Cw

October 5, 1956

Dear Jim:

I regret exceedingly that all of the reviewers of this application were unable to justify a recommendation for its approval.

s/ Mitt

C. O. Mittendorf
Administrator

Mr. James D. Williams
Pine Grove Mines
Salt Lake City, Utah

File Copy
Surname
Klugescheid
Diamond
Lamb
Kiilsgaard
Selfridge

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

OCT - 5 1956

Mr. James D. Williams
Pine Grove Mines
Post Office Box 1446
Salt Lake City 10, Utah

Re: Docket No. DMEA-4228 (Lead-Zinc)
Pine Grove Mines
Wah Wah Mine
Beaver County, Utah

Dear Mr. Williams:

Your application for aid for an exploration project and other data available to us in Washington relating to the above-named property have been reviewed.

Projects approved by the Defense Minerals Exploration Administration must, in its judgment, show definite promise of yielding materials of acceptable grade in quantities that will significantly improve the mineral supply position for the National Defense Program.

Careful study of all our information, although noting some ore on your lease, indicates to us that the probability of disclosing significant ore reserves is not sufficiently promising to justify Government participation. We regret to advise you, under these circumstances, that your application for exploration assistance is denied.

We wish to thank you for your interest in the Defense Minerals Program and for bringing your property to our attention.

WPKlugescheid/er 9/28/56
Copy to: Docket
Admr R File
Op. Committee
Base Metals
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Region III (2)
Chron.

Sincerely yours,

C. O. Mittendorf

Administrator

R.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION 500
WASHINGTON 25, D. C.

September 28, 1956

Memorandum for the Files

From: W. P. Klugescheid, Base Metals Division

Subject: Denial of Application, Docket No. DMEA-4228 (Lead-Zinc), Pine Grove Mines, Wah Wah Mine, Beaver County, Utah.

The cited application, dated March 24, 1956, was received in this office March 27.

The Applicants are James D. Williams and his wife, Ruth T. Williams, doing business under the name of Pine Grove Mines. They hold a lease and option to purchase agreement with the Wah Wah Mining Company which is the actual owner of the claims involved (25 year lease with option to purchase). All claims included in lease and option agreement are not included in the application.

The Applicant proposes photo-geologic mapping of an area 8 miles wide by 10 miles long, and conducting exploration for ore bodies by means of 10,956 feet of diamond drilling in 21 holes. The estimated cost of the work is $88,592.00.

The Applicant proposes to explore the Black Bed (Tasso), a black shaly limestone, in the vicinity of known mineralization. This limestone bed lies near the top of the Cambrian Pioche shale formation. In addition, the Applicant plans to explore by drilling to the basal part of this formation to determine the presence or absence of a limestone bed which is a favorable host rock in other districts. The Applicant believes that lead-zinc ores of commercial grade will be found in the lower limestone bed, if present. Although no direct evidence of the existence of this bed in the mine area is available, the regional persistence of the other stratigraphic horizons would tend to substantiate the theory.

Mineralization in the upper limestone, which has been partially exploited by the Tasso workings, has not proved to be of economic significance. However, the very presence of ore mineralization in this stratigraphically higher bed infers the upward migration of ore bearing solutions which must have passed through the objective CM, or, as here designated, Wah Wah bed.

A stock-like body of quartz monzonite has intruded the sediments a short distance to the southeast of the Tasso mine workings. Whether there is any genetic relation of this intrusion to the ore deposits is not known. There has been some work in this area in the past in the Lue shaft.

Production of any appreciable tonnage from the upper limestones is unlikely as the extreme selectivity required with its attendant high mining cost prohibits operation of the property at the present metal prices. Past mining operations and exploration in the Tasso bed have demonstrated that its mineralization is generally spotty and not attractive as an individual target. This leaves the Wah Wah bed as the only interesting objective. The examining team does not consider the proposed aerial photography necessary or of any material benefit to the project.

After the original examination was made and a modified program was suggested by the examining team, this was disagreed with by the Executive Officer of the Field Team who said: "We believe that the project recommended by the examiners is of a prospecting nature. The Applicant has not presented sufficient evidence of the geologic probability of finding significant ore deposits in the Wah Wah mine area, and we recommend that the application be denied. Should further prospecting by the Applicant eliminate some of the unknown factors, the ore potential of the Wah Wah bed could be assessed." The Executive Officer further stated that he considered the program outlined by the examiners as logical if the Washington office considered that there is sufficient justification for it with the data at hand.

After the above opinion was expressed, another letter, dated August 9, 1956, was received from the Executive Officer saying that R. W. Osterstock had been informed by the Applicant that he had completed two holes which he stated show the presence of the Wah Wah bed and the presence of mineralization in it.

A later letter, dated August 14, 1956, from the Field Team stated that Mr. Williams indicated that he had no intention of informing the DMEA Field Team of the results of his own drilling operations at the property, but rather would reserve any statements until after he is advised of the Washington office decision on the application. He did, however, advise both members of the examining team by phone that he had drilled several holes at his own expense, some of which were successful in intersecting the favorable ore horizon in the Pioche shale and he further stated to one member of the team that one of the drill holes showed minable ore.

A supplement to the examination report was received from the Field Team on August 28. The property was revisited by R. W. Osterstock and Frank Moore of the USGS to investigate the results of the drilling done by the Applicant. Mr. Earl Young, the consulting geologist for the Applicant confirmed that four holes had been drilled.

The results of these holes briefly are as follows:

Hole No. 1. Total depth - 275 feet. No part of the section penetrated showed any reaction to dilute hydrochloric acid. There is apparently no limestone equivalent of the CM bed (Wah Wah) present in this section. Except for disseminated fine pyrite and one or two extremely small specks of galena no ore minerals were noted in the core. Core recovery seems to have been good and there did not appear to be enough core removed for assay to have accounted for any significant ore zone.

Sample data given by Mr. Young:

		Au.	Ag.	Pb.	Zn.
208-245	Sludge	0.06	6.00	4.20	4.80
238-245	Heavy Sulphides	0.05	9.90	4.30	9.00
250-255	No core. Small pieces, may be good ore bed. There is very little core and there is no sludge either.	0.015	1.30	0.60	0.20

Mr. Young summarizes the results of this hole as follows: "An upper barren shale, a limy shale 45 feet thick containing mineralization, 20 feet of barren shale capping Prospect Mountain quartzite." As there was no reaction to dilute hydrochloric acid Mr. Young assumes that all the lime which was originally present has been replaced by the sulphides.

Hole No. 2 and No. 4 were very shallow and gave no useful data.

Hole No. 3. Total depth - 260 feet. There was no material in this hole either which contained sufficient lime to react with dilute acid. It may be that the CM bed, normally limy, has been so intensely silicified in this area that it no longer exists as a lime unit. From the data at hand no such limy bed appears to exist at the Wah Wah mine.

Assays furnished by Mr. Young for this hole:

		Au.	Ag.	Pb.	Zn.
98-115	Core	0.003	0.10	1.20	8.20
98-115	Sludge	0.000	0.60	2.00	1.10
120-130	Core	0.005	0.00	1.90	0.90
140-150	Core	0.003	0.40	4.00	3.10
140-150	Sludge	0.005	0.90	2.50	1.00
175-185	Sludge	Trace	0.20	1.10	2.50

The core assays for this section of the hole were all of selected sulphides.

Mr. Osterstock states: "It is extremely difficult for me to understand the high sulphide assays which have been presented by the applicant (unwillingly presented, I might add); although the DMEA inspection of the core was very hasty, it is unlikely that any zones containing nearly 25% of combined sulphides would have been overlooked regardless of how hasty the inspection. I would at this stage reiterate an earlier statement made in this memo. There did not appear to be a sufficient amount of core missing from the sections to account for the assays furnished by Mr. Young."

From the information available to date it would appear that the Wah Wah or CM bed does not exist as a limestone bed in this area, and the assays furnished by the Applicant are very open to doubt. We would assume therefore that the only worthwhile objective does not exist.

One of Mr. Young's letters to Mr. Williams notes that the Lue shaft area is under lease to a third party and the present lessor is actively engaged in deepening the shaft to follow a strand of the Tasso fault. The Lue shaft is on the Keystone No. 2 claim which is one of the claims dedicated to the project in the application.

Previous to the arrival of the latest data from Mr. Williams (two reports from Mr. Young and a report by Philip A. Laylander with two strip maps which were platted from large scale vertical stereoscopic color air photographs of the area), the commodity members from

the Bureau of Mines and the Geological Survey had recommended denial. After the arrival of the mentioned data, which were merely a repetition of previous data, it was submitted to the Commodity members and they both agreed that there was no information that would cause them to change their opinions.

We agree with the Commodity members of the Bureau of Mines and the Geological Survey that the application be denied.

W. P. Klugescheid

W. P. Klugescheid

WPKlugescheid/er

Copy to: Docket
Base Metals
Chron.

EXAMINING TEAMS REPORT IS IN SEPARATE ENVELOPE.

Docket DMEA-4228 (Lead-Zinc)
Pine Grove Mines
Beaver County, Utah

NOTE OF MR. JOHNSON TO MR. KLUGESCHEID

Jim Williams called. Told him it looked like a denial. He argued and is sending us some reports. Wants a yes or no answer as soon as possible. Review carefully and justify in summary any action.

Jim Williams called.
Told him it looked like a
denial. He argued & is sending
us some reports. Wants a
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possible. Review carefully &
justify in summary any action

PINE GROVE MINES
P. O. BOX 1446
SALT LAKE CITY 10, UTAH

Klugenhard
Betty

RECEIVED
SEP 17 1956

September 13, 1956

Mr. Frank Johnson, Deputy Administrator
Defense Minerals Exploration Administration
U.S. Department of the Interior
Washington 25, D.C.

Re: Docket No. DMEA 4228 (Lead-Zinc)
Pine Grove Mines - Wah Wah Mine
Beaver County, Utah

Dear Mr. Johnson:

Pursuant to our telephone conversation of this morning, we are enclosing three geological reports on recent work done by us at the Wah Wah mine. Two of these reports are by Mr. Earl B. Young, Chief Geologist, Combined Metals Reduction Company, and one by Mr. Philip A. Laylander, Consulting Geologist. We particularly direct your attention to the aereogeologic map which accompanies the latter report.

We cannot understand the position taken by DMEA with regard to lack of proper geologic targets. A simple reading of U.S. Bureau of Mines Report of Investigations, Number R.I. 3853, April, 1946, which is a part of our application, will establish conclusively the plus 50 foot productive bedding on top of the shale section. The enclosed reports, taken at fair value, certainly demonstrate the existence of some form of mineralized bedding in the lower shale section regardless of the interpretation placed upon its commercial ore value by the various observers. In this respect, may we point out that we all agree additional drilling must be done to establish the significance of this mineralized bed. It has been our understanding, drawn from discussions with responsible DMEA officials, that such is a proper function of DMEA, and we urge that you review our application along these lines.

Thank you for your kind consideration.

Very truly yours,

PINE GROVE MINES
By James D. Williams

JDW-K

Enc.

EARL B. YOUNG
MINING GEOLOGIST
SALT LAKE CITY
UTAH

RECEIVED
SEP 17 1956

August 6, 1956

Mr. James D. Williams
Pine Grove Mines
409 Felt Building
Salt Lake City, Utah

Re: Significance of Drill Cores at Wah Wah Mine

Dear Jim:

At your request, on August first I visited the Wah Wah property in the Wah Wah Mountains of Beaver County, Utah. The purpose of the trip was to examine and evaluate the results of the drilling since my previous visit June 27, 1956.

Four holes were drilling during this preliminary program, which now has been completed.

No. 1 was located approximately 1100 feet N 65 W from the Tasso Shaft at a point about 125 feet north of the Tasso Fault. Total depth 275 feet.

No. 2 was located approximately 850 feet S 65 E from the Tasso Shaft on the south side of the Tasso Fault. Total depth 100 feet.

No. 3 was located approximately 150 feet S 36 W from the Tasso Shaft and about 100 feet south of the Tasso Fault. Total depth 260 feet.

No. 4 was located approximately 1100 feet S 80 E from the Tasso Shaft and about 75 feet north of the Tasso Fault. Total depth 60 feet.

Total footage was 695 feet. The cores are all well arranged in wooden troughs near the holes so that careful inspection can readily be made.

Before going into detail on the cores, I wish to say that I have never before seen so much favorable geological information provided by comparable footage. In my letter of July 3, I stated that the study of the Laylander aerial colored photographs led to the supposition that the Tasso Fault was an important channel for entry of mineralizing agencies into the country rock, and that drilling along the Tasso strip was justified. These four holes were located to test this idea. Hole No. 2 was stopped at 100 feet when it was learned that our objective was too deep to be reached with the supply of drill rods on hand. Holes Nos. 1, 3 and 4 all intersected mineralized beds with core and sludge samples and assays indicating mill grade ore, containing gold, silver, lead and zinc. It is highly improbable that these three holes - two north of the fault and one south of it - covering a distance of about 2200 feet along the Tasso, would all have indicated ore unless the Tasso Fault is the important channel that was postulated. Up to this point we have a 100% verification of the inferred geological conditions.

A discussion of the individual holes will present the data to support the above statement.

<u>Hole No. 1</u>. The log of this hole was presented in my former letter. Assays ob-

tained from various depths in the limy shale section of the Pioche Shales are as follows -

		Au	Ag	Pb%	Zn%
208-245	Sludge	.06	6.00	4.2	4.8
233-238	Low Grade	T	.30	.00	.5
238-245	Heavy Sulphides	.05	9.90	4.30	9.00
250-255	No Core - Small Pieces May be good ore bed	.015	1.30	.60	.20

A vertical section through this hole on a N 70 W plane - at right angles to the bedding - shows that the hole was entering the basal quartzite at the time it was stopped. A barren shale section about 20 feet thick rests on the quartzite and is overlain by a mineralized section about 45 feet thick in which all the lime has been replaced by the mineralizing agencies and in which there are probably three beds of sufficient width and grade to justify development. The upper portion of the hole was barren.

Hole No. 2. Location of this hole had been based on assumed geological conditions which were depicted on an old map by the Bureau of Mines. As the drill penetrated several feet of wash and then entered shale, theerror in the map which indicated limestone at this point was realized, and by making calculations based on our approximate log, it was learned that the mineralized bed which we wished to reach was too deep to be penetrated with the drill rods on hand. It may be well to deepen this hole at some future time. The hole was bottomed at 100 feet in shale. No mineralization.

Hole No. 3. This hole was located on the south side of the Tasso Fault to determine whether the mineralization found in No. 1 Hole would extend also to the south. Assays from various depths in the limy shale section are as follows -

		Au	Ag	Pb%	Zn%
98-115	Selected Pieces	.003	1.4	3.9	20.3
98-115	Core	.003	.1	1.2	8.2
98-115	General Sludge	.0	.6	2.0	1.1
120-130	Core	.005	0	1.9	0.9
135-145	Selected Pieces	.003	.7	1.3	8.2
135-145	Sludge	0	.2	1.8	1.8
140-150	Core	.003	.4	4.0	3.1
140-150	Sludge	.005	.9	2.5	1.0
175-185	Selected Sulphides	Tr	.1	0.5	9.8
175-185	Selected Sulphides	.008	1.8	11.1	3.7
175-185	Selected Sulphides	.003	.7	1.3	8.2
175-185	Sludge	Tr	.2	1.1	2.5
190-200	Sludge	.003	.7	1.0	0.4

A vertical section through this hole on a N 70 W plane at right at right angles to the bedding shows that the drilling must have stopped at the quartzite shale contact. As in Hole No. 1 we have here on top of the quartzite a barren section of shale, but here it is nearly 75 feet thick with one ten foot section with weak mineralization. Above this barren portion there is a ninety foot section in which there are at least three beddings with sufficient width and indicated value to justify development. Mineralization appears to be much stronger in this hole than in No. 1. The top 100 feet of hole was barren. The similarity in Holes Nos. 1 and 3 is significant and leads to the belief that the mineralized section of the lower Pioche Shale is a host rock of major importance.

Hole No. 4. The location of this hole was based entirely on a study of the Laylander pictures which showed a large altered area in limestone north of the Tasso Fault. The log and assays follow -

		Au	Ag	Pb%	Zn%
0-33	Blue limestone with FeO_x in seams				
33-40	Very red sludge	.005	3.4	9.1	
30-40	Pieces recovered from core barrel	.02	21.5	0.9	
0-60	General sample of sludge pond mud	.003	0.1	0.7	

This hole was stopped because of the fractured character of the limestone which warned of coming drilling trouble and because commercial ore had already been indicated at a very shallow depth. This mineralized ore bed is several hundred feet stratigraphically above the lime-shale bed cut in Holes Nos. 1 and 3.

Summarizing to date, the mapping, photography and drilling lead to the following conclusions -

1. There is a mineralized limy-shale bedding about 90 feet thick in the lower Pioche Shales, with barren shale both above and below. In this mineralized section there are at least three portions sufficiently enriched and with sufficient thickness to justify a development program.

2. The Tasso Fault is an important geological structure which served as a conduit for entrance of mineralizing agencies into the favorable host rock.

3. The agencies were of sufficient strength to form commercial orebodies for at least 100 feet on each side of the Tasso.

4. The drilling and research, to date, are of a preliminary nature and should be followed by additional drilling, especially along the Tasso Fault zone.

5. Our present data seems sufficient to justify a program looking to the development of a large tonnage of good grade lead-zinc mill ore.

At this time it may be well to mention two new developments which add interest to the property.

1. The Lue Shaft is a 40 foot shaft sunk in the early days on a split of the Tasso Fault. It is about 2900 feet east of the main Tasso Shaft and is the farthest eastward extension of mineralization that has been observed to date. The following assays speak for themselves -

	Au	Ag	Pb%
3 Foot Cut-middle fissure	.02	9.9	23.0
2 Foot Cut-silicious wall on north side of main fissure	.015	44.5	2.9

This area has already been leased to Mr. Lehman for two years. He is now on the ground with a compressor, truck, drills and other equipment. He proposes to sink an incline on the fissure which will give him 200 feet of backs. It is considered an attractive lease.

2. The presence of uranium in appreciable amounts (0.25% U_3O_8) has been verified in the jasper found on the old Tasso dump. It will be well to keep this in mind for future exploration.

Respectfully submitted,

Earl B. Young.

EARL B. YOUNG
MINING GEOLOGIST
SALT LAKE CITY
UTAH

July 3, 1956

Mr. James D. Williams
409 Felt Building
Salt Lake City, Utah

Re: Visit to Wah Wah Property

Dear Jim:

I am glad to write a brief account of the pleasant and very interesting trip that I took with you on June 27, to the Wah Wah property in Beaver County, Utah.

We reached Milford about 2:00 P.M., registered at the Horn Silver Hotel and immediately left by jeep for the mine. We reached the canyon about 4:00 o'clock and drove up to the location of No. 2 Hole where the crew were finishing the last run for the day. Paul Moody was the driller and Robert Taylor the helper. The rig, a practically new Chicago-Pneumatic Eight with a capacity of 1300 feet of NX drill rods, was running perfectly. While we were at the rig the last core for the day was pulled resulting in a near 100% core of blue-green shale that in texture suggested the B- shale of the Pioche area. Depth of the hole was 100 feet. The entire core to that point was in shale with brown oxidized shale extending to about 60 feet.

We then drove to the location of No. 1 Hole and made a careful study of the cores which were well displayed in wooden troughs arranged on sawhorses for easy inspection. Our determination of the log is as follows -

0	-	10	Alluvium (cased)
10	-	25	Brown oxidized shale
25	-	29	Quartz porphyry sill
29	-	36	Brown oxidized shale - soft
36	-	70	Blue micaceous shale with irregular pods of limy shale, particularly in last five feet
70	-	120	Blue micaceous shale, somewhat sandy in spots - more sandy in the last twenty feet
120	-	128	Gray quartzite with pyrite in small cracks
128	-	203	Sandy shale - blue with sericite
203	-	220	Dark gray silicified and mineralized shale - pyritic min. No acid reaction. Low grade mineralization
220	-	232	Same as above but more pyrite, etc.
232	-	238	Dark gray, fine grained, heavily mineralized limy shale. Much pyrite and some galena visible
238	-	240	Gray quartzite
240	-	245	Silicified limy shale bed. Heavy disseminated, fine grained sulphides - PbS, FeS and ZnS
245	-	250	Dark shale - micaceous
250	-	255	Mineralized bed did not core - too brittle probably. Probably good grade ore judging from the few pieces that were recovered.
255	-	275	Hard, dark gray shale - black on fractures. Some sericite, somewhat sandy
275	-		Driller believes he hit hard quartzite in bottom of hole. No core

RECEIVED
SEP 17 1956

GEOLOGY OF THE WAH WAH MINE DISTRICT

The Wah Wah mine is in a mountain range composed of about 5,000 ft. of pre-Cambrian quartzite and a similar thickness of lower Paleozoic shales and limestones. The section is similar to that at Pioche, Nevada.

The main part of the Wah Wah Range to the north is a typical Basin Range monoclinal block dipping about 20 degrees to the east. The Range south of the mine is a synclinal fold whose strike is about 20 degrees NE of the main strike of the Range, and dipping about 30 degrees to the north. The junction between the two blocks is a hinge fault zone with nearly East-West strike. The principal fault in the mine area--the Tasso fault--is apparently one of the hinge faults which provides adjustment between the monocline and syncline.

There is also some imbrication caused by thrust faulting in the monocline south of the mine area, in which the Paleozoic rocks moved to the SW. The movement over an irregular quartzite basement produced thickening and thinning of the incompetent units, such as the Pioche shale, and minor imbrication.

There is abundant normal and reverse faulting of small displacement throughout the area. There are scattered gossans particularly along the NW faults. The intersections of the E-W hinge faults with the N-W faults may provide mineral concentrating structures, particularly in favorable horizons, such as the Combined Metals Bed analogs in the Pioche shale.

We got the impression that there is a fairly heavily mineralized limy shale bed extending from about 203 to 245. The heaviest mineralization seemed to extend from 232 to 238 and from 240 to 245. There is also strong evidence of a well mineralized bed from 250 to 255. Previous samples of sludge had been assayed which showed that good values in gold and silver also occurred along with the lead and zinc. As there was no reaction to dilute hydrochloric acid throughout the mineralized section, it is assumed that whatever lime was originally present has been replaced by the sulphides. The extent of the mineralization is very encouraging and if additional holes yield cores of similar character and grade, a mine of some magnitude seems assured.

After visiting the Lue Shaft for a brief inspection of the mineralization and condition of the shaft, we returned to Milford by driving over the summit and down the east side of the range. One of the geological features noted was that the dip of the beds was toward the west, in contrast to the dip at the Wah Wah. The inference is that there is a syncline crossing the range with the axis some distance east of the Wah Wah. We also noticed the large amount of volcanics that occur in the area east of the range.

After a good meal we met with Phillip A. Laylander who had completed a photographic flight over the Wah Wah. His pictures, taken from an elevation of about 12,500 were in color and remarkably clear. A clear view of the Tasso Fault and the porphyritic intrusion with the relations to the shales and limestones was obtained through the stereoscopic lense. The Tasso Fault, as shown by the pictures, can be traced for at least two miles and consequently becomes a geological feature of major importance. Several alteration areas were shown in the immediate zone marked by the Tasso outcrop and indicate its importance as a conduit for mineralizing gases and solutions. It was observed that Hole No. 2 was in the wrong place and that it should be moved about 600 feet easterly to a very large area of alteration just north of the Tasso Fault. It was also realized that the 350 feet of rods was not sufficient to reach the bed at the present location. Accordingly decision was made at once to move rig off No. 2 location, drill No. 3 location south of the Tasso shaft, extend the drill road easteard from the No. 2 location into the big altered area shown on the map, and make a No. 4 location in this new altered area shown by the Laylander photographs.

Discussion lasted until about 2:00 A.M., and was thoroughly enjoyed by all. It was felt to be a very profitable session and we congratulated Mr. Laylander on his excellent and very valuable pictures.

Respectfully submitted,

Earl B. Young.

K

A rather unusual rock sometimes described as quartz monzonite occurs in the E-W hinge area, starting just SE of the Wah Wah mine. It extends about a mile to the east and is about half a mile wide. The photogeologic study indicates a probable rhyolite porphyry nature of the rock. There are no broad alteration features which usually accompany a quartz monzonite intrusion of the size. Also, there are no other intrusions cutting the quartzite, which would be normally expected in such an instance. There is a widespread volcanie development SE of the monocline, with some patches overlying the eroded Paleozoic section. There is no apparent relationship between the rhyolite porphyry and the ore.

The age of the ore cannot be determined. A guess would be late Miocene, since there is some similar base metal mineralization at the base of some of the volcanics.

The principal ore situations seem restricted to the hinge fault zone, of which the Tasso fault, dipping 70 degrees to the north has abundant gossan development along its length, and was probably a source for bedding mineralization which occurs near its intersection. Since this fault extends about two miles from the top of the quartzite to the East, it might constitute a zone with considerable ore. It is recommended that initial exploration be concentrated in this zone.

Two strip maps were plotted from the large scale vertical stereoscopic color air photographs of the area, including the area about a mile north and a mile south of the Wah Wah Mine and about eight miles East-West across the range. Distribution of the rocks, structures, and mineralization are shown. Since the maps are compiled

directly from the photographs without photogrammetric rectification procedures, they represent perspective views, with photographic perspective distortion of scale and directions in the overlap areas. However, matching and alignment of the two strips can be readily accomplished.

For future engineering purposes, accurate contour maps can be compiled from the photographs with ground controls and photogrammetric procedures at a later date.

Philip A. Laylander

Philip A. Laylander
Geologist
6 July 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

RECEIVED
SEP 17 1956

September 17, 1956

USBM Comments.

Re: DMEA 4228; Lead-zinc;
$88,592
Pine Grove Mines
Wah-Wah Mine
Beaver County, Utah

Memorandum

To: W. R. Griswold, DMEA

From: O. M. Bishop, Branch of Base Metals

Subject: Review of Field Team report dated August 21, received August 28, 1956.

The applicant requested assistance in meeting the cost of 80 square miles of photogeologic mapping and of 21 diamond drill holes totaling 10,898 feet. The work which was proposed as a 4-stage program would explore the Black Bed limestone near the top of the Pioche shale.

The field examiners state that at no place has there been sufficient ore in the Black Bed to sustain a mining operation and they recommended rather that if exploration be approved it provide for investigation of the basal limestone of the Pioche below areas of known mineralization. They noted however, that there is no assurance that the basal limestone exists in the Pioche shale in this area as the one hole drilled at the date of application into the section by American Smelting & Refining had failed to cut limestone.

The field team in appraising the application and field examination stated there was insufficient evidence of the geologic probability of finding a significant ore deposit in the Wah-Wah area.

Subsequent to this statement of opinion and the application, the applicant put four diamond drill holes into the area to gain additional information on the geologic probability of mineralization. R. W. Osterstock and Frank Moore of the U. S. Geological Survey visited the 4 drill sites. Core observed did not confirm statements of sulfide content by the applicants' geologist and did demonstrate the complete absence of a limestone where the combined

Metals bed was to be expected.

All the evidence at hand with relation to the merit of the exploration indicates a denial is in order and I so recommend.

O. M. Bishop

O. M. Bishop

Copy to: Division of Minerals
Mr. Kiilsgaard
Mr. Geehan
Mr. Bishop
Files

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

RECEIVED
SEP 17 1956

September 17, 1956

Re: DMEA 4228; Lead-zinc;
$88,592
Pine Grove Mines
Wah-Wah Mine
Beaver County, Utah

Memorandum

To: W. R. Griswold, DMEA

From: O. M. Bishop, Branch of Base Metals

Subject: Review of Field Team report dated August 21, received August 28, 1956.

The applicant requested assistance in meeting the cost of 80 square miles of photogeologic mapping and of 21 diamond drill holes totaling 10,898 feet. The work which was proposed as a 4-stage program would explore the Black Bed limestone near the top of the Pioche shale.

The field examiners state that at no place has there been sufficient ore in the Black Bed to sustain a mining operation and they recommended rather that if exploration be approved it provide for investigation of the basal limestone of the Pioche below areas of known mineralization. They noted however, that there is no assurance that the basal limestone exists in the Pioche shale in this area as the one hole drilled at the date of application into the section by American Smelting & Refining had failed to cut limestone.

The field team in appraising the application and field examination stated there was insufficient evidence of the geologic probability of finding a significant ore deposit in the Wah-Wah area.

Subsequent to this statement of opinion and the application, the applicant put four diamond drill holes into the area to gain additional information on the geologic probability of mineralization. R. W. Osterstock and Frank Moore of the U. S. Geological Survey visited the 4 drill sites. Core observed did not confirm statements of sulfide content by the applicants' geologist and did demonstrate the complete absence of a limestone where the combined

Metals bed was to be expected.

All the evidence at hand with relation to the merit of the exploration indicates a denial is in order and I so recommend.

O. M. Bishop

Copy to: Division of Minerals
Mr. Kiilsgaard
Mr. Geehan
Mr. Bishop
Files

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

USGS Comments

August 30, 1956

Memorandum

To: W. R. Griswold, Defense Minerals Exploration Administration

From: W. P. Williams, U. S. Geological Survey

Subject: Review of supplement to field examination report, DMEA 4228 (lead-zinc), Pine Grove Mines, Wah Wah mine, Beaver County, Utah

The examining geologist reports that the applicant has completed four core-drill holes on the property. The existence of the holes and the data therefrom were withheld from the application by the applicant. Data from the drill holes were given to the examining geologist on a visit subsequent to the field examination by the examining team.

The hole logs and assays furnished by the applicant are at wide variance with the findings of the examining geologist. If it can be assumed that the examining geologist for the Government is of reasonable technical competence, the conclusion is inescapable that the drilling information supplied by the applicant is erroneous. The discrepancy is of such magnitude as to be difficult of explanation.

I find myself reluctant to agree with the Field Team in their memo of August 27, 1956 in which they suggest the Administrator press the applicant for further analysis of his drilling results. I can see no worthwhile results from such action.

On the basis of information available to me I believe, and recommend, that the application be denied.

W. P. Williams

W. P. Williams

RECEIVED
AUG 31 1956

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

August 30, 1956

Memorandum

To: W. R. Griswold, Defense Minerals Exploration Administration

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W. P. Williams

WPWilliams:jeh
8/30/56
cc: Director's reading 4212
Branch reading 4212
DMEA (3)
Docket file
O. M. Bishop, 3617

RECEIVED
AUG 31 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

Klugpchard

224 New Customhouse
Denver 2, Colorado

August 27, 1956

RECEIVED
AUG 28 1956

Memorandum

To: Secretary to the Operating Committee

From: DMEA Field Team, Region III

Subject: Supplement to Report of Examination, Docket DMEA-4228, (Lead-Zinc), Pine Grove Mines (Wah-Wah mine) Beaver County, Utah

Enclosed are the original and three copies of a memorandum to E. N. Harshman, member of the Field Team, from R. W. Osterstock covering a visit he made to the subject Applicant's property and a discussion he had with the Applicant's consultant, Mr. Earl Young, concerning core drilling performed on Pine Grove Mines company account.

The memorandum is for the Operating Committee's review as a supplement to the Report of Examination forwarded to you on August 8, 1956, and Field Team memoranda of August 8 and August 14. It adds very little to previous information submitted and in no way alters our original recommendations, unless it would be to change the recommendation from denial without prejudice to outright denial.

Possibly it would now be in order for the Administrator to write the Applicant and request his analysis of the results of this latest drilling before rendering a final decision.

DMEA Field Team, Region III

W. M. Traver

Enclosures

By W. M. Traver
Executive Officer

Reviewed by
DMEA OPERATING COMMITTEE
8-31-56
(date)

IN REPLY REFER TO:
DMEA
Date Rec'd
AUG 24 1956
BUREAU OF MINES
Denver, Colorado

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
506 Federal Bldg.
Salt Lake City 1, Utah
August 22, 1956

Memorandum

To: E. N. Harshman, DMEA Field Team, Region III

From: R. W. Osterstock

RECEIVED AUG 26 1956

Subject: Docket DMEA 4228 (Lead-zinc) Pine Grove Mines (Wah Wah Mine), Beaver County, Utah.

The subject property was visited August 16, 1956, by R. W. Osterstock and Frank Moore, (USGS) to investigate the results of a drilling program reported to have been undertaken by the applicant. Mr. Earl Young, consulting geologist retained by the applicant, was visited August 21, 1956 by R. W. Osterstock. Mr. Young confirmed the applicant's report of having completed four drill holes and very kindly furnished me with the locations and very brief logs as well as assay data resulting from these drill holes.

Four drill hole sites were located on the Wah Wah property:

DDH No. 1 - 1100' N. 65' W. of the Tasso shaft (125 feet north of Tasso fault. TD 275 feet. Vertical hole. Core from this hole is stored in wooden troughs mounted on sawhorses. A hastily constructed DMEA log of the hole is as follows:

0 - 35	Olive to brown oxidized micaceous shale.
	26-28 White quartz porphyry.
35 - 70	Silty gray shale.
70 - 95	Sandy gray shale.
95 - 109	Silty gray shale.
109 - 112	White quartzite.
112 - 120	Silty gray shale.
120 - 128	White quartzite.
128 - 154	Nodular laminated siltstone and mudstone, gray-green.
154 - 168	Gray sandy shale with thin quartzitic bedding units.
168 - 270	Silty nodular dark gray shale. (One foot of white quartzite at 239'.)

Reviewed by
DMEA OPERATING COMMITTEE
8-31-56
(date)

General comments on the above log: No part of the section penetrated showed any reaction to dilute hydrochloric acid. There is apparently no limestone equivalent of the CM bed present in this section. Except for disseminated fine pyrite and one or two extremely small specks of galena no ore minerals were noted in the core. Recovery seems to have been good and there did not appear to be enough core removed for assay to have accounted for any significant ore zone.

Following is a portion of Mr. Young's log of this drill hole:

203 - 220	Dark gray silicified mineralized shale, pyritic, no hydrochloric acid reaction, low grade mineralization throughout interval.
220 - 232	Same as above interval but contains more pyrite.
232 - 238	Dark gray fine-grained heavily mineralized limy shale, much pyrite and some galena visible.
238 - 240	Gray quartzite.
240 - 245	Siliceous limy shale, disseminated very fine-grained sulfides, PbS, FeS, ZnS.
245 - 250	Dark shale, micaceous.
250 - 255	Mineralized bed, no core, too brittle, probably good grade ore judging from pieces recovered.
255 - 275	Hard dark gray shale, black in fractures, some sericite, sandy.
275	Hard quartzite.

Sample data for drill hole No. 1 as furnished by Mr. Young is as follows:

		Au	Ag	Pb	Zn
208-245	Sludge	.06	6.00	4.2	4.8
233-238	Low Grade	Trace	.30	.00	.5
238-245-7	Heavy Sulfides	.05	9.90	4.30	9.00
250-255	No core, Small pieces may be good ore bed.	.015	1.30	.60	.20

Mr. Young summarizes the results of this hole as follows: An upper barren shale, a limy shale 45 feet thick containing mineralization, 20 feet of barren shale capping Prospect Mountain quartzite.

