

Property File
Motherlode
082Fsw041

002888


REPORT
OF EXAMINATION OF THE
NUGGET & MOTHERLODE MINES.
HALKO. B. C.

BY

CHAS. C. STARR.

JULY 3, 1925.

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SUMMARY.

NUGGET and MOTHERLODE MINES.

- LOCATION:** On Sheep Creek, eleven miles east of Salmo, B.C.
- PROPERTY:** Fifteen claims, amounting to 506 acres, owned by the Selkirks Mining Co, Ltd.
- POWER:** Water power is used, but it is insufficient in amount about half the year.
- PRODUCTION & COSTS:** The total production is approximately 93,400 tons from which \$12.82 per ton has been recovered in gold. During the best days of the property (1913) 2727 tons of ore were milled per month, having a gross value of \$13.41 per ton, at a cost of \$7.11 per ton. In 1921 and 1922 due to the lack of ore and power, 1667 tons were milled per month, having a gross value of \$7.14 at a cost of \$7.73 per ton. (\$7.73)
- EQUIPMENT:** There is the usual mine equipment, tramway, and a very good 80 ton cyanide mill.
- DEVELOPMENT:** 4900 feet of crosscutting and 10,700 feet of drifting as well as much raising, stoping, and 170 feet of shaft.
- GEOLOGY:** The mine is in an area of northerly striking, steeply dipping, beds of massive quartzites and schists. The veins strike nearly east and west, are nearly vertical, and make ore in the quartzites only. The veins are quartz filled fissures averaging about two feet wide and carrying gold; the ore is oxidized. There is faulting which is not large but rather complicated. There is, geologically, reason to expect continuance or at least recurrence, or ore bodies to a considerable depth.
- ORE:** There is very little ore exposed on one side ^{of} the mine and none developed. A limited tonnage is indicated in the Nugget upper workings, and there is good expectation of the Nugget ore going below the present deepest level and showing a grade of \$10 to \$15. The lowest work on the Motherlode has not exposed much ore.
- FUTURE PROSPECTS:** Prospects of developing ore laterally to the east are good in the Nugget, and there is a reasonable hope of getting a tonnage of ore at greater depth that is comparable to that obtained in the past, but the cost and risk of such work is too great to be justified by the grade of ore that may reasonably be expected, on the basis of past operations.
- CONCLUSION:** The acquisition and development of the property can not be recommended.

INTRODUCTION:

About a week was spent in the examination of the property, assisted by five men. Mr. O. D. Frith was in charge of the sampling.

Mr. Harold Lakes, the former superintendant, and Mr. Harry Gamble, the former foreman, represented the owners and acted as guides over the property.

LOCATION

The Motherlode Mill is situated on Sheep Creek, a tributary of the Salmon River, eleven miles southeast from Salmo, a small town on a branch of the Great Northern Railway. The property is 37 miles by highway from Nelson, B. C.

From the mill, a pack-trail about a mile and a half long leads to the Motherlode Mine which is nearly 2000 feet higher. The old upper workings of the Nugget Mine may be reached by a steep trail, less than a mile in length, from the Motherlode Mine, or by an auto road from Salmo to within two miles of the workings, and thence by fair trail.

PROPERTY:

The group consists of eleven nearly full sized claims, the Motherlode, Independence, Golden West, Virginia, Camstock, Eldorado, Nugget, Bonanza, Minoru, Lone Star, and Cayoto, and four fractions, the Motherlode Fr., Dominion Fr., Cook Fr., Searchlight Fr., these claims are all crown granted and cover an area of 506 acres.

The property is owned by the Selkirks Mining Co., Ltd., of which Mr. Alister Forbes, 901 Vancouver Block, Vancouver, B. C., is the President and principal stockholder.

TOPOGRAPHY:

Sheep Creek forms a narrow "V" shaped valley, at an elevation of approximately 2150 feet at the Salmon River, rising to 3400 feet at the Motherlode Mill. The No. 5 tunnel of the Motherlode Mine is on the steep slope on the north side of the creek little more than a half mile distant and at an elevation of 5330 feet. Thence, the mountain rises to an elevation of 6400 feet, and the Nugget Mine lies to the north of the summit, at an elevation of from 5950 to 6200 feet. The apex of the mountain lies between the Nugget and Motherlode outcrops, from which point it slopes downward in all directions, the slopes to the east, north and west, are comparatively smooth, but to the southward the slope is quite rough.

TRANSPORTATION:

The Mill is connected with the railway at Salmo by a fair auto road 11 miles long. To and from the mill ore and supplies are taken to the Motherlode mine by aerial tram; from the Motherlode to the Nugget material is taken through the mine.

WATER:

Sheep Creek furnishes an ample supply of water at the mill. At the Motherlode Mine there is no surface water but a crosscut in the mine has been dammed up and furnishes a limited, but generally sufficient, supply of water for camp use. There is a good spring at the Nugget Camp.

POWER:

Power is obtained from the water of two forks of Sheep Creek, the dams being two miles from the mill, and the head at the mill about 700 feet. This water supplies about 500 H.P. during the period of high water, which usually lasts about four months of the year. During the period of extreme low water there is little more than 75 H.P. available, and for eight months of the year operations must be more or less curtailed.

To operate the property efficiently about 350 H.P. must be provided from other sources.

