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Banker Hill 117

New York, October 24th, 1910.

Dr. L. A. Dessar and  
Mr. Max E. Bernheimer,  
New York City.

Dear Sirs:

At your request, I have examined the properties of the Nevada Smelting & Mines Corporation, located at Tybo and Reveille, Nevada, and beg to hand you herein my report. The report is divided into three parts:

- (a) The Mines located at Tybo, Nevada;
- (b) The Mines located at Reveille, Nevada;
- (c) Railroad situation.

In the calculations I have figured silver at \$0.52 per ounce, gold at the United States standard of \$20.67 and lead at \$0.04 per pound.

I am

Yours very truly,

(Signed) John B. Farish



ON THE PROPERTIES OF  
THE TYBO CONSOLIDATED MINING COMPANY,  
AT  
TYBO, NYE COUNTY, NEVADA.

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The property of the Tybo Consolidated Mining Company consists of the following mining locations or claims: LaFayette, Bunker Hill, Crosby, Caskett, 2-G, Garrett, Edna, Elsie, Edith, Ela, Emma, Hickey Fraction, and two others lying to the west of the Hickey Fraction. Some of these claims are held by possessory rights, subject to the performance of \$100. worth of work per annum on each claim; but the more important ones, - those covering the apex of the vein - are covered by United States Patents.

The relative location of these claims is shown on the accompanying map.

LOCATION AND ACCESSIBILITY.

Tybo, where the mines are located, is in Nye County, Nevada, at a point about 50 miles northeast of Tonopah, a station on the Goldfield & Tonopah Railroad. The town is located in a canyon which opens into the Hot Creek Valley, and which extends in a westerly direction to the summit of the Hot Creek Range of Mountains. The wagon road to either Tonopah or Goldfield, - the latter a station on the Tonopah & Tidewater Railroad - extends across the desert, and a low divide separating the Hot Creek Range of Mountains from the Kawich Range of Mountains, and up Hot Creek Valley to the canyon in which Tybo is situated. The road is an excellent one for wheeled vehicles; and the distance can be covered readily in three hours and thirty minutes by automobile.

A north and south line of railroad, unfortunately under the ownership of several different companies, has been constructed, connecting Ludlow, a station on the main Atchison, Topeka & Santa Fe Railroad, with the station of Haxen on the main Southern Pacific Railroad. Owing to the differences in ownership, freight over these connecting lines is



excessive; and because possibly, of friction, is often discriminating; for instance, - freight rates from Goldfield south to Needles, Arizona, is \$2.54 per ton on ores of not over \$30. per ton valuation; while from Tonopah to Goldfield, 30 miles, an additional charge of \$5. per ton is made. The rates from Tonopah north to Salt Lake or San Francisco, on the same grade of ore, is \$5. per ton, while the same discrimination against shipments in that direction from Goldfield, 30 miles farther south, is likewise made.

The railroad time-tables give the distances between the stations and the smelting points named, as follows:-

Goldfield to San Francisco -	518 Miles
Goldfield to Salt Lake, by Union Pacific -	761 "
Goldfield to Salt Lake by Clark's Road -	644 "
Goldfield to Needles -	356 "
Goldfield to El Paso -	1159 "
Tonopah to San Francisco -	487 "
Tonopah to Salt Lake by Union Pacific -	730 "
Tonopah to Salt Lake by Clark's Road -	675 "
Tonopah to Needles -	387 "
Tonopah to El Paso -	1190 "

The line of the proposed railroad connecting the Tonopah & Tidewater Railroad from some point near Cuprite Station with the Ely Northern Railroad at Ely, passes near the entrance to the Tybo Canyon. I am informed that the distance from Cuprite to Tybo along this proposed line is 71 miles; and from Tybo to Ely, 120 miles. From Tybo to the former prominent mining camp of Eureka, is 80 miles; to Belmont, about 35 miles; and to Hamilton, in the neighborhood of 100 miles.

The country through which this railroad would pass, consists of nearly level deserts having an approximate average elevation of from 3,000 to 5,000 feet, with isolated north and south ranges of mountains. There are no streams of running water, and very few springs. Railroad building, therefore, is relatively cheap, especially as to grading and bridging. With this road completed the distance to the smelting points named would be approximately as follows:-



Tybo to Ely	120 Miles
Tybo to Salt Lake	434 "
Tybo to San Francisco	632 "
Tybo to Needles	462 "
Tybo to El Paso	1265 "

#### P O W E R

The Tybo Mines have, in the past, been operated entirely by steam power. The fuel of the country is pinon pine; and this has all been cut off for a distance of about eight miles from the mines. It grows high on the mountains and this, together with the distance it must be packed on animals, and hauled in wagons, makes its present cost from \$8. to \$9. per cord. Probably the latter figure will obtain in large operations in the immediate future; and a gradual increase will take place as it is cut to greater distances from the mine. A cord of Pinon wood does not equal in quantity, a cord of other wood, as the sticks are crooked and it cannot be piled so closely.

