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REPORT ON THE CLOSING OF THE
JORDAN RIVER MINE
OF
SUNRO MINES LIMITED

PROPERTY FILE

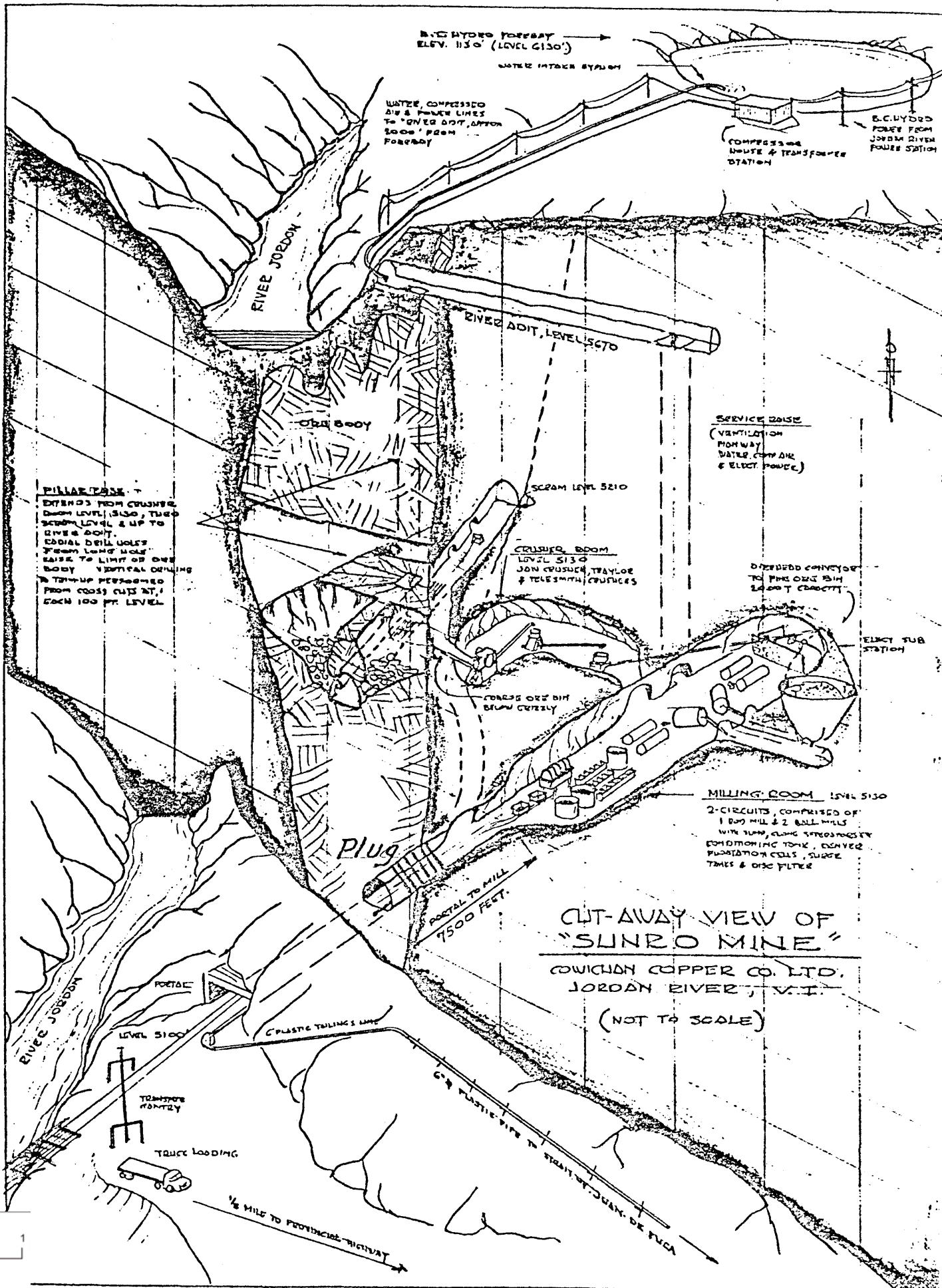
REPORT ON THE CLOSING OF THE
JORDON RIVER MINE
OF
SUNRO MINES LTD.

By

A.J. RICHARDSON
CENTRAL MINE ENGINEERING

June 1977

PROPERTY FILE



PILLAR CASE
 EXTENDS FROM CRUSHER ROOM LEVEL, 5130, THROUGH SCRAM LEVEL & UP TO RIVER ADIT. COAL DRILL HOLES FROM LONG WOLF RAISE TO LIMIT OF ORE BODY. VERTICAL DRILLING IS TAKEN UP FROM COSS CUTS AT 1 EACH 100 FT. LEVEL.

