

018358

21 Aldred:
103P 089
103P 088

THE BIG FOUR SILVER MINE
MARWOT RIVER AREA
PORTLAND CANAL MINING DIVISION
BRITISH COLUMBIA

*Bought by Cassiar
consolidated in
1951*

*↓
name change +
control change in
1977 to Pacific
Cassiar + present
directors*

416 Bank of Nova Scotia Building,
Vancouver, B.C.,
August 2nd, 1950.

B. W. W. McDougall,
Consulting Mining Engineer.

THE BIG FOUR SILVER MINE

Portland Canal Mining Division, B.C.

INTRODUCTION

This report is based principally on an examination made from July 11th to 15th, inclusive, 1950, and from information obtained from maps and other records prepared by engineers and officials of Premier Gold Mines Ltd. while development and production operations were under way. The mineral claims owned by the Big Four Silver Mines Ltd. Company include three separate claim Groups each of which, during their earlier histories, was owned and operated by a separate mining organization. These three Groups were known as the Porter Idaho, Prosperity and Silverado. My examination and study has been concerned, principally, with the Porter Idaho - Prosperity section and the report, for the most part, will deal with these Groups. Mention will, however, be made of the Silverado section and its general relation to the whole consolidated Group discussed.

The principal metal of the Big Four Silver properties is silver; there are, however, minor values in gold, lead and zinc. At one stage in their history, and while being operated by Premier Gold Mines Ltd., production of crude ore won by selective mining methods was maintained at an average rate of more than 100,000 ounces of silver monthly for a continuous period of 17 months. Operations were suspended due to the low price of silver which, in the spring of 1931, sagged to a low of 28¢ per ounce. At that time the mine was only partly developed and important tonnages of lower than shipping-grade ores remained in certain developed sections of the workings awaiting the operating Company's decision with reference to milling. Since almost all of the available information concerning ore bodies has its source in Premier production records and assay maps, frequent reference must be made to Premier in this report. I took only some 22 samples for special check purposes. Since the assay maps record thousands of samples and their assays, no good purpose could be served by any small attempt at re-sampling.

A careful study was made of the major economic factor affecting operations, - namely transportation. I was accompanied on the property by Mr. L. S. Davidson of the Big Four Silver Mines Company, Mr. A. Bugneallo, the Company's foreman and Mr. M. P. McDonald, an experienced aerial tramway construction man. Mr. McDonald's visit to the property was for the express purpose of investigating the condition of the aerial tramway and estimating the cost of restoring it to good operating condition.

PROPERTY

MINERAL CLAIMS:

The Mineral Claims and Surface Lot owned by the Big Four Silver Mines Company are listed as follows:

PORTER IDAHO GROUP

Lucille

Gem of the Mountains

Lot No. 4729

" " 4735

R.W.D. 7-2

PORTER IDAHO GROUP (Cont'd)

Gem of the Mountains Fr.	Lot No. 4738
Never Sweat,	" " 4733
Prickly Heat,	" " 4734
Prickly Heat Fr.	" " 4737
Slide,	" " 4728
Never Sweat Fr.	" " 4738
Nettie L,	" " 4730
Sunday,	" " 4731
Eureka,	" " 4732

PROSPERITY GROUP

Teapot Dome,	" " 1857
Prosperity,	" " 1858
Prosperity Fr.	" " 1859
Honest John,	" " 1860
Gargoyle Fr.,	" " 1866
P. G. No. 1 Fr.,	" " 5105
P. G. No. 2 Fr.,	" " 5106

SILVERADO GROUP

Silver Bow No. 3 Fr.,	" " 4514
Glacier Fr.,	" " 4515
Silver Bow No. 1,	" " 4518
Silverado No. 3,	" " 4520
Silverado No. 4,	" " 4521
Silverado No. 4 Fr.,	" " 4523
Silver Key No. 1,	" " 5104
Key Fraction,	" " 5113
Silver Key No. 3,	" " 5114
Silver Key No. 4,	" " 5115
Silver Key No. 5,	" " 5116
Cambria,	" " 5119

OTHER MINERAL CLAIMS

Silver Key No. 6,	" " 5117
Silver Key No. 7,	" " 5118
Guard,	" " 5120
Silver Key Fraction,	" " 5103
Silver Key No. 2,	" " 5122
Fortune,	" " 4512

Surface Lot No. 467, (Indefeasible Title). *(not now owned)*

NOTE: Lot No. 467 is situated near the mouth of the Mamot river. On it is located the lower aerial tramway terminal and bunkers for ore storage and wharfage facilities for loading direct on deep-sea ships.

There are, in all, some 36 Mineral Claims and Fractions all of which are Crown Granted. The total area is, approximately, 900 acres. Except for one claim, (Fortune L 4512) these claims form a compact aggregation without intervening alien territory. The claims comprizing the several Groups are shown in color in their relation to each other and to the geography of the area on a Mineral Reference Map which accompanies this report.

B.W.M.

SITUATION:

The Porter Idaho and Prosperity Groups are situated on the northerly side of the North Fork of the Marmot river and extend from the Marmot glacier to the approximate summit of the ridge which joins Mts. Rainey and McGee. The terrain above this ridge is ice-capped. The easterly boundary is about 3 miles, nearly due east, from the British Columbia-Alaska boundary line at Hyder. The Silverado Group extends from near the east shore of the Portland Canal, about one mile south from the town of Stewart, over the summit and across the ice cap to make contiguous contact with the northerly boundary of the Prosperity Group. More briefly - the properties may be described as being situated about 3 miles SW from the town of Stewart and on the easterly side of the Portland Canal near its head. It is in the Portland Canal Mining Division.

TOPOGRAPHY:

Mt. Rainey rises directly from tide water, at the head of the Portland Canal, to an altitude of 6,550 feet in a horizontal distance of two miles. The Marmot river flows into the Canal from the east some four miles southerly from Stewart. Three miles from its mouth it forks and the North Fork occupies a glacier-filled, precipitous valley which trends about NE or nearly parallel with the course of the Canal. The properties lie athwart the high divide extending from an altitude of about 2,900 feet at the northerly rim of the Marmot glacier - up slopes averaging close to 37 degrees to the rim of the ice cap some 6,000 feet or higher in altitude - across the ice cap and westerly down over the slopes of Mt. Rainey nearly to the Canal. Certain areas are precipitous but being, for the most part, above timberline and, to a large extent, without vegetation of consequence that part of the area not covered by the ice cap was relatively easy to prospect.

