



Kamloops Research & Assay Laboratory Ltd.

2095 WEST TRANS CANADA HIGHWAY-KAMLOOPS, B.C. V1S 1A7
TELEPHONE 372-2784 - TELEX 048-8320

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B.C. LICENSED ASSAYERS
GEOCHEMICAL ANALYSTS
Prop. Sub.
82L

CERTIFICATE OF ASSAY

G.I. J.B. Randtke.

TO Cyprus Anvil Mining Corporation,
330 - 355 Burrard St.,
Vancouver, B. C. V6C 2G8

Attention: Dr. G. Simpson

Certificate No. K-2162

Date August 10, 1979.

I hereby certify that the following are the results of assays made by us upon the herein described _____ samples

Kral No.	Marked	GOLD	SILVER	Pb	Zn	As				
		Ounces Per Ton	Ounces Per Ton	Percent	Percent	Percent	Percent	Percent	Percent	Percent
1	J,G,S #2	.49	3.72	5.60	6.84	12.2				
2	J,G,S #3	.68	2.25	3.25	5.00	15.6				

NOTE:

Rejects retained three weeks
Pulps retained three months
unless otherwise arranged.

.....
[Signature]
.....
Registered Assayer, Province of British Columbia

T. E. ARNOLD

10 Sept. 1979

Alan, John asked me to leave a copy of this letter for you.

Thanks Mel de Quaker

Tel: (201) 531 - 2426.

P. O. BOX 126
OAKHURST, N. J. 07755

April 24, 1979.

Mr. J. Mirko, .
2249 West 34th Avenue,
Vancouver, B. C. V6M - 1G5.

File J. & M Prop
properties File
Revelstoke area

Dear Mr. Mirko: J&L Revelstoke.

Your letter postmarked April 17th. was received yesterday. and was turned over to me for reply. I handle all Mrs. McBride's mining business.

We are ambivalent about making a deal at this time. The present inflationary period means gold in particular, and silver and base metals to a great extent, will rise as inflationary pressures increase. Also if we get cash its purchasing power decreases rapidly, so unless a huge sum is received, and can be reinvested quickly money means little. The conclusion is that unless a very good deal were offered we are better off sitting on the mine.

J&L has a lot of good ore already developed, but it is complex so to make a profit a very expensive plant is required costing some \$10million for a 350 ton per day operation. Sure there is now enough ore developed and in sight to amortize the entire investment required, even with 50% taxes, in under three years operation, plus being able to operate profitably for a generation or more. J&L controls well over 95% of what is in the area, so no one in right senses will even consider developing the area without it.

I don't like discouraging you, but unless you have access to at least \$15,000,000.00 you would only be bumping your head against a stone wall.

If the major [redacted] mining company you mention can come up with an adequate deal, and can demonstrate it is capable of doing a proper job, we are interested in considering any equitable proposal made by anyone. If you wish to put me in contact with the organization and anything comes of the introduction I will see you are protected for the usual 5% commission for such services.

Very truly yours,
T. E. Arnold
T. E. Arnold.

P. S. I know BC very well. If you want to get a good prospect for a nominal sum I may be able to suggest something you could handle much more easily.

File Properties
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In neither No. 4 nor No. 5 adit was any mineralization encountered. No. 5 is entirely in sediments and No. 4 passes through the greenstone and into the sediments on the west thereof. The other showings, in the numerous surface cuts, are all small and quite discontinuous, most of them being lenticular replacements in schisted greenstone. Some small bodies containing much chalcopryrite are exposed. The continuous lead shown on the southeastern corner of the figure is extensively pyritized across widths of 10 feet or more and contains narrow stringers of chalcopryrite in several places. Over a mineable width it would probably be below commercial grade. The two short adits on the northern end of the area represented by the figure were intended to explore a small showing of chalcopryrite along the greenstone dyke shown near them. Nothing of importance was found.

On the whole, although some small bodies of rich copper ore have been developed, the exposures do not indicate the persistence and quantity that would be necessary to make a mine.

In No. 2 and No. 3 adits, along shear zones in the greenstones, small quantities of slip-fibre asbestos and larger amounts of pure, light green talc are exposed. The occurrences are mentioned in a separate section on non-metallic minerals.

Iron Cap

This group was not visited by the writer. It is on the divide between LaForme creek and Fifteenmile creek. The Annual Report of the Minister of Mines, British Columbia, 1919, states that chalcopryrite and pyrite occur in a dyke of augite-diorite (?), but that the deposit is low in copper values. There is no good trail to the workings which were operated by A. Kitson of Revelstoke, B.C.

LEAD-ZINC DEPOSITS

J and L Group

This group is on the shoulder between the east and south forks of Carnes creek, about 8 miles by trail from the Columbia River auto road just north of Carnes creek. There is a good cabin on the bank of the east fork of Carnes creek, about one-quarter mile from the lower workings. The J and L, Annie M, '98 York, and Dunbar claims are staked from northwest to southeast along the showings. In 1924 the Porcupine Gold-fields Development and Finance Company, Limited, held the property under option and employed about fourteen men driving the lower adit ahead 70 feet on the vein and starting another adit halfway between it and the east fork. The latter passed through 70 feet of drift and entered solid rock, but did not reach the vein. M. E. Hurst examined the property in 1924 and published a complete report on it. The owner, E. E. McBean, of Revelstoke, B.C., has recently optioned the property to Regina interests. The following paragraphs are extracted from Mr. Hurst's report.¹

"The rocks in the vicinity of the J and L deposits are chiefly schist and limestone with occasional bands of quartzite. The vein or mineralized zone occurs at or near a schist-limestone contact which strikes north 65 to 75 degrees west (magnetic) and dips 30 to 55 degrees to the northeast (into the hill). This contact has been traced at intervals by open-cuts and trenches for several thousand feet up and across the hill-side (See Figure 9).

¹ "Arsenic-bearing Deposits in Canada"; Geol. Surv., Canada, Econ. Geol. Ser. No. 4, 1927, p. 77.