SERVICE RAISE
 (VENTILATION HIGHWAY WATER COMP. AIR & ELECT. POWER)

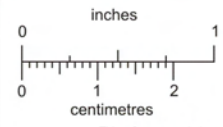
CRUSHER ROOM
 LEVEL 5130
 JOHN CRUSHER TRAYLOR & TELESMITH CRUSHERS

OVERHEAD CONVEYOR TO FINE ORE BIN 24,000 T. CAPACITY

ELECT. SUB. STATION

MILLING ROOM, LEVEL 5130
 2-CIRCUITS, COMPRISED OF 1 ROLL MILL & 2 BALL MILLS WITH SHAW-WALK SPEEDROCKETS. CONDITIONING TANK, CONVEYER, FLOTTATION CELLS, SURGE TANKS & DISC FILTER

CUT-AWAY VIEW OF "SUNRO MINE"
 COWICHAN COPPER CO. LTD.
 JORDAN RIVER, B.C.
 (NOT TO SCALE)



This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

Introduction

The mine flooded in 1963-1964 when a stope caved through to the bed of the Jordon River. The flooding caused the 5100 level main adit to cave in several places from 1,700 to 4,300 feet from the portal. The cave at 1,700 feet went through to surface and subsequent flooding caused considerable damage. The flooding was eventually stopped and six bypasses created around the caved areas on the 5100 level.

Early in 1977 it was discovered that two major caves had occurred at the location of the first two bypasses, approximately 1,700 and 2,500 feet from the portal. There was now a potential for a flood similar to that which occurred in 1963. If such a flood occurred, the consequences could be more serious because there is now a danger to a B.C. Hydro installation located downstream from the potential flood.

The B.C. Ministry of Mines instructed Cominco to construct a suitable plug in a safe location on the 5100 level so that there would never be any future danger of the river flooding through the level.

Summary

Rehabilitation of the caved 5100 level started in early March and made rapid progress through the first cave at 1,700 feet and to the second at 2,500 feet. Five separate attempts to excavate and timber through this cave were abortive. The last failure at the end of April resulted from crushing of heavy timber. The Ministry of Mines approval was gained for an alternative method of sealing the level. They also requested that a rock mechanics expert be consulted.

The proposal was to choke blast approximately a 100 foot section of the level in the vicinity of 6,600 feet from the portal. Access was gained through a ramp and raise system located in the north end of the mine and extending from 5700 to 5100 level. All equipment, blasting accessories, etc., had to be man-handled through this system. Surface access was via a two mile logging road to the 6200 level and then down a 25% grade to the 5700 ramp portal.

On June 2, 1977 110 feet of choke blasted plug had been successfully drilled and blasted. This required approximately 750 holes or 6,000 feet of stoper and jackleg drilling. 2,500 lbs. of explosive were required. It is expected that the mine will now be flooded by the present drainage into it.

Eight external openings to the mine were sealed with heavy timber. Cominco is committed to the inspection of these seals once each year.

A rock mechanics consultant reported on a preliminary assessment of the rock plug and after a site visit during the early drilling and blasting stages issued a final recommendation report which was closely followed. Approval of the Ministry of Mines was obtained after an on-site inspection of both the underground plug and the surface access closures.

The 1977 estimated total cost of the project is \$172,000.

Details

White Mine Development Ltd. of Vancouver was engaged as contractor to rehabilitate the 5100 level of the Jordon River Mine. They were on site March 7 and had repaired track, replaced timber, installed 30 inch fan ducting and mucked and timbered their way through the first cave at 1,700 feet by March 25.

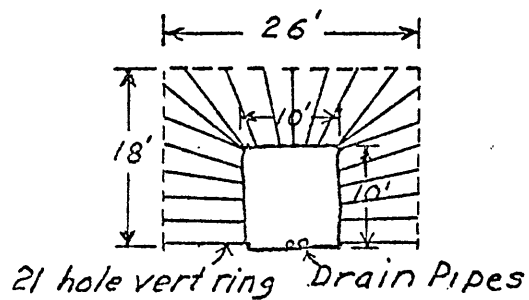
Five separate abortive attempts were made to get through the second of the two caves at 2,500 feet. 12 inch by 12 inch posts and caps plus 45 lb. rail were used. In each case several sets of timber and rails were installed and either the weight of ground or large falling chunks of rock wiped them out. Some of these chunks weighed several tons. The caved area was observed to be from 20 feet to 6 feet in diameter and more than 80 feet high. In addition, the original drift back and one wall were crushed for about 35 feet. Work was slowed by changes in the muck from free running fines to chunks and by the need to tram excavated material to surface once underground storage areas were filled. It was estimated that it would require about 350 feet of drift to drive around this cave with cost in the order of \$50,000.

