History of the Phi Kappa Mine, Custer County, Idaho

Victoria E. Mitchell

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Idaho Geological Survey
Morrill Hall, Third Floor
University of Idaho
Moscow, Idaho 83844-3014
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INTRODUCTORY NOTE

This report was prepared under a cooperative agreement with the U.S. Forest Service, Region IV, as part of a project to identify and describe inactive and abandoned mines in the state of Idaho. Work on this project included preparing detailed histories of mines in Region IV that had significant recorded production. The information in this report is taken from published and unpublished sources in the Idaho Geological Survey’s mineral property files. Unless otherwise noted, most mine production data are drawn from the U.S. Geological Survey’s (USGS) annual volumes on Mineral Resources of the United States (1882-1923) and the equivalent volumes produced by the U.S. Bureau of Mines (USBM) (Mineral Resources of the United States, 1924-1931, and Minerals Yearbook, 1932 to the present). Information on underground workings and mine equipment is generally from the annual reports of the Idaho Inspector of Mines (IMIR), published from 1899 to 1979. After 1974, the Mine Inspector’s office was known as the Mine Safety Bureau, a section of the Idaho Department of Labor and Industrial Services. Detailed accounts of mine operations are mostly drawn from the annual reports prepared by the companies for the State Inspector of Mines; these reports were required by law, and the information contained in them formed the basis of the Mine Inspector’s annual reports. Reports of recent developments are taken from the Idaho Geological Survey’s (IGS) annual reports on mining and minerals in Idaho (from 1984 to present) or from similar reports produced by the Survey’s predecessor, the Idaho Bureau of Mines and Geology (IBMG) from 1975 to 1984. Other published sources are referenced in the text. A complete bibliography is included at the end of the report. Where direct quotations are taken from source materials, the original spelling and grammar are preserved.
History of the Phi Kappa Mine,  
Custer County, Idaho

Victoria E. Mitchell¹

The Phi Kappa Mine is in the Alto mining district on the east side of Phi Kappa Creek in Custer County at an elevation of about 8,000 feet (Figures 1 and 2). Phi Kappa Creek is a tributary to Summit Creek, which is a tributary to the North Fork of the Big Lost River. The mine was discovered in January 1885, and the Phi Kappa claim was patented the following December (Tuchek and Ridenour, 1981). At various times, additional claims have been located and relocated around the patented ground.

The mineralized zone is a limestone bed that has been metasomatically altered to a diopside-grossularite skarn containing up to 15 percent sulfides. The ore occurs as lenses, pods, isolated grains, and fine-grained disseminations. Sulfide minerals include galena, sphalerite, pyrite, and chalcopyrite. The main zone of mineralization varies from 2 to 5 feet in width and is more than 4,000 feet long. Additional zones and stringers occur above and below the main zone. These range from 2 inches to 3 feet in thickness and are laterally discontinuous (Tuchek and Ridenour, 1981). Patches of fine-grained scheelite occur locally, particularly along fractures (Cook, 1956.)

A mill was built at the mouth of Phi Kappa Creek in 1896; it was dismantled long before 1930. After it was installed, the mill ran for 30 days and produced a few carloads of concentrates. The mine was worked intermittently during the next few years (Umpleby and others, 1930).

¹Idaho Geological Survey, Main Office at Moscow, University of Idaho, Moscow.
Figure 1. Location map of the Phi Kappa Mine and vicinity, Custer County, Idaho (U.S. Forest Service Challis National Forest map, scale $\frac{3}{6}$ inch = 1 mile).
Figure 2. Topographic map of the Phi Kappa Mine (U.S. Geological Survey Phi Kappa Mountain 7.5-minute topographic map).
The 1905 IMIR contained the following information about the Phi Kappa (p. 54):

At the Phi (sic) Kappa a force of ten men are employed in development work for a strong syndicate of eastern capitalists. This mine carries an immense zone of concentrating mineral that runs about $10.00 or $12.00 per ton in combined values.