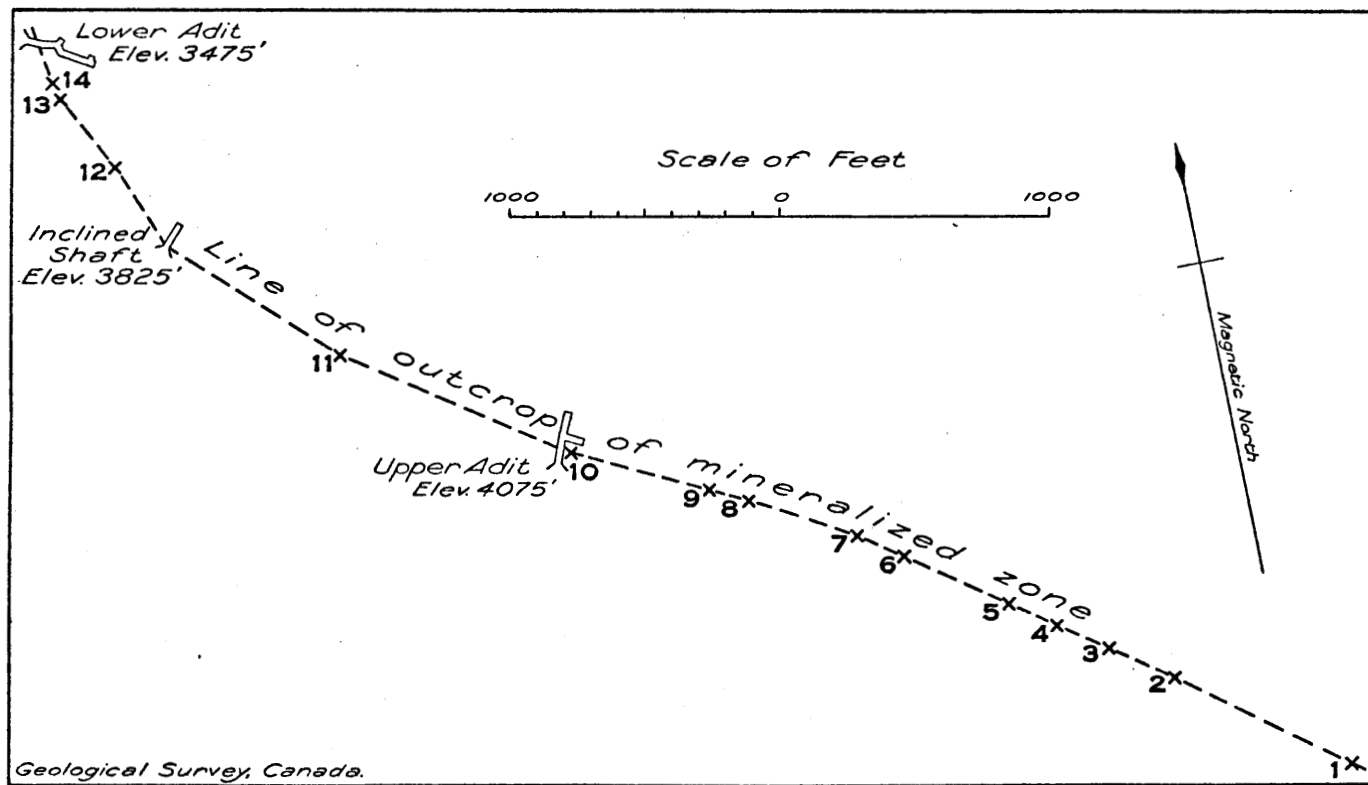


Figure 9. Plan of J and L property, Carnes creek, Kootenay district, B.C.

The mineralized zone is not continuous throughout this distance. In places it reaches a width of 6 to 8 feet. The hanging-wall consists of schist and the foot-wall of limestone. Gouge is present in many places. The ore is a fine-grained mixture of zinc blende, galena, arsenopyrite, pyrite, and chalcopyrite, with minor amounts of quartz and calcite. The sulphides occur as veinlets, lenses, or bunches occasionally as much as 3 feet wide, but usually not more than 12 to 16 inches. The vein matter has been extensively altered and decomposed by oxidation.

The positions of various outcrops and workings along the mineralized zone are indicated on Figure 9. At locality No. 1 the zone, partly mineralized, has a width of 24 inches. At locality No. 2 it is 12 inches wide, and at locality No. 3 it is 24 inches wide. At locality No. 4 pyrite and arsenopyrite, with a width of 30 inches are exposed for a length of 6 feet. At locality No. 5 the mineralized zone is 12 to 18 inches wide and is visible for a length of 4 feet. At locality No. 6 the width is 16 inches and the exposed length is 4 feet. At locality No. 7 an open-cut reveals two bands of sulphides each 12 inches wide, separated by 8 feet of partly mineralized schist. At locality No. 8 an open-cut has been made on the schist-limestone contact. At locality No. 9 the schist-limestone contact is exposed. At locality No. 10, 36 inches of oxidized vein matter appears in an open-cut. At locality No. 11 the schist-limestone contact is visible and there is present 24 to 36 inches of sulphides, mostly pyrite, with quartz and schist. At locality No. 12 the schist-limestone contact is exposed, but no sulphides are present, and the same condition holds at locality No. 13. At locality No. 14 a short adit exposed 30 inches of sulphides.

At an elevation of 4,075 feet an adit (upper) was driven 90 feet to crosscut the vein at a depth of 60 feet below the outcrop. At this point a winze was sunk at an angle of 37 degrees for 120 feet on the vein. This passed through soft, white to brown, decomposed schist and vein matter for about 40 feet. Stringers and streaks of sulphides varying from 1 to 30 inches in width were then followed downward for 80 feet farther. From the top of the winze, a drift was run southeasterly for 80 feet in highly altered schist in which the vein matter appeared to be 6 or 12 inches wide.

At an elevation of 3,825 feet a shaft was sunk at an angle of 43 degrees for 125 feet on the vein. Stringers and bunches of the sulphide minerals, varying from almost nothing up to 30 inches in width, extend more or less continuously from the top to the bottom of the shaft. In places the schistose hanging-wall is impregnated with sulphides for a foot or more from the vein.