HISTORY:

Most of the claims of the property were located previous to 1909. The first record of production from the Motherlode is in 1906 and the Nugget is 1907. The Motherlode mill began production about the middle of 1913 and closed down in October 1915. About 1919 it was bonded to E. McMartin and incorporated as the Motherlode Sheep Creek Mining Company.

The Motherlode and Nugget properties were consolidated under the name of the Nugget Gold Mines Ltd., in 1918, and in March 1919 development was begun, which principally consisted of the driving of a 1200 foot crosscut from the lower Motherlode workings to the Nugget vein; this was completed about the end of the year. The first record of production of the Nugget was in 1907; later a four stamp mill was erected and ran for three years, closing in 1911, and the mine lay idle until 1919. During the year 1920 the mill was operated for four or five months on part time, due to lack of ore. During 1921 and 1922 the mill was run for ten months, usually at less than full capacity. Since 1923 the property has been idle.

PRODUCTION AND COSTS:

The total production of the two properties compiled from Government and Mine records, is as follows:-

	Tons	Recovery per ton	Gross Recovery.
Motherlode, shipt up to 1911	805	\$81.27	\$65,420
Motherlode, up to 1916 - milled	60504	11.67	706,180
Nugget up to 1916 -	13471	18.97	292,549
Motherlode & Nugget since 1916	<u>16675</u>	<u>6.92</u>	<u>115,454</u>
	<u>93455</u>	<u>12.62</u>	<u>1,179,603.</u>

Throughout the operation of the property the mill was periodically shut down, or its operation curtailed on account of lack of water, and from the fact that the mine was unable to produce ore fast enough. On this account costs have been high and variable. The period during which there appears to have been the least interference to continuous operation was from June to November, inclusive, 1913 during which time the following record was made:

Average tons per month.	Average gross value per ton.	Average Cost & mill loss per ton	Profit per ton.
2727	\$13.41	\$7.11	\$6.29

The "average cost" includes development expense, but it is probable that insufficient development was done to develop the amount of ore mined. The mill loss was approximately 54 cents per ton.

From the summer of 1912 when the mill started, to December 31st., 1923, a profit was made every month aggregating \$190,500 at the end of the period; from then to September 1915, when operations were suspended, the surplus dropped to \$116,750.

Since the mill and mine equipment cost around \$300,000 exclusive of the mining property, the operation was a

considerable less.

During 1921 and 1922 the mine and mill were operated about ten months with the following results:-

Average tons per month	Average gross value per ton	Average cost & mill loss per ton	Loss per ton
1667	\$7.14	\$7.73 #	\$0.59#

Figures are approximate.

The above costs apparently covered current development done during the months the mill was operated, only.

During the early operation of the mine, development costs are given as approximately \$9.00 per foot, but it is not specified just what is included in these figures.

Cost figures given by Mr. Harold Lakes, the last superintendent, in his report to the Nugget Company, are as follows: based on continuous and full capacity operation:-

Tunnel work in schist	\$10 to \$12 per foot.
" " quartzite	\$15 " "
Drifting on vein	\$12 " "

The above are direct costs, only.

Mining and Milling costs, on an 80 ton per day basis, are:

Mining, Labor	\$2.58	
" Supplies	1.04	
" proportion of general	.23	\$3.85
<hr/>		
Milling labor	.73	
" supplies	.94	
" Proportion of general	.23	1.90
<hr/>		
Total operating cost per ton		5.75

EQUIPMENT:

MINE: The mine equipment consists of the usual track, cars, etc., stoping drills and steel, and a limited number of hammer drills for drifting. In the blacksmith shop at the

No. 5 Motherlode tunnel there is a Waugh drill sharpener and other usual mine equipment. The mine and Blacksmith equipment is, in general, in fair condition.

TRAMWAY: The tramway from the No. 5 Motherlode tunnel to the mill, was built by the A. Leschen & Son Rope Co. It is 3600 feet long, and the terminals are 1770 feet apart vertically; its capacity is ten tons per hour.

MILL: The mill is a ten-stamp cyanide plant of rated at eighty tons per day capacity, designed by the Merrill Metallurgical Co. It is a well designed and well built plant containing standard machines for crushing, classifying, agitating, filtering and precipitation.

It is driven by nine Pelton water wheels, including one from the 1400 feet Sullivan compressor which furnishes air for the mine. The machinery and equipment at the mill is generally in good condition.

BUILDINGS: At the Nugget Mine opening there is one small bunk - and - cook-house, and several other buildings in poor condition. Between the No. 3 and No. 5 tunnels on the Motherlode there are three good sized buildings for the accomodation of men, the tramway terminal, and several small buildings of various sorts.

Near the mill there are ample buildings for the accomodation of the mill crew and the staff, besides other necessary offices, etc. These are generally in very good condition.

DEVELOPMENT: The footage of "level" development on the property is approximately as follows:

Mine & Level	Main Crosscut	Miscellaneous Crosscuts	Main drift mostly on vein	Other drifts	Elevations
Nugget #1	0	0	75	0	6240
" #2	70	45	435	170	6190
" #3	130	70	945	235	6110
" #4	350	185	1500	250	5960
" 200 Sub.	0	15	380	0	5550
" #5	1375	0	240	0	5360
Total	1925	315	3575	655	6470

Motherlode

#1	70	85	600	70	5735
#2	400	160	1025	375	5655
#3	635	300	1710	130	5555
#4	0	50	360	0	5450
#5	780	175	1400	85	5330
#6	0	20	660	0	5225
#7	0	0	115	0	5145
	<u>1885</u>	<u>790</u>	<u>5870</u>	<u>660</u>	<u>9205</u>
Both Mines	3810	1105	9445	1315	15675 feet.
	<u>4915</u>		<u>10760</u>		

In addition to the above there is 175 feet of winze to the #6 and #7 levels, on the Motherlode, and 615 feet of raise from the #5 to #4 levels of the Nugget; there is probably a total of about 200 feet of raising.

