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Kicking Horse Valley
Old Monarch & New Monarch Mines

PRELIMINARY REPORT

ON THE PROPERTY

OF

BASE METALS MINING CORPORATION, LTD.

Arthur Lakes
March, 1930.

INDEX

MAPS AND PHOTOGRAPHS

COPY

ARTHUR LAKES
Geologist and Mining Engineer

Vancouver, B.C.
March 31st, 1930.

F. O'Hearn & Co.,
Toronto, Ontario.

Gentlemen:

In accordance with your instructions I made an examination of Base Metals Mining Corporation property near Field, B.C. I spent five days, March 14th. to 18th. at the property.

Kicking Horse mine was not accessible for examination as the trail had not been used all winter and the steep slopes were ice covered. Surroundings of this mine are shown on accompanying photograph. My examination of the two other properties indicates conservatism of company representations.

Stope widths at the Monarch mines exceed sample widths which, therefore, represent fractional parts of the ore bodies. The fairest average is represented by mill heads which check closely with Assay Plans, subject to indicated increase of metallic content in the southern parts of the two mines. Representative samples were taken to check Assay Plan. The ore faces are so wide and area so extensive that the thirty samples mentioned in your letter would take about two weeks to procure accurate results. I have satisfied myself that company sampling is substantially correct and gives more accurate indication of values than could be obtained in a reasonable time by other sampling.

I was given every assistance consistent with company policy as outlined in accompanying letter. I had no access to books of record nor to smelting contracts. However net smelter returns were worked out for me on basis of schedule and my estimate of costs, profits, etc. were substantiated by Mr. Eichelberger.

I have answered your questions as fully as circumstances permit, reducing uncertainties to certainties as far as possible and outlining variables within limits of my best judgment. Examination for more detailed report would take two weeks at least.

The attached plans and sections are essential and should be referred to in reading this report.

Respectfully submitted,

(sgd) ARTHUR LAKES

PRELIMINARY REPORT
ON THE PROPERTY
OF
BASE METALS MINING CORPORATION, LIMITED

SUMMARY AND CONCLUSIONS

PROPERTY The property comprises the original Monarch mines on south side of Kicking Horse Valley and the Kicking Horse mine ⅜ mile away on north side of the valley. Leases on two square miles have been added. The property now covers strike of the three ore zones more than two miles.

DEVELOPMENT The two Monarch mines are connected by underground gravity tram extending to aerial tramway which connects with the mill. All ore is moved from stopes to mill by gravity at cost of a few cents per ton.

Drifts, crosscuts, and raises have developed Old Monarch ore body 600-ft. long by 70 to 140-ft breadth, by average of 25-ft. thick.

Drifts, crosscuts, raises and winzes, have developed New Monarch ore body 900-ft. long by from 70 to 135-ft. breadth, by average of 26-ft. thick. The present company has concentrated most of development work on this ore body.

Kicking Horse mine is developed by three short tunnels exposing the ore body about 200-ft. long by 80 to 150-ft. breadth, by average of 15-ft. thick.

The Monarch Mines are one operation but Kicking Horse mine is a separate operation.

ORE VALUES Assay Plans, checked by mill heads and by representative samples, show average values for the various mines as follows:

	Lead	Zinc	Silver
New Monarch	14.9%	13%	1.5-oz
Old Monarch	15.	13	1.7-oz
Kicking Horse	5	15	3.0-oz

Assay values in New Monarch show increased metallic content as progress is made south into the mountain up the ore rake. Tonnage blocks show the following range of averages:

	Lead	Zinc	Silver
Block "A" (north end)	11%	10%	0.8-oz
Block "B" (centre)	14	12	1.5-oz
Block "C" (south end)	19.2	13	2.1-oz
Average	14.9%	13%	1.5%

Check samples at three raises compared with Assay Plan show as follows:

	Lead	Zinc	Silver
Average of check samples	16.2%	9.4%	1.5-oz
" Assay Plan "	17.1	12.5	1.5-oz

Mill head average from 18,234 tons is:

Lead	Zinc	Silver
14.32%	7.09%	1.65-oz

Ore occurrence and values in Old Monarch are practically the same as those in New Monarch.

Average values in Kicking Horse mine according to assay map are:

Lead	Zinc	Silver
5%	15%	3.0-oz.

ORE RESERVES Ore reserves comprise only part of the ore possibilities indicated in the three mines. In addition are three other possibilities at present undetermined, (a) possible north extensions of the two Monarch zones and (b) strong fissured, stained zone in vicinity of New Monarch which may be south extension of Kicking Horse zone. The blanket character of ore bodies is such that longitudinal extend of ore can only be determined by underground work. Indications are that undeveloped extensions may be far greater than may be determined from present developments and the mines may be considered as still in initial stages of development.

Ore developed in the various mines

	Tons	Lead	Zinc	Silver
New Monarch (including broken ore stored)	292,000	15%	13%	1.5-oz.
Old Monarch " " "	58,000	15	13	1.7-oz.
Kicking Horse	50,000	5	15	3.0-oz.
	400,000	13.5	13.2	1.7-oz.

COSTS On basis of 300-tons per diem costs are calculated at from $2.60 to $2.75 per ton. On basis of 500-tons per diem costs are calculated at from $2.50 to $2.65 per ton. Before 500-ton operations may be put in effect the mines should develop at least twice the present tonnage.

ESTIMATES OF RETURNS & PROFITS The properties comprise silver-lead-zinc deposits whose metal markets are variable and at present depressed below normal to about £18 for lead and zinc and 42¢ for silver. I believe that a fair average price for the next five years will approximate £25 for lead and £22 for zinc and 45¢ for silver. Recently the lead price was marked up in New York which may be indicative that lead may be on the upturn. Zinc future is less satisfactory than lead. Silver future is indeterminate.

Based upon present milling efficiency and capacity the average grade ore indicated in the Monarch mines would produce lead concentrate containing 76.5% lead and 6.5 oz. silver, the ratio of concentration being 6 to 1. Zinc concentrate will average 58.5% zinc the ratio of concentration being 5.5 to 1.

Net value of ore blocked out in Old and New Monarch mines

London prices				
Lead	L18	L20	L24	L25
Zinc	L18	L19	L22	L22
Total	$2,212,500	$2,330,500	$3,962,000	$4,154,000
Per ton	$6.35	$7.23	$11.32	$11.87

Profits on basis 300 tons per diem, 90,000 tons per year.

Per day	$ 1,905.	$2,169.	$3,396.	$3,561.
Per month	$57,150.	$65,070.	$101,880.	$106,830.
Per year	$ 571,500.	$650,700.	1,018,800.	1,068,300.

Net values and profits on basis 500 tons per diem, 150,000 tons per year, including ore developed in Monarch mines and Kicking Horse mine.

London prices				
Lead	L18	L20	L24	L25
Zinc	L18	L19	L22	L22
Net value per ton	$5.65	$6.34	$9.58	$10.05

Profits				
Per day	$2,825.	$3,170.	$4,790.	$5,025.
Per month	$84,750.	$95,100.	$143,700.	$150,750.
Per year	$847,500.	$951,000.	1,437,000.	1,507,500.

SALES CONTRACTS I was not shown details of contract for lead concentrate with Selby plant nor for zinc contract with Japanese buyers but was supplied with net smelter returns over range of prices outlined in this report. Comparing net smelter returns with published schedule of Consolidated M. & S. Co., the following differences are shown:

	Lead-silver concn.		Zinc concentrate	
	L18	L25	L18	L22
Present contracts (per ton)	$39.00	$57.48	$8.50	$15.60
Canadian smelter	24.94	45.96	4.92	12.47
Difference in favor present contracts	$14.06	$11.52	$3.58	$ 3.13

View looking West showing relative position mines, mill & railway.

Base Metals Mill. Looking East.

View looking East from
upper tram terminal showing
mill and railway.

View looking North across
valley - "x" Kicking Horse
Mine.

GEOLOGY Three strong ore zones are developed striking generally N17°W. They have been cut through by east-west Kicking Horse valley and now outcrop on Mt. Field and Mt. Stephen ¾ mile apart. The two Monarch mines on Mt. Stephen may be considered as one operation and Kicking Horse mine on Mt. Field as a separate operation. South extension of Kicking Horse zone near New Monarch warrants further attention. North extensions of Old and New Monarch zones in Mt. Field have not been prospected and their possibilities are undetermined.

