the overall consumption of fresh surface water in the mining and milling processes can be reduced while maintaining an acceptable quality of effluent. These methods will be applied to reduce the total quantity of water which becomes contaminated during the industrial process and are intended, together with the improvement of effluent quality, to reduce the total quantity of contaminants which are released to the environment.

2. Study Requirements

The study shall consider all uses of water in the mining and milling processes, and shall include, but not be limited to the following:

- (a) The use of effluent from the tailings area for milling and mining purposes;
- (b) The recycle and reuse of treated and untreated mine process and seepage water for mining and milling;
- (c) The increased reuse and recycle of mill process water within the mill;
- (d) The recycle and reuse of compressor cooling water.

NORTHWEST TERRITORIES WATER BOARD

Licensee: Cominco Limited, Con Mine
Licence Number: N1L3-0040
Effective Date: January 3, 1977

SURVEILLANCE NETWORK PROGRAM

A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
40-1	Pud Lake Tailings Area Discharge at the decant structure
40-2	Mill Freshwater Intake at the Yellowknife Bay Pump House
40-3	Meg Lake Discharge to Keg Lake
40-4	Keg Lake at its Centre

B. Sampling and Analysis Requirements

- The Pud Lake Tailings Area Discharge at Sampling Station 40-1 shall be sampled every week during periods of flow and analyzed for the following parameters:

Total Arsenic	
Total Copper	
Total Cyanide	
Suspended Solids	
Specific Conductivity	
pH	
- The Pud Lake Tailings Area Discharge at Sampling Station 40-1 shall be sampled monthly during periods of flow and analyzed for the following additional parameters:

Total Hardness	Total Alkalinity
Total Lead	Calcium
Total Nickel	Chloride
Total Zinc	Sodium
	Sulfate
	Oil & Grease
- The Mill Freshwater Intake at the Yellowknife Bay Pump House, and Keg Lake at its Centre, Sampling Stations 40-2 and 40-4 respectively, shall be sampled at least once every three (3) months and analyzed for the following parameters:

Total Arsenic	Total Alkalinity
Total Copper	Calcium
Total Cyanide	Chloride
Total Lead	Total Hardness
Total Nickel	Sodium
Total Zinc	Sulfate
Suspended Solids	Specific Conductivity
	pH

4. The Meg Lake Discharge to Keg Lake at Sampling Station 40-3 shall be sampled four (4) times yearly on dates specified annually by letter from the Chairman of the Board and shall be analyzed for the following parameters:

Total Arsenic	Total Alkalinity
Total Copper	Total Hardness
Total Cyanide	Calcium
Total Lead	Chloride
Total Nickel	Sodium
Total Zinc	Sulfate
Suspended Solids	Specific Conductivity
pH	

5. The Licensee shall submit samples of the Pud Lake Discharge to Meg Lake at Sampling Station 40-1 to the office of the Board twice per year for acute fish toxicity testing. The dates of sampling shall be specified annually by letter from the Chairman of the Board.
6. All sampling and sample preservation must be done according to methods approved by the Board.
7. All analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" or by such other methods as are approved by the Board.
8. All analyses shall be performed in a laboratory approved by the Board.
9. All results of analyses shall be submitted to the office of the Board within one month of the date of sampling.

C. Data Requirements

1. The quantity of surface water pumped from Great Slave Lake shall be recorded daily in Imperial gallons.
2. The quantity of groundwater pumped from the mine shall be recorded daily in Imperial gallons. This quantity of water shall be calculated based on:
 - (a) A daily record of the quantity of water pumped underground from (i) the City of Yellowknife Water Supply and (ii) with the tailings backfill; and
 - (b) A daily record of the total quantity of water pumped to the surface to permit mining.
3. The quantity of waste discharged from the Pud Lake Tailings Area through the decant structure shall be recorded daily in Imperial gallons. This quantity of waste shall be calculated based on:
 - (a) A record of the daily average water level in the tailings pond behind the decant structure; and
 - (b) A record of the time and day on which stop logs were placed in or removed from the decant structure and the elevation of the overflow weir after each operation.

4. A record of the average daily quantity of ore milled in tons, for each calendar month.
5. All data recorded above shall be submitted to the office of the Board within fifteen (15) days of the end of the months of June and December of each year.

WIL3-0040
W Register

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IAND OTT

WATER WM WB YK

W83

16/3/77

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MR BRIAN GIBSON
NEPRR
DINA
OTAW ONT

WE HAVE BEEN INFORMED THAT THE CON LICENCE HAS BEEN SIGNED
BY THE MINISTER.
AS WE HAVE NOT RECEIVED IT COULD YOU PLEASE CHECK AND ADVISE
US THE PRESENT STATUS AND IF IT HAS IN FACT BEEN MAILED.
PLEASE USE OUR NEW TELEX NUMBER 034-45623.

ALSO COULD YOU PLEASE SEND US AN UPDATED TELEPHONE ESTABLISHMENT
LISTING FOR THE DEPARTMENT.

THANKS

ARTHUR G REDSHAW
CONTROLLER
DINA YELLOWKNIFE

*
IAND OTT

WATER WM WB YK

N1L3-0040
Water Register

March 15, 1977

Mr. J. Gowans
Acting Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1HO

Dear Mr. Gowans:

Re: Northern Inland Waters Act
Water Licence Application #N1L3-0040
Cominco, Con Mine Limited

Thank you for your submission dated March 7, 1977.

I have distributed copies and requested comments from Members of the Water Board's Technical Committee and these will be passed to you as they become available.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW
A. G. Redshaw
Controller

AGR:sh



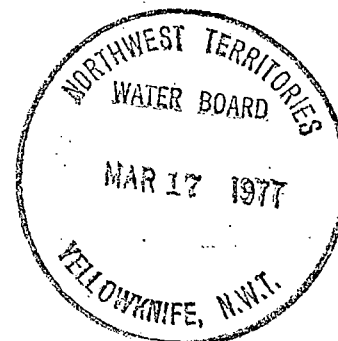
Minister
Indian and Northern Affairs

Ministre
Affaires indiennes et du Nord

NIL3-00495

11 MAR 1977

Mr. J.A. Bergasse,
Chairman,
Northwest Territories Water Board,
P.O. Box 1500,
Yellowknife, Northwest Territories
XOE 1H0



Northern Inland Waters Act
Cominco Limited, Con Mine, Yellowknife, N.W.T.
Water Licence #NIL3-0040

Thank you for your letter of February 21, 1977 and the attached copies of the above-noted water licence. I have reviewed this licence and approve the contents as written. Accordingly, I have signed the licence and enclose herewith the original and one copy.

With reference to Section 11 of the licence, I am pleased with the recommended compliance schedule. However, if measures for attainment of the compliance schedule cannot be implemented within the specified 36 month period, I ask that the Board submit its recommendation on any extended time frame for my approval.

Regarding your comments on the method of information exchange between the Board and my officials, I realize that Mr. Redshaw is fully informed on the workings of the Board. However, I would very much like to retain a direct line of communication between my senior officials and the Chairman of the Board. Therefore, I suggest that yourself, as Chairman, maintain close contact with Dr. M.J. Ruel, on major items concerning licences.

Yours sincerely,

Warren Allmand

Warren Allmand

Encl.



Minister
Indian and Northern Affairs

Ministre
Affaires indiennes et du Nord

c.c. Mr. J.A. Bergasse

11 MAR 1977

The Honourable Roméo LeBlanc, P.C., M.P.,
Minister,
Environment Canada,
Ottawa, Ontario
KLA OH3



Northern Inland Waters Act
Cominco Ltd., Con Mine, Yellowknife, N.W.T.
Water Licence

I thank you for your letter of February 14, 1977, in which you expressed concern over the terms which the N.W.T. Water Board included in the Con Mine water licence.

As you are aware, this licence was referred to me for approval by the Water Board late last year. Upon review of the licence I too expressed concern over the lack of a definite compliance schedule for effluent water quality improvement. As such, I referred the licence back to the Water Board for reconsideration of this matter.

I am pleased to report that I have now received an amended version of the licence from the Water Board in which a target period of 36 months has been established for meeting the effluent requirements. I now intend to approve the licence with the stipulation that any deviation from the 36 month compliance period must be submitted for my approval. However, I am convinced that the Water Board will take all possible action to improve the effluent water quality as soon as possible.

Regarding your post script on underground arsenic storage, I understand that I will very shortly be receiving, for approval, the Giant

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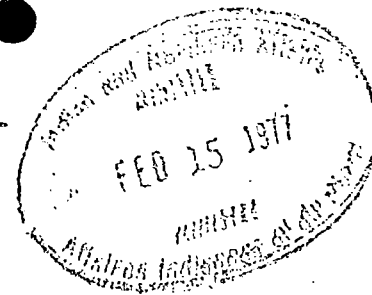
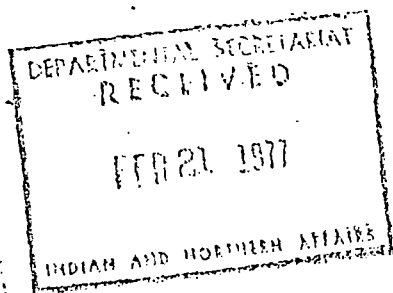
Yellowknife Mine water licence which contains a stipulation for very detailed studies on this question. I am of the opinion that the Water Board has this matter well in hand and will ensure that every possible precaution will be taken to avoid future problems.

Yours sincerely,


Warren Allmand

Minister
Environment Canada

Ministre
Environnement Canada



Ottawa, Ontario
K1A 0H3

FEB 14 1977

ED4252

The Honourable Warren Allmand, P.C., M.P.
Minister of Indian and Northern Affairs
House of Commons
Ottawa, Ontario
K1A 0A6

My dear *Warren* (

I am writing to express my concern about the terms in the draft NWT Water Board licence for Con Mine which, I understand, has been referred to you for approval.

At the NWT Water Board Meeting of October 19-20, 1976, the Board gave final consideration to the draft water licence for the Cominco Limited Con Mine and decided not to include a compliance schedule for effluent water quality improvement. As the licence now stands, the Company would be allowed to use water at the present rate and discharge waste at the present effluent quality levels. The implications of this are of particular concern to us as they affect the federal government's ability to prescribe requirements for other mining operations and suggest both that the present effluent levels are acceptable and that there is no environmental degradation of the receiving water.

It is my understanding that the NWT Water Board Technical Committee recommended effluent limits and a compliance schedule. Members of my staff believe that the compliance schedule allowed adequate periods of time (a total of 33 months) for plant design, construction and start-up and that the specified effluent limits provided for an environmentally acceptable effluent. We are also concerned that the R & D aspect now built into the draft licence will delay remedial measures which, in the circumstances, we feel are required.

W. Allmand
M. J. [unclear]

In view of the general widespread concern about arsenic and the toxicity related to cyanide, copper, zinc, etc., I hope that the Board will be asked to re-examine the availability and practicability of abatement technology with a view to requiring the company to make incremental progress in the level of contaminant discharge according to a specified compliance schedule.

Yours sincerely,

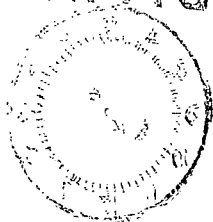
Roméo LeBlanc

Roméo LeBlanc

P.S. The recent Arsenic
situation in underground storage
impels me to ask for tougher
and faster action when problems
are detected.

Roméo LeBlanc

YELLOWKNIFE, N.W.T.
NUNAVUT
DIARY



MAR 16 '77 AM



Minister
Indian and Northern Affairs

Ministre
Affaires indiennes et du Nord

FILE NIL3-0040

O T T A W A K1A 0H4
February 28, 1977



Mr. J. A. Bergasse,
Chairman,
Northwest Territories Water Board,
P.O. Box 1500,
Yellowknife, N.W.T.
XOE 1H0

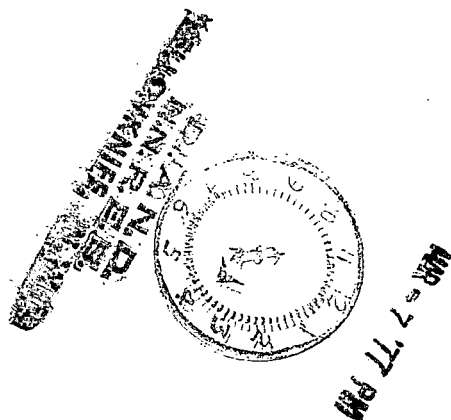
Dear Mr. Bergasse:

This is further to your letter of February 21, 1977, addressed to the Honourable Warren Allmand, Minister of Indian and Northern Affairs, in which you submitted Water License #NIL3-0040, revised, for approval.

At the earliest opportunity your correspondence will be brought to the Minister's attention.

Yours very truly,

Murray Hardie,
Special Assistant.



NIL3-0040

File

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IAND OTT

WATER WM WB YK

W57 24/2/77 1415 HRS

DR M RUEL
NEPRR
OTTAWA

RE: CON LICENCE

=====

CON LICENCE MAILED DOUBLE REGISTERED TODAY FEBRUARY 24, 1977.
EFFECTIVE DATE OF LICENCE IS MARCH 1, 1977, THEREFORE WOULD
APPRECIATE ANY ASSISTANCE YOU CAN GIVE TO ENSURE IT IS RETURNED
TO US AS SOON AS POSSIBLE.
WE APOLOGIZE FOR DELAY AT THIS END, MR BERGASSE WAS OUT OF TOWN
FOR A FEW DAYS.

THANK YOU.

ARTHUR REDSHAW
CONTROLLER
WATER MANAGEMENT
YELLOWKNIFE

*

IAND OTT

WATER WM WB YK

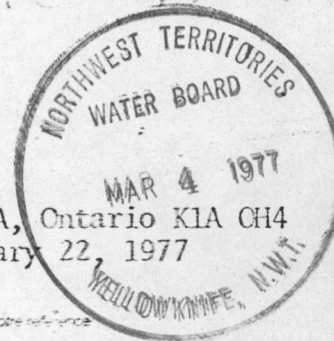
Indian and
Northern Affairs

Affaires
Indiennes
et du Nord

(1) cc. Robb
Glover

(2) PA

FILE NIL3-0040



OTTAWA, Ontario K1A 0H4
February 22, 1977

Your file Votre référence

Our file Notre référence

N-9545-105

Mr. Frederick J. Joyce,
Director,
Northern Operations Branch.

Con Mine Licence #NIL3-0040

This refers to Mr. Hornal's memorandum of January 31 concerning delays in processing the above licence. As far as we are aware, there has been no suggestion that the delays were caused, in any way, by inaction of the regional staff.

The Water Board may not have provided us with sufficient information with which to brief the Minister on this complex matter. Nevertheless, we are satisfied that Mr. Hornal's people gave us all the information that they had in their files. However, as you know, the matter kept getting more complex with the introduction of the arsenic problems, etc. in Yellowknife. When we finally were able to assemble all the facts and place them in perspective, we could not recommend approval of the licence to the Minister.

The Minister has referred the matter back to the Water Board with some very specific requests for additional supportive information and a strong suggestion that the Board make a careful review of the draft licence.

Dr. M.J. Ruel,
Director,
Northern Environmental Protection and
Renewable Resources Branch.

Lo
✓
A. Redshaw
Wester



NIL3-0040

DOUBLE REGISTERED

February 21, 1977

The Honourable Warren Allmand
Minister of Indian and Northern Affairs
Centennial Towers
400 Laurier Avenue West
Ottawa, Ontario
K1A 0H4

Sir:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine, Yellowknife, NWT
Water Licence #NIL3-0040

Thank you for your letter dated February 9, 1977 with your comments on the Water Licence for the above operation. Your suggestions have been reviewed by the Board, in light of proposals made by me, and the majority of the members have approved the modifications and additions tabulated below. These are:

1. The effective date of the Licence has been changed from January 3, 1977 to March 1, 1977, with the expiry date also adjusted from December 31, 1979 to February 29, 1979; and
2. Under Part C, Item 11 the following clause has been included to allow for implementation of the long range effluent quality requirements:

"The Licensee shall implement such measures as are required by the Board based on the results obtained from the above studies. These measures shall be implemented within thirty-six (36) months of the date of issue of this Licence or within such other time as is approved by the Board."

In regards to Item 1, the Board would like to have this Licence in the hands of Cominco Limited at the earliest possible time and have, therefore, set the new effective date at March 1, 1977. I hope that you will be able to return it to me, with your approval, prior to this time. Under Item 2, I have drafted the new clause such that the Board still has some option over the measures to be implemented and the time in which these measures must be implemented. As you are well aware, the Water Board is very concerned over the current state of water management at this

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The Honourable Warren Allmand . . . Page 2

operation, and I have directed Mr. Redshaw to ensure that the required work is undertaken by the Company, have regular meetings between the Company and the Water Board's Technical Committee to review progress, and keep the Board fully informed of what is being accomplished. By this process I am confident, the required effluent quality requirements will be met within the three years of this Licence.

Your comments regarding my dex message to you of January 21, 1977 leaves me with some concerns. You state that in my letter accompanying the Water Licences, I should give a substantiation for any outstanding items. I was of the opinion that since copies of all correspondence relating to major items occurring during the processing of a licence are forwarded to your department officials in Ottawa, and since the office of the Board in Yellowknife is managed by the staff of your Department, and your department is represented on the Board's Technical Committee, and the Vice-Chairman is a member of your department, that your officials would through the process be fully informed on all matters, controversial and otherwise, related to the issue of a Licence. Based on the above, I did not see the need to include any detailed explanations on the Licences sent to you for approval. To avoid such a situation arising again in the future, I would like to recommend, for your approval, that if during your review of a Licence any points arise that require clarification, that your officials immediately contact Mr. Redshaw, in Yellowknife, for the necessary information, since he is fully informed of all matters related to the Board, being in attendance at all Board meetings and Public Hearings, as well as being Chairman of the Board's Technical Committee.

In conclusion, I hope that these amendments will meet with your approval and allow for the issue of this Licence.

Yours sincerely,

ORIGINAL SIGNED BY
J. A. BERGASSE
J. A. Bergasse
Chairman

AGR:sh

N/A 3-00406

NORTHWEST TERRITORIES
WATER BOARD

OFFICE DES EAUX DES
TERRITOIRES DU NORD-OUEST

Your file Votre référence

Our file Notre référence

February 11, 1977

COMINCO LIMITED, CON MINE
Yellowknife,
Northwest Territories
XOE 1HO

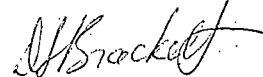
Dear Sir:

I have been requested by the Technical Committee of the Northwest Territories Water Board to conduct for their consideration a survey on analytical techniques employed by water users in the Northwest Territories.

Enclosed is a questionnaire on analytical methods. Please refer this questionnaire for completion to your Chief Chemist, and forward to me.

Your prompt attention to this matter is appreciated.

Yours Sincerely,



D. S. Brackett
Water Quality Technologist

DSB:sh

MAILING ADDRESS P.O. BOX 1500

OFFICE: BELLANCA BUILDING

YELLOWKNIFE, N.W.T., XOE 1HO

PHONE (403) 873-4421

TELEX 034-4-5519

000391

P.O. Box 1500
Yellowknife
Northwest Territories
X1A 2R3

February 2, 1977

Mr. A. D. MacPhail
Manager Con Operations
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1H0

N1L3-0040 ←
Water Register

Dear Sir:

Re: Water Licence #N1L3-0040
Inspection Report on Con Mine of December 23, 1976

Thank you for your comments of January 12, 1977 concerning the above inspection report. I am sorry about the report being sent to you without it being signed by the author. As you are aware this error has been corrected.

The second point raised in your letter regarded the management of lower Pud Lake and the operation of the drainage ditch through this area. While it is acknowledged that conditions in your Licence only reflect the protection of Kam Lake from overflow from lower Pud Lake, I must make clear that it is the responsibility of the appointed Inspector to ensure that any potential areas of concern are raised in the report and brought to the attention of the Licensee. I appreciate being informed that you are looking at alternate ways of channelling through this area and would you please keep me informed of your progress.

The third point raised that the lower Pud Lake area is included in your submission as part of your tailings area is acknowledged. However, I must point out that the Water Board considers only that area of Pud Lake behind your decant structure as being the designed tailings area and as such no tailings may be discharged from the mill into any other area.

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Mr. MacPhail . . . Page 2 . . .

