

W.A. No.

NAME GEOL RPT

SUBJECT

.....

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MONARCH

**82N019 - 07
PROPERTY FILE**

005160

MONARCH



~~Barford~~
~~Barford~~

OFFICE OF THE MINING ENGINEER

304 FEDERAL BUILDING
325 GRANVILLE STREET
VANCOUVER

Mr. Foreland

Copy for Mr. Foreland

June 4, 1942.

REGISTER
VIA AIRMAIL

George Bateman, Esq.,
Metals Controller,
Department of Munitions and Supply,
Room 221, No. 3 Bldg.,
OTTAWA, Ont.

Dear Sir:

Herewith is a report dealing with the possibility of recovering additional zinc by treating some 4000 tons of rather oxidized sulphide tailings, previously cyanided at the Ymir Yankee Girl mill. The company does not propose to treat this material because it would be necessary to install a small amount of equipment, and according to report, attempts to secure the equipment met discouraging results. If use of the equipment could be obtained for the short period, the present campaign at the mill could be extended for a month or so, and would probably make an additional 300,000 pounds of zinc as well as some lead and cadmium available. It would probably require remission of the United States duty on the zinc.

Also enclosed herewith is a report regarding Base Metals Mining Corporation's operation at Field, outlining a proposal to bonus production of sub-marginal ore principally from floors and roofs of stopes in the Monarch and Kicking Horse Mines. This proposal calls for no new equipment, except possibly rock drills to replace some nearly worn out. It would probably make an additional 3,500,000 pounds of zinc and some lead available, and might contribute toward considerably greater additional production. It would definitely require a bonus in addition to remission of United States duty.

Reserves of profitable ore at the company's mines were some 25,000 tons on April 19th, and profitable ore may therefore be exhausted by fall. Submarginal material available April 19th was estimated at probably 45,000 tons, averaging 5% combined lead and zinc or better. This quantity would probably yield 3,500,000 pounds of zinc in zinc concentrates as well as a considerable quantity of lead in lead concentrates.

The report shows probable cost of lead or zinc as about 2.2¢ per pound more than present net return. This would require a bonus of say 1¢ per pound, in addition to remission of the United States duty. The matter is complicated by the fact that the submarginal material should be handled along with profitable ore, and that to secure maximum rate of production, it is desirable to leave every incentive to produce profitable ore which yields more metal per ton.

If bonusing is considered warranted, it might be that payment could be made on monthly declaration of average grade and tonnage of sub-marginal ore milled and of grade and tonnage of profitable ore milled, mine books and works being at all times open for inspection.

Yours very truly,

H. Sargent,
Mining Engineer.

HS/LEC
Encls.

BASE METALS MINING CORPORATION

This company, with mill situated on the main line of the Canadian Pacific Railway about 3 miles east of Field, produces zinc, lead, silver ore, from the Monarch Mine on the southern side of Kicking Horse River and from the Kicking Horse Mine on the northern side. The Monarch Mine has produced substantial quantities of metal and recently the Kicking Horse Mine has produced important quantities. The ore occurs in bodies of low dip replacing limestone. The total lead and zinc content varies in the bodies and in different parts of the bodies as does the ratio of zinc to lead. In general zinc is substantially in excess of lead. The zincblende is almost iron free. Lead concentrates and zinc concentrates of exceptionally high grade are produced from this ore. The current rate of milling is between 275 and 300 tons per day. For some time grade of ore has averaged 3 to 4 percent lead, about 11 percent zinc, and less than one ounce silver per ton. On ore of this grade, recovery of lead in lead concentrate has been about 93% and of zinc in zinc concentrate, has been about 86%. Total costs, including mining, tramming and milling, have averaged a little less than \$4.00 per ton for the past year.

82N019

Pro Formo settlement sheets attached illustrate smelter contracts and arrive at net returns, per pound of lead recovered in lead concentrate, 3.10¢, and per pound of zinc recovered in zinc concentrate, 2.69¢. These are very close approximations to average returns per pound for the two metals under present conditions. With average recovery of 93%, one unit of lead (20 lb.) per ton of ore milled yields a net return of 57.6 cents and one unit of zinc with average recovery of 86% yields a net return of 46 cents. Recently the "out off" for profitable grade has been taken as 11% combined lead and zinc.

On the margins of the oreshoots which have been stoped, particularly in the floors and roofs, there may be several feet of low grade mineralization. Some oreshoots are entirely of low grade material. Current exploration work is finding some profitable ore, particularly in the southeasterly extension of the east Monarch workings.

