

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Estimate of Reserves

RUTH ZINC MINE

Pacific Mining and Smelting Company

Marion County, Oregon

UNITED STATES GEOLOGICAL SURVEY

May, 1943

Frank C. Armstrong and John J. Collins

Distributions:

D. F. Hewett	1
E. T. McKnight	3
District Engineer, U. S. Bureau of Mines	2
Northwest Regional Office, U.S.G.S.	2

TABLE OF CONTENTS

	Page
Summary and Conclusions	1
Purpose and Scope	2
Location and Access	3
Previous Reports	3
Geology of the Ore Deposit	4
Reserves	6
Costs	9
Exploration	10

LIST OF ILLUSTRATIONS

	Folio
No. 4 Level Ruth Mine	"
No. 5 Level Ruth Mine	"
Cross Sections Ruth Mine	"
Longitudinal Section Ruth Mine	"

RUTH ZINC MINE
Marion County, Oregon

May, 1943

I. Summary and Conclusions

In response to a request from the War Production Board, the Survey has carefully estimated the reserves at the Ruth Mine as follows:

Measured (or developed) ore	24,000 tons	4.8% Zinc	8.9 Ft.
Indicated (probable) "	28,000 "	4.8% "	8.2 "
Inferred (possible) "	<u>48,000 "</u>	<u>4.9% "</u>	<u>7.7 "</u>
	100,000 tons	4.8% Zinc	8.0 Ft.

These are assay widths and grades rather than mining estimates. Present exposures suggest that material of 6% grade is developed to the extent of 8,000 tons, as estimated by George Heikes.

On the subject of costs and mining methods, this geological investigation refers to the Bureau of Mines War Minerals Report, but suggests allowances for 100% dilution in shrinkage stoping. The mineralized zone is severely faulted and brecciated, and the ore lenses are discontinuous, alternating from foot to hanging wall across a fault zone from 5 to 50 feet wide. In view of these conditions, any method of selective mining would be costly also. There is but little mining equipment and no concentrating equipment on the property.

II. Purpose and Scope

At the request of Edwin T. McKnight, Commodity Geologist for Zinc of the Geological Survey, an examination of the Ruth Mine was undertaken for the Zinc Division of the War Production Board. Mr. P. C. Benedict of the Zinc Division of the War Production Board requested the Geological Survey to supply the following information, as quoted from his letter of May 17, 1943, to W. E. Wrather:

"(1) Ore estimate and grade. If present workings are insufficient to establish same with an acceptable degree of accuracy, we should appreciate specific statement of work necessary and probable cost to satisfactorily demonstrate same, and a recommendation as to the worthwhileness of such additional development.

"(2) An estimate of probable over-all operating costs plus total overhead based on observable characteristics of the vein, its walls, etc.

"(3) An estimate of cost per pound of producing zinc from this property."

This information was needed to assist the WPB in deciding whether or not to recommend a loan for the Ruth Mine.

This request was transmitted through E. T. McKnight, Commodity Geologist for Zinc, and Frank C. Armstrong of the Northwest Regional Office, mapped the geology of the Ruth Mine between May 26th and 29th and took 30 samples. He was accompanied by John J. Collins the first two days.

The major portion of the geology of the fifth level was accepted as mapped by G. C. Heikes of the Zinc Division of the WPB in February, 1943. A survey of the mine workings by the U. S. Bureau of Mines made in August, 1942, was used as a base for the geological mapping. All the samples appearing on the plans and used in computing the grade in the longitudinal section are those taken by the Bureau of Mines, Geological Survey, and another Federal agency.

III. Location and Access

The Ruth Mine is located on the south side of the Battle Axe Fork of the Little North Santiam River in unsurveyed T. 3 S., R. 5 E., 27 miles by road east of Mehama. A moderately good, graded and drained gravel road extends as far as Elkhorn. From Elkhorn to the mine, approximately 10 miles, the road is along a cliff and would need improvement if heavy traffic were anticipated.

IV. Previous Reports

A comprehensive report on this district was published in 1938 by Callaghan and Buddington 1/, and in 1939 Thayer wrote a report on the North Santiam River Basin 2/. These two reports adequately cover the general geology and describe the rock types of the district.

In 1941 F. G. Wells and T. P. Thayer made a reconnaissance survey of the Northwest with the object of determining the possible sources of zinc which might be tributary to a proposed zinc refinery at Portland, then contemplated as a possible consumer of surplus Bonneville power. They made a brief visit to the mines in the North Santiam district and were underground at the Ruth.

The BFC investigated the property in 1941 and made a \$20,000 loan to the Pacific Mining & Smelting Company, but recently refused an additional loan.

In August and September, 1942, the Bureau of Mines made a five-week examination of the Ruth property which involved sampling, surveying, mill tests and cost estimates. The Bureau's War Minerals Report and maps dated January, 1943, were made available to the Geological Survey.

-
- 1/ Callaghan, Eugene, and Buddington, A. F. Metalliferous Mineral Deposits of the Cascade Range in Oregon. Geol. Survey Bull. 893
2/ Thayer, Thomas P., Geology of the Salem Hills and the North Santiam River Basin, Oregon. State of Ore. Dept. of Geol. and Min. Ind. Bull. #15

V. Geology of the Ore Deposit

The general geology of the area has been adequately presented 1/, 2/; so only features of economic importance at the Ruth Mine are mentioned in this presentation of ore reserves.

The ore mineral is essentially sphalerite whose iron content is fairly high judging by the color of the mineral. Galena is widespread but much less abundant. Chalcopyrite is scarce. The gangue minerals are quartz and carbonate predominantly. Pyrite is about as abundant as sphalerite. Silicification and chloritization are moderate. These minerals occur in small disseminated grains, in stringers, and occasionally in replacement masses several feet across.

The ore minerals occur in a complex fault zone from 5 to 50 feet wide. The walls of this zone are marked by strong faults. Within the fault zone there is a complex of branching cross-faults, brecciated rock, and gouge. Both barren and mineralized areas alternate in an unpredictable, discontinuous fashion. Probably the geology picture of the No. 5 level as mapped by Heikes applies equally well to the raises and to the No. 4 level, which are less well exposed.

Most of the mineralization occurs along the junctions of two sets of faults, one striking Northwest and the other nearly East-West. Both dip steeply to the North. They are joined for at least 800 feet, as now exposed, forming a wide shattered zone.

No reliable exposures were found to prove any considerable off-setting of one set of faults by the other. In fact, the evidence is in places conflicting. Presumably movement was recurrent. Furthermore, it appears that faulting was both pre-and post-mineral, but it is not yet clear in

which period the greater movements took place. In general the Northwest faults are poorly mineralized as compared with those striking more nearly East-West. Apparently both combine to offset the rhyolite so that the north block moved eastward.

Exposures may not be complete but the mineralized fault zone apparently decreases in average width and the grade increases in the 200 feet from the No. 4 to the No. 5 level. These could be local changes or they might suggest the narrowing of the structure in depth. It should be pointed out that this district is characterized by ore shoots of small extent.

Most of the mineralization is found at present in oligoclase andesite of fine- to medium-grain size. However, the foot-wall side of the southeast end of the No. 4 level is in tough aphanitic andesite porphyry. It may be a coincidence that very little mineralization is found in that rock, but a change of rock type may have had an adverse effect on ore deposition. This possibility has not been adequately tested.

The same problem arises on the No. 5 level with the appearance of a rhyolite dike about 30 feet wide that is intersected at a low angle by the ore structure. The exposure is short but there appears to be more mineralization in the andesite than within the rhyolite. The attitudes of the rhyolite and fault zone indicate that with increasing depth more and more of the mineralized zone will be within the rhyolite. On the basis of the limited evidence now available, this change may not be favorable to the formation of ore shoots.

VI. Reserves

In computing the reserves on the longitudinal section only the assays by Federal agencies were used. The tonnage factor was taken as 12.5 cubic feet per ton. With one exception all the assays appearing in a block were used to compute the grade of that block. In block No. 6 a Bureau of Mines assay of 0.5% zinc over four feet was not used because it was felt that this sample may have been taken in the footwall whereas at this point the ore appeared to follow the hanging wall. Where only a few or no assays were available, the blocks were assumed to have the grade of adjacent blocks. The averages of blocks Nos. 29, 30 and 31 were cut to 5% zinc to conform with the mine grade because it was felt that one sample which assayed 12.1% zinc did not represent the grade of the material in these blocks. All assays were weighted as to widths but their lengths of influence were not weighted because the mineralization is considered more erratic than the distribution of the samples.

Ore shoots are not projected far because of the lenticular nature of the deposit. For example, when the ore was developed on only one level, it was projected only 25 feet. Where the ore shoots were long and the ore was opened on two levels, longer projections were made.

Reserve figures in reports on the Ruth Mine do not agree, as is indicated in the following tables:

	<u>Date</u>	<u>Tons</u>	<u>Grade</u>	<u>Source</u>
Pacific Co.	1940 ?	300,000	8%	Draper
Wells-Thayer	1941	150,000	8%	Company data
U.S.B.M.	1942	183,000 probable	4.7%	War Minerals Report
		100,000 possible	4.7%	
Heikes	Feb. 1943	8,000	6.0%	W.P.B.
U.S.G.S.	May, 1943	24,000 measured	4.8%	Armstrong-Collins
		28,000 indicated	4.3%	
		<u>48,000</u> inferred	4.9%	
		100,000 Total	4.8%	

The first two estimates are based on samples and assays by the Pacific Mining and Smelting Company. The assays by this company were higher than those taken by the Federal Agencies. This may be due in part to the fact that high-grade areas were mined out after the Pacific Company cut the samples and before the Federal agencies made their examinations. Samples cut by the Federal agencies agree closely and it can be presumed that they are a conservative representation of the ore that remains within the developed area.

Because of time allotted to Wells and Thayer for estimates on potential mineral production within reach of Bonneville power, it was necessary for them to use company assays. The tonnage estimates of the Bureau of Mines are higher than those of the Survey. The difference may be due to the fact that more consideration was given by the Survey to the geologic evidence. The Bureau's blocks of probable ore include more than the Survey's total estimated ore; the comparison is 183,000 tons of probable ore for the Bureau, as against 100,000 tons of total measured, indicated, and inferred ore for the Survey. The Survey has plotted all critical federal assays on its longitudinal projection as a basis for comparing ore blocks. The location of the Bureau's block of 100,000 tons of possible ore is not shown on their longitudinal projection, but is described in the report as "in the area surrounding the ore shoots".

Heikes' estimate is believed to be accurate for material averaging 6% zinc. The Survey's tonnage estimate is higher because it is based on a lower zinc content.

For purposes of comparison with other classifications of ore, the term "measured" ore is essentially the same as "developed" ore; "indicated", the same as "probable"; and "inferred", the same as "possible" ore. Following is a list of ore blocks as computed by the Survey.

Summary of Reserves
U. S. Geological Survey, May, 1943

Block No.	Measured Tons	Width Feet	% Zn.	Indicated Tons	Width Feet	% Zn.	Inferred Tons	Width Feet	% Zn.
1				1,600	7.6	5.3			
2	1,600	7.6	5.3						
3				1,600	7.6	5.3			
4							1,600	7.6	5.3
5							9,700	8.9	5.2
6							2,600	4.8	4.6
7				1,700	5.3	4.9			
8	2,400	8.0	7.0						
9				1,800	8.0	7.0			
10							3,600	8.0	7.0
11							*3,100	6.7	3.9
12	*2,100	6.7	3.9						
13				*2,100	6.7	3.9			
14							*4,100	6.7	3.9
15							4,800	11.5	4.1
16				4,800	11.5	4.1			
17	6,000	11.5	4.1						
18	700	4.2	4.0						
19	5,700	11.5	4.1						
20				700	4.2	4.0			
21							1,500	6.9	4.5
22				5,700	11.5	4.1			
23							8,000	7.9	4.8
24							3,600	6.1	4.7
25				4,800	6.1	5.4			
26	5,700	6.1	5.4						
27				2,800	6.1	5.4			
28							5,600	6.1	5.4
29				** 500	3.3	5.0			
30	** 300	3.3	5.0						
31				** 500	3.3	5.0			
Total	24,500	8.9	4.8	28,600	8.2	4.8	48,200	7.7	4.9
Second Total	22,400	9.1	4.8	26,500	8.3	4.9	41,000	7.9	5.1

* Omitted from second total.

** Cut from 6.4%.

VII. Costs

As explained to P. C. Benedict by W. E. Wrather, Director of the Geological Survey, the estimation of costs "lies within the field of competence of the Bureau of Mines" and is outside that of the Geological Survey. However, if geologic conditions are such that they might have a profound influence on costs, they should be emphasized.

The ore at the Ruth lies within a broad shear zone in relatively small, discontinuous lenses. This zone is composed of weak brecciated rocks.

It has been proposed to mine this deposit by shrinkage methods. The rock within the shear zone is so weak that dilution of nearly 100% could be expected. The walls of the mineralized zone are marked by strong gouges. The material between them can be expected to slough along faults and breccia zones until a natural adjustment is reached. Present exposures have attained this stage in many places. However, on resumption of mining operations, slough of waste would recur. The expected dilution would probably be by material grading 1 or 2% zinc; thus it is expected that the average grade would be lowered to possibly 3% zinc.

The alternative of using some method of selective mining, presumably square setting, would increase the costs indicated by the Bureau of Mines, which seem to have been based on shrinkage methods. Square setting would probably keep the grade at the estimated assay figure, but because of the lenticularity of the deposit it should be pointed out that there would be a great deal of trouble following the ore lenses. Much waste would have to be handled in the stopes in searching for continuations of the faulted ore segments. It is therefore a question whether the possible increase in grade would compensate for the expected increased cost of mining. This is a province outside the field of the Geological Survey.

An item which might further be mentioned with regard to deeper development is the assurance of more water with depth. The fifth level is much wetter than those above. The creek, which presumably governs the elevation of the ground water, lies only 40 feet below the portal of the fifth level and a heavy flow of water could be expected along the shear zone.

VIII. Possible Exploration

It is believed that diamond drilling is unsuitable for exploration purposes because of the highly fractured, crumbly nature of the ore zone.

If any exploration is contemplated it should be pointed out that drifts 5A, 5B, and 4A, as shown on the plans, could all start on material which assays over 4%. Crosscut 4B as shown on the plans might greatly increase the tonnage of Blocks 17 and 19.

It is believed that most tangible results could be attained by this type of exploration rather than diamond drilling.

The Bureau has proposed to open a level 200 feet below No. 5 level. This exploration might be advisable only after running the above drifts and if the material now exposed is of minable grade.

Respectfully submitted,

FRANK C. ARMSTRONG

JOHN J. COLLINS

Northwest Regional Office
U. S. Geological Survey
Spokane, Washington
June 11, 1943

PACIFIC NORTHWEST ZINC BUSINESSES

as reported by United States Geological Survey

October 4, 1941

<u>Mine and District</u>	<u>Tons of ore</u>	<u>Z. Zinc</u>	<u>Tons of slab</u>	<u>Sub-total</u>	<u>Grand Total</u>
<u>Metalline Falls (Leahs & S.C.)</u>					
<u>Ford (Falls)</u>	1,000,000	5.0 %	30,000		
<u>Roosevelt-Connell</u>	1,000,000	4.3 %	<u>189,000</u>	279,000	
<u>Richards (Oregon)</u>	100,000	7.0 %	7,000		
<u>Wells and Chapman</u>	14,000	5.9 %	<u>824</u>	7,826	
<u>Helena</u>					
<u>Sentinel (Oregon)</u>					
<u>North</u>	150,000	8.13 %	12,195		
<u>Blusley</u>	6,000	12.0	720		
<u>Bucara</u>	3,600	9.0	<u>324</u>	13,239	
<u>Silver Peak (Oregon)</u>	15,000	5.0	750	750	300,815
<u>Silver Peak</u>					<u>zinc metal</u>

3,238,600

(The above covers zinc only. The above ores carry varying amounts of lead also.)

During the Summer of 1941, some estimate figures were made up in Portland on the basis of considerable available information, to give tentative ideas on zinc smelter costs of operation, profits, etc. They are given below:-

Plant Cost and Operation

The cost of installing an electrolytic zinc smelter is approximately \$30,000, per ten-day of capacity. Plants are usually installed in units or multiples of 35 tons of slab zinc. About 3680 kilowatt-hours of power are required for each ton of electrolytic zinc. Normal or current cost of production per pound of slab zinc is divided about as follows:

	<u>Cents</u>
Labor740
Plant maintenance550
Fuel073
Power360
Plant overhead133
Contingencies (10%)186
Total.....	<u>2.042</u>
	(This neglects taxes, depreciation, and freight on product.)
Add purchase price of zinc	3.290
Add marketing (5% of 8%)	.400
Add total above	<u>2.042</u>
Grand total	5.732 cents
Selling price	8.000
Loss Grand total above	<u>5.732</u>
Operating profit.....	2.268 cents per pound

(Note - that the above figures are on the basis of 8 cent zinc. So also, are the figures in the profit calculation given on the following page. They were made up at the same time.)

(Note- The following figures were made up during the Summer of 1941 for an electrolytic zinc smelter at an Oregon location. The calculations were made on the basis of 50 tons of metal per day output - from a plant rated at larger capacity, - in other words, assuming a possible condition of affairs after the present War Emergency.

.....

50 tons per day for 350 days = 35,000,000 lbs per year output.

Operating surplus per year - 35,000,000 x 2.248 cents..... \$ 793,800✓

Depreciation - Tax deduction - 10% of plant cost ... \$210,000.
\$793,800 less \$210,000 = \$ 583,800, or tax base.

Taxes

State (8% of \$583,800 \$ 46,704
Federal - normal (24% of \$583,800 140,112
excess profits - bracket 91,500

(Plant cost, \$2,100,000
Oper capital 150,000
8% of..... 2,250,000 = \$180,000
Add 5,000 (allowed)
\$185,000)

From \$583,800
deduct 185,000
398,800 (new base)
deduct 250,000 - bracket
\$148,800

Take 45% of 148,800 for tax 66,960 345,276

Net Profit Surplus for year \$ 443,724

In the above profit calculation, no credit is taken for sale of smelter by-products, - not that values will not certainly be realized from them, but rather to indicate the outcome of a smelter operation standing on its own feet on the basis of zinc production alone.

The value and production of by-products is estimated as follows:*

Cadmium - 196,387 lbs @ \$1.00 F.O.B. plant \$ 196,387
Copper - 126,000 lbs @ 9.0% " " 11,340
Residue - 1,000 tons @ \$24.16 " " 24,160
Sulphur - 10,910 tons @ \$10.00 " " 109,100
Total \$ 340,987

W.M.R.
January 1943

WAR MINERALS REPORT 1/
UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

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

THE RUTH OR OLD AMALGAMATED MINE
Marion County, Oregon

- Zinc and Lead -

Summary

The Ruth or Old Amalgamated Mine is located 28 miles northeast of Mehama, Oregon, in the Lester mining district, Marion County. It is a low-grade zinc and lead mine which, with the exception of a short operation of a pilot mill, has had no production. The property is owned and managed by the Pacific Smelting and Refining Company of Portland, Oregon; who, by the means of a Reconstruction Finance Corporation loan, is now further developing it. The mine is, however, already fairly well developed on the two lower levels and to a small extent on the three upper levels by about 5,100 feet of drifts, crosscuts, and raises. The company does not possess the necessary financial resources to construct a concentrating mill, install the necessary mining and power equipment, and to carry on an extensive development program.

As a result of a sampling program of the mine workings conducted by the Bureau of Mines, it is estimated that there are about 283,900 tons of ore of a grade of 4.7 percent in zinc and 0.4 percent in lead, and containing minor amounts of copper, gold and silver. This ore is classified as follows:

183,900 tons probable ore
100,000 tons possible ore

A considerable portion of the probable ore reserve is reasonably well developed, that is, on three sides. Conditions are favorable for developing considerable additional ore of 6 to 7 percent.

1/ The reports of the War Minerals Series are based upon field and laboratory work of engineers of the Bureau of Mines together with data available to the Bureau from other sources. The purpose of these reports is to supply information that may be helpful to owners and operators of properties examined, and to others who are especially interested in them. For this reason distribution is limited to those who request the reports individually.

To put this property into operation on a 200-ton daily basis would require an estimated capital expenditure of about \$355,500, the major portion of which would be required for surface plants.

From the results obtained by the sampling program, the Bureau of Mines concludes that:

- (1) With a capital expenditure of about \$355,500 it may be possible to produce 12,000 tons of zinc and 700 tons of lead as metal. At an estimated mining and concentrating cost of \$3.52 per ton of ore, and after paying shipment and smelter costs on the concentrates, it is estimated that the total net return to the company would be about \$363,000.
- (2) Production of zinc and lead can begin in about 12 months after the equipment and laborers have been obtained.
- (3) It is possible that by mining and concentrating 200 tons per day, production would extend over a period of about 4 years on the basis of present development. Production could be increased if additional ore was found and if a critical shortage of zinc was anticipated.

Introduction

During August and September of 1942, an examination and sampling program was carried out on the Ruth or Old Amalgamated Mine by the Bureau of Mines. Although the primary purpose of this investigation was to determine the approximate tonnage and tenor of the zinc and lead ore developed by the 5,100 feet of drifts, crosscuts, and raises, it included also metallurgical testing, estimation of capital and operating costs on a 200-ton daily basis, and consideration of a Bureau of Mines project to aid in finding additional ore.

History

It is reported that a small amount of prospecting for gold took place in the Lester Mining District of central Oregon as early as 1850. Mining in this area then apparently became dormant until about 1900 at which time the Ruth vein was discovered. At this time, the operators of the property apparently still were searching for gold since the Ruth vein, consisting of zinc and lead ore, was cut on what is now known as the fourth level but was not developed. About 400 feet of drifting and crosscutting was done on this level in following quartz stringers, and additional development work was done at this time by driving what are now known as the second and third levels.

Active development work of the Ruth vein was begun in 1929, when Mr. J. P. Hewitt acquired control of the Ruth Group of claims and of other properties in the district and formed the Amalgamated Mining Company. The development work done by this company consisted of an additional 1,550 feet of drifting and crosscutting on the fourth level and driving a raise connecting the fourth and third levels.

In 1935, the Amalgamated Mining Company was reorganized and became known as the Columbia Mines Development Company. Under their direction the fifth level and two raises connecting the fifth and fourth levels were driven. A small amount of stoping above the fourth level was also done at this time and a portion of the mined ore was put through a small mill while the remainder was stored at the portals of the fourth and fifth levels.

In January 1941, the Columbia Mines Development Company reorganized to form the Pacific Smelting and Refining Company with Mr. J. P. Hewitt as president. The principal activities of this organization to date have been to rehabilitate the mine and buildings, to develop the mine with funds obtained by a Reconstruction Finance Corporation development loan, and to attempt to obtain additional government aid in erecting a mill for concentrating the ore.

Physical Features and Communications

The climate is mild and humid and temperature ranges are moderate with either extreme heat or cold being unusual. A considerable amount of rain falls during the spring and fall while during the winter months, snow often accumulates to depths of from 3 to 4 feet but seldom remains on the ground for any appreciable length of time. A small snow plow probably could keep the road from Mehama to the mine open at all times. The region is heavily timbered with Douglas fir, white pine, red cedar and hemlock. There is sufficient standing timber on the property to insure an adequate supply for mining, building, and heating purposes.

The Lester Mining District is situated on the west slope of the Cascade Range and is drained by the Little North Santiam River and its tributaries. The country is extremely rugged and mountainous, with steep V-shaped canyons and sharp crested ridges. The elevation varies from 2,500 feet at the junction of Battle Axe Creek and the Little North Santiam River to 4,974 feet above sea level at the crest of Whetstone Mountain. There is a decided uniformity of maximum relief in the area and practically all ridges and peaks are very close to 5,000 feet above sea level. The property of the Pacific Smelting and Refining Company is situated on Battle Axe Creek one mile above where it empties into the Little North Santiam and all of the mine workings are on the south side of this stream. The No. 5 portal, which is located just above the creek level, is at an elevation of 2,464 feet and the highest point on the property is about 4,500 feet above sea level. The structures in this area are softer than the country rock and are commonly outlined by depressions along which small streams flow intermittently. The Ruth vein has been deeply entrenched in this manner.

The U. S. Forest Service maintains a telephone line which affords local and long distance service from the mine. At present, the mail is received at the Post Office at Mehama, Oregon, but when and if actual production is started, there may be enough permanent residents to have a post office at the mine.

Portland, Oregon, the principal supply point for the district, is located 97 miles by road, northwest from the mine. Mehama may be reached from Portland by U. S. Highway 99E to Salem and thence by State Highway 222, a total distance of 69 miles. The distance from Mehama to the mine is 28 miles by secondary and mountain road. The first 17 miles is maintained by Marion County and the remainder by the U. S. Forest Service and the Pacific Smelting and Refining Company. From the mine to the Detroit Branch Line of the Southern Pacific Railroad at Lyons is 29 miles via Mehama. Although there are two other roads from the mine (one to the same railroad at Gates, Oregon, a distance of 18 miles, and one which runs up along Battle Axe Creek and over the mountains to the railhead at Detroit, Oregon a distance of 18 miles) the most practical road is the one to Lyons via Mehama. This road would require considerable improvement to put it in good condition.

The first 15 miles from Lyons is surfaced and would require little or no betterment, while the last 14 miles, and especially the last 10 miles towards the mine, is badly in need of improvement. This work would consist of widening and surfacing at an estimated cost of about \$10,000.00

Mining is the principal industry in this area and the men now thus engaged at the Ruth Mine at present number only from 10 to 20. Therefore, about 50 more men would have to be brought in to operate the mine and mill at 200-ton daily capacity.

There are two camps at the Ruth Mine, which are known as the upper and the lower camp. The upper camp, which lies on property owned by the Pacific Smelting and Refining Company consists of six three- and four-room houses that are equipped with running water and electric lights. There is a bunkhouse equipped with showers and electric lights capable of housing 14 men, also an office, an assay office, a commissary, and a powder house. Most of these buildings are in fair condition but it is the plan of the management to modernize and repair all of the structures. Construction of two change rooms, one at each of the portals of the fourth and fifth levels, is also contemplated.

There are 13 houses at the lower camp consisting of two one-room, one two-room, one three-room, eight five-room, and one six-room, all of which are in fair condition. In addition there are 3 bunkhouses capable of accommodating 4 men each, a boarding house with a capacity of 40 men, a commissary and a sawmill which are in good condition. Construction of additional houses and other necessary buildings is also planned and this would include twenty-five five-room houses, one recreation building, one company store, and one two-room schoolhouse. Construction and repair of buildings are relatively inexpensive since the company owns its own sawmill and there is an abundance of timber on the property.

The company will operate the boarding house and the charge per man will be approximately \$1.50 per day.