An adit was driven at an elevation of 3,475 feet for 225 feet in a southeasterly direction along the schist-limestone contact. For most of this distance it passes through the limestone on the foot-wall side of the vein. The contact is marked by 12 inches of rusty, decomposed material for about 65 feet from the adit. From this point lenses and patches of sulphides, 4 to 18 inches wide, occur at intervals on the northeast side of the adit up to the face. Two crosscuts driven into the quartz schist of the hanging-wall showed very little mineralization.

Other showings of arsenopyrite occur between the lower adit and the east fork of Carnes creek. It is likely that some of these do not mark the continuation of the main vein, but of veins lying to the northeast which have not been explored.

The principal values in the J and L deposit are in gold, silver, and possibly, arsenic. The following assays were made from samples taken from the various showings by B. T. O'Grady in 1922 and are quoted in the Report of the Minister of Mines, for that year.

Sample No.	Description	Ounces per ton		Per cent		Copper
		Gold	Silver	Zinc	Lead	
1	Open-cut. Elevation 4,350 feet. Sample across 8 inches.....	0.8	0.8	4.0	nil	nil
2	Open-cut. Elevation 4,250 feet. Sample across 2 feet.....	0.36	2.0	3.0	nil	nil
3	Open-cut. Elevation 4,200 feet. Sample across 8 feet.....	0.24	4.5	2.0	2.0	nil
4	Open-cut. Elevation 4,150 feet. Sample across 2½ feet on hanging-wall side.....	0.3	2.0	5.0	nil	nil
5	Same as 4. Sample across 1 foot on foot-wall side.....	0.26	1.2	3.0	tr.	nil

Figure 9. Plan of J and L property, Carnes creek, Kootenay district, B.C.

Sample No.	Description	Ounces per ton		Per cent		Copper
		Gold	Silver	Zinc	Lead	
6	Bottom of winze from adit. Elevation 3,870 feet. Across 6 feet.....	0.32	3.0	2.5	3.0	nil
7	Drift on vein in adit. Elevation 3,870 feet. Across 4½ feet decomposed vein matter..	0.60	6.0	2.0	8.0	nil
8	Open-cut. Elevation 3,750 feet. Sample across 2 feet.....	0.30	0.8	2.0	nil	nil
9	Incline shaft. Elevation 3,620 feet. Across 1½ feet at bottom.....	0.42	9.0	6.0	8.0	nil
10	Same as 9. Across 2 feet. Fifty feet from bottom.....	0.62	8.0	7.0	4.0	0.5
11	Short adit. Elevation 3,260 feet. Sample across 2½ feet.....	1.14	1.5	9.0	1.0	nil
12	Main adit. Elevation 3,160 feet. Across 2 feet at 160 feet.....	0.30	7.0	20.0	9.0	nil
13	Grab sample from ore dump at portal of main adit.....	0.62	8.0	14.0	8.0	0.7

The average value in the ore, as indicated by the assays quoted above, is in the neighbourhood of \$10 a ton. W. E. Narkaus, a mining engineer who examined the property, took twenty samples from the various showings. The lowest assay for gold and silver combined was \$4.15 and the highest \$27.10 a ton. The average for the twenty samples was \$12.04 a ton in gold and silver and 12.7 per cent of As₂O₃. The J and L is obviously not a high-grade deposit. It is, therefore, doubtful if the ore could be mined, hand-sorted, and shipped to a smelter at a profit, even if transportation facilities were vastly improved. The future of the property lies in the development of a sufficient tonnage of ore to warrant the erection of a mill capable of recovering all the values present."

In 1926 Porcupine Goldfields Development and Finance Company, Limited, submitted a sample of ore from the J and L, weighing 70 pounds, to the Mines Branch, Department of Mines, Ottawa, and the following investigations were made.¹

Characteristics of the Ore. The ore is complex and consists principally of the sulphides of arsenic, zinc, lead, and iron, with smaller quantities of the sulphides of copper and antimony. The gold is chiefly associated with the arsenopyrite and pyrite and the silver with the galena. The gangue is siliceous.

Sampling and Analysis. The entire lot was crushed to ½ inch, cut once, reduced to -10 mesh and cut twice, reduced to -48 mesh and cut twice, then reduced to 150 mesh at which size the head sample was taken. Analysis was as follows:

Gold.....	0.52 oz. per ton	Copper.....	0.15 per cent
Silver.....	3.50 "	Lead.....	6.0 "
Zinc.....	4.57 per cent	Iron.....	21.8 "
Arsenic.....	11.90 "	Antimony.....	0.22 "
Insoluble.....	16.38 "		

Purpose of Tests. The purpose of these tests was: (1) to ascertain if the gold could be extracted by cyanidation; (2) to separate the sulphides of lead, zinc, and arsenic.

Tests Nos. 1, 2, 3, and 4

Cyanidation. The purpose was: (1) to ascertain if the gold and silver values could be extracted by cyanidation; (2) if finer grinding aided the extraction; (3) if water washing aided the extraction or reduced the cyanide consumption; and (4) if the addition of an oxidizing agent, sodium peroxide, made any appreciable difference in the extraction. In test No. 1, 500 grammes of the ore were dry crushed to -65 mesh. In test No. 2, 500

¹ Godard, J. S.: Mines Branch, Dept. of Mines, Canada, "Investigations in Ore Dressing and Metallurgy", 1926, p. 13.

per cent	Copper
Lead	
3.0	nil
8.0	nil
nil	nil
8.0	nil
4.0	0.5
1.0	nil
9.0	nil
8.0	0.7

grammes were dry crushed to -150 mesh. In test No. 3, 500 grammes were wet crushed in a ball mill and screened through 150 mesh, the oversize returned for regrinding, until all passed 150 mesh. The pulp was dewatered before cyanidation. In test No. 4, 500 grammes of ore were crushed as in test No. 3, pulp dewatered. All four tests were cyanided in a 1:3 pulp, using 0.10 per cent KCN. Time of agitation was 48 hours. In test No. 4, 0.25 gramme sodium peroxide was added after 7 hours, and again after 31 hours' agitation.