At April 19, 1942, the mine engineer estimated recoverable ore as follows:

| | |
|--|--------------|
| Type A, 11% combined lead and zinc or better | 26,700 tons |
| Type B, 8% combined lead and zinc | 14,100 tons |
| Type C, 5% combined lead and zinc | 29,000 tons. |

These estimates are based largely on experience in working the deposit. The submarginal material, Type B and Type C, is not defined by workings or drill holes. Therefore the estimates might be some distance from the mark. The estimate for Type B is the best guess at the quantity of ore mineable lower than 11% but not lower than 8% in combined lead and zinc, and for Type C lower than 8% but not lower than 5%. On April 29th, the manager, T.C. Botterill, wrote that diamond drilling has indicated the likelihood of an additional substantial quantity of material below commercial grade.

The reserves of profitable ore, 26,700 tons, are small and it is likely that profitable ore will soon be exhausted. If the operation shuts down in a few months after exhausting the profitable ore, the organization will almost certainly be broken up and it is probable that the equipment will be moved from the property.

The estimated quantity of submarginal material, 43,000 tons (Type B and Type C), according to the estimated grade, would have an average metal content of 6.2 percent combined lead and zinc. Per cent of metal recovered from milling this material would be lower than from milling higher grade ore; it seems reasonable to expect that about 105 pounds of metal per ton would be recovered. This would be about 80 percent zinc, so that the tonnage estimated would yield roughly 3,500,000 pounds of zinc in zinc concentrates, as well as a considerable quantity of lead in lead concentrates. If it were possible to mine and mill this ore along with the remaining profitable ore, the efficient plant equipment and organization would be used, development required would be small, and equipment required would be restricted almost entirely to replacement of wearing parts. The life of the operation would be prolonged and important quantities of metal would be made available. Exploration should be continued during the life of the operation, and it might well find added ore of profitable, or submarginal, grade, prolonging the life of the operation and increasing the yield of metal considerably beyond the present anticipation.

Some program of bonusing production to cover the loss on submarginal ore would be necessary. If the need for metal is great enough, such a program at this property would have a good chance of yielding valuable results.

The manager of Base Metals Mining Corporation after consultation with the writer had estimates prepared designed to show the bonus necessary per ton of submarginal ore. It must be remembered that quantity and grade cannot be estimated closely. For working purposes it was proposed that, as is now the case, the limits of mining would be controlled by sampling, but that the minimum grade would be reduced to 5% combined lead and zinc.

Mr. Botterill's estimates are as follows:

| | |
|--|---------------------|
| "Mining Costs | \$2.00 per ton |
| Milling Costs | 1.38 " " |
| Administration and General Expense at Mine | .34 " " |
| Mineral Output Tax | .06 " " |
| School and Property Taxes | .02 " " |
| Head Office Administration, Interest and Legal | .09 " " |
| Production Cost Total | <u>\$3.89</u> |
| Depreciation on Plant, Buildings, and Equipment | .61 " " |
| Profit per Ton | <u>1.00</u> |
| Total Cost per Ton | 5.50 |
| Value of metal recovered from submarginal ore (present prices) | <u>2.72 per ton</u> |
| Cost Difference per ton | 2.73 " " |

The amount of metal recovered from weighted averages per ton equals 105 pounds.

Per Ton Cost Difference $\frac{2.73}{105}$, 2.6¢ per pound.

A bonus of 2.6¢ per pound of metal is required to balance above figures. This does not allow for any development program.

To allow for development while sub-marginal ore is being mined:-

| | |
|---|-------------|
| Total Cost per Ton | 5.50 |
| Add 25¢ per ton to allow for con- tinuing exploration for new orebodies | <u>.25</u> |
| Per Ton Cost | 5.75 |
| Value of metal present prices recovered from sub-marginal ore | <u>2.77</u> |
| Per Ton Cost Difference | 2.98 |

Per Ton Cost Difference $\frac{2.98}{105}$, 2.84 cents per pound of metal.

A bonus of 2.84¢ per pound is required to balance the above figures."

The estimates of operating and administrative costs seem reasonable. Some factors in regard to costs must be kept in mind. The present operation is regarded as salvage with limited life and equipment has been allowed to run down, replacement of wearing parts would be required and some replacement of rock drills might be necessary if the life of the operation is to be extended for say 6 months. Some sections counted upon to yield ore might be disappointing and the necessary preparation putting in chutes, installing slushers, etc., would have involved expense which would yield little or no return. In milling the lower grade material with low content of friable sulphides, the quantity ground per day would be less than when treating higher grade ore. Replacements, and the lower rate of grinding were considered in preparing the estimates but failure of some sections to produce ore has **not** been allowed for.