The zone proper is 150 feet wide and can be readily followed along its strike for a mile and a half in length. It consists of a succession of veins or belts of gangue minerals richly impregnated with sulphides of lead, zinc, iron and copper. These ore courses are 10 to 15 feet wide, with intervening spaces of limestone which forms the local country rock and presents the possibility of developing into an immense resource of concentrating mineral.

The ore carries very fair values in gold and silver, as well as the baser metals. It is being developed by drifting and sinking on the best courses, and if it shows sufficient encouragement by spring the operation will be greatly enlarged and an extensive plan of underground work undertaken.

In 1912, Federal Mining and Smelting Co. became interested in the Phi Kappa. (Table 1 shows the companies operating at the mine.) According to Federal's annual report for 1913 (p. 21-22):

In October, 1912, a bond for $45,866.65 was taken on the Phi Kappa group in Custer County, Idaho. This is a low-grade lead-zinc property, which has surface promise of making large bodies of ore. So far as we know it carries about 2 ounces of silver to the unit of lead. A tunnel was started to cut the vein at a depth of 200 feet below the surface. Development is being pushed. If an extension of the bond can be secured, sufficient work will be done to determine whether the value of the property will justify its purchase.

The 1912 IMIR described this work (p. 97-98):

Another likely mining enterprise in progress tributary to Mackay is that of the Phi Kappa Mine on the Upper Lost River near Mount Hyndman.

This property has been taken over by the Federal Mining & Smelting Company of Wallace, Idaho, who are now running a 400-foot tunnel to tap the deposit at further depth. Its deposits consist of a wide dike of igneous rock richly sprinkled with gold and silver bearing lead and zinc sulphides.

The dike in which these minerals occur is of large size and very persistent for hundreds of feet in length and indicates an enormous resource of concentrating ore.

The porphyry gangue in which the mineral occurs is light and the sulphide crystals are coarse and readily separated and will form an ideal concentrating mineral on which it is believed a successful separation of the zinc and lead values may be made to clean shipping products, and it is sincerely to be hoped that the present flattering values in the ore bodies will be maintained at the new level being sought by the present development at this point.

The 1913 IMIR (p. 142) noted that while the ore grade at the Phi Kappa was not high, the size of the deposit would provide an "immense tonnage resource" if the
Table 1. Companies operating at the Phi Kappa Mine.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Officer</th>
<th>Date Incorporated</th>
<th>Charter Forfeited</th>
<th>Year(s) at Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Mining &amp; Smelting Co.</td>
<td>F.H. Browneil, President</td>
<td>Sept. 23, 1903</td>
<td>merged with ASARCO--May 11, 1953</td>
<td>1912-1914</td>
</tr>
<tr>
<td>Standard Coal Co.</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1917-1918</td>
</tr>
<tr>
<td>Oreland Mining Company</td>
<td>F.A. Sweet, President</td>
<td>Feb. 9, 1918</td>
<td>Nov. 30, 1923</td>
<td>1919-1922</td>
</tr>
<tr>
<td>MacGinnis-Walker Metals Co.</td>
<td>John E. Walker, President</td>
<td>May 25, 1925</td>
<td>1928</td>
<td>1926-1928</td>
</tr>
<tr>
<td>Billiton Exploration U.S.A., Inc.</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1984-1985</td>
</tr>
</tbody>
</table>

1Information not available in IGS’s files.
2Owner of record in 1994.

company was able to separate the ore minerals profitably. However, Federal’s results were disappointing and the company surrendered its bond on July 24, 1914. Federal’s 1914 annual report stated (p. 19):

The development work which had been carried on as steadily as conditions would permit finally resulted in cutting the vein.

The values encountered, however, were so unsatisfactory as to forbid further exploration.

The total amount expended on this bond was $11,444.27, of which $1,178.98 was expended during the year.

In all, Federal drove the main tunnel 500 feet at a cost of $9.75 per foot (Umpleby and others, 1930). The Standard Coal Co. further extended the tunnel in 1917 and 1918 for a total of 1,155 feet of workings. Included in this total were some short, branching drifts near the end of the tunnel. The other tunnels on the property were the Clifton, which was 195 feet long with some very short branching drifts, and the
Copper tunnel, which was 175 feet long and had a 25-foot drift leading off it (Figure 3; Umpleby and others, 1930).

