History of the Leadville, Kimmel, and Baby Joe Mines, Lemhi County, Idaho

Victoria E. Mitchell
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INTRODUCTORY NOTE

This report was prepared under a cooperative agreement with the U.S. Bureau of Land Management as part of an ongoing project to identify and describe inactive and abandoned mines in Idaho. The information in this report is from a number of published and unpublished sources in the Idaho Geological Survey’s mineral property files. Where not otherwise noted, most of the mine production data is 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 1984; since 1995, the *Minerals Yearbook* has been published by the U.S. Geological Survey. 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, for the most part, 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 the developments in 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 even in cases where they do not conform to currently accepted usage.
History of the Leadville Mining Area, 
Lemhi County, Idaho

Victoria E. Mitchell

INTRODUCTION

The Leadville mining area is along the base of the Beaverhead Mountains (Figure 1), predominantly in sections 13, 14, 23, and 24, T. 16 N., R. 26 E., in Lemhi County, Idaho (Figure 2). The mines are about 4 miles northeast of Leadore, Idaho, at elevations of about 6,200-7,000 feet. Primary access to the area is from State Highway 29 from Salmon south through the Lemhi Valley (Figure 3). Secondary access is from State Highway 29 from Leadore through Railroad Canyon to Bannock Pass and Montana. Unpaved, two- and four-wheel-drive subsidiary roads lead to the various mines and prospects in the area. The area is part of the Junction mining district.

Mineral deposits were found in the Junction district a number of years before the Leadville Mine was discovered in 1904. Active development began the following year at the Leadville, and prospecting in the surrounding area increased. Adjacent discoveries on the Baby Joe and Kimmel properties were eventually consolidated with the Leadville Mine. In 1919, the IMIR (p. 61) described the area as follows:

The accompanying small kodak views [Figures 4 and 5], which are poor but the only views available, will give an idea of the local surface of these deposits. All the openings are less than 200 feet vertically above the flat floor of the Lemhi Valley, which is 10 miles broad at this point, and are three miles from the town of Leadore, a substantial little settlement in the valley at the junction of the Gilmore-Pittsburgh Railway extension from Armstead, Montana, to Salmon City, Idaho, where a branch runs off to the Gilmore district 20 miles further south.

The railroad cut across the Leadville area claims as it left Railroad Canyon and headed toward Leadore.

In the early years of the district, mining operations were hampered by the lack of transportation. The 1911 IMIR (p. 77) noted:

________________________
1Idaho Geological Survey, Main Office at Moscow
Figure 1. Location of the Leadville Mining area, Lemhi County, Idaho (Idaho Transportation Department Leadore, Idaho-Montana, 1:100,000 map).
Figure 2. Location of the major workings in the Leadville mining area, Lemhi County, Idaho (U.S. Geological Survey Leadore, Idaho, 7.5-minute topographic map).
Figure 3. Location of and access to the Leadville area, Lemhi County, Idaho (Idaho Transportation Department 2002 official highway map).
Figure 4. Surface views of the Kimmel and Baby Joe Mines in 1919 (Bell, R.N., 1920, Twenty-first annual report of the mining industry of Idaho for the year 1919, p. 62).
Figure 5. View of the portal of the upper tunnel at the Baby Joe Mine in 1919 (Bell, R.N., 1920, Twenty-first annual report of the mining industry of Idaho for the year 1919, p. 63).
Lemhi, one of the last counties in the State to be afforded the advantages of railway transportation, the lack of which has always proven the greatest drawback to the development of its extensive mineral resources, has been brought into touch with the outer world by the construction of the Gilmore & Pittsburgh Railway, from the Oregon Short Line connection to Armadead, Montana, to Salmon City, with a spur branch from Leadore to Gilmore at the head of the Lemhi Valley. This county has risen to the occasion and made an exceptional showing during the past year in the matter of mineral production by virtue of this advantage, and its mineral output will exceed that of any previous year in its history.

The Gilmore and Pittsburgh Railroad stopped service to the area in 1939, and the tracks and other metal associated with the railroad were salvaged for scrap in 1940 (Ruppel and Lopez, 1988).

Exploration efforts were carried out in the area surrounding Leadville in the years following the construction of the railroad. The Leadville area mines were operated sporadically for the next twenty years, but by the early 1930s, the mines were idle. The Leadville and Kimmel mines, consolidated under one company, were operated for a time in the early 1950s. Extensive exploration projects examined the three major properties during the 1960s, but despite these efforts, the mines were not reopened.

Total production from the Leadville, Kimmel, and Baby Joe mines between 1907 and 1954 was 26,868 tons of ore which yielded 44 ounces of gold, 203,166 ounces of silver, 1,331 pounds of copper, 6,065,888 pounds of lead, and 100 pounds of zinc (see Table 1).

**GEOLOGY**

The Leadville area is crossed by a west-northwest-striking mineralized fault zone along the Beaverhead range front which dips 40º southwest (Umpleby, 1913) and places Quaternary fan gravels against the older rocks (Ruppel, 1968). The latest movement on the fault post-dates mineralization (Umpleby, 1913). The main rocks near the Leadville area are Ordovician granites (Evans and Zartman, 1988) which have intruded thrust-faulted slices of older rocks, predominantly the Mississippian Middle Canyon and Scott Peak Formations and the Pennsylvanian Snaky Canyon Formation (Rember and Bennett, 1979). Smaller patches of the Ordovician Kinnikinic Quartzite, the Ordovician Saturday Mountain Formation, and the Devonian Jefferson Formation crop out nearby (Ruppel, 1968; Figure 6). The age and character of the most recent rocks in the area is somewhat in question. Ruppel (1968) and Hershey (1920) described the rocks as Recent alluvial fan gravels or detrital slope gravels, while Umpleby (1913) and Melbye (1964) mapped the rocks as Miocene lake deposits. Without detailed study of these rocks, the exact nature of these sediments cannot be resolved.

Umpleby (1913, p. 114-115) described the geology and ore deposits as follows:

Near the town of Junction the prospects and mines are distributed along a fault plane which probably served to direct the mineralizing solutions. Later movement has taken place along this fault with the result that now unmineralized lake beds form the hanging wall of the ore bodies, being separated from them by a thin gouge seam consisting of clay and in a few places of pulverized ore. The line of prospects extends for about 5 miles northwestward from the mouth of Canyon Creek gorge [Railroad Canyon]. . . .

The only property with sufficient development to afford conclusions concerning the ores is on the Leadville claim of the Junction Mine Co.’s group. In this property the predominating ore is fine-grained argentiferous galena, usually remarkably free from gangue. Many small amounts of pyrite appear in the deposits and in a very few places chalcopyrite. The better grade of ore runs from 50 to 60 per cent lead and 28 to 35 ounces of silver per ton. Two ore shoots occur in the deposit, the ores of which differ somewhat in composition, as shown by smelter analyses, although in the hand specimen no mineralogic difference is evident. The analyses follow:
Table 1. Total production from the Leadville, Kimmel, and Baby Joe mines (data from U.S. Bureau of Mines files).