For development, 25 cents per ton is added to the estimated operating cost; its purpose is defined as exploration. The estimated costs include "\$0.61 for depreciation on Plant Buildings and Equipment," and "\$1.00 Profit per Ton". Provision for exploration is entirely reasonable. The write-offs for Depreciation, and the allowance for Profit are approximately those prevailing in handling profitable ore. If production is bonused, the allowance for depreciation and profit need not be as high as for ore of profitable grade; it represents a return made possible by granting the bonus; \$1.00 per ton to cover Depreciation and Profit should be adequate. My calculations indicate a return from 105 pounds of metal of at least \$3.85. Accordingly the figures become:

| | |
|--|-------------|
| Production Costs | \$3.89 |
| Development | .25 |
| Allowance for Depreciation and Profit | <u>1.00</u> |
| | \$5.14 |
| Net return for 105 pounds metal | <u>2.85</u> |
| Deficit | \$2.29 |

Bonus required per pound of metal $\frac{2.29}{105}$, 2.24.

A little more than half the bonus would be covered by removal of United States Duty. If the metal is urgently needed, I recommend that this possibility be considered with a view to immediate action.

Pro Formo Settlement for Lead Concentrates
Shipped to East Helena, Montana

1 ton dry weight, moisture 8%, Assay Pb 78%, Ag 10 oz.

Contents 1560 lb. Pb 10 oz. Ag

| | | |
|-------------------|------------------------|-------------|
| Gross Value | Lead 1560 @ 6.5 | 101.40 |
| " " | Silver 10 oz. @ 35.125 | <u>3.51</u> |
| Gross Value Metal | | \$104.91 |

Less Metal Deductions

| | | |
|---|-------------|--------------|
| Lead 30 lb. @ 6.5 | 1.95 | |
| Silver 1 oz. @ 35.125 | .35 | |
| 10% of rem.lead, 10% of (1560-30) lb., 1530 @ 6.5 | <u>9.95</u> | <u>12.25</u> |
| | | \$92.66 |

Less Price Deduction
(2.3¢ lb. on 90% of settlement
assay, includes allowance for
duty) (1530-153) @ 2.3¢

| | | |
|--|--|--------------|
| | | <u>31.67</u> |
| | | \$60.99 |

| | | |
|----------------|------------|--------------|
| Less Treatment | 9.25 | |
| Handling | <u>.25</u> | <u>9.50</u> |
| | | \$51.49 U.S. |

| | | |
|---|--|--------------|
| Add Exchange Premium | | <u>5.15</u> |
| | | \$56.64 Cdn. |
| Less Freight @ \$6.74 + 6% + 7%(1.08 ton) | | <u>8.22</u> |

Net Value per ton \$48.42

Net Value per pound of lead 3.104¢ per lb. total Pb.

Base Metals Mining Corporation

Zinc Contract

Shipped to La Salle, Ill., through
Tennant Sons & Co., N. Y.

Zinc content to be 57% Zn or better.

Pay 2.95¢ per lb. for 100% of zinc content at quotation
6.25¢/lb. Add 0.64¢ per lb. for increase of 1¢
per lb. in quotation, fractions in proportion.

Unloading charge 15¢ per ton.

Brokers' Commission 50¢ per ton.

Pro Formo Settlement

1 ton dry weight, assay 59.00% Zn, Moisture 10%.

Zinc Content 1180 lb.

Quotation 6.25¢

Settlement Price 2.95 plus 1.28 , 4.23¢
Less duty 1.2¢ 3.03¢ net.

Settlement

| | | |
|---------------------------|-----|--------------|
| 1180 lb. Zinc @ 3.03¢ | | \$35.75 |
| Less | | |
| Unloading | .15 | |
| Commission | .50 | |
| Assays and weighing | .16 | .81 |
| | | <hr/> |
| | | \$34.94 U.S. |
| Add Exchange Premium | | 3.49 |
| | | <hr/> |
| | | \$38.43 Cdn. |
| Deduct Freight (1.1 ton) | | 6.64 |
| | | <hr/> |
| Net Value per ton | | \$31.79 |
| Net value per lb. on 100% | | |
| of contained Zinc | | 2.694¢. |

Vancouver, B.C.
June 4, 1942.

H. Sargent,
Mining Engineer.

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SPECIAL REPORT

ON THE ACTIVITIES OF

BASE METALS MINING CORP^Y CO., LTD.

BY

K. J. CHRISTIE.

circa Sept., 1948.

**FILE ↓
82N019 + 020**

SPECIAL REPORT
ON THE ACTIVITIES OF
BASE METALS MINING CORP[']M CO., LTD.