DDH No. 2 - Located 865' S. 65' E. of Tasso shaft on the south side of the Tasso fault. Bottomed at 100' in barren shale. Core from this hole was strewn somewhat indiscriminately on the ground and obviously no attempt was being made to preserve the cored section. Brief DMEA log of the hole is as follows:

0 - 30	Brown oxidized sandy shale.
30 - 50	Laminated blue and brown silty shale.
50 - 70	Greenish laminated mudstone.

General Statement on the above log: No core could be identified which may have covered the interval from 70 to 100 feet. There was no trace of mineralization in any of the penetrated section.

DDH No. 3 - Located 150' S. 36' W. from the Tasso shaft, 100 feet south of the Tasso fault. TD 260'. Following is a brief log of the hole as constructed by DMEA personnel:

0 - 63	Oxidized brownish gray shale.
63 - 101	Gray-green sandy micaceous shale with fine disseminated pyrite.
101 - 130	Gray-green shale with more sand than last unit.
130 - 143	Gray-green laminated sandy shale.
143 - 148	White quartzite, bedding 45° angle with core.
148 - 164	Gray silty shale, mudstone nodules.
164 - 190	Very sandy gray shale (Thin quartzite lens at 186').
190 - 235	Nodular gray-green silty shale, bedding 25° angle with core, becomes regular bedded in lower part of interval.
235 - 260	Sandy nodular gray-green shale.

General statement regarding the above section: The sandier shale units appear to carry most of the pyrite. A few scattered specks of galena and dark sulfides (probably sphalerite) are scattered throughout the section, however, these have at no point attained a sufficient concentration to be of economic interest. Following is the assay data

furnished by Mr. Young pertaining to the section penetrated by DDH No. 3:

		Au	Ag	Pb	Zn
98-115	Selected Sample	.003	1.4	3.9	20.3
98-115	Core	.003	.1	1.2	8.2
98-115	General Sludge	.0	.6	2.0	1.1
120-130	Core	.005	.0	1.9	0.9
135-145	Selected pieces	.003	.7	1.3	8.2
135-145	Sludge	.0	.2	1.8	1.8
140-150	Core	.003	.4	4.0	3.1
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175-185	Sludge	Trace	.2	1.1	2.5
190-200	Sludge	.003	.7	1.0	0.4

Mr. Young's general statement regarding the penetrated section is as follows: 100' of barren shale underlain by a 90' section containing three beddings of well mineralized ground, underlain by barren shale 75' thick, underlain by Prospect Mountain quartzite.

DDH No. 4 - 1100' S. 80 E. of Tasso shaft, 75' north of Tasso fault. TD 60'. According to Mr. Young this hole is located on an alteration zone which appeared in color photographs taken by Mr. Phillip Laylander for the applicant. Core from this hole is thrown indiscriminately on the ground and apparently no attempt has been made to preserve the sequence in which the various core runs were withdrawn from the hole. Only 40' of core could be located by the DMEA personnel and this core is identified as Lyndon lime. A small amount of iron oxide is noted in tight fractures, however, the core is essentially barren of ore minerals. The following data has been furnished from Mr. Earl Young.

		Au	Ag	Pb	Zn
0-33	Blue limestone with iron oxide in seams. No samples taken.				
33-40	Very red sludge.	.005	3.4	9.1	
30-40	Pieces recovered from core barrel	.02	21.5	0.9	
0-60	General sample of sludge pond mud.	.003	0.1	0.7	

General statement regarding holes 1 and 3 which have penetrated the Pioche shale in the area: It is noteworthy that in neither of these holes was any material encountered which contained sufficient lime to show hydrochloric reaction. This may be explained by the fact that the correlative CM bed, normally limy, has been so intensely silicified in this area that it no longer exists as a lime unit; or as is more likely the case, the correlative CM unit in this area has become such an impure lime as to no longer be identifiable as a limestone unit. I am certain that on purely lithologic evidence a unit can be found, by detailed study of the cored sections, which would be correlative with the CM bed of the Pioche section, however, at the Wah Wah Mine no such limy bed appears to exist. Lack of the limy bed is attested to by the lack of resistent lime outcrop in the shale saddles.

It is extremely difficult for me to understand the high sulfide assays which have been presented by the applicant (unwillingly presented, I might add); although the DMEA inspection of the core was very hasty it is unlikely that any zones containing nearly 25% combined sulfides would have been overlooked regardless of how hasty the inspection. I would at this stage reiterate an earlier statement made in this memo. There did not appear to be a sufficient amount of core missing from the sections to account for the assays furnished by Mr. Young. I think that, in the event that this

application for government assistance be pursued to its logical conclusion, it might be well for a DMEA man to accompany the applicant to the property and have him explain to a DMEA field examiner exactly where this high grade core and sludge came from.

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I seriously doubt that the information contained in this memo will do more than help confuse the issue as regards the Wah Wah Mine application. There is no longer any doubt but ~~that the~~ applicant put some holes down

in the area, there is considerable doubt as to the existence of the CM bed as such, and the presence of mineralization within the zone where this bed might have occurred has not been verified.

R. W. Osterstock

cc: S. R. Wilson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

224 New Customhouse
Denver 2, Colorado

August 27, 1956

RECEIVED
AUG 28 1956

Memorandum

To: Secretary to the Operating Committee

From: DMEA Field Team, Region III

Subject: Supplement to Report of Examination, Docket DMEA-4228, (Lead-Zinc), Pine Grove Mines (Wah-Wah mine) Beaver County, Utah

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DMEA Field Team, Region III

Enclosures

By W. M. Traver
Executive Officer

Reviewed by
DMEA OPERATING COMMITTEE
8/31/56
(date)

DMEA
Date Rec'd.
AUG 24 1956
BUREAU OF MINES
Denver, Colorado

506 Federal Bldg.
Salt Lake City 1, Utah
August 22, 1956

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RECEIVED
DMEA OPERATING DIVISION

(over)

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R. W. Osterstock

R. W. Osterstock

cc: S. R. Wilson

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

August 21, 1956

Memorandum

To: W. R. Griswold, Defense Minerals Exploration Administration

From: W. P. Williams, U. S. Geological Survey

Subject: Review of field examination report, DMEA 4228 (lead-zinc), Pine Grove Mines, Wah Wah mine, Beaver County, Utah

The examining team recommends approval of a staged drilling project to search for lead-zinc ore deposits in the Pioche shale.

The Field Team, Region III, does not, however, concur with the recommendation for approval. They reason that the presence of the ore-host shale on the property has not been demonstrated and, furthermore, that the geologic and lithologic characteristics of the ore zone are unknown. The Field Team believes that the proposed project would constitute a prospecting venture.

It seems that the applicant has drilled several holes on the property at his own expense. There seems to be some reluctance on the part of the applicant, however, to turning the drilling results over to the Government.

If the applicant has completed the purported drilling the property should not be definitely evaluated for DMEA purposes until results of the drilling have been submitted by the applicant to the Government. If the drilling results are not forthcoming, then denial of the application, possibly without prejudice, seems advisable.

W. P. Williams

W. P. Williams

RECEIVED
AUG 23 1956

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

August 21, 1956

Memorandum

To: W. E. Grimwald, Defense Minerals Exploration Administration

From: W. P. Williams, U. S. Geological Survey

Subject: Review of field examination report, DMEA 4225 (lead-zinc), Pine Grove Mines, Wah Wah mine, Beaver County, Utah

The examining team recommends approval of a staged drilling project to search for lead-zinc ore deposits in the Pioche shale.

The Field Team, Region III, does not, however, concur with the recommendation for approval. They reason that the presence of the ore-host shale on the property has not been demonstrated and, furthermore, that the geologic and lithologic characteristics of the ore zone are unknown. The Field Team believes that the proposed project would constitute a prospecting venture.

It seems that the applicant has drilled several holes on the property at his own expense. There seems to be some reluctance on the part of the applicant, however, to turning the drilling results over to the Government.

If the applicant has completed the purported drilling the property should not be definitely evaluated for DMEA purposes until results of the drilling have been submitted by the applicant to the Government. If the drilling results are not forthcoming, then denial of the application, possibly without prejudice, seems advisable.

W. P. Williams

WPWilliams:jch
G-8/21/56
cc: Director's reading 4212
Branch reading 4212
DMEA (3)
Docket file
O.M.Bishop, 3617

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

224 New Customhouse
Denver 2, Colorado

August 14, 1956

Klugscheid

Docket

RECEIVED
AUG 16 1956

Memorandum

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Docket DMEA 4228 (Lead-Zinc) Pine Grove Mines (Wah Wah mine) Beaver County, Utah

It develops that the statement in the last paragraph of the Field Team's memorandum of August 9, 1956 quoting R. W. Osterstock as stating, with reference to the subject application, that the applicant, J. D. Williams, would write a letter to the Executive Officer was erroneous.

Apparently Mr. Williams indicated that he had no intention of informing the DMEA Field Team of the results of his own drilling operations at the property, but rather would reserve any statements until after he is advised of the Washington office decision on the application. This would appear to be rather short-sighted on his part. He did, however, advise both members of the examining team by telephone that he had drilled several holes at his own expense, some of which were successful in intersecting the favorable ore horizon, the Pioche shale, and he further stated to one member of the team that one of the drill holes showed minable ore.

Under the circumstances, the Field Team recommends that in accordance with their memorandum of August 8, 1956 the application be denied without prejudice pending substantiation by the applicant that his program qualifies as exploration. It is quite possible that the work he has performed would be sufficient for such qualification.

DMEA Field Team, Region III

W. M. Traver

By W. M. Traver
Executive Officer

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

RECEIVED
AUG 13 1956

224 New Customhouse
Denver 2, Colorado

August 9, 1956

Klugerlind

Memorandum

Docket

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Docket DMEA 4228 (Lead-Zinc) Pine Grove Mines (Wah-Wah mine) Beaver County, Utah

It has been learned from R. W. Osterstock that the subject applicant had told him in a very confidential manner that he has completed two holes which he stated show the presence of the Wah-Wah bed and mineralization in it. It is our understanding that these holes are on opposite sides of the fault and may be essentially the same as holes recommended by the field examiners in their proposed Stage I drilling.

R. W. Osterstock stated that the applicant said he would write a letter to the Executive Officer, DMEA Field Team, Region III giving the results of his drilling. You will be furnished copies of this letter when it is received by this office.

DMEA Field Team, Region III

W. M. Traver

W. M. Traver

E. N. Harshman

E. N. Harshman

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

RECEIVED AUG 13 1956

224 New Customhouse
Denver 2, Colorado

August 8, 1956

Memorandum

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Report of Examination, Docket DMEA 4228 (Lead-Zinc) Pine Grove Mines (Wah-Wah mine) Beaver County, Utah

Enclosed are the original and three copies of a joint engineering and geologic report of examination on the subject property.

The field examiners recommend a modified exploration program in which we do not concur.

We believe that the project recommended by the examiners is of a prospecting nature. The applicant has not presented sufficient evidence of the geologic probability of finding significant ore deposits in the Wah-Wah mine area, and we recommend that the application be denied. Should further prospecting by the applicant eliminate some of the unknown factors, the ore potential of the Wah-Wah bed could be assessed.

If you believe the project recommended by the examiners is justified by the available data, the program proposed by them appears to be a logical method of exploring for ore in limestone beds in the lower part of the Cambrian shale (Pioche?).

DMEA has in the past had unsatisfactory relations with the applicant on the Harrington Mines Company, Contract Idm-E131 in Region III and in the Mount Wheeler contract in Region II.

DMEA Field Team, Region III

W. M. Traver

W. M. Traver

E. N. Harshman

E. N. Harshman

Reviewed by
DMEA OPERATING COMMITTEE
8-17-56
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

Weyerhaeuser
Betty

224 New Customhouse
Denver 2, Colorado

RECEIVED
AUG 1 8 1956

August 8, 1956

Memorandum

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Report of Examination, Docket DMEA 4228 (Lead-Zinc)
Pine Grove Mines (Wah-Wah mine) Beaver County, Utah

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DMEA Field Team, Region III

W. M. Traver

W. M. Traver

E. N. Harshman

E. N. Harshman

Reviewed by
DMEA OPERATING COMMITTEE
8/17/56
(date)

DMEA
Date Rec'd.

APR 18 1956

MINES
Colorado

April 17, 1956 ~~Klapschinski~~

Docket

RECEIVED
APR 20 1956

Memorandum

To: S. R. Wilson

From: Superintendent, Denver Experiment Station, R.g. III

Subject: Docket DMEA 4228 (Lead-Zinc), Pine Grove Mines (Wah Wah Mine), Beaver County, Utah

Enclosed please find the subject application in the amount of $88,592.00.

A field examination and suitable report are required. The completed report should be sent directly to the Executive Officer with a copy of the memorandum of transmittal to this office.

JOHN F. SHAW

John F. Shaw

Enclosure

cc: W. M. Traver (3)
E. N. Marshman
R. W. Osterstock
Sec. Op. Com (2)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

April 16, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

TO: J. F. Shaw (2)
R. W. Osterstock

Docket

From: Field Team, Region III

Subject: Docket DMEA 4226 (Lead-Zinc), Pine Grove Mines (Wah Wah Mine), Beaver County, Utah

Enclosed is the subject application in the amount of $66,592.00. Also enclosed for your additional information is a copy of a letter from the Chairman, Operating Committee dated April 11, 1956 and attached memoranda of review of the application by O. M. Bishop and N. E. Nelson.

A field examination and suitable report are requested and the report should give detailed answers to the questions in the attached letter from the Chairman, Operating Committee.

DMEA Field Team, Region III

W. M. TRAVER,

W. M. Traver
Executive Officer, DMEA
Field Team, Region III

Enclosures

DMC:ab

cc: Chair. Op. Comm. (2)
Harshman
Docket 4226
Chron.

File Copy
Surname
Klugescheid
Selfridge

500

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

APR 11 1956

Mr. W. M. Traver
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

Re: Docket No. DMEA-4228 (Lead-Zinc)
Pine Grove Mines
Wah Wah Mine
Beaver County, Utah

Dear Mr. Traver:

The cited application for exploration assistance is being referred to your office for consideration, a field examination of the property if warranted, and recommendation.

If the project is favorably considered by the Field Team, it will be necessary for the Applicant to get two additional bids for the diamond drilling.

We would like to get the reaction of the Field Team to the aerial photography. Is it necessary and will it benefit the project to any great extent?

The Applicant frequently alludes to the "45 foot thick limestone bed about 100 feet above the quartzite-shale contact", and this bed is one that the Applicant has included in the drilling program. Careful study of all the reports fails to reveal where there is any proof of the existence of this formation. Mr. Nelson has also referred to this in his recommendations, and some drilling as suggested by him might be necessary to either prove or disprove the presence thereof.

The contingencies would have to be carried as extra drilling footage, if it is found that depths are uncertain.

If the field recommendations are favorable, it would be necessary to obtain a "Consent to Lien" from the lessor.

Under assaying, the cost per determination is certainly reasonable, but why so many different determinations are necessary is more difficult to understand.

RGS

Copies of memoranda dated March 29 and 30, 1956, by W. M. Bishop, Bureau of Mines, and M. E. Nelson, Geological Survey, respectively, relating to the project are enclosed for your information.

Sincerely yours,

George C. Selfridge
Chairman, Operating Committee (JHB)

Enclosures

APPROVED:

Richard H. Mots (JHB)
Member, Bureau of Mines

Thor H. Kiilsgaard (JHB)
Member, Geological Survey

WPKlugescheid/bjl (6/9/56)

Copy to: Docket
Admr. R. File
Op. Committee
Base Metals
Mr. Bishop
Mr. Kiilsgaard
Chron.

File Copy
Surname
Klugescheid
Mineral
Nielsgaard
Mote
Selfridge
Johnson

APR 11 1956

Mr. James D. Williams
Pine Grove Mines
P. O. Box 1446
Salt Lake City 10, Utah

Re: Docket No. DMEA-4228 (Lead-Zinc)
Pine Grove Mines
Wah Wah Mine
Beaver County, Utah

Dear Mr. Williams:

Your application for Government assistance to explore the cited property has been reviewed by the Base Metals Division of the Defense Minerals Exploration Administration and has been referred to:

Mr. W. A. Traver
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

If the Field Team requires additional information concerning your application, they will contact you at an early date.

Sincerely yours,

C. O. Mittendorf

Administrator

WPKlugescheid/bjl (4/6/56)

Copy to: Docket
Admr. R. File
Op. Committee
Base Metals
Mr. Bishop
Mr. Nielsgaard
Region III
Chron.

P.C.K.

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
APR 3 - 1956

March 30, 1956

Klugschend

Re: DMEA 4228
J. D. and Ruth Williams
Pine Grove Mines
Beaver Co., Utah
$88,592.00 - Lead, Zinc

Memorandum

To: W. R. Griswold, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of application.

The applicants request assistance in further exploring by diamond drilling (10,956 feet) certain beds of a Cambrian sedimentary series which in the Wah Wah mine and by drilling have been shown to be ore bearing. Supporting work includes aerial photography, mapping, bulldozing, etc., as:--

Diamond drilling, 10,956 feet	$76,942.00
Colored aerial photographs and geologic mapping	2,500.00
Bulldozing	3,000.00
Consultants	3,000.00
Mileage, station wagon	2,000.00
Assaying, insurance	1,150.00
Contingencies	5,500.00
Total	$88,592.00

The work in the Wah Wah mine and underground exploratory drilling have shown a marked similarity of the small ore bodies and the beds in which they occur to the large ore bodies and associated beds at Tintic and Pioche.

The proposed drilling would extend the exploration effected by the mine workings and drilling to adjoining areas. A large part of the drilling in the Wah Wah mine was done by the U. S. Bureau of Mines. At least five diamond drill holes and probably four churn drill holes were put down by the American Smelting and Refining Company in 1939. The U. S. Bureau of Mines work was done in 1944 and is covered in R. I. 3853, 1946.

Most of the ore mined to date came from chunky "oxide" ore bodies in limestone, but underground work and drilling have disclosed irregular 'sulfide' ore bodies in the black shales which underlie the limestone. Certain rock associations and structures, as portrayed on the plans and sections which are part of the well documented application, appear to be important. The extent to which the rock associations and structures are essential seems to be rather well demonstrated as for the immediate mine area as only two small ore blocks are shown as having "open" ends. If such is the case, only imaginary targets are afforded the proposed drill holes.

The important, as proven, beds, the limestone and the black shale, no doubt underlie much of the project area. The basic and pebble dikes may be peculiar to the mine area, also the subordinate faults and fissures. The Tasso fault is long, probably deep and is not a mine feature alone. The porphyry body, if important, is probably large enough to influence a large volume of surrounding rock.

The applicants, in support of the application, envisage a 45-foot bed of limestone in the thick shale member resting on the basement quartzite. By analogy it may be there since the productive Combined Metals bed is present at Pioche and the shales at Pine Grove are correlated with similar beds (Pioche shale) at Pioche. I have found no reference confirming the assumption of the applicants. As it is one of the "two main target areas having large tonnage potentials" its presence should be established by shallow drilling around the edge of shale bottomed basin. If the "CM" bed is present in the project area some deep drilling may be warranted.

The assumption that the black shales constitute another 'main target area', etc., is not borne out by results of intensive work in that member in the mine area, but some drilling may be justified.

Referral of the application to the Field Team for appropriate action is recommended.

N. E. Nelson

N. E. Nelson

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
APR 3 - 1956

March 30, 1956

Re: DMEA 4228
J. D. and Ruth Williams
Pine Grove Mines
Beaver Co., Utah
$88,592.00 - Lead, Zinc

Memorandum

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From: E. E. Nelson, U. S. Geological Survey

Subject: Review of application.

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The assumption that the black shales constitute another 'main target area', etc., is not borne out by results of intensive work in that member in the mine area, but some drilling may be justified.

Referral of the application to the Field Team for appropriate action is recommended.

N. E. Nelson

NENelson:iml
G-3/30/56
cc: Director's reading, 4212
Branch reading, 4212
IMEA (3)
Docket file
O. M. Bishop, 3617

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

Klingenbeck

March 29, 1956

Re: DMEA-4228; Lead-Zinc;
$88,592
Pine Grove Mines, SLC, Utah
Wah Wah Lead-Zinc Mine
Beaver County, Utah

Memorandum:

To: W. R. Griswold, DMEA

From: O. M. Bishop, Branch of Base Metals

Subject: Review of application, dated March 24, 1956, received March 26, 1956

The applicant proposes to diamond drill 21 holes in 4 stages for a total of 10,956 feet at the Pine Grove Mines, Wah Wah Mine, Beaver County, Utah. This work will explore two target areas; the 60-foot Black bed at the Tasso limestone-Pioche shale contact and the 45-foot limestone bed in the Pioche shale about 100 feet above its base. This latter horizon is correlated with the Combined Metals ore horizon at Pioche, Nevada, 80 miles to the southwest. The primary ores previously developed in these zones are replacement bodies. Stage I provides for 7 vertical holes, totaling 2,186 feet drilled at intervals of approximately 200 feet along a northwesterly line in the downfaulted block of ground northeast of the Tasso shaft. It will test the 60-foot Black bed correlated with the productive Prince bed at Pioche. Stage II consists of 5 holes, totaling 1,786 feet to be drilled south of the Tasso shaft and Tasso fault-zone in the vicinity of a N 55° W fissure, to explore the Wah Wah limestone bed (C.M. bed at Pioche). Stage III consists of 5 holes totaling 3,380 feet and is designed to explore the Black shale zone of Stage I somewhat further to the east. Hole 13 is programmed to be drilled through the Black shale and the upper part of the Pioche shale and the Wah Wah limestone. Stage IV, 4 holes totaling 3,622 feet, provides for exploration of the Black bed at the limestone-shale contact near the rhyolite porphyry contact which lies to the east of the Tasso shaft.

In addition to the 10,956 feet of drilling costing $6.52 or $71,442 there are projected costs as follows: Drill site preparation at $3,000; aerial photography in color of an 8 by 10 mile area with photogeologic interpretation at $2,500; engineering and geologic services at $3,000 with another $2,000 for vehicle use; assaying $1,000; liability insurance $150 and contingencies $5,500.

RECEIVED
MAR 30 1956

The program as presented appears to be well conceived and planned, and there seems but little doubt that the project outlined or one quite similar will be acceptable. I recommend that the application be referred to the field team for their consideration and such additional field work as they may consider warranted. In reviewing the application with Pine Grove Mines the field team may find it advisable to include the contingency item under drilling costs, and should certainly get other drill cost quotations than that of Boyle Brothers.

O. M. Bishop

O. M. Bishop

Copy to: Division of Minerals
Branch of Base Metals (2)
Mr. Kiilsgaard, Room 5222
Mr. Geehan, Room 3608
Files

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

March 29, 1956

Re: DMEA-4228; Lead-Zinc;
$88,592
Pine Grove Mines, SLC, Utah
Wah Wah Lead-Zinc Mine
Beaver County, Utah

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To: W. R. Griswold, DMEA

From: O. M. Bishop, Branch of Base Metals

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O. M. Bishop

O. M. Bishop

Copy to: Division of Minerals
Branch of Base Metals (2)
Mr. Kilkgaard, Room 5222
Mr. Cochran, Room 3608
Files

March 27, 1956
Subject: DMEA-4228
Re: Exploration Assistance
Wah Wah Mine

Pine Grove Mines
409 Felt Building
Salt Lake City 11, Utah

Gentlemen:

The receipt of your application dated March 24, 1956, for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-4228 and referred to the Base Metals Division.

Kindly identify all future correspondence relating to your application by this docket number.

Sincerely yours,

Robert E. Adams, Chief
Operations Control and
Statistics Division

JAMES D. WILLIAMS
P. O. BOX ~~480~~ 1446
SALT LAKE CITY 10, UTAH

RECEIVED
MAR 26 1956

March 24, 1956

Dear Mitt:

Yesterday I forwarded you a new application on one of my latest projects and after it was in the mail discovered that the forester had made an error on the box number on the letterhead. The name of the project is Pine Grove Mines and the P.O. Box should be 1446 instead of 1466. Would you please do me the favor of making this correction on the letter of transmittal of the four copies of the application when you receive them. This should avoid any mis-up in address. Thanks!

Kindest personal regards.

Sincerely,

Jim

PINE GROVE MINES
P. O. BOX 1446
SALT LAKE CITY 10, UTAH

RECEIVED
MAR 26 1956

March 24, 1956

Mr. C. O. Mittendorf, Administrator
Defense Minerals Exploration Administration
United States Department of the Interior
Washington 25, D.C.

Re: Pine Grove Mines (Unincorporated)
Wah Wah Lead-Zinc Mine
Beaver County, Utah
Application for Aid in Exploration

Dear Mr. Mittendorf:

We have prepared four copies of our "Application for Aid in an Exploration Project, Pursuant to D.M.E.A. Order 1, Under the Defense Production Act of 1950, as Amended", and submit them for your consideration.

The subject mining property is well known to us, having been under our active study and consideration since 1950. The geology and mineralization of this mining district has been well documented by examinations, reports and projects by the U.S.B.M., U.S.G.S., R.F.C., and A.S.& R.Co., all of which information has been incorporated into this application to supplement our own investigations and conclusions. You will undoubtedly note certain differences in the mapping of the surface geology as expressed by the various investigators, but these are of a nature which may readily be resolved by appropriate field examination.

It is our considered opinion that the exploration project, as outlined in Sections III and IV of this application, represents a minimum program consistent with good exploration practice, and is fully justified by favorable geology and demonstrated lead-zinc-silver mineralization.

Thank you for your kind consideration.

Sincerely yours,

PINE GROVE MINES

James D. Williams

James D. Williams

JDW-K

Enc.

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

MAR 23 1956

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. DMEA-4228
Metal or Mineral Lead-Zinc
Date Received 3-26-56
Estimated Cost $88,592.00
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: James D. and Ruth T. Williams, as Joint Tenants, with Right of Survivorship, and not Tenants in Common, doing business under the trade style of PINE GROVE MINES, 409 Felt Building, Salt Lake City 11, Utah.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.
(*c*) If a corporation, add to above statement, titles, names and addresses of officers.
(*d*) If a partnership, add to the above statement the names and addresses of all partners.
Not applicable

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract

SEE SECTION I of Application

(*b*) State any mine name by which the property is known.

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property.

(*e*) If you own the land, describe any liens or encumbrances on it

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes. SEE SECTION II of Application

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you. SEE ALSO SECTION V of Application

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore See Section III of Application

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within 60 days and be completed within 18 months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.). See Section IV of Application

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)? See Section IV of Application

(*b*) How do you propose to furnish your share of the costs?

[x] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated March 24, 1956

PINE GROVE MINES
(Applicant)

By James D. Williams
Rich T. Williams

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

ABSTRACT OF PROJECT

1. Property

Situate in unsurveyed portion of Township 28 South, Range 11 West, Salt Lake Base and Meridian, Pine Grove Mining District, Beaver County, Utah, approximately 58 miles West of Milford, Utah, on the West flank of the Wah Wah Range. Twenty-two patented and thirty-two unpatented mining claims under contract of lease, with option to purchase, to James D. and Ruth T. Williams.

#6.0-7.0. page 9, 10.

2. Geology and Ore

The measured section of lower Cambrian sediments, consisting of quartzite, shales and limestones, is similar to that of the Ophir and Tintic districts in Utah, and almost identical to that of the Pioche district in Nevada. These sediments, which normally strike N 20° E with a 23° Southeasterly dip, are in contact with and cut by a large quartz-monzonite porphyry stock which probably was the source of mineralization. A major fault, running Easterly and Westerly (about N 70° W), which can be traced on the surface for more than a mile, cuts these sediments and displaces them approximately 1000 feet horizonally and 420 feet vertically. This fault appears to be the main channel of mineralization. There are numerous other faults and fissures, generally parallel to this main fault, which have been explored at shallow depth in the quartzite and which contain appreciable amounts of high grade gold-lead-silver ore. Early operations were confined to this quartzite area and a number of high grade shipments were made direct to the smelters.

Later operations consisted of sinking a 200 foot vertical shaft (Tasso shaft) in the limestone area, East of the quartzite where two large oxide orebodies were outlined in the upper limestone (one, oxide lead-silver; the other, oxide zinc), and three sulfide lead-silver-zinc orebodies were outlined in the 60 foot thick black shaly limestone bedding lying between the top of the shale and bottom of the upper limestone. Some 2700 tons of all classes of ore have been shipped from the Tasso Shaft workings; reserves are estimated at 78,000 tons in the War Minerals Report by the U.S. Bureau of Mines. Approximately 3000 feet Easterly from this shaft, down bedding dip, near the linestone-porphyry contact, significant showings of lead-silver ore were explored in both the limestone and porphyry (Lue Shaft). Several cars of high grade lead-silver ore have been shipped from this area.

The area embraced in this proposed exploration project is heavily mineralized and presents a most favorable geological framework within which to conduct drilling exploration. Two main target areas having large tonnage potentials are immediately evident; the 60 foot Black bed at the limestone-shale contact and the 45 foot thick limestone bed about 100 feet above the quartzite-shale contact (corresponds to the productive C.M. Bed at Pioche). Both horizons can be explored by relatively short drill holes in areas where these favorable beds are cut by mineralizing fissures. Such a drilling program to explore the deeper limestones has been suggested and recommended by the Bureau of Mines. (See R.I. No. 3853 and War Minerals Report-1944, in Section II.) Subsequent development and production should present no unusual problems and relatively low mining costs can be expected.

Where bed is shale.

3. Proposed Exploration

The project anticipates drilling 21 holes, in four stages, for a total of 10,956 feet, as follows -

Stage	Target	No. Holes	Total Feet	Ave. Length of Hole
I	60' Black Bed	7	2186	312'
II	45' Wah Wah Bed	5	1768	353
III	60' Black Bed 45' Wah Wah Bed	5	3380	676
IV	60' Black Bed	4	3622	905
		21	10956	521'

In addition, it is proposed that the central area of the Wah Wah Range (with the Pine Grove area roughly in the center), be photographed in vertical stereoscopic color for the purpose of providing a reliable base for a geological map of the area. This photo-geologic interpretation will be supplemented by appropriate ground study and correlation.

All project work will be executed by independent contractors on a flat fee or unit footage or hourly basis. The area is easily accessible and climatic conditions permit all-year operations.

4. Project Cost Estimate

1.	Aerial Photography and Base Map		$ 2,500.00
2.	Bulldozing Drill Sites - 200 Hrs. @ $15/Hr.		3,000.00
3.	Diamond Drilling - 10,956 Ft. 6.52 Ave.		76,942.00
4.	Consultant Service:		
	Engineer - 30 Days @ $50/Day	$1,500.00	
	Geologist - 30 Days 50/Day	1,500.00	
		$3,000.00	3,000.00
5.	Supporting Costs		
	Mileage on 4 W.D. Station Wagon	$2,000.00	
	Assaying	1,000.00	
	Liability Insurance	150.00	
		$3,150.00	3,150.00
6.	Contingency @ $0.50/Ft. Hole		5,500.00
			$88,592.00

5. Time Estimate

Work to start within sixty days of date of contract and be completed within eighteen months of date of exploration contract.

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- Report by P. M. McCree - 1909
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- Early Map Showing Fissures in the Quartzite — Envelope X

ACKNOWLEDGMENTS

Applicant is indebted to the following individuals for providing reports, maps, assays, shipments and a wealth of other pertinent information for his use in compiling the information contained in this application.

Mr. Stephen R. Wilson, Supervising Mining Engineer
United States Bureau of Mines
1600 East First South Street
Salt Lake City, Utah

Mrs. Edgarda W. Dugdale, Secretary
Wah Wah Mining Company
564 West Fourth North
Woods Cross, Utah

Mr. Louis W. Cramer, Consulting Geologist
(Was Examining Engineer for RFC Mining Division)
504 Atlas Building
Salt Lake City 1, Utah

Mr. William E. Young, Engineer
United States Bureau of Mines
1600 East First South Street
Salt Lake City, Utah

Mr. James A. Marsh, Chief Geologist, Minerals
Union Pacific Railroad
303 Park Central Building
Los Angeles 14, California

Mr. W. R. Landwehr, Chief Geologist
Western Mining Department
American Smelting and Refining Company
700 Crandall Building
Salt Lake City, Utah

Mr. Robert W. Osterstock, Geologist
United States Geological Survey
222 South West Temple
Salt Lake City, Utah

Mr. Earl B. Young, Chief Geologist
Combined Metals Reduction Company
218 Felt Building
Salt Lake City 11, Utah

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SECTION I

MF-103 INSTRUCTIONS Nos. 1, 2 and 3

QUESTION 1 - Name of Applicant - Trade Style

(a) The full legal name of applicant is:

James D. and Ruth T. Williams, as Joint Tenants, with right of Survivorship, and not Tenants in Common, doing business under the trade style of PINE GROVE MINES, 409 Felt Building, Salt Lake City 11, Utah.

(b)
(c) Not applicable to applicant.
(d)

QUESTION 2 - General

This application for government assistance for exploration for lead-zinc minerals is made in accordance with D.M.E.A. Order 1, as amended March 19, 1954, and issued pursuant to Section 303 (a) of the Defense Production Act of 1950, Amended. Applicant has read carefully D.M.E.A. Order No. 1, Amended, and has prepared this application in conformance therewith.

QUESTION 3 - Applicant's Property Rights

(a) Legal Description of Claims

The claims are situate in an unsurveyed portion of Township 28 South, Range 11 West, Salt Lake Base and Meridian, Pine Grove Mining District, Beaver County, Utah. A map of all claims, with a tie to a section corner of the public land survey, will be found in Envelope I at the end of this section. Also appended is a brief patent abstract of the patented claims.

Claims to be dedicated to this exploration project are as follows:

1. Four Patented Claims

January	U.S. Survey	No. 4887
Tasso	"	No. 5201
Ben	"	No. 5201
El Kallah	"	No. 5201

2. Eight Unpatented Claims

Ben No. 8	Book 21	Page 61
Reva	"	61
Ben No. 2	"	59
Reva No. 2	"	61
Reva No. 3	"	62
Keystone	"	53
Keystone No. 1	"	54
Keystone No. 2	"	54

A map of these claims will be found in Envelop II at the end of this section.

(b) Name of Property

The property has been known as the Wah Wah mine since 1937. Prior to that date the claims were held under the various corporate names of Revenue Mining Company, Utah Revenue Mines Corporation and Revenue Consolidated Mining Company, and the mine was usually referred to then as the Revenue Mine.

(c) Interest in Land

Applicant holds land under a 25 year mining lease with option to purchase.

(d) Lease and Option Agreement

A conformed copy of lease and option by and between Wah Wah Mining Company as Owner, and applicant, as Operator, will be found at the end of this section.

(e) Not Applicable

(f) Unpatented Claims - Recorded Information

The following recorded information on the unpatented mining claims is from the official mining records of the County Recorder, Beaver County, Utah.

