MR-138-01

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F. R. B R O W N'S REPORT

APOLLO CONSOLIDATED GOLD MINING COMPANY

KH138-2

LOCATION:

The Apollo Consolidated Gold Mining Company's properties are located at Unga Island, Alaska, and consist of three (3) groups of mining claims: The "Apollo" group, on which the main development work has been done; the "Sitka" group to the North of and adjoining the "Apollo" group, which has been developed to quite a large extent, and the "Delarof" group to the South of and adjoining the "Apollo" group, on which a limited amount of work has been done; in all, fifteen (15) mining claims, all held under U.S. Patent.

The Apollo Mine has been developed by two (2) tunnels, Nos. 1 and 2; also by two (2) shafts, Nos. 1 and 2, and by an extensive number of drifts, winzes and crosscuts.

No. 1 Tunnel is 1200 feet long, and No. 2 Tunnel is 315 feet below No. 1 Tunnel and is over 3200 feet long.

There are three (3) veins - the "East", "Center" and "Feeder" veins, nearly parallel and averaging not more than 50 feet apart.

In Tunnel No. 1, the principal work was done on the East vein, which produced pay ore from a shoot that was 880 feet long, from 8 to 40 feet wide, and was worked to the surface and for about 30 feet below tunnel level, where it was cut off by a fault dipping 50 degrees West.

No. 2 Tunnel cut the Center vein 1800 feet from the portal and this tunnel being the main avenue to the mill, was made a double track 7 x 9 feet. The principal work in this tunnel was done on the Center

vein, the shoot of ore being 800 feet long, from 8 to 16 feet wide, and pay ore extracted for 300 feet above the Main Tunnel level and 200 feet below the Main Tunnel level, at which latter place the free gold rock disappeared, only complex ore then appearing.

SHAFT NO. 1:

From the Main Tunnel level near the ore body a vertical three compartment shaft was sunk 450 feet, from which three levels were driven. The ore below the 200 foot level is complex, carrying galena, silver, copper zinc blend and iron, with low gold content; While crosscuts were frequently made to determine the width and quality of the ore body, if the ore did not contain free gold no further work was done, as at that time no process was known by which to extract values profitably from complex ore of that character. Assays indicated values at from $10.00 to $14.00 per ton of all metals.

The third level in Shaft No. 1 is 400 feet below Tunnel No. 2. In the South drift of this level a vein 20 feet wide of 10 to 15% ore was encountered from which a mill test of 400 tons was made. Some of the ore was taken from a winze 25 feet below the level. Zinc and only 50% recovery, with lead at three cents, made this prohibitive, while present prices and conditions will warrant further development.

SHAFT NO. 2:

This shaft was sunk 2300 feet North of Shaft No. 1, and within 20 feet of the mill. It is 4 x 15 three-compartment vertical shaft and is timbered with 8 x 8 and 10 x 10, closely lagged with 2 x 12. This shaft is 811 feet deep. Four stations were cut and three levels run, the latter all showing complex ore. The

bottom level is 800 feet below the Main Tunnel level and is 750 feet long. The one vein cut by West crosscut is 16 feet wide. The North-drift 8 feet wide and advanced 20 feet, shows better than 10% ore, principally lead and zinc and around $3. gold, and believe this drift will connect with the work done on the Sitka 1500 feet northerly, this was our intention, so as to eliminate the overhead tramway on the surface; however, we intended to connect with the Apollo workings first. The South drift was extended 750 feet. At about 50 feet from the crosscut the vein faulted. This fault was fullowed South, and at 300 feet a vein 8 to 12 feet wide was encountered. The drift was 5 x 7 and crosscuts every 100 feet determined the width of the vein for about 400 feet. All this work was discontinued at the time of the fire and earthquake in San Francisco. This ore was about 8%, principally lead and zinc; copper, gold and silver about the same as all these complex ores in this property, except in the Center vein we mined for gold, and in places the galene would assay as high as $700.00 per ton. The two upper levels in Shaft No. 2 are very similar to that described in the bottom level.

SITKA GROUP OF MINES

The King Mines of this group has been opened by a vertical three compartment shaft 350 feet deep. In the early development a tunnel was run from the North side, 60 feet below the surface. A portion of this tunnel was stoped close to the surface, and remaining in this stope are about 2000 tons of broken rock averaging about $13.00 gold and silver values - base metals not considered. Owing to the large percentage of base metals in this ore and the difficulty of saving an appreciable amount of the previous metals with any known character of treatment at the time, it was deemed good policy to de-

fer working it until a better method of treatment was found. A drift was run 90 feet below the tunnel level, both North and South, and in the North drift native copper was encountered, appearing in hard white quartz. Width of vein was not sought owing to the discontinuance of operations on the entire property at that time. On the South drift milling ore was encountered for the entire length of about 400 feet, with good ore in the face. In this level, on the South drift there are about 500 tons broken rock; timbering in place under this 500 tons for drawing.

On the 250 foot level drifts were run both North and South for over 700 feet, and from this level to the surface 40,000 tons of ore was blocked out, and in the South drift the ore encountered for the last 15 to 20 feet went 15% metal.

There are 400 tons of ore at the Sitka Mill from the Sitka Mine, making all told, close to 3,000 tons of available broken rock. The 40,000 tons of milling ore mentioned above are blocked out and ready for extraction, assays from $10.00 to $14.00 per ton.

EQUIPMENT

There are two mills on the property, both under the same roof, one of 40 stamps called the "Apollo Mill" and one of 20 stamps called the "Sitka Mill," both thoroughly equipped at the time operations were suspended at the outbreak of the "World War" and Apollo Mill is in fair condition now considering the length of time they have been idle and the wear and tear of the elements.

ORE PRODUCED

Five hundred thousand (500,000) tons of ore were milled from the Apollo Mine, yielding six ($6.00) dollars per ton, the percentage of saving being 75% free gold and 25% concentrates.

COMPLEX ORE

On the Main Tunnel level complex ore has been exposed by crosscuts at several points. Low gold content and zinc penalty made it prohibitive to handle at that time, consequently only slight development was carried on in that class of ore. The tunnel was extended south following a fault but none of the veins encountered were developed.