The unusual uniformity and continuity of ore occurrence and values in Old Monarch and New Monarch mines together with geologic indications of persistence give encouragement to anticipate considerable extension of these ore bodies beyond the present faces. Mode of occurrence affords hope that recurrence of other extensive ore bodies may be found in longitudinal extension of the ore zones.

EQUIPMENT The mine is fully equipped with compressed air facilities, gravity tram along incline raise connecting the two Monarch ore bodies, slusher scrapers for mucking stopes, etc. The gravity tram is equipped with two 4 ton mine cars and delivers about 1 ton per minute to aerial tram. The size of ore body requires limited use of air drills to maintain tonnage. No timber is necessary in the mine. The ore is broken, mucked, and transported to tram for about $0.90 per ton.

The aerial tramway is equipped with two 24 cu. ft. buckets and delivers about 35 tons per hour to the mill.

The mill is fully modern, selective flotation plant of 300 tons capacity. The efficiency is high, the saving of lead into high grade concentrate being better than 95% and of zinc into high grade zinc concentrate being around 85%. The ore is particularly amenable to the milling method. Cost of milling, inclusive of tramming is about $1.05 per ton.

Power is generated by two 400 HP and one 180HP Fairbanks full Deisel engines at C.P.R. tracks. Electricity is generated and every unit of the mill is motor operated. Air is furnished by 1000 cu. ft. per min. compressor. Additional capacity is afforded by 350 cu. ft. water driven compressor.

In planning mill and power plant provision was made for additional units when required and power capacity may be increased 400 HP for cost of new unit. Mill capacity can be increased to 500 tons for $35,000.

Adequate and comfortable bunk and boardinghouses for mine and mill crew have been built near the mill. Modern cottages, guest house and manager's residence complete the living quarters.

MANAGEMENT The present staff has been connected with the property since Mr. Eichelberger started mine development and plant construction. Mr. Eichelberger and his assistants Messrs. Proctor and Oxley are to be credited with the very effective mill and plant and the economical and satisfactory method of exploration and mine operation. Mine and mill discipline is good and labor turnover is small. Capital expenditure has been advantageous and economical. My impression is that Mr. Eichelberger showed unusual ingenuity and capacity in solving problems and difficulties that faced the earlier period of development and construction. It is my opinion that the present costs are about as low as may be anticipated though the management expects to lower them.

These costs are lower than any mine in British Columbia with which I am conversant. Allowing for advantages of position, ore occurrence, etc. the fact remains that efficiency of management has directly influenced results being attained.

CAPITALIZATION I am informed that the Treasury is amply supplied with funds to meet capital expenditures of future expansion anticipated at present. On basis of the 2,000,000 shares outstanding the annual return per share at present prices would be 28.5¢ at 300 ton output or 42.5¢ per year at 500 ton output. At anticipated L25 lead and L22 zinc prices the annual return per share would be 55.5¢ and 75¢ respectively. Further issue of stock would depreciate these earnings accordingly. It would seem that present issue is about all that should be made in order to give adequate return on investment unless metal prices exceed the figures taken and increase profits beyond the anticipated amount.

LIQUIDATION VALUE Liquidation value on basis of present ore developments does not give a true indication of real value as the property appears to be still in initial stages of development. Salvage of plant would not be taken into account at this time, nor would return from Kicking Horse mine which is not yet an active economic factor. The two Monarch mines have developed in part of their ore possibilities about 4 years supply for present mill. Undeveloped possibilities might prove considerably more, therefore present developed tonnage is not indicative of the life of the mine.

At L18 lead and zinc with 4 year life and 7% compound interest the present output would give present liquidation value of $0.86 per share. These prices may be regarded as subnormal.

At L25 lead and and L22 zinc the present liquidating value per share would be $1.62.

As a means of illustration I have worked out the present share value on basis of 10 years ore supply and return of 7% and 10%.

At 300 tons per day, 10 years at	7%	$6,284,000	$3.09 per share
	10%	$5,341,500	$2.67

At 500 tons per day based upon averages for the three mines

10 years at	7%	$9,000,000	$4.50 per share
	10%	$7,535,000	$3.77

These figures indicate that present price per share anticipates profits not yet shown by developments. On the other hand the true value exceeds $1.62 per share. Increased metal prices will have very direct bearing upon profits and therefore show increase stock value. The reverse is also true. Increased metal content would have similar bearing. I do not believe that costs can be reduced sufficiently below estimates to make material difference in share value.

CONCLUSIONS Base Metals is the outstanding mine development in British Columbia of recent years and is one of the few major lead producers opened up in Canada during the past five years. Indications are that the mines may yet be considered in initial stage of development and that their possibilities may greatly exceed present developments. Position and character of ore deposits are such that future ore developments cannot be anticipated but geologic indications are promising for considerable continuation of present ore bodies and for occurrence of other ore bodies in longitudinal extension of ore zones. Surface conditions preclude prospecting outcrops of other indications except by underground means. The high grade lead content makes this property more attractive than any lead-zinc mine in the Province except the Sullivan which is the largest lead-zinc producer in the world.

Natural facilities are excellent and the efficient plant and mine layout affords very low costs for the type of mine. A small improvement in metal prices will result in marked increase of profits. Production under present adverse conditions, whilst it shows operating profits, has disadvantage of wasting assets for returns considerably below anticipated normal markets. Production is essential to maintain the energetic exploration of ore possibilities essential to determine the prospective value of the mines. Provision for waste dump is necessary and is being planned for immediate future.

I believe that the property possesses much greater ore possibilities than present developments indicate and conditions warrant assumption of potential ore not determinable by strict technical interpretation at the present time. A detailed geologic investigation might help anticipation of ore possibilities but the most assured method will be by energetic exploration along the ore zones. Temporary cessation of values should not be cause for pessimism.

I consider Base Metals the outstanding mining investment in British Columbia but believe the present price per share is higher than present xxxxx conditions warrant.

Details from which this Summary is drawn are appended. The plans and sections are essential in interpreting this report.

Vancouver, B. C.
March 31, 1930.

Respectfully Submitted,
ARTHUR LAKES.

GENERAL

The property comprises three partially developed mines on precipitous slopes north and south of Kicking Horse valley, 3 miles east of Field, B. C. Canadian Pacific Railway affords daily traffic East and West. Lead-silver concentrates are shipped to Vancouver thence to smelter at San Francisco, Calif. Zinc concentrates are shipped to Japan.

The property is the only developed mining property in Canadian Rockies, despite the very prolific returns that have been made in the Rockies of the United States. This is partially due to the fact that considerable areas have been in Railway Belt reserved from public prospecting and also that its scenic beauties have been reserved by Dominion National Parks. This property is in Yoho National Park where mineral claim location is no longer permitted. The company has recently acquired leases on two square miles from Dominion Government. These cover the northerly and southerly extensions of the three ore zones 1 mile each way from the older claim locations.

Natural facilities are good. Where difficulties existed they have been efficiently overcome so that now operation goes smoothly. Timber is not needed in mining which is an important saving. The Monarch mines are located in steep cliffs directly over C.P.R. tracks therefore have no dumping facilities for waste rock. So far development has been all in ore which was stored in the old stopes where there is probably about 10,000 tons at present. The encroachment of development ore made it necessary to push mill construction and put the mill in operation to provide an outlet so that essential exploration could continue. In other words the mines have been put into production on paying basis in face of adverse metal prices and in their normally initial stages of development. The good showings may therefore be classed as indicative of the future rather than illustrative of ull development of either of the two mines. Working tunnel will have to be driven underneath the ore bodies in barren rock. Should "Indication A" prove worthy development the incline raise will be connected with it through barren rock. With these in view provision will have to be made for waste dump. Probably the best plan will be to establish a waste pocket at tramway and make a dump at the mill, transporting waste on off shift of ore tramming.