Name of Claim	Record Reference Book	Page
Ben No. 2	21	59
Ben No. 3	21	59
Ben No. 4	21	59
Ben No. 5	21	60
Ben No. 6	21	60
Ben No. 7	21	60
Ben No. 8	21	61
Zem Zem No. 2	21	55
Zem Zem No. 3	21	56
Zem Zem No. 5	21	56
Zem Zem No. 6	21	57
Zem Zem No. 7	21	57
Zem Zem No. 8	21	57
Zem Zem No. 9	17	286
Zem Zem No. 10	21	58
Zem Zem No. 11	21	58
Zem Zem No. 12	21	58
Reva	21	61
Reva No. 2	21	61
Reva No. 3	21	62
Reva No. 4	21	62

Keystone	21	53 ×
Keystone No. 1	21	54 ×
Keystone No. 2	21	54 ×
Keystone No. 3	21	54
Keystone No. 4	21	55
Keystone No. 5	21	55
Keystone No. 6	17	453
Keystone No. 7	17	454
Keystone No. 8	17	454
Keystone No. 9	17	455
Keystone No. 10	17	455

(g) Additional Locations

It is anticipated that additional mining claims may be located by applicant, in applicant's name, as the result of the vertical stereoscopic color aerial photography and base geologic map of the area resulting therefrom, as requested in Sections 3 and 4 hereunder, and in such event applicant agrees that any additional mining claims located by him in the area which benefit from this work, will be included in the list of claims to be dedicated to the project.

AFFIDAVIT

STATE OF UTAH :
) ss
County of Salt Lake:

James D. Williams and Ruth T. Williams, being first duly sworn, each deposes and says -

That they have commenced and it is bona fide their intention to carry on business in Salt Lake County and in Beaver County, State of Utah, under the name of PINE GROVE MINES, not incorporated.

Business address: 409 Felt Building, Salt Lake City 11, Utah.

That the above named are the sole and only members of said organization, and the proprietors and owners of the business above designated.

This affidavit is to be filed in Salt Lake and Beaver Counties, State of Utah, and is made in compliance with Title 42, Chapter 2, Section 42-2-1, Utah Code Annotated, 1953.

WITNESS the due execution hereof by each said member this 20th day of February, 1956.

James D. Williams
James D. Williams

Ruth T. Williams
Ruth T. Williams

Subscribed and sworn to before me this 20th day of February, 1956.

H. Van Dam
H. Van Dam
Notary Public
Salt Lake City, Utah

My Commission Expires:
September 7, 1956.

MAR 26 1956

AGREEMENT

THIS AGREEMENT made and entered into in duplicate this 19th day of November, 1955, by and between Wah Wah Mining Company, a corporation under the laws of the State of Utah, hereinafter referred to as company, and James D. Williams and Ruth T. Williams, as joint tenants with right of survivorship, and not tenants in common, hereinafter referred to as operator,

WITNESSETH:

Recitals

The property the subject matter of this agreement, situate in the Pine Grove Mining District, Beaver County, Utah, consists of twenty-two patented lode mining claims, thirty-two unpatented lode mining claims, with buildings, materials and machinery situate thereon, water and water rights (including the Tasso workings and shaft 200 feet deep); also including all the right, title and interest of the company in Applications to Appropriate Water numbered 15634 and 15582, including all extensions thereof, on file in the office of the Utah State Engineer.

The twenty-two patented lode mining claims are as follows -

✓January	U.S. Survey No. 4887
✓Revenue Mine	"
✓Eldorado	"
✓Iron Duke	"
✓Parrington	"
✓Lafayette	"
✓Turo (TYRO?)	"
✓Charmion	"
✓Heber	"
✓Buckbee	U.S. Survey No. 4195
✓Buckbee No. 2	"
✓Cliff	"
✓June	"
✓Tasso	U.S. Survey No. 5201
✓Ben	"
✓Elkallah	"
✓Zemzem	"
✓Queen	U.S. Survey No. 4815
✓Midway	"
✓Southside	"
✓Ben Hur	"
✓Sapho	"

Map #2

The thirty-two unpatented lode mining claims are as follows -

Name of Claim	Record Reference Book	Page
Ben #2	21	59
Ben #3	21	59
Ben #4	21	59
Ben #5	21	60
Ben #6	21	60
Ben #7	21	60
Ben #8	21	61
Zem Zem #2	21	55
Zem Zem #3	21	56
Zem Zem #5	21	56
Zem Zem #6	21	57
Zem Zem #7	21	57
Zem Zem #8	21	57
Zem Zem #9	17	286
Zem Zem #10	21	58
Zem Zem #11	21	58
Zem Zem #12	21	58
Reva	21	61
Reva #2	21	61
Reva #3	21	62
Reva #4	21	62
Keystone	21	53
Keystone #1	21	54
Keystone #2	21	54
Keystone #3	21	54
Keystone #4	21	55
Keystone #5	21	55
Keystone #6	17	453
Keystone #7	17	454
Keystone #8	17	454
Keystone #9	17	455
Keystone #10	17	455

Zem Zem #4?

Each of said claims is described by metes and bounds in location notice thereof of record as above indicated, in the office of the County Recorder of Beaver County, Utah, reference to which record is hereby made for such description.

With reference to the aforesaid patented mining claims company represents and warrants that it has good and marketable title thereto free and clear of all liens and incumbrances of every kind and character, except -

1. Company obtained an R.F.C. mining loan in October, 1942, in the amount of $20,000, with interest at 4% per year; that a portion of said loan was retired by company through the purchase of certain equipment from the joint R.F.C. account, and that the balance of said loan plus accrued interest may be payable from ores which may be produced from said claims

R.F.C Loan

X

by operator. Operator accepts this contingency, and, in the event payment is so made to R.F.C., operator shall have the right to treat monies so paid either as capital funds or operating expense pursuant to Section 13, hereunder; such election to be at the sole option of the operator. Operator is given the express right, if he should so desire, to settle such claim as R.F.C. may have against company, direct with R.F.C. on the best terms operator may deem available, and, in such event, company agrees to lend all assistance possible toward that end. A copy of said R.F.C. loan agreement is attached hereto for reference.

2. Company, in December, 1940, entered into an agreement with certain Cattlemen and Ranchers, a copy of which is attached hereto for reference, by which said Cattlemen and Ranchers reserved certain rights to the use of buildings, water and surface grazing, provided such did not interfere with camp, mining and/or milling operations. Operator accepts said specific reservations and agrees to comply with the same.

3. Certain cash advances, totalling approximately $18,500, have been made from time to time, by individuals to the company for the purpose of paying taxes and assessments, performing annual assessment work and recording proof thereof, purchase of equipment, etc., all as set forth in the schedule attached hereto, and operator agrees to repay said advanced money from 30% of the first proceeds of ores which may be extracted and sold from said claims by operator. Said payment to be made direct to company by operator and company shall thereafter distribute such receipts to said individuals on a pro rata basis. In the event of such payment operator shall have the right to treat monies so paid either as capital funds or operating expense pursuant to Section 13, hereunder; such election to be at the sole option of the operator.

With reference to the aforesaid unpatented lode mining claims the company represents that it is in lawful possession thereof; that a valid discovery was made upon each claim and annual assessment work as required was done upon or for the benefit of said claims for all years prior to July 1, 1955, and proof of labor in such behalf has been duly recorded.

The parties hereto desire to enter into this agreement to provide the operator a period of time for the examination of said properties; a period for exploration; a period for development; a period for the conduct of mining operations, and for an option to purchase said properties.

NOW THEREFORE, in consideration of the premises as recited, of the sum of Ten Dollars paid by operator to the company, and of the terms, conditions and covenants herein stated to be kept and performed by the parties respectively, it is agreed -

Section 1. Definition of Terms

(a) The term, the property, the subject of this agreement, shall include all property, real, personal and mixed, tangible and intangible, owned or controlled by company, located upon or relating to or used in connection with the above described mining claims, and shall include all after-acquired property and rights of the same nature.

(b) Examination period shall mean the period commencing with the date of this agreement and ending not more than ninety days thereafter.

(c) The term exploration period shall mean the period commencing at the end of the examination period and ending not more than two hundred seventy days thereafter.

(d) The term development period shall mean the period commencing at the end of the exploration period and ending not later than December 31, 1958.

(e) The term mining period shall mean the period commencing at the end of the development period and ending on December 31, 1980.

Provided that any such period shall in any event terminate upon relinquishment of rights under this agreement by the operator as hereinafter provided.

Section 2. Option to Purchase

As a part of the consideration for this agreement the company hereby sells to operator the option to purchase during the calendar year 1980, all of the properties the subject of this agreement, for the sum of $300,000, current lawful money of the United States of America, provided this agreement shall be in full force and effect on January 1, 1980; and provided further, that operator shall make such total payment in full to company during said calendar year 1980.

Section 3. Examination, Exploration Development and Mining

(a) Examination Period

Operator shall have the right of entry into and occupation of said property for a period not to exceed ninety days from the date hereof in which to make such examination thereof as operator may desire.

(b) Exploration Period

If operator remains in possession of said property after the termination of the examination period, then operator shall commence exploration of said properties by methods of his own choosing. Operator agrees, however, as a minimum work requirement during this period to conduct aerial photography of said properties and drill at least one diamond drill hole to a depth of not less than 500 feet below the surface. The location of said drill hole shall be selected solely by the operator.

Work Rec. 31, 1958

(c) In the event operator remains in possession of said properties after the end of the exploration period, then operator shall commence actual physical development of said properties, consisting of not less than 100 man shifts of work per month upon or for the benefit of said properties. Each man shift shall mean a day's work for one man consisting of the number of hours current in the industry as constituting a day's work. Provided, that all man shifts of work performed in excess of such monthly requirement shall be cumulative and carried forward from month to month and year to year as an accumulated credit to be applied against the monthly minimum above set forth; the provisions of this subsection shall

be fully satisfied when 2500 man shifts of work shall have been performed. Provided further, that during the development period the equivalent value of alterations, additions, improvements and/or surface and/or underground exploration which may be done, or caused to be done by the operator, on or for the benefit of, said properties, and all underground and surface engineering, geology, aerial photography, sampling, assaying, diamond drilling, road work, and map making (full reports of which shall be furnished by operator unto company), shall be accepted pro tanto in lieu of the equivalent value of said man shifts of work; said man shifts of work to be taken into account for the purpose of such calculation at the rate of Fifteen ($15.00) Dollars per day. All such beneficial work done, or caused to be done, on said properties by operator during said development period shall constitute man shifts of work applicable under the provisions of this subsection. If, at any time during or at the conclusion of the development period, operator, in his sole opinion, determines that such development work has demonstrated the existence of substantial ore reserves which may be extracted and marketed at a profit, and so notifies the company in writing prior to December 31, 1958, then the continuing operations, as contemplated by this agreement, shall thereafter be conducted as mining period operations as set forth in the subsection next following.

(d) Mining Period

It is anticipated by the parties hereto that when operator has performed the minimum exploration and development work as contemplated under Section 3, subsections (b) and (c) above, sufficient information shall have been adduced to permit operator as an experienced mine operator, to determine whether or not the properties may then be placed upon profitable operations. In the event operator so decides in the affirmative, and so notifies company as provided herein, then operator agrees to do all things reasonable and necessary to place properties in profitable operation in accordance with accepted mining practice and within a reasonable period of time after January 1, 1959, and to pursue such program continuously and with diligence. It is the intent of the parties hereto that by so performing under Section 3, subdivisions (b) and (c), hereunder, operator shall have earned the right to continue said operations during the mining period solely on the basis of performance indicated by economic conditions and accepted mining practice. Operator agrees to exercise his best judgment in conducting said operations during said mining period in order that such operations may produce an economic return to the parties hereto. It is further understood and agreed by and between the parties hereto that all expense of operation during the mining period shall be for operator's account, or the joint profit account as set forth in Section 13, hereunder, and that company shall not be requested nor required to furnish any funds whatever.

(e) All such examination, exploration and development work, and all alterations, additions and/or improvements, shall be carried out at the sole cost and expense of the operator; and during the examination, exploration and development periods operator may install, replace, renew and remove, without limitation (except in event of physical damage to properties of company by such removal), any and all of his own buildings, improvements, machinery, equipment, materials and supplies.

Section 4. Status of Operator

During the examination, exploration and development periods the operator shall be deemed to be and shall be a licensee thereon for the purpose of examination, exploration and development, with the right to use all buildings, machinery, equipment, materials and supplies which may be found thereon and to extract and dispose of ores upon the terms and conditions hereafter set forth.

Section 5. Company Representative

Throughout the period of this agreement the company hereby reserves and shall have the right to maintain an agent and representative upon the properties. Said agent and representative may occupy any one of the presently existing buildings on said properties and shall be allowed free access to all portions of said properties for the purpose of investigating and reporting unto company the work being conducted by the operator.

Section 6. Taxes and Assessments

The company represents that all taxes on said properties have been paid to date. The operator agrees that he will pay any and all such taxes which may be levied during the current year 1955-1956, as and when due and payable, and any and all other taxes and assessments levied and/or assessed during the period of this agreement; subject, however, to the right of the operator as herein provided to terminate this agreement and relinquish the premises. If this agreement is so terminated and the premises are so relinquished, then such taxes and/or assessments prorated to the elapsed period in which operator was in possession of said properties shall be deemed an expense of operation for such elapsed period and shall be borne and paid by the operator, and the balance of such taxes and/or assessments shall be borne and paid by the company.

Section 7. Annual Assessment Work

Company represents that all annual assessment work has been performed upon the thirty-two (32) unpatented quartz lode mining claims for years prior to July 1, 1955, and proof thereof has been duly recorded. In the event operator remains in possession of said properties after the end of the examination period, operator agrees to perform, and record proof thereof, annual assessment work for the period July 1, 1955, to June 30, 1956, and thereafter for any assessment period year in which he is in possession of said properties at the close of the calendar year; i.e., December 31.

Section 8. Operating Expenses

All maintenance and operating expenses incurred by the operator shall be borne and paid solely by him and he agrees to indemnify and defend company and said properties from and against all liability, claims, demands and liens growing out of or resulting from obligations incurred or other acts in such maintenance and operation.

Section 9. Damage to Properties

Operator shall indemnify company against and hold it harmless from any loss or damage to said properties, caused or contributed to, directly or indirectly, by the negligence of operator, his servants, agents, employees, licensees and/or sub-contractors.

Section 10. Labor and Material Liens

Operator shall indemnify and defend company and said properties against and hold them and each of them harmless from all mechanic's and materialmen's liens by reason of operations of operator upon said properties; it being further understood and agreed that company reserves, and at all times shall have the right, to post upon said properties in such places and/or positions as it may elect nonresponsibility notices, but any failure to post said notices and record same shall in no respect relieve the operator from his obligations hereinabove set forth to protect the company and said properties from such liens.

Section 11. Income and Other Tax Liens

Operator shall indemnify and defend the company against and hold it harmless from any and all liability, claims, demands or liens upon said properties by reason of nonpayment by the operator of (a) any Income Taxes, Federal or State; (b) any so-called Social Security and Unemployment Insurance Taxes, Federal or State; (c) any Sales and/or Use Taxes, and (d) any and all other taxes, assessments, premiums and charges upon or against the operator or in connection with his operations (except as otherwise specifically provided in the concluding sentence of this section). All Sales taxes upon the sale of ore and/or concentrates, and any severance taxes, mineral rights taxes, net proceeds taxes, occupation taxes, taxes upon ore mined, moved or blocked out, or other taxes of a similar nature, shall be paid by the operator, but (notwithstanding the foregoing provisions of this section) the amounts thereof shall be taken into account as a deduction in calculation of net profit, under the provisions of Section 13 hereof.

Section 12. Compliance with Laws

In his operations upon said properties, and in particular in connection with Workmen's Compensation on account of injuries to employees arising out of and in the course of their employment, operator shall fully and faithfully comply with all laws, ordinances, rules and regulations of competent governmental authority governing such operations or pertaining thereto.

Section 13. Royalties-Profit Sharing
Return of Capital

(a) In lieu of the payment of rental based upon a percentage of net smelter and/or mill returns, the parties hereto agree that such rental payment from operator unto company shall be on a profit-sharing basis during the term of this agreement in order that all mining operations hereunder may be conducted by operator in such manner as to allow the free play of natural economic forces; to provide an incentive for the mining of lower

grade ores which operator might not otherwise deem economic to so extract and market under a percentage of net smelter and/or mill return rental; and to provide funds from the joint profit account for further exploration and development which might not otherwise be economically attractive to operator; provided that any exploration or development work undertaken by operator which shall be a charge against the joint profit account must first be approved by an authorized representative of the company. Company hereby appoints James A. Marsh as such authorized representative. Company may, at any time, change said representative upon written notification to operator as herein provided for written notices.

(b) During the term of this agreement operator shall pay unto company as rental on company properties, thirty (30) percent of annual net operating profits resulting from mining operations conducted by operator on company's properties, after first deducting all expenditures made by operator on said properties during the examination, exploration and development periods. All such expenditures made, or advanced, by operator during the mining period shall be for the joint profit account of the parties hereto and shall automatically be taken into account as a deduction from operating income, and payable to operator, before calculating net profits for the purpose of this section. Any net loss resulting from operator's operations hereunder shall be borne exclusively by operator, but such net loss shall be carried forward from year to year as a charge against the joint net profit account and a credit to account of operator.

(c) Net profit, as the term is used herein, shall be ascertained as follows: Gross income shall consist of receipts from all sources, including net smelter and mill returns on ores extracted and marketed. Net smelter and mill returns shall mean gross returns less transportation, treatment, assaying and sampling charges. From the gross income there shall be deducted all of operator's capital investment in operations, which shall include but shall not be limited to the entire costs of exploration, development and mining operations, payments made by operator for account of company as set forth under "Recitals", paragraphs 1 and 3, the cost of all labor, supplies, equipment, buildings, roads, power supply and materials furnished, property taxes and taxes on production (but excluding income taxes), industrial insurance premiums and Social Security contributions, other insurance premiums, supervision, engineering, geology, management, and overhead expense directly attributable to said operations. Provided, however, that said overhead expenses shall not exceed 10% of gross expense of operation. The remainder is net profit which shall be distributed annually, thirty (30) percent to company and seventy (70) percent to operator.

Section 14. In Event of Title Litigation

In case any action or special proceeding is brought, at law or in equity, or otherwise, in any court or in any governmental department, asserting title to the properties covered hereby, or any interest therein, in hostility to the company, then, during the pendency of any such action or proceedings and until final decision thereof, unless the company shall indemnify the operator, the operator may discontinue operations on said properties and the periods as defined and specified in Sections 1, 2 and 3 hereof shall be extended accordingly, or if operator elects to continue operations of said properties, may deposit the company share of annual profits

in the Milford State Bank, Milford, Utah, to the joint account of the parties hereto, to be paid to company in the event it is successful in said litigation; and in the event it is not, then subject to such disposition as a court of competent jurisdiction may make of same. It is understood between the parties that the foregoing provision shall not be an exclusive election on the part of the operator and shall not operate to vitiate any other cumulative remedy or remedies which may be available to operator.

Section 15. Forfeiture Provisions

Upon any failure or default by the operator in any of his obligations hereunder (except the payment of money as herein provided), and his failure to commence rectification thereof within thirty (30) days after receipt of written notice from the company so to do and his further failure to carry out such rectification diligently and continuously thereafter until such default is remedied, then at the option of the company this agreement shall forthwith cease and determine, and all rights of operator in, to and upon the properties covered hereby shall be at an end. Upon any failure or default by the operator in the payment of company share of operating profits unto company, as herein provided for, and the failure to remedy the same within twenty (20) days after written notice from the company so to do, then at the option of the company this agreement shall forthwith cease and determine, and all rights of operator in, to and upon the properties covered hereby shall be at an end.

Section 16. Strikes, Fires, Floods or Acts of God

In the event operations of operator are suspended by reason of the elements, accidents, fires, floods, slides or other catastrophe, or by acts of God or other cause (whether similar or dissimilar to the foregoing) beyond the control of the operator, such suspension, if operator shall exercise reasonable diligence in overcoming the results thereof and resume operations as soon as reasonably possible, shall not be the cause for forfeiture of the rights of operator under the provisions of this agreement; and in any such event the periods specified in Sections 1, 2 and 3 of this agreement shall be extended for a reasonable period, conforming to the time necessary to overcome the effects thereof. Prompt notice in writing shall be given by operator unto company of any such element, accident, strike, fire, flood, slide or other catastrophe or act of God beyond the control of the operator.

Section 17. Unprofitable Operations-Suspension

At any time after operator has completed the minimum work required under the examination, exploration and development periods, as specifically set forth in Section 3 herein, operator may suspend operations on said properties under this agreement in the event that such operations become economically unprofitable because of low metal prices, lack of market, material decrease in grade of ore available for mining, excessive labor, supply, hauling, freight, treatment charges or other costs; it being the express intent of the parties hereto that operator shall be relieved of conducting unprofitable operations whenever such operations may result from causes beyond the control of the operator. Such suspension shall not be the cause of forfeiture of the rights of operator under the provisions of this agreement; and in any such event the option period and mining period, as defined

herein, shall be extended for a reasonable period conforming to the elapsed time of any such suspension. Prompt notice in writing shall be given by operator unto company of any such suspension of operations and shall be accompanied by a statement setting forth the justification of said suspension. Provided, however, that operator shall pay, or cause to be paid, any and all taxes upon said properties, and shall perform, and record proof thereof, the annual assessment work upon the unpatented claims, during any such period of suspension of operations.

In the event of a dispute between company and operator over the provisions of this section, the parties hereto expressly agree to have such dispute arbitrated by a board of three arbitrators, one of whom shall be selected by company, one by operator, and a third by the two so selected. A majority decision of said board of arbitration shall bind the parties hereto. All expenses of such arbitration shall be borne equally by said parties.

Section 18. Relinquishment by Operator and Removal of his Property

Should operator elect at any time during the term of this agreement to terminate his rights and privileges and subsequently accruing duties and obligations hereunder, he may do so upon notice in writing to the company. In any such event or in event of forfeiture or other termination of this agreement he may, and within sixty (60) days after receiving written notice from the company so to do, he shall commence the removal from said premises of all property placed thereon by him which may be removed without physical damage to the properties of the company, and thereafter the operator shall prosecute said removal continuously and with diligence until all of his said property has been removed; provided that upon any such relinquishment or other termination of this agreement, operator shall pay, or cause to be paid, to the company such (if any) unpaid share of profits as the company may be entitled to under the provisions hereof; provided, that any such property which may have been purchased or paid for by the joint profit account shall be accounted for by operator unto the company, and should operator wish to remove same he shall first pay to company 30 percent of the original cost of said property less depreciation.

Section 19. Notices

All notices herein provided for and all statements to be given by either party to the other shall be in writing, sent by registered or certified United States mail, postage prepaid, return receipt requested, addressed as follows -

Company

Wah Wah Mining Company
James H. Dugdale
R.F.D. Box 569
Woods Cross, Utah

and

James A. Marsh
11005 Wrightwood Place
North Hollywood, California

With copies by regular mail to:

D. A. Skeen
1501 Walker Bank Building
Salt Lake City 1, Utah

and

Edward F. Richards
1007 Walker Bank Building
Salt Lake City 1, Utah

Operator

James D. Williams
409 Felt Building
Salt Lake City 11, Utah

Either party may change the address to which such notices and statements are to be mailed by giving written notice thereof as provided in this section.

Section 20. Remittance to Company by Operator

Rental payment due company hereunder shall be calculated upon annual profits based upon the calendar year. Operator shall prepare an annual report of operations and a preliminary profit (or loss) statement annually and shall submit same to company not later than thirty (30) days after the close of the calendar year for which said statement shall be due, and shall enclose therewith a payment to company equal to seventy-five (75) percent of the profits as may be due company based upon said preliminary statement. Operator shall then have an additional thirty (30) days thereafter in which to prepare a final profit (or loss) statement for the annual calendar period involved, and shall submit this final statement to company together with the remaining balance of profits which may be due company for said period. Company shall accept or reject this final statement within thirty (30) days after receipt thereof. If not so rejected it shall thereupon be deemed to have been accepted by company and final as between the parties hereto.

Should a dispute at any time arise between the parties hereto as to net operating profits, capital expenditures or any matter of accounting, such dispute shall be referred to the firm of Wells, Baxter and Miller, Certified Public Accountants, Salt Lake City, Utah, for determination. The decision of said accounting firm shall be final and binding upon the parties hereto. In the event for any reason said firm shall be unable to act, an impartial umpire to decide such dispute shall on petition of either party, be appointed by any court of competent jurisdiction.

Section 21. Company Right to Inspect Books, Records, Accounts & Maps

All books, records, accounts and maps of operator, his successors and assigns, pertaining to the maintenance and operation of said properties, including sales or other disposition of ores therefrom, the number of man shifts of work performed on the properties, capital expenditures, and tax payments, shall at all times be open to inspection and audit by any designated representative of the company. Operator

agrees to provide company with a summary of operations being conducted on an interim quarterly basis.

Section 22. Transfer by Operation of Law

In the event of any transfer by operation of law of the interests of operator under and pursuant to this agreement, this agreement and all rights of operator and any such transfereee by operation of law, shall at the option of the company terminate one year after any such transfer; subject, however, to the right of the operator within said one year period to obtain a retransfer to him and to proceed with the performance of his obligations hereunder.

Section 23. Relationship of the Parties

It is expressly agreed, understood and declared by and between the parties hereto that their legal relationship is and shall continue to remain that of lessor and lessee, and not that of employer and employee, partners and/or joint adventurers; that said operator is customarily engaged in the independent established trade, occupation, profession and business of mining under lease for his own profit and benefit.

It is further agreed and understood between the parties hereto that operator may make application to Defense Minerals Exploration Administration or other Governmental agency or agencies for financial or other assistance to accomplish the work program herein contemplated, and, in the event operator so does, company shall do all things reasonable and necessary which may be required on the part of the company, as owner of the mining claims, to give its consent to any such assistance to operator pursuant to the rules and regulations of the Governmental agency or agencies involved.

Section 24. Successors and Assigns

Subject to the provisions of Section 22, hereof, this agreement shall be binding upon and inure to the benefit of the respective heirs, administrators, executors, successors and assigns of the parties hereto; provided, however, that no assignment or transfer of any rights, privileges, duties or obligations herein contained shall be effective for any purpose until and unless prompt written notice thereof shall be given to the other party; and provided further, that operator shall not assign this agreement to any party having less financial responsibility than operator.

IN WITNESS WHEREOF this agreement is executed in duplicate original counterparts on the date herein first written.

WAH WAH MINING COMPANY
By
James H. Dugdale -s-
Its President

Attest:

Edgarda W. Dugdale -s-
Its Secretary

James D. Williams -s-
James D. Williams

Ruth T. Williams -s-
Ruth T. Williams

STATE OF UTAH :
) ss
County of Salt Lake:

On this 19th day of November, 1955, personally appeared before me, Wood R. Worsley, a Notary Public in and for Salt Lake County, State of Utah, James H. Dugdale, who being by me duly sworn, did say that he is the President of Wah Wah Mining Company, and that the foregoing instrument was signed in behalf of said corporation by authority of a resolution of its Board of Directors, and said James H. Dugdale acknowledged to me that said corporation executed the same.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal the day and year first above written.

Wood R. Worsley -s-
Notary Public in and for the
said County and State
(Seal)

My Commission Expires:
March 18, 1958

MINUTES OF BOARD OF DIRECTORS
OF
WAH WAH MINING COMPANY

A meeting of the Board of Directors of Wah Wah Mining Company was regularly called and held at the University Club in Salt Lake City, Utah on October 1, 1955 at the hour of 12 o'clock A.M.

The following directors were present:

Edgarda W. Dugdale
James H. Dugdale
D. A. Skeen
James A. Marsh

Waiver of notice and consent to the holding of the meeting of the Board duly signed by Edward F. Richards was presented and duly filed.

James H. Dugdale, the President, presided at the meeting.

There was a discussion concerning the terms and conditions of a proposed operating agreement to be entered into with James D. Williams and Ruth T. Williams, as joint tenants, covering the entire holdings of the Wah Wah Mining Company. Mrs. Dugdale suggested certain changes in the contract and the matter was turned over to Mr. Skeen and Mr. Marsh to work out the details thereof. Thereafter it was moved and unanimously passed that the meeting be adjourned until the 19th day of November 1955 for the purpose of passing upon and authorizing the execution of such a joint agreement when the same has been completely prepared; that at the adjourned meeting of the Board of Directors the following Resolution was unanimously adopted:

"BE IT RESOLVED that James H. Dugdale, as President, be authorized and directed to execute the agreement dated the 19th day of November, 1955 by and between WAH WAH MINING COMPANY, a corporation, and JAMES D. WILLIAMS and RUTH T. WILLIAMS, his wife, as joint tenants with rights of survivorship and not as tenants in common, covering the operation of the mining claims, both patented and unpatented, held by the Wah Wah Mining Company in Pine Grove Mining District in Beaver County, Utah, a copy of which is attached".

The following Resolution was then unanimously adopted:

"BE IT RESOLVED, that James A. Marsh be appointed to represent the company in connection with the operation of the property as is contemplated under the terms of the contract".

There being no further business the meeting was adjourned.

James H. Dugdale

Sarah H. Dugdale

D. A. Keegan

James A. Marsh

Edward T. Richards

TELEPHONE
22-0531

CLARENCE R. HAGEN
MINING ENGINEER
218 FELT BUILDING
SALT LAKE CITY, UTAH

MINERAL SURVEYOR
AND GEOLOGIST

December 30, 1955

Mr. J. D. Williams
Pine Grove Mines
409 Felt Building
Salt Lake City, Utah

Dear Mr. Williams:

At your request, an investigation of the patent records of the Pine Grove Mining District, Beaver County, Utah, was made. The following factual data was obtained.

Survey No. 4195 Consists of 4 patented lode mining claims: Buckbee, Buckbee No. 2, June and Cliff lodes. Patent was issued June 21, 1901. ME. 2817, MA. 3053. Embraces 82.548 acres.

Survey No. 4813 Consists of 5 patented lode mining claims: Sapho, Ben Hur, Southside, Midway and Queen lodes. Patent was issued May 3, 1904. ME. 3221, MA. 3491. Embraces 103.04 acres.

Survey No. 4887 Consists of 9 patented lode mining claims: January, Revenue Mine, Eldorado, Iron Duke, Parrington, Lafayette, Heber, Charmion and Tyro lodes. Patent was issued November 19, 1904. ME.3435, MA. 3654. Embraces 179.689 acres.

Survey No. 4888 Consists of 9 lode locations: Laviste, Revenue No. 3, Tex, Juno, Miss Q, Clements, Burton, Ryanand Beth lodes. These claims were never patented. They extend from the January lode southerly to the Sapho lode. It may be, possible that this survey could be utilized following proper proceedure. Part of the lands embraced in this survey have been relocated under other names.

Survey No.5201 Consists of 4 patented lode mining claims: Tasso, Ben, El Kallah and Zemzem lodes. Patent was issued May 16, 1905. ME. 3579, MA. 3835. Embraces 80.922 acres.

In all, there are 22 patented lode mining claims embracing an area of 446.199 acres in the district.

Very truly yours,

C. R. Hagen

C. R. Hagen

crh/rh

NATIONAL

23-280
4780 SI
Colored Tabs

23-281
4781 SI
Clear Tabs

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NATIONAL INSERTABLE-TAB INDEXES ENABLE YOU TO MAKE YOUR OWN SUBJECT ARRANGEMENT, USING PLAIN INSERTS ON WHICH TO WRITE YOUR OWN CAPTIONS.

RECEIVED
MAR 26 1956

QUESTION 4 - Physical Description

(a) History and Past Operations

The Pine Grove mining district was organized in 1873, but remained idle until the district was reorganized in 1879. Commencing about 1881 the district was worked by the holders of individual claims and an unknown tonnage of lead-silver-gold ore was shipped from the richer surface exposures of fissure ore in the quartzite. The first serious attempt to explore and develop the district was started about 1900 when the Revenue Mining Company consolidated some 46 claims under one ownership and began what at that time was considered a systematic mining program. Considerable exploration was accomplished in the quartzite area on the gold-silver-lead fissures and a number of longer tunnels were driven to open these fissures at greater depth. It is known that some high grade ore was shipped but records of any such shipments do not exist. During the next thirty-odd years several corporate reorganizations were made and further work was done in the quartzite. However, during the latter part of this period efforts were directed toward the replacement ore discovered in the limestone area of the Tasso shaft and considerable exploration was accomplished.

Little or no financial success attended these early efforts, and, as has been the case in numerous other early Western mining districts, interest waned and the property was finally sold for taxes. Such a tax purchase was made by one Lafayette G. Burton, who had been the surveyor for the last company owning the claims; i.e., the Utah Revenue Mines Corporation, and after perfecting title, sold the property to one R. C. Dugdale. Mr. Dugdale spent several years exploring the area, and, after satisfying himself of the possibilities of the district, organized the present Wah Wah Mining Company in 1937.

The Wah Wah company conducted active exploration and development operations on its own account, concentrating such work in the area of the Tasso shaft. For the period 1937-1940 it expended some $48,000 on the property and was successful in developing several substantial ore bodies. The mine was idle during portions of 1941 and 1942 because of lack of finances. In November, 1942, the United States Bureau of Mines started a project as the result of its War Minerals Examination and Report. This project was recessed in February, 1943, before the Bureau's objective was reached. In October, 1942, an R.F.C. loan was granted to Wah Wah. Work under this loan started in March, 1943, and funds were fully expended by November, 1943, at which time the Bureau of Mines instituted a diamond drilling program. The combined efforts of the Bureau and Wah Wah (thru R.F.C.) resulted in the exposure of some 38,500 tons of oxide zinc ore, 13,000 tons of sulfide lead-zinc ore and 26,900 tons of oxide lead-silver ore. The result of the Bureau work was published in Report of Investigations, No. 3853, in April, 1946. A copy of this report will be found at the end of this section. Copies of the Bureau of Mines plans and sections of the Tasso working will be found in Envelope III at the end of this section.

Maybe ore labeled

During 1945 mining was confined to shipping the zinc carbonate ore from the 200 foot level of the Tasso shaft under the Premium Price Plan. Operations were suspended by Wah Wah in the fall of 1945, and the property has remained idle to date. The applicant first became interested in the mine in the spring of 1944 when he loaned his crew from the Harrington mine at Milford, to Wah Wah to assist in catching up and timbering the 200 level station of the Tasso shaft. During subsequent years applicant has made a careful study of the property and made serious efforts in 1951, 1953, and 1954 to secure the property under a favorable contract of lease and option to purchase. Finally, negotiations which were started in February, 1955, were productive of a signed contract on November 19, 1955.

There are no usable mining facilities on the property. Equipment has all been removed or stolen and the Tasso shaft is badly caved from the surface. A few buildings in camp might be rehabilitated if such were indicated in the future.

(b) Production - Ore Reserves

Records of production prior to 1937 are not available and applicant has found no basis upon which to make any approximation. There can be no doubt, however, that high grade gold-silver-lead ore was shipped.

Production since 1937 was as follows (compiled from original smelter settlements) -

		Assay				
Year	Tons	Gold	Silver	Lead	Zinc	
1938-39	925.8	0.07	8.0	11.0		(Oxide Pb)
1943-44	239.6	0.02	2.4	4.2	4.4	(Sulfide Pb-Zn)
1945	1392.0	-	0.50	-	13.1	(Carbonate Zn)
	70.5	0.14	2.80	2.3	7.6	(Sulfide Pb-Zn)
	46.5	.04	5.70	8.9	-	(Oxide Pb)
	2674.5					

Ore reserves have been estimated by the Bureau of Mines as follows -

Oxide Ore				
Zinc Carbonate	38,500	Tons	8.21% Zinc	0.5 oz Silver
Lead Carbonate	26,900		10.5 % Lead	8.1 oz Silver
	65,400	Tons		
Sulfide Ore				
Lead-Zinc	3,000	Tons	4.2 % Pb 4.4% Zn	2.4 oz Ag
Lead-Zinc	10,000		2.9 % Pb 2.8% Zn	2.8 oz Ag
	13,000	Tons		
	78,400	Tons		

Copies of representative settlement sheets on the several classes of ore produced will be found at the end of this section. Also attached is a copy of the War Minerals Report for 1944.