<table>
<thead>
<tr>
<th>Year</th>
<th>Ore (tons)</th>
<th>Gold (ounces)</th>
<th>Silver (ounces)</th>
<th>Copper (pounds)</th>
<th>Lead (pounds)</th>
<th>Zinc (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadville Mine</td>
<td>11,250</td>
<td>22</td>
<td>94,799</td>
<td>997</td>
<td>2,777,859</td>
<td>100</td>
</tr>
<tr>
<td>(1907-1954)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kimmel Mine</td>
<td>2,184</td>
<td>0</td>
<td>6,784</td>
<td>129</td>
<td>255,085</td>
<td>0</td>
</tr>
<tr>
<td>(1920-1929)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baby Joe Mine</td>
<td>125</td>
<td>2</td>
<td>1,660</td>
<td>205</td>
<td>65,073</td>
<td>0</td>
</tr>
<tr>
<td>(1923-1925)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>13,559</strong></td>
<td><strong>24</strong></td>
<td><strong>101,583</strong></td>
<td><strong>1,331</strong></td>
<td><strong>3,032,944</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Analyses of ores from Leadville Mine, Junction district

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tr.</td>
<td>35.0</td>
<td>56.5</td>
<td>0.2</td>
<td>16.0</td>
<td>—</td>
<td>9.8</td>
<td>2.8</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

From the amount of sulphur contained in both shoots it is obvious that the ore is primarily in the form of sulphides. Copper is negligible, as are also zinc and gold. Iron, although present in noteworthy amounts, is much less conspicuous than in the deposits of the Texas district to the south. The relative amounts of antimony, arsenic, and bismuth are not known; neither is their mineralogic form, although it is very probable that the first two are combined with silver as sulpharsenite and sulphantimonite. Bismuth is not common in such deposits and it is not possible to infer its combinations with any degree of certainty.

Ground-water level occurs at different elevations on opposite sides of the granite porphyry dikes which parallel the range near its base. That the lower elevation prevails on the side toward the Lemhi Valley is obvious from the prevalence of springs at low points in the dikes. Canyon Creek, which derives most of its waters from springs on the upper side of a granite porphyry dike crossing the canyon near its mouth, is a case in point. West of the dikes the position of the water table is determined by the elevation of Lemhi River in the valley opposite, allowing a reasonable gradient toward the river. East of them its level is determined by the point of intersection of the adjacent canyons and the dike.

Along the fault which forms the hanging wall of the deposits near Junction a seam of very impervious clay gouge has protected the ores from descending oxygen-bearing waters, so that they in general retain their primary mineralogic constitution to an extent uncommon above ground-water level elsewhere in the lead-silver deposits. This preservation is probably conditioned by the flat attitude (35º dip) of the fault plane, although another factor may be the small amount of pyrite in the deposit, it having been shown by experiment that the presence of pyrite tremendously facilitates the oxidation of lead sulphide [Buehler and Gottschalk, 1910]. As the 2 per cent of iron (principally pyrite) in the deposits is sufficient to afford considerable ferric sulphate, the relative importance of this factor is not obvious.
Figure 6. Geologic map of the Leadville area, Lemhi County, Idaho (Ruppel, 1968).  
- pCd–Proterozoic Y Big Creek Formation; pCc–Proterozoic Y Apple Creek Formation; Ok–Ordovician Kinnikinic Quartzite; Osm–Ordovician Saturday Mountain Formation; gr–Ordovician granite; Dj–Devonian Jefferson Formation; Mdm–Mississippian McGowan Creek Formation and Devonian Three Forks Formation; Mm–Mississippian Middle Canyon and Scott Peak Formations; Mb–Mississippian Railroad Canyon Formation; Pq–Pennsylvanian Snaky Canyon Formation; Ppg–Permian Grandeur Member of the Park City Formation; ch–chert breccia (age unknown); Trg–Miocene and Pliocene tuff and tuffaceous conglomerate; Qf0–Pleistocene alluvial fans; Qfy–Recent alluvial fans; Qc–Recent creep and solufluction deposits; Qts–Recent landslide deposits; Qt–Recent talus; Qal–Recent alluvium.
In 1907, the Idaho Inspector of Mines described the geology of the district as follows (1907 IMIR, p. 123-124):

This district marks the commencement of Lemhi County’s important lead-silver belt, and lies on the east side of Lemhi valley in the vicinity of Junction settlement, about 50 miles southeast of Salmon City, and the same distance west of Red Rock, Montana, the nearest railway shipping point. Its principal ore development is owned by the Junction Mines Company and is known as the Leadville Group, so called from the similarity of its ore occurrence and geological surroundings to the famous Colorado district of that name, with which it has several features in common. The Junction district proper covers the southwest slope of the main range of the Rocky Mountains, extending from the border of the broad Lemhi valley to the crest of the continental divide, 6 miles farther north, and is made up of a series of flat dipping beds and blue carboniferous limestone quartzite and carbonaceous shale with alternating sheets and immense bodies of quartz porphyry, forming defined contacts, with which are found several extensive outcrops of iron and manganese gossen, associated with rich lead carbonate and galena ores that carry proportionately high values in silver and some gold. These contacts can be traced for long distances and at several points have produced carload shipments of high grade smelting mineral. These interesting geological conditions argue favorably for the development of a very important mineral district that is well worth the attention of capitalists and prospectors alike.

Hershey (1920, p. 1-3) provided the best early description of the geology of the Leadville, Kimmel, and Baby Joe mines:

The mountain slope, on the northeast side of the Lemhi Valley, about 3 miles northeast of Leadore, Lemhi County, Idaho, is underlaid by a thick series of limestone and quartzite beds that has been intruded by a huge dike of what appears to have been a medium-textured alaskite or a granite in which the ferro-magnesian minerals were in very small quantities. In the section studied the dike may average 2000 feet wide, has a northwest course and southwest dip. It contains a few inclusions of limestone and apparently many of quartzite. The igneous rock has been highly altered by the kaolization of the feldspars and partial silicification. A small amount of fine-grained pyrite is irregularly disseminated through it and occasionally one may see a trace of a dark gray sulphide. The fresh rock is rather soft and traversed by many small gouge seams. Upon oxidation it is slightly porous and much limonite-stained. On outcrop and as float much of it is a hard, siliceous, slightly porous rock stained red, brown and in places yellow. The entire dike shows alteration, but to various degrees. I was unable to detect any particular significance in the observed differences at the surface and did not attempt to map distinct phases.

Across the Baby Joe group I mapped a line separating the broad belt of igneous rock from a narrow belt of limestone in the southwest. Beyond the limestone there is a broad band of so-called lake beds, but as far as my observations went the material at the surface and in the tunnels is detrital slope gravel. This underlies the broad valley and rises to an irregular line on the mountain slope. The remarkable feature about it is that it is separated from the underlying limestone by a strong fault gouge. This gouge is fairly straight and dips southwestward, toward the valley, between 35° and 40°. The valley block has been dropped relative to the mountain block, on this fault. Erosion of the detrital slope material and gouge from the middle altitudes has given the face of the mountain a rather straight slope. The deeper tunnels penetrate first the detrital slope material, then the narrow limestone belt and finally the igneous rock.

Irregular bodies of the igneous rock have received a light lead-silver mineralization. Fine-grained galena and pyrite have been deposited in connection with small black gouge seams. So far as present exposures go, in the igneous rock itself the galena is not sufficiently abundant to make commercial ore, but certain highly siliceous bodies of irregular outline and that are probably quartzite inclusions carry 4% to 5% lead and might constitute commercial ore if extensive enough. They are best exposed in the Kimmel property. Two long cross-cuts penetrate them. One was sampled by Mr. Gwinn in January. In this cross-cut one 30-foot section averaged 4.44% lead and 0.46 oz. silver and a 20-foot section averaged 4.52% lead and 1.3 oz. silver. On the strength of these assays, I suggested to you verbally that an option be secured on the property and work done to determine the length of these bands. It was
impossible to secure a satisfactory option. Another party is now developing the mine under option. Before visiting the mine I thought it probable that the 4% to 5% bands are portions of the igneous rock that have been more highly silicified and mineralized than the remainder and hence might persist far laterally and downward. Now, however, they appear to me to be quartzite inclusions. The galena has been deposited along thin crevices in the quartzite. Some quartzite inclusions are essentially barren. The probable explanation of the difference is that only those quartzite inclusions are mineralized that were on the line of fractures in the igneous rock along which galena-depositing solutions were circulating. The clean quartzite was more favorable to the deposition of galena than was the gougy igneous rock. Furthermore, I suspect the galena-bearing seams as being secondary, in the sense of having been deposited by descending water that derived the lead by leaching from the oxidized zone; hence, these deposits might not extend deep. But my chief objection to them is that only the supposed quartzite inclusions are of commercial grade and they are not likely to be large. However, some doubt remains and, although I would not now recommend your company to work on them, the work being done by the present company may be watched by Mr. Gwinn as long as he goes to the Baby Joe mine and it may prove their character beyond doubt.