Description of Property

The property of the Pacific Smelting and Refining Company is situated in sections 21, 22, 26, 27 and 28, T 8 S, R 5 E, Willamette Meridian in the Lester Mining District, Marion County, Oregon. It consists of 18 full-size lode claims which are known as Adventure Nos. 1 to 4 inclusive and Ruth Nos. 1 to 14 inclusive. These claims were located in 1929 and all are still held by virtue of this location. It is reported that the company's rights are undisputed and that they also own all surface improvements.

The Pacific Smelting and Refining Company is incorporated in the State of Oregon and is capitalized at \$500,000. There are 50,000 shares of stock (common), 36,002 of which have been issued. According to Mr. J. P. Hewitt, president, the company is debt free and has a small working capital in the treasury.

Description of the Deposit

There are several wide shear zones in this area of unknown length which run parallel to each other and which show some mineralization at their surface exposures. Several of these have been developed to a limited extent with the exception of the Ruth vein which has been more extensively developed than any of the others. The Ruth vein strikes N 55° W and its dip varies from 55° to 72° to the northeast. Only a small amount of development work has been done on the first and second levels so very little information was obtainable as to the nature of the vein structure at these elevations. On the third and fourth levels, the vein, or shear zone, is made up of several fractures at varying distances apart which more or less parallel the vein and which account for the pinching and swelling of the ore zone. On the fifth level the vein appears to be more consolidated with less variation in width. The foot and hanging walls are better defined and the zinc assays are less erratic and also higher than in the upper levels. These indications are favorable for finding additional ore at depth, and it is possible that the Ruth vein may be more productive at depth, and by an extension of the fifth level under higher backs, than from the area now developed.

There are numerous cross fractures that cut the vein at varying angles and an increase in the tenor and thickness of the ore often occurs at the more prominent intersections. It is possible that drifts driven beyond such intersections have followed the cross fracture instead of the vein itself. This possibility seems to have occurred on the third level which after encountering a mineralized zone shortly ran into barren ground.

The country rock consists largely of a calcic andesite which is dark green in color and shows an abundance of ferromagnesium minerals. What appeared to be a porphyritic rhyolite dike was observed near the portals of the fourth and fifth levels. The country rock has been altered in some places for as much as 50 feet from the vein with narrow zones of calcite and

soft alteration products such as chlorite and sericite being found on the walls. The chief ore minerals in the Ruth vein in the order of their abundance are sphalerite, galena, pyrite, and chalcopyrite. Typical assays also show minor amounts of gold and silver. The chief gangue minerals are altered wall rock, quartz and gouge with quartz being the principal vein filler.

Mine Workings

The Ruth vein is opened up on five levels on a vertical distance of about 440 feet between the first and fifth levels. Development work consists of about 5,100 feet of drifts, crosscuts and raises; the major part of which has been done on the third, fourth and fifth levels. Only a small amount of ore has been mined and that immediately above the fourth level as can be seen on the mine maps. Table 1 shows the elevation at each portal above sea level and total footage of drifts, crosscuts and raises.

Table 1

	Elevation Above Sea Level	Total Footage		Raises
		Drifts	Crosscuts	
Level No. 1	2894 ft.	90	40	-
Level No. 2	2864 ft.	82	-	-
Level No. 3	2754 ft.	135	18	-
Level No. 4	2660 ft.	1855	450	145
Level No. 5	<u>2464</u> ft.	<u>1675</u>	<u>180</u>	<u>425</u>
Total		3837	688	570

Examination by the Bureau of Mines

The Ruth or Old Amalgamated Mine was examined by the Bureau of Mines during August and September of 1942. The purpose of this investigation was to take sufficient samples for checking other engineers' results and to obtain information as to the approximate tenor and tonnage of ore reserves in the mine. This information was necessary before a decision could be made regarding the advisability of starting production and/or for setting up a Bureau of Mines project.

The investigation included surveying and mapping all of the workings and taking samples. Channel samples were cut six inches wide by 1 inch deep across the mineralized zone about every 50 feet along the drifts, crosscuts, raises and stopes. The channels were extended into wall rock whenever possible and samples across low-grade material were kept separate from those of higher grade ore.

Ore Reserves

The ore reserves were classified as probable and possible ore. Some of the probable ore was reasonably well developed, that is, on three sides. The ore seems to be confined to ore shoots, and ore of a spotty and erratic nature occurs between them.

The average assay for each block was calculated by multiplying each assay width by the assay and dividing the sum of these products by sum of the widths. In calculating the tonnage, 13 cubic feet in place was considered equal to one ton of ore. Tonnage of probable ore reserves for each block, assays, sample widths and number of samples included are shown in table 2.

Table 2. Probable Ore Reserves

Block	Total No. of Samples Included	Average Ft. Sample Width	Tons	Percent Zinc	Tons x Percent Zinc	Percent Lead	Tons x Percent Lead
A	2	6.7	3,685	4.50	16,582	.10	369
B	17	7.54	15,544	6.74	104,767	1.09	16,943
C	4	4.2	10,765	4.28	46,074	.07	754
D	13	6.68	18,172	6.12	112,126	.89	16,173
E	23	16.8	83,190	4.41	366,868	.35	29,117
F	3	3.4	3,034	7.82	23,726	.21	637
G	9	5.8	6,653	4.51	30,005	.41	2,728
H	33	13.7	35,499	3.77	133,898	.10	3,550
I	6	8.3	5,999	4.39	26,336	.43	2,579
J	4	21.4	1,383	4.53	6,265	.49	778
Total			183,924		866,647		73,628

$$866,647 \div 183,924 = 4.7 \text{ percent zinc average}$$

$$73,628 \div 183,924 = 0.4 \text{ percent lead average}$$

Possible Ore - 100,000 tons at 4.7 percent zinc and 0.4 percent lead

As shown by table 2, the probable ore reserve is estimated at 183,924 tons at 4.7 percent and 0.4 percent zinc and lead respectively. The ore also carries minor amounts of copper, gold and silver. It is estimated that 100,000 tons of ore may be found in the area surrounding the ore shoots and this is classed as possible ore.

Metallurgy

A 200-pound sample made up of channel sample rejects was submitted to the Bureau of Mines station at Salt Lake City, Utah, for ore testing. This sample assayed 3.6 percent zinc, 0.7 percent lead, 0.18 percent copper and 6.5 percent iron. This material contained about 1 percent less zinc than the average ore reserve since it included portions of channel samples that were subsequently determined as being very low in grade. However, this ore was readily treated by selective flotation after grinding to minus 65-mesh in producing lead and zinc concentrates. From the results obtained by this preliminary investigation, the metallurgical results shown in table 3 can be expected by similar treatment of the available grade of ore.

Table 3

Product	Lbs., Weight	Wt. %	Assay, Percent		Distribution			
			Pb	Zn	Lbs. Pb	% Pb	Lbs. Zn	% Zn
Lead Con- centrate	9.2	.5	54.0	7.6	5.0	62.0	.7	.8
Zinc Con- centrate	166.0	8.3	.39	52.0	.65	8.6	86.5	92.0
Tails	1824.8	91.2	.13	.37	2.35	29.4	6.8	7.2
Heads	2000	100.0	.40	4.7	8.00	100.0	94.0	100.0

About 62 percent of the lead can be recovered in a lead concentrate which would assay 54.0 percent in lead; and about 92 percent of the zinc can be recovered in a zinc concentrate which would assay 52 percent in zinc. The concentration ratios would be about 200 and 12 to 1 for the lead and zinc concentrates respectively.

The Pacific Smelting and Refining Company plans to ship the lead concentrates to Selby, California, and the zinc concentrates to the zinc plant at Great Falls, Montana. Smelter schedules and calculation of smelter returns per ton of lead and zinc concentrates are given in table 4. The analysis for gold, silver and insolubles was obtained from data in the possession of Pacific Smelting and Refining Company.

Table 4. Concentrate Returns

LEAD CONCENTRATE TO SELBY

BASIS: Lead in New York - 6 $\frac{1}{2}$ ¢

Analysis

Au 0.35 oz; Ag 24.65 oz; Cu 4.2%; Pb 54.40%; Fe 9.70%; Insol 5.0%

Payments

Gold 0.35 oz. @ \$31.8163	\$11.14	
Silver 24.65 oz. x 95% @ 70-5/8¢	16.50	
Copper (4.20 - 0.75%) x (17 - 6¢)	7.59	
Lead (54.40 - 1.5%) x 90% x (9.25 - 1.5)*	73.25	
Iron 9.76 units @ 6¢	.58	\$109.06
	<u>109.06</u>	

Deductions

Treatment - Base Charge \$4.00		
Less 24 units over 30		
@ 10¢	2.40	
	<u>\$1.60</u>	\$1.60
Sulfur Charge		3.50
Insoluble 5 units @ 10¢		.50
		<u>5.60</u>
		5.60
		<u>103.46</u>
Less R. R. Freight Lyons to Selby - 1.1 net tons @ \$15.90 Car-load Lots		17.49
		<u>85.97</u>
Haulage from mill to Lyons Mill		2.00
		<u>83.97</u>

ZINC CONCENTRATES TO ANACONDA - BASIS St. Louis Zinc @ 8 $\frac{1}{2}$ ¢ per pound.

Analysis

Au .023 oz; Ag 1.0 oz; Cu 0.57%; Zn 54.0%; Fe + Insol. 10.0%

Payments

Zinc 2000 x 54% x 80% = 864# @ 8 $\frac{1}{2}$ ¢	71.28	
Silver - 1.0 oz. x 80% @ 70-5/8¢	.60	
Gold below pay limit	—	
Lead below pay limit	—	71.88

Deductions

Base Charge	16.00	
Add \$2.50 x (8 $\frac{1}{2}$ - 4¢)	10.63	
Lead deficiency (3.0 - 1.5%) x 50¢	.75	
Combined Fe & Insol - 10% @ 25¢	2.50	29.88
		<u>42.00</u>
Less R. R. Freight Lyons to Great Falls, Montana		
1.1 wet tons @ 10.18 on carload lots		11.20
		<u>30.80</u>
Bonus of 2-3/4¢ per lb. from Metals Reserve		23.76
		<u>54.56</u>

ZINC CONCENTRATES TO ANACONDA - BASIS (Cont.)
Haulage from mill to Lyons

\$54.56
2.00
\$52.56

The revenue at the mine per ton of lead and zinc concentrates is estimated at \$83.97 and \$52.56, respectively, and would amount to about \$.42 per ton from the lead concentrate and about \$.438 per ton from the zinc concentrate and/or a total of about \$.86 per ton of ore.

Operating Cost and Estimated Production

The cost of mining will vary somewhat depending on the type of mining method used. It is believed that part of the ore body can be mined by the shrinkage system, since the ore requires little or no support and the walls are strong and have a dip of 60°. It is possible that the sections of the ore body which occurs interspersed with considerable gangue could be selectively mined and the waste left in stopes. The vein matter is soft and friable and, consequently, it is easy to drill and is easily broken. These factors are favorable for low mining costs. The estimated number of men required for supervision and labor and the proposed salary and wage scales are listed in table 5.

Table 5.

GENERAL

1 General Superintendent	\$400 per month
1 Power Superintendent	300 " "
1 Assayer	200 " "
1 Accountant	200 " "
1 Warehouse Man	150 " "
4 Men in Powerhouse @ \$8.00 per day	32 " "

MINING

1 Mine Superintendent	\$325 per month
1 Night Foreman	250 " "
1 Engineer and Sampler	225 " "
1 Engineer's Helper	180 " "
6 Miners @ \$8.50 per day	51 per day
6 Helpers @ \$7.50 " "	45 " "
4 Muckers @ \$7.00 " "	28 " "
3 Timbermen @ \$8.50 per day	25.50 per day
4 Trammers @ \$7.25 " "	29 " "
1 Timberframer @ \$8.50 per day	8.50 " "
1 Sawyer @ \$15.00 " "	15 " "
4 Loggers @ \$7.00 " "	28 " "
1 Mechanic @ \$9.00 " "	9 " "
1 Blacksmith @ \$9.00 " "	9 " "

MILLING

1 Mill Superintendent	\$300 per month
4 Mill Operators @ \$8.00	32 per day
3 Repairmen @ \$7.50	22.50 per day
52 Total number of men.	

Attention is called to the fact that the above wage scale is lower than in the industrial areas but they are also higher than those reported as being currently paid in the Coeur d'Alene district. It is reported that the daily wage scale there is as follows: miners, \$7.25; timbermen and timberframers, \$7.75; miners' helpers, muckers and trammers, \$6.50 and mechanics and blacksmiths, \$9.00. It may be difficult to induce miners to work at the Ruth Mine for the proposed higher wage when extremely attractive wages are being paid for less hazardous work in the defense industries. There is a possibility that miners can be obtained from gold mines that have been shut down.

The total estimated cost for superintendence, labor, supplies, power and miscellaneous is summarized in table 6. This estimate is based on miners working 26 days and mill men 30 days, in mining and concentrating 6,000 tons of ore per month.

Table 6. Estimated Mining and Milling Cost per Ton

	Mine	Milling	Total
Supervision	.27*	.16*	.43
Labor	1.11	.40	1.51
Supplies	.36	.68	1.04
Power	.05	.10	.15
Overhead (taxes, insurance, etc.)	.06	.06	.12
Miscellaneous	.15	.12	.27
	<u>\$2.00</u>	<u>\$1.52</u>	<u>\$3.52</u>
Total cost per ton			
* Includes engineering and assaying.			

As can be seen from table 6, the estimated mining cost per ton of ore is relatively low. However, the management believes that these costs are reasonably accurate based on their previous experience. It has been pointed out that conditions are favorable for low mining costs and for a fairly high production per man. The company also plans to use as much mechanical equipment underground as will be practical.

With an estimated mining and milling cost of \$3.52 per ton, it is estimated that the net returns from the probable ore reserve would be about \$235,400 and that from the possible ore would be an additional \$128,000 or a total of \$363,400.00

By treating 200 tons of ore per day, the estimated probable ore reserves would be mined out in about two and one-half years and, if the possible ore reserves proved to be ore, the total ore reserves would last for about four years. During this period, it is very probable that with further development additional ore will be found of possibly higher grade than is now developed. The geological conditions for this are favorable both below and along the fifth level since it was noted that the assays on this lowest level were uniformly higher and the mineralization more persistent than on the upper levels. The estimated production of zinc and lead concentrates, their gross and net value at the mine, and tons of zinc and lead that might be produced from the probable and possible ore reserves are shown in table 7.

Table 7.

Ore Classification	Tons	Tons Concentrate		Tons Metal ^{1/}		Value Concentrate ^{2/}	
		Pb	Zn	Zn	Pb	Gross At Mine	Gross less Shipment & Smelter Returns
Probable	183,900	920	15,300	7,950	460	\$1,202,000	\$883,000
Possible	100,000	500	8,330	4,320	248	653,500	480,050
Total	283,900	1,420	23,630	12,270	708	\$1,855,500	\$1,363,050

^{1/} Includes only zinc recovered in zinc concentrate and lead recovered in lead concentrate.

^{2/} Includes revenue from minor metals such as copper, gold, silver, etc. See smelter schedule.

Allowing 12 months for a 200-ton mill and other surface plant construction, installing of mining equipment and stope preparations, about 7,950 tons of zinc as metal and 460 tons of lead as metal might be produced in a total period of 42 months from the probable ore reserves alone. It is probable that the total production may be increased considerably if additional ore of sufficient quantity would be developed to warrant increasing the concentrating plant capacity.

Although the financial success of this operation is primarily dependent on premium prices for zinc and lead and on the grade of ore that will be found by future development, much too, depends upon competent and able management and on the availability of adequate equipment. However, in spite of the fact that the ore is of a marginal tenor, it is developed to start production in a relatively short time after the necessary equipment will have been delivered. This is an important factor to consider if increased production of zinc is desired.

Plans for Company Operations

The plans for mining and concentrating 200 tons of ore per day includes, (a) construction of a hydroelectric plant; (b) installing mine equipment, doing additional underground development and stope preparation; (c) construction of a 200-ton flotation mill; (d) repairing surface buildings and construction of additional buildings and (e) improvement of the road from the mine to Mehama.

(a) Power:

It is estimated that the total power requirement, sufficient for the mill, mine, sawmill and camp would be about 500 to 600 h.p. The company plans to produce this power with a hydroelectric plant, which would be located near the proposed mill, utilizing either or both Little North Santiam River, or Battle Axe Creek for this purpose. By constructing about 1 mile of flume to these streams it would be possible to obtain a head of about 300 feet at the penstock. Two generators, each of 250 kw. capacity, are proposed to be installed and are to be driven by water wheels or turbines. The estimated cost of the power house and units installed are as follows:

2 miles of flume and 300 feet of penstock and turbine or water wheel.....	\$ 8,000
2-250 kw. generators installed including switchboard.....	30,000
Building and accessories.....	<u>5,000</u>
Total estimated cost	\$43,000

(b) Mining preparation and mine equipment:

To mine 200 tons per day, the following underground work must be done: stope preparation, driving of one transfer raise from the fifth to the fourth level, building chutes and installing about 2,400 feet of mine rails. Trolley haulage of the ore is planned to be used on and from the fifth level to the receiving line at the mill site, a total distance of about 6,500 feet and preparation for trolley haulage must be made over this distance. Thirty one-ton capacity mine cars, 8 air drills (stoper and jack-hammers) air hose and drill steel must be purchased. A compressor house must be constructed and one 600 c.f.m. compressor, air lines and water lines must be installed. A machine shop must be constructed and equipment installed. The estimated costs of this mine preparation are as follows:

1. Stope preparation and driving of one transfer raise from the fourth to the fifth level.....\$ 6,500
 2. Purchasing and installing mine equipment such as mine track, 2 locomotives, 30 mine cars, trolley lines, air and water lines, 8 drills and drill steels, a 600 c.f.m. compressor and small electrical underground hoist..... 43,000
 3. Construction of compressor house, machine shop, machine shop equipment..... 10,000
 4. Purchasing of stocks and supplies such as powder, drill steel, etc..... 5,000
- Total.....\$64,500

(c) Mill construction:

The cost of a 200-ton selective lead and zinc flotation plant is estimated as follows:

1. Excavation.....\$ 2,500
 2. Building..... 30,000
 3. Equipment installed..... 80,000
 4. Water storage tanks..... 2,000
 5. Ore Trucks..... 6,000
 6. Equipment - bulldozer, tools, etc..... 10,000
 7. Loading Ramp at Lyons..... 1,500
 8. Warehouse stacks..... 6,000
 9. Contingencies, engineering fees, etc..... 17,250
- Total.....\$155,250

(d) Buildings:

The cost of repairing present buildings and construction of additional buildings is estimated as follows:

1. Repairing and modernizing buildings at upper camp, construction of change rooms, timber sheds and framing shed.....\$ 4,000
 2. Additional living quarters, store school-house and recreation room at the lower camp..... 29,000
- Total.....\$33,000

(e) Road construction and improvements

The first ten miles of road from the mine to Lyons, via Mehama, needs widening and surfacing, while the next four miles needs to be improved only at a few places, and the last 15 miles is in good condition and does not need any repairs. The cost of this road improvement is estimated at about \$10,000.

The estimated total capital cost of placing this mine in operation is summarized as follows:

(a) Power development.....	\$ 43,000
(b) Mine preparation and equipment.....	64,500
(c) Mill and equipment.....	155,250
(d) Houses and other buildings.....	33,000
(e) Road Construction.....	10,000
Contingencies.....	49,750
Total.....	<u>\$355,500</u>

Exploration Work to be Performed by the Bureau of Mines

Although there is an estimated 183,000 tons of ore that is reasonably well developed and an estimated additional 100,000 tons of possible ore, these ore reserves are sufficient for only 2½ to 4 years operation at 200 tons daily capacity. There are, on the fifth level, favorable indications that the ore persists at depth and this includes a more uniform mineralization, higher grade ore and more sharply defined walls than on the higher levels. Additional ore of higher grade than now developed might be found by extending the fifth level under higher backs and by exploring the vein at depth below this level. Increasing the ore reserves by a substantial amount would allow for increasing the daily tonnage treated and would lead to an increased zinc production which is vitally needed.

The company proposes to continue driving the fifth level but the small margin of profit will make it difficult for them to do additional exploration. The Bureau of Mines recommends a project on this property and proposes two alternative plans for developing the ore body at depth.

Exploration plan No. 1 includes diamond drilling after crosscuts have been driven in order to prepare suitable locations for drilling. Two 200-foot crosscuts must be driven into the hanging wall on the fifth level in order that the vein may be intersected at a proper angle at about 200 feet below this level. The crosscuts will be about 330 feet apart at the stations indicated on an accompanying map. Diamond drill stations will be prepared at the end of these crosscuts and three holes are proposed to be drilled from each one. These holes will be "fanned" out to intersect the vein at intervals of about 80 to 120 feet and at about 200 feet on the dip

of the vein below the fifth level. Two more diamond drill holes will be drilled from intermediate stations along each crosscut to intersect the vein at about 100 feet below the fifth level. The total length of these holes is estimated at 2,600 feet. It is proposed to contract the driving of the two crosscuts with the mine operators and to contract the diamond drilling program with drilling contractors. The cost of this project is estimated as follows:

Driving two, 200-foot crosscuts @ \$13.00 per foot.....	\$ 5,200
2,600 feet of diamond drilling @ \$3.50 per foot.....	9,100
Extras @ .50¢.....	1,300
1-Project Engineer \$300 per month for 4 months.....	1,200
2-Sampler Foreman @ \$9.00 per day.....	2,070
2-Samplers @ \$8.50 per day.....	1,955
2-Helpers @ \$3.00 per day.....	1,840
Supplies.....	355
Transportation.....	455
Total.....	\$23,475

The above crosscutting and diamond drilling program would explore the vein for a lateral estimated distance of about 700 feet. If the holes encountered ore they would add an estimated 110,000 tons of possible ore to the ore reserves. The two 200-foot crosscuts are necessary only to obtain suitable locations for spotting the diamond drill holes. It is extremely doubtful if any ore would be encountered by these crosscuts and they would therefore be of little value in actual exploitation of the ore body.

Exploration plan No. 2. The Bureau of Mines proposes an alternative and preferable plan of exploration. This would consist of developing the ore body below the fifth level and this work would be contracted for by the mine operators. The program would include sinking a 200-foot, 5 foot by 8 foot winze on the vein and drifting on the vein for about 700 feet. About 100 feet of crosscuts would be driven from this drift to explore the vein to the walls. The mine operators report that the mine makes very little water so this problem would not be difficult. This underground development would be contracted for by the mine operators and the personnel needed by the Bureau of Mines would only be a project engineer and one or two samplers. The cost for this project would be as follows:

Sinking a 200-foot winze @\$40 per foot.....	\$ 8,000
Preparing ore and loading pocket.....	1,000
800 feet of drifting and crosscutting@ \$18 per foot.....	14,400
Project engineer 5 months @ \$300 per month....	1,500
2 Samplers @ \$9 per day.....	2,340
Supplies.....	500
Transportation.....	300
Total.....	\$28,040

The cost of an electric hoist, rails, skip and cable has been included in the capital cost of mine equipment.

The above proposed program would cost an estimated \$28,040.00, or about \$5,000 more than the proposed diamond drilling program.

However, it would explore the ore body as well as developing it on at least two sides. It is estimated that ore thus developed would amount to about 110,000 tons.

There are advantages and disadvantages of either method proposed. There is, however, some question as to obtaining a good core recovery of the vein matter by diamond drilling. The sphalerite which occurs in calcite and quartz and the latter gangue minerals are friable in places and it is possible that core recovery of this material would be low and the results would therefore be inaccurate. Further, since it would be necessary to drive two 200-foot crosscuts only to obtain suitable drilling stations, underground work would be to better advantage by sinking a winze on the vein instead of as proposed in plan No. 2.

If the diamond drilling program proved the continuity of the ore at depth and laterally for about 700 feet, this would have to be developed in the same manner as proposed in Exploration Plan No. 2, and the estimated total cost would then be \$51,510.00.

The estimated length of time for the diamond drilling program, Plan No. 1 is about 4 months and that for the underground development, Plan No. 2 is about 5 months. If ore was developed, it would be available for mining much sooner by the latter method than by the diamond drilling program. It is, therefore, recommended that the project involving only development as discussed under Exploration Plan No. 2 be carried out by the Bureau of Mines.

Most of the necessary equipment, with the exception of an electric hoist, cable and skip, is on the property now. The company is now engaged in doing a small amount of development with a Reconstruction Finance Corporation loan, and it is probable that miners could be furnished for a Bureau of Mines project immediately.

Either plan could be started as soon as the necessary equipment was obtained and a project engineer available.

Geological Survey

In the Lester Mining District, there are a number of undeveloped and partially developed mineral deposits. These deposits are all similar to the Ruth Mine in that they are found along shear zones in andesite. The entire area is apparently traversed by a series of nearly parallel shear zones and it is along these shears that the mineralization occurs. The degree of persistency and continuity of any one shear zone or ore body is not known and the district as a whole warrants an extensive survey and mapping program as

well as some exploration work. There are copper prospects which include the Lotts Larsen Mine, Black Eagle Mine and others; and lead-zinc mines which include the Ruth, Blue Jay, Ogle Mountain, Crown and others. The zinc properties are located on a rough circle with the copper properties being located in the center.

It is recommended that a detailed geologic study be made in this area.

Conclusions

The purpose of the investigation by the Bureau of Mines was to obtain a sufficient number of samples which would serve as a check on other engineers' results, to determine the approximate tenor and tonnage of ore and to determine the advisability of a project on the property. From the results obtained by the investigation, the Bureau of Mines concludes that:

1. That there are an estimated 183,900 tons of reasonably well developed ore and an additional estimated 100,000 tons of possible ore of a grade of 4.7 percent in zinc and 0.4 percent in lead.
2. That there are good possibilities of developing a considerable additional tonnage of ore.
3. That an estimated 12,250 tons of zinc as metal and 700 tons of lead could be produced over a period of about 4- $\frac{1}{2}$ years from the present probable and possible ore reserves. The total estimated mining, milling, shipping, smelter deductions and smelter costs are \$1,492,000. The company's profits, although marginal, would amount to about \$363,400 and which would balance the estimated capital investment cost of \$355,500.
4. The ore could be mined at the rate of 200 tons per 24 hours for about 4- $\frac{1}{2}$ years and if additional ore was developed, the rate of production could be increased considerably. Production could start within 12 months after obtaining the necessary equipment, laborers and personnel.
5. In view of the facts presented above, it is recommended that proper steps be taken immediately to put the property into production if there is a critical shortage of zinc.

SUPPLEMENT

Ruth or Old Amalgamated Mine

Introduction

The management has recently considered the installation of a "Sink and Float" Plant as an adjunct to the flotation plant. It was stated that such a plant would allow the mining and treating of lower grade ores which would increase the total production of metals from this property. A mining method to include mining the very low-grade ore as well as the higher grade ore would undoubtedly be less expensive per ton mined than a selective method applied on the better ore alone.