(c) Geology, Mineralization, Type of Deposit

(1) Geology

The geology of the Pine Grove district shows a striking similarity to the Eureka and Ophir, Utah, districts, 140 miles to the Northeast, and the Pioche, Nevada, district, 46 miles to the Southwest. The sedimentary rocks of the area consist of the basal quartzite overlain by shales and limestones, all of which normally strike N 20° E and dip 23° Southeasterly. The oldest exposed formation is the quartzite of Cambrian age which corresponds to the Tintic quartzite at Eureka and Ophir, Utah, and to the Prospect Mountain quartzite at Pioche, Nevada. A series of shale and limestone beds, approximately 700 feet in thickness, lie conformably upon the quartzite. These shales and limestones probably correspond to the Ophir formation at Ophir, Utah, and to the productive Pioche shale section at Pioche, Nevada. These, in turn, are overlain by a series of limestones corresponding to the Ophir limestone of the Tintic District, Utah, and the Lyndon limestone of Pioche District, Nevada. A large stock of quartz-monzonite porphyry outcrops immediately to the Southeast and cuts these sediments, and is probably the source of mineralization. Correlation diagrams of the lower to middle Cambrian formations of the Pine Grove District with the Tintic, Utah, District, Pioche, Nevada, District, and other districts in the general area, will be found at the end of this section. A Bureau of Mines topographic and geologic map will be found in Envelope IV. A geologic map covering all claims will be found in Envelope IV-A.

A strong N 70° W fault zone, with an almost vertical dip, having a width of about 150 feet, traverses the length of the property and displaces the sedimentary beds about 1000 feet horizontally and 420 feet vertically. This is called the Tasso fault. Numerous smaller faults, fractures and fissures parallel and cut the Tasso fault and these probably formed secondary passageways for the entrance of the mineral solutions into the shale and limestone beds. This faulting has apparently given splendid structural preparation to the beds. Work done to date strongly suggests that the Tasso fault has been the main channel thru which the ore-bearing solutions migrated from the quartz-monzonite porphyry to the receptive limestone and shale beds.

(2) Mineralization

The primary sulfide lead-zinc ore bodies opened on the 200 foot level of the Tasso shaft, just North of the Tasso fault, are typical replacement deposits in the limestone and black shale. It is well to mention here that the 60 foot black shale section, between the Tasso limestone and brown Pioche shale, in which the sulfide ore has replaced, has probably been misnamed since careful examination strongly suggests it to be a thin bedded shaly limestone containing an abundance of colloidal carbon and a high CaO content. This classification would correlate it to the lower productive part of the Lyndon limestone called the Prince bed at Pioche. The ore has been oxidized above the 125 foot level and consists mainly of limonite and lead carbonate (cerussite), with essentially all of the original zinc removed. The line of demarcation between the oxide and sulfide zone is sharp and suggests that the water level lowered quite rapidly after maintaining a level at, or near, the 125 foot level for a fairly long period.

Oxidation of the 200 foot level sulfide ore apparently has lagged behind the fairly recent lowering of the water level. The zinc carbonate ore body, which occurs both above and below the 200 foot level in the Tasso limestone, was probably precipitated from descending solutions coincident with the lowering of the water table. Evidence adduced from the Bureau of Mines drill holes below the 200 foot level reveals that mineralization is most intense at the lime-shale contact and within the black bed, all of which offers additional credence to the limy nature of this bed.

(3) Explorations - Reasons For

Applicant's early interest in the property was based upon the possibility of finding large replacement ore bodies of lead-zinc by exploring down dip in the Tasso limestone and the Black bed, from the Tasso shaft Easterly, toward the Lue shaft and in close proximity to the Tasso fault and lime-monzonite contact. Later, applicant recognized the striking similarity of the geology and mineralization of the Pine Grove district with the Pioche, Nevada, district. This later analogy suggested the possibility of finding substantial ore bodies in the first limestone above the quartzite within the Pioche shale section. This is known as the C.M. Bed at Pioche, and applicant has named it the Wah Wah bed locally. This Wah Wah limestone occurs approximately 100 feet above the contact of the basal quartzite and Pioche shale and is 45-50 feet in thickness. Several other limestone beds, ranging in thickness from 5-20 feet, also exist in the upper part of the shale section, and may represent other favorable horizons for ore deposition. The ability to explore this first limestone bed (and other higher beds) within the shale and in close proximity to the Tasso fault, with relatively short diamond drill holes, immediately presented itself by virtue of the exposure of a large shale section lying to the South of the Tasso shaft between the Tasso fault and the porphyry.

This concept of the geology affords the possibility of two major ore horizons; i.e., the 60 foot Black bed at the bottom of the Tasso limestone and the 45 foot Wah Wah bed near the bottom of the shale, both of which may be explored from the surface by relatively short diamond drill holes. Based upon this set of facts, applicant is of the opinion that a splendid opportunity is presented for delineating large blocks of ore at a very low exploratory cost. Such a concept forms the basis of this application.

(d) Accessibility of Project

(1) Access Roads - Distance to Shipping

The property is 58 miles Southwest of Milford, Utah, a division point on the Union Pacific Railroad. The main state highway, Utah No. 21, which runs from Milford to Ely, Nevada, passes within 18 miles of the mine. Of the 40 miles to the mine turnoff, 31 miles are oiled and the balance is scheduled for oiling during this summer. The 18 miles from U 21 to the mine is a good gravelled road. A U.S. Grazing Service gravelled road, 42 miles in length, runs Southeasterly from the mine to Lund, Utah, on the main line of the Union Pacific, where an ore-loading ramp is available. The grade of this road down Pine Valley favors the load, dropping approximately 1500 feet in elevation in the 42 miles. Past experience indicates that climatic conditions in the area permit mining and trucking operations throughout the year.

(2) Supply and Residence Points

Milford, Utah, is the main supply and residence point for the area. Most ordinary mining supplies may be obtained from the several supply houses there. Equipment and unusual supplies may be obtained from Salt Lake City by overnight motor freight. Milford has a population of about 3000 with ample housing for any foreseeable requirements and two satisfactory hotels are available.

(e) Manpower, Supplies, Etc.

Ample mining labor is available in Milford - Minersville, 13 miles East of Milford, and Beaver, 31 miles East of Milford. Applicant conducted mining operations in the Milford area from 1943 to 1948 and from 1950 to 1952 and is well acquainted with practically every available man. There will be no problem whatever in securing adequate crews.

Materials, supplies and equipment may be readily obtained either in Milford or Salt Lake City and no problem exists in such procurement. A small creek flows the year around down the canyon at the mine and there is sufficient water for all mining needs and future milling requirements. Electric power at 44,000 volts, 3 phase, 60 cycle is available at Frisco, 20 miles Northeasterly from the mine from the Telluride Power Company. Construction of a power line to connect with this source would be a relatively simple matter if, as and when indicated.

(f) Literature References

The geology and mineralization of the Wah Wah Range and Pine Grove Mining District are discussed in the following -

1. U.S.G.S. Professional Paper No. 80
   Geology and Ore Deposits of the San Francisco and Adjacent Districts
   By- B. S. Butler
   Pages 20, 25 to 27, and 90

2. U.S.G.S. Professional Paper No. 111
   The Ore Deposits of Utah
   By- B. S. Butler
   G. F. Loughlin
   V. C. Heikes
   Pages 528 and 529

3. U.S.B.M. Report of Investigations No. 3853
   Examination of the Wah Wah Lead-Zinc Mine
   Beaver County, Utah
   By- Robert L. Jones
   W. Clifford Dunham

4. U.S.G.S. Bulletin No. 945-D
Tungsten Deposits in Beaver County
War Minerals Investigation
By- S. W. Hobbs

5. U.S.G.S. Unpublished Studies
Geology of Wah Wah Range and
Pine Grove Mining District
Wah Wah Lead-Zinc Mine

R. I. 3853

APRIL 1946

UNITED STATES
DEPARTMENT OF THE INTERIOR
JULIUS A. KRUG, SECRETARY

BUREAU OF MINES
R. R. SAYERS, DIRECTOR

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REPORT OF INVESTIGATIONS

EXAMINATION OF THE WAH WAH LEAD-ZINC MINE

BEAVER COUNTY, UTAH

BY

ROBERT L. JONES AND W. CLIFFORD DUNHAM

R. I. 3853,
April 1946.

REPORT OF INVESTIGATIONS

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

EXAMINATION OF THE WAH WAH LEAD-ZINC MINE

BEAVER COUNTY, UTAH[1]

By Robert L. Jones[2] and W. Clifford Dunham[2]

INTRODUCTION

The Wah Wah mine was examined[3] by the Bureau of Mines in September, and a project was started in November 1942. Assistance was given by the Federal Geological Survey in formulating proposals and plans, and two geologists were assigned to map the surface and underground workings in October 1942.

HISTORY

The Pine Grove mining district was organized in 1873, but no work was done there until it was reorganized in 1879, after which it is reported that a little ore was shipped. The Wah Wah Mining Co. was incorporated September 2, 1937. Prior to that time, predecessor organizations had spent approximately $122,000 on the property now held by this company. The board of directors of the Wah Wah Mining Co. approved expenditure of $47,652.14 from September 1937 to June 1942 for development. This work was confined to the Tasso shaft and connecting levels. Shipments in 1939 amounted to 925.789 dry tons with a gross value of $12,477.83. This ore contained 204,130 pounds lead, 1,390 pounds copper, 7,424 ounces silver, and 65.09 ounces gold. The mine was idle from July 1941 to November 1942, when, the Bureau initiated a project to unwater the Tasso shaft and proceed with the exploratory work as outlined in the War Minerals Report.

Physical Features and Communications

The Wah Wah mine is on the west side of the Wah Wah Range, a prominent north-south mountain range that attains an altitude of approximately 9,000 feet, with an average altitude of 7,000 feet.

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 3853."

2/ Mining engineers, Salt Lake City Division, Mining Branch, Bureau of Mines.

3/ James A. Marsh, supervising engineer, Salt Lake City Division, Mining Branch, Bureau of Mines.

The mine is 58 miles southwest of Milford, Utah, the nearest supply point. There is an excellent graveled road between the mine and Milford. The United States Grazing Service has completed a new road from the Milford-Ely highway to the mine and has constructed a new road from the mine to Lund, the nearest shipping point, 42 miles away. The freight rate from Lund to Salt Lake City is $1.50 per ton, and trucking from the mine to Lund costs $2.50 per ton.

Approximately 3,000,000 board feet of timber is available in the vicinity of the mine. There is enough water in the small stream near the mine for any future milling operation.

Climatic conditions permit mining operations throughout the year.

Labor and Living Conditions

In the past, labor for mining has been available at Milford and Beaver, but at present it is difficult to find an unemployed man within a radius of 200 miles of the mine.

Board and room for a crew of about 15 men can be had at the mine.

PROPERTY OF THE WAH WAH MINING CO.

The property of the Wah Wah Mining Co. consists of 22 patented lode-mining claims and 33 unpatented claims totaling 1,080 acres and all rights and title to the application of R. C. Dugdale to appropriate 2 second-feet of water from the Pine Grove Springs and Creek. By covering this large area, the company has protected itself from litigation over the possible extension of the ore bodies. J. H. Dugdale of Milford, Utah, is vice president and general manager of the company.

GEOLOGY AND ORE DEPOSITS

The sedimentary rocks in the area consist of quartzite, limestone, and shale, which normally strike N. 20° E. and dip southwestward at approximately 23°. The oldest exposed formation is Cambrian quartzite, which corresponds to the Tintic quartzite at Eureka and Ophir, Utah, and to the Prospect Mountain quartzite at Pioche, Nev. A series of shale and limestone beds approximately 800 feet thick lies above the quartzite. These shale and limestone sediments, which probably correspond to the Ophir formation at Ophir, Utah, and to the productive beds of Cambrian age at Pioche, Nev., are in turn overlain by a great thickness of limestone. The mineralized limestone at the Wah Wah mine appears to be a part of the Ophir formation. The massive limestone probably lies stratigraphically above the Ophir formation. The sediments are cut by a rhyolite porphyry intrusion, which outcrops 1,000 feet southeast of the Tasso shaft. A strong east-west fault zone which is about 150 feet in width, known as the Tasso fault, traverses the entire length of the Wah Wah property and displaces the sedimentary beds about 700 feet. The Tasso fault and a number of smaller fractures and fissures, some paralleling and others crossing the Tasso

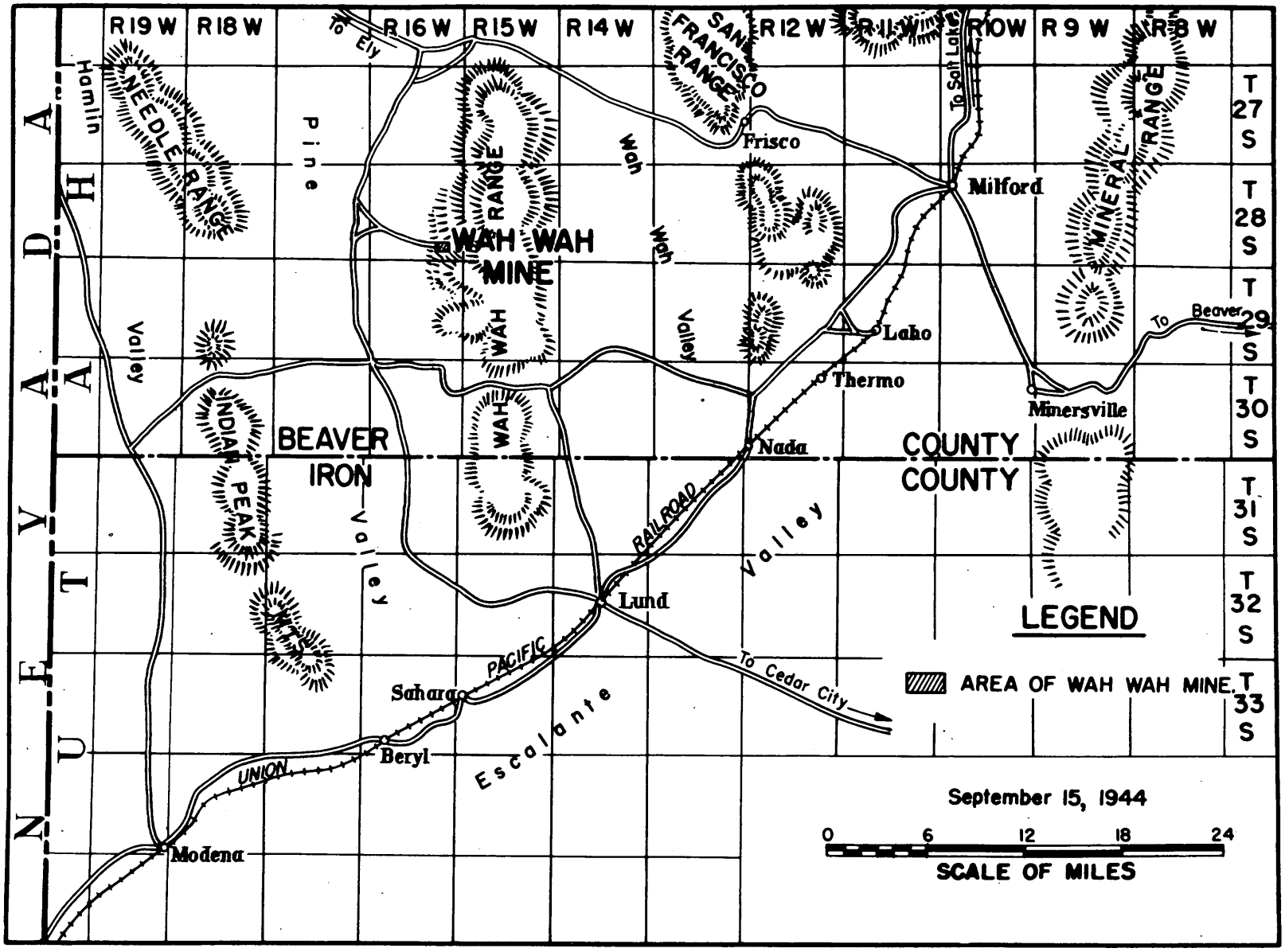


Figure 1. - Location map of Wah Wah mine, Beaver County, Utah.

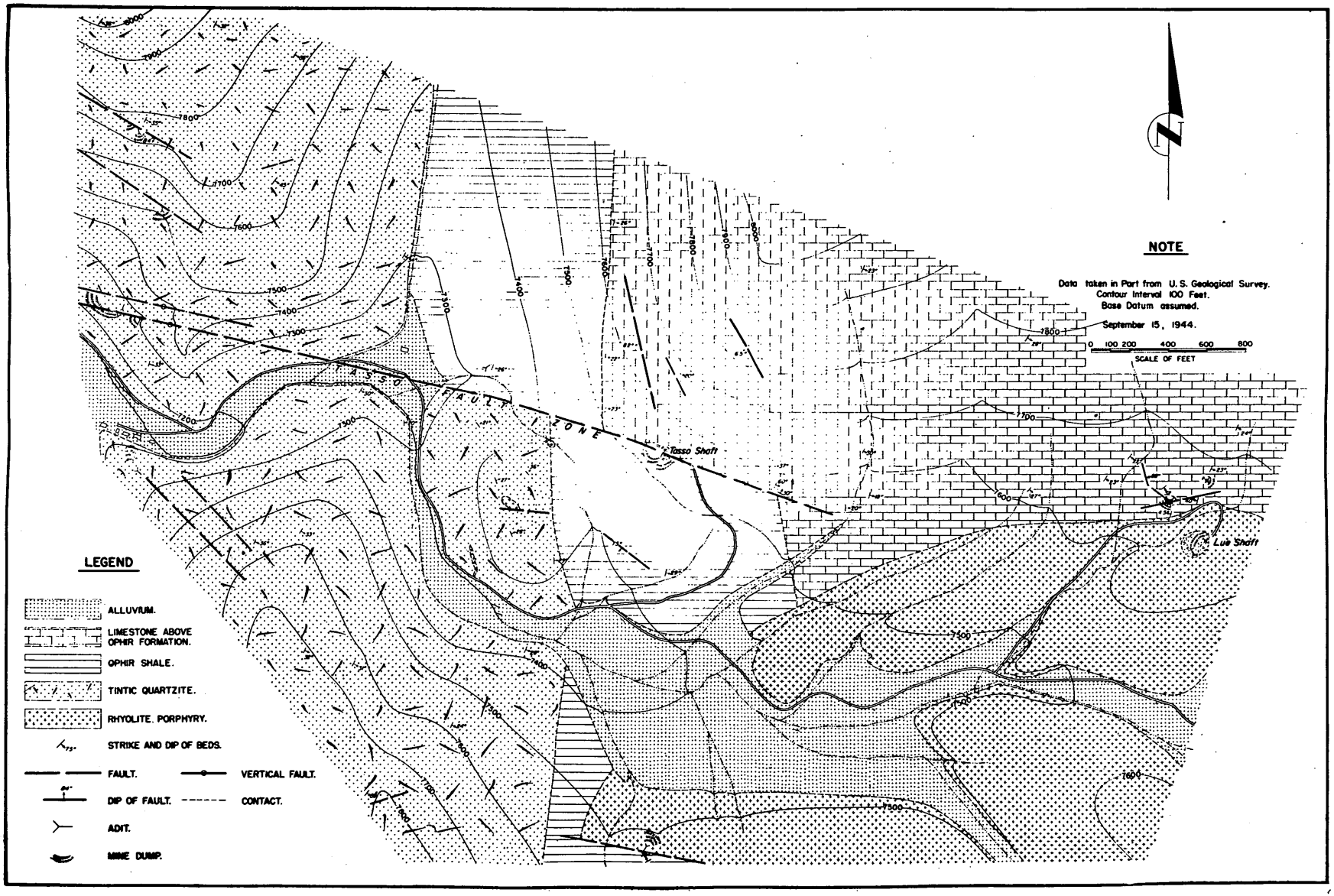


Figure 2. - Topographic and geologic map of Wah Wah mine, Beaver Countu, Utah.

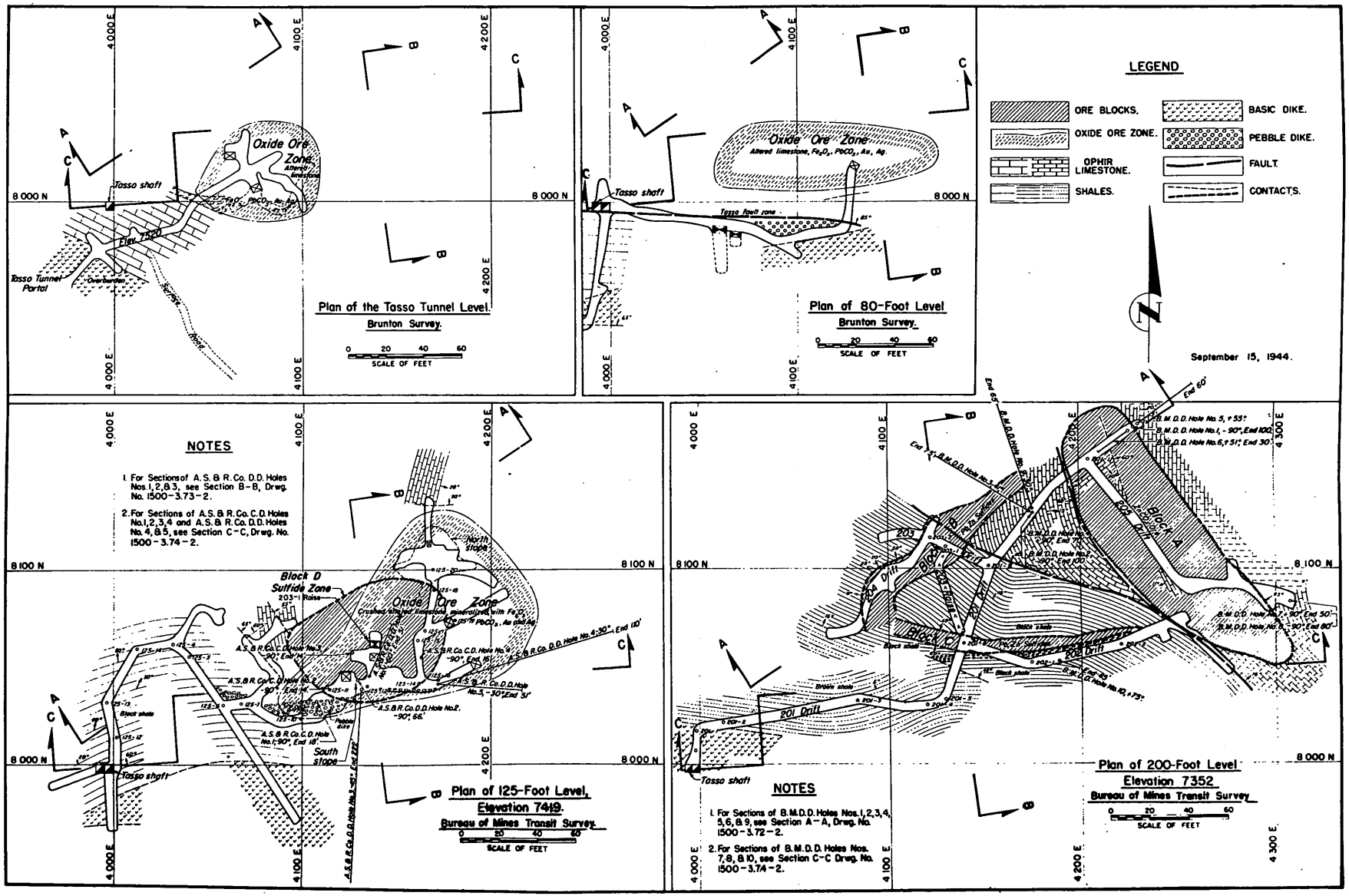


Figure 3. - Plans of Wah Wah mine, Beaver County, Utah.

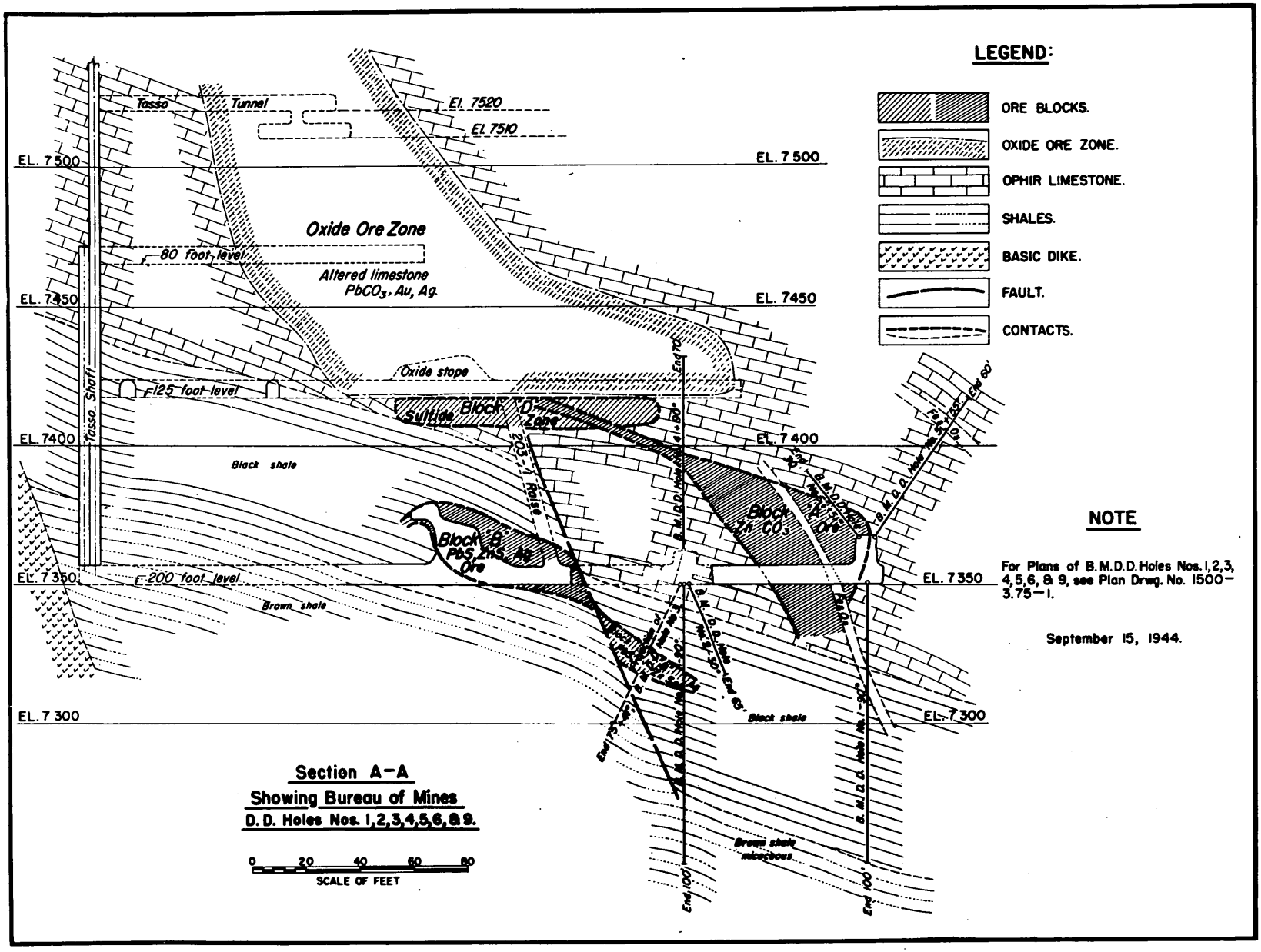


Figure 4. - Section of Wah Wah mine, Beaver County, Utah.

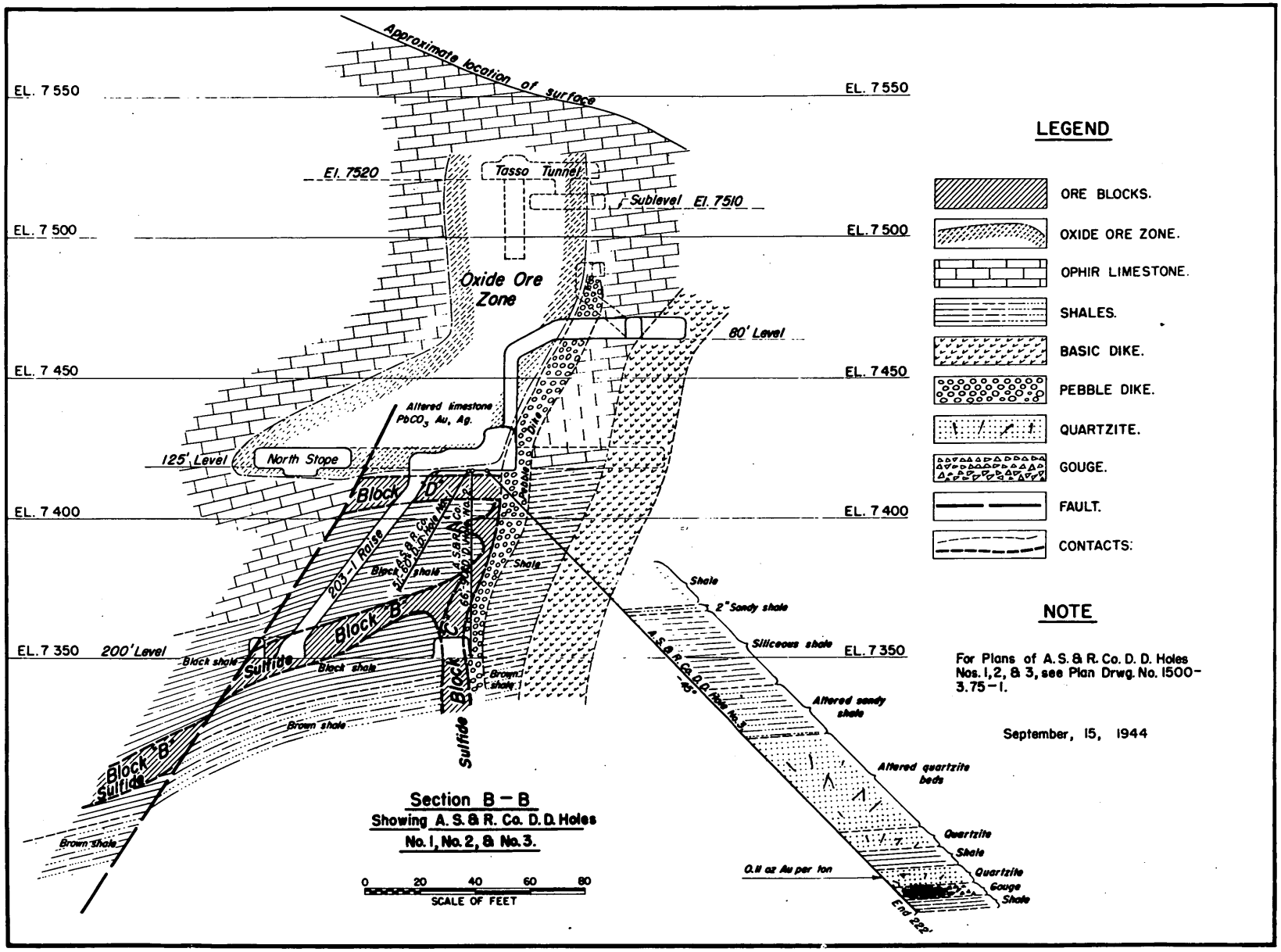
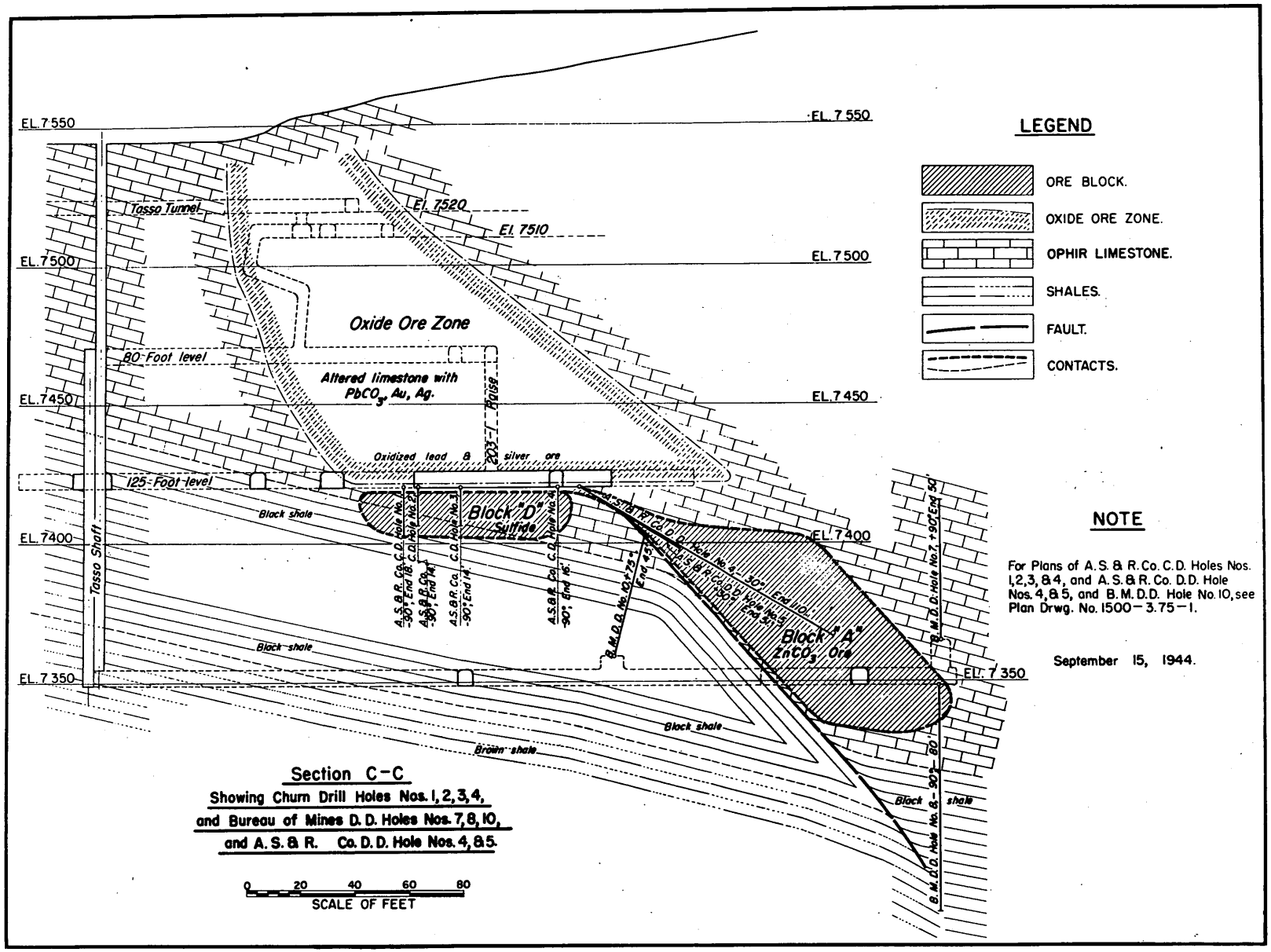


Figure 5. - Section of Wah Wah mine, Beaver County, Utah.