The first location was made in 1885. The Mines have changed hands several times. The ~~xxxxxxxx~~ two Monarch mines produced considerable tonnage of ore which was m illed by jig and table methods. The high metallic content of the tailings first brought the property to Mr. Eichelberger's attention. Inspection of the mine indicated that previous operators had missed continuation of the ore bodies. Preliminary work at Mr. Eichelberger's personal expense resulted in opening up these extensions within a short distance from the tunnel face at Raise No. 255 and exploration under constant supervision has maintained succeeding workings in ore to present faces.

Reference to plans and sections shows that the method is economical and gives maximum results. If waste disposal is provided it is probable that extension of some of the raises and crosscuts might open up additional ore behind barren brecciated faces. The present important showings may thus be considered to date from the time Mr. Eichelberger took over the property. His vision also took into consideration necessity for more adequate plant than might have been planned by most engineers in the intial stages. Results fully justify his forethought. The aerial tramway is unique in that the two buckets are probably the largest tram buckets in the world. They were needed to provide necessary tonnage over single span. The upper terminal was blasted out of solid rock as illustrated in accompanying photograph and ore pockets also stoped out at the tram head.

GEOLOGY & TOPOGRAPHY

The terrain is rugged with almost perpendicular cliffs rising above deep V and U shaped glacial valleys. Kicking Horse valley cuts east and west across formation dividing the property in two parts (1) the Monarch mines on Mt. Stephen at the south and (2) Kicking Horse mine on Mt. Field at the north.

Elevation of Kicking Horse River is 4100 ft. above sealevel, the railway and mill 4300, Kicking Horse mine workings 5000, upper terminal of Monarch tramway 5050, Old Monarch mine at incline 5130, New Monarch mine at incline 5340, and Indication "A" approximately 5500 ft. Mt. Stephen is 10,495 ft. altitude and Mt. Field 8,645 ft. altitude.

The ore bodies occur in Cathedral limestones which are at the base of Middle Cambrian. The favorable limestone bed is about 300 ft. thick underlain by a distinctive dolomite bed and overlain by thinner bedded limestones. These evidently had confining influence to ore solutions causing their deposition within the brecciated zones of the favorable bed. The ore zones occur along minor flexures and longitudinal fissures on the east arm of an anticlinal fold which is cut across by Kicking Horse valley. Strike of ~~anticlinal fold which is cut across by Kicking Horse Valley. Strike of~~ anticline and formation is about S30°E at acute angles to formation. About 1200 ft. east of the mill a major fault, a striking nearly parallel to anticline and formation, has displaced formation about 3000 ft. with downthrow west. This has brought Pre-Cambrian formation up sharply against Middle Cambrian as illustrated on Section "A". The dynamic forces that caused this fault probably originated the flexures and longitudinal fissured preceeding ore deposition. Minor cross fissuring is evidenced but whether or not they are post mineral has not been determined. Near surface the fissures are prominent but underground they are sealed and obscured.

Present developed ore bodies form in zones of intense brecciation of the limestone directly above the dolomite bed. These appear to be defined by the flexures. As the ore zones on the north side of the valley appear to line up with those on the south, nearly 1 mile away indicating continuity of the individual zones the persistence of brecciation favorable for ore is indicated over this distance which has since been eroded. The unusual

continuity and uniformity of the developed ore bodies is further evidence of persistence and their progression into the mountains ahead of the present workings is strongly indicated. It is my belief that the present ore bodies will continue for considerable distances beyond the workings and furthermore that there is good basis for belief that other extensive ore bodies will be found along these persistent brecciation zones. Whether ore deposition originated by solutions up through the longitudinal fissures or whether the solutions progressed up from deeper zone along the brecciated zones has not been determined. The fact that Kicking Horse mine in the deeper extensions shows lower lead and higher zinc than the Monarch mines which are about 1 mile higher up the measures and that as progress is made upwards in these orebodies the lead contents increase may be indicative of a zonal deposition and would give basis for belief that the ore solutions came up through and along the brecciation. On the other hand the indicated increase of lead in the southern parts of the Monarch mines might have occurred by constriction of the breadth of the ore bodies which might have retarded solutions and acted as a sort of filter with galena as precipitate. In any event the continuity and uniformity of ore occurrence and values in the Monarch mines is indicate of probable extensive mineralization.

The acute angle intersection of ore bodies with strata gives them a gentle upward rake to SE and a gentle dip to the east but they have general form of blanket veins. For this reason they outcrop only in transverse section and their longitudinal extensions are covered by overlying strata. Thus prospecting ore extensions must be entirely by underground work. This precludes estimation of ore possibilities far beyond the workings so that estimate of ore reserves concerns practically ore blocked out eliminating much calculation of probabilities and possibilities by ore exposure. The steep cliffs make outcrops practically inaccessible. Zones of fissuring appear to have characteristic stains that are visible on surface.

In the Monarch mines mineable ore occurs practically throughout the mineralized areas worked in brecciated zone. Cessation of ore is abrupt though no walls occur and brecciation still persists. The outer parts of commercial ore are rimmed by small amounts of iron pyrites which does not occur generally throughout the ore body. This has been taken as an indicator of cessation of the individual bodies. Occurrence of breccia beyond the faces suggests possibility that if some of the faces were extended recurrence of ore may be anticipated. To date no work has been possible in barren rock due to the fact that all material must be put through the mill on account of lack of dumping space. Crosscut 232 and upraise 260 appeared to afford opportunity in this direction. The end of Old Monarch stope was barren and drift 102 failed to get ore. However crosscut 128 opened up high grade galena-zinc ore which is being followed back towards the barren face which indicates that the cessation was temporary. Like conditions may be expected as work progresses in these mines and so long as brecciation and longitudinal fissuring persists there is chances for ore occurrence.

The apparent effect of the dolomite has been to form a base for the mill ore bodies at present worked. The brecciation extends up above the workings and it is possible that other ore bodies might be found in upward continuation of some of the raises within the breccia area. These may prove to be lower grade. As suggested lateral expansion of ore possibilities might occur by crosscut extension. Thus the strong ore showings at present developed might be further extended.

Ore minerals are essentially galena with some silver and aphalerite. The ore values are high. Gangue minerals are calcite and brecciated limestone. The ore is particularly amenable to separation into high grade lead-silver concentrate and into high grade zinc concentrate. In view of the markets the lead content is the most important economic factor.

In addition to the partially developed bodies are a number of undetermined possibilities that might prove commercially important. About 500 ft. west of New Monarch is a strong shear zone highly stained on inaccessible cliffs. This lines up with the Kicking Horse zone. If it develops commercial possibilities it can be connected to Monarch workings by extension of crosscut 227 and the incline raise may be extended into it thus affording the same cheap method of gravity transportation that the Monarch mines have. The possible north extensions of Old and New Monarch zones are partially buried by slide rock at base of Mt. Field. The areas of their north projection show fissuring and stained zones. If they develop the workings will be inclined downward similarly to Kicking Horse workings therefore the ore will not be mined by gravity method prevailing at the Monarch mines and costs will be relatively higher. The possibilities of lower lead and higher zinc content are indicated by average values of Kicking Horse mine. In addition to these possibilities are two other minor indications, one above the incline near New Monarch, and another east of the Monarch tram terminal.

DEVELOPMENT (Refer to Exhibits B, C. & D)

The two Monarch mines are connected by incline raise 950 ft. long to upper terminal of mill tramway. The incline is equipped with 2 car gravity tram which delivers ore at rate of about 1 ton per minute to loading pocket at tramway. Transport of ore from the stopes to mill is thus entirely by gravity methods at cost of a few cents per ton.

Kicking Horse mine on the opposite side of the valley is in downward extension of the ore zone and will be developed by incline

winz requiring hoist to bring ore to surface. The mine is not in production and is not an active economic factor. Before ore can be delivered to the mill about ¾ mile continuous bucket tramway will have to be built. The mine should be developed further before this is done.

In view of the advantages of Monarch situation and equipment probably the best sequence regards this ore zone would be to determine possibilities of the supposed southern extension "Indication A" which, if commercial could be put quickly into production. The comparative values show better ore in the south extensions.

Old Monarch mine was stoped from surface 350 ft. south by from 60 to 140 ft. breadth by from 20 to 35 ft. highth. The stope face is barren, probably a horse of unreplaced breccia or a small fault as good ore has been exposed in southern extension of the ore body beyond this face in crosscut 128. Raise 127 has been blasted therefore faces south of it were inaccessible but I am informed show good mill ore. Workings show Old Monarch ore body for 600 ft. longitudinally by from 60 to 140 ft. breadth, by average of 25 ft. thick.