Reference is again made to the large bodies of complex ore as exposed in the drifts run from No. 2 shaft, the lowest drift being 800 feet below the level of No. 2 tunnel; also the complex ore encountered in the Sitka Mine. No attempt was made to develop these complex ore bodies North toward the Sitka, as zinc penalization and only 50% recovery was prohibitive. This deep exploration work was done in the effort to locate free milling ore and develop the ore under shaft No. 1; also to connect with the Sitka in order to eliminate surface tranway.

The complex ore bodies thus encountered were from 10 to 24 ft. wide, averaging probably from 12 to 14 feet in width. All work on the property was suspended at the beginning of the World War, at which time the flotation process was not known.

WATER POWER

All machinery is run by water power, water being delivered from a reservoir about one mile distant from the camp, through a 26" pipe at the beginning and ending with a 12" pipe at the mill, furnishing power for the compressor the year round, for the mill eight months of the year - sometimes more.

CLIMATE

Owing to the proximith of the Japanese current the weather is comparatively mild, temperature very rarely going below zero and then only for short intervals.

FREIGHT HANDLING

Freight is lightered from ocean-going ships that anchor in the outer bay to the head of the inner tide-bay, three miles, and hauled one mile by rail with a 10 ton Baldwin locomotive. The freight rate in is from $17.00 to $20.00 per ton; back freight around $6.00 to Seattle; 500 to 1000 ton lots more reasonable. We chartered vessels which made our rate five dollars per ton, freight on concentrates back to Tacoma three dollars per ton.

PASSENGER SERVICE

From San Francisco to Bellingham Bay by rail, thence by comfortable steamers to the mine, transportation there and back costing about $300.00

DALAROF GROUP OF MINES

On the six adjoining claims to the south of the "Little Joker" only enough work was done to secure the patents; the work was confined to the "Feeder" vein on the "California" claim. A shallow tunnel was started from the lowest available point about 300 feet above sea level and followed the vein 200 feet. The samples from the first 50 feet assayed from $5.50 to $90.00 gold. As it was so near the surface, a winze was sunk 50 feet from the tunnel floor, and from the bottom of the winze a crosscut was driven to the "Center" vein 40 feet distant, showing that vein to be 20 feet wide. Samples from the "Center" Vein assayed only $3.30 gold and 3 oz. silver - foreigh metals not assayed. There were about 3% concentrates containing lead, zinc, iron and traces of copper. They will probably connect within another 100 feet in depth, and will become enriched in a like manner as the same vein crossings in the Apollo.

The formation is andesite on the West wall and porphyry on

the East wall. The ground stands well and requires no timber for stoping the ore except for manways and chutes.

Upon due notice ample accomodations will be provided for the comfort of engineers and other desiring to inspect the property, and power boats will be provided where necessary.

In addition to the ore mentioned in my report we did some work on a vein parallel to lense we worked on, one hundred feet west which mp doubt is the apex of the center vein that produced over four-fifths of the three million dollars we produced, we raised 120 feet on a 45 degree angle which developed it laterally and vertically crossout shows to be 20/30 feet wide.

The center vein did not go through to the surface, was cut off by a fault near the upper tunnel (see diagram), the gold content is mostly in the Galena with gold at $35 this would now be around $10 to $12 dollars ore, with the prospect of better ore to the North where the ore was richest in the center vein. That ore would no doubt make a high grade lead concentrate. We had a representative sample of this ore tested by the Pan-America Engineering Corporation which showed very satisfactory recovery. Estimates show fully eleven thousand tons ore blocked out with this raise and no change in size or grade.

Writer is of the opinion this ore will go through to the surface 600 feet and be the same length and width as the lower portion, we worked out 500 feet high by 800 feet long. The North portion contained the richest ore we had in the mine. We also have pay stringers to follow that will lead us to the same Apex body of ore North, that we have South and now that the fault system is determined in this portion of the mine we will no doubt be able to pick up the continuity beyond the fault to the North. The same continuity of the lower portion that we

stoped out, we have found to the south on the lower tunnel near the south end of the Apollo Claim 660 feet below the surface at a point marked A on the map, (assays were 2.50 to 3.75 old price of gold,) just one round was blasted and left to be extended at some future time, later on the south tunnel caved at a point marked B & B nothing further was done in that portion, writer has since opened and timbered that portion to point marked C where there is a short cave to be timbered about twenty feet. Beyond this cave the veins are exposed beyond the fault and will not find any more caved ground into the drift south on the Little Joker ground.

There is seven claims joining Apollo South on the same lode. Next to Apollo is Little joker with Apollo Tunnel #2 into the Joker claim about 200 feet showing the vein in the face of the south drift over 8 feet wide all complex ore, assaying about the same as all the complex ore in Apollo over 10% concentrates.

Next to the Joker is the Empire, Alamedia and California Claims. On the California enough work was done to secure the patents on five claims, a shallow tunnel was run on the feeder vein assays ran 5.50 to 90.00 in gold old standard. A shaft was sunk 50 feet and a crosscut was run 40 feet east from bottom of winze cutting a vein 20 feet wide, assaying 3.30 gold 3oz. silver, 3% concentrates mostly Galena, gold will be over $5.00 now.

These southern claims lay close under high range of hills, the erosion has covered the surface so the croppings cannot be seen but with the veins and values determined in Apollo and California it is very evident that pay shoots will be found right through the Island as we have the same veins to the north on Popof Island with some character and value of milling ore. These claims can be devel-

oped by tunnel #2 four to 600 feet below the surface 200 feet above sea level with abundance of pay ore above the main tunnel.

In addition to the ore mentioned above the lower tunnel there is three claims east of shaft namely: "OLGEN", "RISING SUN" and "LITTLE GIANT" with large veins assaying 3 and 4 dollars gold value with silver values varying with grade of ore expecially with the bunches of Galena scattered through the vein. This vein is 400 feet east of shaft #2 on the 175 foot level, and crosscut cut the vein 20 feet, the work was discontinued to resume sinking #2 shaft.

The heavy complex ore below the lower tunnel would not have to be considered for several years as there would be plenty ore above the lower tunnel for several years.

This lode is one mile wide traceable for miles through the Islands and projecting points of the mainland. Andesite west with rhyolite on the east porphyry in the center.

