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REPORT ON THE PROPERTY OF "BIG FOUR" SILVER MINES, PORTLAND CANAL DISTRICT, BRITISH COLUMBIA

10 Nov 48

by

D. F. Kidd.

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ILLUSTRATIONS.

INTRODUCTION:

As instructed I visited the property - Prosperity Porter-Idaho mine, in the Portland Canal District, British Columbia, June 29th and August 28th 1945. In June I spent two days at the Mine, and in August four days. No attempt was made to make a comprehensive examination investigating titles and the locations of the workings on the claims. Work was confined to the Prosperity-Porter-Idaho part of the property as the records indicate the only showings of likely present economic interest are on this part of the property. I did not see the Silverado mine.

With the exception of the surface showings opened up last year and this, all plans and assays reported are taken from maps and records of the former operator, Premier Gold Mining Co. Ltd. No evidence of mistakes was seen and I believe these records may be taken to have sufficient accuracy for use in this examination.

July 16th, in a letter to Mr. W. B. Milner, President, Big Four Silver Mines Limited, I made interim recommendations pending the advancement of the season enough to permit an examination. These have been, in the main, carried out.

SUMMARY:

The Prosperity and Porter Idaho properties in 15 months' operation mined 29,000 tons of ore containing just over 2,000,000 oz. of Silver and 1,100 tons of Lead. The property is a silver mine. Even if the production period had been at today's high prices for lead 75% of the values would have been in silver. The property shut down in April 1931 primarily because of exhaustion of reserves of shipping grade ore.

secondarily because of low metal prices. For detail see page. 5. "Analysis of Operating History."

Ore has been mined from several persistent sub-parallel lodes. A considerable part of the ore mined was secondarily enriched and the continuance to depth of this grade of ore is not to be expected; the relation of host rock structures to ore shoots in lodes has never been studied. The ore bodies of shipping grade found never paid for their discovery and development and mining. Although high-grade, they were so small and far apart in the lodes that for economic reasons development did not keep pace with production.

Ore reserves below the bottom level exist in: 301 drift northwhere Premier sampling shows 23 ft. length which averages 91.19 oz. silver and 2.2% lead across 1.2 feet; 304 drifts north and south where a length of 117 feet averages 136.16 oz. silver and 9.19% lead across 0.91 feet; and in "B" tunnel. The first two showings are typical of the smaller ore bodies found in the upper levels. In "B" tunnel an ore occurrence exists 120 ft. long which can be figured to give 185 tons to the vertical foot of 20 oz. silver ore with 0.5-1% lead. This allows for 20% dilution. This ore has been selectively mined up for 250 feet but down not at all. At 460 ft. below this level, a drive presumed to be on the same lode, found no ore. No tonnage estimates are therefore possible. This ore is amenable to concentration and tests have been made. Adjoining this ore on the north is an area of lower grade mineralization 230 feet long. Allowing 20% dilution this makes 460 tons per vertical foot of 7.9 oz. silver grade. This is not ore now at this place. No ore has been found in the Black Nick or Angel lodes. In the Tesoro lode a lense 27 feet long assayed 146 oz. silver and 7.45% lead across 1.3 feet. It gives no promise of enlargement.

CONCLUSIONS:

Two courses are open to the management:

(1) Recover the ore in the known high-grade occurrences as cheaply as possible and quit Or

(2) Attempt to develop enough ore to warrant construction of a mill to handle the type of ore found in "D" body.

It is my opinion and recommendation that the first course be followed. This can be no more specific than an opinion as it is based on factors not susceptible to measurement at present. These factors are primarily (1) the chances of finding an ore body to feed a 150-ton mill, and (2) ability to maintain satisfactory labor conditions and reasonable costs at this time and place. The first course can best be followed by leasing sections of the mine on a royalty basis.

In the event that other opinions should prevail, the logical things to do are:

(1) Make a thorough detailed geological study, both surface and underground, to determine the ore shoot control.

(2) Resample "D" tunnel and conduct further mill tests on the sample rejects.