We have reviewed the data sheet and find that the following errors were made in the tabulation of the water quality results:

Sample Site a): No Nickel, Zinc or Arsenic values were reported for the sample collected on September 9, 1976. They are as follows:

Nickel (extractable)	0.28 mg/l
Zinc (extractable)	0.07 mg/l
Arsenic (dissolved)	0.35 mg/l

Sample Site b): for the sample collected on September 22, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	0.28 mg/l	0.05 mg/l
Zinc (extractable)	0.07 mg/l	0.01 mg/l
Arsenic (dissolved)	0.35 mg/l	3.75 mg/l

Sample Site c): for the sample collected on September 22, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	0.05 mg/l	0.16 mg/l
Zinc (extractable)	0.01 mg/l	0.07 mg/l
Arsenic (dissolved)	3.75 mg/l	4.85 mg/l

Sample Site d): for the sample collected on September 22, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	0.16 mg/l	0.05 mg/l
Zinc (extractable)	0.07 mg/l	0.01 mg/l
Arsenic (dissolved)	4.85 mg/l	1.75 mg/l

Sample Site e): for the sample collected on September 22, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	0.05 mg/l	0.06 mg/l
Zinc (extractable)	0.01 mg/l	0.01 mg/l
Arsenic (dissolved)	1.75 mg/l	1.2 mg/l

Sample Site f): for the sample collected on September 22, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	0.06 mg/l	0.05 mg/l
Zinc (extractable)	0.01 mg/l	0.01 mg/l
Arsenic (dissolved)	0.12 mg/l	0.004 mg/l

. . . 3 . . .

Mr. MacPhail . . . Page 3 . .

Sample Site g): for the sample collected on September 22, 1976:

	<u>Value reported</u>	<u>Correct Value</u>
Nickel (extractable)	LO.05 mg/l	0.05 mg/l
Zinc (extractable)	LO.01 mg/l	LO.01 mg/l
Arsenic (dissolved)	0.004 mg/l	<1. mg/l

Sample Site h): for the sample collected on September 10, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	0.05 mg/l	1.7 mg/l
Zinc (extractable)	LO.01 mg/l	0.20 mg/l
Arsenic (dissolved)	2.55 mg/l	14.0 mg/l

Sample Site i): for the sample collected on September 9, 1976:

	<u>Value Reported</u>	<u>Correct Value</u>
Nickel (extractable)	1.7 mg/l	LO.05 mg/l
Zinc (extractable)	0.20 mg/l	LO.01 mg/l
Arsenic (dissolved)	14.0 mg/l	0.0067 mg/l

The last column on the second page of the sampling results attached to the report does not have a column heading. This column should be deleted.

The arsenic value of 2.55 mg/l listed on Page 3 of the Inspection Report for the west discharge point on Great Slave Lake is incorrect. Would you please change this value to <1 mg/l.

Thank you for pointing out our mistake and I can assure you this will not happen again in the future.

Yours sincerely,

A. G. Redshaw
Controller

AGR:sh

NORTHWEST TERRITORIES
WATER BOARD

OFFICE DES EAUX DES
TERRITOIRES DU NORD-OUEST

Your file Votre référence

Our file Notre référence

February 1, 1977

Members
NWT Water Board

Gentlemen:

Re: Amendments to Con & Giant Water Licences

I would like to express my appreciation to you all for your very prompt reply to my telex of January 28, 1977 regarding the above matter.

On the replies I have received, the following are the opinions of members.

In Favour

Opposed

1. Board Motion (26-8) - Giant Mine
Board Motion (24-10) - Con Mine

Mr. Lafferty
Mr. Dubinsky
Mr. Humphrys
Mr. Glazier
Mr. Gibney
Dr. Frost


Mr. Bryant

2. Amendment of date of Con Licence

All in Favour

Since the majority of Board members are in agreement with my proposed amendments, I will proceed immediately to implement these changes.

Yours sincerely,


J. A. Bergasse
Chairman

MAILING ADDRESS P.O. BOX 1500

OFFICE: BELLANCA BUILDING

YELLOWKNIFE, N.W.T., XOE, 1H0

PHONE (403) 873-4421

TELEX 034-4-5519

000395

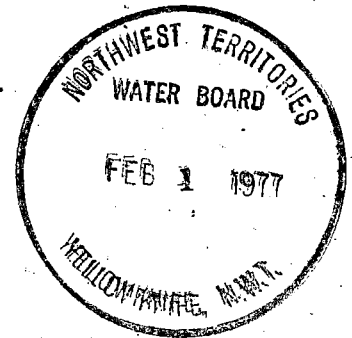
Indian and
Northern Affairs

Affaires indiennes
et du Nord

FILE NIL3-0040

P.O. Box 1500
Yellowknife, N.W.T.
X1A 2R3

31 January 1977



Mr. F.J. Joyce
Director
Northern Operations Branch
DIAND
400 Laurier Avenue West
Ottawa, Ontario
K1A 0H4

Your file Votre référence

Our file Notre référence

NIL 3-0040

Dear Fred:

Con Mine Licence # NIL3-0040

It has been brought to my attention that it has been suggested that the delay in the processing of the above Licence was caused, in part, because of inaction of my staff to requests for clarification on certain points. I have reviewed this matter with my staff and report the following.

The Con Licence was mailed to the Minister from Mr. Redshaw's office on 25 October 1976, double registered. The only request for additional information was made by Alan Jones during the Water Board meeting with Mr. Cotterill on 23 and 24 November 1976 in Ottawa. At this time he requested a tabulation of the actual cyanide levels measured at the Con Mine Tailings decant structure. Following a meeting with your legal people it was noted that under Part A, Item 5 of the Licence, Section 10(3) and not 10(2) should be indicated. Mr. Redshaw therefore brought the Licence back to Yellowknife, discussed it with Mr. Bergasse and on his approval, had the Licence retyped, resigned and returned it to Ottawa, again double registered on 08 December 1976. The data requested by Mr. Jones was included with the Licence. Since that time there has been no request for any further information.

I am concerned that because of apparent delays the licence will now have to be redrafted and issued at a later effective date.

I suggest that incidents of this sort could be avoided in the future if we could develop better mechanisms for the review in Ottawa of the draft licences before the final product is prepared. Could you discuss this matter with Maurice.

Yours sincerely,

Robert

Robert W. Hornal
Regional Director
Northern Operations Branch

c.c. G. Glazier
A. Redshaw

RWH/eep

000396

N1L3-0040

January 21, 1977

DEX

The Honourable Warren Allmand
Minister of Indian & Northern Affairs
Centennial Towers
Ottawa, Ontario
K1A 0H4

Sir:

Re: Northern Inland Waters Act
Con Mine, Cominco Limited, Yellowknife, NWT
Water Licence #N1L3-0040

The Water Board at its meeting yesterday registered grave concern over the extended period of time that has expired since the above Water Licence was submitted to your office for your approval.

In review, the licence was forwarded to your office on October 21, 1976 and had an effective date of January 3, 1977. Contained within the licence are the requirements for the Company to meet certain requirements within specific periods of time, and so any delay beyond the effective date in forwarding the licence to the licensee presents great problems in the administration of the licence.

Further, Mr. Minister, the Water Board in its review of the application and in the development of the licence, gives all departments, both within the Federal and Territorial Governments, and the applicant, ample opportunity to register with the Board any points of issue, and the Board is therefore unable to understand why this extended delay must occur.

. . . 2 . . .

The Honourable Warren Allmand . . . Page 2

It would therefore be appreciated if you could investigate this matter, and the Board requests that if the Con Licence is not going to be released this week that it be returned to me allowing the effective date to be changed to reflect more closely the date of issue.

Yours sincerely,

ORIGINAL SIGNED BY
J. A. BERGASSE

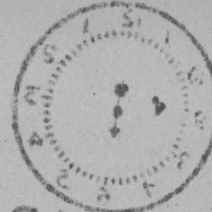
J. A. Bergasse
Chairman

cc: Members, NWT Water Board
cc. Comm. Hodgson

AGR:sh

FILE N1L3-0090
JN5L4-0008
JN5L3-0009

MA 11 15 11



YELLOWKNIFE, N.W.T.
N.H.E.B.
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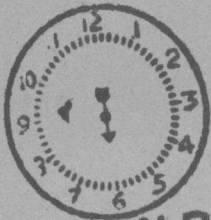
YELLOWKNIFE
DMK070 INAHOTT
TX
BT
2Y0763
MR A G REDSHAW
PO BOX 1500
YELLOWKNIFE

CON MINE LICENSE SHOULD BE IN MINISTER'S OFFICE THIS WEEK.
SECURITY DEPOSIT RELEASE PAPERS FOR NANISIVIK MINES CURRENTLY
IN MINISTER'S OFFICE. SECURITY DEPOSIT FOR WATER LICENCE
CANNOT BE PREPARED UNTIL MINISTER HAS SIGNED A RELEASE ON THE
ORIGINAL DEPOSIT. WE WILL KEEP YOU INFORMED.

MR A JONES
NORTHERN ENV. PROTECTION AND RENEWABLE RESOURCES
WATER RESOURCES OTTAWA OUR TLX 0533711

*
I AND YK

JAN 21 '77 AM



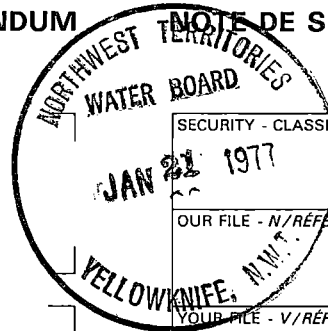
D.I.A.N.D.
N.N.R.E.B.
YELLOWKNIFE, N.W.T.



Government of Canada
Gouvernement du Canada

MEMORANDUM

NOTE DE SERVICE



FILE - N163-0040
WATER REGISTER

N163-0040
WATER REGISTER

TO
A
Mr. A.G. Redshaw, Controller
Controller
N.W.T. Water Board
P.O. Box 1500
Yellowknife, N.W.T.

FROM
DE
M.J. Hardin
Senior Project Biologist, N.W.T.
Environmental Protection Service
P.O. Box 2310
Yellowknife, N.W.T.

SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE - N / RÉFÉRENCE 4705-37/Co 4705-37/G1
YOUR FILE - V / RÉFÉRENCE
DATE January 20, 1977

SUBJECT Disposal of Domestic Wastes into Tailings Areas at Cominco Limited Con Mine
OBJET and at Giant Yellowknife Mines Limited

The matter of the disposal of sewage from the townsites at Con Mine and Giant Mine was discussed at Meeting 48 of the Technical Committee, and the Environmental Protection Service agreed to take samples at both sites for chemical and bacteriological analyses.

The results of these analyses have now been received, and are appended to this letter as two tables. In both cases, the concentrations of fecal indicator organisms were below the detectable limit at points where the tailings pond effluent enters receiving waters. Assuming that these samples were representative, there would appear to be little danger of contaminating the receiving waters with high concentrations of potential bacterial pathogens.

Concentrations of nutrients appeared to be high, though other data which we have collected show that there is considerable temporal variation for these parameters. At the present time, we are not able to completely predict the effects of nutrient enrichment on the receiving waters, although no indications of gross eutrophication have yet been measured.

Please contact this office if you or your staff have any questions in regard to these results. I would suggest that you pass this information to the two mines for their information.

M. J. Hardin

M.J. Hardin
Senior Project Biologist, N.W.T.

enc.

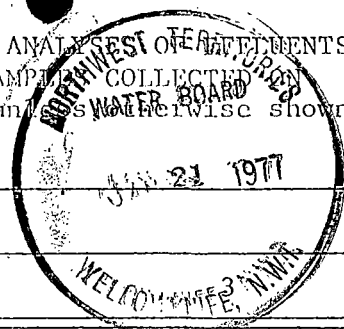
cc: Mr. W. Hartery HWC
Mr. V. Christensen GNWT

COPY TO - GIANT MINES LTD
- CON MINE, COMINCO LTD.

000401

Table 1

RESULTS OF CHEMICAL AND BACTERIOLOGICAL ANALYSES OF TAILINGS
AT COMINCO LIMITED CON OPERATIONS FOR SAMPLE COLLECTED ON
OCTOBER 7, 1976. All data are in mg/l unless otherwise shown.



PARAMETER	STATION		
	1	2	3
Nitrite	0.04	0.15	0.16
Nitrate	6.27	8.89	9.41
Total Kjeldahl Nitrogen	3.05	4.59	4.50
Total Phosphorus	0.17	0.26	0.23
Total Carbon	1100	37	37
Inorganic Carbon	800	17	17
Organic Carbon	300	20	20
Total Hardness	2884	1830	1870
pH	7.7	7.4	7.3
Alkalinity	895	71	71
Coliform MF per 100 ml	100,000	650	<2
Fecal Coliform MF per 100 ml	88,000	82	<2
Fecal Streptococci MF per 100 ml	5,800	92	<2

STATION LOCATIONS: Station 1: Tailings discharge to tailings disposal area
Station 2: Decant structure from Upper Pud Lake
Station 3: Outflow of Lower Pud Lake to Meg Lake

Table 2 RESULTS OF CHEMICAL AND BACTERIOLOGICAL ANALYSES OF EFFLUENTS AT GIANT YELLOWKNIFE MINES LIMITED
FOR SAMPLES COLLECTED ON OCTOBER 7, 1976. All results are in mg/l unless otherwise indicated.

PARAMETER	STATION				
	1	2	3	4	5
Nitrite	0.01	0.15	0.17	0.17	0.26
Nitrate	3.03	3.89	3.87	3.87	3.25
Total Kjeldahl Nitrogen	0.42	8.45	8.62	8.62	4.24
Total Phosphorus	1.35	3.20	2.68	3.71	1.00
Total Carbon	5200	41	44	44	42
Inorganic Carbon	4100	21	21	21	25
Organic Carbon	1100	20	23	23	17
Total Hardness	1392	446	450	457	442
pH	9.8	9.0	8.2	8.7	7.8
Alkalinity	5800	107	103	111	111
Coliform MF per 100 ml	200	<2	<2	<2	<2
Fecal Coliform MF per 100 ml	100	<2	<2	<2	<2
Fecal Streptococci MF per 100 ml	1400	<2	<2	<2	<2

STATION LOCATIONS:

- Station 1: Tailings discharge to tailings disposal area
- Station 2: Decant structure from Pond #1 to Pond #2
- Station 3: Decant structure from final tailings pond
- Station 4: Culvert carrying effluent from tailings ponds under Ingraham Trail
- Station 5: Mouth of Baker Creek



Government of Canada
Gouvernement du Canada

MEMORANDUM

NOTE DE SERVICE

TO
A

M.J. Hardin,
Senior Project Biologist, Northwest Territories,
Environmental Protection Service, P.O. Box 2310,
Yellowknife, Northwest Territories.

FROM
DE

A.E. Rothwell,
Water Quality Officer,
Department of Indian and Northern Affairs,
P.O. Box 1500,
Yellowknife, Northwest Territories.

SECURITY-CLASSIFICATION - DE SÉCURITÉ
OUR FILE - N/RÉFÉRENCE N1L3-0040
YOUR FILE - V/RÉFÉRENCE 4705-37/co
DATE January 20, 1977.

SUBJECT
OBJET

Re: Inspection Report of May 11, 1976 at Cominco Limited Con Mine

Arsenic analyses at the Yellowknife Water Laboratory are done on samples filtered through 0.45 micron millipore filters and are therefore measures of dissolved arsenic only. The data I refer to in my report indicated high levels of dissolved arsenic during the winter (12.0 ppm under the ice on March 23, 1976) and early spring (6.4 ppm on May 3, 1976) with lower levels of dissolved arsenic having been found at a later season in the previous year (0.011 ppm on October 15, 1975). This indicated to me that the arsenic accumulated over the winter might be precipitating out during the summer and I therefore recommended that the discharge from Pud Lake tailings area not be allowed in spring.

Also, water from the Robertson Shaft does not go to Meg Lake via a trench. That is water from the Pud Lake tailings area which discharges from the decant structure located in the dyke near the Robertson Shaft. According to Dave Egli water from the Robertson Shaft is pumped to the old shaft and then to the mill. We have data on minewater as it enters the mill but this includes water from all of the shafts mixed together.

We do not measure particulate arsenic in the Yellowknife Water Laboratory because we have found the method to be too cumbersome and the results too unreliable.

Yours truly,

A. Rothwell
Water Quality Officer

AR/jr

000404

N1C3-0040
7

0*

I AND OTT

I AND YK

YK 1564

18/1/77

1450 HRS

A.H. JONES
WATER RESOURCES
NORTHERN AFFAIRS PROGRAM
DIAND
OTTAWA ONT



RE: WATER BOARD MEETING - DEC 19/77.

BOARD MEMBERS HAVE REQUESTED STATUS REPORT ON CON MINE
LICENCE. PLEASE ADVISE BY RETURN TELEX CURRENT STATUS AND
DATE OF SIGNATURE - ALSO PLEASE ADVISE IF NANISIVIK MINES
LIMITED HAVE FILED THEIR SECURITY DEPOSITS AND IF YES, WOULD
YOU SEND COPIES OF DOCUMENTATION. THANKS. I WILL BE OUT OF
THE OFFICE, SO TELEX REPLY IS REQUESTED.

A.G. REDSHAW
WATER MANAGEMENT
DIAND
YELLOWKNIFE NWT

*

I AND OTT

I AND YK

000405



Government
Canada

Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
À

Mr. A.E. Rothwell, Water Quality Officer
Water Management Section
Dept. of Indian and Northern Affairs
P.O. Box 1500
YELLOWKNIFE, N.W.T.

FROM
DE

Senior Project Biologist, N.W.T.
Environmental Protection Service
P.O. Box 2310
YELLOWKNIFE, N.W.T.

SUBJECT
OBJET

INSPECTION REPORT OF 1 JUNE 1976 FOR COMINCO
LIMITED CON MINE

	SECURITY - CLASSIFICATION - DE SÉCURITÉ
	OUR FILE - N/RÉFÉRENCE JAN 19 1977 4705-37/Co
	YOUR FILE - V/RÉFÉRENCE
	DATE 13 Jan 77

In the subject report, you indicated that arsenic in the spring overflow water from the tailings area is in the particulate, rather than dissolved, form, and you therefore made a recommendation for increased retention time. Are there chemical data which support this, and if so, could I please receive a copy (i.e., did you measure both particulate and/or total or dissolved arsenic?).

Also, do you have data on the quality of the water which is discharged from the Robertson shat to Meg Lake via a trench?

Thanks for your attention to these requests.

M. J. Hardin

M. J. Hardin

FILE { N143-0040
WATER REGISTER



Mines

Mr. A.G. Redshaw
Controller
Water Management
Indian and Northern Affairs
P.O. Box 1500
Yellowknife,
N.W.T.

January 12, 1977

Dear Sir:

Re: Inspection Report on Con Mine December 23, 1976

We are returning an acknowledged copy of the above report to you, although neither report received here was signed by the author or anyone in your department.

In our submission which accompanied our application for a water licence we declared that we would not allow a flow of contaminated tailings pond water through the dykes from lower Pud Lake into Kam Lake. Because these dykes are not impervious we decided the best way to ensure they did not leak was to try to drain the water away from them by deepening the outflow ditch to Meg Lake by four feet. This we did and it has removed the hydrostatic head from the not impervious dykes. As a further improvement we decided to dig out the tailings between the decant structure and the entrance to the Meg Lake ditch across the lower end of Pud Lake. This was not a requirement for our water licence but an effort on our part to further ensure no head against the dykes blocking the flow to Kam Lake.

This second excavated ditch has not proved successful as the area is very nearly flat and considerable sloughing and silting problems have occurred. In addition the ditch crosses an area of very porous peat and easily leaks back into the lower Pud Lake area. But the water does not provide a threat to the Kam Lake dykes as its level is still well below the invert of the creek leading to Kam Lake.

We do however realise that should the level rise through some unforeseen occurrence these dykes will probably leak again and we are therefore looking at an alternative way of channelling the water between the decant structure and the Meg Lake ditch. But I would like to point out that this is not a condition of our water licence.

- 2 -

Reclamation of the lower Pud Lake area will take a long time and is at the bottom of our revegetation priority list. It was included as part of the tailings dam in our submission accepted by the Water Board.

There has to be a mistake on page two, probably with the numbering of the columns, I do not believe 14 ml total arsenic in compressor cooling water.



A.D. MacPhail.