Section C-C

Showing Churn Drill Holes Nos. 1, 2, 3, 4, and Bureau of Mines D. D. Holes Nos. 7, 8, 10, and A. S. & R. Co. D. D. Hole Nos. 4, & 5.

LEGEND

- ORE BLOCK.
- OXIDE ORE ZONE.
- OPHIR LIMESTONE.
- SHALES.
- FAULT.
- CONTACTS.

NOTE

For Plans of A. S. & R. Co. C. D. Holes Nos. 1, 2, 3, & 4, and A. S. & R. Co. D. D. Hole Nos. 4, & 5, and B. M. D. D. Hole No. 10, see Plan Drwg. No. 1500-3.75-1.

September 15, 1944.

Figure 6. - Section of Wah Wah mine, Beaver County, Utah.

fault, probably formed passageways for the ore-bearing solutions to enter the shale and limestone beds. The sedimentary beds, where exposed by the mine workings, are faulted and warped.

The primary sulfide ore bodies are typical replacement deposits in the limestone and shale. These deposits have been oxidized in one area above the 125-foot level where the boundary between the sulfide and the oxidized ore is sharp. The ore in the oxidized zone above the 125-foot level, consists chiefly of limonite and lead carbonate with essentially all of the original zinc removed. It appears that the ground-water table on the property was lowered rapidly after remaining near the 125-foot level for a long period. Oxidation has lagged behind the recent lowering of the ground-water table.

Zinc carbonate ore occurring as a replacement of limestone and shale below the 125-foot level probably resulted from solution, migration, and precipitation of the zinc originally contained in the primary sulfide ore above the 125-foot level. This carbonate ore extends from the floor of the 125-foot level to a point estimated at 20 feet below the 200-foot level, and was probably precipitated from descending solutions at the time the ground-water table was lowered. It may be that the faulting in the area resulted in two temporary water tables, the precipitation from zinc secondary solutions being influenced by one and the lack of intense oxidation of the primary ore below the 125-foot level being influenced by the other. Primary sulfide ore, as well as secondary zinc carbonate ore, was found in the diamond-drill holes below the 200-foot level. This drilling also revealed that the mineralization was most intense at the limestone-shale contacts.

The ore bodies have been developed by the Tasso shaft, which is 200 feet deep. The Tasso-tunnel level, the 80-foot level, and the 125-foot level were driven in the oxide zone. The Tasso level, above the 80-foot level, cuts the highly leached gossan of the ore bodies. The oxidized ore on the 125-foot level, consisting chiefly of limonite and cerussite and small amounts of residual galena and sphalerite, contains 5 to 25 ounces of silver per ton. This ore is bounded on the south by an east-west fault zone and pebble dike.

MINE WORKINGS

Before the Bureau's exploration began, the principal mine workings consisted of the Tasso shaft, 200 feet deep, with drifts on the 80-, 125-, and 200-foot levels totaling approximately 1,000 feet. Most of this drifting had been done on the 125-foot level. In addition, drifting on the Tasso-tunnel level above the 80-foot level aggregated approximately 120 feet. Five diamond-drill holes totaling 471 feet and 4 churn-drill holes totaling 59 feet were drilled by the American Smelting & Refining Co.

The Lue shaft, which is within the property of the Wah Wah Mining Co., 3,000 feet east of the Tasso shaft, has not been explored by the present company.

Water conditions do not present serious problems, although the mine is developing a little more water as the drifts progress on the 200-foot level. At present (May 1944), about 15,000 gallons of water is being pumped from the mine every 24 hours. This water is handled easily with a small centrifugal air pump and air lift.

THE ORE

The primary sulfide ore at the Wah Wah mine consists chiefly of massive pyrite with small amounts of galena, sphalerite, and chalcopyrite, with gold and silver occurring in unidentified minerals. Quartz is also present in small amounts.

The oxidized lead ore contains appreciable amounts of limonite, with cerussite and small quantities of residual galena and sphalerite. Silver occurs in this ore, but its form has not been identified.

The zinc carbonate ore consists essentially of smithsonite and residual shale and limestone fragments. Considerable hematite is found in some areas, particularly in the shale.

SAMPLING AND ANALYSES

The accessible mineralized areas on the 80-, 125-, and 200-foot levels were sampled during the exploratory period. In addition, the Bureau's diamond-drill holes were logged, and samples from mineralized sections were assayed. The locations of the samples are shown on figure 7. The following tables show the results obtained from the underground and diamond-drill hole samples:

80-foot level

Sample No.	Percent			Ounces		Description
	Pb	Zn	Cu	Au	Ag	
A-1	4.0	2.9	0.05	0.01	5.2	3-1/2-foot channel, 80-1 raise.
A-2	1.6	1.8	.05	Tr.	6.0	4-foot channel, 80-1 raise.
A-3	2.8	2.6	.10	Tr.	1.7	Do.
A-4	2.8	3.4	.05	Tr.	5.3	5-foot channel, 80-1 raise.
A-5	4.4	2.5	.05	0.01	5.0	2-foot channel, 80-1 raise.
A-6	1.2	3.5	.05	.01	5.2	Do.
A-7	.3	4.0	.05	.01	.7	4-foot channel, 80-foot level.
A-8	.4	.4	.10	Tr.	.8	2-foot channel, 80-foot level.
A-9	2.8	.4	.05	Tr.	4.1	8-foot channel, 80-foot level.
A-10	2.8	.4	.05	Tr.	2.1	6-foot channel, 80-foot level.
A-15	.05	.8	.10	Nil	.2	2-foot channel, 80-foot level.

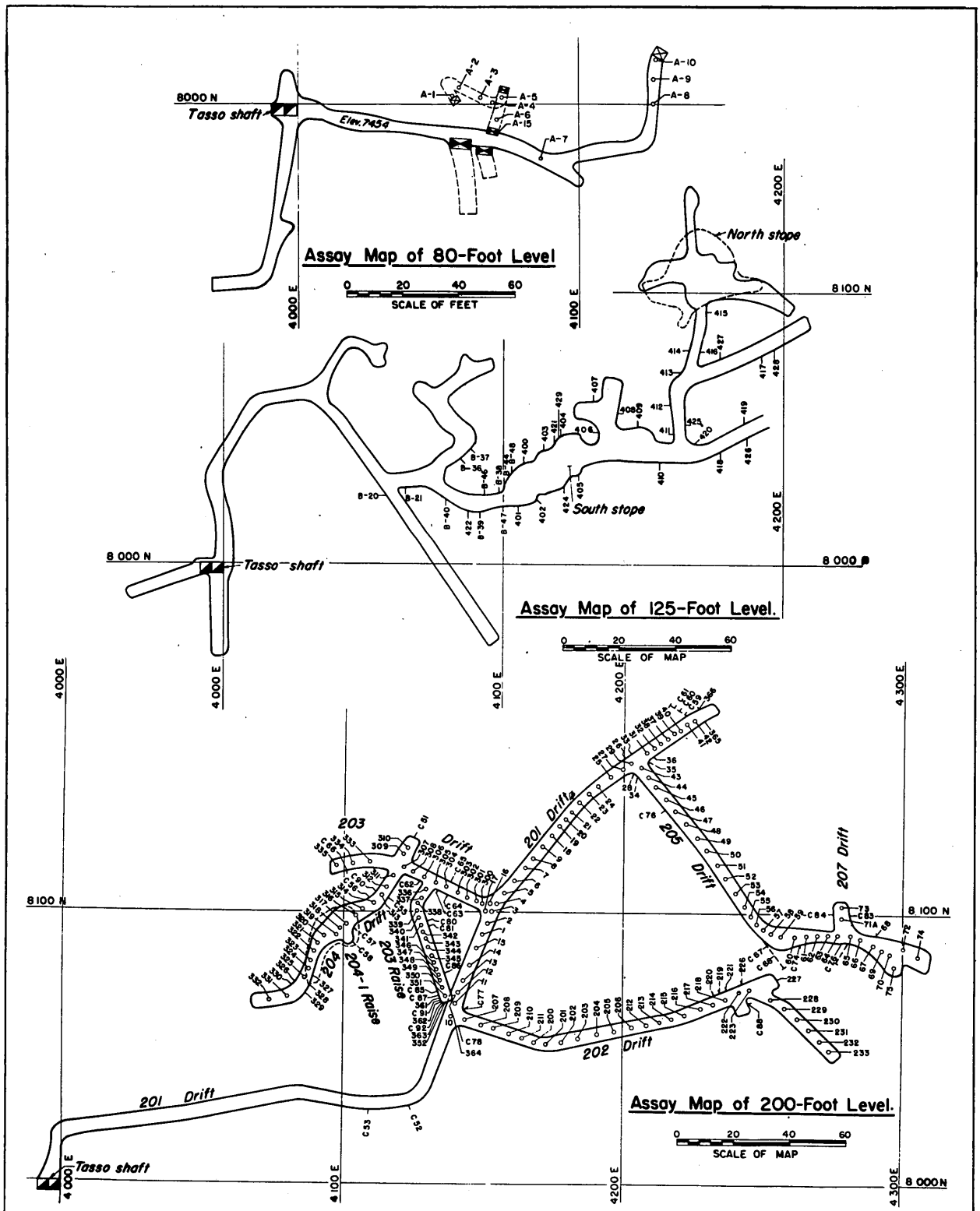


Figure 7. - Assay map, Wah Wah mine, Beaver County, Utah.

125-foot level

Sample No.	Percent			Ounces		Description
	Pb	Zn	Cu	Au	Ag	
400	0.1	1.0	0.2	Tr.	0.15	6-foot channel sample.
401	.4	.4	.4	0.04	3.30	9-foot channel sample.
402	.1	.2	.1	Tr.	.65	8-foot channel sample.
403	.1	.1	.1	.02	1.20	6-foot channel sample.
404	.05	.05	.1	Tr.	2.0	Do.
405	5.1	.2	.15	.02	4.4	Do.
406	5.8	.2	.1	Tr.	2.65	Do.
407	5.2	.2	.05	.06	.7	Do.
408	14.1	.1	.1	.02	4.45	Do.
409	4.6	.3	.1	.02	5.85	Do.
410	.6	.05	.1	.02	5.84	7-foot channel sample.
411	5.8	.05	.15	.02	12.6	6-foot channel sample.
412	7.4	.01	.1	.05	21.35	Do.
413	5.9	.05	.1	Tr.	2.4	Do.
414	9.3	.05	.1	Tr.	5.1	Do.
415	4.7	.2	.05	.01	12.45	Do.
416	5.5	.05	.05	.02	1.9	5-foot channel sample.
417	5.6	.15	.1	.02	6.8	Do.
418	.4	.6	.1	Tr.	.9	6-foot channel sample.
419	3.8	.6	.2	.01	1.95	Do.
420	5.3	.1	.1	.02	3.4	Do.
421	1.0	.15	.7	.01	1.0	4-1/2-foot channel sample.
422	2.3	5.35	.25	.12	2.46	5-foot channel sample.
424	6.4	.05	.1	.25	6.8	12-foot channel sample.
425	3.8	.15	.05	.03	6.42	6-foot channel sample.
426	4.1	.25	.35	.02	5.04	5-foot channel sample.
427	2.1	1.9	.05	.01	1.94	2-1/2-foot channel sample.
428	4.9	.1	.05	.01	2.19	5-foot channel sample.
429	4.1	.25	.05	.02	5.09	4-1/2-foot channel sample.
B-20	1.6	8.6	1.10	Tr.	4.0	2-foot channel sample.
B-21	1.2	1.0	.1	0.02	2.9	6-foot channel sample.
B-36	2.1	14.8	.35	.31	3.2	2-1/2-foot channel sample.
B-37	.15	1.1	.05	.01	.65	2-foot channel sample.
B-38	4.6	6.0	.17	6.92	7.6	3-foot channel sample.
B-39	2.7	12.3	.35	.05	2.8	4-foot channel sample.
B-40	.75	1.2	.05	.02	1.8	6-foot channel sample.
B-44	3.0	6.8	.10	.14	2.4	3-foot channel sample.
B-46	2.1	8.2	.20	.03	2.9	6-foot channel sample.
B-47	4.1	9.8	.80	.31	5.3	Do.
B-48	2.6	6.6	.10	4.93	7.9	2-1/2-foot channel sample.

200-foot level

1	0.2	0.4	0.10	Tr.	2.73	Car sample 5-foot round.
2	.3	.4	.05	0.01	5.54	Do.
3	.2	.3	.10	.01	3.90	Do.
4	.1	.1	.05	Tr.	1.10	Do.

200-foot level (Cont'd)

Sample No.	Percent Pb	Percent Zn	Percent Cu	Ounces Au	Ounces Ag	Description
5	0.05	0.3	0.05	Tr.	0.35	Car sample; 4-foot round.
6	.05	.3	.05	Nil	.14	Do.
7	.05	Nil	.05	0.01	.13	Car sample; 6-foot round.
8	.05	Nil	.05	Tr.	.20	Do.
9	.05	0.2	.05	Nil	.20	Car sample; 5-foot round.
10	1.7	1.4	.05	0.02	8.55	7-foot vertical channel.
11	.2	1.3	.05	.02	7.05	Do.
12	.1	.2	.05	.01	3.45	6-1/2-foot vertical channel.
13	.1	.1	.05	Nil	.15	Do.
14	.1	.3	.05	Nil	.40	7-foot vertical channel.
15	.1	.3	.10	Nil	.40	Do.
16	.05	.9	.05	Nil	3.15	Muck-pile sample.
17	.1	.7	.05	0.01	7.30	7-foot vertical channel.
18	.05	.05	.05	Nil	.15	Muck-pile sample.
19	.05	Nil	.05	Nil	.10	Car sample, 6-foot round.
20	.05	Nil	.05	Nil	Nil	Do.
21	.05	Nil	.05	Nil	Nil	Car sample, 5-foot round.
22	.05	Nil	.05	Nil	Nil	Car sample, 4-foot round.
23	.05	Nil	.10	Nil	Nil	Car sample, 5-foot round.
24	.05	0.05	.05	0.06	1.40	Do.
25	.05	.05	.05	Nil	.1	Do.
26	.05	7.3	.05	Nil	.5	5-foot vertical channel.
27	.2	.1	.05	Nil	Nil	Car sample, 5-foot round.
28	.05	4.9	Nil	Nil	Nil	2-foot vertical cut.
29	.05	13.3	Nil	Nil	0.34	Car sample, 6-foot round.
31	.05	11.2	Nil	Nil	Nil	Car sample, crushed zone.
32	.20	7.3	Nil	Nil	Nil	Do.
33	.05	7.6	Nil	Nil	Nil	7-foot vertical channel.
34	.05	10.7	Nil	Nil	Nil	Do.
35	.05	6.4	0.05	Nil	Nil	Do.
36	.05	8.4	Nil	Nil	0.1	Do.
37	.1	8.2	0.05	Nil	Nil	Do.
38	.1	8.2	.05	Nil	0.06	Car sample.
39	.1	5.6	.05	Nil	.16	Do.
40	.1	3.1	.05	Nil	Nil	Car sample, 4-foot round.
41	.05	2.7	Nil	Nil	Nil	Do.
42	.1	1.6	Nil	Nil	Nil	Car sample, 3-foot round.
43	.05	4.5	Nil	Nil	Nil	Do.
44	.05	6.1	0.05	Nil	0.20	Car sample, 6-foot round.
45	.05	5.6	.05	Nil	.18	Do.
46	.05	7.9	.05	Nil	.26	Do.
47	.05	7.3	Nil	Tr.	.16	Do.
48	.1	7.1	0.05	Nil	Tr.	Do.
49	.1	7.7	.05	Nil	0.10	Do.
50	.1	6.2	.05	Nil	.10	Do.
51	.1	10.2	.05	Nil	Tr.	Do.
52	.1	9.2	.05	Nil	0.10	Do.

200-foot level (Cont'd)

Sample No.	Percent Pb	Percent Zn	Percent Cu	Ounces Au	Ounces Ag	Description
53	0.05	7.2	0.05	Nil	0.02	Car sample, 6-foot round.
54	.05	8.4	.02	Nil	Tr.	Do.
55	.05	10.2	.05	Tr.	0.50	Do.
56	.05	13.5	.05	Tr.	.30	Do.
57	.05	14.5	.05	Tr.	.40	Do.
58	.05	13.6	.05	Tr.	.32	Do.
59	.05	14.6	.05	Tr.	.34	Do.
60	.30	7.1	.05	Tr.	Tr.	Do.
61	.05	3.4	.10	Nil	0.3	Car sample.
62	.05	2.7	.05	Tr.	.2	Do.
63	.10	9.9	.10	Tr.	Tr.	Do.
64	.05	7.0	.05	Tr.	0.1	Do.
65	.05	4.2	.05	Tr.	Tr.	Do.
66	.02	2.7	.2	Nil	0.2	Do.
67	.05	12.4	.1	Nil	.3	Sludge, 8-foot jackhammer hole.
68	.02	8.2	.05	Nil	Tr.	Do.
69	.05	9.7	.1	Nil	Tr.	Do.
70	.07	1.9	.05	Nil	0.1	Car sample.
71A	.05	9.0	.10	Tr.	.1	Do.
72	.05	1.8	.10	Tr.	.1	Car sample, 4-foot round.
73	.05	5.7	.10	Tr.	.1	Do.
74	.05	2.9	.10	Tr.	.45	Car sample.
75	.05	4.3	.10	Tr.	.4	Do.
200	.15	.1	.05	Tr.	.15	Car sample, 5-foot round.
201	.15	.1	.05	Nil	.10	Do.
202	.05	Nil	.05	Nil	.11	Do.
203	.05	Nil	.05	Tr.	.10	Do.
204	.05	Nil	.05	Tr.	.10	Car sample, 7-foot round.
205	.05	Nil	.05	Tr.	.10	Car sample, 5-foot round.
206	.1	0.1	.05	Nil	.15	Car sample, 7-foot round.
207	.1	.2	.10	Nil	1.90	6-foot vertical channel.
208	.1	.5	.05	Tr.	1.25	Do.
209	.05	.1	.15	Nil	.45	Do.
210	.1	.3	.15	Nil	.20	Do.
211	.1	.1	.05	Nil	.20	Do.
212	.05	Nil	.05	Nil	Nil	Car sample, 5-foot round.
213	.05	Nil	.05	Nil	Nil	Car sample, 4-foot round.
214	.05	Nil	.1	Nil	0.16	Muck-pile sample.
215	2.10	Nil	.15	Nil	.1	Car sample, 6-foot round.
216	1.50	Nil	.1	Nil	.1	Car sample, 5-foot round.
217	.05	1.9	.05	Tr.	.1	Car sample, 7-foot round.
218	.05	9.2	.05	Tr.	.4	7-foot vertical channel.
219	.1	3.9	.05	0.01	2.9	Car sample.
220	.05	.1	.05	Nil	.1	Do.
221	.3	4.8	.02	Nil	Tr.	Do.
222	.2	9.7	.02	Nil	0.4	Do.
223	.2	8.1	.02	Nil	.3	Do.

200-foot level (Cont'd)

Sample No.	Percent Pb	Percent Zn	Percent Cu	Ounces Au	Ounces Ag	Description
226	0.05	14.8	0.05	Tr.	0.8	6-foot vertical channel.
227	.05	10.0	.05	Nil.	.2	4-foot vertical channel.
228	.05	7.2	.05	Nil	.4	Car sample.
229	.1	2.4	.05	Tr.	.4	Do.
230	.1	1.6	.05	Tr.	1.6	Do.
231	.1	.6	.05	Tr.	.35	Do.
232	.1	1.1	.05	Tr.	.8	Do.
233	.1	5.8	.05	Nil	.5	Do.
300	.05	.3	.15	Tr.	4.75	Do.
301	.05	.5	.1	Tr.	5.20	Car sample, 4-foot round.
302	.1	.05	.1	Tr.	4.40	Car sample, 5-foot round.
303	.15	.7	.05	0.01	8.30	Do.
304	1.4	1.8	.05	.01	8.90	Car sample, 6-foot round.
305	1.1	1.6	.05	Tr.	5.90	Car sample, 5-foot round.
306	5.0	3.0	.03	0.01	2.90	Car sample, 6-foot round.
307	.05	.5	.1	Tr.	2.0	Car sample, 8-foot round.
308	3.6	1.3	.1	0.03	4.5	2-foot vertical channel.
309	4.6	2.2	.1	.01	3.7	Car sample.
310	4.5	2.0	.1	Nil	.1	Do.
311	.4	2.1	.05	Nil	3.0	Do.
312	.05	2.1	.05	Nil	1.4	Do.
313	1.0	2.1	.07	Nil	1.6	Do.
314	4.5	3.1	.1	Nil	1.2	Do.
315	3.1	1.8	.1	Tr.	1.3	Do.
316	1.6	1.0	.05	Nil	1.0	Do.
317	3.0	2.7	.05	0.01	2.8	Do.
318	2.1	1.9	.05	.01	5.1	Do.
319	2.3	2.1	.05	.01	4.6	Do.
320	2.4	2.6	.05	Tr.	6.5	Do.
321	.4	1.9	.8	Tr.	4.5	Do.
322	.5	.2	.15	Nil	5.4	Do.
323	.4	Nil	.1	Nil	5.0	Do.
324	.1	1.4	.05	Nil	2.8	Car sample, 5-foot round.
325	.1	.6	.05	Nil	1.9	Do.
326	.1	.6	.05	Nil	2.4	Car sample, 6-foot round.
327	.2	.6	.1	Tr.	1.8	4-foot vertical channel.
328	.2	.2	.05	Nil	4.7	3-foot vertical channel.
329	4.0	5.8	.1	Tr.	1.4	Do.
330	4.3	5.1	.15	Nil	1.4	4-foot vertical channel.
331	.05	1.0	.05	Nil	1.3	Car sample, 4-foot round.
332	.05	.6	.05	Tr.	.7	Car sample, 5-foot round.
333	.05	.6	.05	Nil	.16	Car sample, 4-foot round.
334	.05	Nil	.1	Tr.	.6	Car sample, 5-foot round.
335	.05	0.3	.05	Tr.	.32	Car sample, 4-foot round.
336	.05	3.7	.07	Tr.	4.32	Car sample, 3-foot round.
337	2.8	2.4	.1	0.01	3.0	Do.
338	3.0	2.9	.1	.01	4.3	Car sample, 4-foot round.

200-foot level (Cont'd)

Sample No.	Percent Pb	Percent Zn	Percent Cu	Ounces Au	Ounces Ag	Description
339 ...	3.0	2.9	0.1	0.01	3.3	Car sample.
340 ...	.05	.3	.05	Tr.	1.3	Do.
341 ...	.05	.9	.1	Tr.	3.4	Do.
342 ...	.05	.1	.05	Tr.	.7	Do.
343 ...	.05	.6	.05	Tr.	.4	Do.
344 ...	.05	.8	.05	Tr.	Tr.	Do.
345 ...	.05	Nil	.05	Tr.	Tr.	Do.
346 ...	.05	Nil	.05	Nil	Tr.	Do.
347 ...	.05	0.2	.05	Nil	Tr.	Do.
348 ...	.05	6.9	.05	Nil	Tr.	Character sample.
349 ...	.1	1.8	.05	Tr.	0.3	Car sample.
350 ...	2.3	2.4	.35	Tr.	.6	Do.
351 ...	7.0	2.0	.55	0.09	14.4	Do.
352 ...	5.1	3.2	.9	.01	6.0	Do.
361 ...	1.5	.5	.1	Tr.	.85	Sludge, 7-foot jackhammer hole.
362 ...	1.15	.5	.42	Tr.	.95	Do.
363 ...	3.75	.4	.4	Tr.	.5	Do.
364 ...	1.45	.3	.1	Tr.	.65	Sludge, 4-foot jackhammer hole.
C-51 ..	1.6	2.2	.07	Tr.	1.5	4-foot vertical channel.
C-52 ..	1.8	1.9	.07	Tr.	1.1	Do.
C-53 ..	.05	.4	.05	Tr.	3.4	2-foot vertical channel.
C-55 ..	4.5	3.6	.15	Tr.	1.2	6-foot vertical channel.
C-56 ..	4.1	3.6	.15	Tr.	.9	7-foot vertical channel.
C-57 ..	5.7	5.4	.1	Tr.	1.4	4-foot vertical channel.
C-58 ..	5.1	4.2	.1	Tr.	1.7	4-1/2-foot vertical channel.
C-59 ..	3.0	1.9	.1	0.01	9.5	Sludge, 0- to 3-foot jackhammer hole.
C-60 ..	.05	9.0	.02	Tr.	Tr.	Sludge, 3- to 8-1/2-foot jackhammer hole.
C-61 ..	.05	9.9	.02	Nil	Tr.	Sludge, 8-1/2- to 12-foot jackhammer hole.
C-62 ..	5.1	4.6	.1	0.01	3.8	6-foot vertical channel.
C-63 ..	3.7	4.3	.1	.04	3.5	Do.
C-64 ..	2.6	2.8	.1	.01	7.7	Do.
C-65 ..	1.5	1.3	.1	Tr.	11.5	Do.
C-66 ..	.1	1.6	.1	0.02	5.4	Character sample.
C-67 ..	.1	8.0	.05	Nil	1.1	Sludge, 0- to 6-foot jackhammer hole.
C-68 ..	.05	8.4	.1	Nil	1.1	Sludge, 6- to 12-foot jackhammer hole.
C-74 ..	.05	2.9	.15	Nil	Tr.	3-1/2-foot vertical channel.
C-76 ..	.05	3.6	.02	Nil	Tr.	3-foot vertical channel.
C-77 ..	.3	2.2	.1	0.02	8.7	8-foot vertical channel.
C-78 ..	1.7	1.4	.1	.01	6.5	7-foot vertical channel.
C-80 ..	.05	.2	.05	Nil	2.4	3-foot vertical channel.
C-81 ..	.05	.2	.05	Nil	2.0	Do.
C-83 ..	.05	9.2	.05	Nil	Tr.	2-foot channel in fissure.
C-84 ..	.05	8.8	.05	Tr.	Tr.	8-foot horizontal channel.
C-85 ..	4.5	1.4	.55	Tr.	0.7	5-foot vertical channel.
C-86 ..	2.1	1.8	.70	Tr.	.8	6-foot horizontal channel.
C-87 ..	2.1	11.9	1.45	0.02	5.0	3-1/2-foot vertical channel.
C-88 ..	3.0	6.3	.10	Tr.	.95	6-inch channel in sulfide.
C-90 ..	6.5	5.9	.07	Tr.	2.0	Character sample of sulfide.
C-91 ..	3.5	1.8	.7	Tr.	.9	6-foot vertical channel.
C-92 ..	2.2	2.3	.8	0.02	.9	Do.

Diamond-drill holes

Hole	Coordinates North	Coordinates East	Bearing	Inclination, °	Depth of hole, feet	Depth of sample, feet	Description	Analyses Percent Pb	Analyses Percent Zn	Analyses Percent Cu	Analyses Ounces Au	Analyses Ounces Ag
1	8,168	4,223	Vertical	-90	100	-	-	No mineralization.				
2	8,128	4,176	do.	-90	100	-	-	No mineralization.				
3	8,129	4,173	N. 60° W.	-41	75	10-15	Limestone with strong hematite.	0.05	0.17	0.02	Tr.	1.03
						15-20	do.	.05	.68	.02	Tr.	.57
						20-25	Sandstone with strong hematite.	.05	.52	.02	Nil	2.97
						25-30	Limestone with few sulfides.	1.24	1.79	.02	0.01	7.69
						30-35	Limestone with strong sulfide replacement.	1.09	1.67	.02	.01	4.69
						35-40	Sandy limestone, some pyrite and manganese.	.10	.64	.02	Tr.	2.34
						40-45	Limestone.	.05	.65	.02	Tr.	.69
						45-50	do.	.05	.39	.02	Nil	.08
						50-55	Shale.	.05	.28	.02	Nil	.04
						55-60	Shale with pyrite.	.05	.61	.02	Nil	4.05
						60-65	Sandstone.	.39	.19	.02	Tr.	2.35
4	8,128	4,176	Vertical	+90	70	29-34	Limestone containing oxide mineralization.	.05	5.77	.02	Nil	.33
						34-40	do.	.31	3.43	.05	Tr.	.47
						40-45	do.	.30	2.37	.07	Nil	.30
						45-50	do.	.73	2.44	.09	Nil	.74
						50-55	do.	.44	2.01	.07	Nil	.49
						55-60	do.	.37	1.00	.05	Tr.	.40
						60-65	do.	.97	1.49	.03	Tr.	.48
						65-70	do.	.36	1.39	.02	Tr.	.28

Diamond-drill holes (Cont'd)

Hole	Coordinates North	Coordinates East	Bearing	Inclination, °	Depth of hole, feet	Depth of sample, feet	Description	Analyses Percent Pb	Analyses Percent Zn	Analyses Percent Cu	Analyses Ounces Au	Analyses Ounces Ag
5	8,174	4,230	N. 53° E.	+55	60	45-50	Limestone containing oxide mineralization.	0.05	7.90	0.02	Nil	0.30
6	8,170	4,225	S. 53° W.	+51	30	0-5	Shale, green to brown.	.05	13.05	.02	Nil	.2[illegible]
						5-10	do.	.05	17.35	.02	Nil	.28
						10-15	do.	.05	10.30	.02	Tr.	.28
						15-20	Shale and limestone.	.05	3.73	.02	Nil	.28
						20-25	Limestone.	.05	2.40	.02	Tr.	.25
7	8,083	4,307	Vertical	+90	50			No mineralization.				
8	8,083	4,307	Vertical	-90	80			No mineralization.				
9	8,130	4,175	N. 18° W.	+30	65			No mineralization.				
10	8,053	4,188	S. 70° E.	+75	45	20-23	Shale with pyrite.	0.78	0.80	0.03	Tr.	1.60
						23-30	do.	.77	.60	.03	Tr.	1.30
						30-35	do.	.60	.90	.02	Tr.	5.30
						35-40	do.	.77	.95	.03	Tr.	3.60
						40-45	do.	.78	1.10	.02	Tr.	2.80

BUREAU OF MINES EXPLORATION

The Bureau's project at the Wah Wah mine was started in November 1942. From then to February 20, 1943 the mine was unwatered, the workings on the 200-foot level were rehabilitated, and 145 feet of drifting was completed. The project was then recessed before the Bureau's objectives were reached.

The Wah Wah Mining Co. obtained a loan from the Reconstruction Finance Corporation, and exploration and development were continued under the supervision of a Bureau of Mines engineer with the Bureau's equipment.

From March 1, to November 1943, the Wah Wah Mining Co. drove 516 feet of drifts and raises on the 125- and 200-foot levels. As a result of this work, a large body of oxidized zinc ore was exposed for 110 feet along the strike and 35 feet in width. The ore body probably extends 100 feet along the dip of the zone. A 90-foot raise was driven from the 200-foot level to the 125-foot level to develop the sulfide zone.

In November 1943 the Bureau reopened the project and to April 1944 completed 675 feet of core drilling from the 200-foot level and drove 28 feet of raise in the sulfide zone from the 200-foot level.

METALLURGICAL TESTS

A representative sample of the sulfide ore from the Wah Wah mine was tested at the Bureau's laboratories in Salt Lake City. The ore contained small amounts of galena, sphalerite, and chalcopyrite in a highly pyritic gangue. The sample assayed 4.0 percent lead, 3.5 percent zinc, 2.9 ounces silver, and 0.01 ounce gold per ton.

Although some of the galena and sphalerite occur as fairly coarse-grained particles, a reasonable degree of liberation will be obtained only by 200-mesh grinding. A considerable portion of the galena and sphalerite occurs in fractures in the highly shattered pyrite with a grain size of 20 to 48 mesh. Some of the galena and sphalerite is present as inclusions in the pyrite with a grain size of 100 to 280 mesh. The analysis of the sample is as follows:

	Percent		Percent		Percent
Pb.....	4.0	Cu.....	0.35	CaO.....	1.0
Ox. Pb.....	.6	Ox. Cu.....	Nil	Al_2O_3.....	10.8
Zn.....	3.5	S.....	28.8	MgO.....	.8
Ox. Zn.....	.4	Insol.....	11.3		Ounces
Fe.....	32.6	SiO_2.....	8.9	Ag.....	2.9
				Au.....	.01

The ore-dressing procedure consisted of selective flotation of ore ground through 100- and 200-mesh as follows:

WAR MINERALS REPORT*

Report of the Bureau of Mines to Secretary of the Interior, Harold L. Ickes

HAN WAN MINE

Beaver County, Utah

Lead - Zinc

Supplement to War Minerals Report submitted to Washington January 13,1944

RECEIVED MAR 26 1956

SUMMARY

The Hah Wah mine situated in the Pine Grove mining district, Beaver County, Utah, was examined by the Bureau of Mines in September, 1942. An exploratory project was recommended, and work was started in November 1942, and completed in April 1944.

The ore bodies which have been explored are replacement deposits in limestone and shale of the Opair formation. The mineralized horizons are estimated to be approximately 700 feet above the Pintic quartzite. Three classes of ore have been indicated in several ore bodies on the property; zinc carbonate ore in an ore body containing an estimated 38,500 tons of indicated ore averaging 8.21 percent zinc; lead carbonate ore in an ore body containing an estimated 26,900 tons of indicated ore with an average grade of 10.5 percent lead, 8.1 ounces silver and .02 ounces gold per ton; and primary sulfide ore in ore bodies containing an estimated 3,000 tons of indicated ore averaging 4.22 percent lead, 4.39 percent zinc, 2.44 ounces

*The War Minerals Reports of the Bureau of Mines are issued by the United States Department of the Interior to give official expression to the conclusions reached on various investigations relating to domestic minerals. These reports are based upon the field work of the Bureau of Mines and upon data made available to the Department from other sources. The primary purpose of these reports is to provide essential information to the war agencies of the United States Government and to assist owners and operators of mining properties in the production of minerals vital to the prosecution of the War.

Selective flotation of ore ground to minus 100-mesh

Reagents, pounds per ton

	CaO	$ZnSO_4$ $7H_2O$	NaCN	Z-3	Sodium aerofloat	Frother 1/	pH
To grind	4	4	0.5	-	-	-	9.5
To Pb circuit	-	-	-	0.04	-	0.03	-
To Zn circuit	-	-	-	-	0.05	.03	-

Metallurgical data

Product	Weight, percent	Assay, percent			Distribution, percent		
		Pb	Zn	Fe	Pb	Zn	Fe
Pb recleaner concentrate.	3.82	55.4	9.0	8.1	53.2	10.1	1.0
Pb recleaner tails	3.71	26.4	13.6	16.5	24.6	14.8	1.9
Zn cleaner concentrate...	5.12	10.5	37.6	13.2	13.5	56.4	2.1
Zn cleaner tails	1.71	5.2	17.2	23.0	2.2	8.6	1.2
Rougher tailings	85.64	.3	.4	35.2	6.5	10.6	93.8
Calculated head	100.00	3.98	3.41	32.13	100.00	100.00	100.00

1/ Frother is 25 percent cresylic acid, 75 percent methyl amyl alcohol by volume.