Practically all this work is now open and accessible, and the workings are in excellent condition.

The stopes were worked on the shrinkage system and on account of lack of timber are generally inaccessible although open.

GEOLOGY:

GENERAL: The general geology of the district has been briefly summarized by LeEoy (see Sketch Map of Sheep Creek Mining Camp, Dept. of Mines, Canada) and the local geology has been worked out in considerable detail by Arthur Lakes.

Both of these sources of information have been largely drawn on in the following.

In the area covered by the Nugget and Motherlode claims the rocks are massive quartzites, with interbedded schists, belonging to the Beehive and Ripple formations of Cambrian age. The strike is generally slightly east of north and the dip steeply eastward.

A porphyry dyke crosses the west end of the property following the stratification of a band of the Beehive schist; several small basic mica dykes occur in the mine.

The maps accompanying this report, are those made to accompany the report on the geology of the property by Arthur Lakes, and gives a good illustration of the geology of the property in detail. The essential details have been checked over and appear generally to be correct; any essential differences noted will be mentioned later.

VEINS: The veins, which vary from a mere crack to seven or eight feet wide, occur in fault fissures in the quartzites and schists. They vary only slightly from N 80° E in strike, and from vertical to 75° south in dip.

The vein filling is vein quartz and quartzite, with small amounts of pyrite which have oxidized and stained the vein a brownish color. The hanging wall is usually, though not always, well defined but the footwall is more indefinite and irregular and leaves a rather jagged footwall in the stopes. With one unimportant exception the ore occurs exclusively in the quartzite, and the vein is narrow and nearly barren in the schist.

FAULTING: There are a number of faults in the mine which have a strike and dip nearly parallel to the vein, viz., N 60 to 70 E and Vertical to 70 ° south. Since these faults cut the vein, which itself occupies a fault plane, and since the filling of the veins and the faults are almost indistinguishable considerable complication results.

There are also several other faults of small throw in the mine which cut the vein more or less at right angles and dip to the westward.

NUGGET MINE, DETAILS: The theory of faulting, as worked out in considerable detail by Arthur Lakes, and shown on the level maps of the Nugget, fits the observable data well as far as the Nugget vein and the Calhoun fault are concerned. In the case of the Calhoun and No. 2 veins, and the Middle and South faults the data is not always in accord with the theory, although it can hardly be said to definitely disprove it. As an example of this note the insert on the Nugget No. 4 level map, showing the observed vein and fault fractures at the east end of the level.

On the whole, however, in the absence of any other theory, Mr. Lakes' delineation of the structure forms a good working hypothesis.

MOTHERLODE MINE, DETAILS: On the Motherlode vein the evidence of similar faulting is not as conclusive as it is in the Nugget, and there seems to be a reasonable doubt as to the correctness of Lakes' hypothesis, although the evidence against it is mostly negative, in that it fails to prove it. The distinction between the vein and the nearly parallel fault, if there is such a fault, is very hard to make and must be based on the presence

of slips, difference in the amount that the strata are faulted by the veins and faults, on the presence or absence of ore, and on the strike at any given point.

On Level No. 1 nothing was observed, that has any direct bearing on the problem.

On Level No. 2 the east end of the west workings was not entered on account of rotten timber, but the extension of the fault, as shown by Mr. Lakes, is not in evidence in the tunnel between the portal and the vein.

On Level No. 3 at "305" there is a seam leaving the drift toward the southwest which may connect with the slip shown in the Main Crosscut, and which may be the evidence of a fault which cuts the vein and extends eastward to the Blacksmith Fault. A similar fault appears to occur at "329."

On No. 5 level a fault slip leaves the drift to the southwest between "510" and "511" but does not appear, or at least does not fault the strata, in the tunnel between the portal and the vein. This fault or vein continues westward to the Blacksmith fault.

As for the amount of faulting of the strata, so far as I could determine the faulting along the vein, along the fault, or along the combination of the two (as shown by Lakes) is essentially the same, indicating that there is no fault but a vein only. Between, and somewhat beyond, "306" and "307" Lakes shows a segment of the vein cut by a fault on both ends, here he attempts to show that the vein faults the strata a short distance, only, as compared with the dislocation of the strata by the fault. I am unable to see that the vein has

been cut, or that there is any difference in the amount of the faulting. It does not appear that ore is always present in the vein, and it is not entirely certain that the faults are always entirely barren.

While admitting that Lakes undoubtedly spent much more time on the geology than I, and that he worked it out in much greater detail, I am not able to see much indication of the system of faulting nearly parallel to the vein on which he lays much stress.

There are a few faults, of small throws, more or less at right angles to the vein which are shown on the maps so clearly that they need no comment.

The two ore bodies parallel to each other at the east end of the No. 5 level appear to be on two separate parallel veins, and not, as Lakes believes, parts of the same vein thrown into their present position by faulting. The insert on the map shows my interpretation of the structure there.