A.D. MacPhail
Manager Con Operations

ADM/pw

FILE NIL3-0040
226

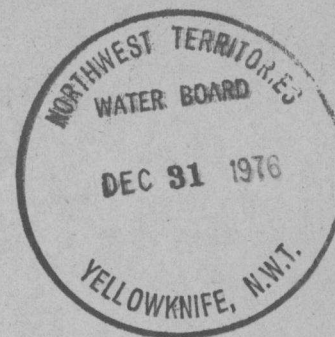
I AND OTT

I AND YK

YK 1431

31/12/76

1205 HRS



MR. F. JOYCE, DIRECTOR
OPERATIONS BRANCH
NORTHERN PROGRAM
DIAND
OTTAWA ONT

RE: WATER LICENCE - COMINCO CON MINE - YELLOWKNIFE.
THE ABOVE LICENCE WAS SENT TO OTTAWA ON OCTOBER 21, 1976
FOR MINISTERIAL APPROVAL. IT HAS AN EFFECTIVE DATE OF JANUARY 3,
1977. SINCE I AM EXPERIENCING CONTINUING PROBLEMS FROM LICENCES
THAT WERE ISSUED AFTER THEIR EFFECTIVE DATES, I WOULD APPRECIATE
YOUR ASSISTANCE IN IDENTIFYING THE PRESENT STATUS OF THIS LICENCE,
AND WHEN I CAN EXPECT IT TO BE RETURNED TO YELLOWKNIFE.
MY BEST WISHES FOR 1977.

A. G. REDSHAW,
CONTROLLER WATER MANAGEMENT
DIAND
YELLOWKNIFE NWT



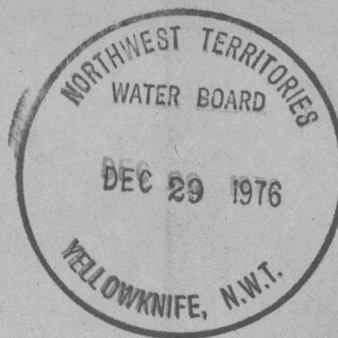
I AND OTT

I AND YK

000409

NK 3-0040

DEC 23 '76 AM



IAN D OTT

IAN D AOC YK

DEC 23 1976

1300 HOURS

AOC 24

MR A H JONES
WATER RESOURCES DIVISION
N N R AND E D I N A
400 LAURIER AVE
OTTAWA

PLEASE ADVISE STATUS 'CON' LICENCE NO. NIL3-0040
EFFECTIVE DATE IS JANUARY 3, 1977 AND WE WOULD LIKE TO ISSUE
IT BEFORE THAT DATE

THANKS AND MERRY CHRISTMAS

SHEILA HERMAN
WATER MANAGEMENT

IAN D OTT

IAN D AOC YK

000410

P.O. Box 1500
Yellowknife
Northwest Territories
XOE 1H0

December 24, 1976

REGISTERED

→ N1L3-0040
Water Register

Mr. A. D. MacPhail
Superintendent, Con Operations
Cominco Limited
Con Mine
Yellowknife, Northwest Territories
XOE 1H0

Dear Sir:

Enclosed you will find the original plus one copy of the inspection report on your mine prepared by Mr. B. Doulton, Inspector under the Northern Inland Waters Act. Please sign and return the original along with any comments or questions you may have. The copy is for your file.

It is noted in the report that the ditch constructed between the decant structure on Pud Lake and Meg Lake does not adequately contain the decant water. I recommend that steps be taken to ensure that the flow does not overtop the banks of the ditch so that reclamation and restoration of the Lower Pud Lake tailings area will be facilitated. Also, due to the permeable nature of the dykes between Kam and Pud Lakes, any decant water spreading over Lower Pud Lake could possibly result in contamination of Kam Lake.

Yours truly,

A. G. Redshaw
Controller
Water Management

BD:sh

NORTHWEST TERRITORIES WATER BOARD
YELLOWKNIFE, N. W. T.

INSPECTION REPORT

ON

COMINCO LIMITED

CON MINE

YELLOWKNIFE, N. W. T.

BY

B. DOULTON

INSPECTOR UNDER THE NORTHERN INLAND WATERS ACT

WATER MANAGEMENT

DEPARTMENT OF INDIAN & NORTHERN AFFAIRS

YELLOWKNIFE, N. W. T.

DATED: December 23, 1976

WATER REGISTER #N1L3-0040

INDUSTRIAL USE

INTRODUCTION

A series of inspections of Con Mine were carried out during the summer and fall of 1976 by B. Doulton and A. Rothwell, Inspectors under the Northern Inland Waters Act, on the following dates: August 16, September 9, 10 and 22 and October 22. The purpose of the visits was to examine the overall water use and waste disposal at the minesite and in the process to collect background information for the upcoming water licence. Water samples were collected from several points.

1. Sampling Sites

One sample per sampling day was collected at each of the following points:
(see attached map for locations)

<u>Station Number</u>	<u>Sample Description</u>	<u>Date Sampled</u>
40-1	Pud Lake Decant to Meg Lake at the Decant Structure	Aug 16, Sept 9 & 22, Oct 22
40-2	Mill Freshwater from Yellowknife Bay	Aug 16, Sept 9
40-4	Keg Lake at center	Sept 22
(a)	Tailings Discharge to Pud Lake	Aug 16, Sept 9, Oct 22
(b)	Kam Lake at the mouth of the old Pud Lake decant creek	Sept 22
(c)	Meg Lake at center	Sept 22
(d)	Narrow Lake at center	Sept 22
(e)	Center of an unnamed lake just west of Narrow Lake	Sept 22
(f)	Tailings (possible) east discharge point on Great Slave Lake	Sept 22
(g)	Tailings west discharge point on Great Slave Lake	Sept 22
(h)	Mine Wastewater at discharge point to the backfill tank in the mill	Sept 10, Oct 22
(i)	Make-up water to the holding tank in the mill	Sept 9

The results of the analysis for the samples collected on August 16, September 9, 10, and 22nd are appended to this report. The results from samples collected on March 23, 1976 and May 3, 1976 are included since they were not included with Mr. Rothwell's inspection report dated May 11, 1976.

Analysis of the samples collected on October 22, 1976 are not available at the time of writing.

Details on the Sampling Sites:

(a) Tailings discharge to Pud Lake

The mill was shut down, due to a strike, on August 16. It was possible to collect a sample at this time because a circulation of water through the mill is continued even during shut-downs.

(b) Pud Lake decant to Meg Lake at the decant structure

On August 16 the flow through the structure was blocked by stop-logs. The sample was collected just upstream of the decant structure.

(h) Mine Wastewater at discharge to the backfill tank in the mill.

This mine wastewater is a combination of water from both the old and the new (Robinson) shaft.

(i) Make-up water to the holding tank in the mill

This make-up water can be excess cooling water from the powerhouse and/or pure Yellowknife Bay water.

2. Observations

The decant structure on Pud Lake was opened between the period of April 21, 1976 until May 27, 1976. The structure was closed again until August 17, 1976, to allow, according to the Mill Superintendent, Mr. D. Egli, for more settling and oxidation of the cyanide in the tailings pond.

As of September 22, 1976, the construction to increase the elevation of the decant structure dyke to ten feet and the improvements to the decant structure itself, had been completed. All of the stop logs were removed on this date. There was ice around the inlet of the structure but there was still a flow. A build up of ice was noted on the sections of Pud Lake.

At the road which crosses just downstream of the decant structure, it was noted that, although the major proportion of the flow passes through culverts, some of the flow passes around the culverts, i.e. it percolates through the road itself.

On September 22, it was observed that decant water flowing through the ditch which was dug between upper Pud and Meg Lake had overtopped the walls of the ditch in a center section on Lower Pud. This results in the decant water spreading out over the Lower Pud Lake area onto the old tails. This decant water has spread as far as the dykes between Pud Lake and Kam Lake.

No flow was observed during any of the inspections through the old Pud Lake decant creeks to Kam Lake (these creeks have been dyked off).

3. Water Quality Results

A few results of note are: the low arsenic and metal values for the flow from the mill during shut-down on August 16, the relatively high (approximately 5 ppm) values for arsenic at the decant structure on September 9 and 22, and the arsenic values on September 22 for Meg Lake, Keg Lake, and Narrow Lake and the west discharge point on Great Slave Lake (4.85 ppm, 5 ppm, 1.75 ppm, and 2.55 ppm respectively).

The results of the bioassay tests for samples collected from the decant structure on May 3, 1976 indicated that the samples were extremely acutely toxic.

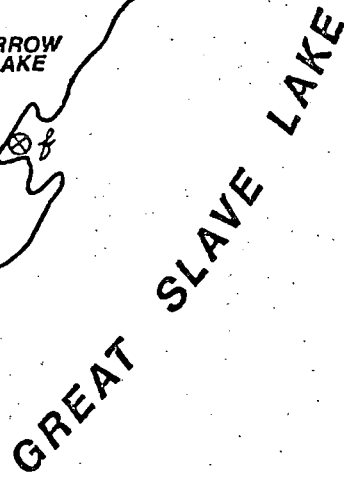
B. Doulton
Inspector under the Northern
Inland Waters Act

Acknowledgement of receipt of a copy of this report.

Signature

Title

Date



⊗. WATER QUALITY SAMPLING STATION

CON MINE SAMPLING RESULTS

See attached map for location of sampling points

Parameters	40-1 March 23	May 3	August 16	September 9	Sept 22	40-2 March 23	August 16	September 9	40-4 Sept 22	a August 16	a September 9	b Sept 22	c Sept 22	d Sept 22	e Sept 22	f Sept 22	g Sept 22	h Sept 10	i Sept 9
pH	7.92	8.1	7.7	7.8	7.8	7.3	7.2	8.1	8.1	7.9	8.4	8.1	7.8	7.9	7.9	8.2	7.8	7.1	8.1
Specific Conductance mmho/cm	11.1	4520	6076	6350	7421	85.1	68	223	7015	448	633	2456	7750	232	6672	230	3990	16000	216
Turbidity	11	5.4	4.4	2.2	5.2	2	4.1	2.2	3.3	4.6	61000	4.1	7.4	3.0	2.9	6.8	3.9	3.1	2.4
Colour	30	20	5	1.5	5	10	5	5	20	10	15	20	20	40	10	10	10	5	5
Alkalinity	142.4	50.7	64	59	59.6	25	34	68	48.9	54	58	58.2	58.7	96.5	61.6	71.4	53.8	67	67
Hardness mg/l	4510	1362	1830	1843	1774	48.7	23	83	1602	147	162	564	1806	99.5	1547	79.6	995	4900	82
Calcium Diss. mg/l	1551.4	459	622	587	390	10.7	6.3	24.0	520	44	49	162	565	31.8	488	24.4	329	1733	22.9
Sodium Diss. mg/l	950	380	320	480	1000	3.7	2.2	6.6	450	170	47.5	160	500	10.0	450	7.0	300	1250	6.3
Chloride Diss. mg/l	390	1300	1900	1900	1900	3.6	3.6	7.0	1700	90	125	450	1850	2.5	1500	8.0	1010	4800	8.0
Potassium Diss. mg/l	365	25	170	13.3	12.5	0.7	0.9	1.0	14	2.4	7.8	7.5	12.5	0.8	12.5	1.0	7.8	15.0	1.1
Copper (Extrable) mg/l	5.9	0.58	0.20	0.18	0.12	L.01	L.0.01	L.01	0.03	L.01	0.05	0.14	0.06	L.01	0.01	L.0.01	L.0.01	0.05	L.01
Cyanide mg/l	11.3	7	.140	.120	.17	0.007	L.005	L.005	.120	.016	18.4	.005	.062	L.005	.007	.005	L.005	.009	L.005
Iron (Extrable) mg/l	1.04	0.08	0.10	0.22	0.22		L.0.05	L.05	0.06	0.05	0.10	0.05	0.30	L.0.05	0.06	0.14	0.06	.15	0.16
Lead (Extrable) mg/l		0.12	0.11	0.07	0.09	L.0.05	L.0.05	L.05	0.06	L.0.05	0.07	L.0.05	0.07	L.0.05	0.07	L.0.05	0.06	0.22	L.0.05
Manganese (Extrable) mg/l	0.24	0.63	0.10				L.0.05			0.01									

CON MINE SAMPLING RESULTS

See attached map for location of sampling points

Parameters	40-1 March 23	May 3	August 16	September 9	Sept 22	40-2 March 23	August 16	September 9	40-4 Sept 22	^a August 16	^b Sept 22	^c Sept 22	^d Sept 22	^e Sept 22	^f Sept 22	^g Sept 22	^h Sept 10	ⁱ Sept 9	
Nickel (Extrable)	0.05		0.20	0.24	0.22	L0.05	L0.05	L.05	0.10	L.05	0.28	0.05	0.16	L0.05	0.06	L0.05	0.05	1.7	L0.0
Zinc (Extrable) mg/l	0.06	0.37	0.09	0.11	0.12	L.01	L0.01	L.01	L.01	L.01	0.07	L0.01	0.07	L0.01	L0.01	L0.01	L0.01	0.20	L0.0
Ar ^c Diss.	12	6.4	3.1	5.0	5.3	0.0055	0.003	.0066	5.0	0.17	0.35	3.75	4.85	1.75	0.12	0.004	2.55	14.0	

N1L3-0040

December 8, 1976

DOUBLE REGISTERED

Mr. A. H. Jones
Chief, Water Resources Division
Northern Natural Resources & Environment
Department of Indian & Northern Affairs
400 Laurier Avenue West
Ottawa, Ontario
K1A 0H4

Dear Mr. Jones:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine, Water Licence N1L3-0040

Enclosed please find the corrected Water Licence for Con Mine. I would appreciate if it could be signed and forwarded to the Chairman prior to the year end, allowing it to be granted to the Company prior to January 3, 1977, the effective date.

In regards to the justification for the cyanide effluent level, this is based on the data collected from analysis of the outflow from the tailings area. A copy of this data is attached. The Board ruled that in order for the Company to continue operation this level would have to be allowed in the present licence. This was the reason for issuing only a three year licence and including Part C Items 11 and 12.

Yours sincerely,

ORIGINAL SIGNED BY
A. G. REDSHAW
A. G. Redshaw
Controller

AGR:sh

COMINCO LIMITED, CON MINE

Outflow from Tailings Area

Cyanide (DINA Data)

Licence Conditions - Average Monthly - 3.0 mg/litre
Maximum Grab -10.0 mg/litre

Historical Data

May 22, 1974	5.4 mg/litre
June 24, 1974	0.73 "
July 30, 1974	0.76 "
August 15, 1974	0.21 "
September 10, 1974	0.11 "
October 8, 1974	2.7 "
November 6, 1974	0.04 "
December 11, 1974	6.4 "
April 24, 1975	10.0 "
October 15, 1975	0.04 "
March 23, 1976	11.3 "
May 3, 1976	7.0 "
August 16, 1976	0.14 "
September 9, 1976	0.12 "
September 22, 1976	0.17 "

FROM CON MINE



COMINCO LTD.
Trail Office

ALLOWABLE LEVEL

TOTAL CYANIDE 10.0 mg/litre
(GRAB SAMPLE)
(MONTHLY AVG) 3.0 mg/litre

CON OPERATIONS - WASTE WATER ANALYSIS
PUD LAKE DISCHARGE - 1976

Date	September 3	September 9	September 17	September 24	September 28	October 1	October 8	October 15	October 20	October 22
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Suspended Solids	18.0	4.0	3.0	3.0	4.0	16.0	4.0	5.0	27.0	5.0
Total Iron					0.34				*2.40	
Total Lead					0.01				0.01	
Total Zinc					0.10				0.08	
Total Copper	0.16	0.16	0.12	0.09	0.10	0.11	0.07	0.07	0.09	0.07
Total Arsenic*	3.10	3.60	3.56	3.32	2.78	3.18	3.26	3.36	2.33	2.70
Total Mercury					<0.00005				<0.00005	
Total Nickel					0.22				0.21	
Total Cyanide	0.20	0.20	0.19	0.11	0.17	0.28	0.27	0.21	0.47	0.37
Oils & Grease					<5				<5	
Specific Conductivity µmho/cm	5,300	6,000	6,100	6,200	-	6,000	6,000	6,000	-	6,000

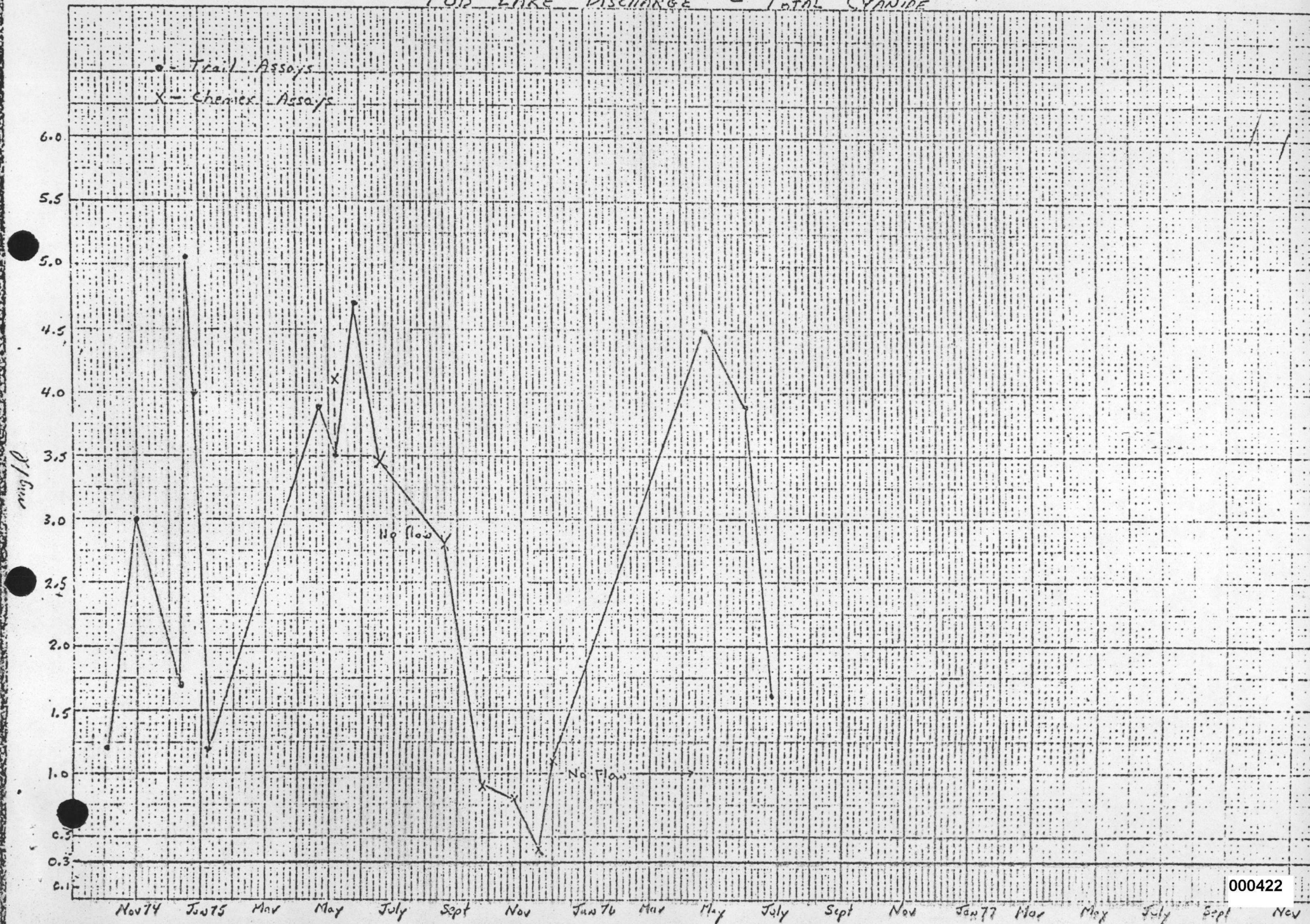
* Indicates assay result exceeds Water Board effluent quality requirements based on maximum acceptable concentration in any grab sample.

R.L. Brown:ff
Supervisor
Waste Control

November 24, 1976

FROM CON MINE

PUD LAKE DISCHARGE - TOTAL CYANIDE



N1L3-0040

DOUBLE REGISTERED

October 21, 1976

The Honourable Warren Allmand
Minister of Indian and Northern Affairs
Centennial Towers
Ottawa, Ontario
K1A 0H4

Sir:

Re: Northern Inland Waters Act
Cominco Limited, Con Mine, Yellowknife
Water Licence #N1L3-0040

Attached for your approval and signature are the original and one carbon copy of the above licence which the Board wishes to grant to Cominco Limited. This licence is recommended for your approval by the Board in accordance with Section 10 of the Northern Inland Waters Act.

If this licence meets with your approval, I would request that both copies be returned to the Board's office, the copy to be forwarded to the Company with the original being retained on the Water Use Register.

Yours sincerely,
ORIGINAL SIGNED BY
J. A. BERGASSE

J. A. Bergasse
Chairman

AGR:SH

0040
N1L3-0400

October 21, 1976

Mr. D. H. Egli
Mill Superintendent
Cominco Limited, Con Mine
Yellowknife, Northwest Territories
XOE 1H0

Dear Mr. Egli:

Re: Water Licence #N1L3-0040
Con Mine, Yellowknife

The concerns raised in your letter of October 19, 1976 regarding the draft water licence for Con Mine were considered by the Board at our meeting on October 20, 1976.