Apollo lies on the west side of this Lode between Andesite and Porphyry while on the east side of this Lode large quartz veins between Porphyry and Rhyolite, no work has been done on this east vein series. The veins all carry gold, silver, and lead values.

The work done on the lower levels now under water has blocked out 100,000 tons of complex ore that will mill about ten dollars per ton by selective flotation, this vein has been cut on all three levels 175, 320 and 750; only enough work was done to determine the ore could not be handled at a profit in our amalgamation and concentrating mill.

Estimate average of Apollo ore below sea level:

Gold	2.50 to 3.50 avg.			3.00 per ton	3.00
Silver	6. to 10 oz.	"	8oz.	0.50	4.00
Lead	4 to 8 %	"	6%	0.03	3.60
Copper	1/4%	"			.25
					10.85

Zinc 3 to 5% Ave. 4% can be eliminated, and piled up until the market calls for it.

This ore is proven from the surface down to the 750 foot level and persistent on this lowest level 600 feet below sea level which will be 1400 feet, below the surface when extended under shaft #1 and the upper works.

Probable ore between the 750 foot level and the lower tunnel will produce a large tonnage. We have proven four chimmeys of ore from 400 to 800 feet long and estimate 2,250,000 tons probable ore from shaft #1 to shaft #2 in a distance of 4000 feet.

Shaft #1 has over 20,000 tons of milling ore blocked out on the 400 foot level the same grade and value as the complex ore in shaft #2 and has been proven both above and below the 400 foot level. All these openings show persistent veins and milling ore on the bottom levels for deeper development when it becomes necessary.

The Feeder vein previously mentioned in this report is nearly parallel to the center vein and in places joins the center vein making the ore very much better grade where connected and for some distance on either side of junction.

We have only milled this ore in the feeder vein where it was connected with the center vein as it was not advisable to stop both veins at the same time owing to its proximity to the center vein, but now the center vein stopes have been filled the feeder vein can be stoped and will furnish a large tonnage of good milling ore as this vein is from four to ten feet wide and proven for over 600 feet along the lower tunnel and places along the windlass level 130 feet above the lower tunnel.

Since we have the complex ore in the face of the main tunnel

level 600 feet below the surface 200 feet in the Little Joker claim, amd very favorable showing the California claim, we have over six thousand feet of Virgin ground to be developed that will most like produce as much ore as we have estimated throughout the proven ground to the north.

Estimate of probable ore in the apex of the center vein through to the surface.

800 x 500 x 10
500

4,000,000
80

320,000 Tons at $10.00

320,000 Tons to each 1000 cubic feet.

Gold	3 to 7 avg.		5.00	5.00
Silver	4 to 7 Oz.	5½ oz.A	.50	2.75
Lead	3 to 7%	5%	.03	3.00
				$10.75

SIGNED

FRANK R. BROWN.

SAMPLE: Apollo Mine ore from Unga Island, Alaska.

ASSAYED HEADS:		
Silver	6.42	oz per ton.
Gold	.230	" "
Copper	.12%	
Lead	4.90%	
Zinc	1.00%	
Iron	2.70%	

DIFFERENTIAL FLOTATION TEST # 1 - #m602

CRUSHING AND GRINDING:

The ore was crushed dry to 10 mesh, then ground wet, in stages, to 65 mesh in a laboratory ball mill.

FLOTATION:

The ground pulp was floated for seven minutes, at 20% solids, in a Kraut laboratory flotation machine with a very small amount of promoter and a large amount of cyanide as depressor. Most of the zinc floated with the lead. The lead concentrate was cleaned and the zinc partially depressed with more cyanide and Zinc Sulfate. The zinc was then activated and floated from the lead cleaner tails. The small amount of zinc remaining in the lead rougher tailing was not refloated.

PRODUCT	WEIGHT %	TEST DATA ASSAYS Pb.%	Zn.%	AG.Oz.	Au.Oz.	Pb.%	DISTRIBUTION Zn.%	Ag.%	Au.%
CALC. HEAD	100.00	4.1	0.9	6.66	0.428	100.00	100.00	100.00	100.0
Pb. Conc.	5.30	71.3	4.1	104.24	4.12	92.4	25.3	83.00	88.1
Zn. Conc.	1.22	10.8	27.6	28.40	1.100	3.2	39.1	5.2	5.4
Zn. Midd.	1.14	8.00	2.5	16.50	0.600	2.2	3.4	2.8	2.8
Tailing	92.34	0.1	0.3	0.65	0.010	2.2	32.2	9.0	3.7

REAGENTS USED:

To Lead Rougher 7 Minutes	Butyl Zanthata Z - 8	0.025	lb/ton
	Sodium Cyanide	0.75	"
	Cresylic Acid	0.05	"
Lead Cleaner 1 Minute	Zinc Sulfate	1.50	"
	Sodium Cyanide	0.60	"
Zinc Conditioning 5 Minutes with copper sulfate		2.00	"
Zinc Flotation 3 Minutes	Butyl Zanthate	0.20	"
	Cresylic Acid	0.05	"

REMARKS:

Zinc depression from the lead concentrate is very good but unfortunately too much gold and silver followed the lead lost into the zinc concentrate. The zinc is probably barren and this lead with finer grinding should be thrown into the lead concentrate.

With the small amount of zinc present, an excellent lead concentrate running over 70% Pb and carrying about 90% of the gold and silver may be expected. The percentage of iron and difficult slime, which is activated with copper sulfate along with the zinc makes zinc flotation objectionable. A straight gold, silver, lead concentrate with zinc and iron rejected in both roughing and cleaning, seems to offer the best solution for this ore.

The above tests were made for Frank R. Brown and L. C. Green, Secretary of Apollo Consolidated Mining Company, of 310 Sansome Street, San Francisco, California. The name of A. W. Wilding is also mentioned. He is of Alaska Commercial Company, Alaska Commercial Building.

Tests run by M. W. MacAfee of Pan-American Engineering Corp. Ltd. 1080 Mills Building, San Francisco.

June 6, 1935.

C O P Y

Courtesy Mrs. J. Pechovich.

INTRODUCTION:

In the 90s of the last century mining for gold started on Unga island and when it was stopped just before the first World War it had a recorded gold production at the then price of gold of something worth just over $3,000,000 and the freemilling gold ore had passed into an auriferous comples one containing important percentages of lead, zinc and copper in sulphide minerals. That an attempt to work these base ores was made is evidenced by the fact that water concentration was practiced with chlorination of the concentrates to recover the gold.