The Marmot glacier is a valley spill-over from the Cambria ice fields which blanket many square miles of high territory. The Kitsault glacier 18 miles SW of the Marmot is another spill-over from the same ice fields. The Kitsault glacier is the source of the river which flows into the head of Alice Arm. The topographic features of the properties are of particular importance because of their bearing on circumstances affecting mining operations.

ECONOMICSCLIMATE:

The average annual precipitation at Stewart is about 75 inches which figure includes the water from an average annual snowfall of about 220 inches. At sea level the snowfall period usually begins in November and continues until late March or early April. Light snowfall or snow flurries may occur during any month of the year on the high summits. January is the coldest month; in this month, in 1917, a record low temperature of 22 degrees below zero was registered at Stewart. Precipitation and, to a lesser extent, temperatures vary more or less directly according to the altitude. At the Porter Idaho and Prosperity camps and working sites temperatures, during winters, are no particular impediment to operations but snow builds up to great depths and snow sheds are necessary at all tunnel portals.

The higher portions of the properties, except for the ice fields,

B.D.D. m^o

are usually more or less free of snow from July until late in October. While climatic conditions are rigorous the properties were successfully operated by the Premier Company during the winters. Comfortable camps, conveniently placed plant buildings, snow sheds, covered runways to portals of working adits and aerial tramway transport having been provided, underground operations were carried forward without extraordinary difficulty and, presumably, at reasonable cost.

TIMBER:

Except for some of the lower Silverado claims the properties are above timberline. In the earlier stages of the Porter Idaho operations mine props and lagging were packed in by horses from sources in the lower Marmot valley. During the time of Premier's operations timber and lumber was taken in over the aerial tramway. All timber used underground was obtained from a small saw mill which, at that time, was operating near Hyder. Only square timber and planking was used underground.

Timber is, of course, an essential requirement. A great deal of it was used in driving raises and lesser amounts in drifts and crosscuts through loose ground. It will be necessary, before important operations can be re-commenced on any important scale, to provide for this requirement. There are no saw mills operating in the district at this time.

There are two alternatives - one is to purchase timber and lumber from the nearest available mill, possibly at Prince Rupert, and convey it to Stewart by barge. The other is to instal a small saw mill on the lower margin of the Silverado property or in the lower Marmot valley. The only trees in the district suitable for timber are hemlock and spruce - the former being much the more abundant. Spruce, of course, is much to be preferred for mining and construction work. Lumber purchased from outside sources, plus the cost of transport, would be very expensive. It will, I am sure, be a great deal cheaper to manufacture timber and lumber on or in the vicinity of the properties. It will, obviously, be necessary to thoroughly investigate the details of this matter.

WATER:

There is an abundance of water for all requirements. The water distribution system installed at the camp and plant sites can be restored at little cost. In the event that a milling operation should be established the processing plant must be constructed at or near tide water where plenty of water is available for all purposes - even including a small-capacity hydro-electric plant for lighting purposes.

TRANSPORTATION:

Transportation is the key factor to the successful operation of these properties. Altogether probably close to half a million dollars have been expended in an effort to solve this problem in a satisfactory manner but in spite of this the problem is not, and has never been, solved in a permanent and altogether satisfactory manner.

In order to understand this problem it is necessary, again, to introduce further descriptions of the Premier operations. At the outset it is important to note that the Premier Company owned only about a 60% interest in the Porter Idaho and an 80% interest in the Prosperity properties.

B.D.W.M.

Furthermore the Company was under the necessity of keeping the two operations entirely separate in spite of the fact that the two Groups are contiguous and the same veins traverse portions of both properties. This must have been a somewhat costly nuisance to the operators and it is to be supposed that the Company's method of solving the transport problem was considerably influenced by these circumstances.

An aerial tramway was constructed from tide water, near the mouth of the Marmot river, to the portal of No. 3 tunnel on the Sunday claim at an elevation of 5,000 feet. The horizontal distance is a little more than 5 miles. This tramway follows the Marmot valley to the "Forks"- a distance of 3 miles from the beach terminal. At this point there is an angle station at an elevation of about 500 feet and to which approximate point a road, constructed to a good trucking grade, extends from the shore line. From the angle station to the upper terminal the tramway traverses exceedingly difficult terrain. One span is 4,100 feet long. Two generators, one at the upper terminal and one at Green Point transfer station, were installed to feed electric power back into the near-by 6,900 volt power transmission line while the tramway was in gravity operation. The towers are of steel with concrete footings. It was constructed in 1928 and 1929 at a cost of about \$315,000. In respect to design and construction it was a splendid achievement. Its operation is said to have been entirely satisfactory except during high-velocity gales when, due to the swaying of buckets on the long spans, temporary discontinuance was necessary. The tramway, however, did not solve the problem of access to personnel which remained difficult. After the suspension of operations the Premier Company removed the standing cables between the wharf and the "Forks". Rock and snow slides along the upper sections have, during the two decades which have elapsed since the close-down, caused minor or extensive damage, or even total loss, to almost every tower between the angle station and the upper terminal. The cables which once traversed the long spans are down and rolled together and some of the cable had disappeared entirely. Mr. McDonald estimates that the cost of putting the tramway back into operating condition, between the angle station and the upper terminal would be about \$70,000 and that the time required to effect the repairs would be the better part of two seasons.

Premier conveyed all incoming supplies, including 18 foot long square timbers, explosives, fuel and other oils, machinery and groceries by tramway. It was necessary to construct a smaller tramway from the No. 3 tunnel portal and upper terminal down to the lower tunnel portals in order to deliver supplies to these places and to the two camps and to transport ore up to the terminal bins for out-loading to tide water. I am informed that it required 8 men per shift to operate the main tramway and that the book cost of transport, mine to beach, was about \$2.20 per ton.

I am of the opinion that it is inadvisable to repair this tramway and for the following reasons:

1. The high cost and length of time required to effect repairs.
2. The high cost required for transport over the tramway even if repairs were to be completed.
3. The uncertainty that it will remain intact for any assured length of time, - it might be put out of commission at almost any time of the year by rock or snow slides.
4. It does not solve the problem of access to mine personnel.

B. J. J. M. J.

5. Further expense is required for transport of ore up the upper terminal and for supplies down to the working sites.
6. A permanent and more economical avenue of transport can be provided.