INFERENCE FROM GEOLOGY:

There is no geological reason why the vein and ore should not extend to much greater depths than present developments has shown them. The same formation should continue thousands of feet below the present workings, and there is no evidence of the weakening of the vein fractures in the present lowest workings. Ore has been found at an elevation of from 6500 feet on the Reno claim, to 2400 feet in the Queen Mine. On the Nugget vein ore has been worked over a vertical range of more than a thousand feet.

It is evident that there has been a certain amount

of enrichment in the veins adjacent to the surface, and, in the Motherlode vein there was apparently a diminution of values in the No. 6 and No. 7 levels which may or may not indicate the approaching end of the oreshoot. Even if the oreshoot has been bottomed, there is every reason to expect that another shoot will be opened at still greater depth. On the Nugget vein there is no evidence of the values decreasing since the zone of surface enrichment was passed. Oxidation continues nearly as strong at a thousand feet depth in the Nugget as at any point, and it is probable that the primary sulphide ores will carry essentially the same values as the oxidized ores.

It seems to be well established that the white massive quartzites are the favorite locations of the orebodies, and there are excellent chances that the Nugget vein will prove productive in the Eastern Quartzite.

SAMPLING: There was said to be very little ore exposed in the Nugget and Motherlode workings, and practically no ore that was in any sense blocked out. The lack of workable ore was apparently the cause of the property being shut down. Therefore no great number of samples were taken, and these that were taken were with the idea of, generally, checking former sampling.

In most cases samples taken in the past seem to have been taken over a stoping width, with its attendant possibility of error due to taking too large a proportion of the softer high grade material. The samples taken on this examination covered the good portion of the vein only, leaving the value of the stoping width to be calculated on the assumption that the wall rock is barren. This is not entirely true, but it is certain that in most cases the vein

walls contain very little value, and no serious error should result. Wherever bottom samples were taken the coarse pieces only, were saved in order to obviate salting by fine ore from the chutes.

Nugget Workings: On the No. 3 level twelve samples were taken across the bottom of the drift under the east stope; they represent a length of 120 feet, width of 3.9 feet and show a value of \$4.85.

Just west of the first stope on the No. 4 level five samples represent a length of 50 feet, width of 2.4 feet and show a value of \$18.25.

Four samples from the east stope on the No. 4 level, two in the top and two in the bottom, show an average width of 2.5 feet and average value of \$21.30.

Underneath this stope five samples represent a length of 50 feet, width of 2.7 feet and average of \$5.43.

On the No. 4 level, on the Calhoun vein, ten samples represent a length of 100 feet, over an average of 2.0 feet width, and average \$10.81.

In the main Nugget Raise, ten samples roughly represent 150 feet along the vein, and show an average width of 2.0 feet, and average value of \$4.40.

The top of the stope above the 200 sub-level is represented by seven samples which average 1.7 feet in width and \$5.35 in value. This stope also shows low values in the back by Lakes' sampling.

The back of the drift on No. 5 level under this stope for a length of 150 feet is represented by seven samples which average 2.6 feet in width and \$15.53 in value. If a stoping width of 4.0 feet be assumed with the wall rock containing 1.00, this

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at 2.0 level
C.C.S.

value will be reduced to \$10.45.

The value obtained by the face samples during the driving was \$19.52 over a width of 3.1 feet; this represents a length of 120 feet. Our samples from the drift, over a length of 103 feet, average \$16.60. Since our samples were spaced at irregular intervals on account of the chutes, it is possible that they give a too low average.

The Suggot workings on and above the No. 4 level have been thoroughly sampled for the American Smelting and Refining Co., and show more or less comparable results, if the large difference in widths sampled is taken into account.

Motherlode Workings: Seven samples in the west raise on the No. 1 level, representing 70 feet in length, average 1.15 feet and \$41.35 or \$12.60 over a 4 foot stopping width. All other samples taken on the Motherlode average less than \$4.00 and do not show any ore.

Samples taken for the Company before or during the first period of operation show the following values and widths on the No. 5 and No. 6 levels:

105 feet,	under slope on No. 5-	Width 3.6 ft.	Value \$26.37
70 "	" " " " " 6 "	1.8 "	15.27.

If these values are brought up to a 4 foot stopping width they are reduced to \$17.49 and \$7.42 respectively. It is to be assumed that the remainder of the No. 6 level is too low grade to be classed as ore. There is no data whatever to be found in regard to the values on the No. 7 level.

ORE DEVELOPED:

On the Motherlode vein there is no ore exposed even on one side, except 60 feet above the No. 1 level which averages

115 feet wide and \$41.04.

On the Nugget vein a little ore is exposed on one side at two places on the No. 4 level, and on the No. 5 level there is 140 feet of ore averaging 2.6 feet wide and \$15.53 in value (according to takes, 3.1 feet and \$19.52 for 120 feet in length) which may be presumed to extend some distance downward.

FUTURE PROSPECTS:

Possibilities of further ore are (1) at greater depth, (2) laterally, (3) ore faulted to one side of the drifts, (4) new veins to be developed.

(1) From a geological point of view the prospect of developing ore at any reasonable depth is very good, but there is an apparent falling off in the value of the ore opened in the levels below the No. 5, which may possibly indicate the bottom of the present west Motherlode crosscut is about reached. If that is the case the discovery of a new shoot might be expensive, and this factor must be considered before planning deeper development.

(2) There is no particularly favorable ground to the westward of the present faces. To the eastward, there is a reasonable possibility of developing ore in the Nugget vein in the eastern quartzite, and a possibility of finding ore in both veins in the eastern band of quartzite of the Ripple formation.