Summary

Test No.	Heads assay, oz. per ton		Tailing assay, oz. per ton		Extraction per cent		Reagent consumption, lb. per ton		
	Au	Ag	Au	Ag	Au	Ag	KCN	CaO	Na ₂ O ₂
1.....	0.52	3.50	0.49	2.41	5.8	31.2	5.04	11.40	None
2.....	0.52	3.50	0.49	3.04	5.8	13.2	5.84	10.48	None
3.....	0.52	3.50	0.50	3.04	3.8	13.2	5.08	6.60	None
4.....	0.52	3.50	0.50	3.10	3.8	11.4	5.40	5.40	2.00

Conclusions

1. The extractions obtained were almost negligible.
2. Grinding—Finer grinding made no practical difference in the gold extraction. The best silver extraction was obtained in test No. 1 when coarse crushing was used.
3. Water washing did not aid in the extraction. It reduced the cyanide consumption slightly in the 150-mesh material.
4. Oxidizer—The addition of sodium peroxide did not aid in the extraction. In the raw state, this ore cannot be successfully treated by the cyanide process.

Test No. 5

Selective Flotation at 150 mesh and Tabling the Tailings. The purpose of this test was to ascertain: (1) if a practical separation of the lead, zinc, and arsenic could be made by selective flotation; (2) with which sulphide the gold and silver were associated; and (3) if tabling the flotation tailing would assist in the recovery.

A sample of 1,000 grammes of -48 mesh ore was ground to 150 mesh in a ball mill and selectively floated in a Ruth machine. The flotation tailing was tabled on a small Wilfley table.

Results:

Product	Weight per cent	Assays					Per cent of values				
		Au	Ag	Pb	Zn	As	Au	Ag	Pb	Zn	As
		oz. per ton	oz. per ton	%	%	%					
Lead concentrate.....	16.6	0.46	15.72	20.67	18.36	7.07	14.2	61.1	54.8	25.6	9.9
Zinc concentrate.....	22.0	0.37	3.20	4.77	27.97	7.63	15.2	16.5	16.7	51.7	14.2
Arsenic concentrate....	26.7	0.80	1.62	2.56	6.44	19.47	40.2	10.1	10.9	14.4	43.8
Table concentrate.....	6.0	0.91	4.19	5.15	2.31	20.21	10.3	5.9	4.9	1.2	10.2
Table tailing.....	13.8	0.34	0.65	2.05	2.52	10.11	8.8	2.1	4.5	2.9	11.8
Slimes.....	14.9	0.40	1.24	3.46	3.32	8.00	11.3	4.3	8.2	4.2	10.1

Conclusions

- (1) *Separation.* A rough separation can be obtained by selective flotation.
- (2) *Association.* The gold is principally associated with the arsenopyrite, the silver with the galena.
- (3) *Tabling of Flotation Tailing.* Tabling of the flotation tailing was effective in this test, largely on account of the poor results in the flotation of the arsenic. With improvement in the flotation of the arsenic, this step might be omitted.

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Selective Flotation Tests

The purpose of these tests was to separate the lead and zinc, and the arsenic.

Test No.	Product	Weight per cent	Assays					Per cent of values				
			Au	Ag	Pb	Zn	As	Au	Ag	Pb	Zn	As
			oz. per ton	oz. per ton	per cent	per cent	per cent					
6	Lead concentrate.....	13.5	0.52	16.72	19.92	18.21	7.00	14.6	61.4	39.2	21.6	7.2
	Zinc concentrate.....	25.6	0.30	3.84	6.97	31.08	6.88	15.9	26.7	26.0	69.8	13.4
	Arsenic concentrate.....	47.6	0.68	0.84	3.49	1.66	21.39	67.3	10.8	24.2	6.9	77.7
	Tailing.....	13.3	0.08	0.30	5.48	1.44	1.67	2.2	1.1	10.6	1.7	1.7
7	Lead concentrate.....	11.1	0.48	20.80	23.80	20.12	5.58	9.5	62.0	36.8	19.7	4.8
	Zinc concentrate.....	20.4	0.22	3.18	6.23	35.01	5.08	8.0	17.4	17.7	62.9	8.1
	Arsenic concentrate.....	53.2	0.84	1.32	4.48	3.32	20.65	80.0	18.8	33.3	15.5	85.8
	Tailing.....	15.3	0.03	0.43	5.73	1.41	1.12	2.5	1.8	12.2	1.6	1.3
8	Lead concentrate.....	10.7	0.54	15.86	20.32	20.79	6.30	11.4	47.4	36.0	19.5	5.3
	Zinc concentrate.....	35.9	0.39	4.17	6.95	24.04	8.39	27.6	41.8	41.3	75.5	23.8
	Arsenic concentrate.....	37.8	0.77	0.87	1.47	1.28	22.77	57.3	9.1	9.2	4.2	68.2
	Tailing.....	15.6	0.12	0.39	5.23	0.57	2.16	3.7	1.7	13.5	0.8	2.7
10	Lead concentrate.....	6.4	0.62	7.38	11.00	14.53	9.67	8.2	13.7	11.7	8.1	4.7
	Zinc concentrate.....	26.5	0.23	7.19	12.43	33.95	4.64	12.5	55.2	54.9	78.7	9.4
	Arsenic concentrate.....	52.8	0.71	1.95	2.56	2.54	20.61	76.6	29.8	22.5	11.7	83.5
	Tailing.....	14.5	0.09	0.31	4.56	1.19	2.16	2.7	1.3	10.9	1.5	2.4
11	Lead concentrate.....	32.7	0.48	8.17	11.35	18.34	10.62	30.4	76.0	65.5	53.6	28.4
	Zinc concentrate.....	16.8	0.48	2.10	3.09	19.66	11.00	15.7	10.0	9.2	28.7	15.1
	Arsenic concentrate.....	36.6	0.72	1.16	1.78	4.93	18.13	51.2	12.0	11.5	16.2	54.3
	Tailing.....	13.9	0.10	0.50	5.63	1.17	1.92	2.7	2.0	13.8	1.5	2.2
12	Lead concentrate.....	15.7	0.52	10.40	13.75	18.55	9.98	15.2	46.8	36.7	25.9	11.7
	Zinc concentrate.....	23.1	0.37	5.55	7.62	27.66	8.20	15.7	30.2	29.9	56.8	14.1
	Arsenic concentrate.....	46.9	0.76	1.50	2.54	3.74	20.67	66.0	20.2	20.2	15.6	72.3
	Tailing.....	14.3	0.12	0.68	5.45	1.25	1.78	3.1	2.8	13.2	1.7	1.9
13	Bulk concentrate.....	30.9	0.70	1.30	1.99	7.04	19.02	40.6	11.3	10.4	18.9	47.0
	Arsenic concentrate.....	52.1	0.56	5.84	8.39	17.44	11.70	54.9	85.8	74.3	79.2	48.6
	Tailing.....	17.0	0.14	0.60	5.28	1.27	3.24	4.5	2.9	15.3	1.9	4.4
14	Lead concentrate.....	23.7	0.54	10.32	14.28	17.30	10.68	23.3	66.3	56.2	35.6	18.5
	Zinc concentrate.....	35.5	0.52	2.50	4.21	18.13	13.42	33.8	24.1	24.7	55.9	34.7
	Arsenic concentrate.....	29.3	0.76	1.04	1.99	2.80	21.24	40.7	8.3	9.7	7.1	45.4
	Tailing.....	11.5	0.10	0.43	4.96	1.40	1.59	2.2	1.3	9.4	1.4	1.4