New Monarch mine at the time Mr. Eichelberger took over, had been stoped 70 ft. southerly across 100 ft. breadth by 25 ft. average heighth with ore in top and bottom. The drift workings extended 300 ft. further south to raise 255 where former operators missed the ore. Since Mr. Eichelberger discovered the ore and worked out the system of occurrence the body has been followed about 500 ft. southerly to a total length of about 900 ft. Crosscuts indicate breadth varying from 70 ft. to 140 ft. and upraises and winzes show thickness of ore from 20 to 40 ft. Additional stoping has been done 130 ft. southerly by about 60 ft. east-west to heighths varying from 25 to 40 ft. The old stopes are about half full of broken ore taken out in driving south. At the south end the breadth is about 70 ft. but indications of further E-W extensions were shown at crosscut 232 and possibly crosscut 235. The ore at raise 260 (southern face) is more than the average 26 ft. and ore showings still persisted above. It might be that constriction of breadth is compensated by increased thickness. Work has not progressed far enough to prove whether or not the condition is local.

Similarity of ore occurrence in Old Monarch and New Monarch is marked. The discovery of ore south of the barren stope face in Old Monarch and the extension of New Monarch ore bodies give encouragement for continuation of Old Monarch ore. The plan indicates lenticular shape of both ore bodies. Cross section of New Monarch does not show constriction of ore thickness at the south. Work will determine whether the present ore bodies are nearing a pinch. In any event the longitudinal extensions ahead of faces is favorable for continuation of the present ore bodies and geologic conditions are favorable for recurrence of other extensive ore bodies in case these pinch down.

COSTS

The mill has not yet been brought up to full capacity of 300 tons per day. Costs are estimated by normal employment of 48 men at the mine, 37 men at the mill and 9 men at other work, making a total of 94 men to provide 300 tons per day. These estimates have been substantiated by the management as substantially correct and a little higher than they anticipate. Mine supply costs amount to from $40. to $50. per day. The fact that no timber is required is an important saving as timber would have to be brought in from outside the park. Mill and plant supplies amount to about $125. per day.

Costs per mine ton on basis of 300 tons capacity

Mining and development of ore	$0.95	to $1.05
Milling, tram, etc.	1.10	1.15
Power and other	.30	.30
Direct costs	$2.35	$2.50
Overhead	.25	.25
Total	$2.60	$2.75

The per ton cost on basis of 500 tons capacity would be reduced the amount of overhead on the added 200 tons, thus total costs would be from $2.50 to $2.65.

In the following calculations I have used the higher cost in each case.

Power costs are comparatively high due to necessity of Deisel units. On the other hand mine work is cheaply performed by use of scrapers for mucking, large tonnage per drill, no need for timber, gravity haulage, etc.

TONNAGE & VALUES

Markets The properties comprise silver-lead-zinc deposits. Markets for these metals are variable and at present depressed. The prices at time of writing this report range about£18 for lead and zinc and 42¢ for silver. Lead and zinc have been prominent in the list of falling commodity prices. Depression of zinc is probably due to overproduction and anticipated continuance in that direction due to large mines soon to come into production whose by products will represent large tonnage of zinc. Depression of lead is probably not so much due to over production as to under consumption due to business depression. Present markets will be largely determined by how long mines can produce at reduced prices; Lead and zinc cannot be profitably produced at £18. Lead surplus is not abnormal and the recent increases in price, though small, may be indicative of possible early improvement. Past experience has indicated that often metal price improvements come with surprising quickness. Despite the fact that past average price of zinc has exceeded lead I believe that lead will average higher than zinc for the next five years.

Production of lead in Couer d Alene has been materially reduced. The Tri State field is becoming exhausted and the Base Metals appears to be about the only major lead producer of recent years development. Curtailment will undoubtedly have marked influence for early improvement of lead prices and anticipated business improvement should increase demands. The future of silver is uncertain and cannot be anticipated.

In view of the situation I believe that the next five years should show prices about as follows: Lead at L25, zn. at L22 and silver possibly 45¢.

Tonnage The three ore bodies are only partially developed and present ore reserves are only fractional of what may be expected by further development.

Tonnage blocked out in Old Monarch Mine (Refer to Plan B)

After careful inspection of the workings I estimate the tonnage in Old Monarch as follows:

Block "A"	$\frac{90 \times 120 \times 25 \text{ ft.}}{8.5}$	31,765 tons x 2/3	21,176 tons.
Block "B"	$\frac{130 \times 90 \times 25 \text{ ft.}}{8}$	36,565	36,565
Total			57,741 tons.

Deduction of 1/3 from Block "A" in view of barren face at old stope which has given way to high grade lead ore at crosscut 128.

Cu bic contents figures on basis of relative metal contents which are higher in the south.

Tonnage blocked out in New Monarch Mine (Refer to Plan B)

I estimate tonnage in New Monarch Mine as follows:

Block "A"	$\frac{310 \times 135 \times 28 \text{ ft.}}{8.5}$	138,000 tons	
Less stoped ore	$\frac{135 \times 50 \times 28}{8.5}$	22,000	116,000 tons
Block "B"	$\frac{160 \times 123X \times 25 \text{ ft.}}{8.5}$		58,000 tons
Block "C"	$\frac{350 \times 95 \times 25 \text{ ft.}}{8}$		108,000 tons
Add tonnage broken ore in stopes			10,000 tons
Total			292,000 tons

Tonnage blocked out in Kicking Horse Mine (Refer to Plan D)

Block "A" $\frac{95 \times 200 \times 15 \text{ ft.}}{9}$ 31,600 tons.

Block "B" $\frac{45 \times 100 \times 15 \text{ ft.}}{9}$ 7,500 tons

Block "C" $\frac{160 \times 40 \times 15 \text{ ft.}}{9}$ 10,700 tons

Total 49,800 tons.

The widths, lengths, and breadths, were measured from Assay Plan as I did not examine Kicking Horse Mine.

Total ore blocked in Base Metals mines at time of examination

		Average contents		
	Tons	Lead	Zinc	Silver
Old Monarch Mine	58,000	15%	13%	1.7 oz.
New Monarch Mine	292,000	15	13	1.5 oz.
Kicking Horse mine	50,000	5	15	3.0 oz.
Total	400,000	13.5	13.2	1.7

This practically checks company estimates.

Values Assay faces along drifts, crosscuts, and raises show only fractional widths where they penetrate the ore body. The stopes show approximate complete section. They are invariably higher than ore thickness indicated by sampling faces. The best check on averages is by mill heads. Mill head average for 18,234 tons is 14.32% lead, 7.09% zinc and 1.65 oz. silver. The stopes produced over 90% of the ore, the rest from drifts, crosscuts, and raises exploring southern extension of New Monarch ore body. New Monarch produced most of the mill ore. The assay plan in vicinity of stoped area gave average 11% lead, 10% zinc and 0.8 oz. silver.

Assay plans show increased metal content in New Monarch as progress is made south along the ore body. (Refer to Exhibit B) The following averages are shown on Assay plan:

	Lead	Zinc	Silver
Block "A"	11%	10%	0.8 oz.
Block "B"	14	12	1.5
Block "C"	19.2	16.5	2.1
Average	14.9	13	1.5

As raises show better cross section of the ore bodies and the extent of mining operations and thickness of vein precluded taking many samples within reasonable time limits I took check samples from the following raise locations: (Refer to Plan B & C.

Sample No.	Location	Height	Check samples Lead	Zinc	Silver	Assay Plans Lead	Zinc	Silver
X 1	Raise 255	25 ft.	10%	8%	1.2	11.6	7.88	0.8
2	255	15	14.8	11.8	1.4	13.1	12.7	0.77
3	258	24	23.3	9.4	2.3	25.2	15.3	2.5
Average			16.2	9.3	1.5	17.1	12.5	1.5
4	Raise 260	20 ft.	26.4	14%	2.8 oz.	(ore in roof)		

The following net smelter returns are based upon contract with Selby smelter at San Francisco for lead/silver output and with Japanese buyers for zinc output.