Metallurgical Results by "Sink and Float" Treatment

A 200-pound sample of ore was shipped to the Bureau of Mines at Salt Lake City for metallurgical investigation by "Sink and Float" treatment. This sample was taken near the southeast end of the fifth level by Mr. F. Draper of the Pacific Smelting and Refining Company.

The material was crushed to minus 2 inches in size and then screened on screens of 1-inch and 3-mesh openings.

The two coarse fractions were treated separately - first with a media density of 2.76 and the float products were removed and treated with a media density of 2.62.

A summary of the results are given in table 1.

Table 1. Metallurgical Data, "Sink and Float"

Product	Percent Weight	Assay Percent			Distribution Percent		
		Pb	Cu	Zn	Pb	Cu	Zn
Sink at 2.76 Untreated	5.01	1.6	.6	15.07	63.6	39.8	27.5
Minus 3-mesh Composite	19.19	.05	.12	4.6	7.1	29.5	32.2
Sink at 2.62 Composite 2	33.52	.05	.05	2.35	13.5	20.5	23.7
Float at 2.62	42.28	.05	.02	.75	15.8	10.2	11.6
Calculated Head	100.00	.13	.08	2.74	100.0	100.0	100.0

The heads to this test were considerably lower in zinc content than the heads that would be anticipated by selective mining.

As can be seen in table 1, a minor amount of the base metals was recovered in a high-grade sink product with a media density of 2.76 which, combined with the minus 3-mesh fines, contained 70.7, 69.3 and 59.7 percent of the total lead, copper, and zinc respectively. This composite amounted to 24.2 percent by weight of the total heads and assayed 0.37, 0.22, and 6.8 percent in lead, copper and zinc respectively.

Only a low-grade concentrate assaying 2.35 percent in zinc was recovered by additional treatment at a lower media density of 2.62. A composite of the two sink products and minus 3-mesh fines assayed only 4.21 percent in zinc.

The results indicate that "Sink and Float" treatment of this ore, as represented by the sample tested, was not particularly successful so far as obtaining a high recovery of zinc in a relatively high-grade product. The grade of products as represented by composite 2 was 4.21 which is only marginal ore. To obtain one ton of this "concentrate", 1.75 tons of ore would have to be mined, which would be impractical from an economic standpoint. In producing composite 2 which assayed 6.8 percent in zinc, 4 tons of ore would have to be mined to obtain 1 ton of this product and this would also be impractical from an economic viewpoint.

Conclusions

1. "Sink and Float" treatment of the sample of ore shipped by Mr. Draper was not successful in separating the low- and the high-grade ores with a high recovery of the zinc in the latter product.
2. A "Sink and Float" Plant is not recommended at this time but should be considered after more development has been done and the nature of the average mill heads definitely determined. When this is known, "Sink and Float" investigations should then be made on representative samples of the mill heads to determine the practicality of this treatment in raising the grade of the mill heads.

Name of Mine	Location	Development	Vein	Sulphides present		
				Zn	Pb.	Cu.
<u>Fall Creek District</u>						
No mines or prospects of any consequence						
<u>Barron Area-Barron Mine</u>	sec. 23, T. 39 S R. 2 E.	No development given but has gravity mill		X	▼	▼
			Sulphides small stringers mostly sphalerite			
<u>Mt. Emily District-Curry County</u>						
<u>Florence Prospect</u>	Northern slope of Mt. Emily			X	▼	▼
			Zn 3.6 trace gold. Possibility milling grade			
<u>Silver Peak District</u>						
<u>Silver Peak Copper Co.</u>	sec. 26, T. 31 S. R. 6 W	Quite extensive Ore shipped not includ. Zn \$73,000	Massive tabular bodies and dis- seminated in highly foliated schists. NW band about 15' wide SE band over 20'	X	▼	▼
<u>Ashland District-</u>						
<u>Barron Mine</u>	12 miles north of Cal. boundary in Jackson Cte, 3 mi. N. Soda Springs	500'	16' thick and sulphides of iron and zinc.	X	▼	▼
<u>Treasury Group</u>						
<u>Golden Wedge</u>	NE Galice	Production of mine may have reached \$50,000		X	▼	▼
<u>Baker District-Eastern Oregon</u>						
<u>Buckley Mine</u>	NW 1/4 sec. 6, T. 7 N., R. 40 E	Considerable equip- ment	Not accessible	X	▼	▼
<u>Sumter Quadrangle</u>	Zinc is a common lode mineral					
<u>Elkhorn District</u>						
<u>Baisley Elkhorn</u>	Bet. Pine & Rock creek, near head of group	Tot. Pro. to 1912 \$936,717.59	2-10' thick soft mixture of coarse sulphides	X	▼	▼
<u>Cable Cove District</u>						
<u>Imperial Mine</u>	Bet. Silver Creek and North Creek of John Day River	"Ore consists of heavy sulphurets chiefly pyrite, arsenopyrite and zinc blend. Production \$50,000 in gold since 1904."				

MINES AND DISTRICTS
HAVING POSSIBILITIES FOR ZINC IN OREGON

Bohemia District

Name of Mine	Location	Development	Vein	Sulphides present		
				Zn.	Pb.	Cu.
Champion and Evening Star	On ridge between Cham- pion & City Creek basins.	10,000 feet of workings.		X	v	v
Helena Mine	East side of Grizzly Mountain.	5 tunnels. Vein proved 3,000 ft.	5' - 10' wide.	X	v	v
Music	Valley of City Creek across divide into Sharps Creek.	4,900 ft. drift & cross cut levels 100' apart.	2½' - 5½' wide.	v	X	v
Cosmos	Southern part, Sec. 25, T. 2 S., R. 11 E.	Not given.	Not given.	v	v	v
Crystal	Northern part, Sec. 11, T. 23 S., R. 1 E.	Vein proven 3,000' by tun- nels and pits.	Breccia ce- mented with quartz. 2' wide.	v	X	v
Grizzly Group	NE¼ Sec. 12, T. 23 S., R. 2 E.	3 tunnels & several cuts.	Small ore shoots.	v	v	v
Leroy	Sec. 11 & 12, T. 23 S., R. 1 E.	1000' tunnel, several cuts.	large amt. low % base metals.	v	v	v
Mayflower	Sec. 16, 17, 20, T. 23 S., R. 2 E.	Considerable mining done. No development given.		X	v	v
Sunset	Sec. 26, T. 22 S., R. 1 E.	Cape Horn vein proved 4,000 ft.	4½' vein.	X	v	v
War Eagle	Sec. 13, 14, T. 23 S., R. 1 E.	4 veins pros- pected. Consid- erable vein prospected.	3 - 4' wide. brecciated & contain- ing dissem- inated sul- phides.	v	X	v

X Predominating Sulphide.

North Santian

<u>Name of Mine</u>	<u>Location</u>	<u>Development</u>	<u>Vein</u>	<u>Sulphides present</u>		
				<u>Zn.</u>	<u>Pb.</u>	<u>Cu.</u>
Amalgamated	T. 8 S., R. 5 E., 26 miles from Lyons	1350 feet of drift Several short adits	Zinc, 3½ to 28%	X	▼	▼
Blende Ore	T. 8 S., R. 5 E., 2 miles by trail from road at mouth of gold Cr.	215' tunnel.	-----	X	▼	▼
Capital	Sec. 28, T. 8 S., R. 4 E.	400' workings	2½ - 3' wide	X	▼	▼

Quartzville

The Albany	Dry gulch. Sec. 23, T. 11 S., R. 4 E.	1,100 ft. tunnel.	-----	X	▼	▼
The Galena	Sec. 11, T. 12 S., R. 4 E.	Not found.	Are found on dumps.	X	▼	▼

Blue River

Lucky Boy	Secs. 32 & 33, T. 15 S., R. 4 E.	Over 10,000' working.	Production, ▼ \$159,000, mostly gold.	X		▼
-----------	-------------------------------------	--------------------------	---	---	--	---

No.	Location of Sample	Width in Inches	Taken by	Assayed by	Gold Value
-----	--------------------	-----------------	----------	------------	------------

ARGENTY.

27.	At discovery point 500' NE of river	96"	Merritt	Lazell	40.00
-----	--	-----	---------	--------	-------

BACKBONE.

28.	Sample from center end between claims	Grab	Merritt	Montana	3.00
29.	Sample from near N.E. end	Grab	Merritt	Montana	3.40
30.	Sample from forks of Creek	Grab	Merritt	Montana	1.40

AMALGAMATED MINE
(RUTH MINE) which see

North Santiam

Marion

War Minerals Report (restricted, in Confidential File)

0724

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Estimate of Reserves

RUTH ZINC MINE

Pacific Mining and Smelting Company

Marion County, Oregon

UNITED STATES GEOLOGICAL SURVEY

May, 1943

Frank C. Armstrong and John J. Collins

Distribution:

D. F. Hewett	1	
E. T. McKnight	3	
District Engineer, U. S. Bureau of Mines		2
Northwest Regional Office, U.S.G.S.		2

TABLE OF CONTENTS

	Page
Summary and Conclusions	1
Purpose and Scope	2
Location and Access	3
Previous Reports	3
Geology of the Ore Deposit	4
Reserves	6
Costs	9
Exploration	10

LIST OF ILLUSTRATIONS

	Folio
No. 4 Level Ruth Mine	"
No. 5 Level Ruth Mine	"
Cross Sections Ruth Mine	"
Longitudinal Section Ruth Mine	"

See 1-6

RUTH ZINC MINE
Marion County, Oregon

May, 1943

I. Summary and Conclusions

In response to a request from the War Production Board, the Survey has carefully estimated the reserves at the Ruth Mine as follows:

Measured (or developed) ore	24,000 tons	4.8% Zinc	8.9 Ft.
Indicated (probable) "	28,000 "	4.8% "	8.2 "
Inferred (possible) "	<u>48,000 "</u>	<u>4.9% "</u>	<u>7.7 "</u>
	100,000 tons	4.8% Zinc	8.0 Ft.

These are assay widths and grades rather than mining estimates. Present exposures suggest that material of 6% grade is developed to the extent of 8,000 tons, as estimated by George Heikes.

On the subject of costs and mining methods, this geological investigation refers to the Bureau of Mines War Minerals Report, but suggests allowances for 100% dilution in shrinkage stoping. The mineralized zone is severely faulted and brecciated, and the ore lenses are discontinuous, alternating from foot to hanging wall across a fault zone from 5 to 50 feet wide. In view of these conditions, any method of selective mining would be costly also. There is but little mining equipment and no concentrating equipment on the property.

II. Purpose and Scope

At the request of Edwin T. McKnight, Commodity Geologist for Zinc of the Geological Survey, an examination of the Ruth Mine was undertaken for the Zinc Division of the War Production Board. Mr. P. C. Benedict of the Zinc Division of the War Production Board requested the Geological Survey to supply the following information, as quoted from his letter of May 17, 1943, to W. E. Frather:

"(1) Ore estimate and grade. If present workings are insufficient to establish same with an acceptable degree of accuracy, we should appreciate specific statement of work necessary and probable cost to satisfactorily demonstrate same, and a recommendation as to the worthwhileness of such additional development.

"(2) An estimate of probable over-all operating costs plus total overhead based on observable characteristics of the vein, its walls, etc.

"(3) An estimate of cost per pound of producing zinc from this property."

This information was needed to assist the WPB in deciding whether or not to recommend a loan for the Ruth Mine.

This request was transmitted through E. T. McKnight, Commodity Geologist for Zinc, and Frank C. Armstrong of the Northwest Regional Office, mapped the geology of the Ruth Mine between May 26th and 29th and took 30 samples. He was accompanied by John J. Collins the first two days.

The major portion of the geology of the fifth level was accepted as mapped by G. C. Heikes of the Zinc Division of the WPB in February, 1943. A survey of the mine workings by the U. S. Bureau of Mines made in August, 1942, was used as a base for the geological mapping. All the samples appearing on the plans and used in computing the grade in the longitudinal section are those taken by the Bureau of Mines, Geological Survey, and another Federal agency.

III. Location and Access

The Ruth Mine is located on the south side of the Battle Axe Fork of the Little North Santiam River in unsurveyed T. 8 S., R. 5 E., 27 miles by road east of Mehama. A moderately good, graded and drained gravel road extends as far as Elkhorn. From Elkhorn to the mine, approximately 10 miles, the road is along a cliff and would need improvement if heavy traffic were anticipated.

IV. Previous Reports

A comprehensive report on this district was published in 1938 by Callaghan and Buddington ^{1/}, and in 1939 Thayer wrote a report on the North Santiam River Basin ^{2/}. These two reports adequately cover the general geology and describe the rock types of the district.

In 1941 F. G. Wells and T. P. Thayer made a reconnaissance survey of the Northwest with the object of determining the possible sources of zinc which might be tributary to a proposed zinc refinery at Portland, then contemplated as a possible consumer of surplus Bonneville power. They made a brief visit to the mines in the North Santiam district and were underground at the Ruth.

The RFC investigated the property in 1941 and made a \$20,000 loan to the Pacific Mining & Smelting Company, but recently refused an additional loan.

In August and September, 1942, the Bureau of Mines made a five-week examination of the Ruth property which involved sampling, surveying, mill tests and cost estimates. The Bureau's War Minerals Report and maps dated January, 1943, were made available to the Geological Survey.

^{1/} Callaghan, Eugene, and Buddington, A. F. Metalliferous Mineral Deposits of the Cascade Range in Oregon. Geol. Survey Bull. 893

^{2/} Thayer, Thomas P., Geology of the Salem Hills and the North Santiam River Basin, Oregon. State of Ore. Dept. of Geol. and Min. Ind. Bull. #15

V. Geology of the Ore Deposit

The general geology of the area has been adequately presented 1/, 2/; so only features of economic importance at the Ruth Mine are mentioned in this presentation of ore reserves.

The ore mineral is essentially sphalerite whose iron content is fairly high judging by the color of the mineral. Galena is widespread but much less abundant. Chalcopyrite is scarce. The gangue minerals are quartz and carbonate predominantly. Pyrite is about as abundant as sphalerite. Silicification and chloritization are moderate. These minerals occur in small disseminated grains, in stringers, and occasionally in replacement masses several feet across.

The ore minerals occur in a complex fault zone from 5 to 50 feet wide. The walls of this zone are marked by strong faults. Within the fault zone there is a complex of branching cross-faults, brecciated rock, and gouge. Both barren and mineralized areas alternate in an unpredictable, discontinuous fashion. Probably the geology picture of the No. 5 level as mapped by Heikes applies equally well to the raises and to the No. 4 level, which are less well exposed.

Most of the mineralization occurs along the junctions of two sets of faults, one striking Northwest and the other nearly East-West. Both dip steeply to the North. They are joined for at least 800 feet, as now exposed, forming a wide shattered zone.

No reliable exposures were found to prove any considerable off-setting of one set of faults by the other. In fact, the evidence is in places conflicting. Presumably movement was recurrent. Furthermore, it appears that faulting was both pre- and post-mineral, but it is not yet clear in

which period the greater movements took place. In general the Northwest faults are poorly mineralized as compared with those striking more nearly East-West. Apparently both combine to offset the rhyolite so that the north block moved eastward.

Exposures may not be complete but the mineralized fault zone apparently decreases in average width and the grade increases in the 200 feet from the No. 4 to the No. 5 level. These could be local changes or they might suggest the narrowing of the structure in depth. It should be pointed out that this district is characterized by ore shoots of small extent.

Most of the mineralization is found at present in oligoclase andesite of fine- to medium-grain size. However, the foot-wall side of the southeast end of the No. 4 level is in tough aphanitic andesite porphyry. It may be a coincidence that very little mineralization is found in that rock, but a change of rock type may have had an adverse effect on ore deposition. This possibility has not been adequately tested.

The same problem arises on the No. 5 level with the appearance of a rhyolite dike about 30 feet wide that is intersected at a low angle by the ore structure. The exposure is short but there appears to be more mineralization in the andesite than within the rhyolite. The attitudes of the rhyolite and fault zone indicate that with increasing depth more and more of the mineralized zone will be within the rhyolite. On the basis of the limited evidence now available, this change may not be favorable to the formation of ore shoots.

VI. Reserves

In computing the reserves on the longitudinal section only the assays by Federal agencies were used. The tonnage factor was taken as 12.5 cubic feet per ton. With one exception all the assays appearing in a block were used to compute the grade of that block. In block No. 6 a Bureau of Mines assay of 0.5% zinc over four feet was not used because it was felt that this sample may have been taken in the footwall whereas at this point the ore appeared to follow the hanging wall. Where only a few or no assays were available, the blocks were assumed to have the grade of adjacent blocks. The averages of blocks Nos. 29, 30 and 31 were cut to 5% zinc to conform with the mine grade because it was felt that one sample which assayed 12.1% zinc did not represent the grade of the material in these blocks. All assays were weighted as to widths but their lengths of influence were not weighted because the mineralization is considered more erratic than the distribution of the samples.

Ore shoots are not projected far because of the lenticular nature of the deposit. For example, when the ore was developed on only one level, it was projected only 25 feet. Where the ore shoots were long and the ore was opened on two levels, longer projections were made.

Reserve figures in reports on the Ruth Mine do not agree, as is indicated in the following tables:

	<u>Date</u>	<u>Tonn</u>	<u>Grade</u>	<u>Source</u>
Pacific Co.	1940 ?	300,000	8%	Draper
Wells-Thayer	1941	150,000	8%	Company data
U.S.B.M.	1942	183,000 probable	4.7%	
		100,000 possible	4.7%	War Minerals Report
Heikes	Feb. 1943	8,000	6.0%	W.P.B.
U.S.G.S.	May, 1943	24,000 measured	4.8%	
		28,000 indicated	4.8%	
		<u>48,000</u> inferred	4.9%	
		100,000 Total	4.8%	Armstrong-Collins

The first two estimates are based on samples and assays by the Pacific Mining and Smelting Company. The assays by this company were higher than those taken by the Federal Agencies. This may be due in part to the fact that high-grade areas were mined out after the Pacific Company cut the samples and before the Federal agencies made their examinations. Samples cut by the Federal agencies agree closely and it can be presumed that they are a conservative representation of the ore that remains within the developed area.

Because of time allotted to Wells and Thayer for estimates on potential mineral production within reach of Bonneville power, it was necessary for them to use company assays. The tonnage estimates of the Bureau of Mines are higher than those of the Survey. The difference may be due to the fact that more consideration was given by the Survey to the geologic evidence. The Bureau's blocks of probable ore include more than the Survey's total estimated ore; the comparison is 183,000 tons of probable ore for the Bureau, as against 100,000 tons of total measured, indicated, and inferred ore for the Survey. The Survey has plotted all critical federal assays on its longitudinal projection as a basis for comparing ore blocks. The location of the Bureau's block of 100,000 tons of possible ore is not shown on their longitudinal projection, but is described in the report as "in the area surrounding the ore shoots".

Heikes' estimate is believed to be accurate for material averaging 6% zinc. The Survey's tonnage estimate is higher because it is based on a lower zinc content.

For purposes of comparison with other classifications of ore, the term "measured" ore is essentially the same as "developed" ore; "indicated", the same as "probable"; and "inferred", the same as "possible" ore. Following is a list of ore blocks as computed by the Survey.

Summary of Reserves
U. S. Geological Survey, May, 1943

Block No.	Measured Tons	Width Feet	% Zn.	Indicated Tons	Width Feet	% Zn.	Inferred Tons	Width Feet	% Zn.
1				1,600	7.6	5.3			
2	1,600	7.6	5.3						
3				1,600	7.6	5.3			
4							1,600	7.6	5.3
5							9,700	8.9	5.2
6							2,600	4.8	4.6
7				1,700	5.3	4.9			
8	2,400	8.0	7.0						
9				1,800	8.0	7.0			
10							3,600	8.0	7.0
11							*3,100	6.7	3.9
12	*2,100	6.7	3.9						
13				*2,100	6.7	3.9			
14							*4,100	6.7	3.9
15							4,800	11.5	4.1
16				4,800	11.5	4.1			
17	6,000	11.5	4.1						
18	700	4.2	4.0						
19	5,700	11.5	4.1						
20				700	4.2	4.0			
21							1,500	6.9	4.5
22				5,700	11.5	4.1			
23							8,000	7.9	4.8
24							3,600	6.1	4.7
25				4,800	6.1	5.4			
26	5,700	6.1	5.4						
27				2,800	6.1	5.4			
28							5,600	6.1	5.4
29				** 500	3.3	5.0			
30	** 300	3.3	5.0						
31				** 500	3.3	5.0			
Total	24,500	8.9	4.8	28,600	8.2	4.8	48,200	7.7	4.9
Second									
Total	22,400	9.1	4.8	26,500	8.3	4.9	41,000	7.9	5.1

* Omitted from second total.

** Out from 6.4%.

VII. Costs

As explained to P. C. Benedict by W. E. Frather, Director of the Geological Survey, the estimation of costs "lies within the field of competence of the Bureau of Mines" and is outside that of the Geological Survey. However, if geologic conditions are such that they might have a profound influence on costs, they should be emphasized.

The ore at the Ruth lies within a broad shear zone in relatively small, discontinuous lenses. This zone is composed of weak brecciated rocks.

It has been proposed to mine this deposit by shrinkage methods. The rock within the shear zone is so weak that dilution of nearly 100% could be expected. The walls of the mineralized zone are marked by strong gouges. The material between them can be expected to slough along faults and breccia zones until a natural adjustment is reached. Present exposures have attained this stage in many places. However, on resumption of mining operations, slough of waste would recur. The expected dilution would probably be by material grading 1 or 2% zinc; thus it is expected that the average grade would be lowered to possibly 3% zinc.

The alternative of using some method of selective mining, presumably square setting, would increase the costs indicated by the Bureau of Mines, which seem to have been based on shrinkage methods. Square setting would probably keep the grade at the estimated assay figure, but because of the lenticularity of the deposit it should be pointed out that there would be a great deal of trouble following the ore lenses. Much waste would have to be handled in the stopes in searching for continuations of the faulted ore segments. It is therefore a question whether the possible increase in grade would compensate for the expected increased cost of mining. This is a province outside the field of the Geological Survey.

An item which might further be mentioned with regard to deeper development is the assurance of more water with depth. The fifth level is much wetter than those above. The creek, which presumably governs the elevation of the ground water, lies only 40 feet below the portal of the fifth level and a heavy flow of water could be expected along the shear zone.

VIII. Possible Exploration

It is believed that diamond drilling is unsuitable for exploration purposes because of the highly fractured, crumbly nature of the ore zone.

If any exploration is contemplated it should be pointed out that drifts 5A, 5B, and 4A, as shown on the plans, could all start on material which assays over 4%. Crosscut 4B as shown on the plans might greatly increase the tonnage of Blocks 17 and 19.

It is believed that most tangible results could be attained by this type of exploration rather than diamond drilling.

The Bureau has proposed to open a level 200 feet below No. 5 level. This exploration might be advisable only after running the above drifts and if the material now exposed is of minable grade.

Respectfully submitted,

FRANK C. ARMSTRONG

JOHN J. COLLINS

Northwest Regional Office
U. S. Geological Survey
Spokane, Washington
June 11, 1943

Mineral Survey No. 994

FEET									
No. 2	<p>An adit (2nd level), 7 x 6 ft. in size, the portal of which bears S. 7° 46' W., 386.8 ft. from Cor. No. 2 Ruth Quartz Mine No. 2 lode, running S. 20° E., 20.0 ft. to cave-in. Adit continues another 60.0 ft. according to claimant.</p> <p>Value, \$ 590.00</p>								
No. 1	<p>The discovery cut of the Ruth Quartz Mine No. 4 lode, the face of which being the discovery point, is on the lode line 3.3 ft., S. 75° 55' E. from the center of line 1-2; 10 ft. wide, 10 ft. face, running S. 71° E., 35.0 ft. to face and portal of adit. Adit is caved in but runs 52.0 ft. according to claimant.</p> <p>Value of cut and adit, \$ 1,390.00</p>								
	<p>Claimant has also supplied photographic evidence of previously existing improvements supportive of development of the fifth level of Ruth No. 1. These improvements were constructed about 1935 and were subsequently destroyed by snow or other natural elements after the fifth level operations were discontinued. The improvements were apparently used for a considerable period of time. An inspection of the area of the Ruth No. 1 claim on which the improvements were located discloses the existence of a considerable number of old building remnants and building sites which correlate with the photographs supplied by Claimant. The improvements consisted of a two story bunkhouse, an assay office, a commissary, two cabins, a superintendent's house, an office, a store house, a power house, a cook house, and a portal building. In view of the fact that the improvements are no longer standing or usable, no valuation can be assigned to them other than to state that they would certainly appear to be well in excess of \$500 in value towards the development of the fifth level of Ruth No. 1.</p>								
	<p>Additionally, Claimant has also supplied photographic evidence of previously existing improvements at the fourth level of Ruth No. 1 which have been similarly destroyed. Examination of the area where these improvements previously stood discloses the existence of certain improvements in that area. The improvements consisted of a snow shed, shop, four ore bins, and a powder house. Again, because the improvements are no longer standing, a value cannot be assigned to them other than to state that they appear to have been a value of more than \$500 towards the development of the fourth level of Ruth No. 1.</p>								
	<p>FIELD ASSISTANTS</p>								
	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Name</th> <th style="text-align: left;">Capacity</th> </tr> </thead> <tbody> <tr> <td>Don A. Gresdel</td> <td>Instrumentman</td> </tr> <tr> <td>Glenn K. Bennett</td> <td>Instrumentman</td> </tr> <tr> <td>Jacob P. Gregg</td> <td>Chainman</td> </tr> </tbody> </table>	Name	Capacity	Don A. Gresdel	Instrumentman	Glenn K. Bennett	Instrumentman	Jacob P. Gregg	Chainman
Name	Capacity								
Don A. Gresdel	Instrumentman								
Glenn K. Bennett	Instrumentman								
Jacob P. Gregg	Chainman								

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

CERTIFICATE OF SURVEYOR

36-91-0012

Name of Mineral Surveyor John W. Howe	Date June 26, 1980
--	-----------------------

I HEREBY CERTIFY That in pursuance of an order received from the Oregon State Office U.S. Bureau of Land Management, at Portland, Oregon, dated July 20, 1979, I have carefully executed the survey of the claim of Shiny Rock Mining Corporation, Ruth Quartz Mine No. 2, known as the (lode, placer, or mill site) Ruth Quartz Mine No. 1 & Ruth Quartz Mine No. 4, situated in Secs. 27 and 28, Township 8 S., Range 5 E., Willamette Meridian, in the State of Oregon.

This survey, designated as number 994, has been executed by me and under my direction and has been made in strict conformity with said order, the Manual of Instructions for the Survey of Public Lands of the United States, and in specific manner described in the foregoing field notes.

I FURTHER CERTIFY That the labor expended and improvements made upon and for the benefit of the (lode or placer) Ruth Quartz Mine No. 1, Ruth Quartz Mine No. 2 and location(s) embraced in the said mining claim by claimant(s) or its' Ruth Quartz Mine No. 4 grantors are fully stated in my report. The character, extent, location, and itemized value are specified in full detail. No portion of, or interest in, said labor and improvements so credited to this claim has been included in the estimate of expenditures upon any other claim.