(3) Open up 1 adit, drill from it and then raise, if necessary, to find the bottom of the "D" ore body.

(4) Make a survey of cost of rehabilitating the tram and power line.

LOCATION, TOPOGRAPHY AND ACCESS:

The Porter Idaho and Prosperity claims are on the 6,000 foot high ridge between the Portland Canal on the west and the north fork of Marmot river on the east. The workings are between 4,500 to 5,500 feet elevation on the Marmot river slope of the ridge. They overlook the north fork glacier 1,000 - 1,500 feet below. The claims are on a hillside composed of numerous rock bluffs with intervening acres or talus slopes. Many places on the hillside are swept by snow slides.

TABLE I

Production from Prosperity and Porter-Idaho Mines.

Year:	Property:	Tons:	Ag: Ozs.	Au. Oz.	Pb. Lb.	Pb. %	Au. Oz.	Au. Oz.	Au. Oz. Lb.
1924	Porter-Idaho	147	33,482		36,501		9		
1925	" "	177	21,735		27,867		13		
1926	" "	174	70,090		108,403		16		
1926	Prosperity	29	12,073		15,004		2		
1927	Porter-Idaho	125	61,706		95,948		134		
1929	Prosperity	1584	107,546		839,865		32		56,278
1930	Porter-Idaho	3731	272,797		143,901		58		
1930	Prosperity	18,049	1,364 .729	75.5 oz/T Dlwel	916,135	2.32	384	0.02	
1931	Porter-Idaho	902	77,156		72,169		46		
1931	Prosperity	2502	165,822		153,155		111		
Total:	Porter-Idaho	5,256	536,966	102.16	484,789	4.61%	276	.052	
Total:	Prosperity	22,164	1,650,170	74.45 3.46	1,924,159	4.36%	529	.024	
1938-9	Beach dump	2,484	30,441	12.2	19,634	0.4	32	.013	
Total Production		29,904	2,217,577	73.82	2,428,582	4.06	837	.027	

Zn ~ Pb

ANALYSIS OF OPERATING HISTORY. (See Table II)

In the life of the mine 15,500 feet of level workings have been driven and there are many more thousand feet of raises and sub-levels. The greater part of the main levels was driven between 1927 and 1929 before production started. From February 1930 to April 1931, covering most of the production period, 11,950 feet of workings - largely stope sub-levels and raises for production were driven.

Production and grade shipped increased steadily until October 1930 when over 3,000 tons of high-grade plus low-grade were shipped over the tram. Thereafter the decline in production was precipitous.

Development footage increased steadily until the end of 1930 and then rose very rapidly in the last few months.

The average New York price of silver in 1928, when development was active, was 58.176 cents per ounce, and in 1929 was 53.306 cents per ounce. During the operating period the price of silver declined steadily from 49.927 cents per ounce in November 1929 to 29.504 cents per ounce in March 1931. The average price during this operating period was, however, 35.037 cents per ounce and if weighted according to the monthly production would be higher.

These data are summarized in Table II.

It is plain that the operation was closed down for two reasons:

(1) the mine exhausted shipping grade ore
(2) the low price of silver made the operation unprofitable.

Of these two reasons the first mentioned is primary. Table II makes this clear. Up to November 1930 production and development headings followed parallel courses. Thereafter rate of development rose rapidly

and production and grade of ore fell off sharply. The chart does not show the two-year period of development that preceded production. The ore mined was in large part broadly outlined during this period before production started. At no time during the life of the property did development keep pace with extraction. While the drop in the price of silver undoubtedly caused the property to shut down, even if the price had not declined, the property would have been shut down soon after it did, due to exhaustion of shipping ore reserves. This is a major point.

In June 1930 the "B1" ore body in "D" tunnel was found. This ore body has the best tonnage possibilities in the mine and was the only major ore found after production started. At the time of its discovery the staff referred to it in inter-office letters as "a life saver." It was mined intensively from September until the shut-down, but it proved incapable of supporting the mine rate of production of shipping ore.