Selective flotation of ore ground to minus 200-mesh

Reagents, pounds per ton

	CaO	$ZnSO_4$ $7H_2O$	$CuSO_4$ $5H_2O$	NaCN	Z-3	Sodium aerofloat	Frother 1/	pH
To grind	4	4	-	-	-	-	-	9.5
To Pb circuit	-	-	-	-	0.06	-	0.03	-
To Zn circuit	-	-	-	1.0	-	0.045	.03	-

Metallurgical data

Product	Weight, percent	Assay, percent			Ag.	Distribution, percent			
		Pb	Zn	Fe	oz.	Pb	Zn	Ag	Fe
Pb cleaner concentrate...	5.01	56.0	12.7	6.8	16.0	74.3	18.7	29.3	1.1
Zn cleaner concentrate...	5.53	8.7	41.4	11.1	12.5	12.7	67.1	25.3	1.9
Zn cleaner tails	8.67	4.7	2.8	28.6	5.0	10.8	7.1	15.9	7.7
Rougher tails...	80.79	.1	.3	35.9	1.0	2.2	7.1	29.5	89.4
Calculated head.	100.00	3.78	3.4	32.44	2.7	100.00	100.00	100.00	100.00

1/ Frother is 25 percent cresylic acid, 75 percent methyl amyl alcohol by volume.

REMARKS

Zinc in lead concentrate is present as a constituent of lead-zinc middling particles. Grinding of these to at least minus 400-mesh is necessary for any liberation.

The ore-dressing tests on the ore showed that by selective flotation of minus 200-mesh ore, 73.3 percent of the lead was recovered in a product assaying 56.0 percent lead, 12.7 percent zinc, and 16 ounces silver per ton. The zinc recovery was 67.1 percent in a product assaying 41.4 percent zinc, 8.7 percent lead, and 12.5 ounces silver per ton. An intimate lead-zinc-pyrite middling lowers the grade of the zinc concentrate. Microscopic examination of the ore has indicated that 400-mesh grinding will be necessary to liberate the sphalerite. As the sphalerite contains considerable iron, combined chemically, it is doubtful that a 50-percent zinc concentrate could be made even with 400-mesh grinding.

silver, and .015 ounce gold per ton, and 10,000 tons of inferred ore assaying 2.87 percent lead, 2.84 percent zinc, 2.80 ounces of silver, and .01 ounce of gold per ton.

The Bureau of Mines has proved that the upper shales of the Ophir formation at the Wah Wah mine contain milling grade ore. Continuation of this mineralization can be expected down the dip of the beds along the Tasso fault zone, between the Wah Wah shaft and the Lue shaft, a distance of 3,000 feet. Since the upper Ophir shales, which are normally unproductive in other districts, have been proved to contain ore, and it is known that ore-bearing fissures exist in the underlying quartzites, it is thought that the lower limestones adjacent to the quartzite should be explored by diamond drilling or by shaft sinking. The quartzite-limestone contact at the intersection of the Tasso fault zone may be a productive horizon.

Introduction

The Wah Wah mine was examined by James A. Marsh, District Engineer, in September 1942 and a War Minerals Report submitted to Washington on January 13, 1943. The Federal Geological Survey assigned two geologists to map the surface and underground workings of the Wah Wah mine in October 1942. As a result of the examination by the Bureau of Mines, a project was started at the Wah Wah mine in November 1942. Assistance was given by the Federal Geological Survey in formulating proposals and plans.

History

The Pine Grove mining district was organized in 1873, but no work was done until the district was reorganized in 1879, after which time it is reported that a little ore was shipped. The Wah Wah Mining Company was incorporated September 2, 1937. Prior to this time, predecessor organizations had spent approximately $122,000. The board of directors of the Wah Wah Mining Company approved the expenditure of $47,852.14 from September 1937 to June 1940, for development.

This work was confined to the Tasso shaft and levels. Shipment in 1939 amounted to 925.789 dry tons with a gross value of $12,477.33. This ore contained 204,130 pounds of lead, 1,390 pounds of copper, 7,424 ounces of silver and 65.09 ounces of gold. The mine was idle from July 1941 to November 1942. In November 1942, the Bureau of Mines started a project to unwater the Tasso shaft and proceed with the exploratory work as outlined in the War Minerals Report.

Physical Features and Communications

The Wah Wah mine is on the west side of the Wah Wah Range, a prominent north-south range that attains an approximate elevation of 9,000 feet, with an average elevation of 7,000 feet.

The mine is 58 miles southwest of Milford, Utah, the nearest supply point. There is an excellent gravelled road from the mine to Milford. The U. S. Grazing Service has completed a new road from the Milford-Ely highway to the mine, and has constructed a new road from the mine to Lund, the nearest shipping point, 42 miles from the mine. The freight rate from Lund to Salt Lake is $1.50 per ton and trucking from the mine to Lund costs $2.50 per ton.

There are approximately 3,000,000 feet of timber available in the vicinity of the mine. There is sufficient water in the small stream near the mine for any future milling operation.

Climatic conditions in the area permit mining operations throughout the year.

Labor and Living Conditions

In the past, sufficient labor has been available at Milford and Beaver. At the present time, it is difficult to find an unemployed man within a radius of 200 miles of the mine. Sufficient housing and boarding facilities are available at the mine for a crew of about 15 men.

Property of the Wah Wah Mining Company

The property of the Wah Wah Mining Company consists of 22 patented mining claims and 33 unpatented claims, totaling 1,080 acres, together with all mineral rights, buildings, timber, materials and machinery thereon, and all rights and title

to the application of R. C. Dugdale to appropriate two second-feet of water from the Pine Grove Springs and Creek. By covering this large area, the company has protected itself from litigation over the possible extension of the ore bodies. Mr. J. N. Dugdale, Box 408 Milford, Utah is president and general manager of the company.

Geology and Ore Deposits

The sedimentary rocks in the area consist of quartzite, limestone and shale, which normally strike N. 20° E. and dip 20° southeast. The oldest exposed formation is Cambrian quartzite which corresponds to the Tintic quartzite at Eureka and Ophir, Utah, and to the Prospect Mountain quartzite at Pioche, Nevada. A series of shale and limestone beds approximately 600 feet thick lie above the quartzite. These shale and limestone sediments, which probably correspond to the Ophir formation at Ophir, Utah, and to the productive beds at Pioche, Nevada, are in turn overlain by a great thickness of limestone. The sediments are cut by a rhyolite porphyry intrusion which outcrops 1,000 feet southeast of the Tasso shaft. A strong east-west fault zone which is about 150 feet in width and is known as the Tasso fault traverses the entire length of the Wah Wah property and displaces the sedimentary beds about 700 feet. There are a number of smaller fractures and fissures both paralleling and crossing the Tasso fault, which probably formed passageways for the ore-bearing solutions to enter the shale beds. The faulting has warped the sedimentary beds where exposed by the mine workings.

The primary sulfide ore bodies are typical replacement deposits in the limestone and shale. This ore has been oxidized in one area above the 125-foot level and the line between the sulfide and oxidized ore is sharp. The ore in the oxidized zone consists chiefly of limonite and lead carbonate, with essentially all of the original zinc removed. It appears that the water level on the property has lowered rapidly after having maintained a level near the 125-foot level for a long period. Oxidation has lagged behind the recent lowering of the water level.

Zinc carbonate ore occurring as a replacement of limestone and shale probably resulted from solution, migration, and precipitation of the zinc contained in the primary sulfide ore above the 125-foot level. This carbonate ore occurs above and below the 200-foot level, and was probably precipitated from descending solutions at the time the water table was lowered. It may be that the faulting in the area resulted in two temporary water tables, the precipitation of zinc from secondary solutions being influenced by one, and the lack of intense oxidation of the primary ore below the 125-foot level, being influenced by a second water level. Primary sulfide ore, as well as secondary zinc carbonate ore, was found in the diamond drill holes below the 200-foot level. This drilling has also revealed important information on the stratigraphy of the area, and has shown the mineralization to be most intense at the limestone-shale contacts.

The ore bodies have been developed by the Tasso shaft, which is 200 feet deep. The Tasso tunnel level, the 80-foot level, and the 125-foot level were driven in the oxidized zone. The Tasso level, above the 80-foot level, cuts the highly leached gossan of the ore bodies. The oxidized ore on the 125-foot level, consisting chiefly of limonite and cerussite, and small amounts of residual galena and sphalerite, contains 5 to 25 ounces of silver per ton. This ore is bounded on the south side by an east-west fault zone and pebble dike.

Mine Workings

Before the Bureau of Mines exploration was started, the principal mine workings consisted of the Tasso shaft, 200 feet in depth, with drifts on the 80-foot, 125-foot, and 200-foot levels totalling approximately 1000 feet. Most of this drifting had been done on the 125-foot level. In addition, drifting on the Tasso tunnel level, above the 80-foot level, aggregated approximately 120 feet. Five diamond drill holes totalling 471 feet, and 4 churn drill holes totalling 59 feet were drilled by the American Smelting and Refining Company.

Water conditions do not present serious problems, although the mine is developing a little more water as the drifts progress on the 200-foot level.

At present, about 15,000 gallons of water are being pumped from the mine every 24 hours. This water is handled easily with a small centrifugal air pump and air lift.

The Ore

The primary sulfide ore at the Wah Wah mine consists chiefly of massive pyrite, with small amounts of galena, sphalerite, and chalcopyrite, with gold and silver occurring in unidentified minerals. Quartz is also present in small amounts.

The oxidized lead ore contains appreciable amounts of limonite, with cerussite and small quantities of residual galena and sphalerite. Silver minerals occur in this ore, but they have not been identified.

The zinc carbonate ore consists essentially of smithsonite, and residual shale and limestone fragments. Considerable hematite is found in some areas, particularly in the shale.

The Lue shaft, which is within the property of the Wah Wah Mining Company, 3,000 feet to the east of the Tasso shaft, has not been explored by the present company. Shipments of high-grade sulfide lead-silver ore are reported to have come from this area. Manganese minerals were observed on the dump of the shaft.

Bureau of Mines Exploration

The Bureau of Mines project at the Wah Wah mine was started in November 1942. From November 1942 to February 20,1943, the mine was unwatered, the workings on the 200-foot level were rehabilitated, and 145 feet of drifting was completed. The project was then recessed before the Bureau's objectives were reached.

The above work was done at a cost of $12,869, which included the purchase of a Gardner Denver 235 cu. ft. compressor, mine rails, pipe, drilling machines, drill steel and many other necessary small tools.

The Wah Wah Mining Company secured a loan from the Reconstruction Finance Corporation, and exploration and development were continued under the supervision of a Bureau of Mines engineer, using the Bureau of Mines equipment.

During the period from March 1,1943 to November 1943, the Wah Wah Mining Company drove 516 feet of drifts and raises on the 125 and 200-foot levels. As a result of this work, a large body of oxidized zinc ore was exposed for 110 feet along the strike and 35 feet in width. The ore body probably extends 100 feet along the dip of the beds. A 80 foot raise was driven from the 200-foot level to the 125-foot level to develop the sulfide zone.

In November 1943, the Bureau of Mines reopened the project and between November 1943, and April 1944 completed 675 feet of core drilling from the 200-foot level,and drove 28 feet of raise in the sulfide zone on the 200-foot level.

Ore Reserves

As a result of the combined exploration of the Bureau of Mines and the Wah Wah Mining Company, the following ore reserves are indicated and inferred:

Class	Ore	Tonnage	Percent Pb	Percent Zn	oz./ton Ag	oz./ton Au
Indicated	Lead-Zinc Sulfide	3,000	4.22	4.39	2.44	0.015
Indicated	Zinc Carbonate	38,000	(8.21 - Car grab sample (10.26 -Drill hole samples			
Indicated	Lead Carbonate	26,900	10.5		8.10	0.02
Total indicated ore		67,900				
Inferred	Lead-Zinc Sulfide	10,000	2.87	2.84	2.80	0.01

By selectively mining ore from the zinc carbonate ore body it appears that a substantial tonnage of ore assaying approximately 14 percent zinc may be mined. Some sections of the ore body,exposed in drifting on the 200-foot level,assayed 18 percent zinc. Methods employed in calculating the tonnages and average grades of the different ores are given in the appendix.

Ore Mined from Reserves

During the period from October 10,1943 to April 15,1944, the Wah Wah Mining Company mined and shipped 253.69 wet tons of sulfide ore. A record of the shipments are given in the following table.

Date	Dry Tons	Percent Lead	Percent Zinc	Ounces/ton Silver	Ounces/ton Gold	Metal value/ton	U.S. premium pay/ton	Gross Value/lot
10/10/43	51.75	4.1	3.8	6.3	0.017	$4.98	$4.29	$ 479.48
10/22/43	46.74	5.35	8.4	2.0	0.015	5.399	13.19	869.06
11/28/43	39.12	4.05	3.53	2.35	0.02	3.134	3.12	244.58
1/10/44	43.01	3.4	4.0	1.9	0.01	4.11	8.30	333.02
4/15/44	58.95	4.15	4.17	1.6	0.008	4.35	9.22	800.23
TOTAL	239.57	4.22	4.39	2.44	0.015	4.45	7.77	$2,926.97

Value of Ore

Zinc Carbonate Ore

It is estimated that 7,000 tons of ore can be mined selectively from the zinc carbonate ore body that will assay as follows:

Percent Pb	Percent Zn	Oz./ton Au	Oz./ton Ag	Percent Insol.	Percent Fe	Percent CaO	Percent MgO	Percent S	Percent As
0.3	14.15	Tr.	0.3	11.6	17.1	5.8	0.3	0.15	0.02

Calculations based upon the above assays, and a purchasing schedule provided by the fuming plant of the International Smelting and Refining Company are as follows:

Values per ton

Zn 75% of 14.15 x 20 x 1.515	$3.85	
Fe 17.1% x 6 cents	1.03	
CaO 5.8% x 5 cents	.29	
Zn premium 81% x 14.15% x 20 x 8.25	18.91	
Total value per ton		$24.08

Treatment Charges per ton

Smelting charge	$3.10	
Pb penalty 31.5% - 0.3% at 10 cents	3.12	
Insol. penalty 11.6% x 10 cents	1.16	
Zn penalty 14.15% x 15 cents	2.12	
Freight	1.50	
Total charges per ton		11.00
Net return per ton of ore FOB Lund, Utah		$13.08

Lead Carbonate Ore

The Wah Wah Mining Company reports 26,900 tons of lead oxide ore which assays 10.5 percent lead, 3.1 ounces of silver, and .02 ounce of gold per ton. Based on the above assay, the value of this ore is as follows:

Values per ton

Lead 10.5% - 1.5% = 9.0% x 20 x 90% x 6½ cents	$10.53	
Lead premium "B", 10.5% x 20 x 86% x 5½ cents	9.93	
Silver 8.1 oz. - 0.5 oz. = 7.6 x 95% x 70 5/8 cts.	5.09	
Gold .02 oz. . $31.01	.63	
Total value per ton		$26.18

Charges per ton

Smelting	$4.95	
Freight	1.50	
Total charges per ton		6.45
Net return per ton of ore, FOB Lund, Utah		$19.73

Lead-Zinc Sulfide Ore

The average assay of 239.57 dry tons of ore shipped to the smelters at Salt Lake City, Utah are as follows: 4.22 percent lead, 4.39 percent zinc, 2.44 ounces of silver, and .015 ounce of gold per ton.

Gross value of this ore including "A" and "B" premiums for lead and "A", "B", and "C" premiums for the zinc amounts to $12.25 per ton of ore.

Metallurgical Tests

A representative sample of the sulfide ore from the Wah Wah mine was tested at the Bureau of Mines laboratories in Salt Lake City. The ore contained small amounts of galena, sphalerite, and chalcopyrite in a highly pyritic gangue. The sample assayed 4.0 percent lead, 3.6 percent zinc, 2.9 ounces of silver and .01 ounce gold per ton.

Although some of the galena and sphalerite occur at fairly coarse grained sizes, a reasonable degree of liberation will be obtained only by 200-mesh grinding. A considerable portion of the galena and sphalerite occurs in fractures in the highly shattered pyrite, with grain size 20-48 mesh. Some of the galena and sphalerite is present as inclusions in the pyrite, with a grain size of 100-200 mesh. The analysis of the sample is as follows:

Pb	Ox. Pb	Zn	Ox. Zn	Fe	Cu	Ox. Cu	S	Insol	SiO_2	CaO	Al_2O_3	MgO	Ag	Au
Percent													oz./ton	
4.0	0.6	3.5	0.4	32.6	.035	Nil	25.8	11.3	8.9	1.0	10.8	0.8	2.6	.01

The ore dressing procedure consisted of selective flotation of ore ground through 100 and 200-mesh as follows:

Treatment Selective flotation of minus 100-mesh ore.

	Reagents, Pounds Per Ton							
	CaO	$ZnSO_4 \cdot 7H_2O$	NaCN	$CuSO_4 \cdot 5H_2O$	Z-3	Sodium Aerofloat	Frother*	pH
To Grind	4	4	.5	—	—	—	—	9.8
To Pb Circuit	—	—	—	—	.04	—	.03	—
To Zn Circuit	—	—	—	—	—	.05	.03	—

*Frother is 25 percent cresylic acid, 75 percent methyl amyl alcohol by volume.

METALLURGICAL DATA

Product	Assay No.	Wt.	% Wt.	Assay, Percent Pb	Zn	Fe	Distribution, Percent Pb	Zn	Fe
Pb Recl. Concr.	11847	38	3.82	55.4	9.0	8.05	53.18	10.08	.96
Pb Recl. Tails	11848	37	3.71	26.4	13.6	16.5	24.60	14.8	1.91
Zn. Cl. Concr.	11846	51	5.12	10.5	37.6	13.2	13.52	56.44	2.10
Zn. Cl. Tails	11849	17	1.71	5.2	17.2	23.0	2.24	8.62	1.22
Rough Tailings	11850	853	85.64	0.3	0.4	35.2	6.46	10.6	93.81
Calculated Head		996	100.00	3.96	3.41	32.13	100.00	100.00	100.00

Treatment Selective flotation of minus 200-mesh ore.

Product	CaO	$ZnSO_4 \cdot 7H_2O$	NaCN	$CuSO_4 \cdot 5H_2O$	Zinc Ethyl Xanthate	Sodium Aerofloat	Frother*	pH
To Grind	4	4	—	—	—	—	—	9.5
To Pb Circuit	—	—	—	—	.06	—	.03	—
To Zn Circuit	—	—	—	1.0	—	.045	.03	—

*Frother is 25 percent cresylic acid, 75 percent methyl amyl alcohol by volume.

METALLURGICAL DATA

Product	No.	Wt.	Wt.	Pb	Zn	Fe	Ag	Pb	Zn	Ag	Fe
Pb Cl. Concr.	11920	48	5.01	56.0	12.7	6.8	16.0	74.31	18.65	29.32	1.05
Zn Cl. Concr.	11921	53	5.53	8.7	41.4	11.1	12.5	12.74	67.13	25.27	1.89
Zn Cl. Tails	11922	83	8.67	4.7	2.8	28.6	6.0	10.81	7.12	15.87	7.65
Rougher Tails	11923	774	80.79	0.1	0.3	35.9	1.0	2.14	7.10	29.54	89.41
Calc. Heads		958	100.00	2.78	8.41	32.44	2.74	100.00	100.00	100.00	100.00

Remarks: Zinc in lead concentrate is present as constituent of lead-zinc middling particles. Grinding of these to at least minus 400-mesh is necessary for any liberation.

The ore dressing tests on the ore showed that by selective flotation of minus 200-mesh ore, 73.3 percent of the lead was recovered in a product assaying 66.0 percent lead, 12.7 percent zinc, and 16 ounces of silver per ton. The zinc recovery was 67.1 percent in a product assaying 41.4 percent zinc, 8.7 percent lead, and 12.8 ounces of silver per ton. An intimate lead-zinc-pyrite middling lowers the grade of the zinc concentrate. Microscopic examination of the ore has indicated that 400-mesh grinding will be necessary to liberate the sphalerite. As the sphalerite contains considerable iron, combined chemically, it is doubtful that a 50 percent zinc concentrate could be made even with 400-mesh grinding.

Company Operations

As a result of the recommendations made by the Bureau of Mines, the Wah Wah Mining Company is negotiating an operating agreement with one of the leading Utah smelting companies. The company intends to mine the zinc carbonate ore as well as the oxidized lead ore to explore the lower limestone formations.

Conclusions

After completing 779 feet of drifting and raising and 675 feet of diamond drilling, the Bureau of Mines concludes that:

1. Three classes of ore have been indicated in the ore bodies at the Wah Wah mine.

(a) Zinc carbonate ore in an ore body which contains an estimated 38,000 tons of indicated ore that will average approximately 8.21 percent zinc.

(b) Lead carbonate ore in an ore body containing an estimated 26,900 tons of indicated ore averaging 10.5 percent lead, 8.1 ounces of silver, and .02 ounce of gold per ton.

(c) Lead-zinc sulfide ore in ore bodies containing an estimated 3,000 tons of indicated ore averaging 4.22 percent lead, 4.39 percent zinc, 2.44 ounces of silver, and .015 ounce gold per ton, and 10,000 tons of inferred ore assaying 2.87 percent lead, 2.84 percent zinc, 2.80 ounces of silver, and .015 ounce of gold per ton.

2. The Wah Wah Mining Company has mined 239.57 dry tons of ore from the lead-zinc sulfide ore reserves. This ore averaged 4.22 percent lead, 4.39 percent zinc, 2.44 ounces of silver and .015 ounce gold per ton.

3. The exploration by the Bureau of Mines and the Wah Wah Mining Company has shown that the upper Ophir shales at the Wah Wah mine contain milling grade ore. Continuation of this mineralization can be expected down the dip of the beds along the Tasso fault zone, between the Tasso shaft and the Lue shaft, a distance of 3,000 feet. Since the upper Ophir shales, which are normally unproductive in other districts, have been proved to contain ore, and it is known that ore-bearing fissures exist in the underlying quartzite, it is thought that the lower limestones adjacent to the quartzite should be explored by diamond drilling or shaft sinking. The quartzite-limestone contact, at the intersection of the Tasso fault zone may be a productive horizon.

APPENDIX

A. Calculation of Tonnage

Block A. (zinc carbonate)

150 feet along strike
80 feet along dip as shown by DD hole 4
30 from foot to hanging wall

36,000 tons

Plus area below 125 level on oxide contact

100 feet long
45 feet wide
5 feet thick

2,250 tons

Total zinc carbonate ore 38,250 tons

Blocks B, C, and D

Block B

Average length	110 feet	
Average width	20 feet	
Average thickness	10 feet	2,200 tons

Block C

Average length	100 feet	
Average width	10 feet	
Average height	40 feet	4,000 tons

Block D

Average length	100 feet	
Average width	75 feet	
Average thickness	9 feet	6,750 tons

Total lead-zinc sulfide ore 12,950 tons

In blocks B and C, approximately 13,000 tons, there is at least 3,000 tons of ore equal in grade to that which has been shipped. Although this ore cannot be positively measured, it can be assured by faces of ore seen in the back of the stope, under the track in the bottom of the drift, and under the 125 foot level.

An average assay value was made of all samples taken in sulfide zones. This average includes cut samples, car grabs, and muck pile samples. The average value of these samples is 2.37 percent lead, 2.34 percent zinc and 2.8 ounces of silver per ton.

cc to Greenhalgh

COMBINED METALS REDUCTION COMPANY

Salt Lake City, Utah July 25, 1945

Pay Wah Wah Mining Company

Ore Wah Wah Min C.M.R. Co. Lot No. 2083 Shippers Lot No. 28 Class Mill

Received CMRCo. 7/12/45 E & M J Quotations: Gold Silver Lead 6.50 Zinc 8.25

Assays	Ozs. Au.	Ozs. Ag.	% Pb.	% Zn.	% Fe.	% Insol.	%	%	% Cu	% NaPb	% NaZn
C.M.R. Co.	.14	2.60	2.2	7.5					.15	.2	.2
Shipper	.13	3.80	2.6	7.9					.15	Tr.	Tr.
Umpire		2.765									
Gross	.135	2.765	2.4	7.7					.15	.1	.1
Settlement	.135	2.765	2.3	7.6					.15	.1	.1

Values Per Ton					Treatment	
Gold	100%	@ 20.00	2	700	Base	3 500
Silver -1.5	75%	@ .70625		670	Chg. Pb+Zn under 10.0% @ 10¢	010
Lead -1.5	100%	@ .50		400		
Zinc	100%	@ .50	3	800		
Copper		@				
Gross Metal Payment			7	570		
Less Treatment			3	510		
Net Value Per Ton			4	060	Net Treatment	3 510

Initial	Car Number	Weight
DRG	43319	142500

70.538 Dry Tons @ 4.060 Per Ton 286 38

Freight	@ 2.00	142	50
Tax	@ 3%	4	28
Umpire		3	00
Control		6	50
M.D. Greenhalgh Haulage	@ 2.40	171	00
Tax	@ 3%	5	13

Total Wet Weight 142,500
1.0 % Moisture
Dry Weight 141,076

Total Deductions 332 41

Net Proceeds 46 03

Approved by AG Checked by LJE BS

3M 6-45 27980 © Dittoforms

FORM S. L. 247 6M 4-38

AMERICA' SMELTING AND REFINI G COMPANY

MURRAY PLANT

SALT LAKE CITY, UTAH. March 10,1939

BOUGHT OF Wah Wah Mining Co. MINE Wah Wah LOT NO. 6

RECEIVED 3-2-39 SAMPLED BY MP CLASS crude SHIPPING POINT Frisco, Utah

QUOTATIONS GOLD 34.9125 SILVER .64125 LEAD 4.75 less 1.5625 COPPER

ASSAYS	GOLD OZ. PER TON	SILVER OZ. PER TON	LEAD PER CENT	COPPER PER CENT	INSOL. PER CENT	ZINC PER CENT	SULPHUR PER CENT	ARSENIC PER CENT	IRON PER CENT	CaO
A. S. & R. CO.	.07	8.0	13.9	-	9.7	.5	1.7		24.4	10.6
B&D	.08	8.4	14.2							
UMPIRE										
SETTLEMENT ASSAY	.075	8.2	14.05		9.7	.5	1.7		24.4	10.6

CAR INITIAL	NUMBER	WEIGHT
UCR	21666	

VALUES PER TON		
GOLD	@ 31.81825	2.39
SILVER, 95% Min. .5	@ .64125	4.94
LEAD, LESS 1.5.00%	@ .6375	7.20
COPPER, LESS	@	-
		14.53
LESS TOTAL DEDUCTIONS		2.42

DEDUCTIONS PER TON	
BASE	2.15
Under 30% lead	1.40
INSOLUBLE % @	.97
ZINC % @	
SULPHUR % @	
DEBIT	4.52
CaO % @	.64
IRON % @	1.46
TOTAL DEDUCTIONS	2.42

WEIGHT OF LOT

WEIGHT OF SACKS

WET WEIGHT 118320

LESS MOISTURE 19.1 % 22600

DRY WEIGHT 95720 @ $ 12.11 PER TON $ 579.58

FREIGHT ADVANCED @ 1.75 103.53

ADVANCES watching 4.00

SAMPLING

UMPIRE

ASSAYING 4.00 111.53

Rates, except on contracts, subject to change without notice.
Buyers assays govern if seller fails to make or submit assays prior to acceptance of payment.

NET PROCEEDS $ 468.05

MEM MARCH

AMERICAN SMELTING AND REFINING COMPANY

MURRAY PLANT

SALT LAKE CITY, UTAH. Dec.8,1939

BOUGHT OF WahWah Mining Co. MINE Wah Wah LOT NO. 17

RECEIVED 11-30-39 SAMPLED BY MP CLASS crude SHIPPING POINT Frisco, Utah

Final gold quot.

QUOTATIONS GOLD 34.9125 SILVER .70625 LEAD 5.50 less 1.5625 COPPER

ASSAYS	GOLD OZ. PER TON	SILVER OZ. PER TON	LEAD PER CENT	COPPER PER CENT	INSOL. PER CENT	ZINC PER CENT	SULPHUR PER CENT	ARSENIC PER CENT	IRON PER CENT	CaO
A. S. & R. CO.	.085	3.1	11.3	.1	11.8	1.0	1.0		29.7	7.2
B&D	.08	3.3	11.5	.1	10.1	.9	1.2		31.6	8.6
UMPIRE C&N					9.6				30.8	7.9
SETTLEMENT ASSAY	.0825	3.2	11.4	.1	10.1	.95	1.1		30.8	7.9

CAR INITIAL	NUMBER	WEIGHT
UCR	20382	

VALUES PER TON			
GOLD	@	31.81825	2.63
SILVER. 95% Min .5	@	.70625	1.91
LEAD. LESS 1.5.90%	@	.7875	7.02
COPPER. LESS	@		
			11.56
LESS TOTAL DEDUCTIONS			2.01
	@		9.55

DEDUCTIONS PER TON	
BASE	2.15
under 30% lead	1.61
LABOR ADJUSTMENT	
INSOLUBLE % @	1.01
ZINC % @	
SULPHUR % @	
Debit	4.77
~~xxxxx~~ DEBIT or.under 15.00Gro.	.75
	4.02
~~Labor 10-6-39~~	~~.31~~
	~~4.33~~
IRON Fe & CaO % @	2.32
TOTAL DEDUCTIONS	2.01

WEIGHT OF LOT

WEIGHT OF SACKS

WET WEIGHT 113660

LESS MOISTURE 15.4 % 17504

DRY WEIGHT 96156

PER TON $ 459.14

FREIGHT ADVANCED @ 1.75 99.45

ADVANCES watching 4.00

SAMPLING

UMPIRE 1.50

ASSAYING 5.00 109.95

Rates, except on contracts, subject to change without notice.
Buyers assays govern if seller fails to make or submit assays prior to acceptance of payment.

NM DEC

NET PROCEEDS $ 349.19

INTERNATIONAL SMELTING AND REFINING COMPANY

TOOELE PLANT

Salt Lake City, Utah 8/22/45

Bought of Wah Wah Mining Co.
404 Dooly Block
Salt Lake City, Utah

Mine

Shipped from Lund, Utah

Received 8/4 Sampled 8/8 By Class Crude Mine Lot 29 Smelter Lot 833

ASSAYS	COPPER PER CENT	LEAD PER CENT	ZINC PER CENT	SILVER OZ. PER TON	GOLD OZ. PER TON	INSOLUBLE PER CENT	IRON PER CENT	SULPHUR PER CENT	LIME PER CENT	MANGANESE PER CENT	SPEISS PER CENT
I. S. & R. CO.	Tr	.5	13.0	.15	Tr	6.7	19.9	2.8	6.9		
MINING CO.	.2	.7	13.2	.4	.01	8.35	19.4	1.5	7.2		
UMPIRE D&N		-1.5				7.4m		2.18m			
SETTLEMENT	.1		13.1	.275	.005	7.4	19.65	2.18	7.05		

E. & M. J. METAL QUOTATIONS

Copper (Average for Week Ending)			
Lead (Average for Week Ending)			
Zinc (Average for Week Ending)	8/1	8	250
Silver			
Gold			

VALUES PER TON

Copper		@		
Lead		@		
Zinc	75%	@ .01815	3	566
Silver		@		
Gold		@		
Gross Metal Payment			3	566
Less Treatment			7	408
Net Value Per Ton		Chg.	3	842

TREATMENT

Base		3	100
Chg. Settlement Lead under 30% @ .10		3	090
		6	190
Insoluble	% @ .10		740
Sulphur	.18 % @ .25		045
Zinc	% @ .15	1	965
		8	940
Iron	% @ .06	1	179
Lime	% @ .05		353
Manganese	% @		
Net Treatment		7	408

INITIAL	CAR NUMBER	WEIGHT
DRG	70534	
Total Freight Weight		131200
Less Weight of Sacks		
Net Wet Weight		
% Moisture 5.56		
Dry Weight		123905

PAYMENT

61.9525 Dry Tons @ 3.842 Per Ton		Chg	238 02
Hauling @ $3.25 per wet ton, pay Loy Carson, Milford, U. $213.20			
3% Federal Tax 6.40			
Vo. 44483	219 60		
J. R. Kirk, Sr., Rep., Vo. 44484	3 00		
Crismon & Nichols, Assaying	6 00		
Deason & Nichols, Umpire	6 00		
Not over			
Freight @ 1.50 Per Ton (R. R. Value 5.00)	98 40		
3% Federal Tax	2 95		
Shipped By Wah Wah Mng. Co.			
Mine Lot 29 Crude		Total	335 95
Smelter Lot 833 Zn Voucher No. Due IS&RC		Net Proceeds	573 97

An extra charge made for sampling all lots less than carload. Rates, except on contracts for specified time or specified tonnage, subject to change without notice.

No assent, express or implied, by this Company to any breach or waiver of any covenant contained in any agreement shall be deemed a waiver of any succeeding breach of the same covenant.

FORM 20M 2-13-

INTERNATIONAL SMELTING AND REFINING COMPANY

TOOELE PLANT

Salt Lake City, Utah 11/29/45

Bought of Wah Wah Mining Co.
404 Dooly Bldg., City

Mine

Shipped from Lund, Utah

Weighed 11/16

Received 11/16 *Sampled* 11/20 *By* *Class* Crude *Mine Lot* 51 *Smelter Lot* 1255

ASSAYS	COPPER PER CENT	LEAD PER CENT	ZINC PER CENT	SILVER OZ. PER TON	GOLD OZ. PER TON	INSOLUBLE PER CENT	IRON PER CENT	SULPHUR PER CENT	LIME PER CENT	MANGANESE PER CENT	SPEISS PER CENT
I. S. & R. CO.	Tr	.2	12.4	.05	Nil	11.9	17.6	.4	6.3		
MINING CO.	.1	.45	13.5			11.7	18.8	.5	6.2		
UMPIRE C&N			13.0s				18.3s				
		-1.5									
SETTLEMENT	.05		13.0			11.8	18.3	.45	6.25		

E. & M. J. METAL QUOTATIONS

Copper (Average for Week Ending)		
Lead (Average for Week Ending)		
Zinc (Average for Week Ending)	11 1[illegible]	8 250
Silver		
Gold		

VALUES PER TON

Copper		@	
Lead		@	
Zinc	75%	@ .01815	3 539
[illegible]er		@	
Gold		@	
Gross Metal Payment			3 539
Less Treatment			7 937
Net Value Per Ton		Chg	4 398

TREATMENT

Base			3 100
Chg. Settlement Lead under 30% @ .10			3 118
			6 218
Insoluble	% @	.10	1 180
Sulphur	% @		
Zinc	% @	.15	2 950
			5 348
Iron	% @	.06	1 098
Lime	% @	.05	3[illegible]
Manganese	% @		
Net Treatment			7 93[illegible]

INITIAL	CAR NUMBER	WEIGHT
UCR	20139	100140
	20859	94380
Total Freight Weight		194520
Less Weight of Sacks		
Net Wet Weight		
% Moisture 5.83		
Dry Weight		183179

PAYMENT

91.5895 Dry Tons @ 4.398 Per Ton			Chg 402 81
J. R. Kirk, Sr., Rep., Vo. 44800	6	00	
Deason & Nichols, Assaying	4	00	
Hauling @ $3.00 per wet ton, pay M. D. Greenhalgh, Milford, Utah $291.78			
3% Federal Tax 8.75			
Vo. 44801	300	53	
Due I.S.& R.Co., Lot 50/1212	1210	06	
Not over			
Freight @ 1.50 Per Ton (R. R. Value 5.00)	145	89	
3% Federal Tax	4	38	
Total			1670 86
Net Proceeds			2073 67

Shipped By Wah Wah Mng. Co.
Mine Lot 51 Crude
Smelter Lot 1255 Zn Voucher No. Due IS&RCo

An extra charge made for sampling all lots less than carload. Rates, except on contracts for specified time or specified tonnage, subject to change without notice. T

No assent, express or implied, by this Company to any breach or waiver of any covenant contained in any agreement shall be deemed a waiver of any succeeding breach of the same covenant.