Caldwell, Idaho
(Location)

John W. Howe
Signature of Mineral Surveyor

CERTIFICATE OF APPROVAL

Office Oregon State
Location Portland, Oregon
Date August 27, 1980

The foregoing field notes of mineral survey number 994, in sections 27 and 28 Range 5 E., Willamette Meridian, in the State of Oregon, surveyed unsurveyed Township 8 S., executed by John W. Howe, Mineral Surveyor, under order dated July 20, 1979, having been critically examined and the necessary corrections made prior to their certification by the surveyor, the field notes and the survey therein described are hereby approved.

Frank A. Edwards
(Authorized Signature)

Acting State Director
(Title)

CERTIFICATE OF TRANSCRIPT

I HEREBY CERTIFY That the foregoing transcript of field notes of the above-described mineral survey number 994 is a true copy of the original field notes.

Frank A. Edwards
(Authorized Signature)

Acting State Director
(Title)

FEET

This survey was made with a Wild-Heerbrugg T-2 Theodolite. The instrument was in good condition at the time of the survey, and all adjustments were in good order.

All bearings in this record were determined by angles turned right and referred to the meridian determined by the following observations.

January 22, 1980, at a traverse point S. 53° 18' 15" E., 520.97 ft. from Cor. No. 1 of the Ruth Quartz Mine No. 1 lode, in latitude 44° 51' 12" N., and longitude 122° 11' 13" W., elevation 2,480 ft. above sea level, and temperature 20° F., make a series of six observations on Polaris for azimuth at approximately equal time intervals, three each with the telescope in direct and reverse positions, observing the center of Polaris, and reading the horizontal angle from a traverse point 143.89 ft. northwest, clockwise to the star.

Mean time of observation - 120th
mer. standard time = 23^h 16^m 08^s

GHA of Polaris at
time of observation = 197° 44' 42"

Bearing of Polaris
at time of observation = N. 1° 07' 40" W.

Mean horizontal angle
from traverse point
to star's center = 359° 30' 30"

True bearing to
traverse point = N. 0° 38' 10" W.

The lines were measured with a Hewlett-Packard 3800 A Distance Meter, Serial No. 1118A01484, and a Lufkin Pioneer steel tape 301 ft. in length, graduated every foot for 300 ft. and graduated to tenths and hundredths of a foot for the remaining foot. The distance meter and the tape were compared with a local standard measurement course prior to beginning the survey and were found to be correct within tolerable limits.

All lines and connections of this survey were run by direct methods where the lines were accessible; the inaccessible lines were run by traverse methods.

The magnetic declination observed at each corner of the survey gave a uniform value of 20° 30' E.

Mineral Survey No. 994

FEET	RUTH QUARTZ MINE No. 1 LODE
	<p>At Cor. No. 1 of the Ruth Quartz Mine No. 1 lode.</p> <p>Set an aluminum post, 30 ins. long, 2 ins. diam., 20 ins. in the ground, surrounded by a mound of stone to top, with an aluminum cap mkd. RQM No. 1-1-994; from which</p> <p>The 1/4 sec. cor. of secs. 27 and 28, T. 8 S., R. 5 E., Willamette Mer., bears S. 38° 07' W., 1,150.04 ft. dist.; monumented with an iron post, 1 ins. diam., 8 ins. above ground, firmly set, with brass cap properly mkd.</p> <p>A hemlock, 31 ins. diam., bears S. 82° W., 75.7 ft. dist., mkd. RQM No. 1-1-994-BT.</p> <p>A hemlock, 24 ins. diam., bears S. 28 3/4° W., 59.5 ft. dist., mkd. RQM No. 1-1-994-BT.</p> <p>Thence S. 75° 55' E.</p>
30.	Center of Battle Ax Creek, 20 ft. wide and 5 ft. deep, course S. 55° W.
250.	Center of unnamed creek, 5 ft. wide and .5 ft. deep, course N. 21° W.
525.	Center of road, 10 ft. wide, bears N. 67° E. and S. 67° W.
1,500.00	<p>Cor. No. 2</p> <p>Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, with a aluminum cap mkd. RQM No. 1-2-994; from which</p> <p>A hemlock, 36 ins. diam., bears N. 61° W., 22.9 ft. dist., mkd. RQM No. 1-2-994-BT.</p> <p>A hemlock, 13 ins. diam., bears N. 35° E., 11.1 ft. dist., mkd. RQM No. 1-2-994-BT.</p> <p>Thence S. 52° 26' W.</p>
296.48	Cor. No. 2 Ruth Quartz Mine No. 2 lode of this survey.
382.50	Lode line; discovery point bears N. 75° 55' W., 537.8 ft. dist.
765.00	Cor. No. 3, on line 2-3 Ruth Quartz Mine No. 4 lode and line 1-2 Ruth Quartz Mine No. 2 lode of this survey.

Mineral Survey No. 994

FEET	
	<p>Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, surrounded by a mound of stone to top, with an aluminum cap mkd. RQM No. 1-3-994; from which</p> <p>A yew, 12 ins. diam., bears N. 86 1/2° W., 31.5 ft. dist., mkd. RQM No. 1-3-994-BT.</p> <p>A hemlock, 20 ins. diam., bears S. 51 1/4° W., 27.7 ft. dist., mkd. RQM No. 1-3-994-BT.</p> <p>Cor. No. 3 of the Ruth Quartz Mine No. 4 bears S. 75° 55' E., 20.0 ft. dist.</p> <p style="text-align: center;">Thence N. 75° 55' W.</p>
95.	Center of unnamed creek, 5 ft. wide and .5 ft. deep, course N. 22° W.
1,071.	Center of road, 10 ft. wide, bears N. 58° E. and S. 58° W.
1,131.	Center of road, 10 ft. wide, bears N. 53° E. and S. 53° W.
1,335.48	Witness Cor. to Cor. No. 2 Ruth Quartz Mine No. 4 lode of this survey.
1,345.	Center of road, 10 ft. wide, bears N. 35° E. and S. 35° W.
1,480.00	Cor. No. 2 Ruth Quartz Mine No. 4 lode of this survey.
1,490.	Center of Battle Ax Creek, 40 ft. wide and 5 ft. deep, course S. 52° W.
1,500.00	<p>Cor. No. 4</p> <p>This cor. falls in Battle Ax Creek where a permanent monument cannot be established.</p> <p style="text-align: center;">Thence N. 52° 26' E.</p>
28.29	<p>Set an iron post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, for witness Cor. to Cor. No. 4, with a brass cap mkd. RQM No. 1-4-994-WC; from which</p> <p>A hemlock, 26 ins. diam., bears S. 34° W., 5.8 ft. dist., mkd. RQM No. 1-4-994-BT-WC.</p> <p>A hemlock, 12 ins. diam., bears S. 51° E., 23.3 ft. dist., mkd. RQM No. 1-4-994-BT-WC.</p>

Mineral Survey No. 994

FEET	
230.	Center of Battle Ax Creek, 40 ft. wide and 5 ft. deep, course S. 48° W.
382.50	Lode line and center of Battle Ax Creek, 20 ft. wide, course S. 55° W.; discovery point bears S. 75° 55' E., 962.2 ft. dist.
765.00	Cor No. 1, and place of beginning.
RUTH QUARTZ MINE No. 2 LODE	
At Cor. No. 1 of the Ruth Quartz Mine No. 2 lode, on line 3-4 Ruth Quartz Mine No. 4 lode of this survey.	
Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, with an aluminum cap mkd. RQM No. 2-1-994; from which	
The 1/4 sec. cor. of secs. 27 and 28, T. 8 S., R. 5 E., Willamette Mer., bears N. 88° 53' W., 1,427.23 ft. dist.; monumented with an iron post, 1 ins. diam., 8 ins. above ground, firmly set, with brass cap properly mkd.	
A hemlock, 16 ins. diam., bears N. 49 1/2° W., 23.1 ft. dist., mkd. RQM No. 2-1-994-BT.	
A hemlock, 16 ins. diam., bears S. 10° W., 8.0 ft. dist., mkd. RQM No. 2-1-994-BT.	
Thence N. 52° 26' E.	
88.	Center of draw, course N. 22° W.
130.	Top of ridge, bears S. 30° E. and N. 30° W.
147.	Center of unnamed creek, 5 ft. wide and .5 ft. deep, course N. 78° W.
165.74	Intersect line 2-3, Ruth Quartz Mine No. 4 lode of this survey at a point which is also Cor. No. 3 Ruth Quartz Mine No. 1 lode of this survey; Cor. No. 3 of the Ruth Quartz Mine No. 4 lode bears S. 75° 55' E., 20.00 ft. dist.
317.12	Lode line; discovery point bears S. 56° 29' E., 409.2 ft. dist.
634.24	Cor. No. 2, on line 2-3 Ruth Quartz Mine No. 1 lode of this survey.
Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, with an aluminum cap mkd. RQM No. 2-2-994; from which	

Mineral Survey No. 994

FEET		
	<p>A hemlock, 24 ins. diam., bears S. 25° W., 11.6 ft. dist., mkd. RQM No. 2-2-994-BT.</p> <p>A hemlock, 16 ins. diam., bears N. 35° W., 5.3 ft. dist., mkd. RQM No. 2-2-994-BT.</p> <p>Thence S. 56° 29' E.</p>	
1,500.00	<p>Cor. No. 3.</p> <p>Set an aluminum post, 30 ins. long, 2 ins. diam., 4 ins. in the ground to bedrock, surrounded by a mound of stone to top, with an aluminum cap mkd. RQM No. 2-3-994; from which</p> <p>A douglas fir, 17 ins. diam., bears N. 85° W., 5.6 ft. dist., mkd. RQM No. 2-3-994-BT.</p> <p>A douglas fir, 20 ins. diam., bears N. 15° E., 14.2 ft. dist., mkd. RQM No. 2-3-994-BT.</p> <p>Thence S. 52° 26' W.</p>	
317.12	Lode line; discovery point bears N. 56° 29' W., 1,090.8 ft. dist.	
420.	Center of unnamed creek, 4 ft. wide and .2 ft. deep, course N. 50° W.	
634.24	<p>Cor. No. 4.</p> <p>Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, with an aluminum cap mkd. RQM No. 2-4-994; from which</p> <p>A cedar, 12 ins. diam., bears N. 14° E., 20.6 ft. dist., mkd. RQM No. 2-4-994-BT.</p> <p>A cedar, 20 ins. diam., bears N. 62° W., 18.2 ft. dist., mkd. RQM No. 2-4-994-BT.</p> <p>Thence N. 56° 29' W.</p>	
700.	Top of ridge, bears N. 22° W. and S. 22° E.	
1,350.	Center of draw, course N. 22° W.	
1,500.00	Cor. No. 1, and place of beginning.	
<p>RUTH QUARTZ MINE No. 4 LODE</p> <p>At Cor. No. 1 of the Ruth Quartz Mine No. 4 lode.</p>		

-6-
Mineral Survey No. 994

FEET	
	<p>Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, with an aluminum cap mkd. RQM No. 4-1-994; from which</p> <p>The 1/4 sec. cor. of secs. 27 and 28, T. 8 S., R. 5 E., Willamette Mer., bears N. 88° 58' E., 573.14 ft. dist.; monumented with an iron post, 1 ins. diam., 8 ins. above ground, firmly set, with brass cap properly mkd.</p> <p>A hemlock, 36 ins. in diam., bears S. 32° E., 8.6 ft. dist., mkd. RQM No. 4-1-994-BT.</p> <p>A hemlock, 11 ins. diam., bears S. 54° W., 18.3 ft. dist., mkd. RQM No. 4-1-994-BT.</p> <p align="center">Thence N. 57° 28' E.</p>
115.	Center of road, 10 ft. wide, bears S. 80° W. and N. 80° E.
381.	Center of unnamed creek, 5 ft. wide and .2 ft. deep, course N. 20° W.
412.73	Lode line; discovery point bears S. 75° 55' E. 3.3 ft. dist.
483.	Center of road, 10 ft. wide, bears N. 84° W. and S. 84° E.
825.46	<p>Cor. No. 2, on line 3-4 Ruth Quartz Mine No. 1 lode of this survey.</p> <p>This cor. falls in Battle Ax Creek where a permanent monument cannot be established.</p> <p align="center">Thence S. 75° 55' E.</p>
135.	Center of road, 10 ft. wide, bears S. 35° W. and N. 35° E.
144.52	<p>Set an iron post, 30 ins. long, 2 ins. diam., 30 ins. in the ground, for witness Cor. to Cor. No. 2, with a brass cap mkd. WC-RQM No. 4-2-994; from which</p> <p>A hemlock, 24 ins. diam., bears S. 35° W., 34.3 ft. dist., mkd. WC-RQM No. 4-2-994-BT.</p> <p>A douglas fir, 5 ins. diam., bears N. 68° W., 24.5 ft. dist., mkd. WC-RQM No. 4-2-994-BT.</p>
349.	Center of road, 10 ft. wide, bears N. 53° E. and S. 53° W.
409.	Center of road, 10 ft. wide, bears N. 58° E. and S. 58° W.

Mineral Survey No. 994

FEET	
1,385.	Center of unnamed creek, 5 ft. wide and .5 ft. deep, course N. 22° W.
1,480.	Cor. No. 3 Ruth Quartz Mine No. 1 lode of this survey.
1,500.00	Cor. No. 3. Set an aluminum post, 30 ins. long, 2 ins. diam., 24 ins. in the ground, surrounded by a mound of stone to top, with an aluminum cap mkd. RQM No. 4-3-994; from which A hemlock, 20 ins. diam., bears S. 73 1/4° W., 42.9 ft. dist., mkd. RQM No. 4-3-994-BT. Thence S. 57° 28' W.
18.	Center of unnamed creek, 5 ft. wide and .5 ft. deep, course N. 78° W.
60.	Top of ridge, bears S. 30° E. and N. 30° W.
93.	Center of draw, bears N. 22° W.
178.84	Cor. No. 1 Ruth Quartz Mine No. 2 lode of this survey.
412.73	Lode line; discovery point bears N. 75° 55' W., 1,496.7 ft. dist.
825.46	Cor. No. 4. Set an aluminum post, 30 ins. long, 2 ins. diam., 20 ins. in the ground, with an aluminum cap mkd. RQM No. 4-4-994; from which A douglas fir, 26 ins. diam., bears N. 62 1/4° W., 11.5 ft. dist., mkd. RQM No. 4-4-994-BT. A cedar, 15 ins. diam., bears N. 24 1/2° E., 12.1 ft. dist., mkd. RQM No. 4-4-994-BT. Thence N. 75° 55' W.
1,055.	Center of unnamed creek, 4 ft. wide and .2 ft. deep, course N. 16° W.
1,500.00	Cor. No. 1, and place of beginning.
AREAS	
	Acres
Total area, Ruth Quartz Mine	
No. 1 lode-----20.661	

FEET	
	Total area, Ruth Quartz Mine No. 2 lode-----20.661
	Total area, Ruth Quartz Mine No. 4 lode-----20.661
	Area in conflict with-- Ruth Quartz Mine No. 2 lode of this survey----- .030
	LOCATION
	This survey is located in Secs. 27 and 28, T. 8 S., R 5 E., Willamette Mer.
	The survey of the Ruth Quartz Mine No. 1, Ruth Quartz Mine No. 2 and Ruth Quartz Mine No. 4 lodes is identical with the respective amended locations as marked on the ground.
	EXPENDITURES
	The improvements and the value of the labor and improvements made upon or for the benefit of each of the lode locations embraced in said mining claim by the claimant or its grantors are as follows:
	The discovery adit (4th level), of the Ruth Quartz Mine No. 1 lode, the portal of which being the discovery point, is on the lode line 537.8 ft., N. 75° 55' W. from the center of line 2-3; 8 x 8 ft. in size, running S. 60° E., 76. ft. to sta. R4-2. Adit continues but is considered unsafe to traverse any further. According to a 1935 "Profile and Tunnel map", the adit continues;
	thence S. 57° E., 183. ft. to sta. R4-3;
	thence S. 55° E., 88. ft. to sta. R4-6;
	thence S. 55° E., 86. ft. to sta. R4-8;
	thence S. 54° E., 268. ft. to sta. R4-9;
	thence S. 58° E., 80. ft. to sta. R4-10;
	thence S. 72° E., 68. ft. to sta. R4-11;
	thence N. 67° E., 42. ft. to sta. R4-12;
	thence S. 60° E., 153. ft. to sta. R4-15;
	thence S. 76° E., 113. ft. to sta. R4-16;
	thence S. 53° E., 17. ft. to sta. R4-17;
	thence S. 84° E., 24. ft. to sta. R4-18;
	thence S. 52° E., 51. ft. to sta. R4-19;
	thence S. 69° E., 45. ft. to sta. R4-20;
	thence S. 70° E., 86. ft. to breast.
	Adit is timbered for 1152.0 ft., and has steel ore car rails.
	Value \$ 39,180.00
	An adit (5th level), 8 x 8 ft. in size, the portal of which bears S. 41° 07' W., 357.69 ft. from Cor. No. 1 Ruth Quartz Mine No. 1 lode, running S. 82° 11' E., 402.88 ft. to sta. R5-2;
	thence S. 82° 19' E., 208.32 ft. to sta. R5-3;

36-91-0012

Form 3400-11
(September 1967)
(formerly 4-683)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FIELD NOTES

Mineral Survey number

994

State

Oregon

Land District

Of the Survey of the Mining Claim of *(name and address of Claimant)*

Shiny Rock Mining Corporation, P.O. Box 132, Mehama, Oregon 97384

Known as the *(name of group, if any)*

Ruth Quartz Mine

CONSISTING OF LOCATIONS NAMED AND LOCATED AS FOLLOWS

NAME OF LOCATION	DATE	
	LOCATED	AMENDED
Ruth Quartz Mine No. 1	7/1/29	12/28/78
Ruth Quartz Mine No. 2	7/1/29	12/28/78
Ruth Quartz Mine No. 4	7/1/29	12/28/78

Mining district

Lester

County

Marion

Section

27, 28

Township

8 S.

Range

5 E.

Meridian

Willamette

Survey under order dated

July 20, 1979

EXHIBIT C

1. Selected copies of bills and receipts covering expenditures in the area by the Amalgamated Group.

AMALGAMATED MINING AND MILLING COMPANY

The Amalgamated Mining and Milling Company was incorporated on October 14, 1929 by J.M. Dixon, A.W. Metler, and R.H. Tyson. Mr. J.P. Hewitt was appointed Superintendent of Operations. The Marion County, OR, book of mining records shows that on October 16, 1929, the new company was assetted with a block of mining properties acquired by quitclaim deed from Dixon, Metler, Tyson and Hewitt, among others. Included in this group of claims was the Ruth # 1, the most developed and easily the most valuable of the Amalgamated's assets.

THE COLUMBIA MINES DEVELOPMENT COMPANY

The Columbia Mines Development Company was formed on April 28, 1930 by J.P. Hewitt, J.R. Hewitt, B.E. Hewitt, A.W. Dawes, J.M. Dixon, and George D. La Roche. On May 2, 1930, J.P. Hewitt passed to Columbia by quitclaim deed nine claims adjacent to the Amalgamated group. On September 6, 1930, Hewitt deeded the Columbia five additional claims. On September 8, 1930, J.M. Dixon deeded the Ruth # 1, claim to Columbia. (Dixon acquired the Ruth # 1 from the Amalgamated by quitclaim deed on April 30, 1930, two days after he helped form the Columbia Mines Development Company. Later this claim would be given to George D. La Roche who would give it back to Columbia. On January 28, 1939 Columbia traded it to Charles J. Merten for debts.)

THE AMCOL MINING AND MILLING COMPANY

The AMCOL Mining and Milling Company was organized on October 20, 1934 by Edward Seufert, Charles J. Merten, and J.P. Hewitt. (Art Metler was temporary secretary at the organization meeting.) The purpose of the AMCOL was to bring together all the stockholders of the Amalgamated and the Columbia under one flag. Hence, the name AMCOL which is derived from the

JAWBONE FLATS

The group of claims which comprise the Jawbone Flats area are the Ivanhoe, Tennessee, Lucky, and Big Bend. These claims were all located by principals of the Amalgamated-Columbia-Amcol-Gold Creek group of companies. The Ivanhoe was located by Art Metler on April 29, 1930, and was later owned by J.P. Hewitt who deeded it to the Amcol corporation on January 24, 1935. On January 14, 1939 the Amcol returned this claim to Hewitt. The Tennessee was located by J.P. Hewitt on March 16, 1930, and was owned by T.P. & B.L. Hewitt on June 30, 1938. The Lucky was located by J.M. Dixon on March 15, 1930. Later this claim was controlled by Art and Anna Metler, who transferred it to Amcol on October 28, 1934. On June 12, 1937 the Amcol transferred this claim to J.P. Hewitt.

The Big Bend claim was located by J.P. Hewitt on May 7, 1934. The location notice for this claim, as transcribed in Book 4, Page 452 of the Marion County, OR mining records is interesting: "This claim is located on the Little North Fork of the Santiam River and joins the Ivanhoe and Tennessee claims and lays behind on the river which is South and Easterly of the Lower Camp of Amalgamated and Columbia Mines Development Company's Main Camp." It is this group of structures which is now known as Jawbone Flats. On June 30, 1937 the Big Bend claim was transferred to the Amcol Mining and Milling Company. Clearly, no matter which corporate or personal name was listed on the claim location notice at any given time, the property never left the family.

The Bertha E. mining claim, located by Bertha E. Hewitt (wife of J.P. Hewitt) on April 29, 1930, is an example of how close the interdependence between the different mining companies and individuals really was. The original Amalgamated ore mill which was constructed around this

(two day's after they incorporated) he quitclaim deeded the Ruth # 4 to the new company. A few months later on February 15, 1930 the Amalgamated transferred it's interest in the Ruth # 4 to J.R. and A.N. Hewitt. Later this claim was among the Amalgamated assets acquired by D.W. Logan at the Sheriff's sale, then transferred back to the Columbia Mines Development Company through G.D. La Roche. On April 17, 1939, in a paper shuffle not uncommon to these outfits, the Ruth # 4 went from the Columbia to B.L. Hewitt and back again to Columbia.

The MORNING STAR mine was first located by R.I. Dawes on July 6, 1925. A.W. Dawes, a long time prospector in the area, and one of the original directors of the Columbia, was probably responsible for many mineral locations that are credited to others in the book of mining records. He was, over the years, involved in different capacities with the mining companies. The Morning Star and its extension, the Paris, would become the central assets of the Columbia Mines Development Company. Dawes transferred his interest in these claims to J.P. Hewitt, who quitclaim deeded them to the Columbia on May 2, 1930. The Columbia held these claims until they were deeded to C.J. Merten on January 28, 1939.

Another area of interest is the claim group which lays between the Morning Star and the Ruth # 1. The principal claims here are the Ruth # 5 and Ruth # 11 claims. The chain of ownership for these claims follows the familiar pattern: From the Hewitt family to Amalgamated to Columbia to Logan to La Roche to Columbia to Merten. Across these claims runs the Mining Road which joins together all the claims in the historic district. As with the Amalgamated-Columbia Ore Mill, the Flume Line, the structures at "Upper Camp", and Jawbone Flats, the bridges and culverts, the Mining

TECHNOLOGICAL HISTORY
OF THE
AMALGAMATED GROUP

This section is in response to the allegations in Mr. Kerrick's letter to the Keeper, at page 3, in which he attacks the SHPO's findings regarding the "remarkable degree" to which the complex is preserved, and that the "complete technological process of hard-rock mining" can be observed within the complex.

As noted by the Oregon State Historic Preservation Officer in his letter of July 19, 1985, the historic Amalgamated-Columbia mining complex has survived to a "remarkable degree". When the effects of the Pacific Northwest rain forest upon the constructions of man are fully considered, and in light of how little else of Oregon mining history remains, "remarkable" does not seem too strong a word. In a letter to Shiny Rock Mining Corp., State of Oregon Geologist Don Hull, who has inventoried Oregon's mining properties, states that the North Santiam district (Amalgamated-Columbia mining complex) is ". . . certainly one of the most complete and intact examples of Oregon's historic mining districts". (Letter of April 17, 1987, submitted herewith.)

Still remaining at Jawbone Flats are seventeen (17) of the original buildings. (See the 1934 map at page 109 of The Santiam Mining District: A Cultural Property Inventory and Historical Survey.) All of these buildings are in at least "good" condition, and are even now being used for their intended or similar purposes as mining operations continue.

The Shiny Rock Mining Corporation, as successor to the Amalgamated group, has followed a master plan in preserving the integrity of the Amalgamated complex. Quite simply, the 1934 map constitutes the plan. Neither Shiny Rock nor its predecessors in interest have attempted

not be NRHP eligible, it is true to the technological process of mineral separation by floatation, which is identical to the process used at Jawbone Flats in 1930 - and uses the same equipment used in the original mill. When considered as a part of the Amalgamated group complex, as recommended by the SHPO, it is an integral part of the 1930's mining complex. The master plan of replacing by reconstruction has maintained the integrity of the hard-rock mining community referred to as the Amalgamated group.

The Mining Road which connects the district into a single entity is itself a fine example of period construction technology. Along its length and spurs are found log culvert drainages, log stringer bridges, a reconstructed section of high-bridges, an interesting short span across the portal of an old workings, and an alignment reminiscent of a time and technology when roads were engineered around obstacles instead of through them.

The technological process of hard-rock mining as practiced from the late 1850's, when the first prospectors arrived, throughout the hey-day of mining in the district during the 1925-1940 period and up to modern times, is readily observable at numerous sites around the complex. The many artifacts, pieces of equipment, and mine openings (some still supported by the original hand-hewn timbers) make it possible to consider the process of mining from almost any particular time frame, or in terms of its evolutionary context.

The Santiam Mining District: A Cultural Property Inventory and Historical Survey, submitted herewith, amply demonstrates the propriety of the statement by SHPO that in the Amalgamated group complex "it is possible to observe the complete technological process of hard-rock mining and also

ECONOMIC AND SOCIOLOGICAL HISTORY
OF THE
AMALGAMATED GROUP

In the late 1920's and the 1930's, the Western Cascades, and particularly the Santiam Mining District, saw the highest level of mining activity. By then, J.P. Hewitt's long-term plan for developing the mineral resources of the area was coming to fruition. Enough basic development on the various claims had been done, and enough evidence supportive of the economic potential for the district had been provided by the engineering fraternity so that it was now possible to form the various corporations through which the stock offerings which would fund operations could be made. It is impossible to make an exact accounting of the amount of actual money raised through these offerings. Some stock was exchanged to creditors for debt, some stock was given to contractors in lieu of wages, and large amounts remained in the hands of the Hewitt family and the other principal organizers. Nonetheless, a large amount was sold to the investing public. The remaining corporate records of Amalgamated, Columbia, Amcol and Gold Creek indicate that very substantial sums of money were raised. These monies were used to finance the construction of the Amalgamated-Columbia Ore Mill, the flume line, the upper camp and Jawbone Flats, the mining roads, underground mining and development work, and everything necessary to put the complex on a paying basis.