Some 4 or 5 years ago a large hydro-electric plant was erected at Bishop Creek, California, by the California & Nevada Power Company, and has been supplying power to many of the mining camps and mines lying to the west of Tybo. It has been introduced and is in use at Manhattan, 45 miles from Tybo. It is estimated that an extension can be constructed from Manhattan to Tybo at a cost of, say \$50,000. I am informed that the Power Company will furnish power to any responsible company constructing the line, on the following terms of payment: 1/3 of the bill for power used to be paid in cash, and the remaining 2/3 to apply on the payment for the line; the line when paid for in this manner, to belong to and be the property of the Power Company. The Company is delivering power to Tonopah as low as \$7. per horse power. It would probably charge about \$8. or possibly \$9. at Tybo. If the mine were running to its full capacity, it would require at least 150 horse power, exclusive of power for any possible reduction works. On this basis, the difference between the use of fuel and electric power would be about \$1000. per month.



## HISTORY

7204  
1.10 Ag  
0.05 Pb

Calculated values @  
\$20.67 Gold  
0.52 Ag

Mining in the Tybo District began to attract attention as early as 1870, when small seams of rich silver ore in the limestone began to be worked, and ore shipped to San Francisco and local mills at other mining points. The vein on which your properties are located was discovered in 1871; and the first Company to operate, known as the Tybo Consolidated Mining Company, Limited, was organized in 1874. A smelter was erected by this Company in 1875; the mines actively worked, and the main shaft sunk to its present depth at the fourth level. Charcoal was used as fuel; and all freight had to be transported from the railroad for a distance of at least 100 miles across the desert in wagons. The smelter was run actively until it was closed in 1879. During this time, 61,439 tons of ore from the Tybo or 2-G vein, and 156 tons of ore from other properties, were smelted. The returns show sales of 7100 tons of lead bullion, which contained 1,743,000 oz. of silver and 15,330 oz. of gold. This was equivalent to a recovery of 11% of lead, 27.5 oz. of silver, and 0.24 oz. of gold; a value in silver and gold, at the present quotations on those metals, of \$19.26, against a value in 1879 of about \$37.96, a difference of about \$18.70 per ton; due to the present lower price of silver.

The Company experienced considerable difficulty in smelting the more or less oxidized ores from the upper levels while the heavier sulphides were apparently only mixed in the charge in very limited quantities. In 1876 a 20-stamp dry crushing, roasting and chloridizing mill was erected, which was operated quite steadily by the Company for some two or three years, and then intermittently, by its successors, until 1887. During this period 42,000 tons of ore were treated, which produced bullion containing 834,000 oz. silver and 5050 oz. gold; equivalent at present quotations to \$10.48 silver and \$2.48 gold, a total of \$12.88 per ton.



In 1879 the Company became so involved that on March 12th of that year the property was attached for debts due to San Francisco and local merchants, amounting to over \$50,000.

During the latter part of the same year, the firm of N. S. Trowbridge & Co., storekeepers at Tybo, took charge of the Company's affairs, and operated the mines during the year 1880; but with a loss to themselves in excess of \$25,000.

During the following year, 1881, a second company was organized, under the name of The Nye Mining Company. It confined its work principally to the upper levels of the mine and after an uncertain career, finally failed in 1887, and passed into the hands of its creditors.

In 1901 the property was sold at Sheriff's Sale, and was bought in by two local men, Messrs. Butler and Barndt, who organized The Tybo Mining & Reduction Company. This Company erected a small concentrating mill, and attempted to treat the oxidized and partly oxidized ore from the upper levels, and ship the concentrated product to the railroad and smelters. The plant was incomplete, the separation imperfect, and the expenses large. A considerable deficit therefore resulted, and in 1904 the Company passed into the hands of Mr. Butler, as Receiver, with debts amounting to about \$100,000.

I was informed that the present Tybo Consolidated Mining Company was organized in the latter part of 1906, and took over the property from Mr. M. L. MacDonald, who acquired it from Mr. Butler, the Receiver of the Tybo Mining & Reduction Company. The present owner has confined itself to the unwatering of the shaft on several occasions, and to the prosecution of a limited amount of development work on the 2nd, 3rd and 4th levels. An attempt was made to mine and ship lead ore, but this was abandoned after 147.5 tons had been extracted and shipped.

The above historical sketch of the mine is interesting as showing that the only period during which it was actively operated was during



the time the first company owned it; and that there has been no sinking on the vein since it ceased its operations in 1879.. The subsequent owners contented themselves with extracting the ore remaining in the old works above the level to which the water rises when the pumps are idle, or above the third level during the relatively short periods when the shaft was drained to that depth.