In respect to this latter point it is suggested that the further development and exploitation of the properties can be most economically effected by driving an adit from a portal site on the Silver Bell property, which faces the Portland Canal, at an altitude of about 4,000 feet. The length of drive necessary would be about 5,000 more or less depending on the altitude of the portal and the precise point on the properties it would be directed to. The cost of such an adit, exclusive of buildings, equipment and other necessary facilities would be about \$30.00 per foot.

Access to the portal site would be by road from the present Silverado tractor road to a site to be chosen on the Silver Bell property and probably along the course of Portland creek about 1,000 feet above sea level. An aerial tramway now installed at the Silverado property can be removed and re-erected from the lower Silver Bell site to the site of the adit portal. The re-erecting cost would be relatively small. This plan further visualizes a mill site on the lower slopes of the mountains with a small sawmill near by to supply the major portion of the timber and lumber for the mine as well as for other construction work.

The inside or easterly end of the long adit would be connected by upraise with one of the centrally-located mine workings so that ore for milling or for direct shipment to the smelter could be loaded directly from the chutes and conveyed by motor haulage to bins at the adit portal. Further elaboration of this suggestion need not be given here. It is obvious, of course, that careful investigations would have to be made to establish the practicability of the suggestion from an engineering standpoint and to decide on the precise details of the plan. Such investigations, however, need not be expensive. The advantages of this transport plan would be as follows:

1. Safe, all-weather, all-year access for mine personnel.
2. Uninterrupted in-going and out-going transport for materials and ores.
3. A transport cost from mine leading chutes to mill or tide water of probably not greater than 50¢ to 70¢ per ton.
4. There is probability that such an adit would intersect other, and as yet unknown, veins since the adit course would traverse territory almost all of which is considered favorable for the occurrence of silver-bearing structures.

POWER:

The only power now available on the property is a 250 cfm gasoline-driven compressor. Premier installed a 350 horse-power diesel-driven generator unit at the beach or lower tramway terminal and electric power at 6,900 volts was transmitted to a step-down station on the property. This transmission line was of aluminum conductors suspended by steel towers. At the power house on the property the 6,900 to 440 volt transformers are still in place. The power house is in good condition and it houses a mounted 1,200 cfm Ingersol Rand compressor direct connected to a 440 volt synchronous

B.W.D.M.

motor together with exciter. There is sufficient space on the same concrete floor for a diesel engine or for other power or mechanical equipment. The 350-horse power diesel-generator has been removed and the power transmission line is in more or less complete disrepair. Much transmission cable and many insulators may, however, be reclaimed should they be needed elsewhere.

It would require compressor capacity of 350 cfm for the suggested transport adit drive project and this would require 75 horse power. For the initial work and later as a stand-by a diesel engine would appear to be the most satisfactory power unit. There is a hydro-electric plant at the Dunwell mine which might be used later. I understand that some of the equipment is now gone and I have no accurate estimate as to what it would cost to bring in electric power from that source to the adit. It would have to be transmitted at about 6,600 to 6,900 volts. It might be pointed out, however, that there is a great deal of electrical equipment on the properties including 6,900 - 440 volt transformers, transmission cable and insulators. Whether compressed air power for mine operations could best be provided by using the 1,200 cfm machine with power supplied from a diesel or whether to transmit electric power through the adit by insulated cable to drive the motor is a matter for future investigation.

GENERAL:

Banking, postal, telephone and telegraph, contract freighting and other services are available at Stewart. Radio telephone from the properties to Stewart is excellent and can readily be arranged. Vancouver, of course, is the main center for supplies, equipment and labor. There is, at present, weekly steamer service between Vancouver and Stewart.

HISTORY

The first claims of the Porter Idaho Group were staked by Clay Porter and associates about the year 1921. In the following years development was carried forward on two veins more or less continuously during the open seasons. Work was carried on during one winter. A very considerable amount of work, in the aggregate, was completed. Transport was by pack animals. During this time nearly 500 tons of crude hand-sorted ore was packed out and shipped. Assays ran from about 250 to 400 ounces to the ton on the ore shipped.

Prosperity was staked in 1926 and the discovery outcrops were recognized as being continuations of Porter Idaho veins. A shipment was made of ore from the original outcrop. Some 29 tons assayed about 415 ounces to the ton in silver.

Early in 1928 both the Porter Idaho and the Prosperity Groups came under control of Premier Gold Mines Ltd. Premier acquired a 60% interest in the Porter Idaho property and agreed to spend \$500,000 in providing transport facilities, mining plant and development. It also acquired an 80% interest in Prosperity. Construction of the aerial tramway was begun in the same year. It was completed in September, 1929. The power plant and transmission line installations were completed at about the same time and in November and December of this year 1,650 tons of ore was shipped which averaged about 66 oz/t in silver. In this same year a steam-heated camp was built, the 1200 cfm

B.D.M.

compressor with its motor drive and other mining equipment was installed. In the year 1930 the ore shipped is given as 18,049 tons containing 348 ounces gold, 1,364,729 ounces silver and 916,135 pounds lead. The average values were: 0.015 oz/t gold, 75 oz/t silver, 2.5% lead. Most of this ore was from the Prosperity section. In this year the Prosperity property was the third largest silver producer in the Province. Development and production operations continued until early in April, 1931, when due to the low price of silver, which had dropped to 28¢ per ounce, all work was suspended. Two watchmen were continuously maintained on the properties for a period of about 11 years.

The American Smelting and Refining Company, the controlling interest holders in Premier Gold Mines Ltd., having decided to liquidate their Northern B.C. holdings, the properties were acquired by the present Company in 1946.

REFERENCES

Official references to the two properties are given in the Annual Reports of the Minister of Mines, B.C. as follows: Porter Idaho, 1922 - 1932: Prosperity, 1926 - 1932.

The physical features and general geology of the District, with references to individual properties, are given in publications of the Geological Survey of Canada listed as follows:

- C.G. Memoir 32, 1913, by Dr. R. G. McConnell,
- C.G.S. Memoir 132, 1922, by Drs. S. J. Schofield and G. Hansen,
- C.G.S. Memoir 159, 1929, by Dr. G. Hanson,
- C.G.S. Memoir 175, 1935, by Dr. G. Hanson.