The MacGinness-Walker Metals Co. acquired the Phi Kappa in 1926. The company installed a mine plant and started active development during the closing months of the year. A test lot of lead-zinc ore was shipped. Six men were employed throughout 1927 to develop the mine. A large body of ore was said to have been discovered by this work.

The company did continuous development in 1928. The mine was equipped with a gas-driven compressor and "complete mining equipment." The No. 1 tunnel was 225 feet long, and the No. 2 tunnel was 2,100 feet long. A large amount of development work was also done in 1929.

Zinc-lead-silver ore was produced from the Phi Kappa in 1948. In 1952, 1,714 feet of diamond drilling was done on the property. Drifting on the ore zone was started on two levels (Tuchek and Ridenour, 1981). Zinc-lead ore was shipped from the Old Glory fraction (apparently an adjoining claim) during the year.

In 1956, Ivan I. Taylor shipped lead ore to the Midvale, Utah, smelter. The Phi Kappa was active in 1962. During 1965, Federal Resources Corp. trucked silver ore from the Phi Kappa to the company mill at Bellevue.

U.S. Silver Corp. had four men working at the Phi Kappa in 1971 and 1972. The mine was examined by U.S. Bureau of Mines personnel in 1973 or 1974 as part of the Boulder-Pioneer Wilderness study (Tuchek and Ridenour, 1981; Figures 4 and 5).

During 1975, about 2,000 tons of ore was broken from the north stopes and transported to Mackay for milling tests (Tuchek and Ridenour, 1981). Myko, Inc., took over the mine in 1976 and operated it with a crew of six. The mine was active until 1981 or 1982 (Figure 6). The ore was shipped to the Empire mill at Mackay.

Billiton Exploration U.S.A., Inc., a subsidiary of Royal Dutch Shell, did exploration work in the vicinity of the Phi Kappa during 1984 and 1985. In 1990, the Phi Kappa shipped about 1,300 tons of lead-zinc-copper-silver ore to the Clayton mill. The mine was also active in 1991. Figure 7 shows the mine as it appeared in 1994 when it was visited by an Idaho Geological Survey geologist as part of a program to evaluate inactive and abandoned mine lands in southern Idaho.

Mine development totals more than 4,200 feet of drifts, crosscuts, and stopes. The upper and lower workings in the mine are connected by a series of finger stopes (E. Bennett and J. Ridenour, 1994, personal communication). Most of the underground workings are in good condition and need little support (Tuchek and Ridenour, 1981). Ninety-five samples taken by the USBM from the main ore zone averaged 3.20 ounces per ton of silver, 0.08 percent copper, 3.35 percent lead, and 3.48 percent zinc. Cadmium was present in zinc and lead concentrates assayed at the same time. The mine has 55,000 tons of measured reserves and 1.6 million tons of indicated reserves (Tuchek and Ridenour, 1981).
Figure 3. Principal workings at the Phi Kappa Mine (c. 1923; Umpleby and others, 1930, Figure 15).
Figure 4. Main workings of the Phi Kappa Mine, viewed looking toward the northeast (Tuchek and Ridenour, 1981, Figure 33).
Figure 5. Block diagram of the main workings of the Phi Kappa Mine (Tuchek and Ridenour, 1981, Figure 35).
Figure 6. Mining operations at the Phi Kappa Mine (1980) (Idaho Geological Survey photograph by Earl H. Bennett).
Figure 7. Main adit of the Phi Kappa Mine, 1994 (Idaho Geological Survey photograph by Virginia S. Gillerman).
Total recorded production for the Phi Kappa between 1926 and 1981 is 32,912 tons of ore. This yielded 35 ounces of gold, 53,537 ounces of silver, 118,268 pounds of copper, 1,017,889 pounds of lead, and 846,910 pounds of zinc.

References


Federal Mining and Smelting Company President and General Manager’s reports to the company’s stockholders.

Idaho Geological Survey’s mineral property files (includes copies of company reports to the Idaho Inspector of Mines).


Idaho Inspector of Mines’ (IMIR) annual reports on the mining industry of Idaho, 1899-1970.


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