Most of the money raised by the Amalgamated group was spent in the local area. Clearly, an operation the size of the Amalgamated-Columbia must have had an impact. During the early 30's, the period of greatest activity, there were at times 60-80 men employed in construction and mining and transportation activities. With the closest towns, Gates, Mill City, Lyons and Mehama, OR, being two hours drive from the diggings,

SUMMARY

As noted at the outset of this history, it is meant to supplement the more complete information set forth in The Santiam Mining District of the Oregon Cascades : A Cultural Property Inventory and Historical Survey. This supplement amplifies data provided in the greater history, and is intended to refute the arguments and allegations (none of which is supported factually) made by Mr. Kerrick in his letter to the Keeper. Mr. Kerrick opposes a finding of eligibility for all but a small portion of the Jawbone Flats area, and the contentions he has made to support his position, and in opposition to the SHPO recommendation of eligibility, must fall in light of the true facts - as documented in the records referred to herein.

The documentary evidence that the different companies and individuals were completely related and inter-dependent is plain. An historic district based on this functional inter-dependence would therefore be appropriate.

As a physically representative example of an early mining camp, the area recommended by SHPO as eligible for listing is without parallel in Oregon; a state that respects the role of mining in it's history enough to have included the miner's pick in the State's seal.

The buildings, the mines, the roads and trails, and the very tools the miners used are evidence of the technology of the time. The integrity of the recommended area is apparent to anyone who has reviewed the records and surveyed the area with an unbiased eye. Beyond the supply receipts, and remembrances of the folks who lived in the area when Amalgamated was in its prime, the simple logistics and demographics of the

EXHIBIT A

1. List of claims by owners and previous owners.
2. Histories of Amalgamated, Columbia, Ruth Mine, and the Bueche and Good Hope Group.
3. Correspondence and Memoranda dated:
10/21/29; 11/8/30; 7/3/31; 9/25 and 24/34; 4/23/36; 5/17/36; 5/18 and 29/37; 1/24/38; 4/8/38; 2/7/39 (with attached correspondence); 11/30/39.
4. Copies of transfers of titles.
5. Corporate documents, dated:
12/20/30 (2); 1/2/32; 7/10/33; 8/9/34; 2/10/38; 6/30/38; 11/19/38; 3/25/41.
6. Undated documents:
Account of J.P. Hewitt in Columbia Mines.
Account of Security Pacific in Columbia Mines.
Monies expended by J.P. Hewitt.
"Bertha E" mining claim.
Stockholders of Amalgamated.
Charts of Organization.

SUPPLEMENTARY HISTORY
 OF
 AMALGAMATED MINING AND MILLING COMPANY
 INCLUDING PROPERTIES OF
 COLUMBIA MINES DEVELOPMENT COMPANY
 AND
 AMCOL MINING AND MILLING COMPANY
 AND
 GOLD CREEK MINING AND MILLING COMPANY

This supplementary history was prepared by Joseph E. Weber, who had prepared the biographies contained in The Santiam Mining District of the Oregon Cascades: A Cultural Property Inventory and Historical Survey.

INTRODUCTION

This history is based upon public records, both corporate and mining records on file in Oregon, as well as on files of the Amalgamated group - which, as explained below, includes Amalgamated Mining and Milling Company, Columbia Mines Development Company, AMCOL Mining and Milling Company, and Gold Creek Mining and Milling Company. These private files have been made available for review at the offices of Shiny Rock Mining Corporation.

Submitted herewith as exhibits A, B and C are copies of records, bills, correspondence, memoranda, and other materials taken from the files of the Amalgamated group. These records support and amplify the conclusions reached below, and constitute only a very small selection of the documents contained in twelve (12) file boxes of sorted documents and twenty (20) boxes of unsorted records dating back to 1920.

The purpose of this supplementary history is to refute the various contentions and arguments made by Michael A. Kerrick, Forest Supervisor (U.S.S.A.), in his letter of October 9, 1985, to Jerry Rogers,

5	Ed Reilly	8/28/2000	28611 North Fork Rd. Lyons, OR 97358	503-859-2013	
<p>Comments:</p> <p>A) Will the parking area at the gate be used as a construction "staging area"?</p> <p>B) Will trail access be limited or impacted?</p> <p>C) Will the mine project require heavy equipment to be moved over the road? Noise and road damage must be addressed.</p> <p>D) Will the work generate the possibility of fire? This unique area must be protected from any change in fire.</p> <p>Response:</p> <p>A) Parking at the gate is not expected to be impacted. No construction staging will be required.</p> <p>B) No trail access will be limited or impacted.</p> <p>C) No heavy equipment will be required for the proposed closure methods. Gates can be installed by hand with portable welding equipment.</p> <p>D) The use of ANFO explosives does have the potential to generate fire if used in dry conditions and in large quantities. Due to seasonal restrictions for wildlife, this project will be completed in the fall after the fire season is over. Nevertheless, fire precautions will be implemented when using ANFO explosives as a closure method.</p>					
6	Laura Skaer Executive Director	9/5/2000	Northwest Mining Assoc. 10 N. Post St., Ste 414 Spokane, WA 99201-0772	509-624-1158	nwma@nwma.org
<p>Comments:</p> <p>A) Concern on the apparent application of a different, and more flexible, set of environmental standards to this project than to other abandoned mine closures currently being pursued by the USFS elsewhere in the West.</p> <p>B) ... NWMA would like to know why the USFS believes it does not have to comply with the same requirements it has imposed on others with old mines on their claims. For example, the Forest Service has been using CERCLA authorities delegated to it by Presidential Executive Order in an attempt to coerce individuals to pay for mine closure activities on properties they did not operate.</p> <p>C) ... it appears that your actions are not consistent with several relatively recent court rulings interpreting how NWFP applies to mineral related activities, which closure and reclamation of patented mining claims certainly are. Thus, NWMA would like to know how ESA mandates will be met, as the proposal identifies the Golden Bear mine site as being suitable habitat for the Townsend's big-eared bats, and the portal discharges almost certainly affect critical salmonid habitat.</p> <p>D) We (NWMA) are also aware that mine portals with discharges, such as those described in the project proposal, are considered point source discharges by the EPA and should have an NPDES permit. Therefore, we would like to know what the agency is doing to comply with state and federal water quality standards and regulations. As you go forward with the studies needed to select the plugging alternative, NWMA wishes to review all water quality data collected and hydrologic models developed to address the portal discharges.</p> <p>E) We would like to know what the Forest Service has done or plans to do to recover its costs for site evaluation and closure activities from the Friends of Opal Creek and other PRP's.</p> <p>F) In light of the above factors, it certainly appears that the project will not be able to proceed for quite some time, perhaps as long as several years.</p> <p>Response:</p> <p>A) This project is being completed as a result of issues raised by the USDA Forest Service to address the public safety problems associated with these abandoned mines. These mines do not contain any hazardous materials or pollutants that would qualify them for CERCLA or RCRA cleanup actions. These mines do not exist on active mining claims.</p> <p>B) See response to A.</p> <p>C) The mines proposed for closure do not exist on patented claims. All patents were donated to the government by the Friends of Opal Creek in 1996, prior to the enactment of the Opal Creek Wilderness & Scenic Recreation Area. See the Decision Memo for findings on Threatened, Endangered, and Sensitive plant and wildlife species.</p>					

NWMA Response: (Continued)					
D) An NPDES permit is only required for operations where there is a discharge of "pollutants" into the state waterways. The discharge from these mines is considered natural flow of existing groundwater intercepted somewhere in the mine and has been occurring for the past 30-70 years without any measurable impacts to the area. There have been no pollutants discovered in the water flowing from these mines. If it is determined by DEQ that a NPDES permit is required for mine closures with water flowing from them, appropriate permits will be obtained prior to the activities occurring.					
E) As previously stated, these mines do not qualify under CERCLA authority, therefore, no cost recovery measures are being taken.					
F) This project is expected to begin in 2001 and continue as funding becomes available to close and monitor the remaining mines.					
7	Tom Vuyovich	9/5/2000	P.O. Box 563 Detroit, OR 97342	503-854-3427	
Comments:					
A) Prefer foam over explosives. Gates allowing areas for bats is also a good idea.					
B) What about the other mine shafts in the Detroit District?					
Response:					
A) In terms of cost for each type of closure, foam plugs are the most expensive form of closure. Gates rank second, and explosives generally third depending on type used.					
B) The Forest Service does know of other abandoned mines on the Detroit Ranger District, however, many of these mines are located away from roads or trails and are not generally well known sites. Additional mines may be closed as additional surveys are completed and an analysis on the risks to the public are evaluated.					
8	LeRoy Elliot	9/6/2000	20325 NW Rock Cr. Blvd. Portland, OR 97229	503-645-2738	
Comments:					
A) Supports preserving the Opal Creek area in its natural state.					
B) Supports closing mines to protect the public as long as signs are posted at the entrances to identify it by name and purpose of the mine and to disclose any pertinent historical data.					
Response:					
B) A historic interpretive plan is in the process of being developed for the Opal Creek Scenic Recreation Area with the assistance of the Opal Creek Advisory Council. This plan will include the historic mining district and mines in the area.					
9	Suzanna Mack	9/6/2000	26965 N. Fork Rd. Lyons, OR 97358	503-859-3154	
Comment:					
Suggests putting iron gates on all the mines, instead of plugging them. This would preserve historic sites as well as providing bat and other animal habitat. This would preserve aesthetics for future generations of hikers, etc. and probably be cheaper.					
10	Ann Cavanagh	9/5/2000	1625 Center St. NE Salem, OR 97301	503-362-7123	
Comments:					
A) Supports Golden Bear proposal.					
B) What is the life expectancy of the foam plug? Will hazardous chemicals be discharged during the on-site mixing process?					
C) Santiam #1 – If you use explosives, a chemist should determine the nature of that gas. Otherwise a huge explosion might bring down the hillside.					
D) Ruth #1-5 th level, and Morning Star: Shouldn't the water flowing from these mines be analyzed to find out what noxious chemicals are being discharged into Salem-area drinking water? Mercury for example.					

<p>Ann Cavanagh - Response:</p> <p>B) The foam plug we are proposing to use is manufactured by a company known as Foam Concepts, Inc. Life expectancy for this type of material is virtually endless. The material is only broken down by ultraviolet light – not effected by chemicals. Foam products such as this material have been in use since the 1970's and are still intact today. Installation of the foam product is very safe. The foam chemicals are self-contained in individual bags and mixed on site – no hazardous chemicals are released.</p> <p>C) The odor detected in the Santiam #1 mine was most likely as result of rotting timbers and standing water. None of the mines in the area are suspected to be producers of flammable gases, as sometimes found in deeper gold & silver mines or coal mines.</p> <p>D) The water flowing from the Ruth and Morning Star mines has been discharging for over 50 years with no known effects to water quality in Battle Axe Creek or the Little North Santiam River. Some water testing has been done to determine pH and heavy metal content with results found to be similar to the surrounding surface waters. Mercury has not been detected in any of the samples.</p>					
11	Betty Johnson	9/11/2000	1936 Icabod St. NE Salem, OR 97305-2534	503-581-9541	
<p>Comments: Supports the closure project.</p>					
12	Sophia Hobet	9/15/2000	Water Quality Supervisor, City of Salem Public Works 1410 20 th St. SE, Bldg. #2 Salem, OR 97302-1200	503-588-6483	shobet@open.org
<p>Comments:</p> <p>A) Believe that mechanical closure methods (blasting, backfilling, etc.) could impact water quality, depending on the proximity of these operations to streams.</p> <p>B) Concerned about the chemical stability of the foam used in the plug procedure. This should be evaluated for long term chemical stability in an exposed environment including seasonal temperature variations.</p> <p>C) Concerned with the continuous discharge of water from two of the mines (Ruth #1 – 5th level, and Morning Star). Specifically the chemical composition and quality of the discharge water, as well as the possibility of this water to dissolve and transport unwanted minerals, a source of potential contamination, into nearby streams should be evaluated.</p> <p>D) Are there any mine tailings involved?</p> <p>E) Concerned about how these sites will be reclaimed; i.e. revegetated, re-contoured as necessary after the closure is completed in order to minimize erosion potential.</p> <p>Response:</p> <p>A) The proximity to surface water is described in Table 1. Blasting is proposed for the Black Eagle mine and the Ruth #4 Discovery Cut. Surface water adjacent to these mines will not be impacted due to the confinement of the explosives to a small area near the portal. These explosions are not expected to produce fine sediments and therefore, no impacts to streams are expected. No backfilling with mechanical equipment is proposed with this project. This was identified as a possible option, however, access to several of the mines is difficult.</p> <p>B) The foam plug we are proposing to use is manufactured by a company known as Foam Concepts, Inc. Life expectancy for this type of material is virtually endless. The material is only broken down by ultraviolet light – not effected by chemicals. Foam products such as this material have been in use since the 1970's and are still intact today. Installation of the foam product is very safe. The foam chemicals are self-contained in individual bags and mixed on site – no hazardous chemicals are released.</p> <p>C) The water flowing from the Ruth and Morning Star mines has been discharging for over 50 years with no known effects to water quality in Battle Axe Creek or the Little North Santiam River. Some water testing has been done to determine pH and heavy metal content with results found to be similar to the surrounding surface waters.</p> <p>D) No mine tailings are located at any of the proposed mine closure sites.</p> <p>E) Reclamation of each mine will depend on the amount of surface disturbance located near the adit. A proposed reclamation plan is attached as Appendix C to the Decision Memo.</p>					

13	Opal Creek Advisory Council	9/18/2000	Sub-Committee Recommendations on the Abandoned Mine Closures		
<p>Comments: Black Eagle – Agree with Forest Service recommendation to close it. Santiam #1 – Recommend against proposed permanent closure. Install safety gate with review for future use as part of interpretive activities in the area. There is some evidence of bat habitat in this mine that should be reviewed. Golden Bear – Agree with Forest Service Recommendation to install gate at opening for bat passage with interpretive signing. If unsuccessful as bat habitat review potential as interpretive site. This may be the best interpretive site on the list. Ruth #1, 5th Level – Defer recommended action. Place gate at entrance. There are substantial artifacts in the area that need further cataloguing and study, as well as possible inclusion in interpretive activities in the area. Review timbering for historic or educational significance. Ruth #1, 3rd Level – Defer recommended closure. Gate entrance for safety. (Also, please note accurate name is Ruth #1, 4th Level. Changes in name could confuse future research.) Review timbering for historic or educational significance. Ruth #4, Discovery Cut – Agree with Forest Service recommendation to collapse the opening. Morning Star – Defer closure. Secure existing gated opening. Review this site as part of a broader interpretive activities in the area. Response: Generally, the subcommittee’s recommendations were to defer irreversible action where the sites offered the possibilities for inclusion in interpretive or educational activities contemplated for the area. The subcommittee also agreed that actions were needed to secure several of the sites that are currently open to public access. Safety of the public is a fundamental concern and should be addressed in each alternative. The subcommittee also suggested that video recording be made of all sites particularly those slated for closure and that recordings include expert voiceover. Suggest that this be done as soon as possible due to continued collapsing.</p>					
13a	Tim Cremer	9/18/200	Director of Gov Affairs, Oregon Independent Miners 13737 Triumph Road Sublimity, OR 97385	503-769-2471	
<p>Comments made during the open forum at the OCAC 9/18/2000 meeting: A) Who is paying for the closures? B) Why aren't previous owners paying for it? C) Has the EA, EIS, BE and BO consultations been completed? Response: A) The Federal government. Funding is available on a request basis with Watershed Improvement dollars. B) Currently there is no authority, for these mine closures, for the government to recover costs from past owners. At the time of donation of the patented claims, the USDA Forest Service accepted responsibility for these abandoned mines in order to acquire Federal ownership within the Opal Creek Scenic Recreation Area. The mines are a public safety issue and do not contain hazardous materials, therefore they are not eligible for CERCLA funding. C) An EA or EIS is not required for this type of project as described in the Decision Memo. Biological evaluations were completed for Threatened, Endangered, and Sensitive animal and plant species as well as for Protection Buffer and Survey & Manage Species. Findings are disclosed in the Decision Memo. Consultation with the Oregon Department of Fish & Wildlife is not required based on the findings of no adverse affect on these species.</p>					

13b	Tom Quintal	9/18/2000	Oregon Independent Miners 1718 Sonya Dr. SE Salem, OR 97301		
<p>Comments made during the open forum at the OCAC 9/18/2000 meeting: A) Do any of these sites qualify for cultural sites? B) Is there criteria used for cultural significance? Response: A) None of the sites have been determined eligible for the National Register. B) Generally, in order to be eligible, sites must be 50 years old and have regional significance.</p>					
14	Rodney Stubbs	10/19/2000	3460 Dogwood Drive S. Salem, OR 97302	503-559-3446	
<p>Comments: A) Black Eagle Mine: Believes this mine should be gated and preserved for future development as a demonstration mine. The stopeing is made of old timbers and extends nearly four stories following a vein of ore. B) Santiam #1: Very accessible and dangerous. This mine and its sister mine located directly south on the opposite shore of the river should be closed. C) Golden Bear: Should be gated and developed as a demonstration mine in the future. D) Ruth & Morning Star Mines: This is a unique area of great historical significance. I would hate to see it lost... Response: A) Gating on this mine would be difficult due to the nature of the material at the portal and along the first 150 feet. The loose dirt & rock do not allow a good hold for gating material and this might allow for the gate to be easily vandalized and people to continue to enter. The stopes and old timbers that are described are excellent reasons why this mine should be closed due to the hazards they present. B) The Santiam #2 mine is not included in this proposal because of its relative inaccessibility, however, we will be looking at it in the future. C) Future development of these mines as demonstration mines open to the public would be difficult to manage. Understanding the fact that the two you have identified, Golden Bear and Silver King Mine, are dug into solid rock, there are still liability issues that exist that preclude the USDA Forest Service from managing these mines in this manner at this time. Plans do include posting a information sign outside of the Golden Bear to explain the purpose of the gate and educate the public on the historic nature of the mining district. D) This proposal only includes addressing the mine adits. The additional structures and historic properties located in the Ruth and Morning Star areas will be addressed in a future management plan of the entire Opal Creek Scenic Recreation Area.</p>					
15	Paula Hyatt	11/9/2000	P.O. Box 4087 Salem, OR 97302-1087		
<p>Comments: A) I think closing the mines is a good idea from a safety standpoint. I DO NOT think blasting is a good idea! The method I would prefer seeing would be gates, or partial plugging, so the bats can get in and out. B) Prior to blasting, need to check the stability of the land to prevent collapse or landslides from occurring. Response: A) Closing with explosives has been selected as the closure method on those mines where gates or a foam plug may not work effectively. B) The amount of explosives planned for the proposed closures is not expected to be greater than required to effectively close the portal. The Regional Blasting Expert has made recommendations on the estimated amount of explosives that will be necessary to effectively close the mines. Slope stability is not expected to be a critical factor for the two portals proposed to be closed with explosives on this project.</p>					

Appendix B**Consideration Of Extraordinary Circumstances**

Extraordinary Circumstances	Present?	Significant Effect?
a. Steep slope or highly erosive soils	No	No
b. Threatened and endangered species or their critical habitat	Yes – Spotted Owl & Peregrine Falcon	No
c. Flood plains, wetlands, or municipal watersheds	Yes – Little North Santiam River	No
d. Congressionally designated areas such as wilderness, wilderness study, or National Recreation areas	Yes – Opal Creek Wilderness & Scenic Recreation Area	No
e. Inventoried roadless areas	Yes – Opal Creek and Bull of the Woods	No
f. Research Natural areas	No	No
g. Native American religious or cultural sites, archeological sites, or historic properties or areas	Yes – Little North Santiam Historic Mining District	No

Appendix C

Reclamation Plan

No new roads are proposed with this project. All existing roads are used for the current transportation system or as hiking trails.

Black Eagle Mine:

Following the proposed closure (collapse with explosives), the portal will be shaped with hand tools to match the natural contour of the slope. It is expected that natural growth of the surrounding vegetation will grow in over a short period of time.

Golden Bear:

Proposed closure (Install bat-friendly gate). No reclamation is necessary at this site. Disturbance is limited to the adit opening and all timber associated with the portal will be concealed behind the proposed gate. An interpretive sign is planned to be installed outside this mine to explain the purpose of the gate and educate the public on the historic mining district.

Santiam #1:

Proposed closure (Install bat-friendly gate). No long term reclamation has been planned for this site. Preservation of the surrounding historic properties and interpretation of the historic use of the area is planned.

Ruth #1 – 4th & 5th Level:

This entire site is complex with a large number of collapsed structures and a few standing structures. In addition, there is scattered metal parts from the past mining operations in the area. A complete reclamation, historic preservation, and interpretive plan are expected to be completed in the future as the management plan for the Opal Creek Scenic Recreation Area is developed.

Ruth #4 Discovery Cut:

Following the proposed closure (collapse with explosives), the previous opening is expected to match the natural contour of the slope. No additional reclamation is planned.

Morning Star:

Following the proposed closure (foam plug), the exterior appearance of the mine is planned to be retained. This includes securing the wood door to the foam plug and securing the adjacent timber.

DECISION / SELECTED ACTION

It is my decision to close seven abandoned mines located in the Little North Santiam drainage. Names of the mines, location and closure methods are described in Table 1 on the following page. The purpose of these closures is to improve potential habitat for bat species and to reduce or eliminate public health and safety hazards. There is adequate existing access to all of the sites and no new road construction will be required for these closures. Proposed reclamation for each mine portal and the surrounding area is described briefly in Appendix C.

BACKGROUND / RATIONALE FOR THE DECISION

Prior to the enactment of the Opal Creek Scenic Recreation and Wilderness Act, many of these mines were owned by the Friends of Opal Creek as patented mining claims. Once the act was signed into Law, the Friends of Opal Creek donated these patents to the Government. Now under USDA Forest Service jurisdiction, there is a need to manage these lands to provide safety for the public.

These mines, except the Black Eagle Mine, were originally worked during the early 1930's and again in the 1970's by the Shiny Rock Mining Company but are no longer in use today. Specific hazards in and around the mines include unstable rock at the portal and within the underground workings, rotting timbers and rusting metal, low oxygen levels and stagnant air, deep water, and other unknown hazards. Leaving these mines open presents a substantial risk to the public with the hazards listed above.

Some of these mines have underground characteristics that may provide an opportunity to create suitable habitat for bats of various species, including but not limited to, Townsend's big-eared bat. However, no live bats or evidence of bat use was discovered during the underground surveys. Examples of good bat habitat in mines includes high vaulted ceilings, multiple cracks and crevices, dry and cool during the summer (summer roosts and maternity roosts), cold during the winter (winter hibernaculum), and free of public disturbance. Some of the mines are not free of public disturbance and this may be one of the reasons bats are not using them at this time.

Finally, based on review of the project by District resource specialists and underground surveys, I cannot find any compelling reasons to keep these mines open which outweigh the need to protect the public from the identified underground hazards.

Table 1: Proposed Abandoned Mine Closures		
Name of Mine	Location *	Closure Method **
Black Eagle	T. 8S., R. 4E., Sec. 24. ½ mile west of the gate on Forest Road 2209. This claim is located just inside the Opal Creek Wilderness.	Collapse portal with explosives. Structure of the mine would not support the construction of a iron gate. Unconsolidated alluvial material is too loose to properly secure a gate. No water discharge is occurring at this mine. The portal is located approximately 100 feet from Horn Creek.
Golden Bear	T. 8S., R. 5E., Sec. 30 1 mile east of gate on Forest Road 2209 just past the half-bridges.	Construct a bat-friendly gate just inside the portal. Maintain the existing wood bracing at the portal, if possible. The portal is located approximately 500 feet from the Little North Santiam River.
Santiam #1	T. 8S., R. 5E., Sec. 19 ½ mile east of the gate on Forest Road 2209.	Construct a bat-friendly gate or cage around the opening. The portal is located approximately 50 feet from Little North Santiam River.
Ruth #4 Discovery Cut	T. 8S., R. 5E., Sec. 27 1 mile east of Jawbone Flats along Forest Road 2209.	Collapse opening with explosives. This cut is approx. 20 ft. deep with large rocks falling every year. No water discharge is coming from this opening. The cut is located approximately 100 feet from Battle Axe Creek.
Ruth #1 – 4th level (Previously referred to as the 3rd level)	T. 8S., R. 5E., Sec. 27 1 mile east of Jawbone Flats along Forest Road 2209.	Construct a bat friendly gate at the main portal. Seal the second smaller portal with a foam plug. Maintain the existing wood bracing at the portal. The portals are located approximately 50 feet to an unnamed creek (a.k.a. Ruth Creek).
Ruth #1 – 5th level	T. 8S., R. 5E., Sec. 27 1 mile east of Jawbone Flats along Forest Road 2209.	An attempt will be made to construct a bat-friendly gate at the portal. However, the instability of the portal area may be restrictive on what closure method is used. Other options include a foam plug or collapse with explosives. Drainage will be addressed with a culvert if the adit is closed with a foam plug or explosives. The portal is located approximately 50 feet from Battle Axe Creek.
Morning Star	T. 8S., R. 5E., Sec. 27 1.5 miles east of Jawbone Flats along Forest Road 2209.	Seal the opening with a foam plug. A culvert will be installed under the foam to allow for the drainage of flowing water. The existing wood door and support structure will be secured and left in place to maintain the visual character of the mine for interpretive purposes. The portal is located approximately 25 feet from an unnamed creek (a.k.a. Blue Jay Creek).

* Refer to the attached Vicinity Map for the location of each mine.

** Gates will be constructed from designs recommended by Bat Conservation International to allow the free passage of bats while preventing human entry. Where gates are constructed, an attempt will be made to maintain the visual character of the portal for future interpretive purposes. The mines will be monitored after construction of the gate to determine the species type and use patterns in the mines. In the event bats are not using the mines, the mines may be permanently closed with other methods (Foam plug or collapsed with explosives) in the future.

SCOPING AND PUBLIC INVOLVEMENT

This project was first published in the Forest Focus, the Willamette National Forest quarterly project newsletter, Winter Quarter / February 2000. A public scoping notice was also mailed on August 11, 2000 to 114 groups and individuals who have previously requested information regarding projects in the Opal Creek Scenic Recreation area. In addition, a presentation on the proposal was given to the Opal Creek Advisory Council at their monthly meeting on August 21, 2000, and recommendations were received from the Council at their September 18, 2000 meeting. Information from the scoping notice and the public presentation were both posted on the Willamette National Forest web page at www.fs.fed.us/r6/willamette.

A total of 15 comments letters were received as a result of the public scoping efforts. Comments and responses are disclosed in Appendix A of this Decision Memo.