Conclusions

The flotation of the sulphides was not satisfactory, poor recoveries and poor separations being made in each test. The ore is slightly oxidized and this interfered with the flotation."

The writer spent a few hours on the property in 1928. The schist on the hanging-wall of the vein is an altered quartzite, sheared to sericite schist. Under the microscope it is seen to consist of quartz, pyrite in cubes, sericite, and a little talc. The ore lies along a well-defined shear zone on the contact of marble and schist and has been formed in part by filling of the shear zone and in part by replacement, particularly of the foot-wall marble. Polished surfaces of the ores, which are exceedingly fine grained, were studied. Pyrite and arsenopyrite generally occur as relatively large,

rounded, or crushed grains, most of which are easily visible to the naked eye. Sphalerite, galena, and some pyrite form an extremely fine-grained intergrowth. In the galena, and occasionally in the sphalerite, are minute areas of grey copper which is, presumably, argentiferous. Chalcopyrite is visible in small amount in the sphalerite. In connexion with the above report by Mr. Godard it should be noted that it is concluded that the oxidized condition of the ores interfered with the flotation. It is possible that better results might be obtained from unoxidized material.

A and E Group

The A and E, No. 2, No. 3, and No. 4 claims are owned by E. E. McBean and A. Kitson of Revelstoke, B.C. They are on the southwest side of the upper part of the north fork of Carnes creek, and are reached by a trail that continues east from the Roseberry and Salisbury workings for a mile or more to the summit dividing the north fork from the main stream (See Plate IV A). From the summit, where there are several old open-cuts, a steep descent of about 1,000 feet takes one to the lower workings. The showings range in elevation from 6,000 to 7,200 feet. A small amount of open-cutting has been done on the claims.

The rocks in the vicinity are grey to white crystalline limestones, black carbonaceous schists, and a few intercalations of grey, sericite schist. A few small sills of minette (?), consisting of feldspar, quartz in small amount, biotite, serpentine, and calcite cut the sediments, but are not known to have any direct connexion with the mineralization. They are brownish grey in colour and weather rusty. The sediments strike north 15 degrees to north 25 degrees west and dip from 40 degrees to 50 degrees northeast (See Plate IV A). There are two principal zones of mineralization on the property. The southwesterly one occurs at the contact of grey marble and underlying black schist. It is exposed on the side of a steep bluff for several hundred feet vertically, and, on the summit to the southeast, by several open-cuts, now badly caved. The rugged nature of the locality prevented a close examination of this lead, but 2 to 3 feet of pyrite, sphalerite, and galena were observed in several places. Apparently the sulphides have replaced the limestone along the contact shear zone and are arranged along the zone as lenticular bodies. A second lead, some 200 feet stratigraphically above and northeast of the other, and approximately parallel to it, was being developed by open-cuts at the time of examination. It is in the limestone which contains narrow beds of grey sericite schist. For 150 feet on a steep hillside the vein is well exposed and varies in width from 6 inches to 2½ feet. Pyrrhotite, pyrite, sphalerite, and galena are very finely intergrown. Grey copper occurs in small amount in the galena. The main lead occupies a bedded fissure, but smaller veins, some of which contain almost pure galena, intersect it at small angles. Farther down the hillside are other small exposures, in the lowest of which, about 600 feet below the uppermost, there is much arsenopyrite in the lead zinc ore. Thirty feet stratigraphically below the upper showings is a similar smaller lead.

Very little work has as yet been done on the property. The ores resemble closely those of the J and L group, but contain less arsenic and would probably average a little higher in lead. The continuity of the

nic.

values

Zn	As
21.6	7.2
69.8	13.4
6.9	77.7
1.7	1.7
19.7	4.8
62.9	8.1
15.5	85.8
1.9	1.3
19.5	5.3
75.5	23.8
4.2	68.2
0.8	2.7
8.1	4.7
78.7	9.4
11.7	83.5
1.5	2.4
53.6	28.4
28.7	15.1
16.2	54.3
1.5	2.2
25.9	11.7
56.8	14.1
15.6	72.3
1.7	1.9
18.9	47.0
79.2	48.6
1.9	4.4
35.6	18.5
55.9	34.7
7.1	45.4
1.4	1.4

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Exposed in open-cuts and stripping on the same property there are many other quartz-showings containing varying amounts of pyrite, but it can only be demonstrated by development if there exist any ore-bodies of economic value. It is understood that the English company, which in 1896 acquired the property from Gus Lund, systematically sampled the shaft and surface showings, but no information is available as to the results obtained.

*Orphan Boy Group.**—On account of stormy weather, which seriously interfered with the examination of the Groundhog basin, this old abandoned property was not visited. The writer was informed, however, that the development chiefly consisted of short tunnels which are now caved and inaccessible. The quartz-showings are said to show much the same characteristics as noted throughout the basin.