The costs of operations during the early years were greater than they would be at this time, with economies which could now be introduced. But these were partly offset by the higher price of silver which, previous to 1890 when the more active operations on the vein had ceased, was much greater than it is now. While I have no definite figures at hand, I think it is safe to say that during the years in which the Tybo Mines were actively worked, the average price of silver was about \$1.14 per oz. against a present quotation of 52 cents.

#### FORMATION

That portion of the Hot Creek Range that is cut by the Tybo Canyon, presents several distinct beds of limestone, differing somewhat in texture and character, interbedded in which is one or more thick layers of shale, containing thin beds of limestone. The tops of the highest summits are capped by a white quartzite. The formation is generally supposed to be Silurian. The western flank of the Range is composed of volcanic rocks; rhyolite and basalt. The whole formation is cut by a number of prominent faults. One at the mouth of the eastern end of the canyon is of some considerable magnitude, and throws the overlying shales down to the level of the bed of the canyon.

At a point in the canyon about two miles above its mouth is located the old town of Tybo with the abandoned ruins of the smelter and mill that once made it a populous camp. It is said that the town, at one time, had as many as 5,000 inhabitants and its houses were strung along the canyon for upwards of a mile. Now, few houses are left and there are not more than a dozen permanent inhabitants.



Here a prominent dike of porphyry cuts the sedimentary rocks and outcrops on the side of the canyon to the south of the Company's store and follows the slope of the hills to the west until, at a point some 1500 feet from the store, it descends to the level of the canyon and, is hidden by the wash. Its strike is approximately N. 65° W. and its normal dip is from 80° to 85° to the north. This dike varies in width from a few feet to, in one place on the surface, as much as 100 feet. The limestone on the hanging wall side of the dike has been contorted, is less massive than on the south side, and is apparently more thinly bedded. That on the south side of the dike is more regularly bedded and more massive; the bedding planes dipping generally easterly and northerly. It is apparent, from this condition, that the dike occupies a fault plane of considerable magnitude.

Accompanying this dike, - generally along the hanging-wall though often, especially where the dike is wide, in the porphyry itself, is the S-G or Tybo Vein, on which your property is located. To the east, the outcrop of the vein rises with the mountains to a height of, perhaps, 200 feet above the bed of the canyon. To the west the apex follows the slope of the hills down and into the bed of the canyon where it is for the most part obscured by the wash.

As indicated the vein follows the dike both on its strike and dip. It varies in width from 18 in. to as much as 6 ft. Along the apex on the surface of the hills south of the canyon, a trench or rather an open stope marks the former outcrop of the vein where for nearly 1000 feet in length, the ore has been taken out over a width of from 2 to 4 ft.

On the strike of the vein to the east a decided change takes place in the surface rock near the dividing line between the Casket and Garrett Claims. To the east of this point, the surface shows a lime shale, in which the dike can be distinctly traced as far as the Garrett shaft. The vein has been worked through this shaft, a short distance farther to the east, - beyond which point it is difficult to trace either



the dike or the vein, though a shaft sunk to a considerable depth on the Hockmeister Claim may be on a continuation of it. The stops in the Garrett shaft may be considered the limit of the important mineralization of the 2-G vein in this direction.

Near the Casket shaft a branch vein coming in from the southeast appears to join the 2-G vein. It appears to follow a line of contact between massive limestone and the shales mentioned above, and is apparently unimportant except as it may have influenced the mineralization of the 2-G vein. To the west, the apex of the vein, as stated above, is obscured by the wash in the canyon; but the Crosby Shaft, sunk at a point about 1,000 feet from the main shaft, is on the vein. 50 to 100 feet west of the Crosby shaft, a series of veins show on the surface of the hill to the south of the apex of the 2-G vein. These are apparently parallel and appear to strike towards the 2-G vein at an angle of about 45 degrees; they appear to dip to the southeast. The point however, at which they would probably join the 2-G vein is obscured by the wash, though there is undoubted evidence on the surface that they come together. This is confirmed by the junction of at least one of them underground. Immediately west of this point, there is evidence of an extensive cross-faulting which has had the effect of throwing the vein to the north between 150 and 175 feet. Beyond this fault the vein undoubtedly continues on a course approximately parallel to its course east of the fault, though the apex is obscured until a point 1,250 ft. from the Crosby Shaft is reached, where it is exposed for a length of about 200 feet. The Bunker Hill Shaft is sunk upon this outcrop near its eastern end. To the west of this shaft, the wash of the gulch again obscures the vein. Farther west, an examination of the hills bounding the gulch fails to show the continuation of the vein. It may be assumed, therefore, that the fault immediately to the west of the Crosby Shaft limits the principal mineralization of the 2-G vein to the west. The disclosure in the Bunker Hill Shaft make it possible, however, that an



additional length between the Bunker Hill Shaft and the fault may be found to be mineralized, though on the surface the vein is obscured and there is nothing to indicate what its character may be.