Net Smelter values per ton of concentrate and gross value per mine ton, lead-silver & zinc

Basis of calculation: $4.85 per L.
45¢ per ounce for silver
Lead concentrate 76.5% lead 6.5 oz. silver
Zinc concentrate 58.5% zinc.

London price	Lead conct.	Mine ton	difference	Zinc conc.	Mine ton	Difference
L 18	$39.00	$7.40		$ 8.50	$1.70	
19	40.00	8.00	$ .60	9.47	1.89	.19
20	43.00	8.60	.60	10.45	2.09	.20
21	45.90	9.18	.58	13.02	2.60	.51
22	48.80	9.76	.59	15.60	3.12	.52
23	51.75	10.35	.60	17.72	3.54	.42
24	54.76	10.95	.59	19.85	3.97	.43
25	57.40	11.50	.55	21.57	4.32	.44
26	60.25	12.05	.45	23.40	4.68	.37
27	63.02	12.60	.55			
28	65.80	13.12	.52			

Each pound Sterling increase in lead prices adds 60¢ per ton to value of mine ore up to L25 and about 55¢ per mine ton above. Increase in zinc price for each pound advance is progressive from 19¢ to 52¢ per mine ton to L22, then recessive.

Net value of ore blocked out in Old and New Monarch Mines

Basis: Tonnage estimate 350,000 tons.
Mine ore 15% lead, 13% zinc, 1.5 oz. silver
Lead concentrate 76.5% lead, 6.5 oz. silver
Zinc concentrate 58.5% zinc
Costs $2.75 per ton
Present contracts
Treatment of 300 tons per day.

London prices

Lead	£18	£20	£24	£25
Zinc	£18	£19	£22	£22
Per ton	$6.35	$7.23	$11.32	$11.87
Total	$2,212,500.	$2,330,500.	$3,962,000.	$4,154,000.

Profits				
Per day	$1,905	$2,169	$3,396	$3,561
Per month	57,150	65,070	101,880	106,830
Per year	571,500	650,700n	1,018,800	1,068,300

This table shows variable results of market prices, the net return at £18 lead and zinc being just over half profit on basis £25 lead and £22 zinc. Yearly production taken at 10-months.

The above net is not true value of these mines. It is expected that additional ore will be found in extension of the present partially developed bodies and that other bodies will be encountered in (1) longitudinal continuation of ore zones, (2) possibly in the brecciated-fissured zones above and to side of ore exposures and (3) in nearby zones indicated on maps. The table is indicative of liquidating value of the blocked out ore only.

Profits that may be expected are based only upon ore from the Monarch mines. Kicking Horse mine is not yet an active factor and probbbly its exploitation may await installation of 500 ton capacity. Before this is justified the total tonnage should be at least double present reserves.

If Kicking Horse mine maintained its present average by further development and Monarch mines maintained their present average the ore, mined on basis of 1 ton of Kicking Horse ore to 5 tons of Monarch ore would average about 14% lead, 15.3% zinc, 1.8 oz. silver. Indicated profits per ton and net returns on basis of 500 tons per day would be:

Net Returns on basis of 500 tons per day
Basis: Value as above,
Lead and zinc concentrates as above
Costs $2.65 per ton.

London prices

Lead	£18	£20	£24	£25
Zinc	£18	£19	£22	£22
Per Ton	$5.65	$6.34	$9.58	$10.05

Profits				
Per day	$2,825	$3,170	$4,790	$5,025
Per month	87,750	95,100	143,700	150,750
Per year	847,500	951,000	1,437,000	1,507,500

Production of 500 tons per day of ore of grade figured would be about the economic limit without disturbing market as 150,000 tons per year would yield 25,000 tons of lead concentrate or 38,500,000 lbs. of lead, and 30,000 tons of zinc concentrate or 34,100,000 lbs of zinc.

Production on this basis affords interesting conjecture regards possible establishment of smelter for the property as the 5% deduction of lead by smelters would amount to 1,912,000 lbs per year worth about $79,000., and the 15% deduction of zinc would amount to 5,115,000 lbs. per year worth about $170,000.

EQUIPMENT

The equipment and facilities for mining, transportation, and milling are probably the most striking features of this property despite the good ore developments. The mines may still be considered in prospective stages. The equipment is complete and highly efficient.

Power is developed by two 400-HP and one 180/HP Fairbanks Morse full Deisel engines. This gives flexibility as one of the three engines may be shut down at any time power consumption is reduced enough. Foundations have been provided for another 400-HP unit when needed. Electrical energy is developed at 440-volts and every unit in the mill is motor driven.

The mine is supplied with compressed air by 1000-cu. ft. per min. Sullivan Angle Compound compressor located at the power house. Added air capacity may be had from another 350-cu. ft. water driven compressor at the mill.

An auxiliary pump is provided at Kicking Horse river for emergency use.

Monarch mines are connected to the mill by a 2-bucket single span tramway 1700-ft. long. It is equipped with motor drive to send up men independent of loading the upper bucket with ore to draw the other up.

The mine is fully equipped with drag scrapers for mucking the stopes, with air drills, cars, etc. The incline tram consists of two 4-ton mine cars with drag rope so that the loaded car draws the empty up. Its capacity is about 1-ton of ore per minute.

The mill is fully modern selective flotation plant of 300-tons capacity. Its simplicity and efficiency makes it outstanding in British Columbia and probably one of the most effective in Canada.

Treatment capacity of 500 tons may be attained for about $40,000 by addition of 1-ball mill, more classifiers, 14-cell flotation unit. Provision has already been made for these additions in the mill building and they can be installed when justified.

The ore is particularly adaptable to separation into the two commercial concentrates. Use of reagents has been cut very low. Mill records for February indicate from 95% to 97% recovery of the lead ~~xxx~~ contents into lead-silver concentrate assaying 76.5% lead and 6.5 oz. silver and about 85% of the zinc contents into zinc concentrate assaying 58% zinc. Possibly the lead concentrate might be raised somewhat by wasting some zinc. Ratio of concentration was 5.5 tons of mill ore to 1 ton of lead concentrate.

The high percentage of lead in the concentrate is largely responsible for the higher prices paid for the product and also one of the main reasons that the property can continue production under present adverse conditions. The high grade mine ore is also contributory. The grade of ore and its amenability to concentration gives this property advantage over every other lead-zinc mine in the Province.

LIQUIDATING VALUE Whilst conditions do not permit estimating its possibilities further ahead than present developments the property appears to be in initial stages of development as most of the ore possibilities developed at present have been disclosed within the past two years. Liquidation value under present conditions is, therefore, no true index of the value of the stock as undeveloped possibilities may be of far greater importance than developed ore. Under the conditions the present liquidation value would not take into account salavage of plant nor returns from Kicking Horse mine which requires tramway before it becomes an active factor.

Metal prices being variable have direct influence upon share value. At £18 for lead and zinc the present capacity would return 28.5¢ per share per year but at £25 lead and £22 zinc the annual return would be 53.5¢ per share. If the mine develops sufficiently to warrant 500-tons per day the annual return per share at £18 lead and zinc would be 42.3¢ and at £25 lead and £22 zinc 75¢ per share.

At present the indicated tonnage in Monarch mines is 350,000 tons. At £18 lead and zinc the indicated net profits would be $2,212,500. At £25 lead and £22 zinc the indicated net profits would be $4,154,000. On basis of 300 tons per day or 90,000 tons per year the 350,000 tons would be exhausted in about 4 years.