GEOLOGY

The waterway or inlet known as the Portland Canal extends northerly and inland from the Pacific at Dixon Entrance for a distance of 90 miles. It cuts across the Coast Range batholith and reaches into territory lying on the NE flank of the great body of intrusive rocks. A glance at Map 307 which accompanies C.G.S. Memoir 175 shows that the batholithic rocks which extend northwesterly from Observatory Inlet and east of the Canal are overlain by large remnants of older (Triassic to Lower Cretaceous) sedimentaries and volcanics. On this map the main mass of the central portion of the batholith is shown to be in Alaskan territory. In the vicinity of the Marmot river the batholith, or an outlier from it, plunges northeasterly and the northeastern section of the map area indicates only few and relatively small areas of granodiorite though there are innumerable dykes satellitic to the plutonic rocks. It is in this area, underlain immediately by Bear River Formation rocks, (Hazelton Group), that most of the ore deposits occur. Doubtless most, if not all, of these deposits have been exposed at varying depths below their original tops by deep erosion during Tertiary times and, more recently, by the great glaciers of the Pleistocene Period. It is of interest to note, also, that numbers of the most important gold and silver mines of the Province are situated on the eastern flank of the Coast Range batholith.

B.D.J.M.

LOCAL:

The claims of the Porter Idaho and Prosperity Groups are underlain by Triassic volcanics of the Bear River Formation. These are principally andesites, tuffs, agglomerates, breccias and minor rhyolites. These rocks are older than the batholith but are cut by numbers of lamprophyre dykes which are younger than the orebodies. The general strike of the volcanic rocks is northeasterly and the dip northwesterly. From C.G.S. Map 215 accompanying Memoir 159 it is inferred that these rocks form part of the easterly limb of a synclinal structure the westerly limb of which is formed by the rocks exposed on the westerly side of Mt. Rainey. It will be observed that the entire Mt. Rainey area occupies a section more or less semi-circular in outline and jutting into a major outlier of the batholith. The granodiorites plunge northeasterly and, at some but unknown, depths underlie the entire area.

Ore-bearing shear zones occur in a belt of general shearing which appears to cross the properties in a northerly direction. These shears attain widths up to 35 feet but, in general, the widths are considerably narrower. Sulphides occur, within the ore-shoot areas, in somewhat erratic manner. Several of the shear structures have been extensively developed. Dykes of lamprophyre occur in some abundance cutting across both rocks and ore-bearing shears.

The shear structures are highly oxidized down to the greatest depth reached by development workings, (750 feet). In many places this oxidation is so intense as to obscure structure and even ore minerals and some of the highest grade ore extracted consisted of this highly oxidized material. Ore minerals include galena, pyrite, sphalerite, grey copper, (probably freibergite), ruby silver and native silver. The gangue is largely sheared and silicified country rock - there is comparatively little vein quartz. There has undoubtedly been considerable supergene enrichment of silver but much of the sulphide content is, undoubtedly, primary.

The relative abundance of silver minerals strongly suggests a temperature-sequence zoning of sulphide minerals which would indicate that the Mt. Rainey area occupies a high position in the original ore columns. It has not yet been determined to what depth these silver-bearing sulphides may be expected to extend. Secondary silver enrichment may, of course, be expected to extend well into the base-metal zone - depending on the porosity of the shear structures.

THE MINEGENERAL:

The mine workings of the Porter Idaho - Prosperity section are on the Nettie L, Lucille, Prosperity, Gargoyle Fraction, Sunday and Teapot Dome claims. Ore production has been mainly from the Nettie L and Prosperity claims. The aggregate length of workings has been estimated at about 15,000 feet. All mine entries are adits - there is only one shallow winze in the mine.

The mine workings partly explore and develop an area roughly about 3,000 feet in a N-NW -S-SE direction by 1,750 feet in a NE - SW dire-

B.D.W. 170

ction. They extend in altitude from 4,220 feet to 5,750 feet - a vertical interval of more than 1,500 feet. At four points, three being on the Gar-goyle Fraction and one on the Teapot Dome, workings are at or near the southerly rim of the ice cap.

VEINS:

Some 6 silver-bearing shear structures are opened by the present workings. Of these 4 are more or less parallel and have a general N-NW strike and a dip of 50-70 degrees westerly. Two are somewhat irregular as to course but appear to have a general N-NE strike and a westerly dip. At least two shear systems traverse the area and in directions about parallel to the ore-bearing shears. It seems plain that the multiple intersections of the two systems have had important influence on ore deposition and to the localization of ore shoots.

The surface rocks over the area explored by the mine workings are volcanics of which a particularly conspicuous variety is a tuffaceous agglomerate. Underground, oxidized products of both country rock and sulphide-bearing shear structures often rather effectively masks host-rock identification. The rock formations are sheared over wide areas and, probably for this reason, are very pervious. Heavy oxidation persists to the lowest horizons yet reached and, I think, this condition may be expected to extend to much greater depths.

In ore shoot areas in the shear zones ore mineralization is observed to occur irregularly over widths up to 35 feet. More commonly widths are less than half as great. Walls may terminate at a gouge streak but, in some instances, even this indication is lacking. The most obvious silver-bearing minerals are galena and blende which, invariably, carry high silver values. These minerals occur in small bunches, thin streaks and, in places, in solid bands more than one foot in width. Usually, but not invariably, these more massive sulphide occurrences follow one or both walls. A typical occurrence of this sort was observed in D Level, No. 6 X-cut. At this place there is a band of mixed ~~of~~ galena and blende some 16 inches in width which assayed 179.6 oz/t in silver. This is on the hangingwall. Next to it is an 18-inch width of soft gougy material carrying mashed up sulphides which assayed 87.2 oz/t in silver and on the footwall of this, again, there is a 15-inch of black blende which assayed 168.4 oz/t. The total width of this occurrence (samples 2, 17 and 18) is 49 inches and the average assay applying over that width is 142 oz/t. The sulphides occur erratically. Close inspection of the sulphides usually reveals native silver, ruby silver, freibergite and argentite. It is probable that in the apparently clean galena argentite occurs in more or less solid solution. In addition to the "visible" ore there are occasional streaks of oxidized materials which assay high in silver. Some of the shipments made by the original Porter Idaho owners consisted almost entirely of this oxidized material.

Drifts which follow shear structures outside of the definite ore-shoot zones frequently reveal narrow widths of high-grade sulphides. The shears are persistent in strike and dip and in no case have they been known to fade out or disappear. It is my opinion that the ore shoots are most likely to be found at acute-angled intersections with a second shear system. The shoots so far discovered and to a large extent worked out for their high

B.D.W. 7

grade content are short - rarely exceeding 200 feet in length. They do, however, appear to persist in depth which fact would seem to support the ore-shoot-loci-intersection idea.