FINDINGS / MITIGATION MEASURES

I have determined that this project is consistent with the Willamette National Forest Land and Resource Management Plan, Standards and Guidelines. Based on site specific resource inventory documented in the project file, it is determined that no extraordinary circumstances have significant effects on the human environment (See Appendix B).

A biological evaluation for Wildlife Species was completed on October 2, 2000. This project is not expected to have any effects on Proposed, Endangered, Threatened or Sensitive (PETS) animal species if recommended seasonal restrictions are followed. All blasting activities shall be restricted from January 15 – September 30 to avoid nesting periods in Late Successional Reserve for the northern spotted owl and Peregrine falcon.

A biological evaluation was completed for Fish Habitat and Aquatic Species on October 3, 2000. There are two fish species found in the Little North Santiam River that are listed under the Endangered Species Act. These are winter steelhead (*Oncorhynchus mykiss*) and spring chinook salmon (*Oncorhynchus tshawytscha*). In reviewing the proposed actions in relation to the checklist for documenting effects, the indicators should all be maintained. All effects will be very localized and should not affect any occupied habitat. Therefore, this project will have no effect on any Threatened and Endangered fish species and should have no impacts on sensitive aquatic insects that may be found near the project sites.

A Heritage Resource report was completed on November 13, 2000. Based on the nature of the work, and findings of the Keeper of the National Register of Historical Places, the closure of the seven mines will have no effect on known cultural resources. Recommendations by the District Archaeologist have been included in this decision.

A biological evaluation for Plant Species was completed on December 1, 2000. Based on the pre-field review and field check, no sensitive plant habitat was identified adjacent to or within the proposed disturbance area surrounding these sites. It is determined that these projects will have no impact on the habitat or populations of sensitive plants that appear on the Regional Forester's (Region 6) list of sensitive plant species.

Field reconnaissance for Protection Buffer and Survey & Manage animal species were completed on December 12, 2000. One species, the blue-gray tailed dropper (*Prophyaon coeruleum*) was found near the entrance to the Black Eagle mine. Protection buffer areas contiguous to the habitat near the mine were established in moist, rocky areas along the Horn Creek riparian reserve. No other Survey & Manage mollusk species were found in the area and habitat was not present for red tree vole or great gray owls.

Underground surveys to determine possible closure methods were completed on the following dates: May 15, 1997, September 4, 1997, March 15, 1999, August 17, 1999, and May 18, 2000. During some of these surveys, a wildlife biologist was present and determined that no bats or indication of bat use was found in any of the underground mines. It was recommended that gating be installed on some of the mines to safeguard against destroying potential bat habitat. The site with the best potential habitat is the Golden Bear because it is the most extensive, dry and stable site.

Prior to closure of the mines, an underground survey will be completed by certified Forest Service personnel to check for public use. In addition, a wildlife biologist will accompany the survey team to conduct a final check for bats. In the event bats are discovered using the mines as a hibernaculum or roost site, closure efforts will be stopped to avoid disturbing the bats. An evaluation on the proposed closure method and monitoring plan will be completed at that time. If no bats are discovered, closure will proceed as planned.

No active mining claims exist for these sites. All previous claims and patents have been abandoned. Six of the mines identified in this project are located within the Opal Creek Scenic Recreation Area. The Black Eagle Mine is located within the Opal Creek Wilderness Area. The Opal Creek Wilderness & Scenic Recreation Area were established on November 9, 1998, and this Act subsequently withdrew the area from mineral entry, subject to valid existing rights.

CATEGORY OF ACTION

This action falls within the categories established by the Forest Service that normally do not individually or cumulatively have a significant effect on the quality of the human environment. The specific category for this project is found in Forest Service Handbook (FSH) 1909.15, Chapter 30, Section 31.2(6). This category is described as timber stand and/or wildlife habitat improvement activities that do not include the use of herbicide or do not require more than one mile of low standard road construction. This category requires a project file and decision memo.

The project file contains supporting information and data used in the analysis that lead to this decision. The Decision Memo and supporting documents are available for inspection during regular business hours at the Detroit Ranger District office.

ADMINISTRATIVE REVIEW OR APPEAL OPPORTUNITIES

This decision is not subject to appeal, pursuant to CFR 215.8(a)(4).

IMPLEMENTATION DATE

Project implementation can begin immediately. Mine closure activities will occur in the order they are listed in Table 1, as funding becomes available. Monitoring for bats at the Golden Bear mine is expected to begin after completion of the gate in Spring 2001.

For further information contact: Jim Romero, District Planner
 Detroit Ranger District
 HC73 Box 320
 Mill City, OR 97360
 503-854-4212

 STEPHANIE PHILLIPS
 District Ranger

 Date

REFERENCES:

Tuttle, Merlin D., and Daniel A.R. Taylor, 1994. Bats and Mines Bat Conservation International Resource Publication No. 3

USDA FOREST SERVICE CONTRIBUTORS

Cara Kelly	Archaeologist	Detroit Ranger District
Mike Roantree	Botanist	Detroit Ranger District
Daryl Whitmore	Wildlife Biologist	Detroit Ranger District
Dani Rosetti	Recreation Planner	Detroit Ranger District
Wayne Somes	Fisheries Biologist	Detroit/Sweet Home Ranger District
Dave Halemeier	Hydrologist	Detroit/Sweet Home Ranger District
Doug Shank	Geologist	Detroit/Sweet Home Ranger District
Larry Tennis	Lead Forest Blaster	Lowell Ranger District
Robbie Watson	Regional Blaster	Umpqua National Forest
Pat Ormsbee	Wildlife Ecologist	Willamette National Forest
Ruth Seeger	Minerals Examiner	Willamette National Forest
Mike Doran	Minerals Examiner	Washington Office

Appendix A
Public Scoping Comments & Response to Questions

	Name	Date Received	Address	Phone Number	E-Mail
1	LeRoy Layton	8/18/2000	21241 S. Jubb Rd. Estacada, OR 97023	503-631-2766	laytrefrm@juno.com MS Word
<p>Comments: A) Supports Closure B) Protect Bat Habitat C) Insert Culverts for mine drainage – Add screens to prevent animals from entering Response: A, B, & C) Bat gates will be installed on mines with suspected bat habitat. Gates will be constructed with designs recommended by Bat Conservation International.</p>					
2	Bruce Barbarasch	8/22/2000	Tualatin Hills Nature Park 15655 SW Millikan Blvd. Beaverton, OR 97006	503-644-5595	Bbarbarasch@thprd.com RTF or Word Perfect
<p>Comments: A) Support closures for safety concerns B) Gate as many mines as possible Response: A & B) Bat gates will be installed on mines with suspected bat habitat. Those mines that do not have potential habitat for bats will be closed by other methods.</p>					
3	Opal Creek Advisory Council	8/21/2000	Advisory Council meeting. Presentation on proposed closure.		
<p>Comments: A) Is there a proposal to deal with 'artifact' materials at the Ruth Mine? B) Are any of the materials at the Ruth Mine museum quality? C) Water is coming out of the Santiam #1 mine that is discolored. Do you propose to do something about it? D) There are buildings at the Santiam #1 site. It is a heavily used public area. Are you planning to do anything with the building? E) What about the mining adit located on the other side of the river from Santiam #1? F) What is your time frame? G) A major decision is being made before the Advisory Council gets going. These mines are the most accessible to public. We're also trying to decide on what will be the disposition of the artifacts. When you look at alternatives, it seems you should be considering reversible alternatives, the least permanent decision, so that we can give real input to this. H) Have there been incidents/accidents up there? I) Why not have the proposed alternative be a gate on more of these? J) When you seal up the portal of mine, are you allowing the mine to fill with gas? K) I've seen what happens when public agencies try to keep people out of neat places...what are you going to do about vandals? L) I always hoped the mines could be restored so people could go in as an interpretive site. M) What about closing them just enough so that people can get the feel of a mine? N) What's your funding situation? O) This drives you to a certain conclusion. With that amount of money about all you can do is use explosives.</p>					

Opal Creek Advisory Council Response:

- A) Currently there is not a plan to address the "artifacts" at Ruth #1 at this time. Prior to the enactment of the Opal Creek Wilderness & Scenic Recreation Area, the Forest Service required the Friends of Opal Creek to clean-up the hazardous materials (petroleum contaminated soil) and garbage, but not the metal or equipment. Long-term reclamation of the area will need to be considered in the future.
- B) There is quite a collection of the same type of equipment at Jawbone Flats, that can be found on the Ruth #1 claim area. These mine sites have not been determined to be eligible for inclusion on the National Register of Historic places.
- C) The pH of the discharge water was 6.8, which is slightly on the acidic scale (7.0 is neutral) and should not raise much concern. The discoloration is not caused by heavy metal contamination, but most likely is algal growth. The discharge and slight discoloration do not present a hazard to the public or the environment.
- D) The buildings, on the Santiam #1 mine as well as other abandoned buildings, create a minimal risk to public. Our intent is to leave the buildings at this time. Any future removal of buildings would be part of a long-term remediation plan.
- E) The Santiam #2 adit, located across the Little North Santiam River, is not very accessible to the public primarily due to the high water levels most of the year. No recommendations for closure have been made at this time, but we will be taking a look at it soon.
- F) Because of seasonal restrictions for wildlife, blasting can only occur from Oct. 1st – January 15th. Funding is available in FY2001 for a limited number of mine closures depending on the type of closure. The additional closures will take place as funding becomes available.
- G) The primary purpose for these closures is public health & safety. We are only closing the portals and that would not preclude us from going back in, so we can do additional investigative work on the historical properties. However, there are no plans to re-open any of these mines at this time.
- H) To the best of our knowledge, there have been no reports of injuries or accidents within these mines. We have only noted the amount of underground activity from the public in terms of evidence of use. Evidence of public use includes candy wrappers, garbage, flares, footprints, and hand-made torches. Previous efforts to maintain gates and signs have failed due to excessive vandalism and continued public entry.
- I) Gates are difficult to install on most of the mines and you don't always alleviate the hazard. People can still venture in a short distance and portals are generally the most hazardous areas on these mines. Portal hazards include loose, overhanging rock, loose & rotting timber and deep water, in some cases. Gates are more for habitat improvement or enhancement.
- J) For the mines closed with explosives, the closure will not be solid; air and water can seep through the rubble created by natural fractures in the rock. For mines closed with a foam plug, a small culvert will be installed on the floor to allow water to flow out, and a vent pipe at the top of the plug to allow air flow. The mineral type of these mines also lowers the likelihood of toxic gases or other kinds of gas buildup. Generally toxic gases, such as carbon monoxide and methane, are produced in deep gold & silver mines or underground coal mines.
- K) The gate designs recommended by BCI are generally vandal proof. Also because these mines are located where the general public cannot access them with vehicles, vandalism should be less of a problem. The mines shut by explosives will have large boulder barriers and the foam plugs will be covered with native materials so you don't see the plug.
- L) Public education and interpretation about the mines and mining history of the area is certainly a possibility and planned for at the Golden Bear. The Golden Bear is the most stable in terms of hard rock design and has very few underground hazards as compared to the other mines. The Silver King mine, located near the base of Henline Falls, goes back approximately 1,750 feet and is also a possibility. It's very stable and has no underground timber supports. The main concern for safety is that all underground mines should be considered hazardous and if campfires, torches or flares are used in the mine, they use up the available oxygen. There are no plans at this time to close the Silver King Mine.
- M) Half closing a mine only addresses the safety issue halfway. Generally the biggest safety hazard is at the portal. Loose rock and unstable timbers are common at the entrance to the mines so keeping the mines open only at the entry would be difficult to achieve without eliminating the hazards.

<p>Opal Creek Advisory Council Response (continued):</p> <p>N) Funding for this project, and other mine closures is provided by the USDA Forest Service national office hazardous materials and abandoned mines. When Congress appropriates the money, we have to compete for funds. There are approximately 250 sites across Oregon and Washington and we received a \$10,000 this fiscal year. This is one of the reasons why we only identified seven mines for this project. These seven mines are also the most easily accessible to the public. Depending on closure type, costs range from \$3,000 to \$10,000 per mine. Using explosives is generally the cheaper closure method.</p> <p>O) The proposal is to close these mines over several years as funding becomes available. We do not expect to receive funding to close all of these mines in one year. Depending on issues that are raised, other closure methods can happen. We estimate that this project may take up to five years to complete closure of all mines.</p>				
3a	George Atiyeh	8/21/2000	32338 North Fork Road Lyons, OR 97358	
<p>Comments made during the open forum at the Opal Creek Advisory Council Meeting: Instead of making a decision now, why not install doors on the mines through next spring. You can get the Friends of Opal Creek to monitor them. It wouldn't be that big a deal to do a temporary measure until next spring. Response: Wooden doors have not worked as closure methods. Many of the mines have existing wooden doors that are frequently torn down by vandals. This proposal is to find permanent closure methods to reduce or eliminate the hazards to the public.</p>				
3b	Gary Schrader	8/21/2000	Willamette Valley Miners Association P.O. Box 504 Lyons, OR 97358	
<p>Comments made during the open forum at the Opal Creek Advisory Council Meeting: I encourage members of this committee to gate these mines rather than destroy them. What you said about the money is that if you don't buy the car today it's going to cost you a lot more money. I walk away from those salesmen. Put gates on ones you discussed, but go through talks on the other ones.</p>				
4	Jeremy Hall	8/28/2000	ONRC Fund 5825 N. Greeley Portland, OR 97217-4145	503-283-6343
<p>Comments:</p> <p>A) Explain the survey methods used to determine if mines are used by Townsend's Big Eared bat? B) Have there been winter surveys inside all these mines to look for signs of bats hibernating or using caves for roosting over the summer? C) The characteristics of these mines are explained in terms of the present hazards, but not in terms of habitat. Mines that have potential habitat should be considered for gating, not permanent closure. D) Analysis should be conducted to determine if leeching from these mines is taking place.</p> <p>Response:</p> <p>A) All of the mines were entered by Forest Service personnel, including the Forest Wildlife Biologist to determine if the bats were currently using the mines or if potential habitat existed. No live bats or signs of bats were discovered in any of the mines in this proposal. It was determined that the best potential habitat may exist in the Golden Bear mine. B) Underground mine surveys were conducted in May and September 1997, March and August 1999, and May 2000. No evidence of bats or bat use was discovered in any of the mines during these visits. C) The primary purpose of this project is for the protection of the public from the hazards associated with these abandoned mines. Mines that have good potential habitat for bats will have bat friendly gates installed, and monitoring conducted as funding becomes available. Good habitat for bats includes free of public disturbance, dry or very little moisture inside the mine, temperatures in the winter range between 32-50 degree F, and during the summer between 60-90 degrees F. D) Water discharging from the mines has been tested for pH and heavy metals. Analysis has not shown that these mines are a significant impact on surface or groundwater.</p>				

DECISION MEMO
for the
Abandoned Mine Closure Project

USDA Forest Service
Pacific Northwest Region, Willamette National Forest
Detroit Ranger District
Marion County, Oregon
January 2001

Information Contact: **Jim Romero**
District Planner
503-854-4212

Responsible Official: **Stephanie Phillips**
District Ranger
503-854-4200

SAMPLE LOCATION	TEST RESULTS		STATE GUIDELINES		EPA	
	Element	mg/L	Receptor	ug/L**	Standard	ug/L
4th Level Adit (02/26/01)					Same as for ODEQ	
pH		7.34 units				
Alkalinity, total: CaCO ₃		97.0				
Suspended Solids		2.3				
Total Solids		236.0				
Arsenic*	Was not tested		Aquatic Life	150.0		
Cadmium		0.023	Aquatic Life	0.27		
Copper		ND@0.01	Aquatic Life	9.09		
Lead		ND@0.002	Aquatic Life	3.2		
Nickel		ND@0.01	Aquatic Life	50.8		
Silver		ND@0.005	Aquatic Life	0.12		
Zinc		3.51	Aquatic Life	111.8		
Turbidity		0.929 NTU				
5th Level Adit (02/26/01)						
pH		7.07 units				
Alkalinity, total: CaCO ₃		78.0				
Suspended Solids		ND@1.0				
Total Solids		196.0				
Arsenic*	Was not tested		Aquatic Life	150.0		
Cadmium		0.004	Aquatic Life	0.23		
Copper		ND@0.01	Aquatic Life	7.54		
Lead		ND@0.002	Aquatic Life	3.2		
Nickel		ND@0.01	Aquatic Life	42.3		
Silver		ND@0.005	Aquatic Life	0.12		
Zinc		1.27	Aquatic Life	97.1		
Turbidity		0.138 NTU				

*Arsenic – this is a data gap and needs to be tested in the adit drainage. Arsenic speciation needs to be determined.

** State Guidelines – criteria shown are adjusted for hardness where appropriate.

Note: Main elements that would be of concern at a neutral pH are arsenic and cadmium.

Appendix B

**ABBREVIATED PRELIMINARY ASSESSMENT
CHECKLIST**

ABBREVIATED PRELIMINARY ASSESSMENT CHECKLIST

This checklist can be used to help the site investigator determine if an Abbreviated Preliminary Assessment (APA) is warranted. This checklist should document the rationale for the decision on whether further steps in the site assessment process are required under CERCLA. Use additional sheets, if necessary.

Checklist Preparer:

<u>Dennis Boles, Environmental Engineer</u> (Name/Title)	<u>October 2002 & 2004</u> (Date)
<u>Ochoco NF, 3160 NE 3rd St, Prineville, OR 97754</u> (Address)	<u>541.923.0393</u> (Phone)
<u>djboles@fs.fed.us</u> (E-Mail Address)	

Site Name: Ruth #1 Mine

Previous Names (if any):

Site Location: The Site is located approximately 8 aerial miles northeast of Elkhorn, OR.

Legal Description: Willamette Meridian, T8S, R5E, S27

Latitude: N44° 51' 11" Longitude: W122° 11' 23"

Describe the release (or potential release) and its probable nature: Highest levels of contamination are located in the waste rock material. Arsenic (598 mg/kg), chromium (4339 mg/kg), iron (211, 968), lead (6490 mg/kg), manganese (22,797 mg/kg), and nickel (113,971 mg/kg), exceed EPA Region IX PRGs for industrial soils.

Part 1 - Superfund Eligibility Evaluation

If All answers are "no" go on to Part 2, otherwise proceed to Part 3	YES	NO
1. Is the site currently in CERCLIS or an "alias" of another site?		X
2. Is the site being addressed by some other remedial program (Federal, State, or Tribal)?		X
3. Are the hazardous substances potentially released at the site regulated under a statutory exclusion (i.e., petroleum, natural gas, natural gas liquids, synthetic gas usable for fuel, normal application of fertilizer, release located in a workplace, naturally occurring, or regulated by the NRC, UMTRCA, or OSHA)?		X
4. Are the hazardous substances potentially released at the site excluded by policy considerations (i.e., deferred to RCRA corrective action)?		X
5. Is there sufficient documentation to demonstrate that no potential for a release that could cause adverse environmental or human health impacts exist (i.e., comprehensive remedial investigation equivalent data showing no release above ARAR's, completed removal action, documentation showing that no hazardous substance release have occurred, or an EPA approved risk assessment completed)?		X

Please explain all "yes" answer(s). _____

Part 2 - Initial Site Evaluation

For Part 2, if information is not available to make a “yes” or “no” response, further investigation may be needed. In these cases, determine whether an APA is appropriate. Exhibit 1 parallels the questions in Part 2. Use Exhibit 1 to make decisions in Part 3.

If the answer is “no” to any questions 1, 2, or 3, proceed directly to Part 3.	YES	NO
1. Does the site have a release or a potential to release?	X	
2. Does the site have uncontained sources containing CERCLA eligible substances?	X	
3. Does the site have documented on-site, adjacent, or nearby targets?	X	

If the answers to questions 1, 2, and 3 above were all “yes” then answer the questions below before proceeding to Part 3.	YES	NO
4. Does documentation indicate that a target (i.e., drinking water wells, drinking surface water intakes, etc.) has been exposed to a hazardous substance released from the site?		X
5. Is there an apparent release at the site with no documentation of exposed targets, but there are targets on site or immediately adjacent to the site?	X	
6. Is there an apparent release and no documented on-site targets or targets immediately adjacent to the site, but there are nearby targets (i.e., targets within 1 mile)?	X	
7. Is there no indication of a hazardous substance release, and there are uncontained sources containing CERCLA hazardous substances, but there is a potential to release with targets present on site or in proximity to the site?	X	

Notes:

**EXHIBIT 1
SITE ASSESSMENT DECISION GUIDELINES FOR A SITE**

Exhibit 1 identifies different types of site information and provides some possible recommendations for further site assessment activities based on that information. You will use Exhibit 1 in determining the need for further action at the site, based on the answers to the questions in Part 2. Please use your professional judgment when evaluating a site. Your judgment may be different from the general recommendations for a site given below.

Suspected/Documented Site Conditions		APA	FULL PA	PA/SI	SI
1. There are no releases or potential to release.		Yes	No	No	No
2. No uncontained sources with CERCLA-eligible substances are present on site.		Yes	No	No	No
3. There are no on-site, adjacent, or nearby targets		Yes	No	No	No
4. There is documentation indicating that a target (i.e., drinking water wells, drinking surface water intakes, etc.) has been exposed to a hazardous substance released from the site.	Option 1: APA SI	Yes	No	No	Yes
	Option 2: PA/SI	No	No	Yes	No
5. There is an apparent release at the site with no documentation of exposed targets, but there are targets on site or immediately adjacent to the site.	Option 1: APA SI	Yes	No	No	Yes
	Option 2: PA/SI	No	No	Yes	N/A
6. There is an apparent release and no documented on-site targets and no documented immediately adjacent to the site, but there are nearby targets. Nearby targets are those targets that are located within 1 mile of the site and have a relatively high likelihood of exposure to a hazardous substance migrating from the site.		No	Yes	No	No
7. There is no indication of a hazardous substance release, and there are uncontained sources containing CERCLA hazardous substances, but there is a potential to release with targets present on site or in proximity to the site.		No	Yes	No	No

Part 3 - EPA Site Assessment Decision

When completing Part 3, use Part 2 and Exhibit 1 to select the appropriate decision. For example, if the answer to question 1 in Part 2 was “no,” then an APA may be performed and the “NFRAP” box below should be checked. Additionally, if the answer to question 4 in Part 2 is “yes,” then you have two options (as indicated in Exhibit 1): Option 1 -- conduct an APA and check the “Lower Priority SI” or “Higher Priority SI” box below; or Option 2 -- proceed with a combined PA/SI assessment.

Check the box that applies based on the conclusions of the APA:	
<input type="checkbox"/> NFRAP	<input type="checkbox"/> Refer to Removal Program – further site assessment needed
<input checked="" type="checkbox"/> Higher Priority SI	<input type="checkbox"/> Refer to Removal Program – NFRAP
<input type="checkbox"/> Lower Priority SI	<input type="checkbox"/> Site is being addressed as part of another CERCLIS site
<input type="checkbox"/> Defer to RCRA Subtitle C	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Defer to NRC	
Regional EPA Reviewer: <u> N/A </u>	
Print Name/Signature	Date

PLEASE EXPLAIN THE RATIONALE FOR YOUR DECISION:

Appendix C

SITE PHOTOS

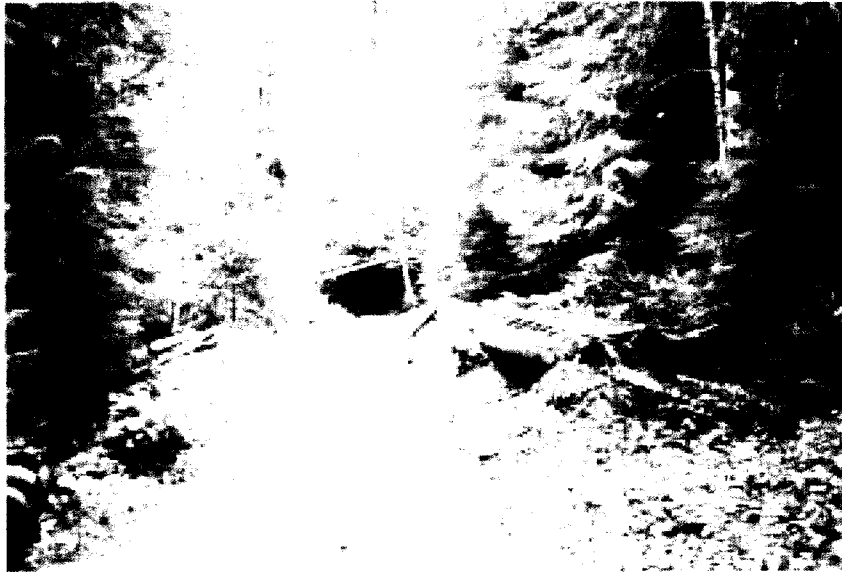


Photo 1. Access to Level 5 of Ruth Mine (photo by R. Seeger).