Melbye (1964, p. 3-4) described the structure, mineralization, and alteration in more detail:

Structure

Structural geology has had an important influence on ore deposition, since mineralization is associated with the east-west Leadville fault. This is a complex fault composed of many strands, and is apparently a normal fault, or at least the last movement has been normal, as evidenced by the faulting of Miocene lake bed sediments against the Mississippian limestone. Many hundreds of feet on both sides of the fault show strong to intense shattering and fracturing. Dip is south at 30º - 55º. A block of limestone appears to have been caught in the fault as shown in the Kimmel adit. Later N-S faulting has displaced the area into numerous complex blocks, each displaced 25' - 200'.

Either uplift of the Beaverhead Mountains or the intrusives themselves have tilted the beds to a south dip of 40º - 60º, although there are numerous local irregularities due to folding.

Mineralization and Alteration

Ore mineralogy is very simple, consisting entirely of argentiferous galena with fairly abundant pyrite. Past district ore shipments have also indicated very small amounts of copper and gold, but this is probably from other mines in the copper areas of the Junction district. Overall, silver:lead ratio appears to average about ¾:1, but this varies a great deal. Accompanying mineralization is strong flooding of quartz and argillization with some sericitization and the porphyry is highly bleaching.

The only vein known at all is that in the Leadhill [Leadville] mine where the higher-grade hanging wall zone was mined 3' - 4' wide. A zone of disseminated ore is known to exist below, from Hole #5 [from the drilling program conducted by Melbye’s company]. Most observed mineralization consists of disseminated galena and pyrite throughout the shattered and altered quartz porphyry as can be seen in the Kimmel adit but it is also present in the limestone in the lower Union Tunnel. Higher-grade zones have no attitudes but rather more nearly a true dissemination.

Ruppel and Lopez (1988, p. 87) discussed the nature of the igneous rocks related to the ore deposits:

The lead-silver deposits in the Junction district are not associated with any exposed Tertiary granitic rocks, but their similarity to the lead-silver deposits in the Lemhi Range, and to those in the adjacent Little Eightmile mining area where Tertiary granite is exposed, suggests a Tertiary intrusive is present at depth. All of these deposits, and others farther south in the Beaverhead Mountains, are in or near granite of early Paleozoic age, but most are replacement deposits in rocks that are younger than the granite of early Paleozoic age. These older granites are thrust-faulted and, in the Junction district at least, have been hydrothermally altered and mineralized along with adjacent sedimentary rocks, younger than the granite. The alteration clearly is later than thrusting; such alteration suggests even more strongly the
presence of a still-buried Tertiary granitic intrusive. The close association of hydrothermally altered granite and sedimentary rocks with the ore-bearing veins of the Junction district strongly indicates the hydrothermal alteration is related to that mineralization. In addition, the pervasively altered granite in the Kimmel mine includes disseminated galena, apparently introduced during the alteration. For these reasons, alteration and mineralization in the Junction district are thought to be related to a buried granitic intrusive of Tertiary age, like the stocks in the central Lemhi Range.

HISTORY OF THE LEADVILLE AREA MINES

LEADVILLE MINE

The Leadville Mine was discovered in 1904, but development did not begin immediately. Umpleby (1913, p. 115-118) described the property and its geology in 1910 and 1911:

The Leadville mine is situated in the southeastern part of Lemhi County, 3 miles northeast from Junction and about half a mile from the Gilmore & Pittsburgh Railroad, on the margin of the valley flat traversed by that line. The property was located in June, 1904 [see Figure 7], but active development did not commence until a later year. Ore shipments, which continued regularly until the summer of 1911, began in February, 1908. In the early summer of 1911 there was a change of management and the period since has been principally spent in development.

The property is developed by two tunnels and a shaft which reaches levels intermediate between them. The upper tunnel is 500 feet long, starting from a point above the shaft. The lower tunnel enters the hill near the level of the valley flat reaching the vein 876 feet from the portal and at a depth of the lode of 510 feet. The main opening at present is a single compartment shaft with drifts totaling 900 feet on the 65 and 110 foot levels.

Since 1908 the property has produced about $75,000 in lead and silver bullion.

The country rock of the Leadville group comprises both later Paleozoic sedimentary rocks and Miocene lake beds. The older rocks consist of limestones, quartzites, and quartzitic slates which strike N. 70°-80° E. and dip 35° SE., thus corresponding in attitude to the veins. Overlying these unconformably are the lake beds which occupy the broad valley of the Lemhi River; they are composed of detrital material largely from the hills adjacent. As exposed at the surface and within the mine the contact between them and the older rocks is a fault plane. (See fig. 17 [Figure 8]). That the fault occurs near the margin of the lake in which the younger beds were deposited is clearly shown by a section along the lower tunnel of the Leadville mine. In the outer part the material is well sorted and stratified, but within the last 200 feet near the fault it grades into heterogeneously arranged and poorly sorted fragments, indicative of a talus-like accumulation near the margin of the lake. Throughout, the material is firmly cemented and presents little evidence of disturbance since its original deposition.

General quiescence since their formation is recorded in the slightly fractured condition of the ore bodies, although the limestone in which they occur is extremely crushed for a few feet next to the fault. As the gouge next [to] the lake beds contains fragments of ore and the principal brecciation of the limestone seems to be older than the ore, it is thought there have been two periods of movement along the vein fissure, one prior to the ore deposition and the other comparatively recent.

A single granite porphyry dike was noted, which cuts the older series and is about parallel with it in strike but stands more nearly vertical; others doubtless occur.

The Leadville deposits contain lead-silver ore, remarkably free from other metals. They occur as replacements in limestone along the footwall of an old fault, the hanging wall of which has moved down relatively, bringing Miocene sediments into juxtaposition with the ores. The thin seam of red clayey gouge accompanying the recent movement contains fragments of galena, especially in sections opposite to and below ore bodies, and although they are in few places sufficiently numerous to constitute an ore, their presence is considered indicative of an ore body adjacent to and up the fault from the place where they are found. In general the replacement bodies are tabular in outline and closely parallel to the fault plane with which they are in many places in contact.
Figure 7. Claim map showing properties staked as of 1910 (Umpleby, 1913, Plate XVI).
Figure 8. Transverse section through Leadville Mine, Junction district, showing geologic relations of the ore body. Diagrammatic in part (Umpleby, 1913, Figure 17).
Two ore shoots, separated by about 40 feet of barren crushed limestone, are recognized in the mine. The shoots are respectively 180 and 110 feet long on the 110-foot level and 80 and 60 feet long on the 65-foot level, the larger body being the western or No. 1 shoot. Both reach to the upper tunnel level. In No. 1 the ore ranges from 2 inches to 2 feet in width, and in No. 2 it ranges from scattered crystals up to 4 feet of galena. No. 2 shoot differs from No. 1 in being more oxidized, containing less lead, silver, and iron, and having an appreciable amount of antimony, arsenic, and bismuth. Even here, however, oxidation is inconspicuous.

Mineralogically the ore is predominantly fine-grained galena (steel galena), with pyrite not uncommon and sphalerite and chalcopyrite very rare. The mineralogic form of the antimony, arsenic, and bismuth is not known, although they may very well be constituents either of lead or of silver minerals. Limited amounts of cerusite, anglesite, and limonite occur in the deposits. Analyses of the ore from the two stopes appear on page 65 [page xx].