#### DEVELOPMENT

The first development on the property consisted in running a tunnel on the vein from a point not far from the southwest corner of the 2-G claim in a westerly direction to a point beyond the Carrett shaft, a total distance of about 1520 feet. The greatest depth obtained by this tunnel was from 250 to 300 feet below the surface; the latter, at a point near its breast. All ore that gave promise of profit has long since been taken out above the tunnel level, and the line of the outcrop of the vein, marked as previously described by open stopes on the surface, was where the vein and ore formerly existed.

The maps in the possession of the Company are colored to show one continuous stope through this distance, but so far as we were able to penetrate the tunnel (a distance of about 1,000 feet), and so far as we were able to examine the stopes, I should say that about 1/4 of the ground is still standing. This represents places where the vein is pinched or where the ore was too low grade to promise a profit under conditions that then existed.

Below the tunnel level the mine has been and is being worked through a vertical shaft sunk at a point about 150 feet west of the westerly end line of the 2-G Claim. This shaft, the Main Shaft, has reached a total vertical depth of 425 feet. From the shaft stations, crosscuts were run in a southerly direction to the intersection of the vein; the cross-cuts having a usual length of about 130 feet. (east)

FIRST LEVEL: This level, at a depth of 130 feet, was long since abandoned and caved; consequently no examination whatever could be made of it. An examination of the records, however, indicates that the ground above it, and as far down as the 2nd level, has been practically worked out, with the possible exception of some little ground remaining



in the extreme ends of the 1st level. This, because of the condition of the level could not be reached and examined.

SECOND LEVEL: This level, at a depth of 215 feet, was driven from the crosscut from the shaft to the vein, in an easterly direction along the vein about 1400 feet; and in a westerly direction, 840 feet; that is, the breasts of the drifts had reached these distances from the crosscut in either direction. To the east of the crosscut, on the 2nd level, the drift was caved, and the only way of reaching it was through a raise from the 3rd level in the extreme eastern end of the mine. The level at this point shows some stoping on the wider part of an ore shoot which is partly exposed by the drift and short crosscuts but is often in the wall. Its length is possibly 250 feet. Its average width is 2.8 feet; and the samples taken indicate an average value of 6.13 per cent lead; 11.13 ounces silver; and 0.121 ounces gold; a gross value of \$13.19 per ton of ore. An analysis of a composite sample from this shoot gave the following result in percentages:- Zinc - 5.28: Iron - 19.02: Sulphur - 16.72: Antimony - 0.22: Arsenic - 1.70: Insolubles - 39.30.

The level was sampled to the west of the crosscut for a distance of about 500 feet at such points as seemed to indicate payable ore. Throughout this distance, the vein is irregular, and much of the ore is oxidized or partly oxidized and generally low-grade, though occasional assays appear that indicate the possible existence of either very short shoots or bunches which may do to extract. One of the best of these comes in at a point about 140 feet west of the Main Crosscut, and appears to extend for a distance of about 60 feet. The average of this ore is 4.35% lead; 13.60 ounces silver; 0.083 ounces gold; over a width of 3.4 feet; a value of \$12.20 per ton.

Another bunch of good ore appears near survey station 208, but generally, as stated above, the ore throughout this level is irregular, partly oxidized and probably represents a zone of considerable leaching, with perhaps lower values.



At survey station 212, at a distance of approximately 650 feet west of the main crosscut, a branch vein comes into the 2-G, which has been called the "South Vein". Its strike corresponds closely to the strike of the veins mentioned on page 11 (page 8 of this copy), and its junction is the definite one referred to there. A drift follows this vein for something over 150 feet, but was stoped for most of that distance and in such shape that it could not be readily examined. The Crosby shaft mentioned above, joins the workings at this point. From here an irregular crosscut runs, first in a northwesterly direction, and afterwards in a northerly direction to the 2-G vein. A drift has been driven on the latter in a westerly direction from the intersection, a distance of about 120 feet to the extreme west breast of the level. This distance shows a very good width of good grade sulphide ore almost entirely free from oxidation.

At survey station 212, at which the drift left the 2-G vein and started off on the south vein, the 2-G vein shows ore of the same appearance as in the 120 ft. drift at the breast. This would seem to indicate that the shoot of the ore in the drifts at the breast of the level extends back in an easterly direction through the unprospected ground to the junction of the South Vein. If this should prove to be correct, this shoot of ore will have a length of about 260 feet. The samples gave an average contents of 4.45% lead; 15.25 ounces silver, and 0.07 ounces gold; over a width of 3.5 feet: a value, per ton, of \$12.91. At the west breast of this level the ground is very much broken, and indicates the near approach of the level to the large fault mentioned above as throwing the vein in a northerly direction, a distance approximately 150 to 175 feet.