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SPECIAL REPORT ON ACTIVITIES OF BASE METALS MINING
CORPORATION CO., LIMITED

INTRODUCTION:

On August 15th, 1948, the writer arrived at the property of the above mentioned Company, where five days were spent examining both the underground and surface workings with a view to obtaining all possible information on the present operations of the Company.

The lead and zinc deposits of this Company are located on the main line of the Canadian Pacific Railway at a point three and one-half miles northeast of Field, B.C., within the confines of Yoho National Park.

The orebodies lie on each side of the narrow glaciated Kicking Horse Valley consisting of the Monarch Mine in Mount Stephen and the Kicking Horse Mine in Mount Field with their outcrops approximately one thousand feet above the valley floor, in almost vertical cliffs. The rugged alpine nature of the topography makes for difficult location of claims and to ascertain definitely whether the Company are operating within their claim boundaries would require an extremely costly survey entailing at least a years work. Therefore, for this report, the writer assumes, on the basis of underground plans, which appear accurate, that no question arises out of the Company not operating on their own ground.

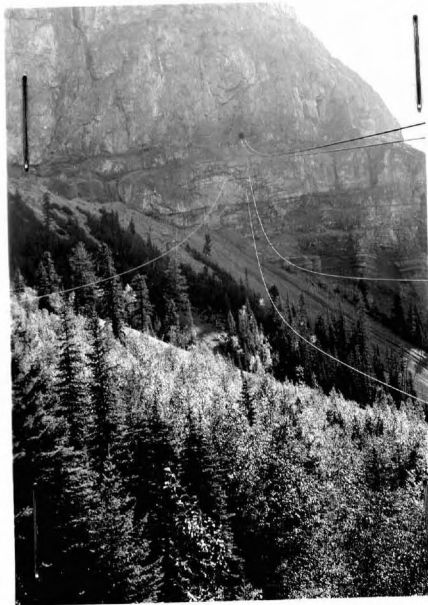
The methods employed in extracting the ore vary considerably in this type of deposit from most mines throughout Canada, which is fully covered under Mining Methods. Little handicap to mining operations is experienced even with the rugged topography, in that the gap between the valley floor and the mine adits is spanned by gravity-controlled aerial tramways.

HISTORICAL:

The mine is one of the oldest in British Columbia, being located in 1884 during Railway construction in the area. The finding of float in the talus slopes below Mount Stephen, led to the discovery of the East Monarch ore body in the cliffs above.

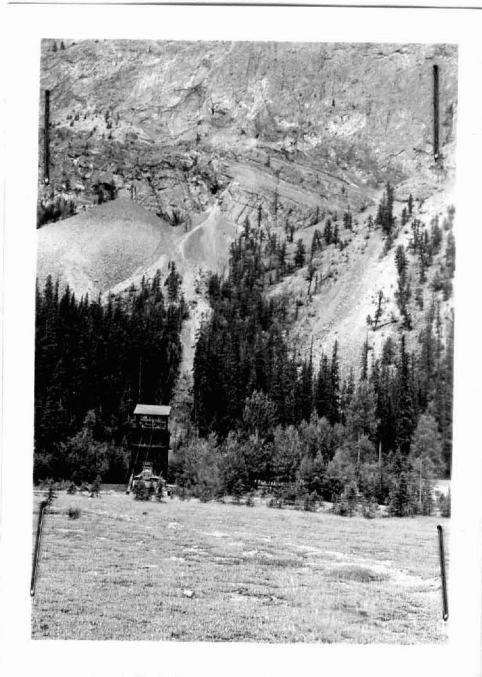
The mine was spasmodically worked from 1884 until 1929. In 1929 a 300-ton mill was erected to concentrate the ore and stoping commenced on the large West Monarch orebody. Between 1935 and 1939, very little milling was done but an active development program was carried on and development commenced in the Kicking Horse Mine in Mount Field.

In 1933 Goldfield Consolidated Mines Company sold its 51 percent interest to a syndicate allied with the Mining Corporation of Canada who continued operating the property until early 1947. The Company is now managed by Chamberlin Management Corp.



East Monarch Mine Entrance in Mount Stephen

Upper cables are $1\frac{1}{2}$ -inch diameter steel track-cables on which the gravity-controlled aerial trams operate. Lower cables are attached to the trams. Line at left of picture is used for telephone communication between operators of the "deadman" brakes in the adit and the crebin at bottom.



ENTRANCES TO MINE WORKINGS OF THE KICKING HORSE MINE IN MOUNT FIELD

Cable-way for aerial trams with upper and lower portals indicated, as well as orebin at base of cable-way and Company buildings. The locally termed "black dolomite" strata, shows up quite clearly. Picture taken from a portal in the East Monarch Mine.