The better-grade ore gives a gross return of $50 to $65 a ton.

In 1905, the IMIR (p. 93-94) noted that reports from the Junction district indicated that “rich discoveries” had been made late the preceding fall. The Inspector of Mines predicted that “bonanza [ore] bodies” would be discovered in the area after more extensive exploration had been done. By the following year, he was actively promoting the mine (1906 IMIR, p. 103-104):

This interesting property is situated down the Lemhi Valley twenty-five miles northwest of the Gilmore mine and three mines [miles] northeast of the Junction postoffice. It has a fine ore showing at present development, is in a very promising district that carries some high grade copper as well as lead ores and is noted for good precious values combined with the smelting minerals.

The Leadville mine is owned by an incorporated company known as the Junction Mines Company, of which Mr. A. J. McNab of Salmon is president, Mr. John H. Padgham secretary, and Mr. J. E. Boss manager. [See Table 2 for a listing of the companies and individuals operating at the mine.] Five men are employed, and the total development is three hundred eighty four feet, most of which was done during the past year.

The property carries a strong contact fissure in lime and porphyry containing a handsome ore shoot of considerable length of high grade silver ore consisting of clean galena and lead carbonate mineral several feet wide in places. Drifting is being continued on the vein and from recent reports is showing evidence of encountering a second ore shoot, and the prospect of the property entering the shipping list during the coming year is very flattering.

Operating costs at this point are as follows: Mine timbers, two and one-half cents per foot; lumber sixteen dollars per thousand; sinking cost is given at fifteen dollars per foot, and drifting at $5.50 per foot. Wages paid miners is $3.50, and laborers $3.00 per day of eight hours. Mr. D. C. Reed is superintendent in charge of the work.

See Table 3 for annual development work and men employed and Table 4 for cumulative development at the property.

By 1907, the mine was developed to a depth of 121 feet, with a total of 1,000 feet of drifts (USBM). The first shipment of ore made from the mine contained 56 percent of lead, 15 ounces of silver, and $2 in gold per ton (at a gold price of $20.67 per ounce). The IMIR (1907, p. 124-126) described the work at the mine as follows:

The Leadville mine is situated at the foot of the range within a few hundred feet of the edge of the Lemhi valley at an elevation of 6,300 feet above sea level. It has been developed through a vertical shaft 117 feet deep, from which 2 levels have been run that are connected with an upraise to an adit level started on the vein at the surface a short distance west of the shaft. These levels are 225 feet and 275 feet long, respectively. They disclose one clearly defined vein wall selvage of red clay, from an inch to a foot or more thick, and the immediate hanging wall above the clay band through most of the development is a glacial or
Table 2. Companies and individuals operating at the Leadville 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>original locator</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1904.1</td>
</tr>
<tr>
<td>Junction Mines Company</td>
<td>A. J. McNab, president</td>
<td>August 8, 1905</td>
<td>Nov. 30, 1936</td>
<td>1905-1917</td>
</tr>
<tr>
<td>Sunset Mining Company</td>
<td>N.G. Morgan, president</td>
<td>Feb. 24, 1917</td>
<td>Dec. 1, 1922</td>
<td>1916-1922</td>
</tr>
<tr>
<td>International Engineering &amp; Finance Corporation</td>
<td>1</td>
<td>June 18, 1924</td>
<td>Nov. 30, 1926</td>
<td>1924-1926</td>
</tr>
<tr>
<td>Leadore Mines Company2</td>
<td>Dr. Oscar Stenberg, president</td>
<td>June 2, 1924</td>
<td>Nov. 30, 1926</td>
<td>1924-1926</td>
</tr>
<tr>
<td>unknown</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1934-1949</td>
</tr>
<tr>
<td>Ralph Geumlek, Alton L. Collins, John Magney</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Lessees</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1955-1965</td>
</tr>
<tr>
<td>Robert Detton and Son (owners)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>(1965)</td>
</tr>
<tr>
<td>Jon W. Farrell (option)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>(1965)</td>
</tr>
<tr>
<td>Superior Oil Company, Minerals Division (exploration)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1965-1970</td>
</tr>
</tbody>
</table>

1Information not in Idaho Geological Survey's files.  
2Leadville and Kimmel Groups.

lacustereine drift of lime pebbles, which seems to have replaced the original limestone hanging wall through erosion down to the ore body, and this erosion has probably wasted a large area of the upper horizons of the vein.]

The width of the vein, or the true nature of the deposit, is not as yet determined, and it looks as if the body of blue limestone under the clay with its accompanying beds of altered gray, ashly lime gangue carbonate and gaelna [galena] ore, for a width of 80 feet, constitutes a great lode more or less impregnated with lead-silver values through its whole width; at least as far as it has been crosscut good lead values have been found for a distance of 30 feet under the hanging wall clay bands, and it is possible that the handsome showing of rich mineral, now in sight are diagonal cross courses originating at the underlying quartz-porphery contact where
Table 3. Development work, number of men employed, and operating companies at the Leadville Mine, by year.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Men employed</th>
<th>Tunnels (feet)</th>
<th>Sinking (feet)</th>
<th>Cross-cutting (feet)</th>
<th>Drifting (feet)</th>
<th>Raising (feet)</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>1</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Junction Mines Company</td>
</tr>
<tr>
<td>1907</td>
<td>1</td>
<td>3</td>
<td>117&lt;sup&gt;4&lt;/sup&gt;</td>
<td>—</td>
<td>620&lt;sup&gt;4&lt;/sup&gt;</td>
<td>—</td>
<td>Junction Mines Company</td>
</tr>
<tr>
<td>1913</td>
<td>5</td>
<td>8</td>
<td>—</td>
<td>50&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>Junction Mines Company</td>
</tr>
<tr>
<td>1914</td>
<td>6</td>
<td>6</td>
<td>220&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Junction Mines Company</td>
</tr>
<tr>
<td>1915</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>50&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>Junction Mines Company</td>
</tr>
<tr>
<td>1917</td>
<td>23</td>
<td>702&lt;sup&gt;2&lt;/sup&gt;</td>
<td>277&lt;sup&gt;7&lt;/sup&gt;</td>
<td>13&lt;sup&gt;6&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>Sunset Mining Company</td>
</tr>
<tr>
<td>1925</td>
<td>2</td>
<td>2</td>
<td>177</td>
<td>—</td>
<td>60</td>
<td>—</td>
<td>Leadore Mines Company</td>
</tr>
<tr>
<td>1929</td>
<td>2&lt;sup&gt;8&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>Idaho Premier Mines Corp.</td>
</tr>
<tr>
<td>1950</td>
<td>3&lt;sup&gt;9&lt;/sup&gt;</td>
<td>—</td>
<td>—</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>East Lemihi Mining Company</td>
</tr>
</tbody>
</table>

<sup>1</sup>Information taken from IMIR and USGS or USBM Yearbooks.
<sup>2</sup>Number is for total development for the year.
<sup>3</sup>Number of men employed was not reported to the Idaho Inspector of Mines.
<sup>4</sup>Estimated from the best available data.
<sup>5</sup>Work was performed by lessees.
<sup>6</sup>Number is combined total for crosscutting and drifting.
<sup>7</sup>Number is combined total for sinking and raising.
<sup>8</sup>Only assessment work was done during the year.
<sup>9</sup>Work during the year also included 200 feet of surface cuts.

still larger ore bodies may be disclosed. This feature is a matter to be determined. The virtue of the property in its present state of development rests in the fine ore shoot exposed in all the openings of the mine, that is 150 feet in length, carrying a pay streak of clean galena ore from a few inches to 2 feet in thickness. Immediately under the red clay hanging wall and next to this rich pay streak there is an accompanying course of soft altered gray lime, richly saturated with lead carbonate ore for a width of 4 to 6 feet, which shades into the harder blue lime and shows bunches of rich carbonate mineral for a distance of 30 feet away from the pay streak towards the footwall.