A very extensive exploration campaign revealed large bodies of complex material from which at that time the valuable metal contents could not be recovered at a profit. This work consisted not only of long adit drifts and crosscuts which exposed very important tonnages but also of three shafts, the deepest of which reached over 800 feet from the collar of one of them. Drifts at various levels from these shafts confirmed the extension of the sulphide bodies to each level explored and on the 750 level of Shaft No. 2 - 800 feet below Adit No. 2 and about 1400 feet below the highest known outcrop - there were exposed 400 feet (with it still in the south face) of material that today would be classed as good ore. But at that time there was no way in which this material could be converted into ore. Now it is relatively high grade ore.

This work has proven four ore shoots from 400 to 800 feet long, with widths averaging from ten to twelve feet, from the surface a vertical depth of about 1400 feet and over a strike distance approximating 5,000 feet. This belt of three parallel veins separated by about 50 ft. of rock are known to outcrop again on Popoff Island and the mainland.

These are sufficient indications to warrant this analysis of the F. R. Brown's Report and the conclusions drawn therefrom.

EXTENT OF PROPERTY:

The property of the Apollo Consolidated Gold Mining Company resulted from the conslidation of four groups of patented quartz claims:

1 - The Apollo Group comprising of the Apollo, Prospect, Ptarmagin, Olgen, Rising Sun and Giant:

2 - The holding of the Sitka Consolidated Mining Company comprising the N.E.King, the King, the Mill Site adjoining them, and the Little Jok

3 - The claims of the Delaroff Mining Company comprising the Tiger, Carleton, Alameda, California and Alaska; and

4 - The Empire of the Alaska Empire Mining Company.

The above claims are shown on Plate 1 accompanying this Memorandum and shows another claim, the Pearl, apparently not patented and not embraced herein.

LOCATION AND ACCESSIBILITY:

This holding is located on Unga Island, one of the Shumagin Islands of the Aueutian chain. It lies due south of Sand Point and about two-thirds of the way from Kodiak Island to Unimak Pass - the straight by which Nome bound vessels pass from the Pacific Ocean to Bering Sea. Ocean going vessels of from four to five thousands tons sailing from Seattle reach roadstead in the outer bay in about six days sailing from Seattle, Wash. It could be a port of call for vessels bound for Dutch Harbor, Adak and Attu as well as those going to Bering Sea.

From the larger vessels the freight is lightered some three miles to the head of the inner bay where it is transferred to small railroad cars to be hauled one mile by a small locomotive to the mine headquarters. Concentrates and outward bound freight would reverse this routing.

Writing in 1935 Brown states that the rates from Seattle to the outer bay are from $17.00 to $20.00 per ton and return cargo about $6.00. When the mine was operating the Company chartered its own boats and freig thus delivered cost about five dollars per ton and concentrates were shipped to Tacoma at three dollars. Under present conditions it is safe to assume that freight on regular vessels will not cost over $25 per ton delivered at anchorage into the mine lighters. The property is most accessible and transportation would seem to offer very little difficulty beyoud the storms prevalent in this section of the North Pacific. On the combination freight and passenger vessels that would serve this port passengers would be carried for about $175. per head first class.

MINING CONDITIONS:

In this latitude in these island, owing to the proximity of the Japanese Current, the climate is mild, the temperature rarely, if ever, falling below zero, but there would be a very heavy rainfall and many periods of long drawn out gales. These whould not unduly interfere with mining operations but would complicate lightering from and to the ocean going vessels.

In the past all power was derived from water stores and taken from a reservoir through about a mile of pipe tapering from 26" diameter at the intake to 12" at the mill and under apparently about a 300 foot head. Formerly this furnished enough power to run the compressor all the year and the mill about eight months. While it is not known just how much power this water would give it is undoubtedly an important amount. In any event with the ready accessibility diesel oil could be developed very cheaply in tankers and should not (at this date - mid 1946) cost more than eight cents per gallon at outer bay. Thus the cost of power for any medium to large size operation - from 350 to 500 tons per day - would be relatively low cost, probably less than eight mills per horse power hour.

Brown states that the vein walls stand very well which indicates that shrinkage stoping over a large part of the system could be used. If any method of mining adopted required timbering the required amount would not be unduly expensive as eithe Washington or Alaska cut material could be relatively inexpensively delivered here.

The ore shoots are long and wide and apparently 200 feet between levels seems proper, all of which mean a minimum charge for development and since most of the drifts are in ore, such work would be further reduced in cost by the credit for the production thus obtained.

Labor and staff wages and salaries would be above the average. Good housing for both would have to be supplied and for recreation in this out of the way place suitable theater and club facilities would have to be available, probably at the cost of the operator. It is believed that the costs under this setup would not exceed those at a corresponding type of mine in the States by over 15%. Supply cost, both for found and for operation, would be lower than for such mines in the States.

Brown does not mention anything of water in depth which is taken to indicate that its handling meant no great difficulty in any way.

Owing to the very great amount of development work - many thousands of feet of drifts, crosscuts, winzes, raises and shafts - the development charge for a great number of years' operation at the 500 ton per day rate would be very low and probebly offset most of the extra cost already noted.

Apparently the metallurgy is rather simple with some gold caught by amalgamation and the balance in a lead concentrate that would offer no difficulty in treating. While at first these concentrates could be shipped to Tacoma at a very low freight cost it is believed that investigation will show that greater profits will result from treating this concentrate lo-

cally rather than shipping and standing all the metallurgical losses included in treatment costs. There should be no trouble in marketing the lead on the Pacific Coast.

DEVELOPMENT:

As remarked earlier there has been done an immense amount of development in this property. Plate 1 shows the plan of probably most of it. Plate 3 shows an ideal vertical section with the relative position of the work done from each shaft and the relations of the shafts to Upper and lower Adits (the word Adit is substituted for the word tunnel in the Brown Report) and Upper and Lower for Eithe Upper or No. 1 and Lower, Main or No. 2, respectively. Note that Plate 3 covers more of the strike than Plate 2, which does not go north beyond the Ptarmagin. There is no plan of the work done on the King.