UPPER ENTRANCE TO No. 4 STOPES OF THE KINKING HORSE MINE

This picture serves to show the rugged alpine nature of the topography at the mine portals indicated by topmost arrow in illustration page.

PLANT AND EQUIPMENT:

The property is equipped with a 300-ton capacity mill and flotation concentrator with production at present coming from daily development. Power for operations is supplied by three Diesel engine driven alternators aggregating 1,000 h.p. One stationary 1,000 c.f.m. and one portable 480 c.f.m. compressor, supply air for mining operations. These compressors are both located in the Power House with over 6,000 feet of pipe line running to the Kicking Horse Mine. An aerial tram, capacity 1 1/2-ton, connects the mine entrance to the ore bin of the Monarch Mine, while a slightly smaller tram connects the Kicking Horse Mine adit to the orebin at the base of Mount Field (See Pages 2 and 3). Kicking Horse Mine ore is then trucked to the ore bin at the mill.

The present payroll consists of seventy-five (75) employees with approximately one-half of this number working underground. Eleven families reside in Company houses on the property and twenty-five married employees living in the nearby town of Field. Two bunk houses are occupied on the property by single employees.

Current wage rates effective August 1st, 1948, are based on a 4 1/2-hour week. Over 4 1/2 hours in one week is paid at the rate of time and a half. Wage rates are listed as follows:

| | <u>Old Rate per Day</u> | <u>New Rate Per Day</u> | <u>New Rate Per Hour</u> |
|----------------------|-------------------------|-------------------------|--------------------------|
| Shifter | \$ 9.36 | \$ 9.04 | \$ 1.23 |
| Miners | 8.08 | 8.72 | 1.09 |
| Muckers | 7.44 | 8.08 | 1.01 |
| Mechanics | 8.80 | 9.04 | 1.13 |
| Welders | 8.80 | 9.04 | 1.13 |
| Steel Sharpeners | 8.80 | 9.04 | 1.13 |
| Blacksmith | 8.80 | 9.04 | 1.13 |
| Carpenter | 8.80 | 9.04 | 1.13 |
| Floatman | 8.00 | 8.56 | 1.07 |
| Ball Mill | 7.20 | 8.00 | 1.00 |
| Powerhouse Operators | 8.00 | 8.56 | 1.07 |
| Crusherman | 7.20 | 8.00 | 1.00 |
| Boilerman | 7.04 | 7.52 | .94 |
| Laborers | 7.04 | 7.52 | .94 |
| Loaders | 7.44 | 7.92 | .99 |

The above new rates are all 1st class and apply to experienced employees only. New men starting underground with no experience will be 2nd class and old rate will apply for a period of three months, unless recommended by Mine Foreman for 1st class rating before. Surface employees working in Mill and Power Plant will follow same procedure.

Shift Differential:

3 cents per hour 4 P.M. to 12 P.M. shift
 4 cents per hour 8 P.M. to 4 A.M. shift
 5 cents per hour 12 A.M. to 8 A.M. shift

Salary employees will receive a \$10.00 per month increase.

Deductions:

Board and room and blankets \$ 1.75 per day
 Single meal .60
 Doctor .25 per month
 Hospital 1.75 per month

PRODUCTION SINCE RE-OPENING:

From 1884 to 1946, the property produced 716,130 tons of lead-zinc ore. In July, 1946, the mine was closed down due to a Miners' strike throughout British Columbia. On July 1st, 1947, operations were resumed by the Chamberlin Management Corp. and milling commenced in September, 1947. From September until the year's end 10,327 tons of ore were treated. Production from January 1st to July 31st, 1948, is listed as follows:

| <u>Month</u> | <u>Monthly Tonnage Treated</u> | <u>Tonnage of Concentrates Produced</u> | |
|--------------|--------------------------------|---|-------------|
| | | <u>Zinc</u> | <u>Lead</u> |
| January | 2,235 | 350.0 | 47.0 |
| February | 2,611 | 508.0 | 30.0 |
| March | 3,200 | 570.8 | 27.9 |
| April | 4,028 | 704.9 | 35.4 |
| May | 2,650 | 402.6 | 45.1 |
| June | 2,622 | 326.3 | 64.9 |
| July | 2,682 | 270.0 | 73.9 |

During the first six months of operation in 1948, 3,476,758 pounds of zinc and 471,772 pounds of lead were recovered from the above concentrates. Upon re-opening the mill in September, 1947, prices for zinc and lead were 10½ cents per pound and 15 cents per pound respectively. Present prices are 15 cents for zinc and 19½ cents for lead. Concentrates from the mill were formerly shipped to the U.S.A. entailing high transportation costs as well as duties, but a contract has now been entered upon with the smelter at Trail, B.C., to reduce the concentrates thus greatly decreasing costs per ton of ore. It can readily be seen from the above factors that former marginal ore has now become positive ore, increasing original estimates of ore reserves.