In regards to Concern (1) the Board has agreed that since your dykes were designed and constructed by competent engineers to allow you to operate the tailings area to a minimum of one foot of freeboard, that this be permitted in the Licence. I would request however, that for any future work regarding the raising of tailings dykes and/or dams, consideration be given to designing structures with a minimum of three feet of freeboard.

On Concern (2), the Board acknowledges the points you raised and has agreed to firstly removing the condition that you meet the new effluent quality requirements within thirty-three (33) months of the date of issue of this licence and secondly to incorporating the requirements of Part C Item 11 as part of Part C, Item 12. I should make very clear that the Board requires that your Company approach the attaining of these effluent quality requirements in a very responsible manner, and I am instructing Mr. Redshaw to monitor very closely over and above that required in the licence, and report to the Board on a regular basis the progress you are making in attaining these requirements. I would request your full cooperation in this manner.

. . . 2 . .

Mr. D. H. Egli Page 2

Concern (3) was rejected by the Board, since it was felt that your Company should be able to accomplish this work during the three years this licence is in force.

For your information, I will now request the approval of the Minister of Indian and Northern Affairs to the granting of a Water Licence to Con Mine for a period of three years with an effective date of January 3, 1977.

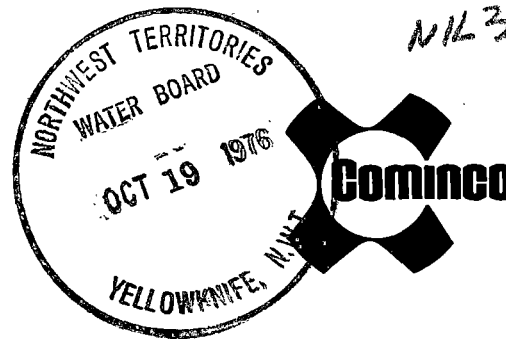
Yours sincerely,

Handwritten signature of J. A. Bergasse

J. A. Bergasse
Chairman

AGR/sh

WB member
N123-0040



Mines

Mr. J.A. Bergasse
Chairman, N.W.T. Water Board
Indian and Northern Affairs
Box 1500
Yellowknife,
N.W.T.

October 19, 1976

Dear Mr. Bergasse:

There are some terms and conditions on the draft copy of our proposed three (3) year Water Licence which greatly concern us. We would like to have this opportunity to express our concern and present our case before final approval is given to the Licence. We ask the Board to consider the following changes:

- 1) We ask not to be limited to a three (3) feet of freeboard, (item 6, part C), so that we are able to hold back the effluent in central Pud Lake during the winter months. We must also be able to confine the flow of tailings during part of the spring and/or summer months next year so that we can complete construction and maintenance work in the lower section of Pud Lake. The control structure dike is located in the centre of our tailings system and has been adequately designed to allow up to one (1) foot of freeboard. The dike was designed by Cominco Engineering and was built under the direction of our geo-technical consultants R.M. Hardy & Associates and Golder & Associates. The dike is only 10 feet in height and is not subjected to excessive wave action. We normally will be operating the Pud Lake tailings area with greater than a one (1) foot of freeboard, however occasionally we will require a larger flood level than can be achieved with a minimum of three (3) feet of freeboard.
- 2) The effluent quality standards outlines in item 11, part C, may not be achieved during the proposed period of the Licence. We are presently doing research and bench scale testing on our effluent but we do not know at this time whether we have the technology to achieve the proposed limits on a full plant scale. At present there are many unknowns that have not been fully investigated such as the possible effect of re-leaching after treatment. How long it will take the existing contaminated effluent in Pud Lake to clean-up cannot be answered. This means that even if we develop the technology to treat our effluent

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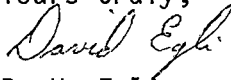
(2)

leaving the Mill, the standards might not be achieved at the sampling point because of the long retention time in the tailings pond. After an economic treatment process has been developed there will also be time needed to build the treatment plant and a "debugging" period to make it operate efficiently. We feel that the period of this Licence is not adequate to achieve this.

- 3) We feel that the conditions outlining the reclamation of the arsenic oxide storage areas, item 20, part C, should be treated in a similar manner as that of the reclamation of the tailings area as stated in the "terms of reference". The requirement in item 21, part C, to complete the reclamation of the arsenic oxide storage areas prior to the expiry date of the Licence is nearly an impossibility. It will take several years just to cover the ponds and the final reclamation could depend on the technology developed from the current reclamation program for covering the abandoned tailings.

We trust that this submission will assist the Board in establishing a Licence which is practical and acceptable to all concerned. Please call us if you require any further explanations or information.

Yours truly,



D. H. Egli
Mill Superintendent

DHE:pw

cc: A.D.M.
W.A.C.
File

0040

4530-9-1
October 14, 1976

MINUTES

Meeting #51

NWT Water Board Technical Committee

Cominco Limited, Con Mine

October 5, 1976

6th Floor Boardroom, Laing Building

Yellowknife, N.W.T.

PRESENT:

A. G. Redshaw, Chairman	NWT Water Board, Yellowknife
M. J. Hardin, Member	DOE, Yellowknife
H. Pawson, Member	Giant Mine, Yellowknife
P. Lofthouse, Member	GNWT, Yellowknife
H. Monaghan, Member	GNWT, Yellowknife
S. Herman, Secretary	DINA, Yellowknife
A.T. Swarbrick	DINA, Yellowknife
A. Goodman	DOE, Yellowknife
A. Rothwell	DINA, Yellowknife
P. Blackall	DOE, Yellowknife
E. D. Fowler	DOE, Yellowknife
B. P. LeClair	DOE, Ottawa
D. H. Egli, Mill Superintendent	Cominco Limited
B. Case, A/Superintendent	Cominco Limited

Mr. Redshaw called the meeting to order at 9:15 a.m. and introduced the two representatives from Con Mine. As background he reviewed the status of the licence, in that the Company had raised some concerns with the draft licence as approved by the Board and he had requested detailed comments from them. These comments were detailed in the letter dated September 20, 1976 from Mr. Egli to Mr. Redshaw, copies of which had been circulated to members on September 27, 1976. The approach he intended to use today was to review the draft licence of August 1976, clause by clause in light of the statements made in Mr. Egli's letter, with additional comments from the mine representatives present.

DRAFT LICENCE REVIEW

Cover Sheet

No comments.

General Conditions Part A

Items 3 & 4 - Mr. Redshaw explained that the words "Security Deposit" were as stated in the Regulations, however the deposit could be made in many forms. He distributed a copy of the guidelines for making the deposit.

Conditions Applying to Construction Part B

It was pointed out that because this was an existing mine no conditions were included in this part. Any requirements for construction were covered under Part C Items 15 through 19.

Conditions Applying to Operation Part C

Item 2 - On the review of data supplied by Mr. Egli, it was agreed that an average annual water use of 340,000,000 Imperial gallons should be allowed for the period of the licence. This is a reduction of 28,000,000 gallons less than that requested by Mr. Egli since his figures included water supplied from City of Yellowknife.

Item 3 - This figure was likewise reduced to a maximum quantity of 1,300,000 gallons per day from the requested 1,340,000 gallons per day.

Item 4 - After discussion, it was agreed that a study outline could be submitted within 3 months with progress reports after 12 months and 18 months with a final report after 24 months. This would allow 12 months for full implementation. The question including broad terms of reference for the studies in the licence was discussed and the Company, while not objecting strongly felt these could be restrictive.
This item was deferred for further committee discussion.

Item 6 - The Company stated that the existing tailings structures were designed with one foot freeboard and the requirement for three feet was excessive in light of the fact that the dykes were only six feet high. It was also noted that the cost of increasing the height of the dykes at this time would be substantial.
This item was deferred for further committee discussion.

Item 10 - Company representatives stated that under existing conditions some of the effluent quality requirements were too high and the Company would be in violation as soon as the licence was issued. Further the two year requirement could not be met in light of the fact that it would take a minimum of 6 months to run a pilot plant, six months to engineer changes, and about six months for ordering equipment and eighteen months for installation and debugging, a minimum total of 36 months.

In discussion it was noted that the data supplied by Cominco was for flow from Pud Lake and not from the decant structure and it was agreed that since the decant structure would be the control point, standards of 15 mg/litre and 30 mg/litre for suspended solids could be met.

On review of each parameter, based on data supplied by Cominco and collected by participants, it was agreed that Arsenic levels be raised to 5.0 and 10.0 mg/litre, that a requirement for iron be deleted since this element was non-toxic and the suspended level was low, and the grab sample for cyanide be raised to 10.0 mg/litre.

The Company requested that the average level for cyanide be raised to 5.0 mg/litre to allow for future operations.

On the matter of zinc, the Company felt that even though the present levels were below the requirement, they should be increased to allow the Company some latitude in which to operate. It was stated that zinc levels could increase when ore was taken from the new Robinson Shaft.

The Committee deferred a decision on zinc and average cyanide levels until discussed later.

Item 11 - The Company's position on this item was that it should be deleted since there was no way of knowing what the end results of studies program would be, and at the end of any given testing period the Company could be in trouble if the stated requirements could not be met.

The position of the Committee was that without any required future levels, the Company would have nothing to work towards, with a possible end result that no progress was met.
This item was deferred for later discussion.

Item 12 - The wording of this item rests on decisions made under Item 11. The Company agreed with the need for further study with a program, a reporting program similar to Item 4 was accepted.

Item 14 - Mr. Redshaw stated that in keeping with recently issued licences many of the requirements would be placed in the "Surveillance Program". This allows modifications while the licence was in force. This was accepted by both parties.

Items 20 & 21 - The position of the Company was stated in Mr. Egli's letter in that reclamation should be an on-going program without any time constraints.
A recommendation of this was deferred until later.

Mr. Redshaw thanked Mr. Egli and Mr. Case for attending the meeting and putting forward the Company's position on the draft licence. He agreed to discuss further with Mr. Egli those recommendations which his Committee would make to the Board which differed from those of the Company, allowing the Company to make further representation to the Board if it is so desired.

With the departure of the Con Mine officials, Mr. Redshaw reviewed each outstanding point with the Committee:

Conditions Applying to Operation - Part C

Item 4 - The Committee recommends that the statement as included in the attached licence be used in the final licence.

The Committee was of the opinion that "Terms of Reference" must be stated and time schedules made so that progress can be adequately monitored by the Board.

The statement for Item 4 was prepared by Mr. Hardin and approved by Messers Pawson, Monaghan and Redshaw at a meeting on October 6, 1976.

Item 6 - The Committee recommends that the 3 foot freeboard required in the draft licence remain. It was agreed that regardless of the design constraints, one foot of freeboard was just not acceptable from an "environmental viewpoint".

Further that three feet is the figure that is accepted by most consultants and the Department of Energy, Mines and Resources requires this in their guidelines for tailings dam design.

Item 10 - The Committee recommends that the Company be given thirty-three (33) months in which to meet new effluent quality requirements. Further that levels for average total cyanide remain at 3.0 mg/litre and levels for zinc remain at 0.5 mg/litre and 1.0 mg/litre since these are now being attained and should be maintained by the operator. It is recommended that the pH be increased to 9.5 to allow for possible better management of the tailings pond.

Item 11 - The Committee recommends very strongly that this item remain in the licence. It was felt that without some strong objectives to seek after, the Company might not approach the problem as fully as required.

The Committee was aware that to obtain a reduction in certain levels, new technology might have to be developed, and on a renewal of the licence less stringent requirements might have to be placed, but this should be resolved when the licence comes up for renewal and not at this time.

Item 12 - With the need for close monitoring of the study program the Committee recommends that Item 12 be approved as stated in the attached draft.

Item 20 & 21 - The Committee recommends that Items 20, 21, and 22 as stated in the attached draft be considered by the Board for inclusion in the final licence.

The statement for Items 20, 21 and 22 were prepared by Mr. Hardin and approved by Messers Pawson, Monaghan and Redshaw at a meeting on October 6, 1976.

The meeting was adjourned at 1:30 p.m.

Attached is a copy of the draft licence dated October 15, 1976 which has been prepared as a result of the Committee's Recommendations made above.



Indian and Northern Affairs Affaires indiennes et du Nord

DRAFT

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the Northern Inland Waters Act and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

----- COMINCO LIMITED, CON MINE -----
(Licensee)

of ----- P.O. BOX 2000, YELLOWKNIFE, NORTHWEST TERRITORIES -----
(Mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence:

Licence Number ----- N113-0040 -----

Water Management Area ----- NORTHWEST TERRITORIES 01 -----

Location ----- YELLOWKNIFE, NORTHWEST TERRITORIES -----

Purpose ----- TO OBTAIN WATER AND RETURN A FLOW OF WATER -----

Description ----- INDUSTRIAL USE IN MINING AND MILLING PROCESSES -----

Quantity of Water Not to be Exceeded ----- SEE ITEM 2, PART C -----

Rate of Use of Water Not to be Exceeded ----- SEE ITEM 3, PART C -----

Effective Date of Licence ----- JANUARY 3, 1977 -----

Expiry Date of Licence ----- DECEMBER 31, 1979 -----

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

Northwest Territories Water Board

Witness

Chairman

Approved by

Minister of Indian Affairs
and Northern Development

DRAFT

PART A GENERAL CONDITIONS

1. The Licensee shall file reports pursuant to section 15 of the Regulations not later than February 1st of the year next following the year reported.
2. The annual water use rental fee shall be payable quarterly in advance.
3. The Licensee shall furnish the Board with a security deposit in the amount of \$100,000. If the Licensee fails to live up to any condition of this licence, the Board may retain such part of the security, as in the opinion of the Board, the circumstances justify to satisfy the Licensee's responsibility hereunder.
4. The Licensee shall carry out a reclamation program in a manner that is satisfactory to the Board upon the termination of the licence or renewals thereof, on abandonment of the operation, or if during the period of the licence or renewals thereof an unauthorized deposit of waste occurs. The security called for shall not limit the legal or fiscal responsibility of the Licensee to clean-up and restore adversely affected property as aforesaid.
5. This licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, in accordance with Section 10(2) of the Northern Inland Waters Act, whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Northern Inland Waters Act, or other statute imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited that this licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations.
6. The Licensee shall comply with the "Surveillance Network Program" as is annexed to this licence.
7. The "Surveillance Network Program" as annexed may be modified at the discretion of the Board.

PART B

CONDITIONS APPLYING TO CONSTRUCTION

DRAFT

Nil

PART C

CONDITIONS APPLYING TO OPERATION

1. The Licensee shall obtain all surface water from Great Slave Lake by using existing intakes, piping and pumping facilities.
2. The annual quantity of surface water obtained from Great Slave Lake plus the quantity of groundwater pumped to the surface to permit mining shall not exceed 340,000,000 Imperial gallons per year.
3. The maximum rate of use of surface water from Great Slave Lake plus the rate of groundwater pumped to the surface to permit mining shall not exceed 1,300,000 Imperial gallons on any day, with the average daily use over the year not exceeding the quantity stated in Part C Item 2 divided by the number of days in the given year.
4. The Licensee shall, within three (3) months of the date of issue of this Licence, file with the office of the Board proposals which adequately satisfy the "Terms of Reference for Studies Related to the Reduction of Water Use" appended to this Licence, and shall receive a letter of approval from the Board prior to the start of the studies. The Licensee shall file progress reports on this work within twelve (12) months and eighteen (18) months of the date of issue, and shall submit a final report within twenty-four (24) months of the date of issue of this Licence. Prior to the expiry date of this Licence and subject to the written approval of the Board, the Licensee shall implement the changes required to reduce water use.
5. The Licensee shall discharge all mine and mill process water to the Pud Lake tailings area unless a letter of approval to discharge these waters at other locations is received in advance from the Board.
6. The Licensee shall maintain and operate the Pud Lake tailings area as outlined on the attached map according to the following conditions:
 - (a) At least 3.0 feet of freeboard shall be maintained at all times;
 - (b) No uncontaminated surface water or ground water except that occurring from precipitation and natural runoff shall enter the tailings area; and
 - (c) All waste discharges from the Pud Lake tailings area shall pass through the decant structure into lower Pud Lake.
7. All wastes discharged from lower Pud Lake shall be directed to Meg Lake. No waste discharge, seepage or other flow shall be permitted at any time from the Pud Lake tailings area or lower Pud Lake to Kam Lake.
8. The Licensee will advise the office of the Board by the fastest means possible should a failure of the waste treatment system, including tailings area dykes, occur, which results in or is likely to result in an unauthorized discharge of waste.

DRAFT

9. The Licensee shall submit a detailed written report on each failure of the waste treatment system referred to in Item 8, Part C, to the office of the Board not later than seven (7) days after the failure.
10. For the first thirty-three (33) months from the date of issue of this licence, all waste discharged by the Licensee from Pud Lake tailings area through the decant structure, or at such other locations as approved under Part C, Item 5, shall meet the following effluent quality requirements:

PARAMETER	MAXIMUM MONTHLY AVERAGE CONCENTRATION	MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE
Total Arsenic	7.50 mg/litre	15.0 mg/litre
Total Copper	1.0 mg/litre	2.0 mg/litre
Total Cyanide	3.0 mg/litre	10.0 mg/litre
Total Lead	0.20 mg/litre	0.40 mg/litre
Total Nickel	0.50 mg/litre	1.0 mg/litre
Total Zinc	0.50 mg/litre	1.0 mg/litre
Suspended Solids	15.0 mg/litre	30.0 mg/litre
Oil & Grease	- -	5.0 mg/litre

The waste shall have a pH between 6.0 and 9.5

11. After thirty-three (33) months from the date of issue of this licence, all waste discharged by the Licensee from Pud Lake tailings area through the decant structure, or at such other locations as approved under Part C, Item 5, shall meet the following effluent quality requirements:

PARAMETER	MAXIMUM MONTHLY AVERAGE CONCENTRATION	MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE
Total Arsenic	0.50 mg/litre	1.0 mg/litre
Total Copper	0.30 mg/litre	0.60 mg/litre
Available Cyanide	0.10 mg/litre	0.20 mg/litre
Total Cyanide	1.50 mg/litre	3.0 mg/litre
Total Lead	0.20 mg/litre	0.40 mg/litre
Total Nickel	0.50 mg/litre	1.0 mg/litre
Total Zinc	0.50 mg/litre	1.0 mg/litre
Suspended Solids	15.0 mg/litre	30.0 mg/litre
Oil & Grease	- -	5.0 mg/litre

The waste shall have a pH between 6.0 and 9.5

12. The Licensee shall, within three (3) months of the date of issue of this licence, file with the office of the Board detailed proposals for studies to be undertaken to achieve the effluent quality requirements under Item 11, Part C, and shall receive a letter from the Board that the proposal is satisfactory. The Licensee shall file with the Board progress reports on this work within twelve (12) months and eighteen (18) months of the date of issue of this licence, and shall submit to the Board a final report within twenty-four (24) months of the date of issue of this licence.

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13. The Licensee shall file with the office of the Board within one month of date of issue of the licence details on the methods and procedures used for the measurement of water use and waste discharge and ensure that these methods and procedures are acceptable to the Board. The Licensee shall install and operate all the equipment necessary to implement these methods and procedures within nine (9) months from the date of issue of the licence.
14. The Annual Report for the preceding year as required under Part A, Item 1, shall contain the following information:
 - (a) The total annual quantity of surface water pumped from Great Slave Lake in Imperial gallons;
 - (b) The total annual quantity of groundwater pumped from the mine in Imperial gallons;
 - (c) The total annual quantity of effluent discharged from the Pud Lake tailings area through the decant structure in Imperial gallons;
 - (d) Both tabular and graphical summaries of the water quality data from the water quality surveillance network. The yearly totals of all quantities measured shall be reported;
 - (e) A detailed record of major maintenance work carried out on the Pud Lake tailings area and the related structures; and
 - (f) Any other details on water use or waste disposal as requested by the Board.
15. The Licensee shall file with the office of the Board, the final design and construction plans and specifications for a new or any additions to the existing pumping plant and associated facilities, the tailings dykes and related structures and other waste treatment facilities and related structures at least two (2) months prior to the start of any construction or work or such other period of time as approved by the Board, and receive a letter of approval from the Board prior to the start of any construction work.
16. The Licensee shall file with the office of the Board at least ten (10) days prior to any construction work referred to in Item 15, Part C a detailed construction schedule.
17. The Licensee shall construct each structure and carry out work in accordance with the plans and specifications approved by the Board.
18. All design alterations from those approved by the Board, shall be submitted to the office of the Board, and the Licensee shall receive a letter of approval from the Board prior to any alterations being made.
19. The Licensee shall provide as-constructed plans and drawings of the works referred to in Item 15, Part C, within three (3) months of completion of the construction. These plans and drawings shall be submitted on transparencies that will reproduce with the use of a standard printer.