Photo 2. Level 5: Ore Car Track and Possible Loading Site. Niton Sample ID 28. Lead 4810 mg/kg. (photo by D. Boles)

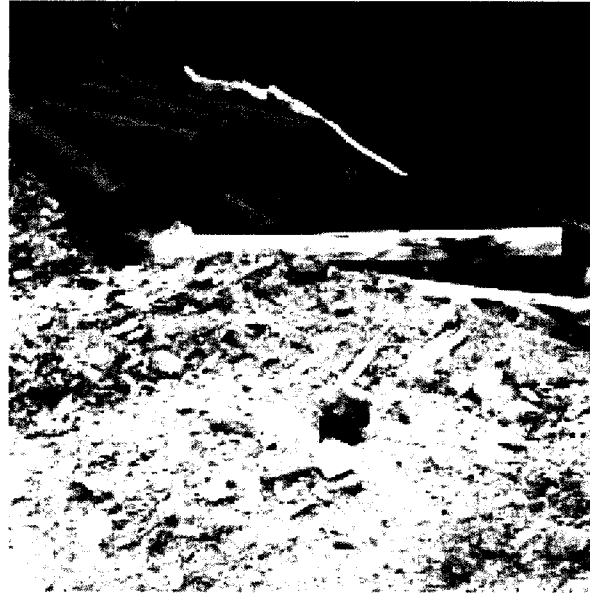


Photo 3. Level 5: Side of Access Road. Niton sample ID 29
Lead – 2939 mg/kg. (photo by D. Boles)



Photo 4. Level 5: Lower Road Segment by Washed out Bridge.
Niton Sample ID 33. Lead 4568 mg/kg. Material Approximately 3' Deep.
(photo by D. Boles)



Photo 5. Level 4: Main Adit (photo by D. Boles)



Photo 6. Level 4: Adit Discharge (photo by D. Boles)

TABLE OF CONTENTS

page

EXECUTIVE SUMMARY.....	i
1.0 INTRODUCTION.....	1
2.0 SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS.....	1
3.0 SITE SAMPLING AND TEST RESULTS.....	2
4.0 SUMMARY.....	2
5.0 RECOMMENDATION.....	2
6.0 DISCLAIMER.....	3
REFERENCES.....	3

APPENDICES

Appendix A	Niton Analytical Results
Appendix B	Abbreviated Preliminary Assessment Checklist
Appendix C	Site Photos

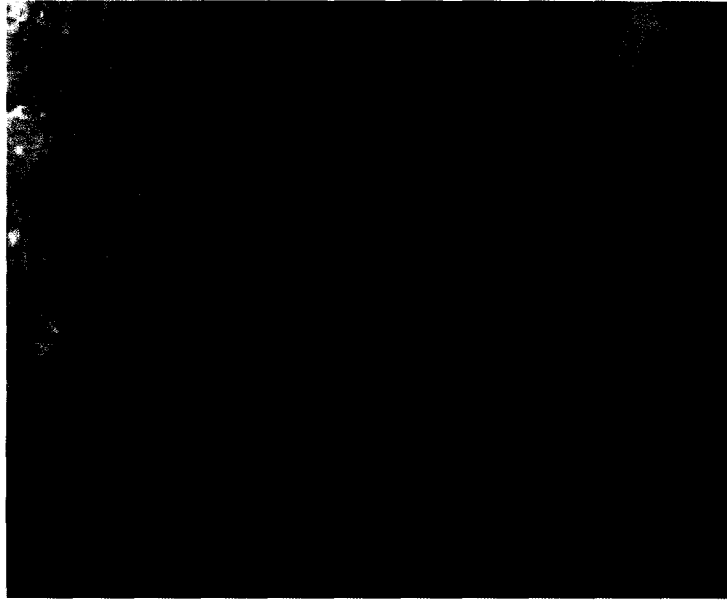


Photo 7. Level 4: Taken Inside of Second Open Portal
(photo by D. Boles)

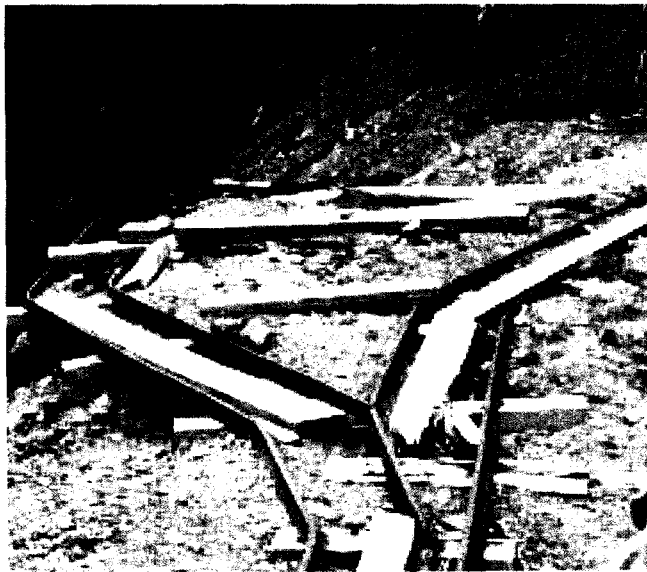


Photo 8. Level 4: Waste Rock and Ore Car Rails
(photo by D. Boles)

EXECUTIVE SUMMARY

The Forest Service performed an Abbreviated Preliminary Assessment for the Ruth Mine (Site) to determine the need for further site characterization. The Site is located approximately 8 aerial miles northeast of the town of Elkhorn, Oregon. The Site is situated on steep side slopes. The site consists of two adits at the 4th and one adit at the 5th Level. Small waste rock dumps occur at the 4th Level.

A Niton XRF unit was used for In Situ field screening of material from the waste rock dumps. Water and sediment samples were not collected as part of this investigation.

Numerous chemical elements exceeded either State or Federal regulations or guidelines (Appendix A). However, the most notable elements of concern are arsenic (598 mg/kg), lead (6490 mg/kg), chromium (4339 mg/kg), iron (211,968 mg/kg), manganese (22,797 mg/kg), and nickel (113,971 mg/kg, although this seems like an anomaly, considering most values averaged about 25,000 mg/kg), which exceed EPA Region IX Preliminary Remediation Goals (PRG) as to acceptable industrial levels in soil.

It is recommended that a Site Inspection (SI) be performed because of the concentrations of various elements as noted; the proximity of the waste rock dump on level 4 to an unnamed tributary; and the adit drainage from Level 5, which discharges into Battle Axe Creek. Estimated volume of waste rock material at Level 4 is 4500cy and estimated volume for Level 5 is 945cy.

1.0 INTRODUCTION

An Abbreviated Preliminary Assessment (APA) was performed by the US Forest Service in accordance with the EPA "Guidance for Performing Preliminary Assessments Under CERCLA", EPA "Improving Site Assessment: Abbreviated Preliminary Assessments" of 1999, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Contingency Plan as outlined in 40 CFR Parts 300.410(c)(1)(i-v).

The purpose of this assessment was to determine whether or not there is a potential for a release of contaminants to the environment and/or to human health. The purpose of an APA is to determine whether further site characterization is warranted. A Niton XRF 700 Series was utilized to help in the preliminary screening of this Site.

2.0 SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

The Site is located approximately 8 aerial miles northeast of Elkhorn, OR at an elevation of 2600 feet above mean sea level (MSL). The Site is 2 miles east of Jaw Bone Flats, along Forest Road 2209. The Site is on National Forest System lands within the Opal Creek Scenic and Recreation Area and is administered and managed by the Willamette National Forest. The area was withdrawn from mineral entry when incorporated into the Scenic Recreation Area, subject to valid existing rights (P.L. 104-333). The Site is within the North Santiam Mining District.

Location information:

Lat./Long.:	44° 51' 11"N 122° 11' 23"W
Legal:	Willamette Meridian, T8S, R5E, S27
USGS quadrangle:	Battle Ax

The Site consists of three adits and several small waste-rock dumps. The 4th Level consists of one adit with a steel door on the portal and a second adit with a partially collapsed portal (see photos 5 and 7, respectively in Appendix C). The second adit connects to the main adit 20 feet inside the side drift. The 5th Level adit has a wooden door on the portal.

The Ruth Mine was formerly known as the Amalgamated Mine and was operated by the Lewis & Clark Mining & Milling Co. This company located five claims south of Battle Ax Creek, a tributary of the Little North Santiam River, sometime before 1902. By that date, they had opened several hundred feet of adits on two levels. In 1920 the Amalgamated Mining & Milling Co. took over the original claims and located 18 more. During 1929 – 1934 a combined effort of Amalgamated and Columbia Mines Development Co. constructed a road to the mine, erected several buildings and a mill, and shipped nine carloads of crude ore and mill concentrates during 1931 and 1932. In 1939 the mine was purchased by the Pacific Smelting & Refining Co. Total production and ore values were not reported.

A total development of more than 4000 feet is reported, mostly on the No. 4 (Ruth #1) and No. 5 levels. About 200,000 tons of ore reserves, containing about 6 percent zinc, are reported to have been blocked out. Various engineer reports on the property estimate reserves of from 200,000 to 800,000 tons that will average from 4.33 to 11 percent zinc and one percent lead in blocks of ore with an average thickness of about 10 feet. Gold, silver and copper values are usually low. (Webber, 1995)

The primary ore mineral is sphalerite, which occurs in fault zones from one to sixty feet thick. Andesite is cut by a rhyolite dike, which was reported in the No. 4 Level. (Brooks & Ramp, 1968) The ore was processed at two mill sites, one known as the Amalgamated mill, which was adjacent to Battle Axe Creek. The second mill, Starvation Mill, was located at Jaw Bone Flats, a private land in-holding at the confluence of Battle Axe and Opal Creeks. Ore from the Ruth #1 Mine was transported to the Amalgamated mill by rail/tram along corridors, which are partially overgrown.

The Amalgamated Mill Site came under a CERCLA removal action in 1991.

The waste rock pile for Level 5 was used to construct the haul roads. Approximate depth of this material is 3 feet and approximately 16 feet wide. It is unclear as to the exact length of road that was built from waste rock material. However, based on visual observations of the area, an approximate volume of material in the roadway, ore car rails, and miscellaneous piles is 945cy. Battle Axe Creek is approximately 30 to 40 feet below the road and the adit drainage discharges into the river. There are signs of material leaving the site and migrating down to the river.

The waste material for Level 4 is directly in the drainage of a small tributary. Water was seen disappearing in the rubble and then reappearing further down gradient. A culvert, approximately 36 inches in diameter, has been washed out, indicating this tributary does carry some good flows during spring runoff. The waste rock material in this area is hard to quantify because of it being scattered down gradient. An estimate would be 4500cy.

Currently, the Site is inactive.

3.0 SITE SAMPLING AND TEST RESULTS

A Niton XRF, XL-722S was used to assess the material from the waste rock dumps for potential contamination. In Situ testing was performed on the Site per EPA Method 6200. Surface soils were removed to approximately 4 to 6 inches below grade in order to get below highly oxidized surface layers. Rocks, debris and other deleterious materials were removed. The soil was worked to gain a flat surface area on which to set the Niton.

Refer to Appendix A for a listing of elements that were detected as well as those that exceeded regulatory requirements.

4.0 SUMMARY

The constituents of concern that exceeded EPA Region IX industrial levels in soil were arsenic, chromium, iron, lead, nickel, and manganese. Appendix A shows all Niton testing results along with associated State and Federal regulations and guidelines for all elements detected.

The Site poses a physical hazard to the general public recreating at the Site in that the wooden door on the portal at the 5th Level is not secured with a lock and one of the portals on the 4th Level is unsecured.

5.0 RECOMMENDATION

Based on the In Situ screening of the waste rock dumps with the Niton XRF unit, physical hazards associated with the Site, and EPA's APA Checklist (Appendix B), it is recommended that a Site

Inspection (SI) be completed. A more thorough search of the area is required over that done during the site reconnaissance performed for the APA. As part of this inspection, a thorough study of the area to determine the extent of contamination is warranted. The area should be sampled to determine the presence of all waste material and tailings, and if present, the potential waste dumps and tailings should be sampled at depth and a determination of volumes should be calculated. Acid base accounting (ABA) is required if waste material is present besides what had been observed during this assessment. Drainage from both adits need to be sampled as well as sediment, surface and pore water from the streams, as well as benthic organisms.

Appendix C contains additional photos of the Site.

6.0 DISCLAIMER

This abandoned mine/mill site was created under the General Mining Law of 1872 and is located solely on National Forest System (NFS) lands administered by the USDA Forest Service. The United States has taken the position and courts have held that the United States is not liable as an “owner” under CERCLA Section 107 for mine contamination left behind on NFS lands by miners operating under the 1872 Mining Law. Therefore, USDA Forest Service believes that this site should not be considered a “federal facility” within the meaning of CERCLA Section 120 and should not be listed on the Federal Agency Hazardous Waste Compliance Docket. Instead, this site should be included on EPA’s CERCLIS database. Consistent with the June 24, 2003 OECA/FFEO “Policy on Listing Mixed Ownership Mine or Mill Sites Created as a Result of the General Mining Law of 1872 on the Federal Agency Hazardous Waste Compliance Docket,” we respectfully request that the EPA Regional Docket Coordinator consult with the Forest Service and EPA Headquarters before making a determination to include this site on the Federal Agency Hazardous Waste Compliance Docket.

REFERENCES

Webber, Bert, 1995, *Gold Mining in Oregon*, Webb Research Group Publishers. (288 and 290 p)

Brooks, Howard C., Ramp, Len; 1968; *Gold and Silver in Oregon*; Oregon Department of Geology and Mineral Industries; Bulletin 61

Callaghan, E., Buddington, A.F.; 1938; *Metalliferous Mineral Deposits in the Cascade Range*; Oregon; U.S.G.S.; Bulletin 893

Cox, James B. Jr.; 1985; *Cultural Resource Evaluation Report – Little North Santiam Mining District*; USDA-Forest Service; Unpublished Forest Service Report

Dames & Moore; 1995; *Final Workplan; Shiny Rock Mill Tailings Disposal Site*; RI/FS; USDA-Forest Service; Job No. 03619-073-005

Grant, A. Robert; 1982; *Report of Mineral Examination Case No. 1070 for 6 Lode Claims In Little North Santiam Mining District*; U.S.D.A. Forest Service; unpublished report

Halemeier, Dave; 2001; *Lab Results from Mine Water Testing; Little North Fork Santiam River*; unpublished data

Hart Crowser; 1990; Preliminary Environmental Site Assessment – Shiny Rock Mining Corporation Tailings Disposal Area, Jawbone Flats, OR

Olson, James Peter; 1978; Geology and Mineralization of the North Santiam Mining district, Marion County, OR; Master's Thesis; Oregon State University

Poston, Pete; 2000; Opal Creek Wilderness Area – Ruth Mine/Jawbone Flats Tailings Pile Water Analysis; http://www.wou.edu/LiberalArtsScience/physical_sci.../ruthmine.ht

Appendix A

NITON ANALYTICAL RESULTS

SAMPLE LOCATION	TEST RESULTS		STATE GUIDELINES		EPA	
	Element	mg/kg	Receptor	mg/kg	Standard	mg/kg
Waste Pile. Level 5	Arsenic	372	Plants	8.0	Industrial	1.6
10/2002	Cadmium	148	Plants	4.0	Industrial	450
	Chromium	4339	Plants	5.0	Industrial	450
	Iron	118,988	Plants	10.0	Industrial	100,000
	Lead	6490	Birds	16.0	Industrial	750
	Manganese	19,290	Invertebrates	100.0	Industrial	19,000
	Zinc	43,878	Plants	50.0	Industrial	100,000
Waste Pile. Level 5	Chromium	2099	Plants	5.0	Industrial	450
10/2002	Iron	52,275	Plants	10.0	Industrial	100,000
	Nickel	21,094	Plants	30.0	Industrial	20,000
Waste Material, Level 5	Iron	78,592	Plants	10.0	Industrial	100,000
River side of collapsed	Lead	106	Birds	16.0	Industrial	750
building. Niton Sample	Manganese	11,296	Invertebrates	100.0	Industrial	19,000
ID 27. 08/03/04	Nickel	14,989	Plants	30.0	Industrial	20,000
	Zinc	733	Plants	50.0	Industrial	100,000
Ballast Material for Ore	Iron	160,973	Plants	10.0	Industrial	100,000
Car Tracks, Level 5.	Lead	4810	Birds	16.0	Industrial	750
Niton Sample ID 28.	Manganese	28,288	Invertebrates	100.0	Industrial	19,000
08/30/04	Nickel	26,394	Plants	30.0	Industrial	20,000
	Zinc	38,886	Plants	50.0	Industrial	100,000
Waste Material used for	Iron	175,923	Plants	10.0	Industrial	100,000
road construction by pipes,	Lead	2939	Birds	16.0	Industrial	750
Level 5. Niton Sample ID	Manganese	26,099	Invertebrates	100.0	Industrial	19,000
29. 08/03/04	Nickel	30,976	Plants	30.0	Industrial	20,000
	Zinc	48,077	Plants	50.0	Industrial	100,000
Material in Pipeline	Chromium	3360	Plants	5.0	Industrial	450
10/2002	Iron	211,968	Plants	10.0	Industrial	100,000
	Lead	4547	Birds	16.0	Industrial	750
	Manganese	22,797	Invertebrates	100.0	Industrial	19,000
	Nickel	29,594	Plants	30.0	Industrial	20,000
	Zinc	34,099	Plants	50.0	Industrial	100,000
Road Surface. Level 5	Copper	2450	Invertebrates	50.0	Industrial	41,000
Niton Sample ID 31	Iron	104,960	Plants	10.0	Industrial	100,000
08/03/04	Lead	3667	Birds	16.0	Industrial	750
	Manganese	12,896	Invertebrates	100.0	Industrial	19,000
	Nickel	31,898	Plants	30.0	Industrial	20,000
	Zinc	35,891	Plants	50.0	Industrial	100,000

ABBREVIATED PRELIMINARY ASSESMENT

RUTH #1 MINE



Willamette National Forest
Marion County, OR

Revised
October 2004

W.M.R. 1
January 1943

WAR MINERALS REPORT 1/
UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

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

- THE RUTH OR OLD AMALGAMATED MINE
Marion County, Oregon

- Zinc and Lead -

Summary

The Ruth or Old Amalgamated Mine is located 28 miles northeast of Mehama, Oregon, in the Lester mining district, Marion County. It is a low-grade zinc and lead mine which, with the exception of a short operation of a pilot mill, has had no production. The property is owned and managed by the Pacific Smelting and Refining Company of Portland, Oregon; who, by the means of a Reconstruction Finance Corporation loan, is now further developing it. The mine is, however, already fairly well developed on the two lower levels and to a small extent on the three upper levels by about 5,100 feet of drifts, crosscuts, and raises. The company does not possess the necessary financial resources to construct a concentrating mill, install the necessary mining and power equipment, and to carry on an extensive development program.

As a result of a sampling program of the mine workings conducted by the Bureau of Mines, it is estimated that there are about 283,900 tons of ore of a grade of 4.7 percent in zinc and 0.4 percent in lead, and containing minor amounts of copper, gold and silver. This ore is classified as follows:

183,900 tons probable ore
100,000 tons possible ore

A considerable portion of the probable ore reserve is reasonably well developed, that is, on three sides. Conditions are favorable for developing considerable additional ore of 6 to 7 percent.

✓ The reports of the War Minerals Series are based upon field and laboratory work of engineers of the Bureau of Mines together with data available to the Bureau from other sources. The purpose of these reports is to supply information that may be helpful to owners and operators of properties examined, and to others who are especially interested in them. For this reason distribution is limited to those who request the reports individually.

To put this property into operation on a 200-ton daily basis would require an estimated capital expenditure of about \$355,500, the major portion of which would be required for surface plants.

From the results obtained by the sampling program, the Bureau of Mines concludes that:

- (1) With a capital expenditure of about \$355,500 it may be possible to produce 12,000 tons of zinc and 700 tons of lead as metal. At an estimated mining and concentrating cost of \$3.52 per ton of ore, and after paying shipment and smelter costs on the concentrates, it is estimated that the total net return to the company would be about \$363,000.
- (2) Production of zinc and lead can begin in about 12 months after the equipment and laborers have been obtained.
- (3) It is possible that by mining and concentrating 200 tons per day, production would extend over a period of about 4 years on the basis of present development. Production could be increased if additional ore was found and if a critical shortage of zinc was anticipated.

Introduction

During August and September of 1942, an examination and sampling program was carried out on the Ruth or Old Amalgamated Mine by the Bureau of Mines. Although the primary purpose of this investigation was to determine the approximate tonnage and tenor of the zinc and lead ore developed by the 5,100 feet of drifts, crosscuts, and raises, it included also metallurgical testing, estimation of capital and operating costs on a 200-ton daily basis, and consideration of a Bureau of Mines project to aid in finding additional ore.

History

It is reported that a small amount of prospecting for gold took place in the Lester Mining District of central Oregon as early as 1850. Mining in this area then apparently became dormant until about 1900 at which time the Ruth vein was discovered. At this time, the operators of the property apparently still were searching for gold since the Ruth vein, consisting of zinc and lead ore, was cut on what is now known as the fourth level but was not developed. About 400 feet of drifting and crosscutting was done on this level in following quartz stringers, and additional development work was done at this time by driving what are now known as the second and third levels.

Active development work of the Ruth vein was begun in 1929, when Mr. J. P. Hewitt acquired control of the Ruth Group of claims and of other properties in the district and formed the Amalgamated Mining Company. The development work done by this company consisted of an additional 1,550 feet of drifting and crosscutting on the fourth level and driving a raise connecting the fourth and third levels.

In 1935, the Amalgamated Mining Company was reorganized and became known as the Columbia Mines Development Company. Under their direction the fifth level and two raises connecting the fifth and fourth levels were driven. A small amount of stoping above the fourth level was also done at this time and a portion of the mined ore was put through a small mill while the remainder was stored at the portals of the fourth and fifth levels.

In January 1941, the Columbia Mines Development Company reorganized to form the Pacific Smelting and Refining Company with Mr. J. P. Hewitt as president. The principal activities of this organization to date have been to rehabilitate the mine and buildings, to develop the mine with funds obtained by a Reconstruction Finance Corporation development loan, and to attempt to obtain additional government aid in erecting a mill for concentrating the ore.

Physical Features and Communications

The climate is mild and humid and temperature ranges are moderate with either extreme heat or cold being unusual. A considerable amount of rain falls during the spring and fall while during the winter months, snow often accumulates to depths of from 3 to 4 feet but seldom remains on the ground for any appreciable length of time. A small snow plow probably could keep the road from Mehama to the mine open at all times. The region is heavily timbered with Douglas fir, white pine, red cedar and hemlock. There is sufficient standing timber on the property to insure an adequate supply for mining, building, and heating purposes.

The Lester Mining District is situated on the west slope of the Cascade Range and is drained by the little North Santiam River and its tributaries. The country is extremely rugged and mountainous, with steep V-shaped canyons and sharp crested ridges. The elevation varies from 2,500 feet at the junction of Battle Axe Creek and the Little North Santiam River to 4,974 feet above sea level at the crest of Whetstone Mountain. There is a decided uniformity of maximum relief in the area and practically all ridges and peaks are very close to 5,000 feet above sea level. The property of the Pacific Smelting and Refining Company is situated on Battle Axe Creek one mile above where it empties into the Little North Santiam and all of the mine workings are on the south side of this stream. The No. 5 portal, which is located just above the creek level, is at an elevation of 2,464 feet and the highest point on the property is about 4,500 feet above sea level. The structures in this area are softer than the country rock and are commonly outlined by depressions along which small streams flow intermittently. The Ruth vein has been deeply entrenched in this manner.

The U. S. Forest Service maintains a telephone line which affords local and long distance service from the mine. At present, the mail is received at the Post Office at Mehama, Oregon, but when and if actual production is started, there may be enough permanent residents to have a post office at the mine.

Portland, Oregon, the principal supply point for the district, is located 97 miles by road, northwest from the mine. Mehama may be reached from Portland by U. S. Highway 99E to Salem and thence by State Highway 222, a total distance of 69 miles. The distance from Mehama to the mine is 28 miles by secondary and mountain road. The first 17 miles is maintained by Marion County and the remainder by the U. S. Forest Service and the Pacific Smelting and Refining Company. From the mine to the Detroit Branch Line of the Southern Pacific Railroad at Lyons is 29 miles via Mehama. Although there are two other roads from the mine (one to the same railroad at Gates, Oregon, a distance of 15 miles, and one which runs up along Battle Axe Creek and over the mountains to the railhead at Detroit, Oregon a distance of 18 miles) the most practical road is the one to Lyons via Mehama. This road would require considerable improvement to put it in good condition.

The first 15 miles from Lyons is surfaced and would require little or no betterment, while the last 14 miles, and especially the last 10 miles towards the mine, is badly in need of improvement. This work would consist of widening and surfacing at an estimated cost of about \$10,000.00

Mining is the principal industry in this area and the men now thus engaged at the Ruth Mine at present number only from 10 to 20. Therefore, about 50 more men would have to be brought in to operate the mine and mill at 200-ton daily capacity.

There are two camps at the Ruth Mine, which are known as the upper and the lower camp. The upper camp, which lies on property owned by the Pacific Smelting and Refining Company consists of six three- and four-room houses that are equipped with running water and electric lights. There is a bunkhouse equipped with showers and electric lights capable of housing 14 men, also an office, an assay office, a commissary, and a powder house. Most of these buildings are in fair condition but it is the plan of the management to modernize and repair all of the structures. Construction of two change rooms, one at each of the portals of the fourth and fifth levels, is also contemplated.

There are 13 houses at the lower camp consisting of two one-room, one two-room, one three-room, eight five-room, and one six-room, all of which are in fair condition. In addition there are 3 bunkhouses capable of accommodating 4 men each, a boarding house with a capacity of 40 men, a commissary and a sawmill which are in good condition. Construction of additional houses and other necessary buildings is also planned and this would include twenty-five five-room houses, one recreation building, one company store, and one two-room schoolhouse. Construction and repair of buildings are relatively inexpensive since the company owns its own sawmill and there is an abundance of timber on the property.

The company will operate the boarding house and the charge per man will be approximately \$1.50 per day.

Description of Property

The property of the Pacific Smelting and Refining Company is situated in sections 21, 22, 26, 27 and 28, T 8 S, R 5 E, Willamette Meridian in the Lester Mining District, Marion County, Oregon. It consists of 18 full-size lode claims which are known as Adventure Nos. 1 to 4 inclusive and Ruth Nos. 1 to 14 inclusive. These claims were located in 1929 and all are still held by virtue of this location. It is reported that the company's rights are undisputed and that they also own all surface improvements.

The Pacific Smelting and Refining Company is incorporated in the State of Oregon and is capitalized at \$500,000. There are 50,000 shares of stock (common), 36,002 of which have been issued. According to Mr. J. P. Hewitt, president, the company is debt free and has a small working capital in the treasury.

Description of the Deposit

There are several wide shear zones in this area of unknown length which run parallel to each other and which show some mineralization at their surface exposures. Several of these have been developed to a limited extent with the exception of the Ruth vein which has been more extensively developed than any of the others. The Ruth vein strikes N 55° W and its dip varies from 55° to 72° to the northeast. Only a small amount of development work has been done on the first and second levels so very little information was obtainable as to the nature of the vein structure at these elevations. On the third and fourth levels, the vein, or shear zone, is made up of several fractures at varying distances apart which more or less parallel the vein and which account for the pinching and swelling of the ore zone. On the fifth level the vein appears to be more consolidated with less variation in width. The foot and hanging walls are better defined and the zinc assays are less erratic and also higher than in the upper levels. These indications are favorable for finding additional ore at depth, and it is possible that the Ruth vein may be more productive at depth, and by an extension of the fifth level under higher backs, than from the area now developed.

There are numerous cross fractures that cut the vein at varying angles and an increase in the tenor and thickness of the ore often occurs at the more prominent intersections. It is possible that drifts driven beyond such intersections have followed the cross fracture instead of the vein itself. This possibility seems to have occurred on the third level which after encountering a mineralized zone shortly ran into barren ground.

The country rock consists largely of a calcic andesite which is dark green in color and shows an abundance of ferromagnesium minerals. What appeared to be a porphyritic rhyolite dike was observed near the portals of the fourth and fifth levels. The country rock has been altered in some places for as much as 50 feet from the vein with narrow zones of calcite and

soft alteration products such as chlorite and sericite being found on the walls. The chief ore minerals in the Ruth vein in the order of their abundance are sphalerite, galena, pyrite, and chalcopryrite. Typical assays also show minor amounts of gold and silver. The chief gangue minerals are altered wall rock, quartz and gouge with quartz being the principal vein filler.

Mine Workings

The Ruth vein is opened up on five levels on a vertical distance of about 440 feet between the first and fifth levels. Development work consists of about 5,100 feet of drifts, crosscuts and raises; the major part of which has been done on the third, fourth and fifth levels. Only a small amount of ore has been mined and that immediately above the fourth level as can be seen on the mine maps. Table 1 shows the elevation at each portal above sea level and total footage of drifts, crosscuts and raises.