KICKING HORSE MINE IN MOUNT FIELD

Waste rock from mine workings appears in two slides from the adits in left fore-ground. Limestone formations of the almost vertical sides of Mount Field stand out clearly showing stratified layers.



BASE METALS MINING CORP. CO. SURFACE PLANT

Picture taken from portal of Kicking Horse Mine looking toward Monarch Mine on Mount Stephen at extreme right. Canadian Pacific Railway grade in centre and centre right. Number 1 Trans Canada Highway appears at left centre, re-appearing at switch-back, crossing C.P.R. tracks going east towards Banff.

Base Metals Mill, Power House and surface plant above C.P.R. tracks appear in centre of picture. Tailings flume from Mill slightly discernible, with tailings pile discharging into Kicking Horse River in mid-foreground.



KICKING HORSE RIVER, TAKEN FROM EAST MONARCH PORTAL

Trans-Canada Highway and bridge over River at mid-right. Tailings discharging into River clearly shown at bottom centre.

GEOLOGY:

The geology of the Base Metals mine, has been described in detail in a number of published papers.*** In brief, the known ore bodies consist of sphalerite (zinc) and galena (lead) replacement deposits in Middle Cambrian carbonate rocks. The ore bodies have been found near the lower contact of an alteration zone in the carbonates which lie above a zone of locally known, black dolomite.

THE MONARCH MINE:

The Monarch Mine consists of the East and West Monarch replacement deposits which are about 600 feet apart at their outcrops on the precipitous sides of Mount Stephen, on the south side of the Kicking Horse River and approximately 750 feet vertically above the main line of the C.P.R. tracks to the portal of the East Monarch mine. The West Monarch mine was mined a distance of 1,800 feet from the outcrop when the ore pinched out, yielding approximately 300,000 tons but has not been worked since 1943. The East Monarch portion has increased reserves considerably through continuous operations of the old workings and with the recent increase in price of lead and zinc, former marginal ore will further increase ore reserves. Present production comes from No. 127 Stope, 200-C Stope and 128 Stope in the East Monarch. These stopes are a continuation of the old workings. There appear to be two definite trends to the ore bodies in the East Monarch, one striking south 40° East and one South 15° East. The latter type are mineralogically different in that they contain essentially galena and the ore is found disseminated through the black dolomite. The ore bodies found in the south 40° East trending type, lie above the alteration zone and appear to be in an en echelon arrangement, with flat-lying lenses of sphalerite and galena separated by "horses" of waste. These series of lenses striking South 40° East are known as the East Monarch, which as previously mentioned, is the portion of the mine now being exploited.

THE KICKING HORSE MINE:

The Kicking Horse mine consists of the No. 1 and No. 4 ore bodies, which outcrop on the side of Mount Field, north of the Kicking Horse river. The two stopes are approximately 100 feet apart horizontally, while No. 4 body is approximately 125 feet vertically higher than No. 1. The latter stope has been mined approximately 600 feet from the outcrop and at present is not being worked, although a fair tonnage of good grade zinc remains along the walls and broken in the stopes. This has not been removed to date.

The No. 4 body has been mined for a distance of 1,400 feet from the outcrop and provides all the present production from this mine. The body swells and pinches along its strike and at the time of the visit to the property by the writer, the face was pinching in galena. However, the last cross-section diamond drill hole from the tramming drift, picked up a good intersection of lead, ahead of the present stope face (see Mining Methods). From former indications

*** (a) Geology of the Monarch and Kicking Horse, Ore Deposits, British Columbia, by E.A. Goranson. - Economic Geology, Vol. XXXII, No. 4, June-July 1937.

(b) Geology of Field Map-Area, Yoho Park, B.C. Can. Geol. Surv., Summ. Report for 1911 pp 175-187 by John A. Allan.

throughout the mine, it has been found that when the ore bodies pinched out completely, they always did so in zinc and not in lead, therefore with the No. 4 body at present pinching in lead, it is assumed that the present face is only a narrowing along the strike of the ore body.