THIRD LEVEL: The shaft station for the 3rd level is at a depth of 310 feet and the crosscut, in a southerly direction to the vein, is about 140 feet long. From this point a drift extends in an easterly direction a distance of about 1400 feet. For over 600 feet from the crosscut, most of the ground has been stoped out above this level, and a heavy flow of water prevented sampling along the floor. Such pillars

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were sampled above the level as were accessible, and these results, together with those obtained by Mr. Freeborne in a former examination, and a study of the ground stoped, show a shoot of ore beginning immediately east of the crosscut and extending about 185 feet. The ground below this level is intact. Beyond this shoot, a crosscut into the footwall, connects with the top of a raise from the 4th level. This raise shows good ore throughout its length, and to a height of 20 feet above the level. Just what relation this ore has to the shoot in the drift cannot, at present, be determined. The vein appears to have been faulted and thrown to the south at this point. It is possible that in stoping, this ore may be found to be the continuation of the shoot just described; if so, the shoot would have an additional length of some 50 or 60 feet.

For the next 100 feet along the level, the ore is low grade and spotted. Exx An improvement then takes place and for about 150 feet an irregular, narrow streak appears with a grade approximating a value of 7% lead; 15.10 ounces silver; 0.12 ounces gold, over a width of 1.6 ft; a value of \$15.87 per ton.

From this point on, for a distance of 600 feet, the vein shows narrow and pinched, and it is doubtful whether the main streak has been followed: crosscuts at several points would determine this. The ore then widens, and its appearance improves, and a shoot of ore is exposed which, undoubtedly, is the downward continuation of the ore exposed above this point in the 2nd level and which was described above.

The first 110 feet of the shoot, sampled, over a width of 2.7 feet; 5.85 per cent lead; 11.62 ounces silver and 0.082 ounces gold; equal to a value of \$12.51 per ton.

The next 100 feet sampled over a width of 2.84 feet; 8.75 per cent lead; 14.42 ounces silver, and 0.13 ounces gold; equal to a value of \$17.18 per ton, or an average width and value for a length of 210 feet, of 2.7 feet, 7.44 per cent lead; 13.14 ounces silver and 0.109 ounces gold, equal to \$15.02 per ton.



The composite sample of this ore gave the following analysis:-  
Zinc, 8.03 per cent; Iron, 18.37 per cent; Sulphur, 17.05 per cent;  
Antimony, 0.17 per cent; Arsenic, 2.48 per cent; and Insolubles, 35.40  
per cent.

There can be no doubt that the 4th level, if extended so far, will open this shoot.

From a point 140 feet west of the main crosscut, the 3rd level was caved and could not be examined for a distance of about 250 feet. In order to reach the level beyond the cave, it was necessary to go through the 2nd level to a winze near its breast, down which ladders extended to the 3rd level. Beginning at the westerly end of the cave, the 3rd level was examined to its breast. At a point on this level below where the South Vein joins the 2-G Vein, the same junction appears and a drift was driven on the South Vein for a distance of about 160 feet. It was caved, in rather bad shape, and could not be satisfactorily examined. A crosscut from this drift carried the main drift back to the 2-G vein, from which point of intersection, good ore continued to a point near the breast where the formation became very much broken, and where the indications are that the fault which disturbs the continuity of the 2-G vein in this direction, was encountered. The ore shoot shows here for a distance of 180 feet and has an average width of 3.5 feet, and an average contents of 5.9 per cent lead; 19.80 ounces silver; and 0.083 ounces gold; a value of \$16.82 per ton.

At the point where the drift on the South Vein leaves the 2-G vein, the latter vein shows good ore, and it is probable that this shoot will, upon development, show a total length of about 275 feet of ore of the grade above stated.

The ore in this shoot is a thorough sulphide ore; and has not been subjected to any oxidation whatever. It may be taken as indicative of the character of the ore that will be found on the 4th level when it is extended this far.



An analysis of a composite sample shows it to contain 7.62 per cent zinc, 18.62 per cent iron, 23.52 per cent sulphur, 0.11 per cent antimony, 1.28 per cent arsenic, and 38.50 per cent insolubles.

The 3rd level for the greater part of its length - say from the South Vein to a point 1600 feet east of the main crosscut - shows a narrow, irregular streak consisting of a mixture of oxide and sulphide ore that has doubtless been subjected to more or less leaching action, with possibly a diminution in values.

FOURTH LEVEL: The crosscut from the shaft station on the 4th level at a depth of 405 feet, is run in a southerly direction, a distance of about 90 feet to the vein. The drifts on this level extend in an easterly direction from this point of intersection, a distance of 86 feet and in a westerly direction, 520 feet. A shoot of ore was struck at the crosscut which extends west a distance of 25 feet and east about 175 feet, - a total length of about 200 feet. This is the continuation downward of the shoot of ore opened above this point on the 3rd level. On this level it consists of massive sulphide ore, free from oxidation, and has a width of 3 feet, with an assay value of 11.27% lead, 21.75 ounces silver, and 0.28 ounces gold: or \$25.12 per ton.