GEOLOGY:

The property lies two miles northeast of the main east contact of the Coast Range batholith of quartz diorite and granodiorite. It is in rocks of the Bear River formation of the Hazelton group. On the claims these rocks are dominantly volcanic breccias with lesser amounts of banded tuffs. There are minor amounts of greywacke and slate.

No geological mapping was undertaken on the claims. The Premier Gold Mining Company's geological maps of the underground workings were got and studied. They show the lodes but give almost no indication of the structure of the enclosing rocks. Apparently no attempt has ever been made to determine the influence of the structures in the enclosing rocks on the ore shoots.

The breccias are in general massive competent rocks averaging andesite in composition. Their attitudes cannot be seen readily. The tuffs and greywackes interbedded with them show good bedding. In general they strike between north and northwest and dip steeply west.

LODES:

A number of lodes have been mined on the property and others have had some development. In rough order of importance the productive lodes are:

(See Map 1)

1. Prosperity Lode.
2. "D" Lode, Porter-Idaho.
3. "304" Lode, Prosperity.
4. "Winze" and "Wake" veins and nearby structures, Porter-Idaho.

In addition the following lodes have had some development:

(5) Tessaro Lode on the Sunday claim.
(6) Black Nick Lode, on the Eureka claim.
(7) Angel Lode on the Honest John and Prosperity Fraction claims.

The first six of these seven lodes strike between north and northwest and dip 50°-70°west. Both strike and dip are regular except for curves up to 30° in area of hundreds of feet. Without detailed mapping it is impossible to tell whether the attitudes of these lodes coincide with that of the volcanics or not, but it is suspected they commonly do. The Angel lode strikes 65°- 80° and is flat to 25° north dip.

All the lodes are similar in having well-developed hanging and footwalls usually marked by clay gouge. These are commonly 1 ft. - 5 ft. apart, but may diverge to 20 ft. or 30 ft. in which case (N end of stope in "D" adit) there is usually a horse of competent rock between the slips.

The lodes are quartz stringer veins with marked silicification and replacement by buff coloured carbonate. This carbonate is manganiferous

and ferruginous and weathers with abundant black manganese stains and brown iron stains. These are distinguishing features of all the lodes. Sulphides in the lodes are pyrite, galena, sphalerite, tetrahedrite and ruby silv silver (pyrargyrite). Pyrite occurs in the altered wall rocks, without the other sulphides, as well as in the lodes.

The ore sulphides, galena, tetrahedrite, and pyrargyrite, tend to occur along either the hanging or footwall shears. Not much could be seen of the detailed relations in the old workings, but they are well exposed in the ore in the 1946 Tessaro adit. Here high-grade ore occurs on both hanging and footwalls and streaks branch O going north - from hanging-wall to footwall. There are indications of repetition of this pattern in some of the mine stopes. Beyond this relation no other ore shoot controls were noted. Detailed mapping would probably disclose them.

Some stoping data are available for the Prosperity lode. On 1 level stopes 1A and 1B averaged 92 ft. long and 3.07 ft. wide and the weighted grade was 127.0 oz. silver and 5.56% lead. About 3 level 10 ore sections in stopes averaged 46.8 ft. long and 1.73 ft. wide and the weighted average grade was 64.0 oz. silver and 4.37% lead.

The lodes are oxidized to a depth of hundreds of feet. Much oxidation is present in 304 lode south, at 300 feet down the dip from the surface. Partial oxidation has taken place in "D" adit ore body at 650 feet dip depth and in 304 drift north, 300 ft. dip depth. Little oxidation is present in 3 drift north on the Prosperity vein, at a dip depth of 500 ft. as far as it could be followed. Where oxidation was intense the lode was a mass of rusty-brown dirt grading to rotten buff carbonate with many manganese stains. Some of this material, with

residual nodules of galena, made high-grade silver ore.

Silver values in the upper part of the mine have almost certainly been considerably enhanced by supergene enrichment. Apart from the obvious weathering and high silver values found at the surface there is one main observation:

The ratio of silver to lead decreases greatly in the unoxidized ore. Ten stopes from the upper part of the mine averaged 127 oz. silver and 5.56% lead, a ratio of 23:1, whereas two of the unoxidized stopes averaged 64 oz. silver and 3.37% of lead, a ratio of 19:1. As lead is relatively stable under weathering conditions it serves as a marker for the silver enrichment.