MINE WORKINGS:

The Big Four Silver Mines Company has been exceedingly fortunate in securing a complete set of Premier's assay maps. These record thousands of assays. They are, for the most part, level plans and vertical projections drawn to a 20-foot to the inch scale. Unfortunately there is no complete plan drawn to a smaller scale which shows all these workings on a single drawing. Accompanying this report is a print showing, in plan, the drifts and crosscuts of the main working levels.

The upper main adit, known as the No. 3 Tunnel, is near the westerly corner of the Sunday claim at an altitude of 5,085 feet. At about the 550-foot point the adit swings westerly and continues for a distance of about 1,200 feet to the present face. Except for the wide-angled turn at the 550-foot point this adit is straight throughout. The D vein was intersected at or near the 550-foot point - it was drifted on northerly for a distance of 300 feet through shear structure. Though it exposes spots and short lengths of narrow high-grade sulphides no stoping was done. At about the 1,650 foot point the "Blind" vein was intersected. This was drifted out 700 feet to the north and about 425 feet southerly. Ore was encountered at the vein intersection with the adit and in the east corner of the Prosperity claim and extending south on the Nettie L claim over a length of about 150 feet. This shoot was worked extensively through two raises and sub-levels above the No. 3 level - other high grade sections on this drift were also stoped to a much lesser extent. About 1,650 feet from the portal the Prosperity vein was cut. It was drifted out 750 feet northerly and about 650 feet southerly to daylight in a canyon on the Lucille claim. Due to the resulting natural ventilation this southerly drift is now choked with ice. This drift encountered good ore similar to that of the Blind vein. A winze was sunk a depth of 50 feet on the main orebody. According to the mine superintendent's reports, however, the ore, though of a satisfactory grade, was mashed and gougy in character and difficult to mine and handle by the selective methods being used. This is the only winze in the mine. Except for the winze work the downward extensions of the orebodies on the No. 3 level - except, of course, for D vein, are intact.

At an elevation of 5,392 feet - or about 300 feet higher than the No. 3 Tunnel - the No. 1 Tunnel has been driven. This working cuts the Prosperity vein at a distance of 200 feet from the portal. It is drifted out northerly a distance of about 1,200 feet and southerly (towards daylight) about 125 feet.

C Tunnel, at an elevation of 5,246 feet, has been driven on the Prosperity vein a distance of 1,200 feet. (It also exposes a fourth vein which is opened over a length of 500 feet.) Mine workings southerly from the main transport adit could not be inspected due to accumulations of ice. It will be understood that the terrain on the northerly side of the No. 3 adit forms part of the westerly side of Mt. Rainey and that it slopes upwards at angles averaging 35 to 40 degrees.

← Prosperity vein (5312 ft)

B.W.D. 7/10

At an elevation of 4,691 feet - nearly 400 feet vertically below the No. 3 Tunnel is the "D" Tunnel. This follows well-defined shear structure from the portal to the face - a distance of about 1,400 feet. In the first 700 feet of the drive a number of narrow 'spots' and short lengths of good ore occur which have not been investigated by raises. Commencing at about the 800-foot point two closely-spaced shoots with a maximum width of up to 35 feet were encountered. The length of these two shoots aggregates about 200 feet. A 300-foot inclined raise and sub-levels developed this shoot and ore production amounting to about 5,000 tons of 'selected' ore was mined and shipped.

At least two, and possibly more, veins occur near the southerly corner of the Nettie L claim. Four tunnels with somewhat extensive workings, including connecting raises, were driven by the original owners of this property. It was largely from these workings that the 500 tons of high-grade ore was shipped prior to 1928. Elevations range from 4,360 to 4,511 feet. These workings are partly sloughed and, in places, blocked with ice. At the time when this work was under way ore assaying 100 oz/t or lower was thrown over the dumps since, under the circumstances then obtaining, it was valueless. G, H
E+

"I" Tunnel, at an elevation of 4,222 feet, or 469 vertically lower than "D" Tunnel, is believed to have been driven on the D Tunnel shear structure. An exploratory drift makes connection with the older Porter Idaho workings. The main working follows the shear structure northerly for a distance of 1,500 feet and the present face is nearly beneath, on the dip, the southerly end of the ore shoot which was worked above the D Tunnel level. The distance, measured on the dip, between D and I levels is about 550 feet. All this vein area is virgin. The Premier Company was driving this I tunnel for the downward extension of the of D Tunnel orebodies at the time when the close-down orders came.

During 1949 the Big Four Silver Company drove a shallow tunnel on a similar type of shear structure to the others. This is more or less parallel to others; it is located a little to the east of the upper camp. A high-grade lens of ore yielded about 7 tons of hand-sorted ore over a length of about 25 feet. Higelo
East of
Buncher

CONDITION OF MINE WORKINGS:

The main workings are equipped with 12-lb track and air lines are, probably for the most part, intact. The main raises are of three well-timbered compartments - all that were inspected are not only in excellent condition but are commodious. Most of them have a manway and slide in the center and an ore compartment on each side. The manway compartments are well and securely lagged with planking. There is ice in certain of the older workings - this being due to proximity to natural ventilation outlets, Both No. 3 and D Tunnels are practically ready for the immediate resumption of operations. I Tunnel has a very heavy flow of water which is probably due to ice dams or sloughs in the old Porter Idaho causing water to back up and overflow into the tunnel below. Only the drills, hoists and tools were removed from the mine workings. Track and air lines were left intact. It might be mentioned here that the ground is easily drilled and the quantity of explosives required is, probably, unusually small.

B. J. D. 7th

ORE PRODUCTION:

The total ore production from the Porter Idaho and Prosperity properties, to date, is about 29,900 tons containing about 2,200,000 ounces silver, 598 ounces gold, 2.5% lead and probably about the same percentage of zinc. No record appears to have been kept of the zinc and there is only incomplete information as to the lead. The ore was shipped to Tacoma for its desirable fluxing qualities. It will be recalled that the A.S. & R. Company owned the controlling interest in Premier Gold Mines Ltd.. Lead and zinc values were thus sacrificed presumably in favor of a much lower smelting rate than would have been obtained had the ore been shipped to a lead smelter. The average grade of this ore was, accordingly, about 0.02 oz/t gold, 73 oz/t silver, 2.5% lead and 2.5% zinc. The total-tonnage figure includes the shipments made by the original Porter Idaho Organization, those made by the Premier Company and a parcel of 2,400 tons of smelter flux from a stock pile at the wharf and which assayed 13 oz/t.