Beyond this shoot to the west for a distance of 65 feet, the vein is narrow and unimportant. To the east it shows occasional bunches of good ore, though it is probable that the drift does not, at all times, carry the vein. This is especially so at the point about 270 feet from the main crosscut, where a long crosscut tunnel was driven into the country rock of the hanging-wall, and a short crosscut into the foot-wall. The latter shows the vein and a raise from this point on the ore connects with the crosscut in the 3rd level which discloses the ore body described in connection with this point.

Beyond this raise two small bunches of ore appear; the first, 20 feet in length, has an average width of 2.2 feet, and an assay value



of 14.05 per cent lead, 17.52 ounces silver, and 0.037 ounces gold, or \$23.00 per ton; while the second has about the same length and average width of 2.1 feet, and a value of 14.6 per cent lead, 18.01 ounces silver, and 0.097 ounces gold or \$23.05 per ton.

The next 50 feet of the drift shows ore of an average width of 2.3 feet that sampled 8.8 per cent lead, 12.0 ounces silver, and 0.04 ounces gold; a value of \$14.10 per ton. From this point the ore improves in value though the streak is narrow. The next 75 feet, to within a few feet of the east breast of the level, averaged over a width of 1.4 feet, 15.35 per cent lead, 18.13 ounces silver, and 0.068 ounces gold; a value of \$23.16 per ton.

The ore on the 4th level is entirely free from oxidation, and presents the character of ore that will undoubtedly be opened in driving the 4th level farther east and west, and also on the 5th level. An analysis of a composite sample of ore taken from the principal shoot, gave the following: Zinc, 11.36 per cent; Iron, 23.0 per cent; Sulphur, 26.03 per cent; Antimony, 0.017 per cent; Arsenic, 1.97 per cent, and insolubles, 18.20 per cent. Particular attention is called to its assay value.

From the above description of the workings and ore development, it will be seen that three well-defined ore shoots have been opened: one in the east end, one in the west end and one in the center, near the shaft. These will probably be found, upon further development, to have an aggregate length of 750 feet and an average width of 3.15 feet. The lower levels on these shoots have all reached the sulphide ore zone and show little effect of oxidation.

Between the shoots there is every evidence of streaks or shoots of ore of lesser length and width which when opened in the 4th level will be found to be of a grade equal or nearly equal, to the average of the ore now exposed in the defined shoots. The actual extent of these can only be determined by further development.

Another interesting fact is demonstrated, and that is, that



there is a gradual but marked improvement in depth. The ore in the east shoot on the 3rd level shows an improvement of 14% over that on the 2nd level; that in the west shoot, an improvement of 30%, and that in the center shoot - though much of it was stoped and satisfactory and complete sampling was impossible 30%. The only shoot opened on the 4th level is the center shoot and the improvement over the 3rd level - though this again is not conclusive because of the stoping in the 3rd level - is most marked, being 65.53%.

It is difficult to explain this improvement except upon the theory of a leaching in part of the silver and lead values in the upper levels. But a microscopic examination of a sample of ore from the 4th level did not show secondary enrichment. It is therefore reasonable to suppose that the east and west shoots and such intermediate seams and bunches as may be opened in the 4th level will show an improvement in values over the 3rd level. What the 5th level will show can only be surmised but I do not look for any further improvement, except possibly locally, as I think the 4th level will have shown the sulphide ore in its original and unaffected condition.

The ore taken out in the recent developments under the present ownership and management has been kept separate and placed in a dump by itself. This was carefully sampled and returned a result of 8.1 per cent lead, 16.40 ounces silver, and 0.10 ounces gold, or a value of \$17.07 per ton. This ore was taken principally from the east and west shoots on the 3rd level and the shoot on the 4th level, and checks to a remarkable degree the result of the sampling at those points.

During the examination it was stated that much oxidized ore remained in the old stopes above the Addit Tunnel which would do to work under more economical conditions. These works had been so long abandoned that access to them was dangerous and no satisfactory examination could be made. But so far as they could be inspected, they give little evidence of any considerable tonnage. A grab sample of the loose dirt lying on the stulls that could be easily reached, gave an assay



value of 9.5 per cent lead, 13.90 ounces silver, and 0.10 ounces gold; a value of \$16.88 per ton. I do not consider this a representative sample of the material that may be found in the old, open works. It has doubtless been concentrated to a considerable extent by the water from rains pouring over it, assisted perhaps by winds. In any event, this material will, as indicated, be found in limited quantities only and can only be utilized under favorable economical conditions and then with very small profit.