STRUCTURE:

Faults trending N N E are common. The largest of these, named by Hanson the "Big Rig Fault", terminates the Porter-Idaho mine on the south. Its displacement is not known. Smaller examples are present in 305 drift south and at other places. These dip steeply north and have left-hand displacements of up to 20 feet. If the "Big Rig fault" is of the same type, as from its attitude it may well be, any faulted south extension of the Porter-Idaho lodes beyond it would be expected to lie east of their junction with the fault.

DESCRIPTION OF LODES:

(1) Prosperity Lode: This structure has been developed underground for a length of 1,950 ft. It strikes 340° to 360° and dips 55° W on the average. It has been mined from the surface for 600 feet down to the foot of 38 winze 100 ft. below 3 level. Development has been chiefly in the central and south part of the lode. A large part but not all of the best ore was oxidized. Records indicate the lead content, proportional to that of silver, increasedwith depth. Also the stopes in the lower part

of this lode were smaller and lower grade than those in its upper part. This lode has been the most productive in the mine.

"D" Lode. This lode has been drifted on from the Porter-Idaho claim into the Prosperity ground for a total length of 1,300 feet. It has been partly explored over a dip depth of 650 feet and, if the "I" tunnel is on the same structure, for 1250 feet. At its south end it strikes 320° and going north swings to 305°, then turns to 350° at "D" stope and at its north end the lode has swung back to 330°. Dip at the stope is 62° west. One ore body was found near the central part of the lode at and above "D" adit. Several thousand tons of shipping ore were mined from it entirely in 250 feet above "D" adit. This ore body has not been completely mined and will be discussed further under ore reserves. It is unique so far to the mine in that the hanging and footwalls are much further apart than usual and enough of the ground between is sufficiently mineralized for the whole mass to make low-grade ore.

304 Lode. This lode is only accessible in Prosperity #3 crosscut adit. The lode strikes 335° south of the main crosscut but swings to 360° north of it. It dips 50° - 60° west. Stoping has been done on it near the main crosscut. North of the crosscut there is a raise up 250 feet on this ore with sub-levels up to 100 feet long off it.

"Winze" and "Wake veins and nearby structures, Porter -Idaho. Little is known of these structures as the workings are mostly down "I" tunnel on their downward extensions was also unfit to enter. In general these structures extend north from a major fault called by Hanson (1) the "Big Rig fault." This fault lies under the depression just north of the Porter-Idaho bunkhouse and trends slightly north of east. Hanson was uncertain

(1) Hanson G.A. "Portland Canal Area, British Columbia"

whether the lodes were branches from the fault or separate structures.

"Tessaro Lode" (See Map 4). This structure was first developed in 1947 and work was continued in 1948. It is now opened by two short adits and several trenches for a length of 300 feet. It lies 300 feet east of the Prosperity bunkhouse and is the farthest in the footwall of the lodes. It strikes 340° and dips 50° west. It is mostly a barren shear with splits extending into the footwall. At places in it are manganese-stained buff carbonate and quartz. Sulphides occur near the north end, in the Tessaro adit and in the open cut above. In the adit, a lense 27 feet long made good ore across 1.3 feet. (See "Sampling and Ore Reserves.") The Tessaro lode in the length developed is a weak structure compared to the productive lodes and lacks both their intensity of shearing and of rock alteration.

"Black Nick" Lode. This lode on the Eureka claim at the north end of the property strikes 20° dips 55° W and has been traced for 750 feet. It is a strong structure with quartz and manganese-stained carbonate. In the cut 120 feet south of the north side of the Eureka claim minor sphalerite and galena were noted. Samples gave negligible amounts of silver and gold.