In addition to this handsome shoot of ore, which is proven to the surface by the 3 levels, an additional shoot further east near the end of the drifts is 40 feet long by 1 to 5 feet thick, with a stronger development of rich sulphide mineral.

At the collar of the shaft, at the time of my recent visit to this property, there was 200 tons of high grade mineral piled up ready for shipment, and a carload had already been sent out.

This consisted of separate piles of massive, black steel galena, and clean, high grade gray carbonate of lead of a sandy nature, with a pronounced yellowish stain, due to antimony or lead oxide. I have since learned that the property has marketed 260 tons of ore all told that has yielded an average value of 56 per cent lead and 45 ounces silver and $2.00 gold per ton.
Table 4. Cumulative development at the Leadville Mine, by year. Information is from company reports to Idaho Inspector of Mines; discrepancies in numbers reflect inconsistencies in the original data.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Development (ft)</th>
<th>No. of Tunnels</th>
<th>Total Length of Tunnels, Crosscuts, and Drifts (ft)</th>
<th>No. of Shafts</th>
<th>Total Length of Shafts (ft)</th>
<th>No. of Raises</th>
<th>Total Length of Raises (ft)</th>
<th>No. of Cross-cuts</th>
<th>No. of Drifts</th>
<th>Length of Principal Tunnels (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. 1     No. 2     No. 3     No. 4     No. 5</td>
</tr>
<tr>
<td>1906</td>
<td>380</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>500       876       —         —         —</td>
</tr>
<tr>
<td>1907</td>
<td>—</td>
<td>1</td>
<td>2</td>
<td>117</td>
<td>1</td>
<td>—</td>
<td>2</td>
<td>527</td>
<td>225</td>
<td>253       275       —         —         —</td>
</tr>
<tr>
<td>1913</td>
<td>2,280</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—         —         —         —         —</td>
</tr>
<tr>
<td>1914</td>
<td>303</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—         —         —         —         —</td>
</tr>
<tr>
<td>1917</td>
<td>5,328</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—         —         —         —         —</td>
</tr>
<tr>
<td>1924</td>
<td>6,500</td>
<td>3</td>
<td>4,816</td>
<td>398</td>
<td>12</td>
<td>527</td>
<td>14</td>
<td>7</td>
<td>391</td>
<td>1,427     575       —         —         —</td>
</tr>
<tr>
<td>1925</td>
<td>7,000</td>
<td>3</td>
<td>3,150</td>
<td>460</td>
<td>5</td>
<td>500</td>
<td>7</td>
<td>8</td>
<td>500</td>
<td>350       2,300     —         —         —</td>
</tr>
<tr>
<td>1928</td>
<td>5,000</td>
<td>3</td>
<td>—</td>
<td>2</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>500</td>
<td>—         —         —         —         —</td>
</tr>
<tr>
<td>1929</td>
<td>6,500</td>
<td>2</td>
<td>1,780</td>
<td>310</td>
<td>1</td>
<td>410</td>
<td>2</td>
<td>3</td>
<td>850</td>
<td>400       —         —         —         —</td>
</tr>
<tr>
<td>1930</td>
<td>6,500</td>
<td>3</td>
<td>—</td>
<td>2</td>
<td>—</td>
<td>3</td>
<td>—</td>
<td>—</td>
<td>87</td>
<td>378       145       —         —         —</td>
</tr>
<tr>
<td>1931</td>
<td>6,500</td>
<td>2</td>
<td>—</td>
<td>2,700*</td>
<td>10</td>
<td>—</td>
<td>7</td>
<td>12</td>
<td>876</td>
<td>900       1,500     500       —         —</td>
</tr>
<tr>
<td>1933</td>
<td>6,500</td>
<td>2</td>
<td>6,500</td>
<td>200</td>
<td>10</td>
<td>—</td>
<td>4</td>
<td>12</td>
<td>876</td>
<td>900       1,500     500       2,700     —</td>
</tr>
<tr>
<td>1934</td>
<td>2</td>
<td>2</td>
<td>—</td>
<td>—</td>
<td>10</td>
<td>—</td>
<td>7</td>
<td>12</td>
<td>876</td>
<td>900       1,500     500       —         —</td>
</tr>
<tr>
<td>1950</td>
<td>4,200</td>
<td>2</td>
<td>900</td>
<td>900</td>
<td>3</td>
<td>400</td>
<td>3</td>
<td>3</td>
<td>500</td>
<td>2,300     —         —         —         —</td>
</tr>
<tr>
<td>1951</td>
<td>4,650</td>
<td>2</td>
<td>3,500</td>
<td>1,150</td>
<td>2</td>
<td>—</td>
<td>3</td>
<td>3</td>
<td>600</td>
<td>2,000     —         —         —         —</td>
</tr>
<tr>
<td>1952</td>
<td>1,800</td>
<td>2</td>
<td>1,300</td>
<td>—</td>
<td>—</td>
<td>500*</td>
<td>1</td>
<td>2</td>
<td>900</td>
<td>200       —         —         —         —</td>
</tr>
</tbody>
</table>

1^1
2^2
3^3
4^4
5^5
6^6
7^7
8^8
9^9
10^10
11^11
12^12
13^13
14^14
Table 4 (continued). Cumulative development at the Leadville Mine, by year.

1Information taken from IMIR. Not all categories of information were present.
2Information not reported to Idaho Inspector of Mines.
3Internal levels.
4The mine had two vertical shafts (a 218-foot two-compartment shaft and a 60 foot shaft) and a 1202-feet inclined shaft that gained a vertical depth of 72.2 feet.
5Kimmel adit.
6The workings also included 3,150 feet of tunnels, crosscuts, and drifts; and 3,000 feet of intermediate drifts, crosscuts, and stopes. The mine had 4 vertical shafts with an aggregate depth of 350 feet, and 1 winze 110 feet.
7The mine had two two-compartment shafts, one a 200-foot deep vertical shaft, and an one inclined shaft 110 feet long.
8The mine had two two-compartment shafts. The vertical shaft was 90 feet deep and the inclined shaft was 110 feet long.
9The company reported two vertical shafts, with a depth of 110 feet; and 1 inclined shaft with a length of 100 feet and a vertical depth of 100 feet. All shafts were reported to be single compartment.
10Combined length of shafts and raises.
11The principal vertical shaft was 450 feet deep. The principal inclined shaft was 550 feet long and gained a vertical depth of approximately 450 feet.
12The principal vertical shaft was 500 feet deep. The principal inclined shaft was 200 feet long and gained a vertical depth of 300 feet. [Author’s note: these numbers are probably reversed. The other possibility is that the length of the shaft is incorrect.]
13The company’s holdings decreased from twenty-seven claims in 1951 to nineteen claims in 1952.
14The principal inclined shaft was 500 feet long and gained a vertical depth of 400 feet.
15Although the company reported this length as being the total for the raises in the mine, it probably was intended to be the length of the shafts.
The shape of the ore bodies in this deposit and their apparent inclination to make away from the hanging wall to the underlying porphyry contact, presents an interesting problem of its future possibilities.

The formation underlying the limestone bed in which the ore occurs is a wide sheet of quartz-porphyry probably 300 feet thick, and at the contact of the porphyry and lime the surface indications, including rich mineral stain and croppings of iron oxide together with some rich lead mineral on this same group, are such as to warrant the anticipation of this lower contact being as important a source of ore bodies as the vein now opened, and probably more so.