An alternative was discussed and agreed upon with the Ministry of Mines whereby a 100 foot section of the level would be drilled off and choke blasted to provide a semi-porous but unyielding plug against a possible 600 foot head of water.

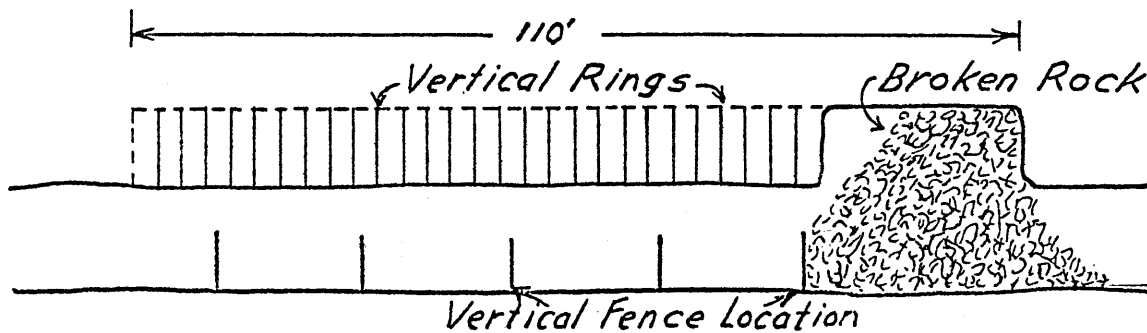
At the request of the Ministry, a consultant, Dames and Moore, Vancouver, was engaged to do first a preliminary evaluation of the plug theory and secondly a final report and recommendations after an on-site inspection of the early stages of drilling and blasting. Copies of both reports are attached. The contained recommendations were followed as closely as possible.

Since the site of the proposed plug on the 5100 level was approximately 6,600 feet from the portal, access on the surface above Jordon River was by logging road some three miles to the 6200 level. From here down to the 5700 ramp portal was via a rocky trail, carved in the mountain side at a 25% grade. Underground access started at the 5700 portal down a vertical raise to the 5500 level then down two steep raises to the 5300 level. From here it was possible to walk down the ramp system to the 5100 level. All equipment, blasting supplies, etc., had to be manhandled through this system. Several days were required to rehabilitate the old airline system which was attached to two portable 150 cfm compressors at the 5700 portal.

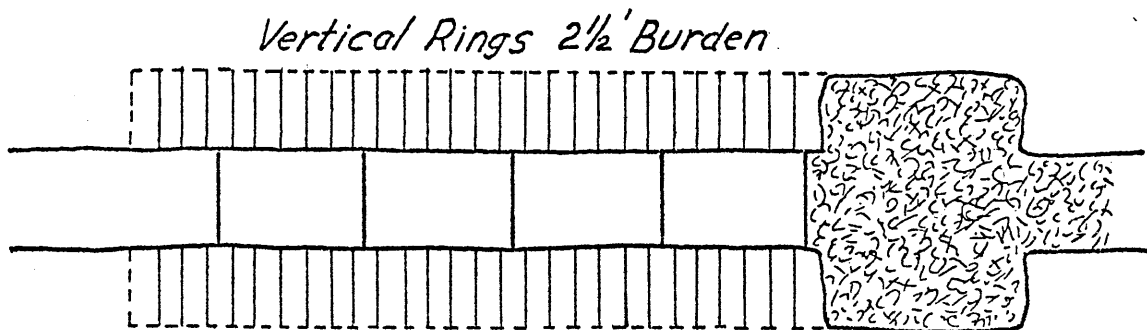
The 5100 level cross section is approximately 10 feet by 10 feet and it was agreed that the back and sides should be broken out an additional 8 feet in order to provide the necessary swell to plug the void. The initial slot was started in a widened out section of the level about 20 feet ahead of the normal cross section. This proved to be fortunate because it took several combinations of hole spacing and ring burden to determine the optimum pattern for breaking the ground with vertical rings. Some redrilling and blasting of the slot was required and by the time this was complete the broken muck was tending to flood back and bury the lower side holes of unblasted rings. To stop this a 6 foot vertical timber fence was constructed between the last ring of one blast and the first ring of the next blast. Burden between rings was 2 1/2 feet. Each