Most of the lateral development and mining has been done in the neighbourhood of the Shaft No. 1. The plan shows the outline of this work. On the Upper and Lower Levels in this section there are the three parallel veins. Brown does not clearly state it but from the text of his Report it would seem as though his "feeder" and "center" veins formed a junction on one of these levels. If that is so there are really only two veins. (Unfortunately Brown no place gives the dip of any vein but the plan shows that the vein has gone westerly about 280 feet from the Lower Level elevation to the 400 foot level south drift from No. 1 Shaft. The vertical distance is about 400 feet so the dip approximates (280 divided by 400 or .70)

Notwithstanding that Plate 4 (copy of Brown's vertical section through Shaft No. 1) shows the veins as vertical. The writer takes this to indicate that Plate 4 is really an ideal - very much so- section only to show Brown's conception of the faulting and to indicate how upper portion of the Center vein may be opened and mined.

Without trying to enumerate the various openings and give their respective lengths it is stated that, disregarding the crosscut length of the Lower Adit from the mill to its intersection with the Center Vein at about 1800 feet undergound, there are approximately 10,000 ft. of openings in this area.

In the region of Shaft No. 2 there is the long crosscut to the west on the 175 foot level to cut the East vein indicated by croppings on Plate 2 but not specifically referred to by Brown except to remark that it cut the vein. But the crosscut to the west cut what is apparently the "feeder" vein and nearly 400 feet of drifting were done on it.

On the 750 Level a crosscut was run 350 ft. to the west and apparently cut the "Center" vein, on whcih about 1300 ft. of drifting was done. For the ore shoot occuring in the south 400 (500) feet crosscuts were run west to determine its width and the character of the material. When it was found that there was no ore in that vein that they could then beneficate, they stopped.

Thus in the neighborhood of Shaft No. 2 there are 811 ft. of shaft, 1800 ft. of crosscuts and 1600 ft. of drifts - a total of 4200 feet.

Between these two shaft areas is the Rising Sun Tunnel - an Adit. about 550 ft. long which cut the same vein as that cut in the easterly crosscut from No. 2 Shaft on the 175 level. A 50 ft. drift was run south on the vein.

The shaft on the King was sunk slightly over 400 ft. and on 3 levels therefrom there were driven about 1600 ft. of drifts with another 200 ft. in from Salmon Creek. This is shown on the vertical longitudinal section on Plate 3.

Thus there are available to study the ore occurrences a total of 16,000 ft. the opening of which would cost a minimum of $300,000. One significant statement in Brown's Report indicates that on the adit levels at

least there has apparently been very little caving. He tried to get into the long south drift beyond the fault along which crosscuts were run both west and east, from this latter the drift on the vein continued south and at point marked "A" he notes an opening into the downward continuation of The same ore body mined directly above. He found caves at points marked "B" and "B", which he caught up and again at "C", where "where there is a short cave to be timbered about twenty feet. " This means that all those openings above the Lower Adit - some 10,000 feet in length - are open to inspection, sampling and study of geology. Also any ore exposed could be run through the present mill, using it purely as a sampling and pilot mill in the investigation.

In the Delaroff group the South Drift on the Lower Adit level has entered the vein.

In the Delaroff Group the only work done was that on the California and only enough to secure the patents to the claims comprising this group. This was a shallow adit run on the feeder vein with a fifty foot winze from which a forty foot crosscut to the west exposed a vein twenty feet wide. As this was base ore no further work was done.

In connection with this work and these claims Brown points out that they lie close under a high range of hills the talus from which had covered the outcrops of the veins revealed by this work. He states that that is probably why the surface south from the Little Joker does not show croppings for the work on the Little Joker and on the California give good evidence that the veins are probably continuous between.

GEOLOGY AND VEIN SYSTEM:

There is very little known on this score. All that Brown says is: "The formation is andesite on the west wall and porporphyry on the east wall." Again he writes: "The lode is one mile wide traceable for miles through the islands and projecting proints on the mainland. Andesite west with rhyolite on the east and porphyry in the center."

Thus far a search of the literature has revealed but one reference. that is in Part 3, Pages 83 to 85, 15th Annual Report of the U.S.G.S. 1904. This may be summarized as follows:

> There is a large reticulated vein system in andesites and decites. The ore contains gold, silver, lead, zinc and copper minerals, will average about eight dollars worth of gold (old gold price) per ton in ore bodies from five to forty feet wide. The copper also occurs as native copper finely divided in quartz. In the Apollo the vein seemed narrow and pinched going north. The King Mines, about one-half mile north of the Apollo, has similar possiblities.

Brown mentions this native copper in quartz in the north drift of the 200 ft. level from the King Shaft. Thus while the geology thus far outlined is very meager it agrees in the main and may be classed as very favourable to the occurrences as outlined by Brown in his Report.

In his Report Brown makes many references to the many apparently parallel veins. He states "There are three (3) veins - the "East", "Center" and "Feeder" veins, nearly parallel and averaging not more than 50 feet apart." This is found when discussing the Apollo Group.

He states that the work in the Upper Adit was done on the East vein and the payshoot therein was 800 feet long. In width it varied from eight to forty feet and was stoped to the surface and for about thirty feet below the Adit. At this point it was cut off by a fault dipping 50° westerly. This is not clear from his vertical cross section reproduced in Plate 4. The crosscut on the Upper Adit level as depicted

there should have shown some place the lower extension of this East vein (as the writer has added in broken lines).

The Lower Adit level was run as an angling crosscut for some 1800 feet from the mill to its intersection with the Center vein. This adit was to deliver the ore to the mill without surface tramming with which snow interfered. In the drift on the vein to the south another shoot about 800 feet long was stoped for 300 feet above the level and 200 ft. below - this latter apparently through the No. 1 Shaft. At this latter point the ore had turned base so that it could not be handled by the then used metallurgical treatment. This shoot ended above at the fault. See Plate 4.

Again he mentions an upraise one hundred feet west from the stoped ground mentioned in the preceding paragraph to a vein which he takes to be the segment of the Center vein above the fault as he represents on Plate 4. A crosscut from the top of this raise shows it to be "20/30 feet wide."