Monarch Group.* This group, consisting of five claims owned by G. Lund and J. Kemps, is situated on the eastern side of the Columbia river a short distance above the mouth of Goldstream, 70 miles north of Revelstoke. The rocks in the vicinity consist of serpentine interbedded with graphitic and talcose schists having a north-westerly strike parallel to the Columbia river and dipping at 25° to 40° to the north-east, or into the hill. A short distance to the east there is a wide belt of limestone which is well exposed in the imposing falls on Goldstream, about a mile from the Columbia river.

The development done is chiefly on the *Monarch No. 4* claim, about a mile north of Goldstream, and consists of three short crosscut tunnels. About 150 feet above the Columbia River level the lower tunnel, 115 feet in length, crosscuts several layers of talcose material and serpentine interbedded with graphitic and talcose schists. Close to the portal of the tunnel there is a width of 7 feet of material which, on analysis, proved to be a talc of very fair quality, except that it contains too much iron to be used as a filler for paper. The iron appears to occur as small grains of magnetite, which might be largely removed magnetically did the value of the material justify it, which unfortunately it does not, being so far from transportation. The analysis is as follows: Silica, 61 per cent.; iron oxide, 4.9 per cent.; alumina, 0.6 per cent.; magnesia, 32 per cent.; lime, trace; loss on ignition, 1 per cent. Three other samples representing widths of 6 feet, 12 feet, and 30 feet of similar material from the same tunnel, on analysis, proved to be not talc and valueless.

Higher up the hill and a short distance from the lower tunnel there are outcroppings of serpentine containing stringers and veinlets of asbestos of the actinolite variety. At this point glacial erosion of the rocks has been severe and a crosscut tunnel driven just below an outcrop of serpentine came into gravel on being driven a short distance. Outcrops of serpentine, from 200 to 250 feet above and parallel to the Columbia, can be traced to within a short distance of Goldstream.

There are also some quartz-outcrops on the claims, one of which, 15 feet wide on the *Monarch No. 1* claim, was crosscut by a short tunnel. The lower 6 feet of the showing contains pyrite and is considerably leached and decomposed. A sample across the 6 feet, however, gave but negligible results on assay.

J. and L. Group.* This group, consisting of five claims owned by E. McBean, of Revelstoke, is situated on the southern side of the East fork of Carnes creek, half a mile above its intersection with the main creek. Carnes creek joins the Columbia river at a point about 24 miles northerly from Revelstoke. The trail, 9 miles in length from the Columbia to the mine cabin, gains in that distance an elevation of 1,050 feet above the river, or a total elevation of 2,650 feet above sea-level. The formation, consisting of schist and limestone, shows uniformity. The strike is N. 65° W. and dip from 30° to 50° to the north-east. The vein, conforming to the stratification of the enclosing rocks, follows a contact between schist and limestone, cutting diagonally up and around a shoulder of the mountain in a south-easterly direction from the creek. The hanging-wall of the vein is schist and the foot-wall is limestone. The vein, from 4 to 10 feet in width, is apparently of the bedded-fissure type, being well defined, with, in places, distinct gouges on both walls.

The ore is a complex mixture of iron, zinc, and lead sulphides, carrying gold and silver values. The solid sulphide ore occurs in the vein in bands from a few inches up to 3 feet in width; but in places the vein is entirely decomposed. The gold values are apparently associated with the iron sulphides, which predominate in the ore, the silver probably being chiefly associated with the galena. In two places assays of samples gave from 0.5 to 0.8 per cent. copper, in

addition to gold, silver, lead, and zinc. Numerous other samples, however, did not contain any copper.

The vein was first encountered at the creek, but little work was done at this point. The highest workings are 1,800 feet above the creek. Commencing at the highest point near where the vein crosses the summit of the ridge, and gradually descending towards the creek and going around the mountain towards the north, the development and ore-showings examined are as follows:—

Near the summit of the ridge, or 1,800 feet above the creek, the vein is 5 feet wide where exposed in an open-cut. Some 800 feet north-westerly along the outcrop and 1,700 feet above the creek an open-cut shows 6 feet of ledge-matter, with, towards the hanging-wall side, a band of solid ore 8 to 10 inches wide. A sample across 8 inches gave: Gold, 0.8 oz.; silver, 0.8 oz.; copper, *nil*; lead, *nil*; zinc, 4 per cent. The earthy decomposed ledge-matter on each side of the solid ore gave but negligible results upon assay.

At 1,600 feet above the creek and 170 feet north-westerly 2 feet of solid ore is exposed in an open-cut. A sample across 2 feet gave: Gold, 0.36 oz.; silver, 2 oz.; copper, *nil*; lead, *nil*; zinc, 3 per cent.

At 1,550 feet above the creek and 575 feet farther north-westerly an open-cut shows 8 feet of solid ore and disseminated mineral in decomposed ledge-matter. The solid ore is in two bands, each 18 inches wide on hanging-wall and foot-wall respectively. A sample across the 8 feet gave: Gold, 0.24 oz.; silver, 4.5 oz.; copper, *nil*; lead, 2 per cent.; zinc, 2 per cent.

At 1,500 feet above the creek and 175 feet farther to the north-west an open-cut shows the vein to be nearly 9 feet wide, with bands of solid ore on foot-wall and hanging-wall, samples of which gave as follows:—Across 2½ feet on hanging-wall side: Gold, 0.3 oz.; silver, 2 oz.; copper, *nil*; lead, *nil*; zinc, 5 per cent. Across 1 foot on foot-wall side: Gold, 0.26 oz.; silver, 1.2 oz.; copper, *nil*; lead, trace; zinc, 3 per cent. Upon assay the 5½ feet of parting proved to contain no values. The ore, however, would break freely from the waste.

At 1,220 feet above the creek and 1,000 feet farther to the north-west there is a tunnel 90 feet long which crosscuts the vein at a depth of 60 feet below the outcrop. From the end of this crosscut a winze has been sunk 125 feet on the vein, which is here from 5 to 6 feet wide, much crushed and decomposed. Throughout the lower 80 feet of the winze there is a band of solid ore, 6 to 20 inches wide, close to the hanging-wall. A sample across 6 feet at the bottom of the winze gave: Gold, 0.32 oz.; silver, 3 oz.; copper, *nil*; lead, 3 per cent.; zinc, 2.5 per cent.