(3) Under Lake's hypothesis of the faulting there is a very good probability of finding ore by short crosscuts at various points to faulted parts of the vein. Although arguments were advanced tending to disprove this theory it still carries weight enough to justify some prospecting.

(4) Other veins in the mine, besides the Nugget and Motherlode, do not, where they have been cut, show any indications of ore and may safely be neglected. If deeper development should be carried out by means of tunnels, other veins will probably be cut, notably the Golden Belle and Clyde, and these have fair possibilities of showing ore in the massive quartzite.

The history of the property, showing that only during low prices for labor and supplies and for a short period, while the richer ores near the surface were being worked, was the operation profitable, is a most discouraging feature, and one which must be given full consideration, since, under future conditions, costs may be expected to be higher and the ore grade lower than during the best days of the property, and to compare with those during the 1921 and 1922 operations.

Since it is impossible to estimate the grade of ore that can reasonably be expected by further development, the grade of ore that would be required to make the venture profitable is

figured, as follows:

Ore developed to date per foot of level work	5.96 tons.
Assuming the same ratio for the future, excepting long tunnels from the surface to cut the veins and \$12 per foot as a reasonable cost, the cost of development will be	\$2.00 per ton

If it be assumed that a new tunnel be driven 400 feet lower, and a crosscut driven to tap the Nugget vein, the footage will be approximately 1400 and 1300 feet respectively, which at \$12 per foot will cost	\$40,500.00
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Assuming that the total length of stopes on the No. 5 level will extend to a level 400 feet below, and a stoping width of 4½ feet, the new ore developed by the new tunnel and crosscut will be	77,000 tons
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Then assuming Lakes' estimate of \$5.75 per ton the cost of mining, milling and general, plus \$2.00 per ton for ordinary development, and \$0.54 (40500-77000) for extra development, a mill recovery is needed to pay expenses amounting to

9.29 per ton

The total cost of development required is estimated by Lakes at \$100,000, which seems a reasonable figure; in addition to this must be included say \$25,000 for additional power equipment at the mill making a total investment before any ore is milled of

\$125,000.00.

The profit on an operation such as this should be at least 100% (really more than this under the conditions) to make it attractive or

\$3.25 per ton

which added to the calculated cost of production necessitates a recovery of

\$11.54 per ton

or an ore value (at 95% recovery) of

12.15 per ton

It is evident, therefore, that on the basis of the assumed development, and costs, the value of the ore must be about \$12. per ton to return the investment required for further development, plus a sufficient profit to make the risk justified. This is a higher value per ton than has been obtained from the mine, except during the first year of the mill operation, and higher than there is any reasonable hope of obtaining through deeper development.

RELATION TO OTHER PROPERTIES:

The Golden Fawn group adjoins the Nugget on the north, and has two small veins from which a little ore has been taken. Further north about a mile is the Reno Group which has some ore. From both of these properties ore could be transported by tramway or road to the Nugget and through the mine to the Motherlode mill.

To the south of the Motherlode mine there are the Golden Belle and Clyde-Belt groups which both have fairly

strong veins and some small showing of ore; they are ideally located for the transport of ore to the Motherlode mill by tram.

Still further south across Sheep Creek the Kootenay Belle property has a small but showing of high grade ore, the outcrop of which is 600 feet above the Motherlode mill, to which ore could easily be transported by tramway. Further east the Eureka group has a strong vein which is well situated for tramway connection to the mill.

None of the above mentioned properties are now equipped with any transportation facilities, and in none of them is there any tonnage of ore developed, with the exception of the Kootenay Belle which has a small tonnage partially developed. None of these properties are particularly attractive at the present time even in conjunction with the mill.

The Motherlode No. 5 tunnel is close to the south edge of the Motherlode ground, and a tunnel driven to cut the vein deeper, would have to be started on the Golden Belle claim which is owned by the Amalgamated Gold Mines.

CONCLUSION:

While the geological and general conditions at the property are favorable, the ore to be expected is too narrow and low grade to be worked at a sufficient profit to justify the further development of the property, and to make a sufficient return for the risk of the capital involved to such development. The property therefore cannot be recommended.

Respectfully submitted.

Chas. C. Starr

Property File
082FSW041

043 - Golden Belle
037 - Blue Stone
040 - Nugget

GEOLOGICAL NOTES AND IMPRESSIONS

ON THE

MOTHERLODE, NUGGET, AND BLUESTONE VEINS

OF THE RENO GOLD MINES LTD.

April 3, 1940.

INTRODUCTION:

These notes are based on a six weeks study of Motherlode levels 5, 6, 8, 9, and 10; Nugget levels 4, 5, and 10; and the two Bluestone levels.

The notes cover, broadly, actual observations, and also impressions of future possibilities gained from the geology. A set of maps showing details are in the Reno engineering office.

GENERAL:

The Motherlode and Nugget veins lie chiefly in Nugget quartzites on the west flank of the east anticline (Sharpstone).

The formations are comparatively regular in dip and strike in the area covered, but vary somewhat in composition, not only from strata to strata across the formation, but along both strike and dip.

The western one-fourth of the Nugget quartzites are firm and somewhat argillaceous on Motherlode No. 10 level, more argillaceous and thinner bedded on No. 8 level, firm and comparatively pure quartzite on No. 5 level. The same zone in Nugget No. 10 level is very thin bedded quartzite alternating with thinner argillite beds, while in Nugget No. 4 level it is predominantly argillaceous with thin quartzite beds.