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20. The Licensee shall file with the office of the Board within six (6) months of the date of issue of the licence detailed proposals for the containment and reclamation of all arsenic oxide storage areas located on the property, and shall receive a letter of approval from the Board prior to the start of any such work.
21. The Licensee shall complete the work referred to in Item 20, Part C, prior to the expiry date of the licence.
22. The Licensee shall submit within three (3) months of the date of issue of the licence, detailed proposals which satisfy the "Terms and Reference for Studies Related to Restoration and Reclamation of Abandoned and Existing Tailings Areas" and shall receive a letter of approval from the Board prior to these studies being commenced. An interim progress report shall be filed within eighteen (18) months of the date of issue of the licence, and a final report shall be filed with the office of the Board not later than thirty (30) months after the date of issue of the licence.

NORTHWEST TERRITORIES WATER BOARD

CHAIRMAN

DRAFT

NORTHWEST TERRITORIES WATER BOARD

LICENSEE: COMINCO LIMITED CON MINE
WATER LICENCE NUMBER: N1L3-0040
EFFECTIVE DATE OF LICENCE: 3 JANUARY, 1977

STUDIES FOR RESTORATION AND RECLAMATION
OF ABANDONED AND EXISTING TAILINGS AREA

"TERMS OF REFERENCE"

1. Objective

The purpose of these studies is to develop a plan for the reclamation and rehabilitation of all tailings disposal areas on the site in order to prevent the pollution of the environment by residual wastes and contaminants.

2. Study Requirements

2.1 Abandoned Tailings Areas

The Licensee shall carry out studies directed towards the reclamation of all lands outside the Pud Lake tailings area which are covered by tails. These studies shall include, but not be limited to, the following:

- (a) A description of the physical and chemical properties of the tails;
- (b) An evaluation of the potential contamination of adjacent watercourses by run-off from these tails;
- (c) An assessment of methods for the stabilization of these tails, including revegetation and covering.

2.2 Pud Lake Tailings Area and Waste Rock Piles

The Licensee shall undertake studies which are directed towards the ultimate reclamation of the Pud Lake tailings area, and these studies shall address, but not be limited to, the following:

- (a) Methods for the stabilization and revegetation of lands covered by tails and waste rock piles;
- (b) Integrity and permanency of dams, dykes and other structures surrounding the Pud Lake tailings area;
- (c) Methods for the collection and treatment of contaminated surface run-off or seepage from tailings areas and waste rock piles.

Full details of the proposed methods and techniques shall be presented, together with an estimate of the cost per acre per year, the total cost, and a map of the disturbed areas.

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NORTHWEST TERRITORIES WATER BOARD

LICENSEE: COMINCO LIMITED CON MINE
WATER LICENCE NUMBER: NIL3-0040
EFFECTIVE DATE OF LICENCE: 3 JANUARY, 1977

STUDIES FOR REDUCTION OF WATER USE

"TERMS OF REFERENCE"

1. Objective

The purpose of this study is to identify methods by which the overall consumption of fresh surface water in the mining and milling processes can be reduced while maintaining an acceptable quality of effluent. These methods will be applied to reduce the total quantity of water which becomes contaminated during the industrial process and are intended, together with the improvement of effluent quality, to reduce the total quantity of contaminants which are released to the environment.

2. Study Requirements

The study shall consider all uses of water in the mining and milling processes, and shall include, but not be limited to the following:

- (a) The use of effluent from the tailings area for milling and mining purposes;
- (b) The recycle and reuse of treated and untreated mine process and seepage water for mining and milling;
- (c) The increased reuse and recycle of mill process water within the mill;
- (d) The recycle and reuse of compressor cooling water.

NORTHWEST TERRITORIES WATER BOARD

DRAFT

Licensee: Cominco Limited, Con Mine
Licence Number: N1L3-0040
Effective Date: January 3, 1977

SURVEILLANCE NETWORK PROGRAM

A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
40-1	Pud Lake Tailings Area Discharge at the decant structure
40-2	Mill Freshwater Intake at the Yellowknife Bay Pumphouse
40-3	Meg Lake Discharge to Keg Lake
40-4	Keg Lake at its Centre

B. Sampling and Analysis Requirements

- The Pud Lake Tailings Area Discharge at Sampling Station 40-1 shall be sampled every week during periods of flow and analyzed for the following parameters:

Total Arsenic	
Total Copper	
Total Cyanide	
Suspended Solids	
Specific Conductivity	
pH	
- The Pud Lake Tailings Area Discharge at Sampling Station 40-1 shall be sampled monthly during periods of flow and analyzed for the following additional parameters:

Total Hardness	Total Alkalinity
Total Lead	Calcium
Total Nickel	Chloride
Total Zinc	Sodium
	Sulfate
	Oil & Grease
- The Mill Freshwater Intake at the Yellowknife Bay Pump House, and Keg Lake at its Centre, Sampling Stations 40-2 and 40-4 respectively, shall be sampled at least once every three (3) months and analyzed for the following parameters:

Total Arsenic	Total Alkalinity
Total Copper	Calcium
Total Cyanide	Chloride
Total Lead	Total Hardness
Total Nickel	Sodium
Total Zinc	Sulfate
Suspended Solids	Specific Conductivity
	pH

4. The Meg Lake Discharge to Keg Lake at Sampling Station 40-3 shall be sampled four (4) times yearly on dates specified annually by letter from the Chairman of the Board and shall be analyzed for the following parameters:

Total Arsenic	Total Alkalinity
Total Copper	Total Hardness
Total Cyanide	Calcium
Total Lead	Chloride
Total Nickel	Sodium
Total Zinc	Sulfate
Suspended Solids	Specific Conductivity
pH	

5. The Licensee shall submit samples of the Pud Lake Discharge to Meg Lake at Sampling Station 40-1 to the office of the Board twice per year for acute fish toxicity testing. The dates of sampling shall be specified annually by letter from the Chairman of the Board.
6. All sampling and sample preservation must be done according to methods approved by the Board.
7. All analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" or by such other methods as are approved by the Board.
8. All analyses shall be performed in a laboratory approved by the Board.
9. All results of analyses shall be submitted to the office of the Board within one month of the date of sampling.

C. Data Requirements

1. The quantity of surface water pumped from Great Slave Lake shall be recorded daily in Imperial gallons.
2. The quantity of groundwater pumped from the mine shall be recorded daily in Imperial gallons. This quantity of water shall be calculated based on:
- (a) A daily record of the quantity of water pumped underground from (i) the City of Yellowknife Water Supply and (ii) with the tailings backfill; and
 - (b) A daily record of the total quantity of water pumped to the surface to permit mining.
3. The quantity of waste discharged from the Pud Lake Tailings Area through the decant structure shall be recorded daily in Imperial gallons. This quantity of waste shall be calculated based on:
- (a) A record of the daily average water level in the tailings pond behind the decant structure; and
 - (b) A record of the time and day on which stop logs were placed in or removed from the decant structure and the elevation of the overflow weir after each operation.

4. A record of the average daily quantity of ore milled in tons, for each calendar month.
5. All data recorded above shall be submitted to the office of the Board within fifteen (15) days of the end of the months of June and December of each year.



GOVERNMENT OF THE NORTHWEST TERRITORIES
CANADA
REFERRAL MEMO

Document disclosed under the Access to Information Act
Document divulgué en vertu de la Loi d'accès à l'information

FILE N165-0090
1.

TO: ARTHUR LEDSHAW.

FROM: PETER LOFTHOUSE

LOCATION: _____

LOCATION: _____

DATE: OCT. 8/76

SUBJECT TECH. COMMITTEE OF WATER BOARD.

COMMENTS Please excuse this informal format, written under severe time constraints:

RESTORATION

My feelings are that: a) A mine nearing the end of its life should have strategic plans for the restoration of property drawn up at least one year prior to its closure, with the necessary monies set aside. The size of the security deposit must be linked as a % to the size of the clean-up job.

I require more information from the Environmental groups about the ways + means of restoration.

REPLY b) A mine continuing in production should be cleaning up as it goes... like the oil + gas forestry companies etc.

TARGET STANDARDS

I feel that we are being too "flexible" with Grant - that if professional opinion says that 3rd year standards are impossible to achieve then realistic standards must be set / explained to the public. Targets, however, can easily be forgotten or explained away.

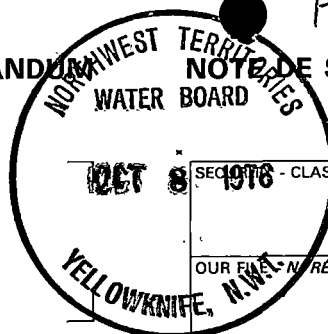
MEETING WITHOUT ADVISORS - I agree with you. We can always recall them if we need them.

TO ORIGINATE:
HAND OR TYPEWRITE MESSAGE - REMOVE PART 2
(FOLLOW-UP COPY) AND FORWARD BALANCE OF SET

TO REPLY:
WRITE REPLY, SNAP SET - RETAIN 000443
PART 1 AND RETURN PART 3

Government of Canada
Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE



SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE - N° RÉFÉRENCE 4705-37/Co
YOUR FILE - V / RÉFÉRENCE
DATE 8 October 1976

TO
À

Mr. A.G. Redshaw, Controller
N.W.T. Water Board
P.O. Box 1500
YELLOWKNIFE, N.W.T.

FROM
DE

Senior Project Biologist, N.W.T.
Environmental Protection Service
P.O. Box 2310
YELLOWKNIFE, N.W.T. XOE 1HO

SUBJECT
OBJET

AMENDMENTS TO DRAFT WATER LICENCE FOR
COMINCO LIMITED CON MINE

Please find attached my recommendations for the wording of Item 4, Part C, and Items 20, 21 and 22 of Part C of the draft water licence. I also attach drafts of the "Terms of Reference for Studies of the Reduction of Water Use" and "Terms of Reference for Studies Related to the Restoration and Reclamation of Abandoned and Existing Tailings Areas".

Since the Technical Committee meeting, we have once again reviewed the question of the effluent quality requirements for cyanide and wish, at this time, to make the following recommendation to the Committee:

Parameter	Maximum Concentration (Monthly Average)	Maximum Concentration of Any Grab Sample
¹ Readily Available Cyanide	0.1 mg/l	0.2 mg/l
² Total Cyanide	1.5 mg/l	3.0 mg/l

¹ Readily Available Cyanide: This includes free cyanide (HCN and CN⁻) as well as weak cyanide complexes with cadmium and zinc, and medium strength complexes with nickel and copper, and is measured by the modified picric acid technique.

² Total Cyanide: This includes free cyanide, weak complexes, medium strength complexes with iron and cobalt, and is measured by vacuum distillation in the presence of hydrochloric acid and sodium arsenite followed by colorimetric determination through modified König reactions employing pyridine-pyrazolene.

...2..

000444



Government
of Canada

Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
À

Mr. A.G. Redshaw

FROM
DE

M. J. HARDIN

SUBJECT
OBJET

SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE - N/RÉFÉRENCE 4705-37/Co
YOUR FILE - V/RÉFÉRENCE
DATE 8 Oct 76

- 2 -

The rationale for this recommendation is similar to that which we presented for the draft water licence of Giant Yellowknife Mines Limited. It is our view that these proposed effluent quality requirements adequately restrict the most toxic chemical species of cyanide at the same time permitting the mine to continue to operate while new pollution abatement equipment is devised and installed.

Please call me if you would like to discuss my recommendations further.

M. J. Hardin

M. J. HARDIN

cc: P.J. Blackall
D.A. Gemmill
W.J. Bryant
G.A. Webster
B.W. Fallis
B.P. LeClair
E.D. Fowler
A.S. Goodman

000445

4. The Licensee shall, within three (3) months of the date of issue of this Licence, file with the office of the Board proposals which adequately satisfy the "Terms of Reference for Studies Related to the Reduction of Water Use" appended to this Licence, and shall receive a letter of approval from the Board prior to the start of the studies. The Licencee shall file progress reports on this work within nine (9) months and eighteen (18) months of the date of issue, and shall submit a final report within twenty-four (24) months of the date of issue of this Licence. Prior to the expiry date of this Licence, the Licencee shall implement the changes in water use recommended by the studies subject to approval by the Board.

20. The Licencee shall file with the office of the Board within six (6) months of the date of issue of this Licence detailed proposals for the containment and reclamation of all arsenic oxide storage areas located on the property, and shall receive a letter of approval from the Board prior to the start of any such work.
21. The Licencee shall complete the work referred to in Item 20, Part C, within three (3) years of the date of issue of this Licence.
22. The Licencee shall submit within three (3) months of the date of issue of this Licence, detailed proposals which satisfy the "Terms of Reference for Studies Related to Restoration and Reclamation of Abandoned and Existing Tailings Areas" and shall receive a letter of approval from the Board prior to these studies being commenced. An interim progress report shall be filed within eighteen (18) months of the date of issue of this Licence, and a final report shall be filed with the office of the Board not later than thirty (30) months after the date of issue of this Licence.

- 2 -

(e) the recycle and reuse of compressor cooling water.

NORTHWEST TERRITORIES WATER BOARD

LICENCEE: COMINCO LIMITED CON MINE
WATER LICENCE NUMBER: N1L3-0040
EFFECTIVE DATE OF LICENCE:

TERMS OF REFERENCE FOR STUDIES RELATED TO RESTORATION
AND RECLAMATION OF ABANDONED AND EXISTING TAILINGS AREAS

1. Objective

The purpose of these studies is to develop a plan for the reclamation and rehabilitation of all tailings disposal areas on the site in order to prevent the pollution of adjacent aquatic environments by residual wastes and contaminants.

2. Study Requirements

2.1 Abandoned Tailings Areas

The Licencee shall carry out studies directed towards the reclamation of all lands outside the Pud Lake tailings area which are covered by tails. These studies shall include, but not be limited to, the following:

- (a) A description of the physical and chemical properties of the tails
- (b) An evaluation of the potential contamination of adjacent watercourses by run-off from these tails.
- (c) An assessment of methods for the stabilization of these tails, including revegetation and covering.

2.2 Pud Lake Tailings Area and Waste Rock Piles

The Licencee shall undertake studies which are directed towards the ultimate reclamation of the Pud Lake tailings area, and these studies shall address, but not be limited to, the following:

- (a) Methods for the stabilization and revegetation of lands covered by tails and waste rock piles,
- (b) Integrity and permanency of dams, dykes and other structures surrounding the Pud Lake tailings area,
- (c) Methods for the collection and treatment of contaminated surface run-off or seepage from tailings areas and waste rock piles.

Full details of the proposed methods and techniques shall be presented, together with an estimate of the cost per acre per year, the total cost, and a map of the disturbed areas.

NORTHWEST TERRITORIES WATER BOARD

LICENCEE: COMINCO LIMITED CON MINE
WATER LICENCE NUMBER: N1L3-0040
EFFECTIVE DATE OF LICENCE:

TERMS OF REFERENCE FOR STUDIES OF THE REDUCTION
OF WATER USE

1. Objective

The purpose of this study is to identify methods by which the overall consumption of fresh surface water in the mining and milling processes can be reduced while maintaining an acceptable quality of effluent. These methods will be applied to reduce the total quantity of water which becomes contaminated during the industrial process and are intended, together with the improvement of effluent quality, to reduce the total quantity of contaminants which are released to the aquatic environment.

2. Study Requirements

The study shall consider all uses of water in the mining and milling processes, and shall include, but not be limited to the following:

- (a) the use of effluent from the tailings area for milling and mining purposes,
- (b) the recycle and reuse of treated and untreated mine process and seepage water within the mine for mining purposes,
- (c) the use of mine process and seepage water for mining purposes
- (d) the increased reuse and recycle of mill process water within the mill,



FILE N1L3-0040

Mines

Mr. A.G. Redshaw
Controller of Water Rights
N.W.T. Water Board
Box 1500
Yellowknife,
N.W.T.

September 20, 1976

*Copies to members - Water Board
Jeh Comm*

Dear Mr. Redshaw:

Re: Con Mine - Application for Water Use Northern Inland Waters Act.

We have examined the draft copy of our three (3) year Water Licence and we would like to comment on some of the terms and conditions which have been included in the Licence. We feel that Con Operations could not operate during the proposed period of the Licence without violating many of the terms and conditions as they are now outlined. At present there are so many unknowns that it makes it difficult, if not impossible, to set definite limits and guidelines. We would like to have the opportunity to research and investigate areas such as water re-circulation, effluent treatment, revegetation, etc., during the period of this Licence so that more precise and fair guidelines can be established in the formation of subsequent water Licences.

The following explains the proposed changes as is shown on the accompanying draft copy of our Water Licence, N1L 3-0040.

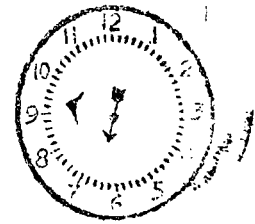
Part A Condition 3 - Similar to the term on Pine Point Operation's Water Licence, we feel that Con Operations should be allowed to furnish a promissory note rather than a security deposit.

Part C Condition 2 - We estimate that we will average 368,000,000 imperial gallons per year, (see accompanying file note on "Con Mine Water Flows" with attached flowsheet).

Part C Condition 3 - A rate of 1,340,000 imperial gallons per day is possible, (see accompanying file note on "Con Mine Water Flows").

Part C Condition 4 - We propose that the period of this Licence should allow us time to research and investigate ways to conserve and re-circulate water so as to establish definite guidelines for the subsequent Licences. As we do not know exactly how much water we now use it is unfair to set finite water restrictions in this Licence. (Delete conditions 2(b) and 3(b)).

SEP 21 76 AM



D.I.A.N.D.
N.N.R.E.B.
YELLOWKNIFE, N.W.T.

(2)

Part C Condition 6 - We are confident that our control structure dike is adequately designed to allow up to 1.0 foot of freeboard.

Part C Condition 10 - Only total copper, total lead, and total nickel will meet the proposed effluent quality requirements which have been set in our draft Licence. Analyses from past sampling indicate that concentrations of grab samples of total cyanide, total arsenic, total zinc, total iron and suspended solids can go as high as 10 mg/l, 15 mg/l, 2 mg/l, 6 mg/l and 90 mg/l respectively. (See Pud Lake discharge assays on accompanying graphs).

Part C Conditions 11 - We request that the period of this Licence allow us time to research and investigate ways to treat out tailings effluent so as to lower the quality requirements. Guidelines for lower effluent quality standards can be better established after adequate technology is developed. (Delete condition 11)

Part C Condition 12 - As in condition 11 above.

Part C Condition 13 - Six months is not adequate time for ordering, delivery and installation of all the necessary equipment.

Part C Condition 14 (c) (i) - All the water used in the mill is pumped from Great Slave Lake.

Part C Condition 14 (f) - The quantity of waste discharge daily from the tailings launder cannot be accurately measured because it flows by gravity as a slurry. It is impossible to get correct readings with a magnetic flow-meter unless it is installed in a vertical line. An estimate of the waste discharged to the tailings can be approximated by calculating the mill tonnage separated to the cyclone overflow by screen analysis and sampling the % solids in the slurry with a density guage. The only effluent flows which can be independently and accurately measured are the barren bleed, the mine water and the fresh water from the City of Yellowknife which is pumped underground.

Part C Condition 14 (g) - as in condition 14 (f) above.

Part C Condition 20 - All time constraints on development and application of a tailings revegetation program should be eliminated and an indefinite period of research and investigation, with annual progress reports to the Water Board, be proposed as an alternative. A final reclamation plan would be submitted when adequate technology was developed. The terms and conditions should be amended in a manner similar to the reclamation permits issued in British Columbia, Part C Condition 20 could be re-written as follows:

20. The Licencee shall carry out, to the satisfaction of the Board, investigations and research for the restoration and covering of all arsenic oxide storage areas located on the property and the re-vegetation of all lands covered with tailings outside the boundary of the Pud Lake tailings area. The licensee shall, with two (2) months of the issuing of the Licence, submit to the Board an outline of the investigations and research on reclamation to be carried out during the balance of the calendar year in which the Licence is issued. The Licencee

(3)

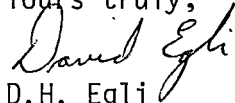
shall file with the Board the investigations and research on reclamation carried out during the calendar year, showing the results obtained therefrom. Such report is to be submitted by February 1st next following the end of the calendar year. At the same time that the report is submitted, the licensee shall submit detailed plans of the investigations and research on reclamation that will be carried out during the next calendar year. When the investigations and research on reclamation have advanced to the stage where the licensee is able to submit detailed plans and programmes for the reclamation of disturbed lands, the licensee shall submit such detailed plans and programmes to the Board. Upon approval by the Board, such plans and programmes shall become a part of the Licence.

