Report on the Ermont Mine Sec. 35, T. 6 S., R. 11 W., Beaverhead County, Montana

Chester Harkins Steele

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REPORT ON THE
ER-MONT MINE
SEC. 35, T6S., R11W.,
BEAVERHEAD COUNTY, MONTANA.

BY
CHESTER HARKINS STEELE

A Thesis
Submitted to the Montana School of Mines
in Partial Fulfillment of the
Requirements for the Professional Degree of
Geological Engineer

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BUTTE
Butte, Montana
May, 1940
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<th>Description</th>
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<td>2</td>
<td>Ermont No. 1 - 55 Ft. Level and Ermont No. 2 - Level No. 2.</td>
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<td>3</td>
<td>Ermont No. 2 - Level No. 3.</td>
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<td>4</td>
<td>Ermont No. 1 - 80 Ft. Level and Ermont No. 2 - Level No. 4.</td>
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<td>Cross-Section A-A.</td>
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<td>Ermont No. 2 - Ore Reserve Blocks.</td>
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REPORT ON THE
ERMONT MINE
SEC. 35, T 6S., R. 11 W.
BEAVERHEAD COUNTY, MONTANA

INTRODUCTION.

An examination of the Ermont Mine was requested by the owners, Messrs. J. R. Bowles and R. B. Caswell, to determine the amount and grade of ore developed, the advisability of constructing a mill at the present time, and to recommend future development work.

The owners familiarity with the location, physical features and extent of ownership, precludes the necessity of a detailed account of these subjects.

Lack of timber on the property is not a handicap, as plenty for mining is available in the nearby mountains and at the lumber yards in Dillon, 15 miles distant. The absence of any water on the property, while serious, will be overcome by a plentiful supply reported to be available on Rattlesnake Creek, 4 miles away.

GEOLOGY AND MINERALOGY.

The country rocks in this area are gray limestone and andesite. The limestone, although locally irregular in strike and dip, generally strikes N. 15° E. and dips 20° easterly. The andesite has intruded into the limestone across and parallel to the bedding.
Gold bearing quartz and limonite occur replacing limestone along the contacts, particularly where the andesite is parallel to the bedding of the limestone. Mineralized fractures cut across the bedding planes at several points, but these occurrences are of minor importance economically, except that such fractures served as channel ways for the introduction of part of the mineralization.

At the Armont Mine two bodies of mineralization occur parallel to the limestone bedding, one on the bottom, No. 1, and the other on the top, No. 2, of 20 feet to 75 feet of limestone with andesite below No. 1 and above No. 2. The relation of these features to each other are shown on Plan Maps 1, 2, 3, and 4, and Cross-section Maps 5 and 6.

Replacement mineralization of this type is generally irregular in shape and cannot be projected far beyond known exposures. Maps 1, 4, and 5 illustrate this point. The large No. 1 Ore Body at the surface should extend downward to the 80 foot level drift, but because of its irregular occurrence possibly is east of the contact in the limestone or south of the present workings.

Ore Body No. 2 is more regular over the length exposed, except for slight offsets by small faults, as shown on Map 2.

Recognition of the character of this type of deposit, however, is of prime importance and development work should be planned accordingly.
Oxidized ores may be reasonably expected for 1000 feet down the dip, provided these ore bodies continue as flat as the present exposures indicate. In this distance they would be within 400 feet of the surface and probably above water level and sulphide mineralization.

WATER POSSIBILITIES.

Considered geologically, a chance of obtaining water exists on or near this property. Although the water level may be deep, the east dipping sedimentary beds outcropping west and above the mine offer good gathering zones. A 1000 foot churn drill hole sunk 2000 feet east of the mine would not only determine water possibilities, but also prospect the downward extension of the ore horizons.

DEVELOPMENT.

Prospect pits and shallow shafts sunk on the property have exposed numerous occurrences of mineralization. The principal development work, however, has been the opening of the outcrop of No. 1 Ore Body and the exploration of the downward extension of No. 2 Ore Body. The accompanying separate level maps and cross-sections show the extent of this work and the ore encountered.

Five tunnels driven into No. 1 Ore Body at the bottom of the Open Pit, shown on Map 1, have not added to the total ore reserves, except to change what was formerly considered "Probable Ore" to "Developed Ore".
The possible downward and lateral extent of this ore body should be determined on Level No. 4 of Incline No. 2, as shown on Map 4 and recommended below.

No. 2 Ore Body is developed by Incline No. 2, now 240 feet long. The upper half is in the ore body, but the lower half, due to faulting, is in limestone under the ore.

Level No. 2 from this shaft, shown on Map 2, has opened the ore body laterally for 120 feet. Additional drifting will be necessary to determine the full lateral extent of mineralization at this elevation, but the thickness reported from Diamond Drill Hole No. 2 and the thickness exposed in the north end of the level are assurances that 200 feet of ore may be expected.

On Level No. 3 sufficient work has been completed to determine the location of the ore in relation to the shaft.