MINING METHODS:

The development drifts driven below the ore lenses for diamond drilling cross-sections ahead of the stoppage face become the tramming drifts when stoppage operations commence. Box holes are run up at intervals of 30 to 60 feet, depending on the area of the orebody in the cross-section, and are calculated to intersect the ore at its lowest elevation to facilitate slushing into the box-holes from the stoppages above the tramming drift. The standard, two-gate, timbered chute, lined with boiler plate on the chute bottoms is used in the box holes on the tramming level.

Appendix "A" attached shows typical development of stoppage operations in this type of replacement deposit. The tramming drift is driven well ahead of the stoppage face above, and diamond drill sections are fanned upwards from the drift to indicate the ore lens. Each drift heading is driven 5 feet by 6 feet. Slushers are employed in the stoppage to move the broken ore to the box-holes.

Appendix "B" attached shows the present stoppage in 200-C Stoppage of the East Monarch Mine. In this case, the stoppage operations have advanced beyond the tramming drift which lagged behind the stoppage development due to labor shortage. From a diamond drill intersection driven from the stoppage, high grade lead ore was encountered and is at present being followed up along the "back" of the stoppage. Benching will follow up the stoppage when the tramming drift is advanced sufficiently to enable box holes to be driven to recover the high grade lead in this stoppage.

ORE RESERVES:

When the mine closed down in July, 1946, due to the miners' strike throughout British Columbia, the estimated ore reserves were 15,700 tons with an estimated grade of 14.1% zinc and 0.98% lead. In a Memorandum dated 1st March, 1948, File Y-11-7, the estimated tonnage was given as 14,000 tons reserve. To correct a false impression re: the above mentioned memorandum, there is no shaft anywhere on the property.

These estimates of ore reserves in the opinion of the writer, are pure guess work with no definite foundation. The present estimates, based on the former price of lead as obtained from the Mine Manager during the visit to the property, are listed as follows:

| | |
|---|-------------|
| Kicking Horse Mine: | |
| Positive Ore (Including broken ore) | 6,000 tons |
| Probable Ore | No Estimate |
| Possible Ore (On cleaning up stoppages) | 1,000 tons |
| East Monarch Mine: | |
| Positive Ore | 4,000 tons |
| Probable Ore | 8,000 tons |
| Possible Ore | 2,000 tons |

From the above figures a total of 21,000 tons is given for present estimates, allowing no dilution factor and not based on present prices as well as the new contract with the trail smelter reducing costs per ton and providing a lower grade of ore to be mined. Thus it may be seen that at present, the estimated ore reserves are a very conservative figure. Due to this type of replacement deposit pinching and swelling along the lenses, from an engineering standpoint, positive ore reserves cannot possibly be estimated until properly sectioned by diamond drilling and the ore blocked out. Present operations in both mines are continuations of old workings. Positive ore in the number Four stope of the Kicking Horse Mine can fairly accurately be determined as the tramming drift has proceeded ahead of the stope face and two diamond drill sections have been taken to determine positive ore reserves. This is not the case in the East Monarch Mine as is clearly shown in 200-C Stope, Appendix "B", this stope only proceeding with the sampled outline in the stope face as the tramming drift is too far behind for proper cross-sectioning.

Referring to the present lease extension covered in a letter to Base Metals Mining Corporation dated December 29th, 1947, File Y. 31-7, signed by the Deputy Minister, doubt is expressed as to authorization to carry out further exploration and it is considered that the activities of the Company are largely a salvage operation. Due chiefly to the type of deposit and the impossible task of determining ore reserves without first properly cross-sectioning, the term "salvage" appears to be broadly interpreted to recover as much ore as possible until the lease expires. It might be pointed out that when the mine closed down in 1946, the stope faces were still in ore and as the present operations are a continuation of previous workings, the literal translation is taken by the Company of recovering all possible ore in salvage operations.

An example of this type of replacement deposit can be cited by pointing out the Tri-State, Lead-Zinc mines. These were considered "worked-out" almost twenty years ago, but are still actively operating. Similarly, the Base Metals mines could possibly continue producing ore reserves for years without being entirely worked-out. A further example of this type of deposit, is, that when slashing out an old curve in the tramming drift to 200-C Stope, although no ore appeared on the old face, after the slash had been taken, high grade galena was found in the face, indicating the possible beginning of a new flat-lying lens of ore.

TAILINGS DISPOSAL:

Tailings from the mill are carried by flume down the lower slope of Mount Stephen, under the C.P.R. tracks and the Trans-Canada highway and on to the tailings pond on the Flat adjacent to the Kicking Horse River. From the pictures on Pages 8 and 9 the size of the tailings pile through years of milling is shown on the river flat, deflecting the course of the stream. A filter well is now in the process of being excavated on the tailings dump. However, as informed by the Park Superintendent that usually every spring and often during the winter months the pond breaks through, discharging directly into the river, which at present is the situation as can be discerned by the picture on page 9.