Part C Condition 21 - This is dependant on condition 20 above.

Surveillance Network Program

We also plan to sample the tailings flow at the point it leaves the mill.

Yours truly,



D.H. Egli
Mill Superintendent

DHE/pw

File Note

Con Mine Water Flows



Con Lake Pumps

Normally operate two pumps at rated capacity of 300 Igpm and 200 Igpm. Also have two spare pumps used for peak demand or emergency. The rated capacity of the spare pumps are 200 Igpm and 150 Igpm.

Estimated average quantity pumped per day = 500 Igpm = 720,000 Igpm.
Estimated maximum quantity pumped per day = 650 Igpm = 936,000 Igpm.

All water pumped from Great Slave Lake is stored in the water tower and distributed to the compressors, mill process, backfill system, mill toilets, wash hoses, fire protection, etc.

(a) Mill process

Approximately 75,000 Igpd of process water is used in the Mill of which 38,000 Igpd is used to replace the barren bleed and 59,400 Igpd is added as fresh water on the last filter, of which 22,400 Igpd is re-circulated to the grinding circuit and 37,000 Igpd is collected with the tailings.

(b) Backfill System

Return mine water is added with the mill tailings feeding the cyclones to lower the percent solids content from 78% to 35%. At 650 tons per day the cyclones will classify 50% of the tailings to U/F at 60% solids. The cyclone O/F is approximately 24.7% solids. The cyclone U/F is stored in a large tank to allow the water and slimes to decant off. Approximately 22,000 Igpd of water is decanted from the classified tailings to provide for extra storage capacity by reducing the % moisture of the backfill to approximately 25%. The equivalent 22,000 Igpd of fresh water is used to re-slurry and pump the backfill at 60% solids when requested by underground. Most of the water drains from the backfill after it is placed in the stopes. After draining, the backfill contains approximately 20% moisture. The backfill drainage is collected with the ground water seepage and is pumped to the Mill. Some of the pumped mine water is recycled to the backfill system, but the majority overflows to tailings. Fresh lake water can also be used in the backfill system if required or when the reclaim cyclones are in operation.

It is estimated that approximately 20,000 Igpd of lake water is used for sanitation and clean-up in the Mill. Most of the water consumed is used to cool the compressors. A part of this water is used for mill process and dilution for the backfill system. The majority overflows to tailings.

Ground Water

After the completion of the Robertson Shaft the quantity of water pumped from underground could go as high as 280 Igpm. It is estimated that it will average about 200 Igpm, or 288,000 Igpd. Of this, it is estimated that approximately 207,000 Igpd is ground water seepage.

(2)



Water Supply from City of Yellowknife

1973 metered consumption - 34,850,995 gals.
1974 " " - 32,514,048 gals.
1975 " " - 21,335,000 gals.

Three year average 81,000 Igals per day
Maximum daily usage 137,200 Igals per day

Con Mine Water Balance

<u>Source</u>	<u>Average</u>	<u>Maximum</u>
Great Slave Lake	720,000 Igpd	936,000 Igpd
City of Yellowknife	<u>81,000</u>	<u>137,200</u>
	801,000 Igpd	1,073,200 Igpd
Estimated ground water seepage	<u>207,000</u>	<u>285,200</u>
	1,008,000	1,358,400
Less water left in backfill	<u>16,000</u>	<u>16,000</u>
	=====	=====
Total Water to Tailings	992,000 Igpd	1,342,400 Igpd

Check

Sampling the tailings flow for one week indicated an average of 6% solids by weight. At 650 TPCD (325 tons to tailings) the flow to the tailings pond is 1,018,333 Igpd of water.

Proposed Water Streams to be Measured

- | | |
|---|-----------------------|
| (1) Water pumped from Great Slave Lake | - digital flow meter |
| (2) Water pumped from underground | - digital flow meter |
| (3) Yellowknife water supply | - digital flow meter |
| (4) Barren bleed | - digital flow meter |
| (5) Fresh water (YK water supply) to
underground | - digital flow meter |
| (6) Backfill to underground | - magnetic flow meter |
| (7) Pud Lake discharge | - weir calculation |

David Egli
D.H. Egli

Based on 650 TPCD
August 1976(1,342,400 I.G.P.D. Max)
992,000 I.G.P.D.
TO TAILINGS(936,000 I.G.P.D. Max)
720,000 I.G.P.D.

678,000 I.G.P.D.

CON LAKE PUMPS

30,000
TANK

COMPRESSOR COOLING

603,000 I.G.P.D.
O/F

TANK O/F

75,000 I.G.P.D.
TO PROCESS37,000 I.G.P.D.
FILTER WASH38,000 I.G.P.D.
BARREN BLEED0-50,000 I.G.P.D.
TO RECLAIM CYCLONES

20,000 I.G.P.D.

MILL TOILETS ETC.

198,000 I.G.P.D.

WITH SLIMES

22,000 IGPD
SPRAYSBACKFILL
CYCLONES22,000 I.G.P.D.
DECANT44,000 I.G.P.D.
WITH FILL
TO MINE

205,000 I.G.P.D.

3,300
MAKE UP
TANK

686,000 I.G.P.D.

OVERFLOW

15,000
TANKO/F TO
MAKE UP
TANK288,000 I.G.P.D.
Total pumped
from mine(90,000 I.G.P.D. Max)
53,000 I.G.P.D.
TO MINE
DRILLING & DRINKING16,000 I.G.P.D.
IN BACKFILL28,000 I.G.P.D.
BACKFILL
DRAINAGE207,000 I.G.P.D.
GROUND WATER
(285,200 I.G.P.D. MAX.)28,000 I.G.P.D.
DOMESTIC WATER

D.H.E

000458



Indian and Northern Affairs Affaires indiennes et du Nord

FINAL
AUGUST '76

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the Northern Inland Waters Act and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

COMINCO LIMITED, CON MINE

(Licensee)

of P.O. BOX 2000, YELLOWKNIFE, NORTHWEST TERRITORIES
(Mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence:

Licence Number N113-0040

Water Management Area NORTHWEST TERRITORIES 01

Location YELLOWKNIFE, NORTHWEST TERRITORIES

Purpose TO OBTAIN WATER AND RETURN A FLOW OF WATER

Description INDUSTRIAL USE IN MINING AND MILLING PROCESSES

Quantity of Water Not to be Exceeded SEE ITEM 2, PART C

Rate of Use of Water Not to be Exceeded SEE ITEM 3, PART C

Effective Date of Licence 3 YEAR LICENCE

Expiry Date of Licence

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

Northwest Territories Water Board

Witness

Chairman

Approved by

Minister of Indian Affairs
and Northern Development



PART A

GENERAL CONDITIONS

1. The Licensee shall file reports pursuant to section 15 of the Regulations not later than February 1st of the year next following the year reported.
2. The annual water use rental fee shall be payable quarterly in advance.
3. The Licensee shall furnish the Board with a ^{promissory} ~~security~~ deposit in the amount of \$100,000. If the Licensee fails to live up to any condition of this licence, the Board may ^{request} ~~retain~~ such part of the ^{promissory note} ~~security~~, as in the opinion of the Board, the circumstances justify to satisfy the Licensee's responsibility hereunder.
4. The Licensee shall carry out a reclamation program in a manner that is satisfactory to the Board upon the termination of the licence or renewals thereof, on abandonment of the operation, or if during the period of the licence or renewals thereof an unauthorized deposit of waste occurs. The ^{promissory note} ~~security~~ called for shall not limit the legal or fiscal responsibility of the Licensee to clean-up and restore adversely affected property as aforesaid.
5. This licence is issued subject to the conditions contained herein with respect to the taking of water and the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, in accordance with Section 10(2) of the Northern Inland Waters Act, whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Northern Inland Waters Act, or other statute imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited that this licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations..
6. The Licensee shall comply with the "Surveillance Network Program" as is annexed to this licence.
7. The "Surveillance Network Program" as annexed may be modified at the discretion of the Board.

PART B CONDITIONS APPLYING TO CONSTRUCTION

N11

PART C CONDITIONS APPLYING TO OPERATION

1. The Licensee shall obtain all surface water from Great Slave Lake by using existing intakes, piping and pumping facilities.

2. The quantity of fresh surface water obtained from Great Slave Lake plus the quantity of water which is pumped to the surface to permit mining shall not exceed:

(a) ^{368,000,000} ~~176,000,000~~ Imperial gallons per year for the first two years from the date of issue of the licence.

(b) ~~88,000,000~~ Imperial gallons per year after two years from the date of issue of the licence.

3. The rate of use of fresh surface water from Great Slave Lake plus the rate of water pumped to the surface to permit mining shall not exceed:

(a) ^{1,340,000} ~~600,000~~ Imperial gallons per day for the first two years from the date of issue of the licence.

(b) ~~300,000~~ Imperial gallons per day after two years from the date of issue of the licence.

4. The Licensee shall, ^{within two (2) years of the} ~~within nine (9) months of the~~ date of issue of this licence, file with the office of the Board details on the methods to be used to reduce the water usage ~~referred to in Item 2, b, Part C,~~ and shall file an implementation schedule for this work. The Licensee shall file a detailed progress on the implementation of this work, with the office of the Board ^{before the} ~~within eighteen (18) months of the~~ date of issue of this licence. ^{expiry}

5. The Licensee shall discharge all mine and mill process water to the Pud Lake tailings area unless a letter of approval to discharge these waters at other locations is received in advance from the Board.

6. The Licensee shall maintain and operate the Pud Lake tailings area as outlined on the attached map according to the following conditions:

(a) At least ^{1.0 foot} ~~3.0 feet~~ of freeboard shall be maintained at all times.

(b) No uncontaminated surface water or ground water except that occurring from precipitation and natural runoff shall enter the tailings area.

(c) All waste discharges from the Pud Lake tailings area shall pass through the decant structure into lower Pud Lake.

7. All wastes discharged from lower Pud Lake shall be directed to Meg Lake. No waste discharge, seepage or other flow shall be permitted at any time from the Pud Lake tailings area or lower Pud Lake to Kam Lake.

8. The Licensee will advise the office of the Board by the fastest means possible should a failure of the waste treatment system, including tailings area dykes, occur, which results in or is likely to result in an unauthorized discharge of waste.
9. The Licensee shall submit a detailed written report on each failure of the waste treatment system referred to in Item 8, Part C, to the office of the Board not later than seven (7) days after the failure.
10. All waste discharged by the Licensee from Pud Lake tailings area shall meet the following effluent quality requirements ~~for the first two (2) years~~ from the date of issue of this licence.

PARAMETER	MAXIMUM MONTHLY AVERAGE CONCENTRATION		MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE	
Total Cyanide	5.0	3.0 mg/litre	10.0	6.0 mg/litre
Total Arsenic	7.5	2.5 mg/litre	15.0	5.0 mg/litre
Total Copper	1.0	mg/litre	2.0	mg/litre
Total Lead	0.20	mg/litre	0.40	mg/litre
Total Nickel	0.50	mg/litre	1.0	mg/litre
Total Zinc	1.0	0.50 mg/litre	2.0	1.0 mg/litre
Total Iron	3.0	1.0 mg/litre	6.0	2.0 mg/litre
Oil & Grease	-	-	5.0	mg/litre
Suspended Solids	25	15 mg/litre	90	50 mg/litre

The waste shall have a pH between 6.0 and 9.0

- ~~11. All waste discharged by the Licensee from Pud Lake tailings area after two (2) years from the date of issue of this licence shall meet the following effluent quality requirement:~~

PARAMETER	MAXIMUM MONTHLY AVERAGE CONCENTRATION		MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE	
Total Cyanide	0.30	mg/litre	0.6	mg/litre
Total Arsenic	0.50	mg/litre	1.0	mg/litre
Total Copper	0.30	mg/litre	0.6	mg/litre
Total Lead	0.20	mg/litre	0.4	mg/litre
Total Nickel	0.50	mg/litre	1.0	mg/litre
Total Zinc	0.50	mg/litre	1.0	mg/litre
Total Iron	1.0	mg/litre	2.0	mg/litre
Suspended Solids	15.0	mg/litre	50.0	mg/litre
Oil & Grease	-	-	5.0	mg/litre

The waste shall have a pH between 6.0 and 9.0

12. The Licensee shall, within nine (9) months of the date of issue of the licence, file with the office of the Board details on the methods to be used to achieve the effluent quality requirements referred to in Item 9, Part C, and shall ~~within eighteen (18) months of the date of issue of this Licence, file with the office of the Board a progress report on the implementation of these methods.~~

13. The Licensee shall file with the office of the Board within one month of date of issue of this licence details on the methods and procedures used for the measurement of water use and waste discharge and ensure that these methods and procedures are acceptable to the Board. The Licensee shall install and operate all the equipment necessary to implement these methods and procedures within ~~six (6)~~ *nine (9)* months from the date of issue of this licence.
14. The Annual Report for the previous year shall contain the following information:
- (a) A record of the daily quantity of fresh water pumped from Great Slave Lake in Imperial gallons per day.
 - (b) A record of the daily quantity of water pumped from the mine in Imperial gallons per day.
 - (c) The total annual quantity of water in Imperial gallons
 - (i) ~~Used in the mill~~ *Pumped from Great Slave Lake,*
 - (ii) Pumped from the mine
 - (d) Both tabular and graphical summaries of the water quality data from the water quality surveillance network.
 - (e) A record of major maintenance work carried out on the Pud Lake tailings area and the related structures.
 - (f) A record of the daily quantity of ^{*effluent*} ~~waste~~ discharged in Imperial gallons per day for each discharge point.
 - (g) The total annual ^{*?*} ~~(per day)~~ quantity of ^{*effluent*} ~~waste~~ in Imperial gallons for each discharge point.
 - (h) The total annual quantity of ore milled in ^{*tons*} ~~town~~.
 - (i) A record of the average daily quantity of ore milled in tons, for each calendar month.
 - (j) Any other details on water use or waste disposal as requested by the Board.
15. The Licensee shall file with the office of the Board, the final design and construction plans and specifications for a new or any additions to the existing pumping plant and associated facilities, the tailings dykes and related structures and other waste treatment facilities and related structures at least two (2) months prior to the start of any construction or work or such other period of time as approved by the Board, and receive a letter of approval from the Board prior to the start of any construction work.
16. The Licensee shall file with the office of the Board at least ten (10) days prior to any construction work referred to in Item 15, Part 6 a detailed construction schedule.
17. The Licensee shall construct each structure and carry out work in accordance with the plans and specifications approved by the Board.
18. All design alterations from those approved by the Board, shall be submitted to the office of the Board, and the Licensee shall receive a letter of approval from the Board prior to any alterations being made.

*total annual
or annual daily
average ? →*

19. The Licensee shall provide as constructed plans and drawing of the works referred to in Item 15, Part C, within three (3) months of completion of the construction. These plans and drawings shall be submitted on transparencies that will reproduce with the use of a standard printer.

change
see letter →

20. The Licensee shall file with the office of the Board within two (2) years of the date of issue of the licence, detailed proposals for the restoration and covering of all arsenic oxide storage areas located on the property and the re-vegetation of all lands outside the boundary of the Pud Lake tailings area which are covered with tails and shall receive a letter of approval from the Board prior to the start of any such work.

21. The Licensee shall file with the office of the Board at least six (6) months prior to the closure of the operation, detailed plans for restoration, re-vegetation, and abandonment of the property with particular emphasis on the areas listed below and receive a letter of approval from the board prior to the start of any such work.

- (a) All stock piles and containers of reagents, fuels, and other chemicals on the property shall be removed or disposed of.
- (b) All garbage heaps, piles of construction materials and piping or any other surplus materials shall be removed or disposed of.
- (c) All waste rock piles and tailings areas shall be stabilized and re-vegetated.
- (d) All contaminated seepage and surface run-off from waste rock piles and tailings areas shall be treated.

NORTHWEST TERRITORIES WATER BOARD

CHAIRMAN

NORTHWEST TERRITORIES WATER BOARD

Licensee: Cominco Limited, Con Mine
Licence Number: N1L3-0040
Effective Date:

SURVEILLANCE NETWORK PROGRAM

A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
40-1	Pud Lake Tailings Area Discharge at the decant structure.
40-2	Mill Freshwater Intake at the Yellowknife Bay Pumphouse
40-3	Meg Lake Discharge to Keg Lake
40-4	Keg Lake at Its Centre

B. Sampling and Analysis Requirements

1. The Pud Lake Tailings Area Discharge at Sampling Station 40-1 shall be sampled every week during periods of flow and analyzed for the following parameters:

PH
Suspended Solids
Specific Conductivity
Total Arsenic
Total Copper
Total Cyanide

2. The Pud Lake Tailings Area Discharge at Sampling Station 40-1 shall be sampled monthly during periods of flow and analyzed for the following additional parameters:

Total Iron	Total Alkalinity
Total Lead	Sulfate
Total Zinc	Chloride
Total Hardness	Sodium
Total Nickel	Oil and Grease
	Calcium

3. The Mill Freshwater Intake at the Yellowknife Bay Pump House, and Keg Lake at Its Centre, Sampling Stations 40-2 and 40-4 respectively, shall be sampled at least once every three (3) months and analyzed for the following parameters:

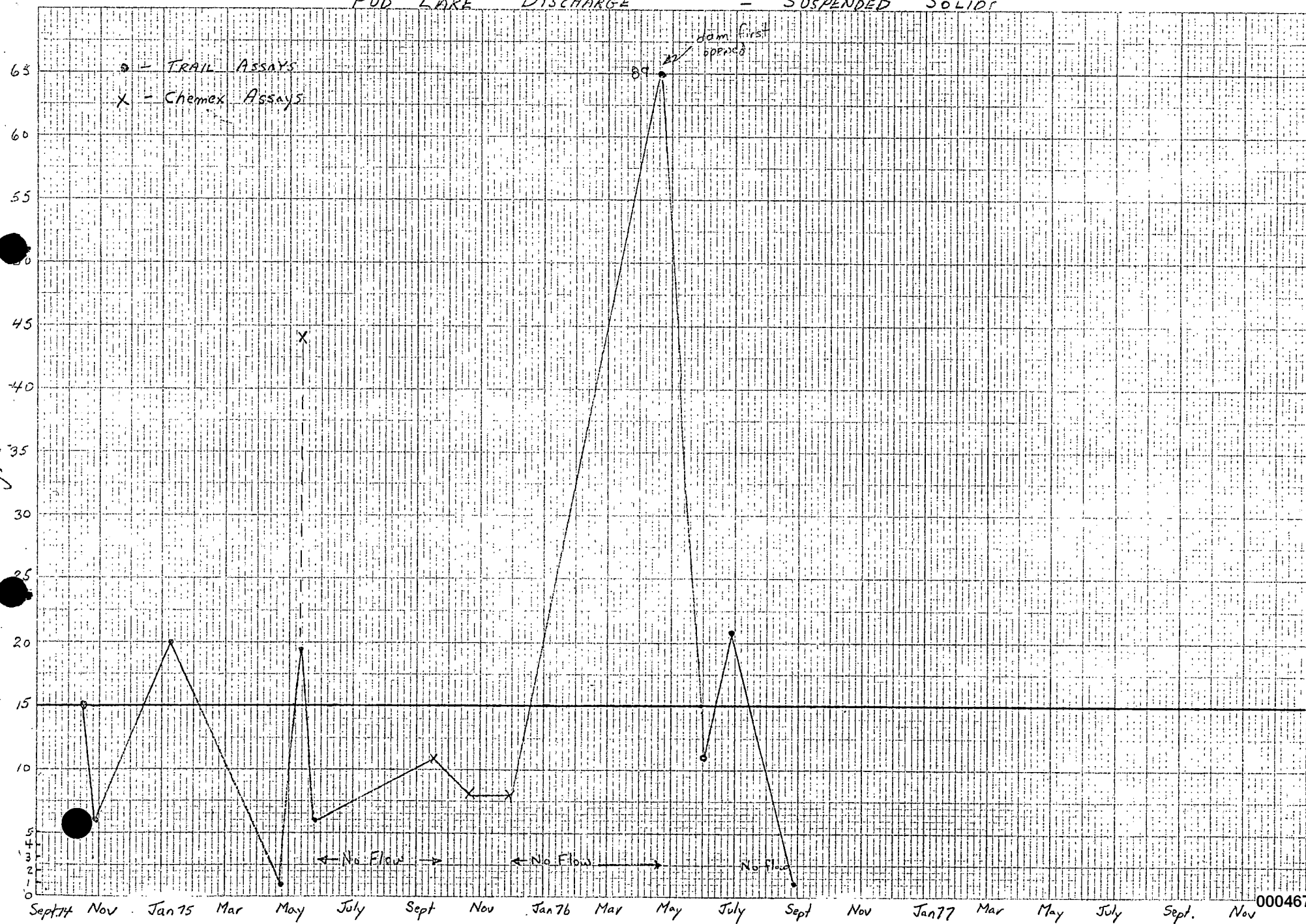
Total Arsenic	Specific Conductivity
Total Copper	pH
Total Iron	Total Hardness
Total Lead	Total Alkalinity
Total Nickel	Sulfate
Total Zinc	Chloride
Total Cyanide	Calcium
Suspended Solids	Sodium