A study of Plate 2 shows clearly the crosscuts on the Lower Adit level that followed faults and the drifts beyond such crosscuts indicate, but Brown does not so definitely state, that the vein on the other side was found and dollowed. Thus while the work clearly indicates faults along the strike and the dip of the veins, they are of relatively mine or throw and do not break the veins or ore shoots into short segments and therefore there would seem to be no difficulty either in following the veins or in extracting the ore developed.

Thus far Brown only describes the veins in the Apollo section and has neglected that indicated by the outcroppings to the east. The Rising Sun Tunnel - hereafter referred to as Adit - was driven to intersect in depth the cropping shown on Plate 2 to the north east of

its course. Brown states that here is a vein about 400 feet to the east of Shaft No. 2 on the 175 foot level with a width of 20 feet. This is undoubtedly cut in this Rising Sun Adit as indicated by the drift to the south. These croppings show for some 3000 feet. These descriptions indicate a belt of intrusive or estrusive rocks extending for many thousands of feet on this island and some 15,000 feet are covered by patented locations. On one side are three parallel veins in a horizontal width of about one hundred feet and on 400 feet to the east is another one. These are the known ones.

CHARACTER OF ORE AND METALLURGY:

When work was started the ore was undoubtedly "free milling" and the gold could be extracted in amalgam during and after crushing in stamp mills. Then sulphides began to appear and some form of wet concentaration was used to recover these concentrates. There have been a "chlorination plant" there, it is assumed that these were at some time treated at the mine and the gold produced as bullion. But Brown also speaks of the outbound freight rates on concentrates so undoubtedly those containing appreciable amounts of lead were shipped to Tacoma. As depth was reached the ore became more base and below are summaries of the various statements made by Brown throughout his Report.

In the 200 foot level from the No. 31 Shaft "free gold rock disappeared, only complex ore then appearing." Again: "The ore below the 200 foot level (of No. 1 Shaft) is complex, carrying galena, silver, copper, zinc blende and iron." "While crosscuts were frequently made to determine the the width and quality of the ore body, if the ore did not contain free gold no further work was done." Assays indicated values at from $10.00 to $14.00 per ton of all metals." (Unless otherwise stated any dollar value assigned to ore is based on fifty cents per ounce for silver and $20. per ounce for fine gold.) The above, as do the following, apply to the work from No. 1 Shaft.

"Speaking of the 400 foot level the bottom - he writes: "In the South Drift of this level a vein 20 feet wide of 10 to 15% (meaning sulphide content) ore was encountered from which a mill test of 400 tons was made. Some of the ore was taken from a winze 25 feet below the level. Zinc and only 50% recovery, with lead at three cents, made this prohibitiv

When describing the development from Shaft No. 2 he writes: "The bottom level is 800 feet below the Main Tunnel (Upper Adit) level and is

750 feet long. The one vein cut by West crosscut (400 feet long) is 16 feet wide. The North drift, 8 feet wide and advanced 20 feet, shows better than 10% (sulphide) ore, principally lead and zinc and around $3. gold."

"The South drift was extended 750 feet. At about 50 feet from the crosscut the vein faulted. This fault was followed South, and at 300 ft. a vein 8 to 12 ft. wide was encountered. The drift was 5 x 7 and crosscuts every 100 ft. determined the width of the vein for about 400 feet." "This ore was about 8% (sulphide), principally lead and zinc; copper, gold and silver about the same as all these complex ores in this property. "The two upper levels in Shaft No. 2 are very similar to that described in the bottom level."

In writing of the Lower Adit level he has the following statements to make: ". . . Complex ore has been exposed by crosscuts at several points. Low gold content and zinc penalty made it prohibitive to handle at that time, consequently only slight development was carried on in that class of ore. The tunnel was extended south following a fault but none of the veins encountered were developed."

Again in speaking of the Shaft No. 2 he writes "No attempt was made to develop these complex ore bodies North towards the Sitka. This deep exploration was done in the effort to locate free milling ore and develop the ore under Shaft No. 1."

METALLURGY:

One can only judge of the metallurgy practices when the mine was running by what Brown states in his Report and the designations of the buildings on Plate 2. Brown several times points out that the gold had to be free milling to be mined and treated profitably. He also speaks of the cost of shipping concentrates to Tacoma. In this connection both he

the USGS publication quoted speak of the recovery being 75% by amalgamation and 25% by concentration.

Further Brown speaks of the two stamp mills being in one building and that type of mill in those days meant crushing for amalgamation. On Plate 2 is noted the "chlorination works" which could only have meant that an attempt must have been made to recover the gold out of the $60. concentrates" at the property. Thus there must have been a coarse crushing followed by stamp milling with the crushed material passing over silver or copper plates and the tailings therefrom being concentrated on frue or wilfley tables.

He was so impressed with the failure of their metallurgical treatment to be successful, on the complex ore that in 1935 he brought back with him a sample of the galena containing material and had a test run by the Pan-American Engineering Corporation, Ltd. Included in his Report is a record of these tests and it is included in the appendix to this memorandum. Only the assay of the sample and the remarks will be quoted here:

ASSAYED HEADS:	Silver	6.42 oz/ton
	Gold	0.23 "
	Lead	4.9 %
	Zinc	1.0 %
	Copper	0.12 %

REMARKS:

> "Zinc depression from the lead concentrate is very good but unfortunately too much gold and silver followed the lead lost into the Zinc Concentrate. The Zinc is probably barren and this lead with finer grinding could be thrown into the Lead Concentrate.
>
> "With the small amount of Zinc present, an excellent Lead Concentrate running over 70% Pb. and carrying about 90% of the gold and silver may be expected. The percentage of Iron and difficult slime, which is activated with Copper Sulfate along with the Zinc makes Zinc flotation objection-

able. A straight gold, Silver, Lead concentrate with Zinc and Iron rejected in both roughing and cleaning, seems to offer the best solution for this ore."

In view of those remarks it is worth while emphasizing that the product treated was only ground to pass 65 mesh in a laboratory ball mill. Apparently there would be no great problem in making a good recovery on ore similar to that sampled by flotation in a modern mill.