The ore deposits, so far disclosed, as well as their enclosing formations, seem to promise to follow the habit and shape of the famous flat lying chambers and shoots of rich mineral mined in the Leadville district of Colorado, and it is not unlikely that under the flat, valley surface the light dip of the vein now disclosed will be still more modified, and very important pools or irregular shaped bodies of rich ore discovered, and as an evidence that this is not a far-fetched suggestion, I would call attention to the great body of high grade sand carbonate ore mined in the Viola, in the same rock series, which was big and rich in lead and similar in shape and action to several of the noted ore bodies for which the Leadville district was famous, and gave Idaho its first eminence as a lead producing State.

In 1908, the company concentrated their work on drifting and raising. A lower tunnel was started from creek level, and operations from the vertical shaft were discontinued. A shipment of rich lead-silver ore was sent to Carnegie, Pennsylvania (near Pittsburg), according to the USBM. An alternate report (Burton, 1917) stated the first ore shipped from the property was hauled by teams to Red Rock, Montana, then carried by the Oregon Short Line to Salt Lake City in 1908. The Gilmore and Pittsburg Railroad reached a point near Junction by December 1909 and was to cross the property just below the dump of the lower tunnel. The railroad was reached Salmon and began operations in 1910.

The mine operated all year in 1910, producing silver-lead ore. The mine also shipped ore the following year. Of the mine’s operations, the 1911 IMIR (p. 86) noted:

Three miles east of Leadore the so-called Leadville contact, consisting of a flat dipping junction of ore bearing blue limestone and quartz porphyry, can be followed along the range for several miles and contains a succession of handsome lead-silver and copper bearing mines and prospects. The important development on this contact is that of the Junction Mines Company, which has an ore deposit opened by a surface adit, a vertical shaft 300 feet deep, and a long cross-cut tunnel, from which about 20 cars of lead-silver ore have been shipped, containing 20 to 50 per cent lead, with about an ounce of silver to each unit of lead and important associated value in gold. This property has in sight at this time an estimated resource of 100 carloads of carbonate ore containing about 20 per cent lead values with the same ratio of silver as previously mentioned. It has recently been leased to some Salt Lake operators and is likely to be heard from as a steady and substantial shipper during the present year.

In 1912, the Leadville Mine was the largest producer in the district. The mine shipped 16 carloads of ore carrying an average value of about 30 per cent lead and 20 ounces of silver per ton. The 1912 IMIR noted that internal dissension among the stockholders had interfered with systematic development of the mine. Several cars of lead ore were shipped from the Leadville in 1913. (See Table 5 for economic data on production from the mine.) The mine hoist was powered by a horse on a whim, and the company’s report to the Idaho Mine Inspector noted that the company was in debt. The miners were paid $3.50 a day. A shipment was also made in 1914, and the company’s annual report to the Idaho Mine Inspector stated the mine was ready for continuous production and development. However, the mine closed at the end of May 1914 and was idle except for assessment work for the next three years.
Table 5. Mine output and economic data for the Leadville Mine for selected years, 1913-1917.

<table>
<thead>
<tr>
<th>Year</th>
<th>Ore produced (tons)</th>
<th>Total mining cost per ton</th>
<th>Ore shipped during year (tons)</th>
<th>Concentrate shipped during year (tons)</th>
<th>Average value per ton</th>
<th>Cost of local treatment per ton</th>
<th>Percentage of recovery</th>
<th>Transport and treatment costs per ton</th>
<th>Silver recovered (ounces)</th>
<th>Lead recovered (pounds)</th>
<th>Gross returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913</td>
<td>447</td>
<td>$5.00</td>
<td>401</td>
<td>—</td>
<td>$30.45</td>
<td>—</td>
<td>—</td>
<td>$6.10</td>
<td>9,699</td>
<td>263,046</td>
<td>$9,257.08</td>
</tr>
<tr>
<td>1914</td>
<td>2</td>
<td>$5.50</td>
<td>291.98</td>
<td>—</td>
<td>$23.98</td>
<td>—</td>
<td>—</td>
<td>$7.35</td>
<td>6,074</td>
<td>170,660</td>
<td>$6,985.61</td>
</tr>
<tr>
<td>1917</td>
<td>1,200</td>
<td>$8.05</td>
<td>1,359.2</td>
<td>—</td>
<td>$22.62</td>
<td>—</td>
<td>—</td>
<td>$14.62</td>
<td>11,355.57</td>
<td>331,100</td>
<td>$30,745.10</td>
</tr>
</tbody>
</table>

1 The company did not receive the returns for the last shipment made during the year in time to report them to the Idaho Mine Inspector.
2 Amount of ore produced was not reported.
3 Junction Mines Company reported the amount of ore produced; the rest of the data is from Sunset Mining Company.
Sunset Mining Company leased the mine in 1916 and reopened it. Burton (1917, p. 3-4) described the mine workings in late 1916 or early 1917:

The portal of the main working tunnel of this group is situated a short distance to the East of Canyon Creek, on the Westerly side of the Leadville group, at an elevation of 6,300 ft. above sea level. The tunnel has been driven in a Northerly direction 870 ft. from the portal, to where it cut the vein, and then in the same direction 21.4 ft., passing through the vein and into the foot wall.

At the point where the tunnel intersects the vein, the drift has been extended in a northeasterly direction along the vein for a distance of 326.7 ft. to the face. That was in January 1912, but I understand that since that time the drift has been continued in the same N. E. Course for a distance of 225 ft. or in all 561.7 ft., and that an upraise has been made on the vein at an angle of 39º for 226 ft., in order to connect with the old winze, passing down on the vein from the 3" level at Station 25 to Station 26. This drift on the main tunnel level opens up the vein at a depth of 520 ft. from its apex and shows the same characteristics as in the vein on the upper levels.

Level No. 3, which opens up the vein for 426 ft. to the N. E. of the old shaft, is 226 ft., measured on the dip of the vein above the main working tunnel.

At station 25 on this level No. 3, a drift has been run northerly for a distance of 145 ft. The first 30 ft. of this drift shows good values in galena ore in the limestone and away from the foot wall of the main vein. The face of this drift is in crushed quartzite and porphyry carrying iron.

Level No. 2 runs on the vein for 378 ft. to the N. W. of the old shaft and is 370 feet measured on the dip of the vein above the main tunnel.

Level No. 1, or the Adit tunnel, is driven 371 ft. to the N. E. along the vein, and at a point 40 feet to the S.W. of the face, a vertical shaft has been pushed up to the surface a distance of 60 feet. This insures good ventilation through the mine.

A vertical shaft connects the surface with levels No. 2 and No. 3, extending 102 ft. vertically below No. 3.

From the collar to Level No. 2 is 64.5 ft. and from Level No. 2 to Level No. 3 is 51.7 ft., making the total depth of the shaft 218.2 ft.

Levels No. 1, No. 2, and No. 3 are also connected by winzes or raises on the vein, from which over $75,000 in silver-lead ore has been stoped. At the time of my visit to the property, however, there was considerable ore left in and above all levels.

About 200 ft. to the northeast of the face of Level No. 1, high-grade galena was shipped from the surface, this and the fact that the vein outcrop is easily traced over the surface, indicate the continuance of the mine to the northeast. The drifts should be carried along the vein in that direction, and winzes sunk on the dip of the vein.

Immense bodies of low-grade ore have been left in the stopes, only the rich ore having been shipped.

Sunset made its first shipment the following year. According to the 1917 IMIR (p. 45-46):

Twenty miles north of Gilmore, at the Junction of the Gilmore & Pittsburg Railway at Leadore, the Sunset Mining Company, a new corporation, took over the old Leadville Mines during the year and employed a crew of 12 men in their further development, and in the shipping of residue second-class dump ore from former operations on the property. Fifty carloads were sent to market during the year, with an average of 11 per cent lead and 7 ounces silver per ton. This is one of the interesting lead-silver deposits of the State and was named originally by a former Colorado miner for its marked resemblance to the geologic conditions prevailing at the famous lead-silver camp of Leadville, Colorado.