Production made by Premier is recorded as 23,952 tons with average mineral content of 0.02 oz/t gold, 75 oz/t silver, 2.9% lead and unknown zinc. This production was won by selective mining methods. Most of it came from the Blind and Prosperity veins between the No. 3 level and the surface.

~ 2,000 tons max.

CONCERNING ORE RESERVES:

It is impossible to compute the ore tonnages and silver contents with any reasonable degree of accuracy in spite of the fact that assay maps of all the workings are available. It will be understood that the Premier Company conducted stoping to produce an average 75-ounce silver product. To maintain this grade ores were mixed - smaller proportions of high grade with larger proportions of lower grade. Some of the lower grade material was trammed to dumps, some used as stopes fill and a great deal remained unbroken in stope margins and pillars.

I have carefully computed the average grade of the orebody opened by the D Tunnel, on the tunnel level, at 22 ounces silver. The orebody area - that is its length by width - is upwards of 3,000 square feet and, accordingly, the ore tonnage, at 22 oz/t, amounts to 300 tons per foot of vein height or depth. The orebody is intact below the floor of the level and, should it persist in its D Tunnel dimensions and grade to the I level, there would be 165,000 tons at 22 oz/t in this block alone. Similarly, the Blind and Prosperity orebodies are almost intact below the No. 3 level. The average grade of ore originally exposed by the level across these shoots was probably 25-30 oz/t, depending on the dimensions used in making the computations.

It will be recalled that Premier was making preparations to mine further from the upper portions of the Blind vein. These preparations had practically been completed when the close-down occurred. It is estimated that a block of possibly 1,000 tons of ore averaging 75 oz/t is indicated as remaining in this sections of the workings. Usually in stoping additional amounts are revealed. The Company also, obviously, expected to open new shipping-grade material either on I Tunnel or in a raise above it.

Ore on dumps, principally at D Tunnel, is estimated at 10,000

B.D.D. 7

tons. Premier records indicate values of 16 oz/t in silver. My samples numbered 8 to 11 were grabs from this dump; they returned assays of 11.3, 10.8, 14.0 and 10.6 oz/t. However it is practically certain that exposure to the elements over a 20-year period has washed much of the heavier and fine-grained sulphides down deeper into the dump. At the beach terminal there is a dump of about 4,800 tons estimated to carry average values of 16 ounces. There are dumps at the portals of the old Porter Idaho workings but these were mostly under snow. This 16-ounce dump ore represents the discard after the shipping grade had been removed. Assuming the original oreshoot grade at 22 ounces (probably too conservative) and the discards, after selectively mining 75 ounce ore, at 16 oz/t this lower grade material should constitute 72% of the total volume of ore in the original stopes if all the ore in these stopes were accounted for. On this basis, in those sections of the mine operated by Premier, there would remain in present stope walls, perimeter margins, stope fills, and including that trammed to dumps, some 95,000 tons of 16-ounce ore. In addition to this there are numbers of drift sections carrying lower grade ore which are wholly intact but from which definite or approximate tonnage figures cannot be estimated.

Important ore tonnages exist below the stoped areas of the Blind and Prosperity veins on No. 3 level and below the D stopes on the D Tunnel level. The following ore-tonnage estimate is empirical only. I believe, however, that it is conservative.

Ore in dumps at Mine and at the beach terminal,	15,000 tons @ 16 oz/t.
Ore remaining in immediately adjacent areas to present stopes and within limits of present workings,-	40,000 tons @ 16-20 oz/t
Ore in virgin areas below present bottoms of main stoped areas,-	50,000 tons @ 25-30 oz/t.

It is, I think, quite reasonable to expect that there is as much silver in ores located in the immediate vicinities of present workings as has already been extracted. There are ore objectives within easy reach of present workings which, if development should prove favorable, could more than double the ore volume indicated in this estimate. While the ore above the working levels has been estimated to contain only 16 oz/t silver, it will be recalled that all the development and stope-preparation work has been done and that these ores are practically ready for extraction. Ores below the main levels being entirely intact may reasonably be expected to average substantially higher in silver values than the 16 ounces estimated as the average content of the partly worked areas.

DEVELOPMENT POSSIBILITIES:

Diamond drilling from the D. Level intersected two veins which at the core intersections assayed low values; these are at distances of 165 and 205 feet westerly from the tunnel. Very high grade silver-bearing float has been found at the rim of the ice cap near the westerly boundary of the property. The easterly vein opened at shallow depth towards the easterly property boundary by the Big Four Silver Company warrants development. Development on D vein in I tunnel, as has already been mentioned, is the most accessible immediate objective and, should ore dimensions and grade similar to those of D tunnel be

S.W. strike of
offshoot of
Prosperity

B.W.M.

encountered there, "possible ore" in this locality alone would greatly exceed the empirical estimate given in a former paragraph. Farther afield - the development possibilities as drifts on the Blind, Prosperity and D shears are pushed out northerly under the ice cap are considered good. There is also the possibility that other "blind" veins will be discovered during the progress of normal development operations. There are several shears which on the surface carry only low values but which will warrant development attention at the proper time.

BUILDINGS & EQUIPMENT:

The ground surface of the area slopes upwards to the north at about 35 degrees - there is no timber or vegetation growth of consequence. The steepness of the terrain and the necessity of having a camp and plant lay-out safe from snow slides has dominated lay-out planning. How well the Premier engineers succeeded in this is attested by the fact that in the two decades which have elapsed since construction work was completed no building has been damaged by snow slides. Some snowsheds have been crushed by snow weights or side pressure but the main structures are undamaged otherwise.

The upper tramway terminal is at or immediately below the portal of the No. 3 Tunnel from which the Prosperity ore was trammed. Ore was dumped through a chute directly into the loading bins. The terminal is a massive affair. The loading deck provides plenty of room for out-loading buckets and for storing incoming supplies. An upper floor provides space and cover for the motor-driven bull wheel and the power-generating mechanism. In this structure are stored quantities of oils, square timbers, drills, steel, portable hoists, tools and other items of equipment and supplies. At the tunnel portal and connected to the terminal building by snowsheds are the shops and supply storage space. A Sullivan steel sharpener and other blacksmithing equipment, and in the store room are unused grill parts, pipe fittings and sundries of various sorts. The snowsheds have been damaged by snow pressure but they can be repaired at comparatively small expense. All structures were electrically lighted and, of course, are wired for this purpose.