In the Nugget mine the central part of the Nugget quartzite is massive, generally white, quartzite on No. 4 and No. 10 levels and presumably all the way between. In the Motherlode the same belt is recognizable but is less well defined and more argillaceous. There is no well defined change in the eastern part of the quartzites.

The Bluestone vein occurs in the Nugget quartzites at the crest of the western anticline and is structurally differently situated from the Motherlode and Nugget veins.

MOTHERLODE MINE:

No study was made of the levels above No. 5.

The Motherlode vein is the strongest fissure on the Reno property and has been exposed cutting the full width of the Nugget quartzites 750 feet, the Nugget Argillites 280 feet, and 230 feet into the Motherlode quartzites. The fissure continues fairly strong at both ends.

The horizontal component of faulting along the vein is about 70 feet to the right on all levels. There is some evidence of a slight increase in the throw at the center of the quartzite, and a slight decrease at the ends. The vertical component of the fault is unknown.

The average strike of the vein is N 75° E and the dip about 85° south. Ore has been found at various horizons in almost all parts of the Nugget quartzites and, in the upper levels, in the western part of the Motherlode quartzites also.

In the quartzites the vein varies from a small fissure with traces of quartz and a small gouge to a strong fissure with several feet of quartz. In the Argillites the vein fissure is usually strong but the filling is crushed wall rock and a small gouge. Ore tends to occur in the harder more massive zones of the quartzite, but such zones are not so clearly defined as in the Nugget mine and the same bed, or zone, often changes considerably in character within a comparatively short distance.

The western half and the eastern quarter of the Nugget quartzites have been the most productive and the third quarter to the east (between 10B and 10C stopes) has produced comparatively little.

A flat fault (dip 15° east) passes from the No. 8 level at the top of the raise from No. 10, through the top of 10 C stope, faulting the upper part of the vein about five feet south, and the strata on the upper side 30 feet, more or less, to the east. This fault is relatively unimportant except as it increases the cost of mining near it.

On No. 5 level the western 300 feet of the quartzites are comparatively pure and massive, though becoming slightly argillaceous near the western margin. Above the level this zone has been nearly all stoped.

On its dip downward it becomes increasingly argillaceous, especially the western part, and at level No. 8, west, it is predominantly of intermediate character between quartzite and argillite, and quite thin bedded.

Downward from No. 8 to 10 level there is a firming of the strata and they become slightly less argillaceous. This may be the reason for 9 A stope failing between No. 8 and 9 levels.

10 B stope is located in comparatively massive quartzite, which ought to be especially favorable for ore. As this zone extends upward the quartzite becomes slightly less massive and more argillaceous, though still appearing favorable for ore. Above No. 8 level the zone becomes more silicious and massive again before reaching No. 6 level.

Between No. 8 and No. 6 levels the favorable zones are from the raise from No. 10 level eastward for 150 feet, and upward to the old No. 6¹/₂ level, - presumably all in massive quartzite; also, upward along the dip of the strata above 8 C stope.

Below No. 10 level the favorable zones are, of course, under the No. 10 level stopes. From a formation point of view, underneath 10 B should be in the most favorable formation, 10 C next, and 10 A last. It is my impression that there is a slight tendency toward a firming of the rocks, and a slight decrease of argillaceous material as the No. 10 level is approached from above, and this change might reasonably be expected to continue for some distance below the level.

There seems a probability, based on rather vague data, that the proposed level, 125 feet below No. 10, should find at least as much and as good ore as No. 10 has.

The Motherlode quartzite is worthy of some exploration, but as No. 10 level has not given much encouragement in that formation, it might be better to explore further on No. 8 level, or between that and No. 6 at some future time.

NUGGET MINE:

No study was made of the Nugget workings above the No. 4 tunnel, nor of the sublevels between Nos. 4 and 5.

On No. 4 level, the west end of the Nugget quartzites is 70 feet west of where the portal crosscut hits the vein. This seventy feet is predominantly quartzite, but to the east of it is 200 feet of platy rock which is predominantly argillaceous but contains many narrow quartzite beds. There is some question, judging solely by the appearance of this rock, whether it should properly be included in the Nugget quartzites but its relations to other parts of the formation indicate that it belongs. To the east of this there is 400 feet of generally massive white quartzite in which all of the Nugget ore has been found. This is followed to the east by 100 feet of impure, generally dark, quartzite to the face of the east drift. The east margin of the quartzites is estimated to lie from 50 to 75 feet further east.

There are two important sets of intersecting fissures, on each of which there is a little faulting. One strikes (average) N 65° E and the other N 85° E; both dip steeply south and both have produced some ore, - intersections appear especially favorable. It is not clear which series is the oldest but both were formed before ore deposition was completed. The Nugget vein, so called, occurs in both sets of fissures at different points; the Calhoun vein belongs to the N 60° E set. These fissures are more prominent in the upper levels than below. On No. 5 level the vein is partly in fissures of both sets, the ore occurring on the east-west set. On Level No. 10 the work east of the main crosscut is on stringers of the east-west series, while that west of the crosscut is somewhat in doubt as the strike of that vein is intermediate. The east-west series of fissures are barely discernable in the Motherlode.

Faulting along the Nugget vein on the No. 4 level is between fifteen and twenty feet (horizontal component) in its western part, but decreases toward the east, where a portion of it appears to be taken up by the Calhoun vein and by the other spur further east.