RECEIVED
MAR 26 1958

Salt Lake City, Utah
April 3, 1 9 4 4.

WAH WAH MINING COMPANY

The Bureau of Mines project at the Wah Wah mine, 60 miles west of Milford, Utah, commenced work in November 1942. From November to January 3, 1943, the mine was unwatered and the shaft and all of the workings on the 200-foot level were rehabilitated.

During the period January 3, 1943 to February 20, 1943, the Bureau of Mines drove 145 feet of drifts on the 200-foot level, exposing two heavily mineralized beddings of lead-zinc sulphide ore. The project was then recessed before the Bureau's objectives were reached.

The above work was done at a cost of $12,659., which included the purchase of a Gardener-Denver 285 cu.ft. compressor, mine rails, pipe, drilling machines, drill steel, and many other necessary mining tools which usually are listed as capital investments that are depreciated over a period of years.

The Wah Wah Mining Company secured a Reconstruction Finance Corporation loan and continued exploration, using the Bureau of Mines equipment under the direction of a Bureau engineer.

During the period from March 1, 1943 to November 1943, the Wah Wah Mining Company drove 516 feet of drifts and raises. As a result of this work, a large oxidized body of zinc ore was exposed for 110 feet along the strike, 35 feet in width and probably extends 100 feet along the dip with a total tonnage of 38,500 tons averaging 10 percent of zinc. A raise 90 feet in length was driven from the 200 level to the 125 level to develop the sulphide zone. Four car-loads of lead-zinc sulphide ore have been mined from this section and shipped to the smelter at Salt Lake City, Utah.

In November 1943, the Bureau of Mines appropriated $7,300 for a diamond drilling project at the Wah Wah mine. To date 435 feet of drilling has been completed.

As a result of the combined efforts of the Bureau of Mines and the Wah Wah Mining Company, the total tonnage exposed at the mine is 38,500 tons of oxide zinc ore, 8,000 tons of sulphide lead-zinc ore and 26,000 tons of oxidized lead-silver ore. The present drilling operation indicates that the sulphide zone continues to the east and below the 200 level.

A mine access road has been completed and gravelled to connect with the Milford, Utah - Ely, Nevada highway, as well as to the railroad loading ramp at Lund, Utah.

The exploratory work completed by the Bureau of Mines and the Wah Wah Mining Company has proven a substantial body of mill grade ore in the upper shales and limestones of the ophir formation, adjacent to the Tasso fault.

In other districts, notably at the Ophir Hill mine in Ophir Canyon, Utah, very large bodies of ore have been mined from the middle and lower limestone horizons near the quartzite contact and intersections of faults and fissures. Therefore, since conditions are quite similar at the Wah Wah mine, it is recommended that these lower horizons should be prospected either by sinking the shaft and drifting along the Tasso fault zone, or by diamond drilling. If shaft sinking should be contemplated, it would be advisable to first drill to the quartzite foot wall to determine its exact position. The quartzite-limestone contact at the intersection of the Tasso fault zone should be a productive horizon from the Tasso mine to the Lue shaft, a distance of possibly 3,000 feet.

(Signed) JAMES A MARSH
Mining Geologist.

J. A. Marsh
Mining Geologist

Phone
Salt Lake, 5-2666

Salt Lake City, Utah
April 26, 1942

Mr. E. F. Richards, Vice President,
Wah Wah Mining Company,
Salt Lake City, Utah.

Dear Sir:

Following is a brief report of the Wah Wah Mine in Beaver County, Utah based on an examination which I made October 4, 1941, in company with yourself, Mr. W. C. Sweeney, and Mr. R. M. Currier of Boston, Mass.:

My examination was confined chiefly to the 125' and 200' levels, however, a casual examination was made of the surface area in close proximity to the Tasso Shaft.

-GENERAL GEOLOGY-

The Tasso Shaft is located near a limestone-shale contact along a very prominent east-west fault zone known as the "Tasso Fault," which traverses the length of the property. This fault zone appears to be a controlling factor in ore deposition throughout the district. The geological formations consist of limestones, shales, quartzites, and intrusions of rhyolite porphyry, varying in age from Pre-Cambrian and Cambrian to Triassic.

-ORE OCCURRENCE-

In the foot-wall of the Tasso Fault there are east-west fissure zones, which appear to control ore-deposition or rather make the ore body and in many cases these fissures are accompanied with basic porphyry dikes and pebble dikes. These pebble dikes are irregular and are filled with quartzite pebbles and siliceous matrix sometimes containing iron and lead sulphides.

The ore body which has now been developed on the property no doubt was previously exposed on the surface but due to erosion is now covered by alluvium material and is first seen in the Tasso Tunnel where it occurs as an oxidized gossan material in chimney-like form.

-DEVELOPMENT OF ORE BODY-

All development work is from the Tasso Shaft 200' in depth, with drifts on the 80', 125', and 200' levels.

80' Level: Drifting on this level failed to encounter the ore body due to its northeast rake. Chiefly all development work was through a sandy shale, with only slight mineralization.

125' Level: Drifting on this level has disclosed an oxidized and sulphide ore body which is 110' from foot to hanging-wall and 175' along its strike, with the eastern limits not having been reached at this time. A very prominent east-west fissure zone and pebble dike forms the foot-wall of this ore body which is persistant as far east as development work has progressed. The ore occurs as a typical replacement deposit in shale. Several winzes below this level have encountered the sulphide zone, at an average distance of 3' below the level. This is a typical concentrating ore, consisting of a mixture of pyrite, galena, sphalerite, and chalcopyrite, carrying gold and silver. Samples of this ore taken by myself are as follows:

Sample No.	Location	Ozs. Per Ton Gold	Silver	% Lead	% Copper	% Zinc	% Insol.	% Iron
1	1-Winze	0.20	2.4	None	0.25	5.8	1.6	41.3
3	3-Winze	0.08	0.8	2.0	2.20	-	1.9	34.6

I do not believe these samples are representative of the true sulphide ore, because the ore exposed by these winzes is very porous and continues to show the general processes of alteration and leaching. When the true sulphide zone is reached assay values of the ore should show a decided increase.

-ORE SHIPMENTS-

From December 22, 1938 to December 26, 1939, 21 cars of ore containing 925.789 dry tons, having a gross metal value of $12,447.83, were shipped from the 125' level, all of which was from the oxidized zone.

200' Level: A total of 194' of drifting to the east and northeast from the shaft has been completed on this level. Entire distance has been through a sandy shale and limestone. Three typical replacement sulphide ore beddings were encountered by this development work, all of which having a general east-west strike and dipping 48° to 56° northerly. The first bedding having an average width of 3' -4' and dipping 47° to the north was followed for a total distance of 130' to the east, where a 4' cut assayed: 0.21 oz. gold, 2.6 oz. silver, 2.0% lead, 0.10% copper, and 5.8% zinc. The second bedding having an average width of 5' and dipping 57° northeasterly, was encountered 20' north of the first, a 5' cut of which assayed: 0.05 oz. gold, 2.6 oz. silver, 3.2% lead, 0.15% copper, and 2.1% zinc. Previous samples of this bedding showed a maximum silver content of 21 oz. The third bedding has just been encountered at the face and may or may not be the downward extension of the ore body on the 125' level. A 3' cut of this, which is the amount now exposed, assayed: 0.06 oz. gold, 12.8 oz. silver, 1.8% lead, 0.07% copper, and 2.1% zinc.

All of these ore beddings which have now been encountered on this level are of mineable size and certainly could be mined as a concentrating ore. It is my opinion that all of these are in the foot-wall of the main ore body being sought and this should be reached in the next few feet of advance.

-WATER CONDITIONS-

Water conditions are not at all a serious problem at this time, as only a small amount of water is making on the 200' level. The level can be kept quite free from water by pumping operations of two-hour periods twice a week. The present water level at the mine is now approximately 30' above the 200' level, which of course could be pumped out in a few days.

-GENERAL CONCLUSIONS AND RECOMMENDATIONS-

Results of this examination verify the existing general geological conditions which are usually considered essential and necessary for ore deposition, i.e.,

1) A suitable magmatic source of desired metallic elements.

2) A proper passage-way for ore solutions.

3) An adequate transporting agent for ore solutions.

4) A suitable country rock for deposition of ore.

In the Wah Wah Mine there are areas of porphyry intrusions which no doubt furnish the source of desired metallic elements.

Strong east-west fissures which are persistant along strikes and dips are found in this property and furnish the necessary passage-ways.

Magma in the form of sills, dikes, etc., aqueous solutions, and vapors, served as transporting agents.

Suitable limestone and shale beds found in the property offer a most favorable country rock for ore deposition.

The oxidized ore body found in the Tasso Tunnel and further d eveloped on the 125' level now shows this to be a typical replacement ore bedding having a width of 110' from foot to hanging-wall and a length of 175' with the east limit not having been reached.

A total of 21 cars of ore shipped from the 125' level and oxidized zone, amounted to 925.789 dry tons, having a gross metal value of $12,447.83, or an average metal value of $13.22 per dry ton. The above tonnage contained 65.09 fine ounces of gold, 7,424.00 fine ounces of silver, 1,390 pounds of copper, and 204,130 pounds of lead.

The sulphide zone has now been encountered by winzes from the 125' level and is found to be about 3' below the level. Samples taken of this ore show it to be a typical concentrating ore, consisting of a mixture of pyrite, galena, sphalerite, and chalcopyrite, carrying gold and silver.

Development work on the 200' level has disclosed three small typical replacement sulphide ore beddings, all of which can be mined as a concentrating ore. The downward extension of the ore body developed on the 125' level should be reached in the next few feet of advanced by the drift on this level.

A quick source of copper could probably be accomplished by means of leaching the copper from the oxidized ore zone, by means of distributing water on the upper areas and recovering this at lower elevations and then precipitate the copper out by running this solution through scrap iron. This water should contain between 10 to 15 pounds of copper per 1,000 gallons, because a sample of water taken in 1 and 2 winze contained 15.86 pounds per 1,000 gallons.

In view of the above conditions and due to the recent government bonus on lead, copper, and zinc, I have no hesitancy in thoroughly recommending this property, providing sufficient capital is secured to carry the work to a successful and producing stage. It is my expert and candid opinion that a substantial tonnage of concentrating ore can and will be developed by further development on the 200' level. I would not recommend any milling project be undertaken until development work has thoroughly blocked out a sufficient tonnage of ore, which would warrant the construction of a mill.

Respectfully submitted,

/s/ James A. Marsh

Consulting Mining Geologist.

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QUESTION 5 - The Exploration Project

(a) Minerals to be Explored For

Lead-zinc, with secondary values of copper, gold and silver.

(b) The Proposed Work

(1) Aerial Photography

It is proposed that this area be flown in vertical stereoscopic color photography in order that a comprehensive geological study may be made of the central portion of the Wah Wah range. Information of this nature will be invaluable in the overall evaluation of the district and will assist materially in planning future exploration. It is applicant's opinion, based upon extensive experience with vertical stereoscopic color photography of similar areas, that the terrain of this district will lend itself well to photo-geologic interpretation. This aereo-photographic project anticipates also the construction of a base geologic map of the area from the information so obtained. The area to be flown is the central part of the range approximately ten miles long in a North-South direction and eight miles wide in an East-West direction.

(2) Preparation of Drill Sites

The topography of the area in which the proposed drilling is to be done is fairly gentle and affords easy entry. It is proposed that bulldozer roads be constructed on the line of each series of drill holes and an area be widened into the hill from this road at each drill hole location. This widened area need only be large enough to accommodate the drill rig and other miscellaneous small equipment. The water supply truck, settling tanks, etc., may be parked on the roadway. The ground can be worked readily with a bulldozer at a minimum cost.

(3) Diamond Drilling (See: Location Map in Envelope V, Summary of Drill Hole Data and Sections.)

It is proposed that the project be set up for 21 drill holes totalling 10,956 feet. Careful analysis of the project suggests this drilling be set up in four stages as follows -

Stage I

The first stage is to consist of 7 holes, totalling 2186'±, in the area immediately to the North and East of the Tasso shaft and workings. The target in this area is the 60 foot thick black shaly limestone bed, in which the sulfide ore made on the 200 foot level, which lies between the two converging fissures (N 30° W dipping 65° Westerly and N 35° W dipping 75° Easterly, as shown on the map).

The position of this bed corresponds to that of the productive Prince bed at Pioche, Nevada. The plan is to drill a series of seven holes, Numbers 1 to 7, through this favorable bed, at spacings of 200 feet between holes, up the trough of the bedding intersection with the converging fissures at depth. These seven holes will explore this trough 1400 feet along its strike up bedding dip. The width of trough at the Southerly boundary, where it meets the Tasso fault, is about 60 feet, and at Hole No. 7, is about 300 feet wide, having an average width of some 180 feet. The target volume may be represented as (1400)(180)(60) = 15,120,000 cu. ft., or at a factor of 10 cu. ft. per ton in place, about 1,500,000 tons of replaceable bed. What the ore factor may be can be answered only by actually drilling the holes.

Stage II

The second stage will consist of 5 holes, Numbers 8 to 12, totalling 1786'±, in the exposed shale area immediately South of the Tasso shaft and between the Tasso fault and the porphyry. The target in this area is the 45 foot thick Wah Wah limestone bed which lies near the bottom of the shale about 100 feet above the quartzite-shale contact. The position of this bed corresponds to that of the productive C.M. bed at Pioche, Nevada. The plan is to test the Wah Wah bed in close proximity to intersections with strong fissures and faults as indicated. Several other limestone beds, 5 to 20 feet in thickness, will also be cut by the holes and these may also prove to be productive. The main Wah Wah bed target in this area may be represented by a triangle, approximating an equilateral, having a side length of 1000 feet, more or less. The target volume would then be (500)(870)(45) = 12,250,000 cu. ft., or at a factor of 10 cu. ft. per ton in place, about 1,250,000 tons of replaceable bed. Again, the ore factor can only be determined by putting the holes down.

Since Stages I and II have entirely different target beds, these two stages should be completed as the first phase of the drilling program without regard for the results obtained from the other. Stage III which follows, would of course, be contingent upon the results of Stage I, with the exception of Hole No. 13, which might be conditioned upon the results of Stage II in the event Stage I results were unfavorable, since its deep objective is the Wah Wah bed.

Stage III

The third stage will consist of 5 holes, Numbers 13 to 17, totalling 3,380'±, in the limestone area immediately Easterly from the N 30° W fissure which bounds Stage I on the East. The target in this area is again the 60 foot thick black shaly lime bed of Stage I, with the exception of Hole No. 13, which will continue down to the 45 foot thick Wah Wah bed for the purpose of testing this horizon on the North side of the Tasso fault, near the strong N 30° W fissure, and reasonably close to the porphyry. This series of holes is designed to test the continuity of mineralization in the black bed Easterly from the Stage I area, and if successful, would strongly suggest the

continuity of this productive bed Easterly down dip, and would form the basis of a future drilling program in the block between coordinates 10,000 and 11,000 North and 14,000 and 17,000 East. However, such a future drilling program is beyond the scope of this application.

Stage IV

The fourth stage anticipates 4 holes, Numbers 18 to 21, totalling 3622'±, in the limestone area adjacent to the porphyry contact, between Holes 13 and 17 of Stage III and the Lue shaft area, where significant showings of lead-silver ore have been developed. The target is the black bed and these holes are designed to test the mineralization in this contact area. Positive results from this stage would suggest a large area of inferred ore and add further support for a long range drilling program as mentioned in Stage III above.

Note At the end of this section the following maps, covering the diamond drilling program, will be found in Envelope V and subsequent exhibits.

Map. #10. 1. Topographic and geological map showing location of drill holes.

Maps #11-14. 2. Sections of the blocks in which each stage of drilling will be performed.

#15. 3. Sections of the proposed drill holes.

A summary sheet, giving pertinent data for all drill holes will also be found at the end of this section.

(c) Time Schedule

The work will start within 60 days and be completed within 18 months from the date of an exploration project contract.

(d) Operating Experience of Applicant

Applicant is a graduate Engineer with twenty-two years' experience in nonferrous mining for his own account. Applicant is fully capable of planning, financing and executing all phases of surface and underground mining operations under his own personal direction and supervision. While it is anticipated that actual drilling will be performed by Boyles Brothers Drilling Company, as independent contractors, on a unit cost per foot contract and bulldozer work will be performed on a unit cost per hour contract, applicant will personally field supervise the conduct of these operations. Applicant anticipates the use of certain consultants in engineering and geology to assist him in the proper conduct and interpretation of the work herein contemplated. The aerial photography and photogeologic interpretation thereof will be done on a flat fee contract by Philip A. Laylander.

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QUESTION 6 - ESTIMATE OF COSTS

(a) Independent Contracts

1. Aerial Photography

How much charge per sq. mi. and employing costs?

Flight over area 8 miles by 10 miles; photo in vertical stereoscopic color; minimum flight line lap 60%, side line lap 30%; develop and case photographs; prepare photo-geologic interpretation report and map. $2,500.00

2. Bulldozing Drill Sites

8)200
25 days?

An estimated 200 hours bulldozer operation @ $15.00 per hour for D-6 or equivalent. This includes moving to and from job. 3,000.00

3. Diamond Drilling
(See Bid of Boyles Bros. at end of Section)

80 sq. mi.
3 beds?

10,956 feet of drilling in 21 holes. Start all holes Nx and complete with Bx or Ax as indicated by prudent drilling practice. Cores to be preserved in boxes. Unit price includes moving to and from job -

2,587 Ft.	@	$5.60/Ft.	$14,487.20		
5,115		6.30	32,224.50		
3,224		7.60	24,730.20		
10,956 Ft.		$6.52 Ave.	$71,442.10	71,442.00	
				$76,942.00	$76,942.00

25'/day

(b) Consultants

1. Engineering

Surveying drill locations, preparation of core maps, and other engineering -

30 Days @ $50.00 Per Day $ 1,500.00

2. Geology

Core study, analyses and interpretation, geologic maps and sections of drill holes, etc. 30 Days @ $50.00 Per Day 1,500.00

(c) Operating Supplies

None

(d) Operating Equipment

60-70 mi/day
more or less
OK

Allowance to applicant for use of 4 wheel drive Willys station wagon - 2000 miles per month to maximum of 25,000 miles @ $.08 per mile — $ 2,000.00

(e) Rehabilitation and Repair

None — -

(f) New Buildings, Etc.

None — -

(g) Miscellaneous

1. Assaying

What for assaying?

200 Samples to be run for Au, Ag, Pb, Zn, Cu, Non-S-Pb, Non-S-Zn, CaO, Fe, Insol - @ $0.50 per determination — 1,000.00

2. Liability Insurance

18 months term covering PL and PD $100,000/300,000 — 150.00

0.50/ft
11,000 (5,5000)
Petition therefore
7% drilling costs

(h) Contingencies

Allowance for unusual drilling conditions, including casing, cementing, fishing, etc., and allowance for extra depth which may be necessary to cut objective — 5,500.00

$11,650.00 — 11,650.00

TOTAL ESTIMATED COST — $88,592.00

Diamond Core Drilling
Mining
Quarries
Shaft Sinking
Tunnel Driving

Boyles Bros.
DRILLING COMPANY

CONTRACTORS - ENGINEERS - GEOLOGISTS
General Offices
1321 South Main Street Phone HUnter 4-4401
SALT LAKE CITY 15, UTAH

March 17, 1956 Reply to: S.L.C.

Mr. James D. Williams
Felt Building
Salt Lake City, Utah

Dear Mr. Williams:

After carefully considering the location, geology, and other problems involved on your proposed drilling program at Wah-Wah-, Utah we feel that certain modifications are in order on Mr. R. T. Goldsworthy's "shotgun" estimate given to you verbally earlier this year. As you remember, his figure was given to you on rather limited information, and was to be used for your preliminary application only. We sincerely hope that the following rates are close enough to that estimate to enable you to receive the loan applied for.

1. For a minimum of 4,000 feet of AX size holes, the rates will be:

0 - 400	$5.60	per foot
400 - 800	$6.30	per foot
800 -1200	$7.60	per foot

2. Cardboard core boxes to be supplies by Boyles.

3. Water. To be pumped or hauled at no cost to you, however access roads and water rights to the water to be arranged for by you.

4. When Quartzite is encountered, the above rates would apply only for 10 feet of penetration. Should you desire to drill beyond that point the rates would increase by $3.00 per foot.

The foregoing rates include all reaming and cementing and it would be our intention to collar all holes NX and continue BX as far as practical before reducing to AX size.

Should those rate meet with your approval, we could mobilize within

twenty days of notice to proceed.

Thank you for calling on us.

Yours very truly,

A. F. Goldsworthy

A. F. Goldsworthy
Manager, Drilling Division

AFG:lm

SUMMARY OF D.D. HOLE COST

Hole No.	Hole Depth Range 0-400'	400'-800'	800'-1200'	Unit Price Per Foot	Amount
1	400			$5.60	$ 2,240.00
2		414		6.30	2,608.20
3	385			5.60	2,156.00
4	355			5.60	1,988.00
5	295			5.60	1,652.00
6	215			5.60	1,204.00
7	122			5.60	683.20
8		440		6.30	2,772.00
9	152			5.60	851.20
10	364			5.60	2,038.40
11	299			5.60	1,674.40
12		513		6.30	3,231.90
13			1125	7.60	8,550.00
14		565		6.30	3,559.50
15		549		6.30	3,458.70
16		435		6.30	2,740.50
17		706		6.30	4,447.80
18		746		6.30	4,699.80
19		747		6.30	4,706.10
20			953	7.60	7,242.80
21			1176	7.60	8,937.60
	2587 Ft.	5115 Ft.	3254 Ft.		$71,442.10
	$14,487.20	$32,224.50	$24,730.40	$6.52 Ave.	$71,442.10

QUESTION 7 - FINANCES

(a) Applicant's Share of Project Costs

Applicant is financially able to furnish his 50% share of all estimated costs of the project as set forth in Section 4 of this application.

(b) How to be Furnished

Applicant will furnish his share in money. This will be done by opening a commercial bank account under the trade style of PINE GROVE MINES and depositing therein a sum equal to 50% of the agreed contract amount.

(c) Development and Mining Finances

Applicant further represents that ample funds will be made available to perform the requisite development work necessary to place the property on production should the exploration project herein contemplated discover ore which may be extracted and marketed at an economic profit.

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SECTION V

SECTION V

This historical section has been added for the express purpose of establishing time continuity of the early activities in the district in support of the premise that the history of the Pine Grove District and Wah Wah (Revenue) Mine definitely suggests an area of sufficient lead-silver-gold and lead-silver-zinc mineralization, all within a favorable geological framework, to justify further exploration. It will also point out that early operators, while they may have been aware of the ore potential in the limestone and shale, did no exploration toward that end but confined their work exclusively to the high grade fissures in the quartzite. This parallels the early history of the Pioche District. It would appear that the history of the Pine Grove District might have been much different had the early operators expended their funds exploring the limestone and shale section. A brief explanation of the several exhibits at the end of this section follows.

1. Mapping and Drilling by A.S.& R.Co. - 1939

Envelopes VI, VII and VIII contain the maps prepared by Mr. R. F. Welch, Geologist, Western Mining Department, A.S.& R.Co. Most of this field work was done in 1939, for the purpose of exploring the sulfide ore horizon (Black Bed) below the 125 foot level from underground drill stations and with short drill holes. Such drilling (with the exception of D.D. Hole No. 2) was confined to the immediate area of the known orebodies, or short projections of them. No serious effort was made to do a comprehensive drilling job in this horizon. However, such exploration was sufficiently productive to cause the Wah Wah Mining Company to raise the money necessary to rehabilitate the 200 foot level and extend the drift into the ore zone indicated from the drilling. Low metal prices and general economic conditions caused a cessation of the project.

2. Early Reports - 1906 to 1919

It will be noted that these early engineers and geologists (with the exception of C. Colcock Jones-1906) confined their main studies to the quartzite area. This was probably because of the fact that then existing operations were limited to this area. However, the important facts brought to light by these early investigators were the number and strength of ore-bearing fissures in the property and the reasonable belief that the district merited major exploration. Mr. Jones saw considerably more and recommended work in the limestone and shale for bedded replacement type orebodies. After reading these reports one feels that a potentially productive district has been sadly neglected.

3. Early Assay Sheets - 1900 to 1914

These sheets are, in themselves, relatively unimportant as a measure of evaluation. However, they do tell an important story; i.e., these early operators were exploring high grade lead-silver ore with good gold values in the fissures in the quartzite. More important, though, is the fact that similar high grade ore was discovered in fissures in the limestone at the Lue shaft, some 4000 feet Easterly from the operations in the quartzite.

4. Early Exploration Map

This early authorless and dateless map gives us a fairly good picture of the numerous ore-bearing fissures in the quartzite which undoubtedly continue into the shale and limestone areas, serving as mineralizing channels. We should certainly expect these fissures to "bed out" where they cut the favorable limestone beds.

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REPORT ON THE PROPERTY OF THE UTAH REVENUE MINES CORPORATION, MADE BY LAFAYETTE G. BURTON, SEPT. 9, 1919.

In accordance with instructions from New York through Mr. W. B. Ridgely, I have recently visited the property of the Utah Revenue Mines Corporation in Beaver County, Utah, and spent several days going over same, renewing my recollection in regard to the geology and the location of the various veins of ore.

I paid special attention to the new work which has been done during the past few months at the Tasco Shaft. The general features in regard to this large property and the details in regard to the showings of ore, the nature of their occurrence and the geological conditions have been so fully covered by previous reports made by Messrs. Chas. Colcock Jones, John B. Taylor and Ed Cook and my report of June 26th last, incorporated in your recent pamphlet; also the reports made by Prof. Lind, Pierre Peogot, A. K. Tiernan, David J. Cook, P. M. McCree and D. P. Rohlfing, which I understand are in your possession and therefore available for your information, that I shall confine this report entirely to the recent work in the Tasco Shaft.

TASSO SHAFT.

This shaft was sunk by the old mine management fifteen years ago to a depth of 125 feet. (See Map Tasso Shaft). At various times since then work has been done at the Tasso Tunnel level near the shaft.

(A) The work done by Joe Mann, Miller and others at the Tasso Tunnel consisted in extending the tunnel to the north from Station 7, sinking a winze 29 feet deep at Station 10, a winze 12 ft. deep at Station 9, a winze 26 feet deep at Station 14 and drifting to the north and east from these various points in the upper oxidized ores, which are porous and leached of much of their metallic values. These ores extend from a point near the mouth of the tunnel through all the workings of the Tasso Tunnel. Careful samples were taken every five feet along the entire works down the winzes, drifts, etc. The average result of the assays was 5% lead, 2 ounces silver and $1.00 gold per ton. This large body of milling ore exposed by the Tasso Tunnel workings and the 80-ft. level, run from the shaft, measured 50 ft. wide by 120 feet in length by 100 feet in depth.

From the above figures I estimate that there are 40,000 tons of mill ore which sample $12.00 to the ton, or $480,000.00, near the surface, easily and cheaply worked. The probable ores (See property map) on the east and west of the Tasso Shaft, along the Great Canyon fault fissures, flanked on the south by the quartz monzonite porphyry and on the north by the soluble

limestone, will extend to the west for 1,000 feet and to the east for 2100 feet, as has been proven by open cuts and shafts; and as depth is reached near this sulphide zone the ore will be morevaluable, as is proven by various samples taken on the 80-ft. level run to the east from the Tasso Shaft under the direction of your present Mine Superintendent, Mr. Ed. Cook. There is therefore every indication that there must be many times this amount of proven ore certainly not less than 200,000 tons with a gross content of $2,400,000.00. This ore can be mined, milled and sold for a net profit of at least $6.00 per ton, or $1,200,000.00.

At a point 34 feet to the east of the Tasso Shaft, in the 80-ft. level, a fissure from four to five feet in width carried high values in Gold, Silver, Copper and Lead. Large samples, 1 and 2, taken on both sides, cut down and quartered, assay $6.00 gold, $4.00 silver and 1% copper, and $2.20 gold, $13.00 silver and 1% copper, respectively. At the left side the ore going down assayed $50.00 in gold.

Sample 3, taken a short distance to the east, assayed $34.00 gold, $11.30 silver, 4.35% copper.

Samples 4 and 5, taken from 34 cars of ore, about 20 tons, broken down, assayed $18.00 gold, $2.20 silver, 8.7% lead.

Samples 6 and 7, broken down, near Station 17, assayed 21.3% lead, 11.6oz. silver, $0.80 gold; and $0.60 gold, 39.1 oz. silver, and 20.7% copper, respectively.

Sample No. 8 from raise near Station # 17 assayed $18.00 gold, 34.2 oz. silver, and 13.42% copper.

Since my return I have received a letter from Mr. Ed. Cook in charge of the work at the Tasso Shaft, in which he states the showing is much better than when I left the mine. The vein is now fully 20 feet wide.

In the raise at Station No. 17 Sample A taken from a streak 2½ feet wide, sampled for a distance of 4 feet along the strike (sample cut down and quartered) assayed 5.84 oz. gold or $116.80. Sample B taken from an 8" streak 2½ feet along the strike, (sample cut down and quartered) assayed 17.92 oz. gold, or $358.40, all of which bears me out in my assertion that the ore values will be richer with depth.

Many other samples of the ore along this level were taken, all carrying good values and showing that the vein gets richer as depth is gained. The ore along this 80 foot level continues strong for a distance of 50 feet, makes from the fissure into the bedding planes of the limestone, and is a replacement, dipping with the beds to the north at an angle of 40°, and should be followed down and connection made with the ore on the 125 foot level. By following the ore on its downward course some large bodies of high grade will be opened up, a very few feet of work and a little timber in the shaft (replacing the old timbers), will make this connection, and make available at once on a forty five foot vertical depth about seventy feet of stoping (on the dip of the vein 40° to the north), on very rich ore probably yielding several hundred thousand dollars. Connection with the ore from the shaft can easily be made on the lower levels. From all indications this

ore will extend to a depth of many hundred feet and the soluble nature of the limestone (easily replaced by the ore) insures very large and rich deposits.

I cannot too strongly urge upon the management the necessity of following this rich ore as it extends into depth and later connecting with same from the main Tasso Shaft before stoping on an extensive scale, so the ore will drop down into the chutes, rather than windlass same up.

If the ore had been found in the quartzite or any hard tight formation not so much importance would be attached to it. But the ore has been found in the soft loose limestone and porphyry where there is every chance for the deposit to be permanent and make in large chambers.

Yours respectfully.

Fayette G. Burton

Mining Engineer.

RECEIVED
MAR 26 1956

R E P O R T

LEVIATHAN CONSOLIDATED MINING COMPANY'S PROPERTY

Pine Grove, Beaver County,

UTAH

Austin K. Tiernan
Mining Engineer
Salt Lake City, Utah

June 18, 1914

REPORT ON THE

REVENUE CONSOLIDATED MINING COMPANY'S PROPERTY

T

SIEVE OF GOD, BEAVER COUNTY,

UTAH

Herewith submit the following report on the property of the Revenue Consolidated Mining Company as supplementary to the report of W. . Schlfing, E. M., covering a period of time from November 1906 to June 1914.

In the latter part of 1906 and the first part of 1907, a tunnel called the Hill Tunnel was started and driven some 200 feet, or only a short distance after intersecting the east and west Fault Fissure. In the spring of 1907, the property was closed down and a watchman retained on the place until August 1909, when a Mr. Walters and associates took an option on the property and drove the lower Cliff Tunnel and intersected the Cliff vein and an ore chute carrying high grade silver-lead values. Just as work was continued on this drift by the Company and connection made with Cliff shaft. At that time, the new wagon road to Newhouse was completed which shortened the distance to the railway from 25 miles to 18 miles.

In May 1913, two men started work on the Tasso claim, driving a tunnel to the north in the mineralized limestone, which is near the prophyry contact. At a distance of 140 feet from the portal of the tunnel, lead carbonates, carrying 23% lead and 2.2 oz. of silver were encountered. A winze was sunk about 15 feet in driving northeasterly from the bottom of this

winze, a large body of iron ore was met with which the writer considers a large gossan or iron capping to an immense ore body located in this territory.

As the means for sinking below this capping were not obtainable at that time, the force of two men, since then, has been developing bunches of more or less high grade silver-lead ore carrying gold values, that have been easy of access in the veins of the Cliff Claim.

R E C O M M E N D A T I O N

Recommendation for the development of the Revenue Consolidated Mining Com any's property:

So far no systematic development has been carried on at this property and none of the suggestions mentioned in Mr. Hohlfing's report have been attempted and in summing up his conclusion, the following is of important consideration:

The rock formations in the ground belonging to the Revenue Consolidated Mining Company consist of quartzite, shale and limestone, with large porphyry intrusions. There are numerous strong veins and fissures, all thoroughly mineralized. The various mine workings show more or less high grade silver-lead ores with good gold values. Hence this property has all the features of a mining proposition of more than ordinary promise, and it is the writer's opinion that the most favorable places for large ore accumulations are:

1. Where the Canyon Fault intersects the different contacts and fissures.

2. In the vicinity of fissures in the limestone near the limestone-porphyry contact.

3. Along the contact of the quartzite and shale where the many fissures comprising the shear zone enter this contact.

The first two most favorable places mentioned above are to be found on the Tasso claim and the adjoining claims, Ben and Avenue No. 1. It has been previously stated in Mr. Kohlsing's report, that the Canyon fault fissure has been slightly opened up in the Tasso shaft, and the Lou shaft immediately east of the Avenue property. In both shafts, high grade lead-silver ores carrying gold values were found. In addition to the above, the Company has recently encountered an extensive gossan or iron capping to the northeast of the Tasso shaft with good silver-lead values. This feature has important economic bearings and in nearly every case overlays vast ore deposits.

It is at this place that the writer recommends that the present Tasso shaft be enlarged to two compartments, re-timbered and sunk to a depth of 500 ft., running drifts to the east to intersect the north and south fissures from the 100, 200, 300, 400 and 500 foot stations and from each of these levels running crosscuts or drifts as the case may be, for developing the large ore deposits underlying the iron capping.