"Angel Lode". (See Map 6) This structure is in the southwest part of the property on the "Honest John" and Prosperity Fraction claims. Trenches were made by the old company. Work in 1948 at the west end of the lode, in a section formerly ice-covered, showed new mineralization. This lode is unique in striking ENE and dipping from nearly flat to 25° north. It has been traced by pits and in natural outcrops for 600 feet. At its west end it runs under a small glacier. Like the other lodes, however, it has hanging and footwall shears and between them abundant manganiferous carbonate and some quartz. At the west end there is in addition

a knowledge of the ore shoot controlling structures.

2. "D" Lode. One ore shoot was found in this lode at "D" adit. It was mined intensively for 250 feet above this level, nearly to surface, and produced several thousand tons of ore in a period of six months. It accounted for most of the Porter-Idaho production in 1930-31. (See Tables I and II). To maintain this grade and production from this stope I believe the eyes were torn from the ore body. The stope cannot be safely entered but I doubt very much if any ore remains worth mining under present conditions of weakened ground.

Drive 301 N. (se Map 1.), which is the probable upward northward extension of this lode was also inaccessible last summer. Assay maps show a shoot 23 feet long and 1.2 feet wide which assays 91.19 oz. silver and 2.2% lead, a type of ore occurrence typical of the lodes.

Below the "D" adit the "D" ore body has not been touched. "I" adit 460 feet below (see Map 3) is inaccessible, but from the maps appears to have been driven on a weak structure without values. It is in about the right place to be the "D" lode. No lateral work has been done at "I" level for parallel structures. However, no such structures were found at "D" level where lateral work was done. It must be assumed, therefore, that the "I" adit structure is the downward continuation of the "D" lode and has failed to make ore at this level. A little crosscutting in "I" adit would check this. The presumption therefore is that the "D" ore body bottoms somewhere between "D" and "I" levels.

The Premier assay plan of the "D" ore body shows streaks or lenses of high-grade silver ore forming perhaps 10% of an area of much lower grade mineralization. In the former operation only the high-grade ore was mined and development failed to keep pace with the rate of production. If it had,

developments costs would have wrecked the operation. It seems to me that this ore area should be figured as larger and lower grade with the idea of finding enough ore for a milling operation. It is on this basis that the ore area has been calculated. In mining this ore in this manner it will probably be necessary to take it to both shear walls and even then to allow a liberal factor (20%) for dilution. The effect, on the average, of the occasional high assays got is improperly excessive so these have been arbitrarily cut to 100 oz. On these premises, the "D" ore area figures out as follows:

Ore 8 X-cut to 9 X-cut - 1,700 sq.ft. @ 11 cu.ft.per ton
= 155 tons per vertical foot
grade 24.0 oz. silver

Allowing 20% dilution by 4 oz. material, there would be 185 tons per vertical foot of 20 oz. silver ore. Assay data do not give lead percentage, but on the basis of previous production 20 oz. silver ore should carry 0.75 to 1% lead.

Lower Grade Mineralization.

9 X-cut to 20 feet N. of 17 X-cut - 4,400 sq.ft.
= 400 tons per vertical foot of
9 oz. grade

Allowing dilution of 20% by 2 oz. material this gives 460 tons per foot of 7.9 oz. silver grade.

In view of the milling and operating factors to be discussed later, this material is not ore at this place and time.

There is nothing from which to estimate the downward extent of the "D" ore body other than that it has not been found at its most likely position on "1" level 460 feet below.

3. 30k Lode. Little is know of this Prosperity lode. It has been stoped from 3 level only, both north and south of the main crosscut. The stopes extended up the dip for 250 feet. The ore has not been touched

below 3 level. At the level Premier calculated the values for 117 feet, part on each side of the main crosscut, to be 136.16 oz. silver and 9.19% lead across 0.91 feet. This grade for silver should probably be discounted somewhat as it is an uncut grade and includes five assays over 300 oz. The ore is considerably oxidized.

4. "Minne and"Wake"veins and nearby structures. Little is known of these Porter-Idaho veins. They were the first lodes opened up on the hill and were early mined out. The workings are inaccessible. The ore was largely oxidized and some was of very high grade. Intensive exploration below them from "I" adit failed to find more ore. From the data their prospects do not look good.