At the top of the winze the vein was drifted on 80 feet south-easterly. The vein in this drift is soft and entirely decomposed for a width of from 4½ to 6 feet. A sample across 4½ feet gave: Gold, 0.6 oz.; silver, 6 oz.; copper, *nil*; lead, 8 per cent.; zinc, 2 per cent.

At about 1,100 feet above the creek and 760 feet horizontally around the hill to the north there is an open-cut which shows 2 feet of solid ore against the hanging-wall, with some oxidized ledge-matter below it. A sample across the 2 feet gave: Gold, 0.30 oz.; silver, 0.8 oz.; copper, *nil*; lead, *nil*; zinc, 2 per cent.

At 970 feet above the creek and 675 feet farther round the hill towards the north an incline shaft has been sunk 135 feet on the vein, which is 4 feet wide. Throughout the lower 75 feet of the shaft there is a band of solid ore from 1½ to 2 feet wide along the foot-wall, the schistose ledge-matter on the hanging-wall being crushed and stained from oxidation. The upper part of the shaft contains streaks of solid ore in decomposed ledge-matter. Assays from the incline gave the following results:—Across 1½ feet of ore from bottom of shaft: Gold, 0.42 oz.; silver, 9 oz.; copper, *nil*; lead, 8 per cent.; zinc, 6 per cent. Across 2 feet of ore 50 feet up from bottom of shaft: Gold, 0.26 oz.; silver, 8 oz.; copper, 0.5 per cent.; lead, 4 per cent.; zinc, 7 per cent.

At about 610 feet above the creek and 665 feet northerly around the hill there is 2½ feet of solid ore exposed in a short tunnel, an average sample of which gave: Gold, 1.14 oz.; silver, 1.5 oz.; copper, *nil*; lead, 1 per cent.; zinc, 9 per cent.

At 510 feet above the creek and 160 feet northerly along the outcrop there is a tunnel 217 feet in length. The first 100 feet of this tunnel, having been driven in the limestone footwall, does not expose the vein, but a change of direction just beyond this point brought the vein into the tunnel, showing an average width of about 2 feet of ore containing considerable zinc-blende. A sample across 2 feet, 160 feet from the portal of the tunnel, gave: Gold, 0.30 oz.; silver, 7 oz.; copper, *nil*; lead, 9 per cent.; zinc, 20 per cent. A grab sample from a large pile of ore

outside the portal of this tunnel gave: Gold, 0.62 oz.; silver, 8 oz.; copper, 0.7 per cent.; lead, 8 per cent.; zinc, 14 per cent.

In addition to the workings along the section of the outcrop above described, there are a number of other open-cuts which, together with the workings mentioned, trace the vein at short intervals for over 5,000 lineal feet. In these open-cuts, which have been omitted in the description, the vein shows much the same characteristics as noted above, the mineralization being remarkably persistent, indicating ore-bodies of great length. The average width sampled was 32 inches, but milling values would probably extend over a good stoping width in many places. The average in gold and silver (taken at 65 cents per ounce) gave \$10.90. Owing to lack of time an examination of the workings between the lower tunnel and the creek (750 lineal feet) could not be made, but the writer was informed that the vein was traced throughout by open-cuts and stripping, with good ore-showings in places.

Transportation would not present a difficult problem, as the country traversed between the Columbia river and the property is of the easiest description for wagon-road construction, with only two short-span bridges required in the entire distance. As the elevation of the cabin is only 1,050 feet above the river a very easy grade is obtainable.

Adequate water-power for mining and milling could probably be developed economically at the intersection of the East fork and Carnes creek, half a mile below the property. There is an abundant supply of mining-timber on the claims.

Providing a satisfactory solution of the treatment of the ore can be made, the *J. and L.* group would seem to have the makings of a mine with some life in it.

TROUT LAKE AND LARDEAU MINING DIVISIONS.

While there were no new developments of striking importance, there was a slight increase in mining activity; this, together with the more optimistic feeling prevailing and the improvement in marketing conditions, surely presages a renewal of activity in this well-mineralized area.

A number of properties were examined and investigated by Major Armstead, of New York, with the result that the *Cromwell* group was acquired by him and a long tunnel is being driven to explore the vein at depth. A. Garrett, a pioneer mining man of the Trout Lake district, is in charge of the work. Should the results of this work come up to expectations, it is understood that an extensive scheme of development will be decided upon, which may be far-reaching in its effects.

Among other activities the following have been reported:—

True Fissure.—A small crew of men has been steadily employed during the year at development, which consists of advancing the lowest level. It is understood that this work will be continued during the winter months.

Foggy Day, belonging to Mrs. Jowett, of Trout Lake, was bonded to the Silver Crown Mining Company, Limited, of Spokane, which had a small crew of men at work during the season.

J. Kirkpatrick, R. Armstrong, and W. Glenn are interested in a discovery of Iceland spar near the head of Lake creek. M. F. Bancroft, of the Geological Survey, accompanied them to the property. It is understood that the prospects for mining a grade suitable for market conditions are encouraging.

Coarse gold recovered from the gravels of Lardeau creek by Dan Savoy, an old-time placer-miner, stirred up quite a little excitement locally, which resulted in a few claims being staked and a little placer-mining being done. Dan Savoy has been more particularly interested in the possibilities of the gravel-deposit near the mouth of the creek, which forms a flat of considerable dimensions. He informed the writer that it was his intention to thoroughly test this ground with a view to working it on a large scale.

Gus Olson, of Trout Lake, did a lot of work on his placer claim below the canyon on Lardeau creek. Sam Cavanaugh was also placer-mining on the creek above Ferguson.

This group comprising the *Goldenville*, *Ophir*, *Olive Mabel*, and *Foundation*, *Ophir Group*. is situated on the summit of the divide between Gainer and Porcupine creeks, which latter is a tributary to the Duncan river. Leaving Ferguson, the road up the South fork of Lardeau creek is followed to 10-Mile, from whence a trail leads up Gainer creek; then climbs steeply to the summit, skirting the base of a towering ridge of limestone, locally known as the "Lime Dyke," the peaks and ridges of which can be seen far in the distance. This route is circuitous and the claims are reached in a distance of about 15 miles from Ferguson.