Table 1

	Elevation Above Sea Level	Total Footage		Raises
		Drifts	Crosscuts	
Level No. 1	2894 ft.	90	40	-
Level No. 2	2864 ft.	82	-	-
Level No. 3	2754 ft.	135	18	-
Level No. 4	2660 ft.	1855	450	145
Level No. 5	<u>2464</u> ft.	<u>1675</u>	<u>180</u>	<u>425</u>
Total		3837	688	570

Examination by the Bureau of Mines

The Ruth or Old Amalgamated Mine was examined by the Bureau of Mines during August and September of 1942. The purpose of this investigation was to take sufficient samples for checking other engineers' results and to obtain information as to the approximate tenor and tonnage of ore reserves in the mine. This information was necessary before a decision could be made regarding the advisability of starting production and/or for setting up a Bureau of Mines project.

The investigation included surveying and mapping all of the workings and taking samples. Channel samples were cut six inches wide by 1 inch deep across the mineralized zone about every 50 feet along the drifts, crosscuts, raises and stopes. The channels were extended into wall rock whenever possible and samples across low-grade material were kept separate from those of higher grade ore.

Ore Reserves

The ore reserves were classified as probable and possible ore. Some of the probable ore was reasonably well developed, that is, on three sides. The ore seems to be confined to ore shoots, and ore of a spotty and erratic nature occurs between them.

The average assay for each block was calculated by multiplying each assay width by the assay and dividing the sum of these products by sum of the widths. In calculating the tonnage, 13 cubic feet in place was considered equal to one ton of ore. Tonnage of probable ore reserves for each block, assays, sample widths and number of samples included are shown in table 2.

Table 2. Probable Ore Reserves

Block	Total No. of Samples Included	Average Ft. Sample Width	Tons	Percent Zinc	Tons x Percent Zinc	Percent Lead	Tons x Percent Lead
A	2	6.7	3,685	4.50	16,582	.10	369
B	17	7.54	15,544	6.74	104,767	1.09	16,943
C	4	4.2	10,765	4.28	46,074	.07	754
D	13	6.68	18,172	6.12	112,126	.89	16,173
E	23	16.8	83,190	4.41	366,868	.35	29,117
F	3	3.4	3,034	7.82	23,726	.21	637
G	9	5.8	6,653	4.51	30,005	.41	2,728
H	33	13.7	35,499	3.77	133,898	.10	3,550
I	6	8.3	5,999	4.39	26,336	.43	2,579
J	4	21.4	1,383	4.53	6,265	.49	778
Total			183,924		866,647		73,628

$866,647 \div 183,924 = 4.7$ percent zinc average

$73,628 \div 183,924 = 0.4$ percent lead average

Possible Ore - 100,000 tons at 4.7 percent zinc and 0.4 percent lead

As shown by table 2, the probable ore reserve is estimated at 183,924 tons at 4.7 percent and 0.4 percent zinc and lead respectively. The ore also carries minor amounts of copper, gold and silver. It is estimated that 100,000 tons of ore may be found in the area surrounding the ore shoots and this is classed as possible ore.

Metallurgy

A 200-pound sample made up of channel sample rejects was submitted to the Bureau of Mines station at Salt Lake City, Utah, for ore testing. This sample assayed 3.6 percent zinc, 0.7 percent lead, 0.18 percent copper and 6.5 percent iron. This material contained about 1 percent less zinc than the average ore reserve since it included portions of channel samples that were subsequently determined as being very low in grade. However, this ore was readily treated by selective flotation after grinding to minus 65-mesh in producing lead and zinc concentrates. From the results obtained by this preliminary investigation, the metallurgical results shown in table 3 can be expected by similar treatment of the available grade of ore.

Table 3

Product	Lbs., Weight	Wt. %	Assay, Percent		Distribution			
			Pb	Zn	Lbs. Pb	% Pb	Lbs. Zn	% Zn
Lead Con- centrate	9.2	.5	54.0	7.6	5.0	62.0	.7	.8
Zinc Con- centrate	166.0	8.3	.39	52.0	.65	8.6	86.5	92.0
Tails	1824.8	91.2	.13	.37	2.35	29.4	6.8	7.2
Heads	2000	100.0	.40	4.7	8.00	100.0	94.0	100.0

About 62 percent of the lead can be recovered in a lead concentrate which would assay 54.0 percent in lead; and about 92 percent of the zinc can be recovered in a zinc concentrate which would assay 52 percent in zinc. The concentration ratios would be about 200 and 12 to 1 for the lead and zinc concentrates respectively.

The Pacific Smelting and Refining Company plans to ship the lead concentrates to Selby, California, and the zinc concentrates to the zinc plant at Great Falls, Montana. Smelter schedules and calculation of smelter returns per ton of lead and zinc concentrates are given in table 4. The analysis for gold, silver and insolubles was obtained from data in the possession of Pacific Smelting and Refining Company.

Table 4. Concentrate Returns

LEAD CONCENTRATE TO SELBY

BASIS: Lead in New York - 6 $\frac{1}{2}$ ¢

Analysis

Au 0.35 oz; Ag 24.65 oz; Cu 4.2%; Pb 54.40%; Fe 9.70%; Insol 5.0%

Payments

Gold 0.35 oz. @ \$31.8163	\$11.14	
Silver 24.65 oz. x 95% @ 70-5/8¢	16.50	
Copper (4.20 - 0.75%) x (17 - 6¢)	7.59	
Lead (54.40 - 1.5%) x 90% x (9.25 - 1.5)*	73.25	
Iron 9.76 units @ 6¢	<u>.58</u>	\$109.06
	109.06	

Deductions

Treatment - Base Charge \$4.00		
Less 24 units over 30		
@ 10¢	<u>2.40</u>	
	\$1.60	\$1.60
Sulfur Charge	3.50	
Insoluble 5 units @ 10¢	<u>.50</u>	
	5.60	<u>5.60</u>
		103.46
Less R. R. Freight Lyons to Selby - 1.1 net tons @ \$15.90 Car-load Lots		<u>17.49</u>
		85.97
Haulage from mill to Lyons Mill		<u>2.00</u>
		83.97

ZINC CONCENTRATES TO ANACONDA - BASIS St. Louis Zinc @ 8 $\frac{1}{2}$ ¢ per pound.

Analysis

Au .023 oz; Ag 1.0 oz; Cu 0.57%; Zn 54.0%; Fe + Insol. 10.0%

Payments

Zinc 2000 x 54% x 80% = 864# @ 8 $\frac{1}{2}$ ¢	71.28	
Silver - 1.0 oz. x 80% @ 70-5/8¢	.60	
Gold below pay limit	---	
Lead below pay limit	---	71.88

Deductions

Base Charge	16.00	
Add \$2.50 x (8 $\frac{1}{2}$ - 4¢)	10.63	
Lead deficiency (3.0 - 1.5%) x 50¢	.75	
Combined Fe & Insol - 10% @ 25¢	<u>2.50</u>	29.88
		42.00
Less R. R. Freight Lyons to Great Falls, Montana		
1.1 wet tons @ 10.18 on carload lots		<u>11.20</u>
		30.80
Bonus of 2-3/4¢ per lb. from Metals Reserve		<u>23.76</u>
		54.56

ZINC CONCENTRATES TO ANACONDA - BASIS (Cont.)
Haulage from mill to Lyons

\$52.56
2.00
 \$52.56

The revenue at the mine per ton of lead and zinc concentrates is estimated at \$83.97 and \$52.56, respectively, and would amount to about \$.42 per ton from the lead concentrate and about \$.438 per ton from the zinc concentrate and/or a total of about \$4.80 per ton of ore.

Operating Cost and Estimated Production

The cost of mining will vary somewhat depending on the type of mining method used. It is believed that part of the ore body can be mined by the shrinkage system, since the ore requires little or no support and the walls are strong and have a dip of 60°. It is possible that the sections of the ore body which occurs interspersed with considerable gangue could be selectively mined and the waste left in stopes. The vein matter is soft and friable and, consequently, it is easy to drill and is easily broken. These factors are favorable for low mining costs. The estimated number of men required for supervision and labor and the proposed salary and wage scales are listed in table 5.

Table 5.

GENERAL

1 General Superintendent	\$400 per month
1 Power Superintendent	300 " "
1 Assayer	200 " "
1 Accountant	200 " "
1 Warehouse Man	150 " "
4 Men in Powerhouse @ \$8.00 per day	32 " "

MINING

1 Mine Superintendent	\$325 per month
1 Night Foreman	250 " "
1 Engineer and Sampler	225 " "
1 Engineer's Helper	180 " "
6 Miners @ \$8.50 per day	51 per day
6 Helpers @ \$7.50 " "	45 " "
4 Muckers @ \$7.00 " "	28 " "
3 Timbermen @ \$8.50 per day	25.50 per day
4 Trammers @ \$7.25 " "	29 " "
1 Timberframer @ \$8.50 per day	8.50 " "
1 Sawyer @ \$15.00 " "	15 " "
4 Loggers @ \$7.00 " "	28 " "
1 Mechanic @ \$9.00 " "	9 " "
1 Blacksmith @ \$9.00 " "	9 " "

MILLING

1 Mill Superintendent	\$300 per month
4 Mill Operators @ \$8.00	32 per day
3 Repairmen @ \$7.50	22.50 per day
52 Total number of men.	

Attention is called to the fact that the above wage scale is lower than in the industrial areas but they are also higher than those reported as being currently paid in the Coeur d'Alene district. It is reported that the daily wage scale there is as follows: miners, \$7.25; timbermen and timberframers, \$7.75; miners' helpers, muckers and trammers, \$6.50 and mechanics and blacksmiths, \$9.00. It may be difficult to induce miners to work at the Ruth Mine for the proposed higher wage when extremely attractive wages are being paid for less hazardous work in the defense industries. There is a possibility that miners can be obtained from gold mines that have been shut down.

The total estimated cost for superintendence, labor, supplies, power and miscellaneous is summarized in table 6. This estimate is based on miners working 26 days and mill men 30 days, in mining and concentrating 6,000 tons of ore per month.

Table 6. Estimated Mining and Milling Cost per Ton

	Mine	Milling	Total
Supervision	.27*	.16*	.43
Labor	1.11	.40	1.51
Supplies	.36	.68	1.04
Power	.05	.10	.15
Overhead (taxes, insurance, etc.)	.06	.06	.12
Miscellaneous	.15	.12	.27
	<u>\$2.00</u>	<u>\$1.52</u>	<u>\$3.52</u>
Total cost per ton			
* Includes engineering and assaying.			

As can be seen from table 6, the estimated mining cost per ton of ore is relatively low. However, the management believes that these costs are reasonably accurate based on their previous experience. It has been pointed out that conditions are favorable for low mining costs and for a fairly high production per man. The company also plans to use as much mechanical equipment underground as will be practical.

With an estimated mining and milling cost of \$3.52 per ton, it is estimated that the net returns from the probable ore reserve would be about \$235,400 and that from the possible ore would be an additional \$128,000 or a total of \$363,400.00

By treating 200 tons of ore per day, the estimated probable ore reserves would be mined out in about two and one-half years and, if the possible ore reserves proved to be ore, the total ore reserves would last for about four years. During this period, it is very probable that with further development additional ore will be found of possibly higher grade than is now developed. The geological conditions for this are favorable both below and along the fifth level since it was noted that the assays on this lowest level were uniformly higher and the mineralization more persistent than on the upper levels. The estimated production of zinc and lead concentrates, their gross and net value at the mine, and tons of zinc and lead that might be produced from the probable and possible ore reserves are shown in table 7.

Table 7.

Ore Classification	Tons	Tons Concentrate		Tons Metal ^{1/}		Value Concentrate ^{2/}	
		Pb	Zn	Zn	Pb	Gross At Mine	Gross less Shipment & Smelter Returns
Probable	183,900	920	15,300	7,950	460	\$1,202,000	\$883,000
Possible	100,000	500	8,330	4,320	248	653,500	480,050
Total	283,900	1,420	23,630	12,270	708	\$1,855,500	\$1,363,050

^{1/} Includes only zinc recovered in zinc concentrate and lead recovered in lead concentrate.

^{2/} Includes revenue from minor metals such as copper, gold, silver, etc. See smelter schedule.

Allowing 12 months for a 200-ton mill and other surface plant construction, installing of mining equipment and stopes preparations, about 7,950 tons of zinc as metal and 460 tons of lead as metal might be produced in a total period of 42 months from the probable ore reserves alone. It is probable that the total production may be increased considerably if additional ore of sufficient quantity would be developed to warrant increasing the concentrating plant capacity.

Although the financial success of this operation is primarily dependent on premium prices for zinc and lead and on the grade of ore that will be found by future development, much too, depends upon competent and able management and on the availability of adequate equipment. However, in spite of the fact that the ore is of a marginal tenor, it is developed to start production in a relatively short time after the necessary equipment will have been delivered. This is an important factor to consider if increased production of zinc is desired.

Plans for Company Operations

The plans for mining and concentrating 200 tons of ore per day includes, (a) construction of a hydroelectric plant; (b) installing mine equipment, doing additional underground development and stope preparation; (c) construction of a 200-ton flotation mill; (d) repairing surface buildings and construction of additional buildings and (e) improvement of the road from the mine to Mehama.

(a) Power:

It is estimated that the total power requirement, sufficient for the mill, mine, sawmill and camp would be about 500 to 600 h.p. The company plans to produce this power with a hydroelectric plant, which would be located near the proposed mill, utilizing either or both Little North Santiam River, or Battle Axe Creek for this purpose. By constructing about 1 mile of flume to these streams it would be possible to obtain a head of about 300 feet at the penstock. Two generators, each of 250 kw. capacity, are proposed to be installed and are to be driven by water wheels or turbines. The estimated cost of the power house and units installed are as follows:

2 miles of flume and 300 feet of penstock and turbine or water wheel.....	\$ 8,000
2-250 kw. generators installed including switchboard.....	30,000
Building and accessories.....	<u>5,000</u>
Total estimated cost	\$43,000

(b) Mining preparation and mine equipments:

To mine 200 tons per day, the following underground work must be done: stope preparation, driving of one transfer raise from the fifth to the fourth level, building chutes and installing about 2,400 feet of mine rails. Trolley haulage of the ore is planned to be used on and from the fifth level to the receiving line at the mill site, a total distance of about 6,500 feet and preparation for trolley haulage must be made over this distance. Thirty one-ton capacity mine cars, 8 air drills (stoper and jack-hammers) air hose and drill steel must be purchased. A compressor house must be constructed and one 600 c.f.m. compressor, air lines and water lines must be installed. A machine shop must be constructed and equipment installed. The estimated costs of this mine preparation are as follows:

1. Stope preparation and driving of one transfer raise from the fourth to the fifth level.....\$ 6,500
 2. Purchasing and installing mine equipment such as mine track, 2 locomotives, 30 mine cars, trolley lines, air and water lines, 8 drills and drill steels, a 600 c.f.m. compressor and small electrical underground hoist..... 43,000
 3. Construction of compressor house, machine shop, machine shop equipment..... 10,000
 4. Purchasing of stocks and supplies such as powder, drill steel, etc..... 5,000
- Total.....\$64,500

(c) Mill construction:

The cost of a 200-ton selective lead and zinc flotation plant is estimated as follows:

1. Excavation.....\$ 2,500
 2. Building..... 30,000
 3. Equipment installed..... 80,000
 4. Water storage tanks..... 2,000
 5. Ore Trucks..... 6,000
 6. Equipment - bulldozer, tools, etc..... 10,000
 7. Loading Ramp at Lyons..... 1,500
 8. Warehouse stacks..... 6,000
 9. Contingencies, engineering fees, etc..... 17,250
- Total.....\$155,250

(d) Buildings:

The cost of repairing present buildings and construction of additional buildings is estimated as follows:

1. Repairing and modernizing buildings at upper camp, construction of change rooms, timber sheds and framing shed.....\$ 4,000
 2. Additional living quarters, store school-house and recreation room at the lower camp..... 29,000
- Total.....\$33,000

(e) Road construction and improvements

The first ten miles of road from the mine to Lyons, via Mehama, needs widening and surfacing, while the next four miles needs to be improved only at a few places, and the last 15 miles is in good condition and does not need any repairs. The cost of this road improvement is estimated at about \$10,000.

The estimated total capital cost of placing this mine in operation is summarized as follows:

(a) Power development.....	\$ 43,000
(b) Mine preparation and equipment.....	64,500
(c) Mill and equipment.....	155,250
(d) Houses and other buildings.....	33,000
(e) Road Construction.....	10,000
Contingencies.....	49,750
Total.....	<u>\$355,500</u>

Exploration Work to be Performed by the Bureau of Mines

Although there is an estimated 183,000 tons of ore that is reasonably well developed and an estimated additional 100,000 tons of possible ore, these ore reserves are sufficient for only 2½ to 4 years operation at 200 tons daily capacity. There are, on the fifth level, favorable indications that the ore persists at depth and this includes a more uniform mineralisation, higher grade ore and more sharply defined walls than on the higher levels. Additional ore of higher grade than now developed might be found by extending the fifth level under higher backs and by exploring the vein at depth below this level. Increasing the ore reserves by a substantial amount would allow for increasing the daily tonnage treated and would lead to an increased zinc production which is vitally needed.

The company proposes to continue driving the fifth level but the small margin of profit will make it difficult for them to do additional exploration. The Bureau of Mines recommends a project on this property and proposes two alternative plans for developing the ore body at depth.

Exploration plan No. 1 includes diamond drilling after crosscuts have been driven in order to prepare suitable locations for drilling. Two 200-foot crosscuts must be driven into the hanging wall on the fifth level in order that the vein may be intersected at a proper angle at about 200 feet below this level. The crosscuts will be about 330 feet apart at the stations indicated on an accompanying map. Diamond drill stations will be prepared at the end of these crosscuts and three holes are proposed to be drilled from each one. These holes will be "fanned" out to intersect the vein at intervals of about 80 to 120 feet and at about 200 feet on the dip

of the vein below the fifth level. Two more diamond drill holes will be drilled from intermediate stations along each crosscut to intersect the vein at about 100 feet below the fifth level. The total length of these holes is estimated at 2,600 feet. It is proposed to contract the driving of the two crosscuts with the mine operators and to contract the diamond drilling program with drilling contractors. The cost of this project is estimated as follows:

Driving two, 200-foot crosscuts @ \$13.00 per foot.....	\$ 5,200
2,600 feet of diamond drilling @ \$3.50 per foot.....	9,100
Extras @ .50¢.....	1,300
1-Project Engineer \$300 per month for 4 months.....	1,200
2-Sampler Foreman @ \$9.00 per day.....	2,070
2-Samplers @ \$8.50 per day.....	1,955
2-Helpers @ \$8.00 per day.....	1,840
Supplies.....	355
Transportation.....	455
Total.....	\$23,475

The above crosscutting and diamond drilling program would explore the vein for a lateral estimated distance of about 700 feet. If the holes encountered ore they would add an estimated 110,000 tons of possible ore to the ore reserves. The two 200-foot crosscuts are necessary only to obtain suitable locations for spotting the diamond drill holes. It is extremely doubtful if any ore would be encountered by these crosscuts and they would therefore be of little value in actual exploitation of the ore body.

Exploration plan No. 2. The Bureau of Mines proposes an alternative and preferable plan of exploration. This would consist of developing the ore body below the fifth level and this work would be contracted for by the mine operators. The program would include sinking a 200-foot, 5 foot by 8 foot winze on the vein and drifting on the vein for about 700 feet. About 100 feet of crosscuts would be driven from this drift to explore the vein to the walls. The mine operators report that the mine makes very little water so this problem would not be difficult. This underground development would be contracted for by the mine operators and the personnel needed by the Bureau of Mines would only be a project engineer and one or two samplers. The cost for this project would be as follows:

Sinking a 200-foot winze @\$40 per foot.....	\$ 8,000
Preparing ore and loading pocket.....	1,000
800 feet of drifting and crosscutting@	
\$18 per foot.....	14,400
Project engineer 5 months @ \$300 per month....	1,500
2 Samplers @ \$9 per day.....	2,340
Supplies.....	500
Transportation.....	300
Total.....	\$28,040

The cost of an electric hoist, rails, skip and cable has been included in the capital cost of mine equipment.

The above proposed program would cost an estimated \$28,040.00, or about \$5,000 more than the proposed diamond drilling program.

However, it would explore the ore body as well as developing it on at least two sides. It is estimated that ore thus developed would amount to about 110,000 tons.

There are advantages and disadvantages of either method proposed. There is, however, some question as to obtaining a good core recovery of the vein matter by diamond drilling. The sphalerite which occurs in calcite and quartz and the latter gangue minerals are friable in places and it is possible that core recovery of this material would be low and the results would therefore be inaccurate. Further, since it would be necessary to drive two 200-foot crosscuts only to obtain suitable drilling stations, underground work would be to better advantage by sinking a winze on the vein instead of as proposed in plan No. 2.

If the diamond drilling program proved the continuity of the ore at depth and laterally for about 700 feet, this would have to be developed in the same manner as proposed in Exploration Plan No. 2, and the estimated total cost would then be \$51,510.00.

The estimated length of time for the diamond drilling program, Plan No. 1 is about 4 months and that for the underground development, Plan No. 2 is about 5 months. If ore was developed, it would be available for mining much sooner by the latter method than by the diamond drilling program. It is, therefore, recommended that the project involving only development as discussed under Exploration Plan No. 2 be carried out by the Bureau of Mines.

Most of the necessary equipment, with the exception of an electric hoist, cable and skip, is on the property now. The company is now engaged in doing a small amount of development with a Reconstruction Finance Corporation loan, and it is probable that miners could be furnished for a Bureau of Mines project immediately.

Either plan could be started as soon as the necessary equipment was obtained and a project engineer available.

Geological Survey

In the Lester Mining District, there are a number of undeveloped and partially developed mineral deposits. These deposits are all similar to the Ruth Mine in that they are found along shear zones in andesite. The entire area is apparently traversed by a series of nearly parallel shear zones and it is along these shears that the mineralization occurs. The degree of persistency and continuity of any one shear zone or ore body is not known and the district as a whole warrants an extensive survey and mapping program as

well as some exploration work. There are copper prospects which include the Lotts Larsen Mine, Black Eagle Mine and others; and lead-zinc mines which include the Ruth, Blue Jay, Ogle Mountain, Crown and others. The zinc properties are located on a rough circle with the copper properties being located in the center.

It is recommended that a detailed geologic study be made in this area.

Conclusions

The purpose of the investigation by the Bureau of Mines was to obtain a sufficient number of samples which would serve as a check on other engineers' results, to determine the approximate tenor and tonnage of ore and to determine the advisability of a project on the property. From the results obtained by the investigation, the Bureau of Mines concludes that:

1. That there are an estimated 183,900 tons of reasonably well developed ore and an additional estimated 100,000 tons of possible ore of a grade of 4.7 percent in zinc and 0.4 percent in lead.
2. That there are good possibilities of developing a considerable additional tonnage of ore.
3. That an estimated 12,250 tons of zinc as metal and 700 tons of lead could be produced over a period of about 4- $\frac{1}{2}$ years from the present probable and possible ore reserves. The total estimated mining, milling, shipping, smelter deductions and smelter costs are \$1,492,000. The company's profits, although marginal, would amount to about \$363,400 and which would balance the estimated capital investment cost of \$355,500.
4. The ore could be mined at the rate of 200 tons per 24 hours for about 4- $\frac{1}{2}$ years and if additional ore was developed, the rate of production could be increased considerably. Production could start within 12 months after obtaining the necessary equipment, laborers and personnel.
5. In view of the facts presented above, it is recommended that proper steps be taken immediately to put the property into production if there is a critical shortage of zinc.

SUPPLEMENT

Ruth or Old Amalgamated Mine

Introduction

The management has recently considered the installation of a "Sink and Float" Plant as an adjunct to the flotation plant. It was stated that such a plant would allow the mining and treating of lower grade ores which would increase the total production of metals from this property. A mining method to include mining the very low-grade ore as well as the higher grade ore would undoubtedly be less expensive per ton mined than a selective method applied on the better ore alone.

Metallurgical Results by "Sink and Float" Treatment

A 200-pound sample of ore was shipped to the Bureau of Mines at Salt Lake City for metallurgical investigation by "Sink and Float" treatment. This sample was taken near the southeast end of the fifth level by Mr. F. Draper of the Pacific Smelting and Refining Company.

The material was crushed to minus 2 inches in size and then screened on screens of 1-inch and 3-mesh openings.

The two coarse fractions were treated separately - first with a media density of 2.76 and the float products were removed and treated with a media density of 2.62.

A summary of the results are given in table 1.

Table 1. Metallurgical Data, "Sink and Float"

Product	Percent Weight	Assay Percent			Distribution Percent		
		Pb	Cu	Zn	Pb	Cu	Zn
Sink at 2.76 Untreated	5.01	1.6	.6	15.07	63.6	39.8	27.5
Minus 3-mesh Composite	19.19 24.20	.05 .37	.12 .22	4.6 6.8	7.1 70.7	29.5 69.3	32.2 59.7
Sink at 2.62 Composite 2	33.52 57.72	.05 .18	.05 .12	2.35 4.21	13.5 84.2	20.5 89.8	28.7 88.4
Float at 2.62	42.28	.05	.02	.75	15.8	10.2	11.6
Calculated Head	100.00	.13	.08	2.74	100.0	100.0	100.0

The heads to this test were considerably lower in zinc content than the heads that would be anticipated by selective mining.

As can be seen in table 1, a minor amount of the base metals was recovered in a high-grade sink product with a media density of 2.76 which, combined with the minus 3-mesh fines, contained 70.7, 69.3 and 59.7 percent of the total lead, copper, and zinc respectively. This composite amounted to 24.2 percent by weight of the total heads and assayed 0.37, 0.22, and 6.8 percent in lead, copper and zinc respectively.

Only a low-grade concentrate assaying 2.35 percent in zinc was recovered by additional treatment at a lower media density of 2.62. A composite of the two sink products and minus 3-mesh fines assayed only 4.21 percent in zinc.

The results indicate that "Sink and Float" treatment of this ore, as represented by the sample tested, was not particularly successful so far as obtaining a high recovery of zinc in a relatively high-grade product. The grade of products as represented by composite 2 was 4.21 which is only marginal ore. To obtain one ton of this "concentrate", 1.75 tons of ore would have to be mined, which would be impractical from an economic standpoint. In producing composite 2 which assayed 6.8 percent in zinc, 4 tons of ore would have to be mined to obtain 1 ton of this product and this would also be impractical from an economic viewpoint.

Conclusions

1. "Sink and Float" treatment of the sample of ore shipped by Mr. Draper was not successful in separating the low- and the high-grade ores with a high recovery of the zinc in the latter product.
2. A "Sink and Float" Plant is not recommended at this time but should be considered after more development has been done and the nature of the average mill heads definitely determined. When this is known, "Sink and Float" investigations should then be made on representative samples of the mill heads to determine the practicality of this treatment in raising the grade of the mill heads.