Level No. 4 has been started and the bottom of the ore exposed in the back of the crosscut, 15 feet southwest of the shaft. This level is 225 feet down the incline from the surface and at approximately the same elevation as the old 80 foot level. Before continuing the shaft, the proposed drifts, as shown on Map 4, should be driven to determine the shape, size and direction of the downward extension of this ore.

From the proposed south drift on No. 4 Level, a crosscut should be driven due west 200 feet to the footwall andesite, to locate and develop the downward extension of No. 1 Ore Body. Splits of this ore may also be expected in the intervening limestone before the contact is reached.
SHIPMENTS.

The first shipment from the Ermont Mine to the Anaconda Copper Mining Company was made in August 1932, by W. J. Corbett and D. V. Erwin, of Dillon, Montana. During several periods of operation, to February 1, 1936, 8,727 dry tons, averaging 0.358 oz. gold and less than 0.1 oz. silver per ton, has been shipped. Approximately 85% of this ore was mined from the Open Pit in No. 1 Ore Body, and the remainder from the development work in No. 2 Ore Body. From the information available, little difference is apparent in the average grade of ore from the two ore bodies where shipments have been kept free of waste.

ORE RESERVES.

The following Ore Reserves are indicated principally from the assays of samples of the present ore exposures, and to a much less extent from old Diamond Drill Hole records, and inaccessible shaft assay records furnished by D. V. Erwin.

<table>
<thead>
<tr>
<th>DEVELOPED ORE</th>
<th>Tons</th>
<th>Oz. Gold per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 Ore Body</td>
<td>12,228</td>
<td>0.37</td>
</tr>
<tr>
<td>No. 2 Ore Body</td>
<td>11,723</td>
<td>0.40</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23,951</td>
<td>0.38</td>
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</table>

<table>
<thead>
<tr>
<th>PROBABLE ORE</th>
<th>Tons</th>
<th>Oz. Gold per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 Ore Body</td>
<td>12,527</td>
<td>0.27</td>
</tr>
<tr>
<td>No. 2 Ore Body</td>
<td>10,496</td>
<td>0.40</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23,023</td>
<td>0.33</td>
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</tbody>
</table>
POSSIBLE ORE

<table>
<thead>
<tr>
<th></th>
<th>Tons</th>
<th>Oz. Gold per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 Ore Body</td>
<td>8,185</td>
<td>0.30</td>
</tr>
<tr>
<td>No. 2 Ore Body</td>
<td>20,108</td>
<td>0.34</td>
</tr>
<tr>
<td>TOTAL</td>
<td>28,293</td>
<td>0.33</td>
</tr>
</tbody>
</table>

SUMMARY

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Total Developed Ore</td>
<td>23,951</td>
<td>0.38</td>
</tr>
<tr>
<td>Total Probable Ore</td>
<td>23,023</td>
<td>0.33</td>
</tr>
<tr>
<td>Total Possible Ore</td>
<td>28,293</td>
<td>0.33</td>
</tr>
</tbody>
</table>

GRAND TOTAL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAND TOTAL</td>
<td>75,267</td>
</tr>
<tr>
<td></td>
<td>0.35</td>
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</tbody>
</table>

Reference to Maps 7 and 8 shows that the Developed Ore is that part well assured by development work. Probable Ore is somewhat less assured but generally requiring little more development to be classed as Developed Ore, while Possible Ore is the lateral and downward extension of the ore bodies beyond present development.

In the calculations used to arrive at the above figures applying to No. 1 Ore Body some Probable Ore was allowed in the same areas as the Developed Ore, by figuring the same areas with extra widths not fully developed by present exposures, but reasonably assured because of known structural conditions.

The Possible Ore blocks in Ore Body No. 2, extending northerly and southerly around Diamond Drill Holes No. 2 and 3, are carried with less thickness but with the same general average as the rest of the
Ore Reserves, although the drill hole records show a lower gold content. This has been done because of the claimed inability of the drillers to obtain satisfactory cores for assaying. While this grade may be high, the average assay of all samples on present exposures checks the shipments so far made, indicating that where mineralization is present it will probably average this amount.

The downward extension of the Possible Ore has been calculated 100 feet beyond the Probable Blocks, although it will possibly extend much farther in some direction determinable by development. A thickness of 14 feet has been allowed for Ore Body No. 1 and 8 feet for Ore Body No. 2. Using these figures and the length indicated in the maps, 20,500 tons of 0.34 oz. gold ore may be expected per 100 feet down the projection of these ore bodies. This figure is probably low, but the limited development work will not allow a higher estimate at present.

COSTS.

The Open Pit mining in the past has produced ore at a low cost. As work continues, however, and considerable development work is necessary with all mining carried on underground, a higher cost should be anticipated. This may be kept under $3.00 per ton, by careful management and the installation of scraper equipment, and additional hoisting capacity. The extent of the development work required will effect this cost materially.