X-SECTION



PROFILE



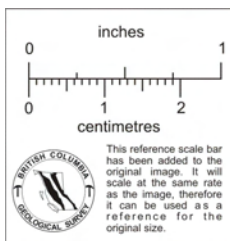
PLAN

SUNRO MINE 5100 LEVEL

SKETCH

CHOKE BLASTED ROCK PLUG AT PORTAL +6700'

Date - June 1977
Scale - 1" = 20'



ring consisted of 21 holes, seven in each side and seven across the back. The side holes were drilled with a jackleg and the back holes with a stoper. When 12 such rings were drilled off then six were blasted at once using 10 foot tape fuse and thermalite igniter cord. Explosive was CIL 75% Cilgel. Before each blast, a 6 inch and a 4 inch drainline was connected and laid between the rails and covered with old plank and loose rock. Despite the fact that the pipe was of old lightwall construction it provided necessary drainage up to the last blast when it was abandoned.

Work was performed on two shifts with three men on each shift. With the aid of compressed air blowing and natural ventilation it was possible to return to the working area within three hours after a blast. The crew could drill between 40 and 48 holes in a shift and it took a full shift to load, hook-up, construct the vertical fence and blast.

The timber fence between rings required four 6 inch bullhorns, two installed 6 feet up each wall and two near the bottom of each wall. 6 inch or 8 inch timber was placed horizontally in the bullhorns from wall to wall. Scrap planking, even an old plywood door, was nailed to the timbers on the blast side. Successive blasts did not even break a plank. Collar overbreak was the biggest problem.

Total drilled and blasted footage was in excess of 6,000 feet requiring over 2,500 lbs. of explosive. The length of blasted plug was 115 feet. Muck size was not deliberately varied from start to finish nor was the footwall drilled and blasted because of the drain lines. The drain lines were not extended into the last blast so it is anticipated that the mine will flood because of the present drainage into it.

A total of eight surface entries were barricaded to prevent normal human entry. They were not blasted closed because it was not possible to guarantee that one blast would be effective and a second would be very hazardous under 100 foot vertical cliffs. All vertical bulkheads were of similar construction, 8 inch by 8 inch posts and caps with 3 inch fir planking spiked to them with 8 inch and 10 inch spikes.

Vertical bulkheads were placed inside the wire gate in the 5700 ramp portal, in the portal 50 feet upstream from 5700 and in a nearly inaccessible portal 200 feet upstream and 50 feet above the 5700 level. The stope opening downstream from 5700 was barricaded 100 feet underground. The vertical ore pass opening was covered with 60 lb. rail and two foot diameter logs rolled on top of the rail. The portals were closed at 5900, 6200 and the main 5100 level. No clean-up was attempted and the trestle at 5100 level was left intact. Cominco has a commitment to inspect these closures once each year.

The Ministry of Mines inspected the underground rock plug and the surface closures and expressed their approval. The letter is attached.

Summary of Actual and Estimated Costs

Contractors charges plus profit	\$146,000
Cominco supervision, expenses and material	24,000
Consultant fees	2,000
	<hr/>
Total	\$172,000 *

* Of this total \$53,000 was estimated.



AJRichardson:lw
Central Mine Engineering
cc: KVMeyer (2)
KGDavies
File (2)

Attachments

APPENDIX

MINISTRY OF MINES CORRESPONDENCE



DEPARTMENT OF MINES AND PETROLEUM RESOURCES

2226 Brotherstone Rd.
Nanaimo, B. C. V9S 3M8

February 18, 1977.

Mr. K. V.S. Meyer,
Manager, Outside Mines
Cominco Ltd.,
Trail, B. C.

Dear Sir:

Re: Sunro Mine - Plug Installation

A portion of the 5100 level of the Sunro mine was inspected by Mr. Harold Armour yesterday. Mr. Armour has advised me, by telephone, that further caving has occurred on the 5100 level since our inspection on January 31, 1977.

*Jan 17.
@ 1700*

In my letter to you of February 1, 1977 it was pointed out that the required plug should be installed with as little further delay as possible to reduce the chance of further caving. Now that further caving has taken place I must advise that it is urgent that rehabilitation of the 5100 level of the Sunro mine be initiated as soon as possible and that work proceed thereafter with the plug installation as described earlier.

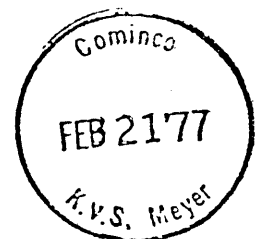
Yours truly,

W. C. Robinson, P. Eng.,
Inspector of Mines &
Resident Engineer

WCR/gp

c.c. J.W. Peck

P. S. The key to the portal is being returned herewith.



Mr. W.C. Robinson
Inspector of Mines
Department of Mines
and Petrolaun Resources
2226 Brothertown Road
Nanaimo, B.C.