The Bunker Hill Shaft, said to be 260 feet deep, was in such condition that only the upper levels could be examined. East of the shaft is an open trench along the outcrop of the vein which, for about 100 feet, shows oxidized ore. West of the shaft is an open stope about 20 feet long. Levels were driven at 46 feet and 96 feet in depth; the latter has a drift in an easterly direction on the vein, 150 feet in length. In the breast the vein is narrow and pinched. Above this level, considerable stoping has been done and all the better ore removed. Below it the shaft could not be entered. Samples from the waste dumps at the shaft gave average assays of 3 per cent lead; 4.34 ounces silver; and 0.04 ounces gold, or \$5.42 per ton. The old records show that previous to 1879 when apparently work stopped, there had been shipped to the smelter from this shaft a total of 2372 tons of ore having an average assay of approximately 40 per cent lead, and 30 ounces silver. These records warrant the belief that further work in this shaft may open more ore, especially to the east toward the big fault near the Crosby Shaft.

#### PRODUCTION AND VALUE OF ORE.

Any estimate of the ore in sight, at the present stage of development would be misleading, but the following figures may be interesting:-

The three defined ore shoots, already described, will probably aggregate 750 feet in length, while the sampling shows that they will average 3.15 feet in width. This will give for each vertical foot of vein extracted, a production of approximately 265 tons.



If we assume that in the 2400 feet of vein opened, which apparently limits the principal mineralization in the vein, there will be found seams and bunches of ore of lesser length and width than the defined shoots, of an aggregate length of, say, 300 feet and a width of 1.5 feet there would be an additional production of 85 tons for each vertical foot of vein extracted: or a total, with the shoots, of 350 tons. In other words, each 100 feet of the vein opened by levels could reasonably be expected to produce, from the present indications, 35,000 tons of ore.

The extension of the drifts on the 4th level to the limits above mentioned, will doubtless add this much tonnage to such payable tonnage as may remain above the 3rd level. The latter is a sum difficult to satisfactorily estimate in the present condition of the old workings.

For reasons already indicated, any estimate of the value of the ore based wholly on the sampling of the present ore exposures, may be misleading. In the absence of other data, however, the assays of the samples taken, have, with certain limitations, formed the basis of the following estimate. I think we are safe in assuming that the ore in the lower workings will average 8-per cent lead, 19 ounces silver, and 0.08 ounces gold; a value of, say \$18.00 per ton. The several analyses show that its chemical composition will be about as follows:- 3.8 per cent zinc, 20.91 per cent iron, 24.85 per cent sulphur, 0.16 per cent antimony 1.77 per cent arsenic, and 30.55 per cent insolubles.

On the above assumption of tonnage and value, each foot of vein extracted below the present lower workings should produce 350 tons of ore of a gross value of \$6300. This does not, of course, consider the possibilities of ore in the Bunker Hill Shaft, nor in the unprospected territory between it and the big fault vein, to the west of the Crosby Shaft.

From the above description of the vein and ore occurrences, it will be seen that a daily production of 80 tons of ore can be maintained, though if the vein opens in the lower levels, as has been indicated, or



developments towards the Bunker Hill Shaft are satisfactory, the output may be increased to 100 tons of ore per day of the grade mentioned.

#### COST OF MINING

The present equipment at the shaft is totally inadequate and much will have to be done in the erection of new hoisting, pumping and air plants. With these installed and in economical operation, the cost of mining the ore, including superintendence, general office and incidental expenses, on a production of from 80 to 100 tons daily, should not exceed \$5. per ton, if economically administered. It must not be forgotten, however, that in Tonopah and Goldfield, the miners' unions have maintained a scale of wages, hours and rules which, with freight rates on supplies in, make them among the most expensive camps in the United States in which to operate.

#### COST AND TREATMENT OF ORE

Sulphide ore of the character shown in the lower workings of the mine can only be treated successfully by the smelting process. This can either be done locally at the mine, or the ore can be sold to a custom smelting company. The basis of the operation would, of course, be lead smelting.

At the present time, the mine is without rail communication, and it appears to me that it is essential for any successful operation of the property, that this means of communication be established. What the cost of smelting or of shipping the ore may be with rail communication established, is difficult to estimate in advance, for the cost of either must necessarily depend upon the freight rates established by the railroad. If a railroad were constructed and local smelter erected, the railroads would undoubtedly make a high freight charge upon coke and necessary supplies, as well as upon the bullion produce shipped to the refineries. This has been the history of railroading in the West. Their object has been to force mining companies into shipping ore rather than to afford them facilities to smelt it locally, in an attempt to obtain the haul on the larger tonnages.



This policy has often been used in a short-sighted or arbitrary manner and has lead to the present attempts to regulate railroad rates. Lines constructed wholly within the limits of a single state still often adhere to it as witness the charge of \$5. per ton on ore for a haul of 30 miles between Tonopah and Goldfield.