On basis of return of capital in annual installments plus 7% compound interest during the life of the ore reserves the following formula would apply:

$$\text{Present value} = \frac{\text{Total profit}}{1 \text{ plus nr}}$$

The term $\frac{n}{}$ is number of years required to exhaust the ore reserves (4 in this case) and r is the rate (7% in this case). The 7% rate is minimum that should be expected from mining venture. On basis present prices the formula would read:

$$\text{Present value } \frac{\$2,212,500}{128} \quad \$1,728,516 \text{ or } \$0.86 \text{ per share}$$

On basis £25 lead and £22 zinc the formula would read:

$$\text{Present value } \frac{\$4,154,000}{128} \quad \frac{\$3,245,367}{2,000,000} \text{ or } \$1.62 \text{ per share}$$

Illustrating the value of the stock on presumptions of 10-year life (1) on basis of 300-tons per diem, grade of ore equal to the Monarch averages, and (2) on basis 500-tons per diem, grade of ore equal to average taken in this report for the Monarch mines and Kicking Horse mine, the following present values would result:

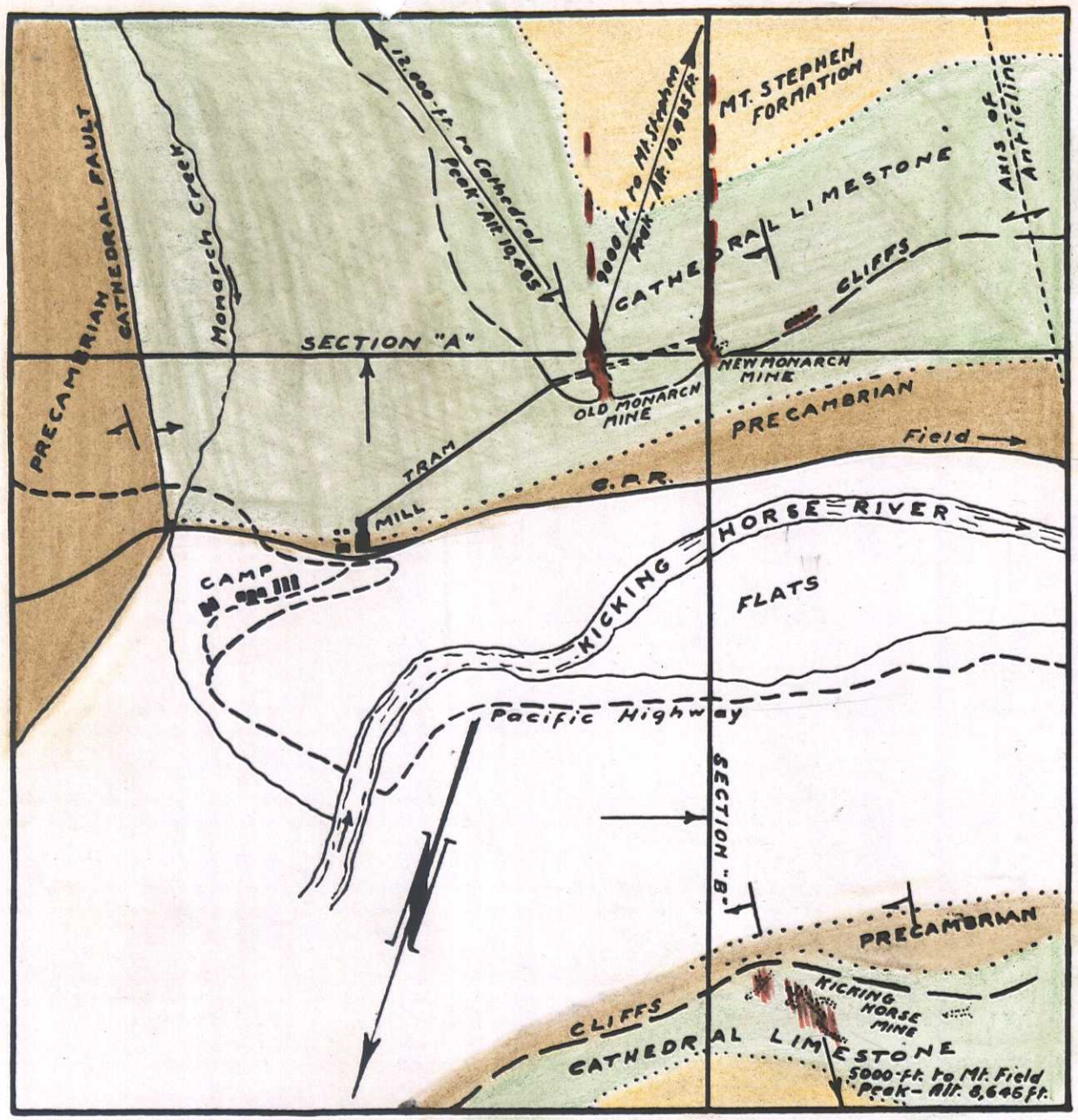
300-tons per day

			Per Share
Total profits $10,683,000	with return 7%	$6,284,000	$3.09
	10%	$5,341,500	$2.67