April 22, 1977

Subject: Plugging the 5100 Level, Sunro Mine

Dear Mr. Robinson:

This will confirm the results of our investigation and discussion on April 20, 1977.

It was agreed that one more attempt will be made to get safely through the No. 2 cave on the 5100 level of the Sunro Mine. The attempt will use 12"x12" timbers and double posting where possible. If this attempt fails then it was agreed that access to the plug site would be gained via the 600 foot vertical escapeway raise at the north end of the level.

In this event, the plug would be created by drilling and chokes blasting not less than 100 feet of drift south from where the drift is marked 6700. This will be done in stages and under my supervision so as to ensure an adequate plug or barrier to any inrush of water. A 6" or 3" line will be laid underneath the blasted rock.

It is understood that you will check the progress of the present work and call it off if the effort becomes unreasonable.

Yours very truly,



A.J. Richardson
Senior Mining Project Engineer

✓ AJR:lv

cc: KVS Meyer
KGDavies
JWhite


THE DEPARTMENT OF
MINES AND PETROLEUM RESOURCES

WHEN REPLYING PLEASE REFER TO

FILE NO.

2226 Brotherstone Rd.
Nanaimo, B. C. V9S 3M8

May 3, 1977.

Mr. A. J. Richardson,
Senior Mining Project Engineer
Cominco Ltd.,
Trail, B.C.
VIR 4L8

Dear Sir:

Re: Sunro Mine - Plug Installation 5100 Level

It was agreed, during our last mutual visit to the Sunro mine on April 20, 1977, that if one more attempt, using 12" x 12" timbers and double posting, failed to proceed through the second cave in the 5100 level then further attempts to gain access to the mine through the 5100 level should cease. It was further agreed that the only other practical means of gaining access to a proposed plug installation site in the 5100 level would be via the 600 foot vertical escapeway raise inspected by us on April 20th.

From a report from Mr. Bruce Lang, of our Ministry, and from my telephone conversation with you this morning, it is understood that the last attempt to gain access to the plug installation site through the 5100 level has had to be abandoned and that the alternate access will be used. It is unfortunate that access to the proposed plug installation site could not have been gained through the 5100 level and the cement plug installed as originally planned. During the inspection visit on April 14, 1977 it appeared that an excessive quantity of "muck" was being removed by the Scooptram and it was recommended that "hand mucking" be resorted to when possible in an attempt to reduce the quantity removed, and thus the size of a void being created above reduced. I have been advised that over 500 tons of cave material was mucked from the second cave, which would indicate a large cavity or large un-stable area above the level.

It is understood that an engineering consultant, expert in rock mechanics, has been engaged to assess the suitability of a rock plug proposed for the area in the 5100 level inspected by us on April 20th. It is further understood that a preliminary engineering report from this consultant, concerning the proposed plug, will be available. Your co-operation in advising me of the time of the proposed visit to the property by the consultant will be appreciated so that a mutual visit can be made by the consultant, yourself, and myself.

Yours truly,



W. C. Robinson, P. Eng., Inspector of Mines
& Resident Engineer

WCR/gp

c.c. Mr. J. E. Merrett



THE DEPARTMENT OF
MINES AND PETROLEUM RESOURCES

WHEN REPLYING PLEASE REFER TO

FILE NO.

2226 Brotharstone Rd.
Nanaimo, B. C. V9S 3M8

June 10, 1977

Mr. K. V.S. Meyer,
Manager, Outside Mines,
Cominco Ltd.,
Trail, B. C.

Dear Sir:

Re: Surface Openings - Sunro Mine

An inspection was made yesterday, in company with Mr. A. J. Richardson of your company, of surface openings at the Sunro mine. It was found that a total of seven openings had been sealed with timber and 3 - inch planking. (It was noted that an eighth opening, an ore pass, had been effectively sealed with steel rails.)

This sealing should prove satisfactory as a means of deterring persons from entering the underground workings as long as the seals remain intact. Mr. Richardson has advised that an inspection would be made by your company of the various seals at least once a year to ensure that they remain effective.

The work undertaken by your company to ensure that conditions at the Sunro mine have been left in a satisfactory condition with regard to safety of the public is appreciated.

Yours truly,

W. C. Robinson, P.Eng.,
Inspector of Mines &
Resident Engineer

WCR/ep

c.c. Mr. A. J. Richardson ✓
Mr. J.E. Kerrett

RECEIVED
JUN 13 1977
ENGINEERING PROJECTS
CENTRAL FILE