On the No. 5 level the faulting is approximately 14 feet; on No. 10 level faulting along the south vein is 7 or 8 feet west of the crosscut, but the amount of throw decreases both east and west. In all cases movement is to the right and the vertical component unknown. There is also faulting of about five feet along the north stringer or vein (No. 10 level) and it is possible that the Nugget vein may have split below No. 5 and that its 14 feet of faulting may, on No. 10, be divided into two or more parts.

All ore found in the Nugget to date has been situated in the massive quartzite, usually near its western boundary and never more than 350 feet from it. On the No. 10 level the western edge of

the massive quartzite is at the crosscut and vein intersection.

The two veins or stringers which have been drifted on a short distance east of the crosscut are not promising. It is entirely probable, though not certain, that one or both of these, most likely the south one, represents the Nugget vein. There is, however, a possibility that the main crosscut has not been extended far enough to cut it; an extension of the crosscut another hundred feet would make sure.

There seems to be no use in prospecting for more than 200 feet east of the edge of the massive quartzite which well covers the favorable zone. There would seem to be a fair chance of finding ore in this zone between the No. 10 and No. 5 levels.

West of the massive quartzites the strata on No. 10 level are thin bedded quartzites with a considerable proportion of argillaceous beds; they are more silicious than the corresponding section on No. 4 level but are still unfavorable for ore.

On the whole, the chances of developing sufficient ore on the Nugget to repay the costs of exploration are, I believe, rather poor, but better in the massive quartzites between No. 10 and No. 5 levels (underneath the No. 5 level stope) than elsewhere.

BLUESTONE MINE:

The Bluestone vein occurs at the crest of the western anticline which is slightly overturned to the westward; the axis strikes a little west of north. The core of the anticline is massive white quartzite, probably the Nugget quartzite, which extends only a few feet above the 5700 level where it ends against the Reno argillites which also lie on both flanks.

A length of about 250 feet of quartzites are exposed on the 5700 level, and 450 feet on the 5600 level. A length of 600 or 700 feet may be expected on the 5500 level. The quartzites are favorable for ore occurrences while the argillites are not.

There are two sets of mineralized fissures in the mine, one striking east and west or nearly so, and the other striking on the average N 60° E; both dip steeply south. The former, so far as exposed, are more numerous but quite limited in extent and are of the general nature of joints. They sometimes contain a narrow quartz and sulphide mineralization, with gold, but have no where formed commercial ore in the present workings.

No appreciable faulting has been noted along the east-west fissures, although there may be a little. Faulting is certain along the northeast fissures, but in the case of the Sta. 5603-5 vein the amount is uncertain. The main vein appears to fault the strata about 16 feet on both levels.

Two of the N 60° E fissures have been found and one of them (at Sta. 5606 to 5615) has produced the ore mined to date. The other (at Sta. 5603-5) has not proven productive and probably pinches out not far from its present exposures.

The productive vein on the 5700 level intersects with an

east-west fissure at Sta. 5709A and west of there is practically untraceable while the east-west fissure fades out at 160 feet west. On the 5600 level the northeast fissure extends nearly the full width of the drift to Sta. 5614, at the east, where it diverges, quite weak, to the left while the remainder of the drift follows a weak east-west fissure. The vein is fairly strong at the west face where it is cut by a dike, but it cannot be expected to extend much further on account of soon passing into argillite.

The 5600 level has proven to have a more continuous vein and better and wider ore than the upper level, and this improvement may be expected to continue for at least a limited depth. The N 60° E fissures and the massive quartzites are the favorable places for ore, although the east-west fissures may also be found to carry ore occasionally, especially at intersect ons.

I have no suggestions to offer additional to the development now under way, - to drift both ways on the vein on a new level 125 feet below the 5600, carrying the work to the limits of the quartzite.

The prospects seem fair for making a small mine underneath the 5600 level.

GOLDEN BELLE VEIN:

A small vein was cut in the 4900 crosscut on Golden Belle ground (not owned by Reno) which appears to be the Golden Belle vein on which two short tunnels have been driven at a higher elevation.

In the crosscut it is situated about 90 feet south of the Independence (Reno) line and about parallel to it.

The vein consists of a crushed zone some ten inches wide with 1 to 3 inches of quartz and a fairly strong gouge striking N 75° E and dipping about 80° south. Where cut it is approximately at the boundary of the Nugget quartzites and argillites. A fault along the vein of about five feet is indicated. The showing is not particularly attractive.

CONCLUSION:

This examination has in general confirmed the previously held opinions of the management, and has not resulted in any special change in geological theories, but has, I hope, clarified some details. Past development, whether successful in finding ore or not, has been along lines thoroughly justified by conditions.

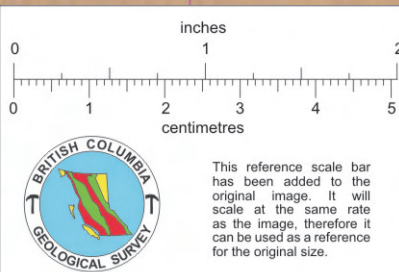
I fully concur in the managements plans for development in the immediate future and have nothing to add.

I feel moderately hopeful as to results to be obtained in the next level or two downward in the Motherlode and Bluestone mines, and believe that a limited tonnage of ore should be found between Motherlode levels No. 5 and 8. I see little hope for lateral development on the present levels of the Motherlode and Bluestone, except that exploration of the former in Motherlode quartzite is justified.