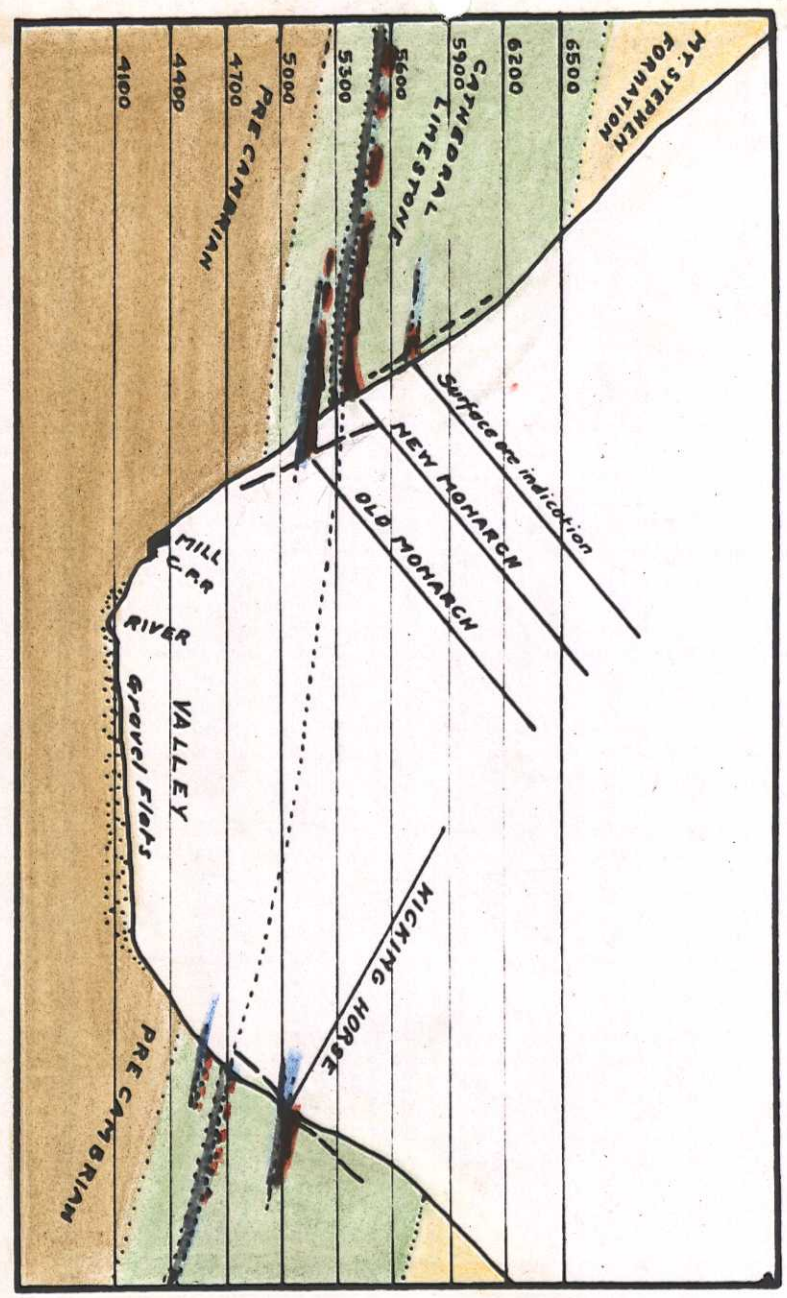
500-tons per day

Total profits $15,075,000	with return 7%	$9,000,000	$4.50
	10%	7,535,000	$3.77

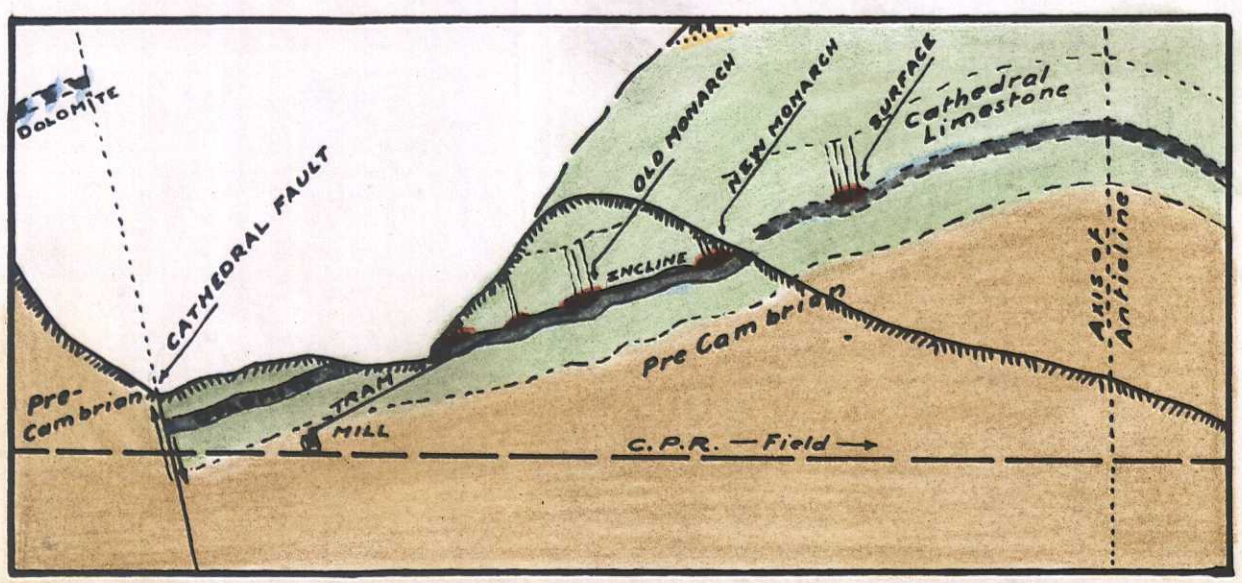
Obviously these figures are illustrative only but give an ~~xix~~ idea of the present value per share under long life conditions. Whether mine developments will show futures indicated cannot be determined under present conditions. On basis of 2,000,000 shares now issued it is probably that these price ranges could not be bettered except by metal prices at higher level than I have anticipated for this report. It is indicated that present share prices anticipate possibilities far ahead of present indications.



PLAN



SECTION "B"



SECTION "A"

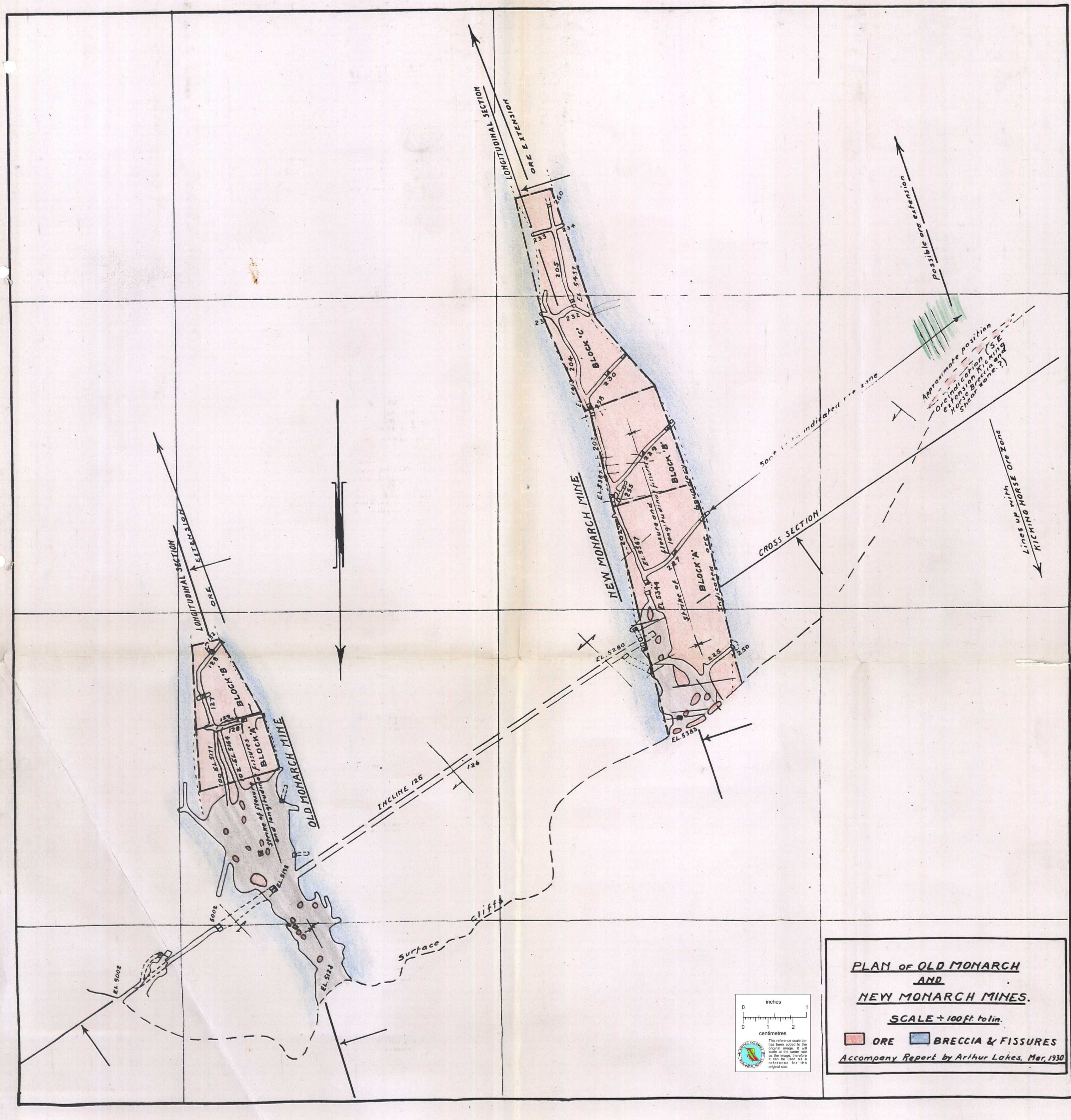
GEOLOGIC PLAN and SECTIONS. KICKING HORSE VALLEY AND PROPERTIES OF BASE METALS MINING CORPORATION.

SCALE 1000ft to 1in.

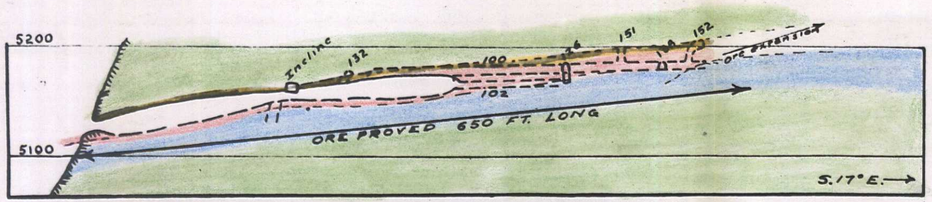
- Cathedral Limestone
- Dolomite.
- Mt. Stephen Formation
- Precambrian.
- Ore zones.
- Fissured & Breccia zones

Accompanying Report by Arthur Lakes, Mar. 1930

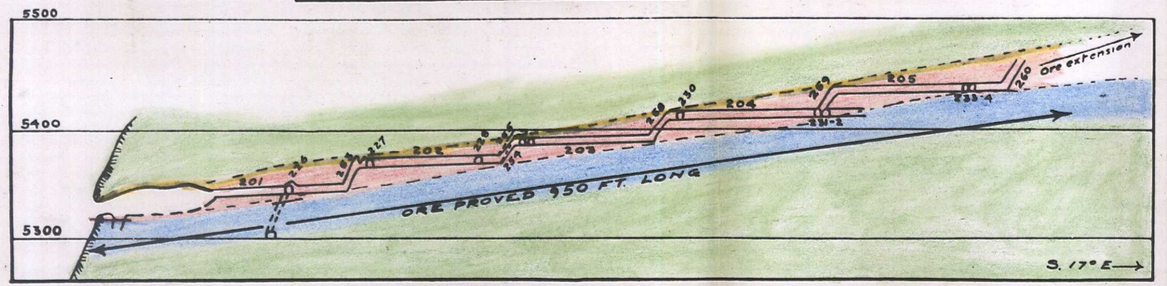
EXHIBIT "A"