The ore occurs at the foot of the main Rocky Mountain Range, in a flat, dipping bed of blue carboniferous limestone overlaying a thick sheet or dike of quartz porphyry. The limestone bed is, in turn, overlaid with fine, pebbly, tertiary, lake bed gravels. These partially consolidated gravels are separated from the ore-bearing horizons by a thick,
leathery, red clay gouge from a few inches to a foot or more in thickness. Immediately under this gouge the best ore occurrence of the district has been found in the limestone. The property is developed to a depth of 500 feet on its flat dip through a vertical shaft and a long lower tunnel driven through the lake bed pebble conglomerate to the shaft workings. The property has shipped 40 or 50 cars from previous operations, of high grade, hand sorted galena and carbonate mineral, rich in lead and silver. A considerable residue was left in the mine of carbonate ore in the middle and upper levels of about the grade shipped from the dump operations this year.

The new owners have extended the drift east from the lower tunnel under the main ore occurrence in the levels above and have disclosed an ore shoot nearly 200 feet long, 5 to 20 feet wide, that I am advised will average 7½ per cent lead and 6 ounces silver per ton. This ore occurs in a finely brecciated phase of the limestone bed, which looks like concrete, and carries a fairly uniform dissemination of shot-like pebbles of steel galena that should afford a good concentrating mill feed. The more recent development on this ore body is an incline shaft from this lower level, now down 100 feet, in which some big bodies of brown gossen have been found in the contact, and several lenzes of the high-grade black steel galena mineral for which the upper levels were noted. The geology of this deposit is decidedly favorable for the occurrence of a profitable source of concentrating lead ore, with the prospect of a re-occurrence of the high-grade galena ore lenzes previously encountered.

Junction Mines Company sold the mine to Sunset Mining Company in 1917. In the latter part of the next year, Sunset installed a 50 tons-per-day (tpd) mill at the mine. The 1918 IMIR (p. 69) noted:

Twenty miles North of Gilmore, near Leadore, the Sunset Mining Company worked a small crew of men intermittently and shipped a number of car loads of oxidized ore carrying about eleven per cent lead and seven ounce silver per ton. The ore deposit on the property is one of the most interesting occurrences from a geological standpoint in this region and was originally known as the Leadville Mine by reason of its comparative geology to that famous district in Colorado. It consists of a contact deposit in blue carboniferous limestone underlaid with a white silicious quartz porphyry dike or sheet. The best ore occurrence has been found under a red clay fault gouge that separates the ore bearing brecciated limestone from the overlying tertiary lake bed gravels which constitute the hanging wall. The deposit has a rather flat dip, has been developed through a shaft and a long drainage tunnel at the valley level to a depth of 500 feet. The ore above the bottom level consists of an ashy grey carbonate of lead. In the lower tunnel the mineral shows a dissemination of fine grained steel galena in a decidedly brecciated lime gangue with occasional segregations of clean shipping ore. The ore body is said to contain paying values for concentration through a width of ten to twenty feet by 200 feet in length at the 500 feet level. The enterprise has previously suffered for a lack of proper financing, but now looks as if it might be made a source of profit and good, clean, shipping lead-silver concentrates with the help of an up-to-date concentrating mill in good hands, and I was advised that the Company was planning the installation of a plant in October.

Sunset operated the mine in 1919, shipping the largest quantity of ore in the mine’s history. The company also shipped concentrates from the 50-tpd mill. The 1919 IMIR (p. 58) described the year’s operations and the new mill:

A small crew of men was employed during the year at the Sunset Mine at Leadore, 20 miles north of Gilmore. This property is equipped with a simple 25-ton concentrating mill consisting essentially of a small Hardinge mill and four Wilfley tables. It shipped a number of carloads of good concentrates containing about 40 per cent lead and 30 ounces silver per ton.
The mine operated the first half of 1920, and both lead ore and concentrate were shipped. Burritt (1920, p. 5) noted the following about the ore occurrence:

Leadville Mine: The ore of this mine occurs in a faulted vein; the high grade shipped to the smelter was mined from the top of the blue limestone just under the mud or talc seam. This ore seems to be the result of replacement and impregnation in a grey limestone, the talc seam, as mentioned above forming the hanging wall. This grey limestone varies in thickness from three to seven feet. Under the higher grade ore, in the grey limestone, is found a lower grade of ore, of the class of milling ore, ranging in thickness from five to seven feet and closely associated with the blue limestone. The shoot of ore, in the Leadville mine, from which the higher grade ore was shipped, has a dip of 37 deg. S. and a range to the S. E. The ore was continuous from the point at which it was discovered near the surface, to the main tunnel level, a distance of about 600 feet; and in a winze on the main tunnel level, to a depth of 100 feet, the ore continues. From the bottom of the winze to the surface, a distance of 600 feet, and of 200 feet in depth, will fairly well represent the known limits of the ore deposit. The most of the high grade ore in this block has been taken out, leaving from 4 to 7 feet of lower grade or milling ore. All of the ore as described is above the blue limestone which is about 100 feet in thickness. A crosscut, driven to the north from the main tunnel level has been extended through the lime and about 20 feet into the quartz porphyry. This quartz porphyry shows a disseminated silver-lead ore which is entirely different in character from that lying between the talc seam and the blue lime.

Burritt (1920, p. 9) described the dumps on the property in mid-1920:

There is [a] tailings dump at the mill, containing approximately 2000 tons of material. Six assay samples, so taken as to give what was intended for a fair average of the dump, gave an average of Silver 1.34 ounces, Lead 2.25 per cent. This dump will pay to work over through a modern plant of capacity.

A dump of milling ore upon the Leadville mine approximates 4000 tons. Some of this ore has been milled with satisfactory results. The whole dump will make good milling ore when run through your modern plant.

Hershey (1920, p. 3-4) visited the mine in the middle of the year and made the following observations:

The Sunset [Leadville] mine, Mr. Hulsman superintendent, adjoins the Kimmel on the east and has been worked for about 15 years. The lower tunnel goes about 900 feet through detrital slope material to the limestone. A drift runs eastward along the strong fault gouge for about 1000 feet. The limestone immediately under the gouge is much crushed in a zone 2 to 20 feet thick. Usually this is barren of galena, but in a section 200 to 300 feet long small irregular seams and pockets of fine-grained galena are scattered through the crushed zone. This material has been extensively stoped in irregular chambers. Some high-grade pockets have been stoped and shipped, but most of the ore has been milled, grade and production unknown. The deposit has been mined to the surface, about 340 feet on the dip of about 40º, but as it approached the surface it became confined to a narrow streak of relatively high-grade ore in the first 2 to 3 feet immediately under the gouge. In other words, with depth it is becoming dissipated in a larger body of crushed limestone. A winze goes down 100 feet from the lower tunnel, along the fault gouge, and is said to reveal galena at the bottom. I saw some small seams about half way down.

The deposit is clearly related to the fault, being confined to a crushed zone that accompanies the fault gouge from the surface to a depth on the dip of about 440 feet. I suspect that it has been deposited by descending water and that it may not go much deeper than it has been exposed. Similar deposits may occur elsewhere along the fault. In the Sunset mine several cross-cuts penetrate the igneous rock and show pyrite with
The mine was idle for all of 1921, but produced several lots of first-class lead ore in 1922 and 1923.

In 1924, Leadore Mines Company assumed control of the property, leasing it from the International Engineering & Finance Corporation for 12.5 percent of the net smelter returns. Leadore Mines also controlled the adjoining Kimmel Mine, and the two properties were operated as a unit after this. Plans were announced to expand the mill to a 100-tpd plant, but the company does not appear to have raised the funds to do this work. Mill equipment in 1924 consisted of a 7x10\textsuperscript{2} Blake crusher, a 4½x13\textsuperscript{3} Hardinge mill, and four Wilfley tables. The mine had a 5½x5\textsuperscript{4} Anaconda prospecting hoist, a Curtis Model A 10x10\textsuperscript{5} duplex compressor, two engines, and one blower. The company reported it had a large quantity of low-grade lead ore. The mine had approximately 6,500 feet of workings on forty-nine claims.