The equipment necessary to carry on this work would consist of a 40 H.P. hoisting engine, a 60 H. P. boiler, together with buckets, head-frame, shaft house and accessories.

The cost of sinking the shaft to the depth of 500 feet should not exceed a cost of $40.00 per foot, the drifts and tunnels should not exceed a cost of $8.00 per foot, or a total estimate

No. 3

REVENUE CONSOLIDATED MINING COMPANY

Timber and Water Estimates.

In 1900 when the Revenue Company were having their lumber and mine timbers sawed by experienced timber men from Beaver, estimates were made on the available timber on the Company's property and on timber ground held by the Company in North Canyon, which were as follows.

Saw Timber.....3,000,000 feet B. M.

Mine Timbers.....4,200,000 " "

Fuel.....5,000,000 cords

In September 1905, a measurement was made of the flow of water in Pine Grove Creek, at a point just east of the Revenue claim, which amounted to 9.2 miners inches or 13.8 cu. ft. per minute or 103.5 gallons per minute. Since that measurement was taken the annual precipitation has increased to considerable extent so that consequently, the flow of the stream at the present time greatly exceeds that at the time of measurement in 1905.

not exceeding $50,000, should develop this section, making this property one of the most successful enterprises in the state, providing it is carried on under conservative, economic management.

At the same time, the third suggestion could be followed out, the point of intersection between Canyon Fault and the shale-quartzite contact could be determined, which would be on the Revenue No. 3 claim, approximately where the Contact Canyon drains into the main Pine Grove Canyon. As there is considerable wash covering the surface at this section, some little time and labor would be necessary to ascertain this. Also a tunnel should be driven to the north on the shale-quartzite contact intersecting the many fissures comprising the shear zone where they enter this contact. This work should not cost to exceed $35,000 to $50,000 and in either of these cases, large accumulations of high grade ore may be encountered before any such estimate or considerable part thereof has been expended.

Respectfully submitted,

(Signed) Austin K. Tiernan

Mining Engineer.

Salt Lake City, Utah,

June 19, 1914

REPORT

on

THE PROPERTY

of

THE REVENUE MINING COMPANY

LOCATED

IN

PINE GROVE MINING DISTRICT

BEAVER COUNTY, UTAH

P. M. McCree, Mining Engineer
Salt Lake City,
Utah

THE PROPERTY OF THE REVENUE MINING COMPANY

LOCATED IN THE PINE GROVE MINING DISTRICT,

BEAVER COUNTY,

UTAH

THE DISTRICT IS ABOUT TWENTY FIVE MILES SOUTH AND west of the mining town of Frisco, where are situated the celebrated Horn Silver and other mines of note.

The C. S. L. Ry has a branch from Milford with a terminus at Frisco; from here to the Pine Grove Mining District is a good and easy wagon road; leaving Salt Lake City at seven o'clock P. M., the mines can be reached by four P. M. the following day.

The Pine Grove Mining District is located on the western slope of the Wah Wah Range, a simple mountain ridge, the axis of which has a general N.-S course, with lateral gulches opening into wide valleys to the east and west. A marked feature of the district is the timber and water. The mountains are covered with a growth of cedar and pinon, while yellow pine of large size are scattered over the hillsides. A perennial stream flows through Pine Grove Canyon to the west. In this arid portion of south-western Utah these have an important bearing on economic mining.

Pine Grove was prospected in a desultory manner about the time of the discovery of the Horn Silver Mine; this drew attention from the district and it has remained unnoticed ever since.

The rocks occurring in the Pine Grove Mining District can be grouped into two classes, sedimentary and igneous; at present only the sedimentaries are of economic importance as being the country rocks of valuable ore deposits.

The lowest formation is quartzite and forms the western base of the range: this is followed by limestone, which, resting conformably on the former, rises to the crest of the range, joining these and forming the eastern base are igneous rocks of several types.

The quartzite is distinctly bedded and dips to the east, at an angle of 40 degrees, and shows strong dynamic action; it is in this rock that the mineral deposits are at present found. They occur in a series of more or less parallel fissures, having a general strike of N.W.-S.E., and more or less vertical.

The quartzite is white in color, turning to brown or red on weathering; brecciated quartzite is frequently found, recemented into a hard rock, and all invariably stained with iron.

The limestone is a massive rock of dolomitic character, blue and gray in color, occasional beds of shale are seen in the vicinity of the igneous rocks.

The igneous rocks are largely rhyolite, covering a large area to the east; andesite and quartz-porphyry are seen, and a rock much resembling phonolite, though this last is uncertain.

The relation of the igneous rocks to the sedimentaries is not clear on a first hurried inspection; extensive accumulations of talus or slide rock conceal the geologic relations, making the work of determination one of time.

The contact between the quartzite and limestone is covered and obscured for the above reasons. What prospecting and mining work has been done is almost entirely confined to the quartzite, because in this rock the mineral outcrops are bold and clear.

In the quartzite the fissures are very extensive, and may be seen in almost any outcrop. They are roughly parallel, with a strike of about N. 60 degrees W., they are plainly traced to within a few hundred feet of contact with the limestone; the talus of the mountain side covered them at this point; they are nearly vertical, a few dip N. or S. at about an angle of 80 degrees; they vary in width from 1 foot to 4 and 6 feet, sometimes swelling to greater widths. The vein filling is brecciated quartzite and crystalline quartz; the ore shoots occur in the later; subordinate fractures sometimes break into the main fissures; at these junctions frequently occur lenzes of ore.

Another system of fissures, though not so numerous, are perhaps more important; they have a strike of N. 10 degrees E., and dip about 70 degrees to the east. They have the same general characteristics as the others.

The silver carrying minerals are, galena, argentite and horn silver, lead carbonate, and are much oxidized and changed in character. The ore occurs in shoots and lenzes and is completely oxidized so far as has been opened, and probably to considerable depth. The size and persistence of the fissures along which the ore has been deposited may indicate that these deposits will have permanence with depth.

The property of the Revenue Mining Company consists of 46 claims, embracing an area of 920 acres; a list is appended. The

more important claims are the Sapho, Ben Hur, South Side, Midway, Queen, U. S. 4813, Buckbee, Buckbee No. 2, June and Cliff, U. S. 4195; these claims are held by U. S. patent and have the most work done on them, the rest of the claims are held by location.

C L I F F

This mine is located on the point of the mountain between Pine Creek and Contact Canyon; it is opened by a shaft 200 ft. deep on the vein and numerous open cuts; the collar of the shaft is 683' above Pine Creek. Two levels are run off at 43' and 86' respectively; below the lower level the shaft is filled with water.

The vein has a general strike of N.W.-S.E. and is well marked, with a width of 4', the ore seam averaging about 1 foot wide down to the first level, is on the hanging wall, at 34' down a level is driven on the vein each way from the shaft; to the eastward the ore seam swells to 3', numerous fractures enter the vein from the south at this point. The face of the level 23' from shaft shows vein well formed and ore seam 1 foot wide; the drift to the westward shows the vein to split into two fissures filled with brecciated quartzite and clay; the ore seam is on the hanging wall and pinches to 3 inches.

The ore is porous quartz, showing highly oxidized products of galena, carrying values up to 34 oz. silver, 20 oz. gold, and 6.2% lead.

Seventy seven feet from the collar of the shaft another level is driven each way from the shaft; the vein shows same character as seen in the upper level; the westward drift shows

the vein to be profoundly fractured at this point; below the cellar of the shaft a crosscut tunnel has been started, it is now in 200', but has not encountered the vein; the various open cuts show the vein to be well defined, carrying an ore seam of from 12 to 18 inches.

B U C K B E E

Twelve hundred feet N. E. from the "Cliff" is the Buckbee, it has a course of N. 60 degrees W., the principle workings are a tunnel on the vein 600 ft. long connecting with a shaft 135 feet, the vein is wider than the Cliff, diping at 85 degrees to the N. E.; three ore shoots are shown in this tunnel, they have a rake to the E., of about 45 degrees; in 102 feet from the mouth is a Winze 10' deep; a fracture coming in from the N. E. carries some ore forming a small ore shoot with the main vein; 58' farther W. is a winze sunk on the main ore shoot; the bottom shows the ore seam to be 3 feet wide carrying galena; here the ore has a more solid appearance, and less oxidation, the decomposed disappearing; 30 feet W. of this is the shaft or raise to the surface, and ore seam of 8" is seen all the way up, but 65 ft. from the surface the ore shoot from the winze crosses, the ore at this point is completely oxidized and has the same character as found in the Cliff, 90 ft. W. of the raise the vein opens to 6 feet wide and continues this width for about 100 feet; along this distance are two ore seams 1 foot wide, divided by 4 feet of crushed vein matter, through which are seams of quartz and clay. From here to the face the vein is 4 feet wide with an ore streak

of 6 inches on the foot wall, the face shows the ore seam to be widening. While the ore does not run so high as in the cliff the ore shoots are larger. The ore disclosed in the 30 ft. winze shows a better class of ore.

REVENUE

The work on the Revenue consists of a shaft connecting with a tunnel; the vein is 3 feet wide; the shaft, which is an incline, is sunk on an ore shoot, but passes through it in making connection with the tunnel; the ore is of good character, and shows considerable galena.

SOUTH SIDE

Perhaps the most important vein in the group, as far as developed, is the South Side. This is a strong fissure with a trend of about N.-S. 6 ft. wide, with a dip to the E. of 80 degrees, cutting the bedding planes of the quartzite, which dip to the East at an angle of 35 degrees.

It is opened by two shafts and a tunnel, and numerous open cuts on the vein; it is strong and well defined carrying an ore streak of from 1 to 3 feet wide. The ore body is highly oxidized quartz, showing lead carbonate, horn silver, carrying good values in silver and gold.

The tunnel is in 147 feet and will cut the discovery shaft at a depth of 73 feet, 157 ft. from the mouth. An ore shoot 1 foot wide in the discovery shaft is shown in the tunnel to widen to 2 feet, carrying 29.5 oz silver, 2.50 oz gold, and 14 per cent lead. The gold and part of the silver seem to be closely associated with the quartz, and in the present oxidized state of

the ore will require careful saving. In the shaft N. of the discovery shaft an ore seam of 1 foot extends to the bottom 50 feet.

The South Side vein can be traced by bold outcrops a distance of 4500 feet.

All the other claims have strong veins shown by outcrops and opened by shafts from 10 to 50 feet deep. The accompanying map will show their relation to each other.

A noticeable feature of the South Side vein is the clean way in which it cuts the rock; the bedding places of the quartzite are distinctly seen on each side; in places the ore solutions have penetrated the planes, leaving small deposits; this fact points to the probability of the existence of large ore bodies lying in the contact between the limestone and quartzite.

The ore shoots in the South Side vein are larger and richer than any found in the Buckbee or other veins. Ore of good shipping character can be mined with a profit. A noticeable feature is the high gold values of the ore.

The contact between the quartzite and limestone has not been prospected; this is important ground, especially when dykes of igneous rock have broken through, valuable disclosures may be looked for along this line.

The scattered condition of the galena and lead carbonate in some of the veins demands concentration. The ore will lend itself admirably to the simplest methods; but, before this is done, tests must be made with view of finding what silver and gold values are associated with the quartz.

REMARKS

The property of the Revenue Mining Company has all the features of a legitimate mining proposition of more than ordinary promise. The work, while of surface character, shows the veins to improve with depth. The South Side vein is especially encouraging. Ore of shipping quality is now extracted, and the shoot improves as it is opened. From samples taken by myself the ore gave an average of Gold 1.5 oz., silver 30 oz. lead 14.2 per cent. By screening this to 1/4" mesh the lead was raised considerably. After paying the present exorbitant smelting and freight rates the ore would give a net profit of $20.00 per ton.

Before it is wise to erect a concentrating mill, it would be necessary to do some more development work on the Buckbee group of veins; meanwhile a hand jig would give valuable information relative to the behavior of the ore and character of mill required.

Before closing this superficial report I must again draw attention to the possibility of finding ore bodies along the line of the contact. This ground is owned by the Company and should be vigorously prospected. The Company owns a large area of the best ground in the district and more should be known about it. Prospecting is expensive work, but in this case it is well worth the outlay.

Respectfully submitted,

(Signed) F. M. McCree

Mining Engineer

Address:

Salt Lake City,

Utah

REPORT OF THE

REVENUE MINING COMPANY'S PROPERTY

AT

PINE GROVE, BEAVER COUNTY, UTAH

RECEIVED MAR 26 1956

As per request, I have examined the property of the Revenue Mining Company, and herewith submit my report completed December 24th, 1906:

The following maps are attached to this report:

Map C is a section along line 1-1.

Map D is a section along line 2-2.

Map E is a section along line 3-3.

L O C A T I O N

The property of the Revenue Mining Company is situated in the Pine Grove Mining District, Beaver County, Utah, on the west slope of the Wah Wah range, about 20 miles southwesterly of the town of Frisco. A good wagon road leads from the railroad to the property.

GENERAL DESCRIPTION OF THE PROPERTY

The property of the Revenue Mining Company consists of the following patented claims: Sapho, Sur No. 4813; Ben Hur, Sur. No. 4813; South Side, Sur. No. 4813; Midway, Sur. No. 4813; Queen Sur. No. 4813; Cliff, Sur. No. 4195; June, Sur. No. 4195; Buckbee No. 2, Sur. No. 4195; Buckbee, Sur. No. 4195; January, Sur. No. 4887; Revenue, Sur. No. 4887; Eldorado, Sur. No. 4887; Farrington, Sur. No. 4887; Iron Duke, Sur. No. 4887; Lafayette,

Sur. No. 4887; Tyro, Sur. No. 4897; Charmion, Sur. No. 4887; Heber, Sur. No. 4887; Ben, Sur. No. 5201; Tasso, Sur. No. 5201; El Kallali, Sur. No. 5201; Zem Zem, Sur. No. 5201; Beth, Sur. No. 4888; Ryan, Sur. No. 4888; Burton, Sur. No. 4888; Clements, Sur. No. 4888; LaViste, Sur. No. 4888; Revenue No. 3, Sur. 4888.

The following claims are not patented, but are owned by the company by right of location: King, Mono, Schepers, Tiernan, Henry, McCree, Chas. S., Tyrone, Sussie, Skelton, Leigh, Austin, William, Saba, Eye Opener, Spring, Burnt Canyon, Bews, Cloa, Revenue No. 2, Grand Prize No. w, Grand Price, Surprise, St. Patrick, Corinne, Oyama, Neippon, Cedars, Ruth, Grace, Grand View, July, Minnie, Moon, Margaret, Florence, Lookout, Edith, Herbert, Marie, April, May, Hills, Cosmos, August, Jack Pot, Paul, Cosett, Alice, O. K., Meppen, September, Rosa and Jim Crow.

The surface improvements consist of a concentrating mill building just completed. The concentrating machinery has not yet been installed. This mill is modern in every respect and is designed to treat 100 tons per day.

An air compressor of the Nordberg type is now being installed. It has a capacity of about 10 drills.

The Company also has erected a large and comfortable boarding house; two spacious bunk houses; and several cottages; a blacksmith shop, carpenter shop, and a large stable. The above buildings are frame houses, all in good condition. There is also a stone assay shop. It has three rooms, and is well equipped for making all the assays and tests for a large mine.

MAR 26 1956

T O P O G R A P H Y

As already stated, the Revenue property lies on the west flank of the Wah Wah range. This range belongs to a type to which the name of Basin ranges has been given. The Basin ranges occur in the Great Basin, the immense arid county which stretches from the Wasatch mountains to the Sierra Nevada. The remarkable structure of this region consists of narrow and frequently quite elevated and rugged mountain chains, with a persistent north-south strike, intervened by broad valleys.

The scenery and topographical features in the region of the Revenue grounds and vicinity are characterized by a peculiarly Alpine aspect. There the range on both flanks is cut narrow and often quite deep ravines, dividing the general mass into rugged and precipitous peaks and ridges, with elevations of several thousand feet above the beds of the gulches.

Pine Grove Canyon cuts through the central portion of the Revenue Mining Company's grounds. It is the main drainage channel in this area. It has an east-west course, and several smaller canyons or gulches empty into it from the north and south.

A constant and abundant stream of clear pure water is flowing through this canyon to the west; and the hillsides are covered with cedar, pinon pine, and yellow pine trees of large size.

The average elevation of the Revenue Company's property is about 7500 feet above sea-level.

G E O L O G Y

In the Wah Wah range there are exposed sedimentary beds of a thickness of more than ten thousand feet, consisting of quartzite,

shales and limestones. The lowest formations are quartzites. They form the western base of the range; have a general north-south strike; and dip from 15 to 40 degrees to the east. The thickness of the quartzite exceeds 5000 ft. These rocks have a white color in their fresh state; but on weathering, turn brown, pink and maroon.

Resting conformably on the quartzite there is a thickness of about 600 feet of shales and limestones. The shales are fissile, black or greenish rocks, fairly hard when fresh, but crumbling easily, and becoming gray with exposure. The limestones in the shale are dark in color, fine grained, argillaceous, and thinly bedded.

Overlying the shales are heavy bedded bluish gray limestones, with a thickness of several thousand feet.

So far no fossils have been found; therefore, the age of the above sedimentary formations can not be stated at present.

Overlying and intruding the sedimentary rocks are great masses of igneous rocks, probably andesites and rhyolites. In this report, we use the name porphyry for the igneous rocks. They occur in large quantities along the easterly base of the Wah Wah range; other large and sometimes small, irregular bodies of porphyry occur along the faults and fissures in the sedimentary layers.

The structure of the above described formations is simple; i. e. they are conformable, have a north-south strike, and dip from 15 degrees to 40 degrees to the east. There are, however, some irregularities in the form of the faults and fissures.

These faults and fissures are the mineral bearing veins in this district. The main disturbance of the rocks occuring

within the boundaries of the Revenue property is a large fault fissure, called "Canyon Fault". This fault follows Pine Grove Canyon in its general course. It has an east-west strike, and about vertical dip. It is traceable through the St. Patrick, Grand Prize No. 2, Revenue No. 2, Revenue No. 3, Revenue, Tasso, Ben and Bews claims, and further east through the claims of the Lou Mining Company. The country south of the Canyon Fault is displaced over a thousand feet to the east. Along its east portion, this fault is filled with porphyry; and this porphyry extends over to the main mass of eruptions covering the east flank of the Wah Wah range. All the other veins and fissures discovered in Revenue ground appear to be more or less closely connected with this fault and porphyry instrusions. No doubt, this fault and the fissures, comprising the mineral veins, had their origin at the time eruptions of igneous rocks and other volcanic actions were taking place in this region; and no doubt they extend deep into the bowels of the earth. A reference to the maps and sections hereto attached may assist the understanding.

V E I N S

Canyon Fault Fissure:

The Canyon Fault follows Pine Grove Canyon as already stated: Its croppings are obscured by wash; but here and there they show sufficiently so that a careful observer is able to trace it. This fault is not a single fissure. It consists of a main fissure with several subordinate and nearly parallel fissures on either side of it. The rocks within this fissured zone, which in places is over 50 feet wide, are crumbled and crushed, and well mineralized. The Canyon Fault Fissure

has been slightly opened up only in two places, in the Tasso shaft and in the Lou Shaft. The Lou shaft is immediately east of the Revenue ground. In both the shafts high grade lead-silver ores, carrying also gold values were found. It is the writer's opinion that this vein offers favorable places for valuable ore accumulations, especially at its intersections with the quartzite, shale ane shale-limestone contacts.

South Side Veins:

These veins are in the quartzite, and may be traced through the Eldorado, Parrington, LaFayette, Charmion, South Side and Ben Hur claims. These veins consist of several nearly parallel fissures of a total width of from 5 to sometimes 20 feet. The dip is nearly vertical. They are opened by several shafts and tunnels and numerous surface cuts. In several of these workings high grade silver gold ores and some lead are shown in seams and bunches.

Shear Zones.

North of the Canyon Fault and west of contact canyon in the Quartzite, there is a remarkable zone of nearly parallel and often interlacing and intersecting fissures. Their strike is about N. 60 deg. W., and dip is irregular, and in a general way about vertical. Some of the more prominent of these fissures are from 3 feet to 6 feet wide, and are thoroughly mineralized. The various workings in these fissures show good lead-silver ore in seams and bunches scattered through the vein rock. This fissured zone is about 2000 feet wide. The new mill tunnel is now being driven through this fissured zone; and

will develop it at considerable depth. The ore so far developed in this vein system needs concentrating, in order to made a commercial product of it. Where this shear zone opens into or intersects the quartzite-shale contact are favorable places for large ore accumulations.

MINE WORKINGS

EL DORADO-PARRINGTON

On these claims there is a tunnel 500 ft. in length, following a strong mineralized fissure.

SOUTH SIDE

The principal workings of this claim consist of two tunnels connected by a winze. These tunnels are driven on the same veins and are about 106 feet apart vertically. The upper channel is 300 feet long. At a point 300 feet from its mouth a shaft from the surface connects with this tunnel. The shaft is 57 feet deep. In the upper tunnel are two crosscuts to the east, one is 50 feet and the other is 90 ft. long. The lower tunnel is 600 feet long, and has a crosscut to the west 25 feet long. Besides these there is a shaft 60 feet deep and a tunnel about 90 feet long.

BEN HUR

Here is a shaft 40 feet deep, showing a fissure filled with porphyry and iron showing silver and gold values.

REVENUE

There is a shaft about 30 feet deep and the new "Mill Tunnel" now in about 90 feet. This tunnel is now being driven in a northeasterly direction to open up the large fissured or shear zone. It will cut this zone in places about 800 feet below the surface.

CLIFF

This claim has a vertical shaft 200 feet deep, with 200 feet of drifts, all in ore.

BUCKEYE

On this claim there is a tunnel driven 500 feet along a strong fissure. 250 feet in from its mouth this tunnel connects with surface by a shaft 120 feet deep. At a point 300 feet in this tunnel has a winze 40 feet deep.

TASSO

The Tasso is 135 feet deep. At the bottom of the shaft there are about 220 feet of drifts.

HILLS

On this claim there is a shaft 50 feet deep, and also a tunnel connecting with bottom of shaft about 80 feet long.

MARIE

On the Marie is a shaft 25 feet deep. The above workings are all in ore.

Besides the above workings there are many small pits and open cuts. As already stated, nearly all the workings show a strong mineralization and here and there masses, bunches or seams of good ore.

WATER SUPPLY

The Revenue Mining Company has water for all mining and milling purposes.

MINING TIMBER

On the grounds belonging to the Revenue Company good mining timber is plentiful; and, as the Company also owns a saw mill, large dimension timbers, and also timber used for building purposes may be procured at a cost of about ten dollars

per 1000 feet B. M. Wood for fuel costs about $2.50 per cord.

C L I M A T E

The climate in the section where the Revenue property is situated is excellent. During the summer the weather is generally beautiful; and the winters are open and mild; so that mining operations may be carried on throughout the year.

C O N C L U S I O N

The rock formation in the grounds belonging to the Revenue Mining Company consists of quartzite, shale and limestone, with large porphyry intrusions. There are numerous strong veins and fissures, all thoroughly mineralized. The various mine workings show more or less high grade silver lead ores with good gold values. Hence, this property has all the features of a mining proposition of more than ordinary promise. It is the writer's opinion that the most favorable places for large ore accumulations are:

1. Where the Canyon Fault intersects the different contacts.
2. Where fault and fissures intersect the Canyon Fault.
3. Along the contact of the quartzite and shale where the many fissures comprising the shear zone enter this contact.

No doubt, the thorough development of the Revenue Mining Company's property takes time and money; but I have no hesitancy in recommending this property as first class mining ground; and I thoroughly believe that, if developed along the lines above suggested, large and valuable ore bodies will be found, which will make the property a successful enterprise.

All of which is respectfully submitted.

D. P. Rohlfing, E. M.

RECEIVED
MAR 26 1956

F. J. NICHOLS

C. C. CRISMON

CRISMON & NICHOLS

CERTIFICATE OF ASSAY

229 & 231 So. West Temple St.

Phone Wasatch 2393
P. O. Box 78

SALT LAKE CITY, UTAH, Mar. 26th 1914.

Revenue Mining Co.

Dear Sir:—We have assayed the 10 *samples of ore which you left with us, and find* them *to contain as follows:*

DESCRIPTION	No.	Per Cent	Per Cent ZINC	Per Cent IRON	Per Cent INSOL.	Per Cent COPPER	Per Cent LEAD	Ozs. Silver Per TON	Ozs. Gold Per TON	Value of Gold Per TON
om dump upper	1	Cliff tunnel					47.5	175.00	.15	$3.00
Surface Cliff	2	veim					10.2	3.80	.01	0.20
Surface tunnel	3	(see if will ship)					10.1	132.80	.13	2.60
Fa[illegible] and selected	4	sample, surface workings.					20.8	230.80	.10	2.00
Luckbee Shaft	5	dump. ~~[illegible] ft. down~~					41.0	38.60	.04	0.80
Both sides shaft	6	Cliff vein, 85 ft. ~~from tunnel.~~					30.3	97.60	.31	16.20
Mineralized quartz	7	Chertides raise.					1.2	14.20	.02	0.40
S. E. Face Faltering	8	drift ~~side surface workings.~~					Trace	9.80	Trace	
Oxidized vein matter, left side surface workings.							Trace	1.80	Trace	
Quartz with casing	10						5.5	30.20	.02	0.40

Yours truly,

Charges $ 10.00

Assayer's

F. J. NICHOLS

GOLD
RETORTED
MELTED
ASSAYED
PURCHASED

PHONES { Ind. 25 / Bell 2293

P.O. Box 78

CRISMON & NICHOLS

CERTIFICATE OF ASSAY

229 S. WEST TEMPLE ST.

C. C. CRISMON

TESTS
CYANIDE
CONCENTRATION
AMALGAMATION &
ANAYLSES OF ORES

Salt Lake City, Utah, July.13th.1911

L.G.Burton

Dear Sir:—We have assayed the 2 *samples of ore which you left with us, and find* them *to contain as follows:*

DESCRIPTION	No.	Per Cent	Per Cent ZINC	PerCent IRON	Per Cent INSOL.	Per Cent COPPER	Per Cent LEAD	Ozs. Silver Per TON	Ozs. Gold Per TON	Value of Gold
Lumps Low Shaft - from file						*187	19.7	270.00	.08	$1.60
Fine							1.3	66.00	.05	$1.00

Yours truly, Crismon & Nichols

Assayers

Charges $ 2.00

RECEIVED
MAR 26 1956

F. J. NICHOLS — C. C. CRISMON

GOLD
RETORTED
MELTED
ASSAYED
PURCHASED

CRISMON & NICHOLS

CERTIFICATE OF ASSAY

219 S. WEST TEMPLE ST.

TESTS
CYANIDE
CONCENTRATION
AMALGAMATION
and ANAYLSES OF ORES

Ind. Phone 25
P.O. Box 78

SALT LAKE CITY, UTAH, Nov 23 1906

Bonanza Mining Co

Dear Sir:—We have assayed the 11 *samples of ore which you left with us, and find the to contain as follows:*

DESCRIPTION	No.	Per Cent	Per Cent	Per Cent IRON	Per Cent INSOL.	Per Cent COPPER	Per Cent LEAD	Ozs. Silver Per TON	Ozs. Gold Per TON	Value of Gold $
	1						58.1	211.60	1.45	29.00
	2						1.1	22.80	.10	2.00
	3						4.6	21.00	.09	1.80
	4						30.3	27.20	.08	1.60
	5						7.8	25.00	.07	1.40
	6						5.9	10.40	.12	2.40
	7						3.	10.00	.18	3.60
	9						Trace		.04	.80
	10						1.	0.40	.03	.60
	11						68.	13.00	.05	1.00
	12			45.8			2.1	0.60	.03	.60

ok 2613

Yours truly, Crismon & Nichols

Charges $ 12.00

J. McVICKER ASSAY OFFICE.

Box 1014

CERTIFICATE OF ASSAY.

SALT LAKE CITY, UTAH, 5/17 1900

J. P. Vizman

Dear Sir: —I have assayed the sample of ore which you me, and find _____ to contain as follows:

PTION	Per Cent INSOL	Per Cent IRON	Per Cent COPPER	Per Cent ZINC	Per Cent LEAD	Ozs. Silver Per Ton	Ozs. Gold Per Ton	Value of Gold
creenings from Cliff Dump.					6 3/10	10 -	.11	2 20
19 1/2 Tree					27 4	46 2	.36	7 20
of shaft					5	3 1/10	.06	1 20
Screenings from 100 ft					6 -	7 4/10	.10	2 00
					5	0. 8/10	Cr	

Yours truly,

John P. Vizman

Assayer.

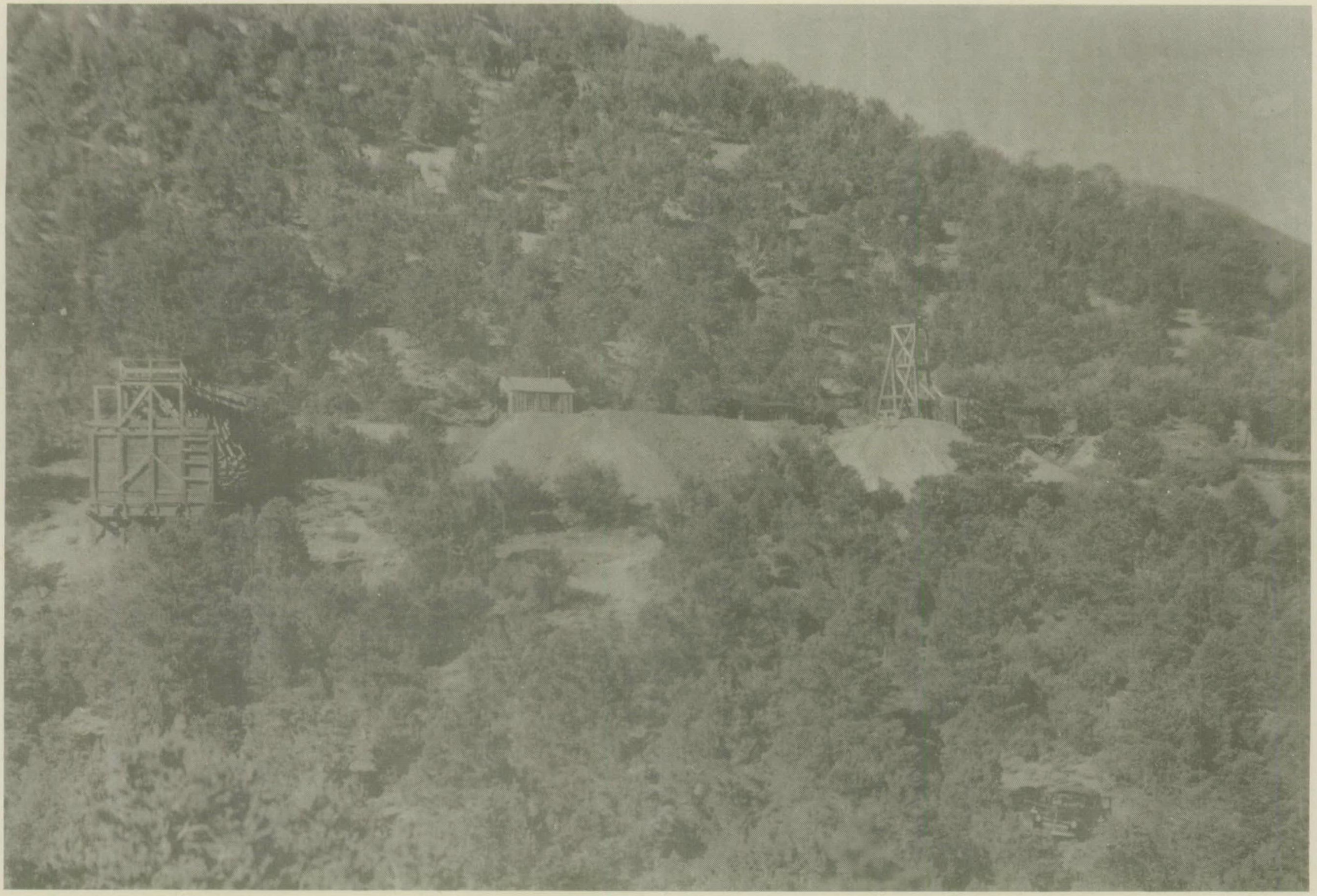
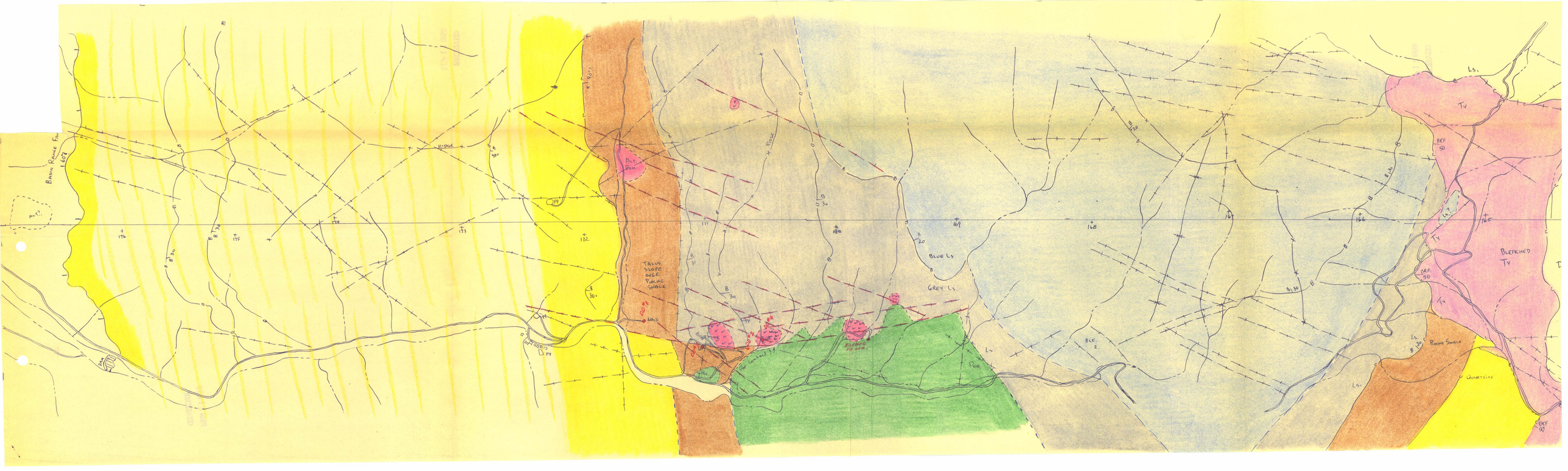


Figure 8. - Surface installations, Wah Wah mine, Beaver County, Utah.


Basin Range Fau
Talus slope over Porphyry Shale
Blue Ls
Grey Ls.
Porphyry
Ls.
Tv
Bleached Tv
Porphyry Shale
Quartzite

FRONTAL (BASIN RANGE) FAULT
DARK QTZ BED
LIGHT QTZ BED
VALLEY
Porphyry Outcrop
Boundary Alkalic Porphyry Intrusion
Tertiary Volcanics
Upper limestones
Lynden limestone
Peche Shale
Prosp. Mtn. Quartzite
Q.M. Porphyry
Alteration zones
D.D. Hole
N