LONGITUDINAL SECTION
ORE EXTENSION
260
233
234
205
EL. 5437
232
BLOCK 'C'
204
230
258
203
EL. 5387
255
229
BLOCK 'B'
flexure and longitudinal fissures
BLOCK 'A'
EL. 5367
202
227
EL. 5344
Strike of
Indicated ore boundary
NEW MONARCH MINE
EL. 5280
225
250
EL. 5383
CROSS SECTION
possible ore extension
Approximate position
Oreindication (S.E. extension Kicking Horse Breccia and Shear zone.?)
Lines up with KICKING HORSE Ore Zone
LONGITUDINAL SECTION
ORE EXTENSION
152
128
127
BLOCK 'B'
129
128
100 EL. 5177
102-EL. 5164
fissures
BLOCK 'A'
Strike of flexure and longitudinal
OLD MONARCH MINE
INCLINE 125
126
EL. 5198
5002
EL 5002
EL. 5123
Surface cliffs
PLAN OF OLD MONARCH AND NEW MONARCH MINES.
SCALE ÷ 100 ft. to 1 in.
ORE
BRECCIA & FISSURES
Accompany Report by Arthur Lakes, Mar, 1930
inches
0
1
0
1
2
centimetres
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.



LONGITUDINAL SECTION OLD MONARCH.



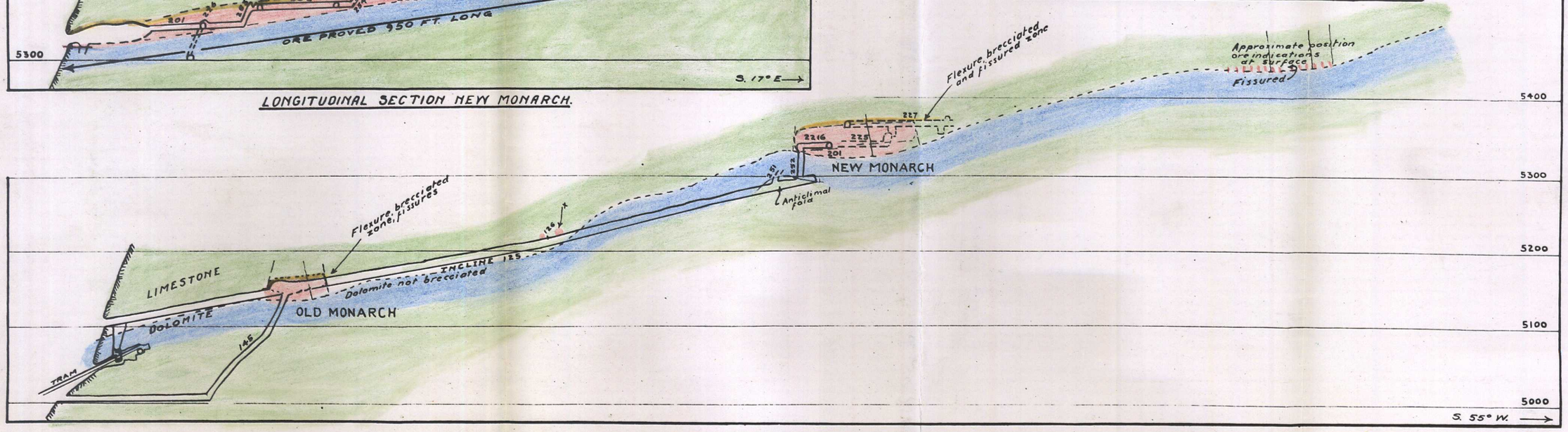
LONGITUDINAL SECTION NEW MONARCH.

LONGITUDINAL SECTIONS & CROSS SECTION ALONG INCLINE. OLD MONARCH and NEW MONARCH MINES.

SCALE = 100ft. to 1in.

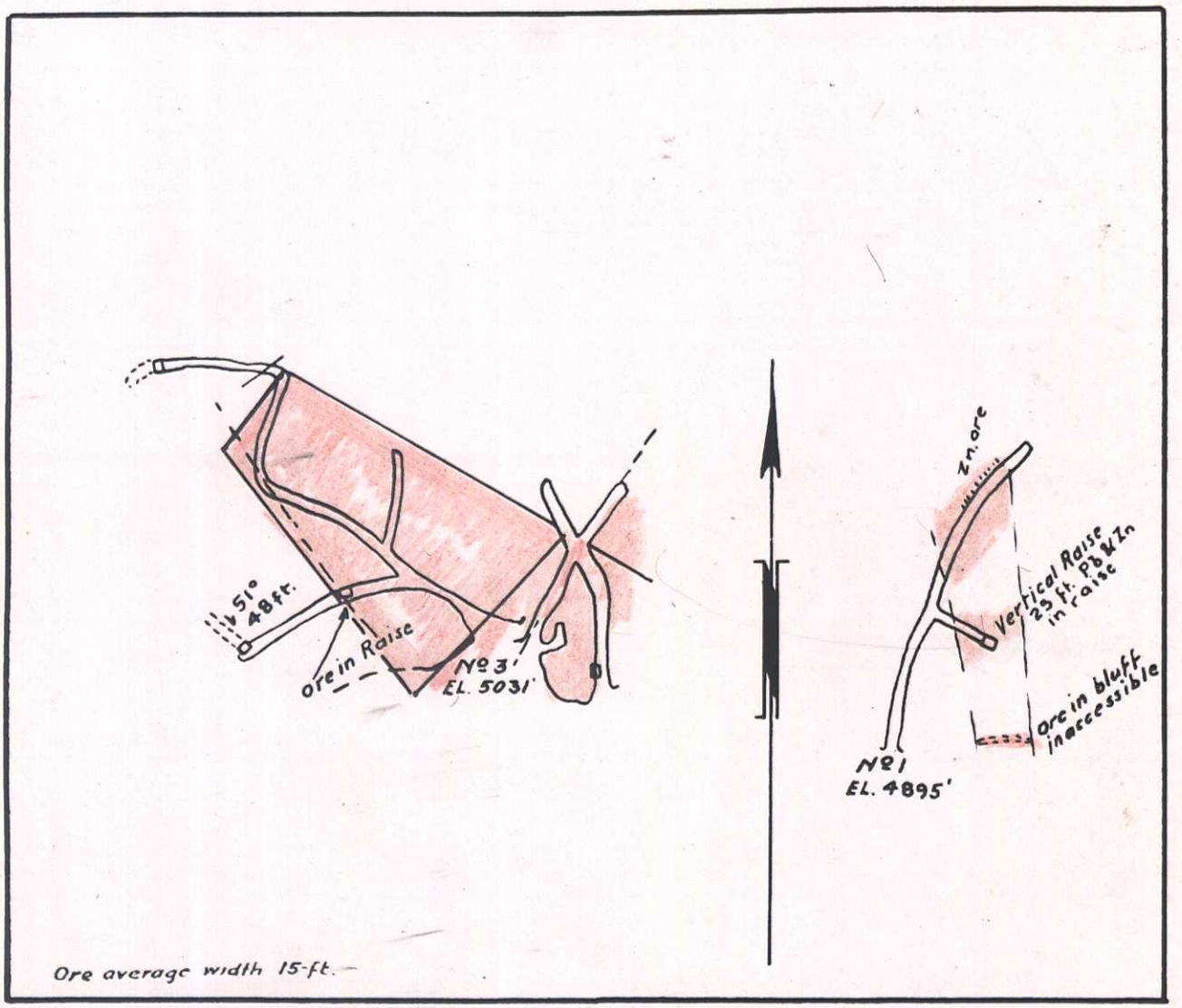
Dolomite. Limestone. Zincy or ? Lead-zinc ore.

Accompanying Report by Arthur Lakes. Mar, 1930



CROSS SECTION ALONG INCLINE.

EXHIBIT "C"



PLAN OF KICKING HORSE MINE.

SCALE : 100 ft. to 1 in.

EXHIBIT "D"