Other than mining, at present, the following amounts are chargeable against this ore:
<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Per Ton</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>1.00</td>
<td>$1.25 now being paid, but this includes shoveling at mine.</td>
</tr>
<tr>
<td>Freight to Butte</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Average Treatment</td>
<td>2.60</td>
<td></td>
</tr>
<tr>
<td>Difference in recovery</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$ 5.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

In case a 125 ton cyanide mill was in operation at the property, and a recovery of 94.5% of the gold was possible with a 12 hour leach of 80 mesh material and a sodium cyanide consumption of 0.5 lb. per ton and CaO 0.10 lb. per ton of solution as your tests made by Booth-Thompson Co., Salt Lake City indicate, your mill operating cost without depreciation and interest should not exceed $2.00 per ton.

This would represent a saving of $3.00 per ton over the present method of treatment, and on Developed Ore alone, 24,000 tons, a saving of $72,000 could be made in addition to the regular profits. With this saving a 125 ton cyanide plant and water supply pipe line for warm weather use could be purchased and constructed. The cost of a power line in addition to the above probably would not be entirely covered by this amount, but would be covered by the saving on a small part of the 51,000 tons of Probable and Possible Ore at $3.00 per ton.

RECOMMENDATIONS FOR DEVELOPMENT WORK.

The Probable and Possible Ore indicated on Maps 7 and 8 should be thoroughly developed to fully determine its extent. This may be accomplished by the following development work:
1. Continue No. 4 Level Crosscut southeasterly from 15 feet southwest of No. 2 Incline Shaft until the footwall of No. 2 Ore Body is cut.

2. Drift northeasterly and southwesterly on the footwall of No. 2 Ore Body on No. 4 Level until the total lateral extent of ore is determined. If the ore is cut off by faulting, recover it beyond the fault and continue.

3. At 50 foot intervals along this proposed drift, drive raises up to the hangingwall to determine the thickness of the ore body.

4. From a point 100 feet southerly from the shaft on Level No. 4 drive a crosscut due west 200 feet to cut the possible downward extension of No. 1 Ore Body and any of its splits which may extend out into the limestone away from the andesite contact.

Note: If after running the crosscut suggested above, no ore is encountered, drift and raise on the andesite limestone contact until the location of the downward extension of this ore body is determined. It is the larger of the two ore bodies at the surface and with the 80 foot level eliminating its downward projection due east of the pit, much of the future of this mine depends on the success of this Recommendation.

If ore is encountered and developed, it should be developed again at the next level proposed in Recommendation #7.

5. Drift on the footwall of No. 1 Ore Body from the above crosscut to its extreme limits and raise at 50 foot intervals to determine its thickness.
6. After the location, shape, and size of No. 2 Ore Body is determined, decide on a method of changing the slope or possibly both the slope and direction of Incline Shaft No. 2 and continue it in ore.

7. If it is possible to keep the shaft in ore, continue it for 100 feet and then duplicate the work outlined above for Level No. 4. If the ore body pinches or faulting displaces it and the shaft advances into country rock, do not continue until sufficient work has been done to locate the ore. Then, change the shaft and advance it in ore.

As development work proceeds according to the above Recommendations, unexpected conditions may be encountered that will necessitate changes, but if these suggestions are followed in general the total amount of ore in these two ore bodies will be determined.

Before Mill construction is started, a thorough cyanide mill test of this ore should be made to determine the details of the process most suited to the ore.

After a mill is in operation, development of some of the outlying occurrences of mineralization should be undertaken, particularly the low grade ore showing on No. 23 claim.

CONCLUSIONS.

The ore bodies on this property are irregular in shape and extent, but sufficient ore to justify the construction of a 125 ton per day cyanide mill is fully developed at present, with twice this amount partially developed.
Development work should proceed as rapidly as possible to add to the supply of assured ore.

Cyanide mill tests, if not already thoroughly made, should start as soon as possible to facilitate mill construction at an early date.

Respectfully submitted,

C. H. STEELE

February, 1936.
ERMONT MINE
CROSS SECTION A-A
Looking N.18°E.
Scale: 1 In. = 50 Ft.

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MAP 5
ERMONT MINE
CROSS SECTION X-X
Looking N. 45° E.
Scale: 1 in. = 50 Ft.

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Feb. 1936 C.H. Steele
NO. 1 ORE BODY
ERMONT MINE
Beaverhead County, Mont.
Composite Map Showing Development and Ore Reserve Blocks

Developed Ore
Probable Ore
Possible Ore

C.H. Steele  Feb. 1936

Scale: 1 in. = 50 ft.

MONTANA SCHOOL OF MINES LIBRARY
BUTTE
No 2 Ore Body
ERMONT MINE
Beaverhead County, Mont.
Composite Map Showing Development Work
And
Ore Reserve Blocks
- Developed Ore
- Probable Ore
- Possible Ore
C.H. Steele
Feb. 1936
Mr. Chester Harkins Steele has satisfactorily completed this 27th day of May, 1940, all requirements prescribed by the Montana School of Mines for the Professional Degree of Geological Engineer.

GRADUATE COMMITTEE

[Signatures]

[Signatures]

[Signature]