If desirable the concentrate could be shipped to Tacoma and sold there but the writer feels that location as this property is and in view of its size and the likelihood that the minimum mill would be 500 tons daily capacity, that the lead concentrate should be treated locally, producing refined pig lead for the west coast market and sending the ore bullion to the mint. The saving in higher price for lead produced thus than sold as concentrates and the saving in the freight, treatment costs and metallurgical losses would total such a sum that the high cost of handling only some twenty five tons of concentrates daily would yield a greater profit than shipment of them.

RESERVES OF ORE AND THEIR METALS CONTENT:

A reading of the Brown Report and the sections of this Memorandum headed CHARACTER OF ORE, GEOLOGY AT VEIN SYSTEM and DEVELOPMENT cannot leave any doubt in one's mind that within the limits of this property there should be found a very large reserve of material from which the metal contents can be won and marketed at a very high percentage profit. Brown, with good reason, has set out figures in showing important tonnages of proven and partially proven ore, to say nothing of the probable, all within the limits of the development work already done. This work allows an excellent examination of the probabilities and will permit the examining engineers to reach well founded estimates of what may be the expectancy in the developed sections only.

One very fortunate feature, and an unusual one in partially developed mines, is the large proportion of the total development openings available from adits which seem to be open. It will not be necessary to unwater the property to find enough ore, if Brown's estimates are confirmed only in part to find enough ore to warrant rehabilitation of the property and the provision of the necessary mining and milling plant to resume operation on an important scale. Below are assembled Brown's statements as to ore reserves - first, for that part of the property available through adits and, second, for that part below the Lower Adit level horizon.

ABOVE THE LOWER ADIT HORIZON:

APOLLO GROUP:

Plates 2, 3 and 4 should be available to follow this discussion. In Upper Adit level a shoot of ore 800 feet long and from 8 to forty feet wide was mined on the East vein from 30 feet below the level to the surface - vertically about 230 feet. The downward extension of this

shoot was never worked. About 200 feet of it should exist above the Upper Adit and a further 400 feet down to the Lower Adit - see Plate 4. There should be 60,000 tons of probable ore in this block. Its yield should approximate $10.00 per ton in gold and silver with an undertermined something for the base metals.

The principal work in the Lower Adit was done on the Center vein, which in places made junctions with the "Feeder" vein. The shoot of ore - about 800 feet long - extended from 200 feet below the Lower Adit to 300 feet above it, where it terminated against a fault. At the lowest point the free milling ore passed into a complex one. The segment of this shoot above the Lower Adit has been found by a 45° raise 120 feet in length. A crosscut from the top of this raise shows from 20 to 30 feet of ore. Brown states that the ore mined from this shoot below produced about 80% of the total and estimates that it contains in the 600 feet to the surface a probable 320,000 tons - see Plate 3. This ore should yield ten dollars per ton in gold and silver and undetermined amount of base metals.

This orebody was cutoff on the north by another fault and now that the northern segment has been found he looks for a continuation of the ore to the north of any that they have worked. The stringers in this section indicate that the richest north portion of the shoot where mined should be found here. He does not place any estimate in tons on this block.

This section of the mine can be opened out by picking up one short cave at the point marked C and stopes can be opened in the vicinity of A - Plate 2, South Drift on Lower Adit level. Still further south ore is indicated in Little Joker ground where the drift started from the last crosscut along a fault.

From the face in this Little Joker ground to the ore found in the California is a distance of about 7500 feet which can be removed through this working. As Brown points out the surface is mantled with talus above this continuation and outcrops, if they exist, are buried. He sees no reason not to find ore in that section but places no figure on what may be revealed. Anything found here will probably be free milling. The find on the California gave some high grade assays and he places the gold and silver alone at over five dollars per ton with the base matals estimated at about $3.00 more.

In the Olgen and Rising Sun Claims a very important vein has been cut with two crosscuts, one on the 175 foot level from No. 2 shaft. The vein where cut was 20 feet wide and assayed from five to seven dollars per ton with bunches of galena scattered through it. Here again he places no figures on what ore may be found in this vein but it must be avery important amount above the level of the Lower Adit.

To the north on the Sitka ground, which can be opened by prolonging the drift from Salmon Creek. Above that level is a small amount - 2000 tons - of ore averaging $13.00 per ton without the base metals. In this block to the next lower level he estimates 40,000 tons as "blocked out". In this section is where native copper was found in white quartz but not developed. On the 150 foot level ore is exposed for the full 400 feet, the north and south drifts were run with good ore in each face. They even started to open a stope here and 500 tons are ready for drawing. On the bottom level a total of over 700 feet were run on ore. With all this work exposing ore his estimate seems justified.

BELOW THE LOWER ADIT HORISON:

SHAFT NO. 1

This shaft is 450 feet deep and is really a winze or interior shaft from the Lower Adit. It was used to hoist the ore stoped from the Center vein above the 200 foot level. Below the 200 foot level the ore is complex with assays indicatimg metal worth from ten to fourteen dollars per ton. Some 400 tons for a test run from this section revealed a shoot twenty feet wide with from ten to fifteen percent of sulphide minerals. Inbility to handle this ore stopped further development.

On the 400 foot level the ore was exposed for several hundred feet and this, together with the work done on the 200 foot level allows Brown to estimate 20,000 tons of proven ore and 76,000 tons of probable. He estimates the worth of the metal content in this block of ore as follows:

Gold	$5.00 per ton
Silver 8 oz.	5.68
Lead 6% at 3¢	3.00
Total	13.68

From this shaft work was done on only one vein and there must be at least two. The above estimate is believed very conservative.

SHAFT No. 2

This shaft extends about 800 feet below the Lower Adit horizon and while stations were cut for four levels, only the 175 and 750 foot levels were opened out. On the former about 400 feet of drifting was done, while on the latter over 750 feet were driven. On the bottom level just one vein was cut - 16 feet wide. In the face of the north drift it is 20 feet in width. It was intended to continue this to the

downward extension of the ore found in the Sitka Shaft, some 1500 feet to the north.

The South Drift was extended about 700 feet and the last 400 feet followed a vein varying in width from eight to twelve feet as exposed in four crosscits at 100 foot intervals. The metal content of the ore exposed here is about the same as elsewhere in the property and would be worth at present day prices for metals something over ten dollars per ton.