A Pioneer aerial tramway was used to bring up ore to the main terminal bins from the D Tunnel below. A snowsheded track leads from D Tunnel to a tramway landing bin. Up-going ore and down-coming supplies were thus handled for the D Tunnel operation. This tramway extends down to the I Tunnel for the same purposes. The Bull wheel and driving mechanism is in the main terminal. Some of the towers of this aerial tramway are down but the device can be put back into service at some expense.

The living quarters for the Prosperity operation are about 300 feet distant and 200 feet (vertically) down hill from the upper terminal. Supplies were sent down to this building over a simple single-rope tram device. The living quarters consist of a large two-story building with corrugated and galvanized roof designed to accommodate 40 men. The kitchen is equipped with a two-oven range. Kitchen and dining room fixtures and equipment are more or less intact. The building is steam heated by an oil-burning furnace - each of the two-man rooms having a radiator. Office quarters, also, are located in this building. The building is in good repair considering that it has had no important maintenance attention for 20 years.

B.W.D. 7/20

The assay office adjoins the living quarters. It is equipped with crusher, pulverizer, sample drier, balances and most of its original equipment. The building is in good condition.

destroyed by slide → The Porter Idaho living quarters are located about 500 feet vertically below and 1,000 feet distant from the Prosperity camp. The location, with respect to elevation, is more or less midway between D and I Tunnels. This building and its arrangements is practically an exact duplicate of the other. It, too, is in reasonably good condition considering lack of maintenance.

Close to the Porter Idaho camp is the power house. The building is about 50' x 28' in floor area - it has a heavy trussed roof and concrete floor. The high tension power line terminated at a bank of 3 6,900 - 440 volt, outdoor type transformers here. These transformers are still in place and, in all probability, in good condition. Inside the building is the 1,200 cfm Ingersoll Rand compressor with its synchronous motor drive together the exciter and starting equipment including switchboard. The motor capacity is 165 KVA (about 200 horse power). There is also a 12' x 4' air receiver; this and the air and water-cooling piping is intact. Building and contents appear to be in first-class condition.

Premier engineers displayed much skill in designing the lay-out for working these properties. Furthermore - construction was obviously planned for permanence. Photographs accompanying this report will give some idea of construction features. Continuous foggy weather, during my visit, prevented my getting a general view of the whole layout since such view can only be obtained from a vantage point some considerable distance away. Including the main tramway, beach power plant, power transmission line, pioneer tramway, power equipment, camps and other construction works, the Premier Company expended probably about \$750,000.

DISCUSSION

In order that the Big Four Silver properties be again brought into successful operation, it is essential that the transport problem be solved. There are but two alternatives and these have already been described. The difference in transport costs - repaired tramway versus adit - is overwhelmingly in favor of the adit. Also - the driving of the adit might well be regarded as 50% normal development and 50% transport avenue.

true → No mention has yet been made of metallurgy or milling. About the only metallurgical data available is that it has been found that screening the run-of-mine through one-inch mesh eliminates about one-third of the volume and raises the grade of the remaining material by about one-third. Old correspondence indicates that Premier officials were studying the matter of milling. It would seem that a high ratio of concentration would be possible on these ores and that a metallurgical extraction of 90% should be anticipated. I have made no serious attempt to study this problem. A more complete investigation of the entire proposition must, of course, include ore testing and metallurgical study. At the present time the Big Four Silver Company has a Tacoma schedule which, for low grade ores, calls for a smelting charge of 50¢ per ton. Bulk, sea-borne freight - Stewart to Tacoma - is \$4.50 per ton.

B.D.W. m

This report is to be considered as preliminary in character. I spent about one week at the property and another 10 days studying Premier maps and records. A detailed investigation would require weeks for an examining staff. My object has been to obtain generalized rather than detailed data from which a comprehensive appraisal of the whole undertaking can be based. I believe, however, that such detailed data, if and when assembled, will show my own more general appraisal to be conservative.

It might be mentioned that, in addition to the Porter Idaho, Prosperity and Silverado property units, the Company also owns the Dunwell and Ben Bolt properties, both of which have long been considered by competent authorities as having important mining merit. The Dunwell property has had a short production career but has had, as yet, inadequate exploration except for a limited portion of its territory. The Ben Bolt property was held by the McKenzie and Mann interests since, I believe, prior to 1910. The estate valued this property, on a sale basis, at \$250,000. I have not examined either of these properties but have known of them for a long time. Both properties are traversed by a regional pre-mineral fault adjacent to which ore occurrences are found. The Ben Bolt property, I am informed, has a wide base metal-bearing outcrop traceable for some distance. This type of a deposit was not considered of particular interest while lead, zinc and copper prices were low. Both Dunwell and Ben Bolt are readily accessible to transport.

COSTS

The cost of providing transport facilities by means of an adit from a portal site on one of the higher claims on the Silver Bell Group, together with the other required items - down to the point of readiness for development operations is estimated at \$300,000. A partial break-down of this estimate is as follows:

Surveys and Preliminary Investigations,-	\$ 5,000
Repairs to Silverado Road and Extension to Silver Bell Lower Camp Site,-	10,000
Camp and Facilities at Silver Bell Lower Camp Site and Lower Aerial Tramway Terminal,-	5,000
Reinstallation of Silverado Tramway on Silver Bell Site with such additional length as may be required,-	25,000
Sawmill installed near Lower Terminal Site (?),-	10,000
Camps and Plant Buildings at Adit Portal,-	15,000
Complete Adit-Driving Equipment including a 350 cfm Diesel-Driven Compressor,-	25,000
Adit Driving,- 8' x 8' - 5,400 feet (?),	162,000
Upraise at Inside end of Adit, 250' @ \$40, (?),	10,000
Reserve for Estimation Errors, etc.,	33,000
Total,	<u>\$ 300,000</u>

The cost of preparing for resumption of development by repairing the existing tramway from the mine to the vicinity of the angle station some three miles from the beach is difficult to estimate since decisions would first have to be made concerning power, bucket-unloading facilities and ore storage at the "Forks", complete rehabilitation of the transport system on

B. J. J. 17

properties and other circumstances. The \$70,000 figure pertaining to the tramway repairs alone is only part of the total expenditure which would be required to provide for an adequate development and production program. Small-scale operations could be undertaken without greatly added expense and it would be relatively easy to complete I Tunnel to its immediate objective and, if ore were found, to commence production by Premier's selective methods from ore located between I and D Tunnels. As a matter of fact this I Tunnel work, which should require a maximum of 500 feet of drift and crosscuts can be done under contract this present season, using pack-horse freighting facilities, for a cost of about \$20,000 and, I think, it very desirable that this be done prior to the decision on the larger program. But, considered from the proper point of view - that of exploiting the mine by the most economic means possible - the \$70,000 expenditure would be wholly inadequate. I would expect that the over-all total cost for tramway, power and other necessary facilities to exceed \$150,000. From the larger point of view the case for the transport-development adit is clear.