4. The Meg Lake Discharge to Keg Lake at Sampling Station 40-3 shall be sampled four (4) times yearly on dates specified annually by letter from the Chairman of the Board and shall be analyzed for the following parameters:

Total Arsenic	Specific Conductivity
Total Copper	Total Hardness
Total Iron	Total Alkalinity
Total Lead	Sulfate
Total Nickel	Chloride
Total Zinc	Calcium
Total Cyanide	Sodium
Suspended Solids	
pH	

5. The Licensee shall submit samples of the Pud Lake Discharge to Meg Lake at Sampling Station 40-1 to the office of the Board twice per year for acute fish toxicity testing. The dates of sampling shall be specified annually by letter from the Chairman of the Board.
 6. All sampling and sample preservation must be done according to methods approved by the Board.
 7. All analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" or by such other methods as are approved by the Board.
 8. All analyses shall be performed in a laboratory approved by the Board.
 9. All results of analyses shall be submitted to the office of the Board within one month of the date of sampling.
-

PUD LAKE DISCHARGE - SUSPENDED SOLIDS



PUD LAKE DISCHARGE - pH

o - Trail Assays

x - Chemex Assays



PUD LAKE DISCHARGE OIL & GREASE

o Trail Assays

x Chemex Assays

6.0

5.5

4.5

4.0

3.5

3.0

2.5

2.0

1.5

1.0

0.5

0.4

0.3

0.2

0.1

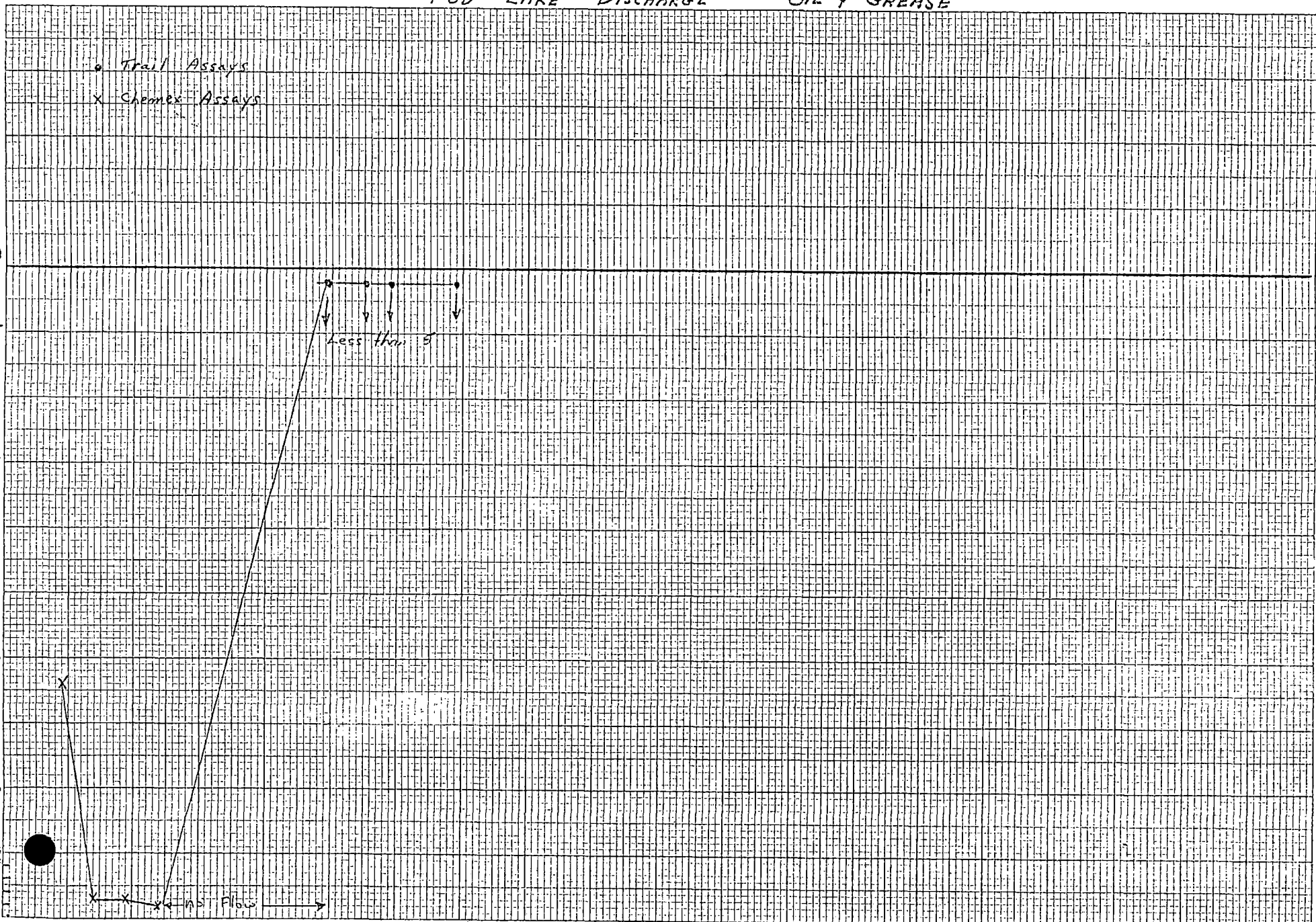
July 75 Sept Nov Jan 76 Mar May July Sept Nov Jan 77 Mar May July Sept Nov Jan 78 Mar May July Sept

000469

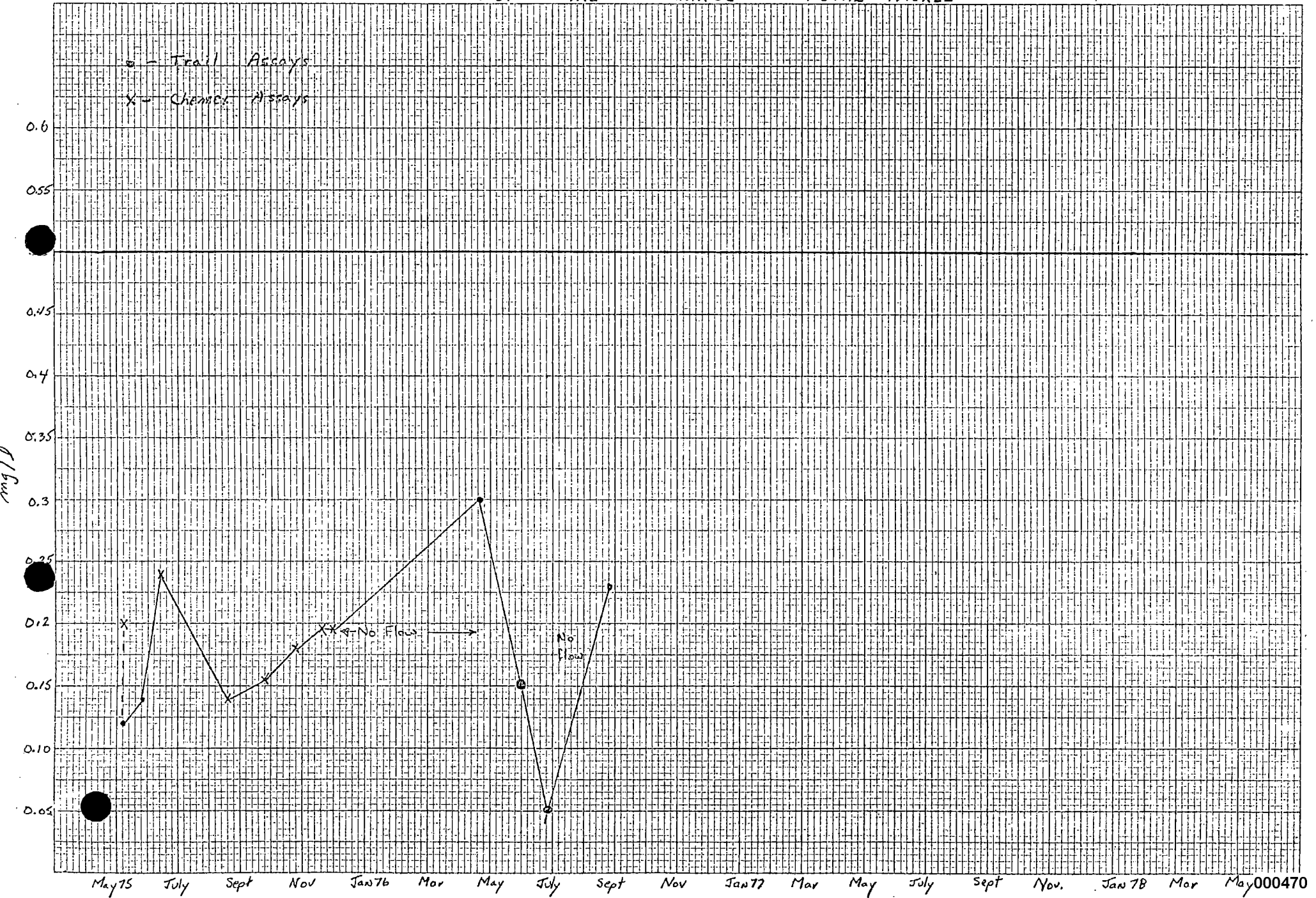
Less than 5

No Flow

mg/lw

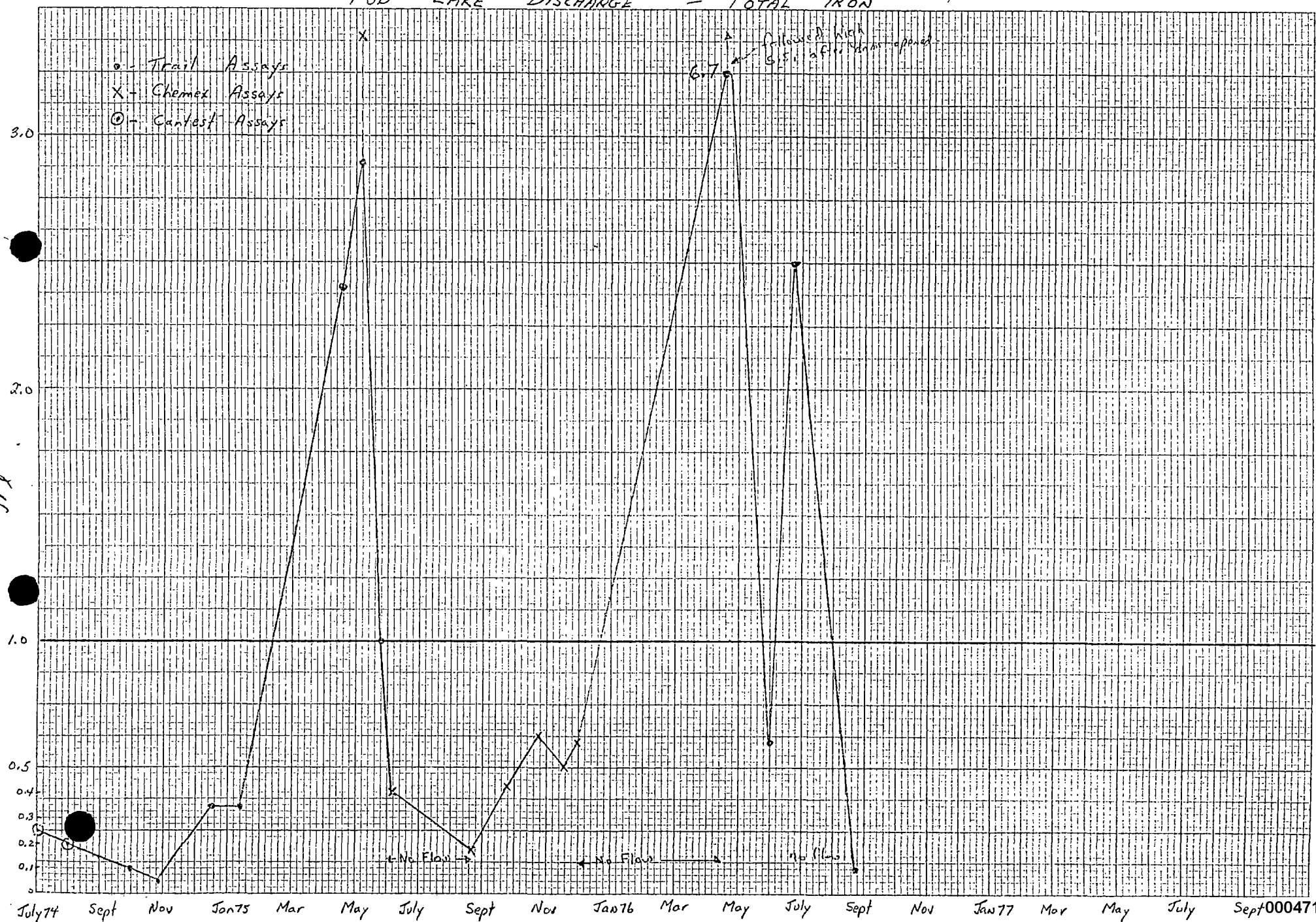


PUD LAKE DISCHARGE - TOTAL NICKEL

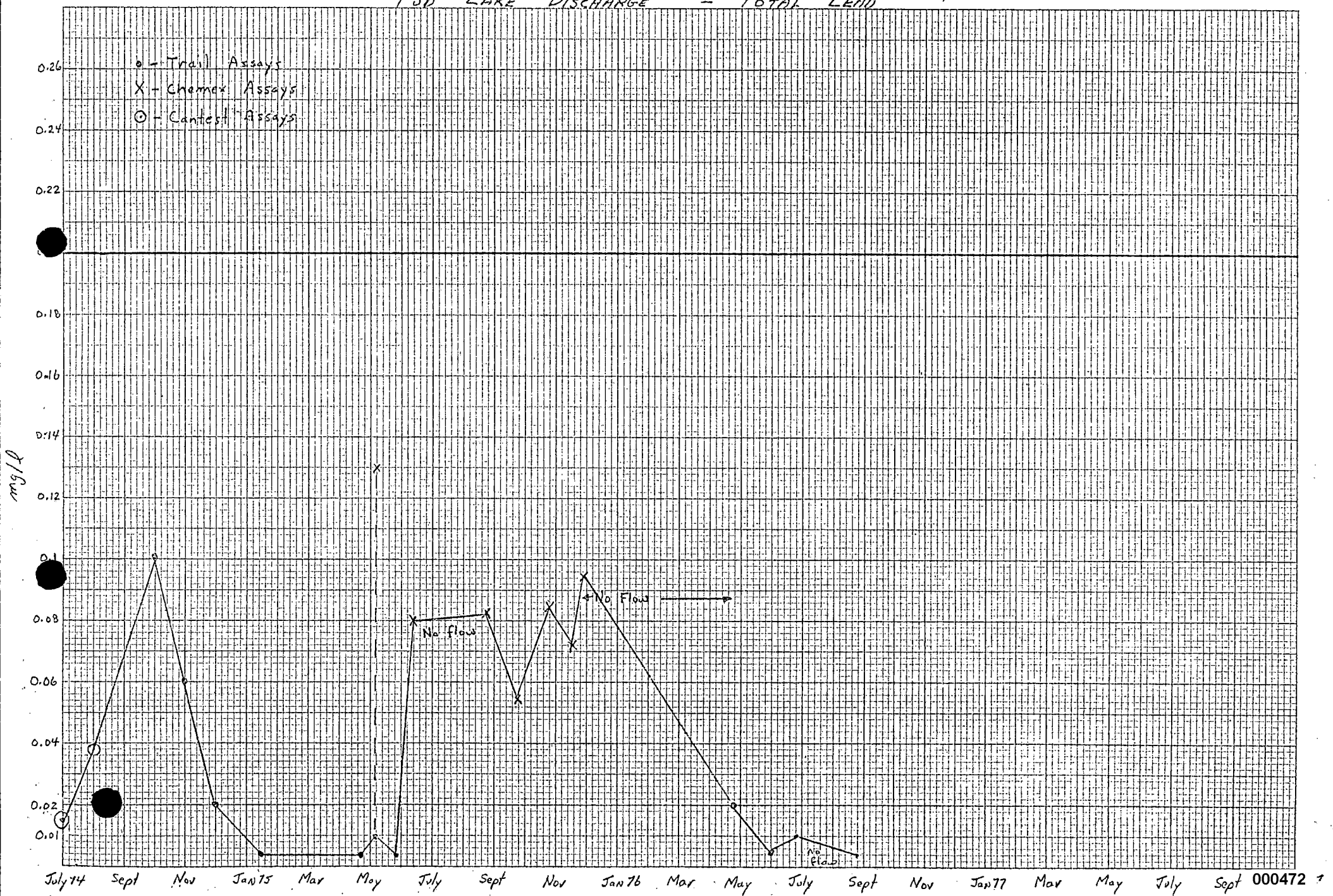


PUD LAKE DISCHARGE - TOTAL IRON

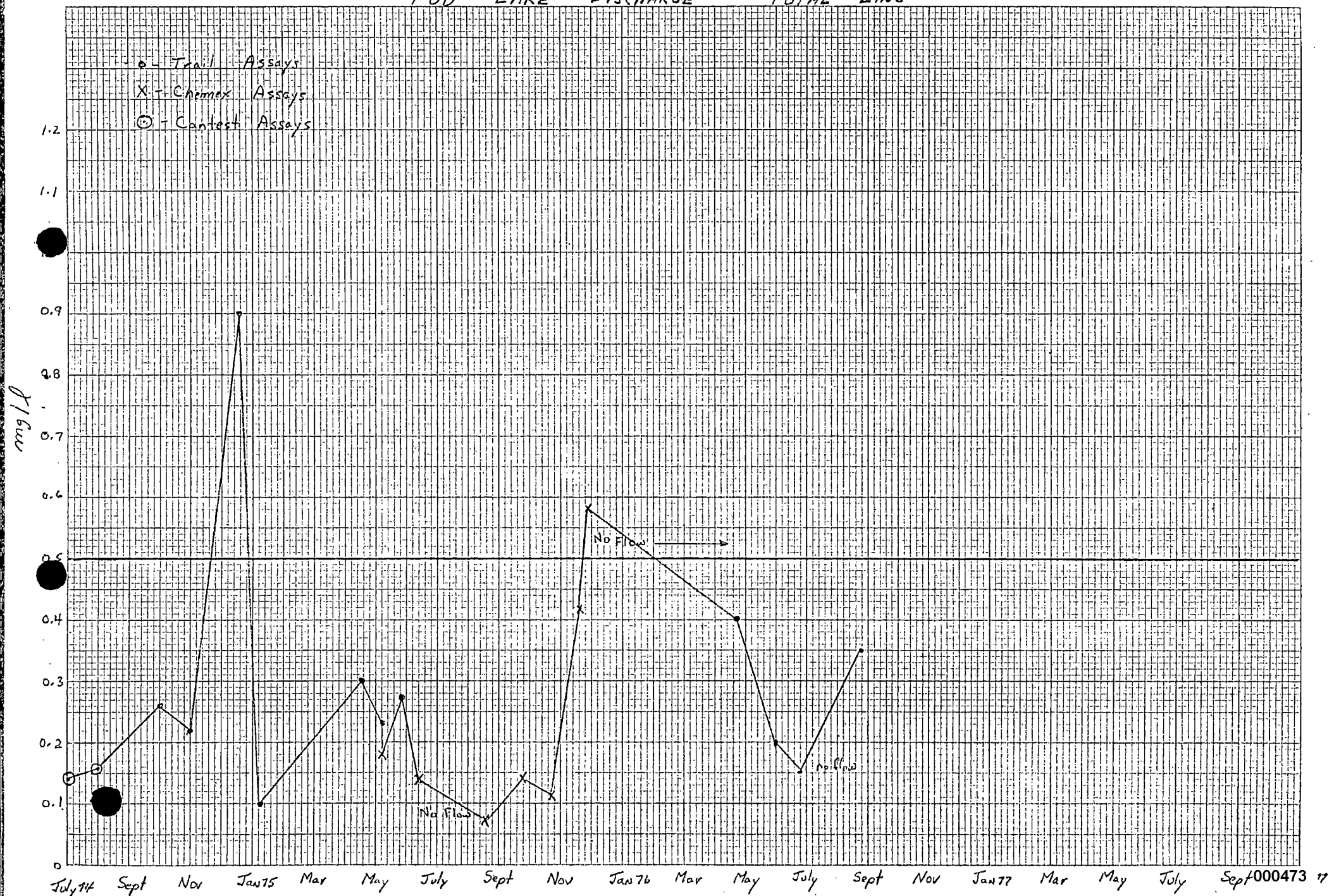
• - Trail Assays
X - Chemex Assays
○ - Cantest Assays