As stated above, a railroad is absolutely necessary for the operation of the property and the construction of the proposed line from Cuprite, on the Tonopah & Tidewater Railroad, to a connection with the line at Ely would fill this requirement, as it would give through connections with trunk lines both north and south. But, as stated above, no satisfactory estimate of the cost of smelting locally can be made until the freight rates are known. Any attempt to do so would probably be misleading.

Let us turn then to the shipment to, and sale of the ores at such smelting centers as Salt Lake and San Francisco. With the railroad finished from Cuprite to Ely, the freight rates on ores of the grade that will be produced at Tybo should not exceed the rates from Tonopah and Goldfield, as given in the early part of this report. (Page 2). But even this rate of \$5. per ton constitutes a serious charge against ores of this grade.

The charges made by the smelting company for the reduction of the ores may be about as follows:

Charges: Smelting - \$6 per ton with a zinc limit of 8%.  
Payments: 95% of the New York quotation for silver;  
          \$20 per ounce for gold;  
          Market quotation for lead, less 1-1/2 cents and  
          10% deduction.

It is possible that if the maximum daily shipments, of which the mine is capable, are made, these rates may be somewhat improved and the iron and sulphur allowed to offset one another. But applying these rates, an \$18 ore of this kind will bring at the smelter a net price of \$8.58 per ton.

If from this net price we deduct the freight rate of \$5 per ton, it will leave a balance of but \$3.58 to meet the costs of mining, superintendence, etc.; a sum totally insufficient for the purpose.



If the railroad were completed to Ely and lead smelting operations established there, Tybo should be <sup>much</sup> more favorably situated in this respect. The distance would be but 120 miles. The haul from Goldfield to Needles is 356 miles with a freight rate of \$2.54; that from Tonopah to San Francisco is 487 miles, and to Salt Lake, 730 miles with a \$5. charge to each point. The freight rate from Tybo to Ely should not, therefore, exceed \$1.50 or, at most \$1.75 per ton: a difference in favor of the mine of \$3.25 or \$3.50. But all of this difference will not accrue to the benefit of the mine for smelting charges at a point like Ely will doubtless be higher than at Salt Lake or San Francisco. Enough should remain, however, to cover the deficit that would result from shipments to these latter points, though not enough to yield a profit to the Company.

The ores below the zone of oxidation contain, as is shown by the analyses, such a large percentage of sulphides and so small a proportion of insolubles as to preclude concentration in any form. The loss in the concentration of the oxide ores is so great that it could not be used successfully, except possibly in connection with other operations where the product could be utilized on the ground as, for instance, in a local smelter. The tailings from the concentration of such ores do not apparently yield their values readily to cyanidation, though the tests in this were not entirely conclusive.

In concluding this subject, I will say that I am inclined to the opinion that when the railroad is completed, local smelting of the ore with a mixture of such other ores as may be obtained near by, will be the solution of this problem, and that when the facts are presented fairly to the railroad company, such freight rates will be made as will enable the Tybo Consolidated Mining Company to operate its property as in doing so, it would be an important freight contributor. But the profit will depend largely upon the freight rates made, and cannot be estimated without a knowledge of them.



### CONCLUSIONS.

In conclusion, I wish to present the following facts:-

Two favorable features as regards the formation and ore are worthy of particular note; first, that as the vein is associated with and accompanies a strong dike that nearly vertically cuts the approximately horizontal formation, there is more assurance of depth than is usually found in limestone formations; and, second, the apparently marked increase in the values of the sulphide ores from the 2nd to the 4th levels. There is every indication that the 4th and 5th levels, when opened will show a better grade of ore than the average of that exposed in the shoots, so far as they have developed. If the ore opened on these levels should maintain a value equal to that exposed in the 4th level, so far as it has been driven, the question of the disposition and treatment of the ore becomes a less serious problem, for ore of that grade will yield a profit even under rates and conditions such as the railroad would establish.

The mine gives no present evidence of being able to maintain a maximum daily production of more than one hundred tons, which in the present stage of development will average about \$18 per ton, or a gross content of \$1,800 per day. Even with railroad connections, ore of this grade and character will not more than pay expenses and charges if shipped and sold to the custom smelting companies. The only possible profit, therefore, is in smelting it in a local smelter owned and operated by the company. And the profit, under these conditions, will depend upon the freight rates charged by the railroads on supplies, bullion and fluxes and cannot therefore now be estimated.

But in view of the improvement in the grade of the ore in the lower levels, I unhesitatingly recommend that the Main Shaft be sunk to the 5th level, and that it and the 4th level be driven on the vein to open the east and west shoots, I think the present showing and promise justifies this expenditure. And if the improvement in the grade of the ore noted holds throughout these levels the average value of the ore reserves will be materially increased.

I am,  
Yours very truly,  
22. (Signed) John B. Farish.