CONCLUSION

The properties warrant complete detailed investigations - both as to the mines themselves and as to the circumstances affecting development and production operations. I am of the opinion that the ore remaining within the limits of present mine workings, and in the reasonable vicinities of these, is more than sufficient to repay the required initial expenditures. Furthermore, I believe that development will continue to disclose reserves adequate to support production on a basis of 100,000 ounces of silver monthly for a long period.

Respectfully Submitted,

B. W. W. Mc Dougall
Consulting Mining Engineer

416 Bank of Nova Scotia Building,
Vancouver, B.C.,
August 2nd, 1950.

GENERAL SUMMARY

Big Four Silver Mines Ltd. owns five mining properties known as the Porter Idaho, Prosperity, Silverado, Dunwell and Ben Bolt. Of these, the first three are contiguous in respect to situation. This report, however, deals only with the Porter Idaho and Prosperity sections.

The most important historical event, in respect to these two properties, is that from early in 1928 to early 1931 they were operated by Premier Gold Mines Ltd., an organization controlled by the A. S. & R. Co. interests. During this period expenditures of upwards of \$500,000 were made for transport, power units, transmission lines and other facilities. In addition, development work aggregating upwards of 12,000 feet was effected during the course of which 23,952 tons of ore containing 1,700,000 ounces of silver, besides minor values in gold, lead and zinc, was mined by selective methods and shipped to the Tacoma smelter. Production was maintained at an average rate of 100,000 ounces silver per month. During this time the New York market price of silver of foreign origin dropped from 35¢ to 28¢ per ounce which circumstance resulted in the suspension of operations early in April, 1931. Following this two watchmen were continuously employed at the properties for a period of 11 years and down to the time when plans for the liquidation of the A. S. & R. Company's interests in Northern British Columbia were being entertained.

Premier, however, is stated to have owned only a 60% interest in the Porter Idaho and an 80% interest in the Prosperity properties and it was required that the two operations be kept separate in respect to certain essential details. This circumstance obviously had considerable effect on the planning of both construction and operational details.

It is obvious that Premier planned for permanence. That the buildings have withstood the elements without maintenance in this exposed location for so many years without extraordinary deterioration is ample proof of this. The most expensive and vital construction features - the aerial tramway and the power transmission line, however, have been badly damaged due to snow slides and snow and ice weights. Both these projects were well constructed and had maintenance been available continuously, it is probable that required repairs, at this time would have been relatively minor. The present extensive damage to these units is due largely to the cumulative effect of the slides after the wires first went down.

The unavailability of the tramway for transport, except at an estimated cost of \$70,000, has resulted in search for an alternative transport plan. It is suggested in this report that the best and most economic plan would be by an adit driven from one of the upper Silver Bell claims at an altitude of about 4,000 feet to a suitable site below the mine workings and contact made with these workings by means of a transport upraise. This plan or idea did not originate with the writer - it was, doubtless, first considered by Premier. Such an adit, though primarily intended as a transport avenue, would also be a very important development working for opening sections of the properties of suspected merit which have not yet been explored. The cost of the completed adit project is tentatively estimated at \$300,000.

Ore production by Premier was won by selective mining methods

B.W.D. m.c.

GENERAL SUMMARY

2

in order to maintain a shipping product carrying 75 oz/t silver. It is, tentatively, estimated that there remain on dumps, in stope walls and margins, intact in stope areas and in stope fills - all within the limits of workings now open - a minimum of 50,000 tons of ore averaging 16 oz/t in silver and a conservative 50,000 tons assaying 25-30 oz/t below the present stoped levels. In addition to these tentative estimates the further over-all development outlook is believed to be most promising. The writer's general impression concerning the probable production scale is that of a monthly output of 100,000 ounces silver.

Ore occurs in shear structures in definite and relatively short shoots. The valuable minerals are galena and blende with which are associated lesser amounts of argentite, ruby silver, freibergite and native silver. These sulphides occur somewhat erratically in bunches, small lenses, streaks and, occasionally, in more massive slabs. The shear zones, themselves, are persistent in dip and strike to the limits of present development.

The mine workings are in good physical condition - track and compressed air lines being largely intact. Water for drilling was obtained by the use of individual pressure tanks of which there are many on hand. Presumably all the major items of equipment and tools remain on the premises. The main raises are exceptionally well constructed and the timbers are in good condition. The mine, itself, is practically ready for the immediate resumption of operations.

Living quarters consisting of two large combined mess and dormitory buildings are adequate for a crew of about 80 men. Much of the original equipment of these buildings is usable. They are equipped for steam heating by oil-fired furnaces.

Power equipment on the premises includes a 250 cfm gasoline-driven portable compressor and a 1,200 cfm motor-driven compressor together with all the electrical connections from the low side of the transformers. Though there is now no power for operating this machine it is an important future asset. Its installed cost, at present prices, would probably exceed \$60,000. A rough estimate of the value of all usable equipment and building facilities to an operating organization should be upwards of \$150,000.

The Big Four Company's Dunwell and Ben Bolt mining properties are believed to have important prospective merit, each on its own account. Metal values are gold, silver, lead, zinc and copper. The Dunwell has road transport and aerial tramway transport mine to mill. The Ben Bolt is accessible by trail but, I believe, a road can be constructed to the probable working sites.

It is the writer's opinion that the properties with which this report is concerned warrant complete and detailed study with a view to planning precise details for adit transport, ore collection to production storage, transport raise and related matters.

B. J. J. J.