Although during the summer the river is silt laden from glacial streams and marine life cannot live in its waters, this condition clears during the Fall and Winter months when the town of Field, three and one-half miles downstream, becomes partially dependent on the Kicking Horse River for its source of water supply. An analysis of water samples sent in to the Department of National Health and Welfare by the Park Superintendent, revealed nothing harmful to humans. However, the danger still exists that if chemical reagents used in the mill were exceeded through error, there might be a serious hazard to human life in the town of Field downstream from the tailings pond. A list of the reagents used in the milling operation is given as follows:

DATA ON REAGENTS

JULY, 1948

| | <u>Month</u> | <u>Year</u> | <u>Total from Sept. 4, 1947</u> | | | |
|------------------|--------------|-------------|---------------------------------|----------------|--------------------|----------------|
| | | | <u>POUNDS USED</u> | | <u>POUNDS USED</u> | |
| | | | <u>Total</u> | <u>Per Ton</u> | <u>Total</u> | <u>Per Ton</u> |
| Tons Treated | 2,682 | 20,028 | | | 28,032 | |
| | | | <u>POUNDS USED</u> | | <u>POUNDS USED</u> | |
| | | | <u>Total</u> | <u>Per Ton</u> | <u>Total</u> | <u>Per Ton</u> |
| Steel Balls | 724 | 0.27 | 7,051 | 0.35 | 12,195 | 0.43 |
| Line | 1,680 | 0.63 | 17,330 | 0.87 | 21,500 | 0.77 |
| Sodium Cyanide | 480 | 0.18 | 3,260 | 0.16 | 4,080 | 0.15 |
| Zinc Sulphate | 1,400 | 0.52 | 11,366 | 0.57 | 16,492 | 0.59 |
| Copper Sulphate | 3,800 | 1.41 | 30,300 | 1.51 | 43,400 | 1.55 |
| Cresylic Acid | 488 | 0.18 | 3,364 | 0.17 | 5,764 | 0.21 |
| Sodium Aerofloat | 200 | 0.07 | 3,100 | 0.15 | 5,036 | 0.18 |
| Aerofloat No. 25 | --- | --- | 1,000 | 0.05 | 1,500 | 0.05 |
| Ethyl Xanthate | 200 | 0.07 | 1,450 | 0.07 | 2,118 | 0.08 |
| Pine Oil | --- | --- | --- | --- | 392 | 0.01 |



BREAK-THROUGH FROM TAILINGS POND EMPTYING INTO KICKING HORSE RIVER.

This picture was taken from near the water of the Kicking Horse River showing the tailings discharging directly into the river. This condition is existent at present.



PRESENT SIZE OF TAILINGS DUMP

This picture was taken part way along the top of the Tailings Dump to illustrate its present size.

SUMMARY:

Due to this type of lead-silver replacement deposit in carbonate rocks, it has been pointed out that positive ore reserves are extremely difficult to estimate until proper cross-sectioning definitely reveals the advance ore. In order to determine this reserve, the Company have proceeded with developing the old workings of both mines to salvage the remainder of the ore left in the ore-bodies. However, it has been shown that with deposits of this nature, it may take years to win or recover all ore in the stopes. Straight salvage of presently developed ore, in the opinion of the writer, would take at least two years to recover along with salvage of the surface plant, providing no further ore is developed and present stope faces are not extended.

Little difficulty in "heavy-ground" is experienced in either mine, due to the nature of the rock in the "backs" and "side-walls", thus little timber is used in the open stopes and dilution from waste rock is not a great factor.

From the illustrations of the Tailings Disposal and the list of Chemical Reagents used in the mill, including Sodium Cyanide, there is a possible danger to human life using the waters of the river downstream from the Tailings Dump, when tailings are discharged directly into the river. This is a definite breach of regulations covered under the National Parks Act. Further, no lease for ground covered by tailings, leaves or deads can be found by the writer for the area covered by this Tailings Dump.

In conclusion, recent developments in available stocks of lead may be a governing factor in any decision affecting operations of the mine, as shown by Appendix "B", now very high-grade lead has been recently found in 200-C Stope of the East Monarch Mine. Ore from both mines contains a certain percentage of Germanium, although this element is not at present being recovered by the Smelter at Trail.

Finally, if this Company were to be granted further leases, it is recommended that immediate direction be given Base Metals Management in the action to be taken regarding its disposal of tailings from the mill flotation concentrator.

K.J. CHRISTIE

Chief Inspector
N.W.T. and Yukon Services.