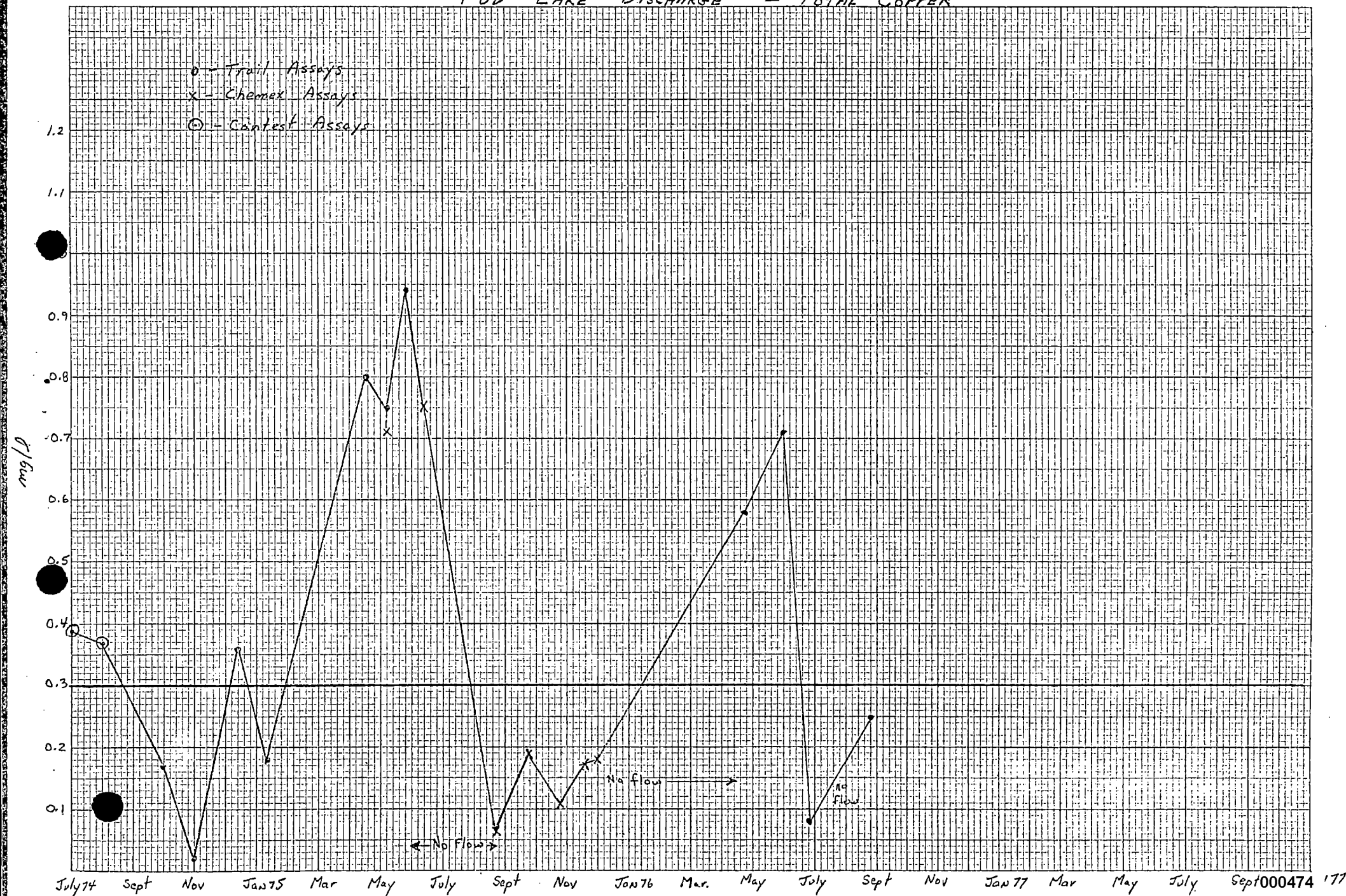
PUD LAKE DISCHARGE - TOTAL LEAD



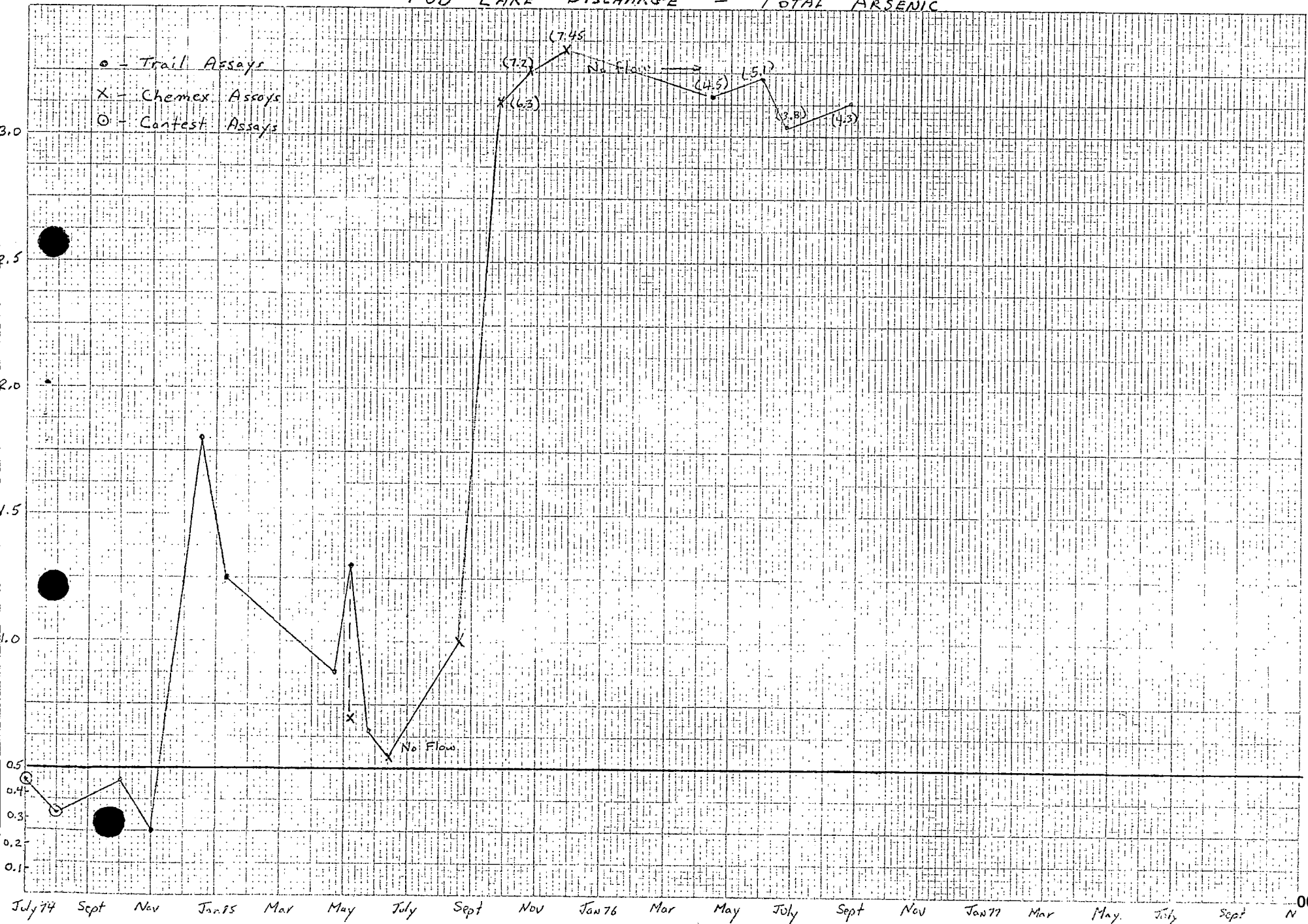
PUD LAKE DISCHARGE - TOTAL ZINC



PUD LAKE DISCHARGE - TOTAL COPPER

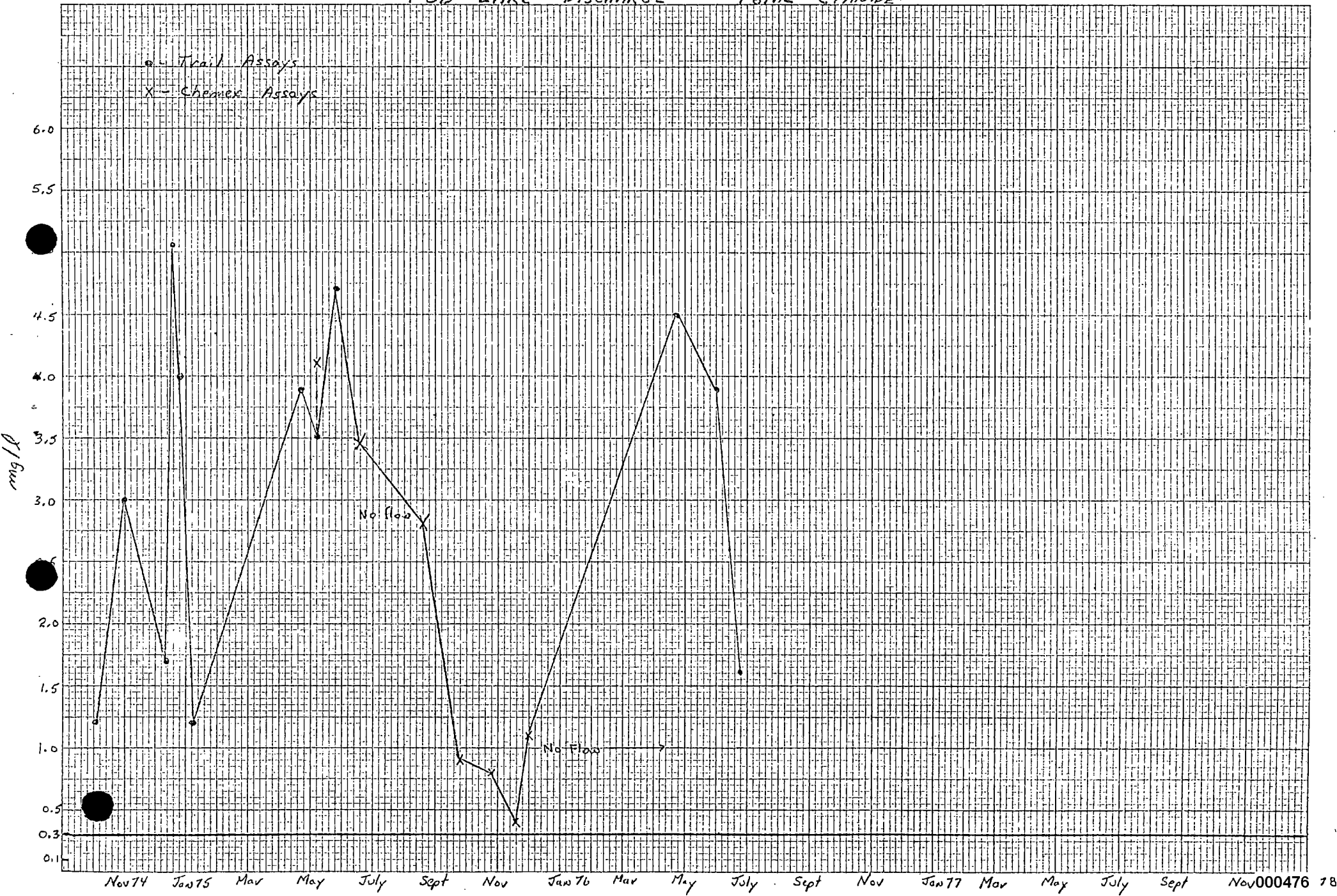


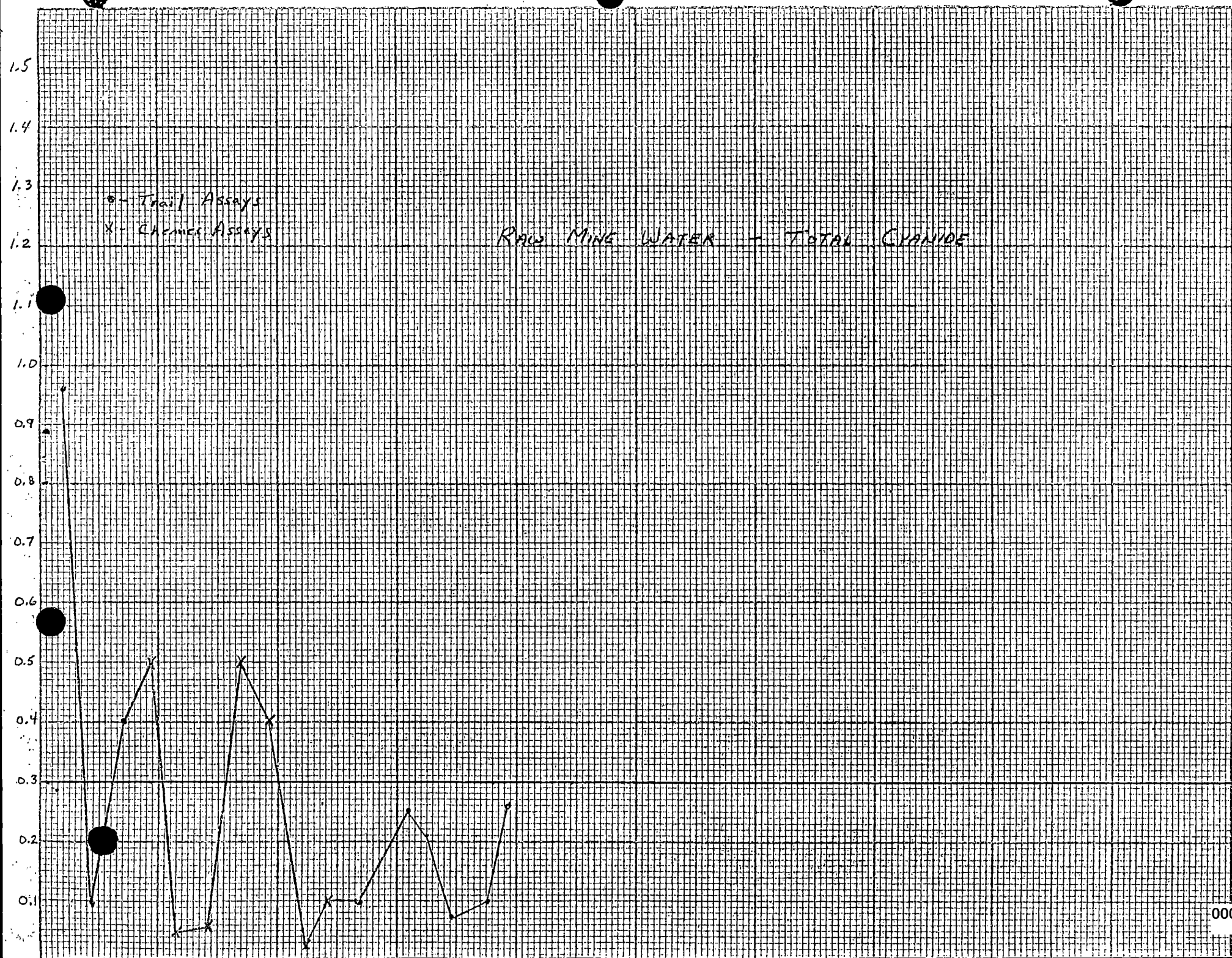
PUD LAKE DISCHARGE - TOTAL ARSENIC

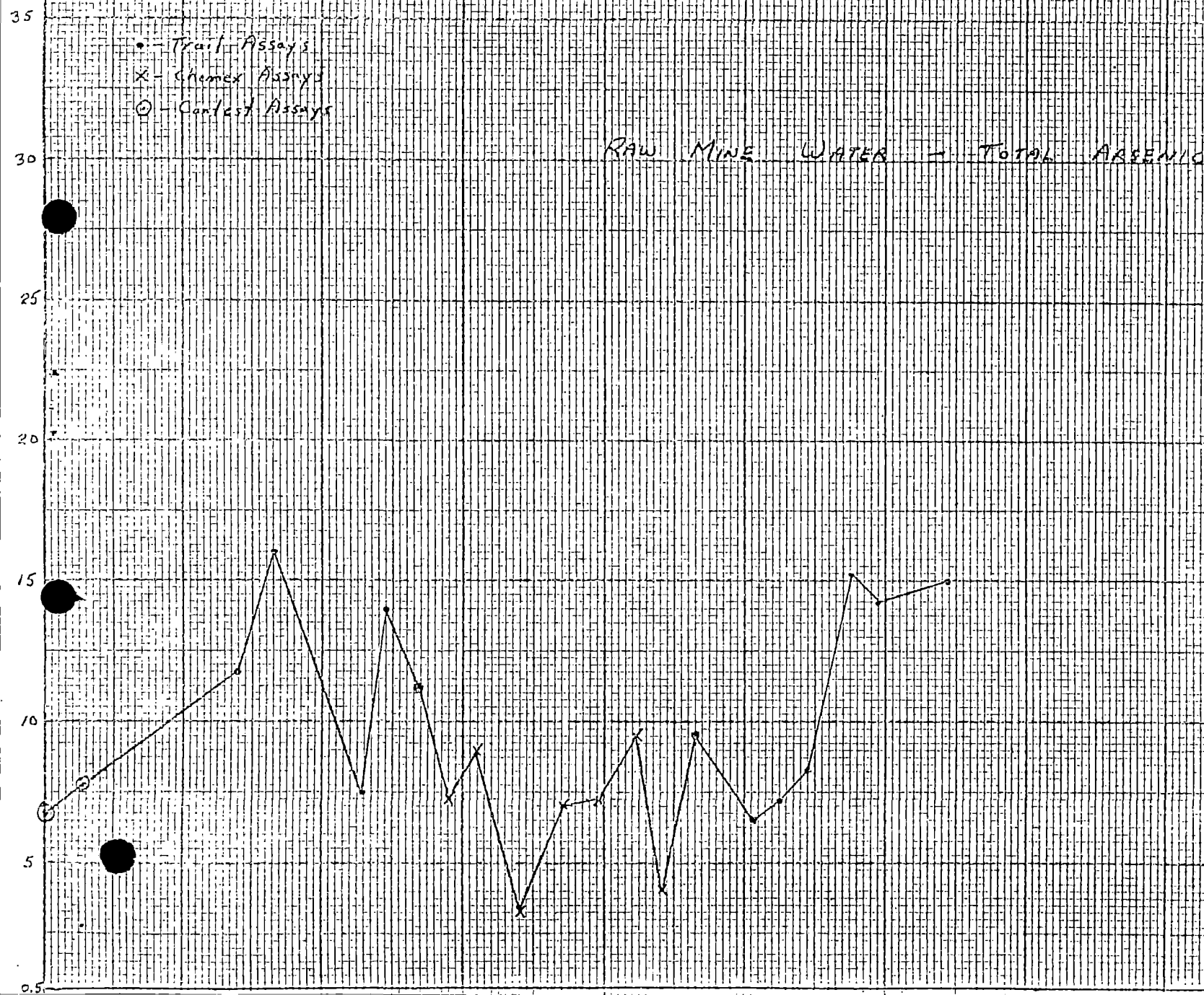


PUD LAKE DISCHARGE - TOTAL CYANIDE

• - Trail Assays
X - Chemex Assays







N1L3-0040

September 21, 1976

Mr. A. D. MacPhail
Superintendent, Con Operations
Cominco Limited
Con Mine
Yellowknife, N.W.T.

Dear Mr. MacPhail

Re: Water Licence Application #N1L3-0040
Northern Inland Waters Act

There will be a meeting of the Technical Committee to the Northwest Territories Water Board at 9 a.m., Tuesday October 5, 1976, in the Boardroom on the 8th Floor of the Bellanca Building, to review the conditions of the Draft Licence for Con Mine.

You are invited to be present and will be given the opportunity to make a presentation with respect to your written comments on the Draft Licence.

Please advise this office as soon as possible whether or not you will be attending this meeting.

Yours truly,

ATS

A. G. Redshaw
Controller

EM:sh