5. "Tessaro"lode. This lode is a comparatively weak structure. At its north end a lense of ore sampled by me for a length of 27 feet averaged .017 oz. gold, 146.5 oz. silver and 7.45% lead across 1.32 feet. I estimate 22 tons of ore have been stockpiled from drifting out this shoot. Sinking in the floor for 3 feet gave poorer ore. This lense is typical of what may still be found in any of several structures.

6. "Black Nick" Lode. Values had been reported to me from this lode. My sampling gave none of interest.

7. "Angel" Lode. Presence of galena and manganese stains made this lode look good. Sampling was disappointing. No ore was found. The high-grade silver minerals do not seem to have entered the lode.

GENERAL CONSIDERATIONS FROM SAMPLING AND ORE RESERVES:

This section should be read in conjunction with "Analysis of Operating Data."

The mine was not able to operate in 1930-31 by selective mining of a shipping-grade of ore. Not enough ore was found, by a large margin,

to pay operating costs and do adequate development. There is no prospect that at this time, even with higher metal prices, the situation would prove different. Two alternatives remain:

(1) To permit lessors on a royalty basis to clean out the known high-grade ore and, if they wish to, look for more ore,

or

(2) To try and develop enough ore to make a milling operation. The grade would have to be at least 20 oz. silver and 1% lead and the ore body would have to be big enough to supply at least a 150-ton mill before any consideration could be given this idea. The ore, too, would have to be amenable to concentration.

A minimum size mill of 150-ton capacity is suggested as at least this size is necessary to achieve reasonable operating costs and (1) write-off of the capital investment of the tram and power line, (2) operating cost of the tram and of a camp in this location.

Even should the "D" ore body extend undiminished to "I" level, which seems improbable, it does not make enough ore to maintain a mill of this size. Therefore at least one more ore body of comparable dimensions would need to be found. No clues exist suggesting the presence of such another body.

Mill Test.

A mill concentration test was run on a composite bulk sample of partly oxidized ore from three places in the lower workings. These samples were:

			Au.Oz.	Ag. Oz.	Pb. %
#1343	Prosperity Lode	#3 level	Tr.	8.4	2.09
#1344	304 Lode.	#3 level	.02	42.1	3.67
#1345	"D" adit	#7 X-cut (across 13.7 feet)	.02	33.0	1.65

Results indicate at least 80% of the values can be recovered in a shipping-grade concentrate assaying 360 oz. silver, 17% lead and 15% zinc.

For details see "Mill Test Report", Appendix "A".

SPECIAL CONDITIONS AFFECTING OPERATING COSTS:

A. Transportation. All movement to and from the mine, including personnel, has been by tram. Probably due to the high original cost of the tram (something over $350,000) the 1929-31 operation figured transportation at $2.21 per ton of ore shipped. The tram is salvageable, but the cost of this is not known and is difficult to estimate. Competent guesses range from $25,000 to $100,000. For a good repair job the larger figure seems more likely.

B. Timbering. Due to the soft ground a large amount of timber has been used underground. A "D"-type ore body would probably have to be mined by square-setting requiring much timber. All this timber has to come in by tram. Cost of suitable timber in this area has probably trebled since the previous operation.

C. Power. Power was supplied over a 4-mile line from a diesel plant at tidewater. This line is completely down and probably the only parts salvageable are a majority of the towers. The beach power plant has been removed. A considerable capital expenditure of at least $100,000 would be needed for power. Diesel fuel has greatly increased in price. Cost of power would be at least double, probably treble, that of the previous operation.

D. Labour. Maintenance of a satisfactory labour supply at the property is a major factor in getting good operating costs. The camp location is one of the toughest I have ever seen. In the 1930-31 operation two large three-story bunkhouses were used and covered walkways gave

access to the tram terminal and adits. There were no facilities for recreation and no accommodation for married men. It would be difficult at this location to provide such accommodation. Without it and recreation facilities, labour will be troublesome and difficult to hold, and therefore expensive.

Submitted,

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Vancouver, B. C.
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