Brown makes no estimate of the ore in this shaft alone but points out that in the 4000 feet from the surface of the North drift on the 750 level to the face of the South Drift of the Lower Adit Level as in the Little Joker, based on the ore shoots found above and with the showing on the 750 level there should be a probable tonnage of 2,250,000. The writer sees no reason to differ with this estimate. It would be worth a minimum of ten dollars per ton.

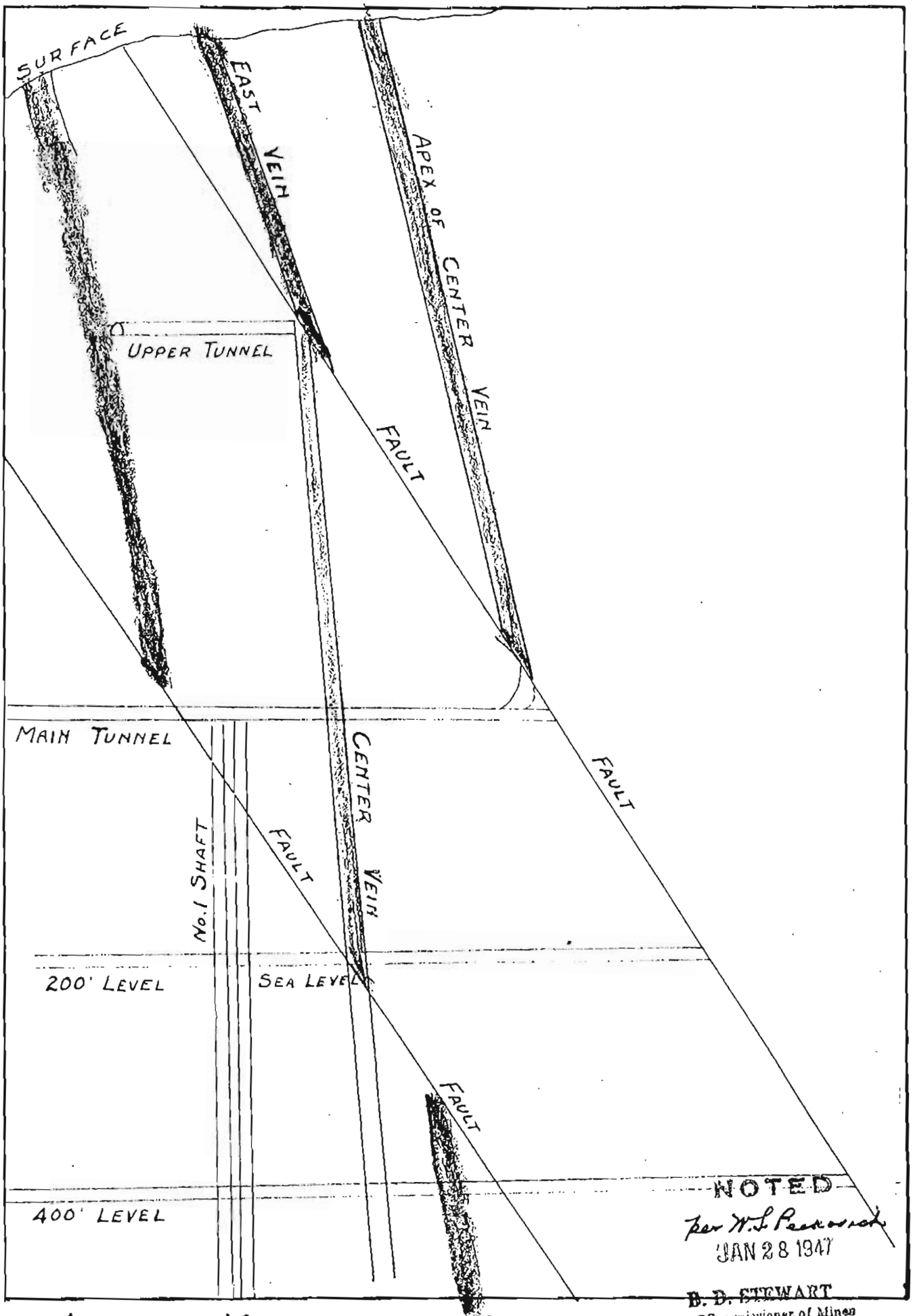
SUMMARY:

There are at least two veins - the East and the Center - that have been opened at various intervals along the strike for something over 4000 feet, with a third one 400 feet to the east that has been cut in three places over a length of 2400 feet. Over a vertical range these veins have been proven to contain ore for 1400 feet from the highest known point. to the lowest. The known shoots very in width from 8 to 40 feet with an average of probably about twelve - a nice stoping width.

Considering the most northerly proven ore on the Sitka to the most southerly proven on the California, the known length is in excess of 10,000 ft. of probable ore being ground. In such a block - 10,000 ft. long by twelve feet wide by 1000 feet deep, assuming only fifty percent ore for one vein, ignoring the known three, there could be an expectancy

of 6,000,000 tons, In the detail considerations set forth the following definite figures:

APOLLO AREA:	60,000	506	
are warranted:	320,000	10.00	3,200,000
	TONS	$/TON	TOTAL $
PROVEN:			
ABOVE WATER LEVEL SITKA AREA	53,000	$13.00	$ 689,000
BELOW WATER LEVEL APOLLO AREA	20,000	12.00	240,000
TOTALS	73,000		929,000
PROBABLE AND PARTIALLY PROVEN:			
ABOVE WATER LEVEL: APOLLO AREA	60,000	10.00	600,000.
	320,000	10.00	3,200,000.
BELOW WATER LEVEL APOLLO AREA	76,000	12.00	912,000.
OVER STRIKE DISTANCE 4000'	2,250,000	10.00	22,500,000.
	2,706,000		27,212,000
PRETTY WELL ASSURED			
GRAND TOTALS	2,779,000		28,141,000
LIKELY TOTAL EXPECTANCY FOR SURFACE TO 1400 FOOT HORIZON OVER 10,000 FOOT STRIKE EXTENSION OF KNOWN ORE OCCURRENCES ON ALL LEVELS	6,000,000		60,000,000.



NOTED
per W. L. Peacock
JAN 28 1947
B. D. STEWART
Commissioner of Mines

APOLLO MINE

NOTE: TRACED FROM CROSS SECTION IN FRANK R. BROWN'S REPORT No Scale