I feel quite pessimistic as regards the Nugget vein on, and below No. 10 level, but believe some development upward is worth undertaking.

Respectfully submitted,

Chas. C. Starr



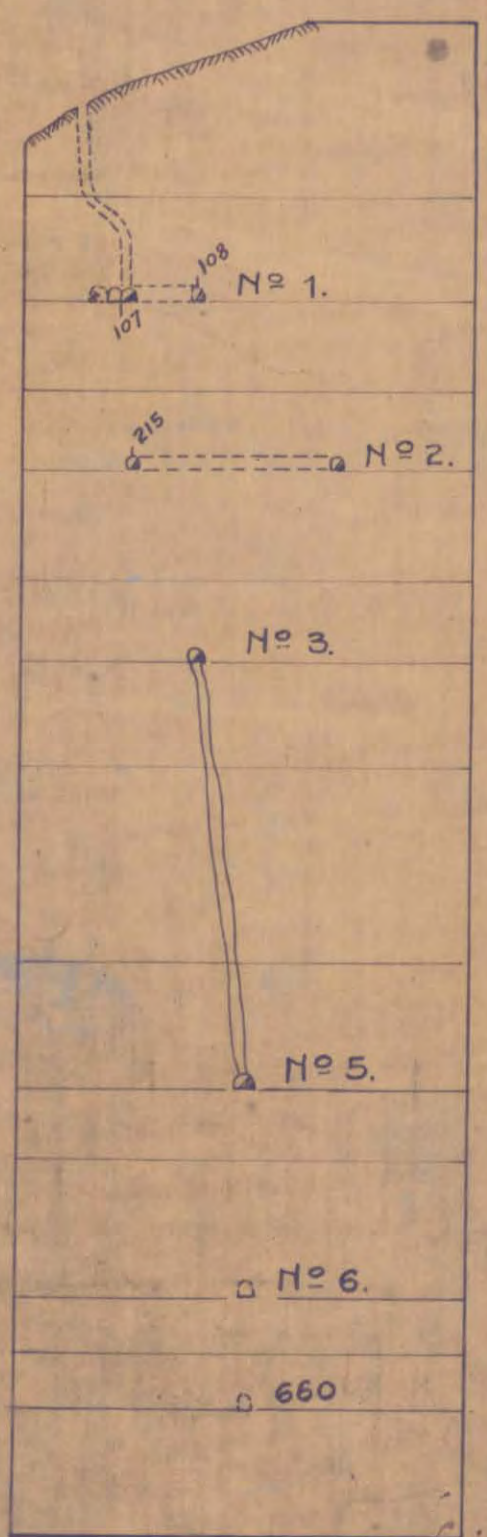
NUGGET-MOTHERLODE MINE.

Scale: 100-ft. to 1-in.

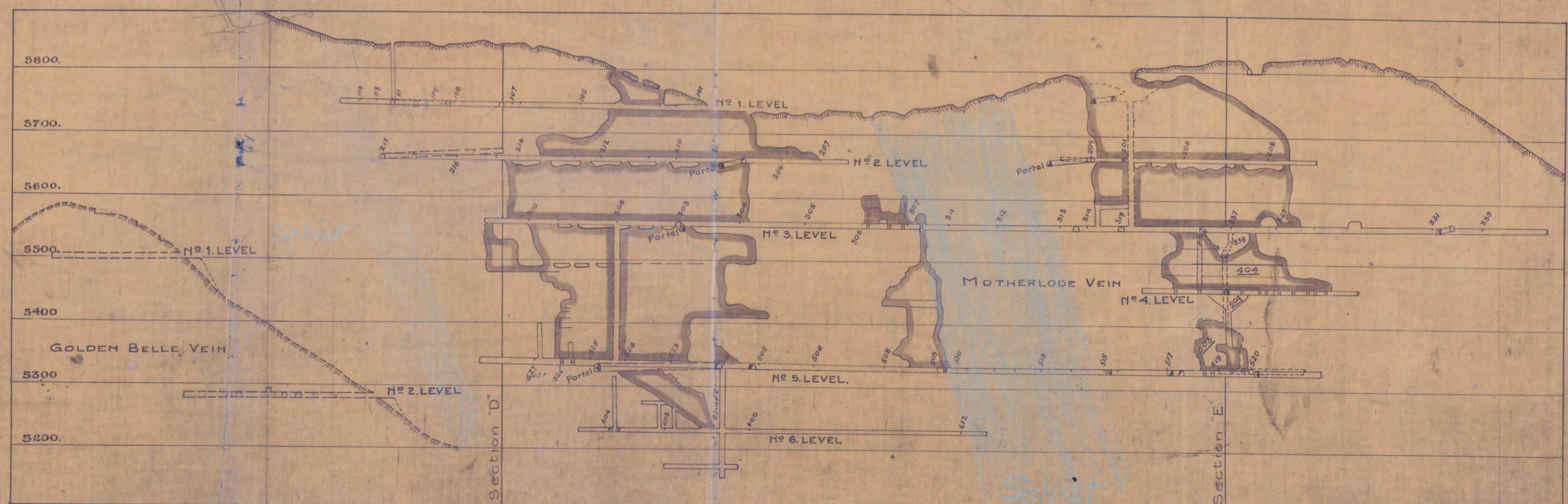
Arthur Lehis July, 30, 1923.



Section E



Section D



Property File 082FSW 041

Section C

P.G. Co.