Silver-Lead

CRAWFORD CREEK

Silver Hill

Ryslo Silver Mines Ltd.
By P. E. Olson

(49° 116° S.W.) Company office, 26, 425 Howe Street, Vancouver 1. This is a private company set up to explore the Silver Hill mine on the southwest side of Canyon Creek, which flows into Crawford Creek, about 6 miles from Crawford Bay. The property consists of the old Silver Hill Crown-granted mineral claims and recorded mineral claims which were recently located around the Crown grants.

Road-building and some geological work were done before winter weather forced operations to stop. Work was directed by David Sloan.

*Silver-Lead-Zinc***Humbolt**

Rose Pass Mines Ltd.
By P. E. Olson

(49° 116° N.W.) The Humbolt mine is about 1 mile west of Rose Pass and is reached by 15 miles of logging-road from Crawford Bay. The company maintained a mine office at Crawford Bay during the summer. An induced polarization survey was done over several claims embracing the known mineralized zones. Following this, bulldozer stripping and diamond drilling were done on anomalous areas. No mineralization was encountered. Work was directed by Glen Champion.

REVELSTOKE MINING DIVISION

Gold-Silver-Lead-Zinc

REVELSTOKE

J & L

Westairs Mines Limited
By James T. Fyles and T. M. Waterland

(51° 118° S.E.) Company office, Box 520, Bathurst, N.B.; mine office, Box 1318, Revelstoke. Ivan C. Stairs, president; T. W. Roynon, regional projects engineer. The company holds by option agreement nine Crown-granted and 48 recorded mineral claims. The property is on the south side of the east fork of Carnes Creek half a mile above its junction with the main creek. Carnes Creek joins the Columbia River 24 miles north of Revelstoke.

During the year 7.7 miles of access road was completed from the Columbia River highway along the south side of Carnes Creek to the property. The road was constructed under a half-cost grant from the Provincial Government. A cook-house, office building, and compressor-house were constructed. A total of 892 feet of drifting was carried out on the 2770 level adit, and 600 feet of AX diamond-drill hole was drilled.

A crew of 13 men was employed under the supervision of T. W. Roynon until work was suspended in August.

Showings on the J & L property are in fine-grained dark-grey and light greenish-grey phyllites, siliceous phyllites, and limestones that strike northwest and dip at moderate angles to the northeast. The rocks are highly sheared, isoclinally folded, and, because of the structure, the rock units are lenticular.

Over a period of years several siliceous zones containing arsenopyrite, pyrite, galena, sphalerite, pyrrhotite, and minor chalcopyrite have been discovered. They strike northwest, dip at moderate angles to the northeast, and are parallel to the schistosity of the enclosing rocks. Current work has been underground exploration of two zones, called the main vein and the middle vein, exposed on the south bank of the east fork of Carnes Creek. In 1965 and 1966 an adit, known as the 2700 level, was driven a few tens of feet above creek-level to follow these two zones. It was collared on the middle vein, which it followed southeastward for about 100 feet. In this length the vein is 2 to 4 feet wide, containing mainly arsenopyrite, quartz,

and pyrite with disseminated sulphides in both walls for 1 or 2 feet from the vein. It is reported to carry 0.1 to 0.2 ounce per ton in gold.

From the middle vein the adit was turned to the northeast for about 100 feet to intersect the main vein, which was followed for about 500 feet to the southeast. In this distance the vein consists of irregular lenses of massive fine-grained sulphides in a light-green sericite schist containing disseminated sulphides. The massive sulphides are folded on small wrinkles with axes that plunge 25 to 30 degrees to the east. In the inner part of the adit, fractured white quartz containing medium- to coarse-grained sphalerite, galena, and pyrite makes up most of the vein. The vein has an average width of about 4 feet.

About 500 feet from the portal, a horizontal hole was diamond drilled 462 feet to the southwest. It encountered the middle vein but no other mineralization.

A vein exposed in old workings above and to the south of the 2700 level is thought to be the main vein. It is described in old reports (*see* Annual Report, 1922, pp. 215-217, and *Geol. Surv., Canada, Sum. Rept., 1928, Pt. A, pp. 165-171*). Considerable limestone, which does not occur at lower elevations, is exposed near the vein in that area.

Copper

S Group (51° 118° S.E.) The old Copper Queen property was restaked in 1966 as the 60-claim S group by T. W. Roynon for I. C. Stairs, of Bathurst, N.B. It is on the east slope of the Columbia River about 18 miles north of Revelstoke. Showings of disseminated chalcopyrite, pyrite, and locally sphalerite in fine-grained hornblende schist are exposed in small bluffs at an elevation of about 3,500 feet 1½ to 2 miles north of La Forme Creek. The hornblende schist trends northward and dips at moderate angles to the east into the hill. It is probably an altered volcanic rock locally containing small lenses of white crystalline limestone, disseminated carbonates, as well as chlorite. The sulphides occur in poorly defined lenses, the most highly mineralized of which, exposed in bluffs on either side of a small creek, is up to 30 feet thick and a few hundred feet long. Scattered sulphides occur in minor amounts to the north and south.

In June, Clearwater Mines Limited drilled five diamond-drill holes from a helicopter-supplied tent camp on a bench of slumped till beside a small pond above the showings. Two holes collared on the bench failed to reach bedrock, but three collared just above the showings intersected mineralized hornblende schist and were drilled to depths of 350 to 400 feet. Assays indicate an average grade of somewhat less than 0.5 per cent copper and 0.1 per cent zinc.

Molybdenum

Joan (51° 118° S.E.) Company office, 1300 Elveden House, Calgary, Alta. This company owns 156 claims, covering the ridge between Hiren and Copeland Creeks, about 15 miles northwest of Revelstoke. The principal showings are at an elevation of 7,200 feet on the north slope of the ridge about 2 miles west of Mount Copeland. Exploration, started in 1965 (*see* Annual Report, 1965, p. 205), was continued in August and September. The work consisted of prospecting and geological mapping both in the area of the principal showings and on the south side of the ridge. Molybdenite mineralization in syenite and lime silicate gneisses was traced eastward from the showings tested last year, and a zone with scattered mineralization, extending a total of 4,000 feet along the formational strike, was mapped and sampled in detail.