The mine was idle for the next two years, and in 1926, the mine’s creditors attached the property. Idaho Premier Mines Corporation was organized in 1927 and took over the mine. The new company noted that the mill was “antiquated” and announced plans the following year to install a 250-tpd flotation mill. However, Idaho Premier did little more than assessment work on the Leadville claims for the next several years, although a shipment of ore was made from the Kimmel in 1929. An unsuccessful attempt to raise funds to modernize the mill and make other needed improvements was made in early 1931. After 1934, the company ceased to file reports with the Idaho Mine Inspector.

The next information about the mine appeared in 1950 (IGS mineral property files). East Lemhi Mining Company held the property under lease and option from Ralph Geumlek of Salt Lake City, Utah, and Alton L. Collins of Portland, Oregon. During the year, the company cleaned out 500 feet of tunnels and installed pipe and rails. Work also included 20 feet of drifting and 200 feet of exploration bulldozer cuts. The shop building was repaired, but the rest of the buildings were in poor condition. In 1951, East Lemhi Mining leased an additional sixteen claims from John Magney of Spokane, Washington. During 1950 and 1951, the company attempted to raise money to buy new equipment and expand operations, but met with little success. By 1952, the mine was again idle.

Lessees operated the mine in 1953. In 1954, John Lindskog operated the mine and produced a small quantity of lead concentrate (USBM). Between 1954 and 1964, “a few under-financed attempts by lessees to reactivate the various mines” were made, but the low grade nature of the deposits discouraged these attempts (Melbye, 1964, p. 2).

In the spring and summer of 1964, Charles E. Melbye and Associates was hired to conduct an exploration and sampling program. The work included geologic mapping, surface geochemical sampling, underground sampling, bulldozer cuts, and drilling

\begin{footnotesize}
\begin{enumerate}
    \item The Bunker Hill Company.
    \item The gape of the crusher's jaws, in inches.
    \item The diameter and the length of the mill, in feet.
    \item The diameter of the cylinder and the length of the stroke, in inches, of the piston in the hoist.
    \item The numbers refer to the diameter of the cylinder and the length of the piston’s stroke, in inches.
\end{enumerate}
\end{footnotesize}
The claims over the old Leadville Mine were restaked as the “Leadhill Group” some time before this, and Melbye’s report uses “Leadhill” instead of “Leadville” for the old Leadville workings.

The overall conclusions of this program were as follows (Melbye, 1964, p. 4):

The geochemical overlay map [not included] illustrates the very striking geochemical high extending for about 6000 feet from the Baby Joe Mine to Italian Canyon. From 100 ppm Pb on up, the gradient is very steep and this is considered to be the edge of the anomaly. Background seems to be about 15 ppm Pb. Within this 6000-foot E-W anomaly are three +1000 ppm Pb area[s], one each over the Baby Joe, Kimmel, and Leadhill* workings. The Baby Joe +1000 anomaly is the largest, as it is 1200 feet long. The substantial size of these anomalies played a major role in determining the advisability of a drilling program.

Melbye (1964, p. 5-6) reported the following results for the Leadville section of the property:

The only underground sampling data available is that at the end of the Union tunnel [see Figure 11]. Average of 8 samples along the drift, representing about a 40-foot width at right angles to the mineralized zone, is 2.3 oz Ag and 3.82% Pb. Average of these plus 4 additional samples to the south in the tunnel is 1.6 oz Ag and 2.79% Pb. Width of this entire zone is about 100 feet. Practically no exploration of this zone was done at this depth since it is below the water table and not amenable to rotary air drilling. Correlation with the ore in the Kimmel adit is probable, but angle drilling will be necessary to verify this. The vertical distance between is about 200 feet, thereby furnishing an ample exploration target.

Hole #5, drilled about 50 feet north of the Leadhill stope, was the best of the entire program. The extension of the previously mined Leadhill orebody was cut from 10" - 15", which assayed 3.8 oz Ag and 10.42% Pb. However, a wide zone below this showed substantial mineralization, and a total width of 65 feet averaged 1.78 oz Ag and 4.22% Pb. The silver:lead ratio was low, indicating oxidation and leaching of some silver values in this near-surface interval. Hole #11 limits this potential ore zone to the east, as it is located 110 feet east of the Leadhill stope. The near-surface interval[s] all run less than 1 oz Ag and 1% Pb, but a 5-foot width from 160'-165' assayed 3.04 oz Ag and 2.68% Pb. In summation, a possible open-pit type of orebody is indicated in the vicinity of the Leadhill mine and below the old stope which averaged only 3' - 4' wide. This area is roughly 400 feet wide.

An additional drilling program in the spring of 1965 defined an orebody measuring 400 feet long and 200 feet wide, if the proposed open pit was 150 feet deep. The cutoff grade for this ore was 1 ounce per ton silver and 1 percent lead, giving reserves of 328,000 tons. Additional ore was reachable from the Union Tunnel, and substantial reserves were indicated at the Kimmel Mine (Melbye, 1965). Between 1965 and 1970, the mine was examined by the Minerals Division of Superior Oil Company. However, the company was unable to negotiate a satisfactory deal with the property owners, and consequently Superior abandoned its interest in the property late in 1970 (Lasmanis, 1970). Recent photographs (Figure 12) show an open pit in the area where the Leadville shaft was located, but it is not certain when this work was done.

**KIMMEL MINE**

The Kimmel Mine is just west of the Leadville Mine (Figure 2). Serious work began at the mine around 1918, although the mine’s disseminated ore had been documented by 1913. The ore is located in the Kimmel adit, which extends for about 600 feet from the surface. The adit was mined up to 100 feet in width, and the orebody is estimated to be about 200 feet long. The ore is a disseminated type, with an average grade of 4.5 oz Ag and 1.2% Pb. The adit is accessible by means of an elevator shaft, and the mine was in operation until 1924. The Kimmel Mine was worked for a total of about 50,000 tons of ore, with a silver:lead ratio of about 3. The orebody is located in the Kimmel adit, which extends for about 600 feet from the surface. The adit was mined up to 100 feet in width, and the orebody is estimated to be about 200 feet long. The ore is a disseminated type, with an average grade of 4.5 oz Ag and 1.2% Pb. The adit is accessible by means of an elevator shaft, and the mine was in operation until 1924. The Kimmel Mine was worked for a total of about 50,000 tons of ore, with a silver:lead ratio of about 3.

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6The claims over the old Leadville Mine were restaked as the “Leadhill Group” some time before this, and Melbye’s report uses “Leadhill” instead of “Leadville” for the old Leadville workings.
Figure 10. North-south cross-section through the Leadville shaft. For legend, see Figure 9 (Melbye, 1964).
Figure 11. Map of the Union Tunnel, Leadville Mine, Lemhi County, Idaho (Melbye, 1964).
Figure 12. Open pit at the site of the Leadville shaft and adit in July 2003 (photograph by Earl H. Bennett, Idaho Geological Survey).
recognized much earlier but not worked because of its low grade (Ruppel and Lopez, 1988). A detailed description of the geology is given in Ruppel and Lopez (1988, p. 95-96):

The Kimmel mine is in the Junction district, just west of the Leadville (Sunset) mine. It explores a deposit of lead minerals, both galena and cerussite, disseminated in granite. The granite is of early Paleozoic age and has been strongly hydrothermally altered, sericitized, and silicified, like younger Paleozoic (Mississippian) limestone that occurs both in small, faulted blocks in the granite and in adjacent fault slivers. The alteration and associated mineralization clearly are much younger than the granite. They are similar, however, to alteration and mineralization in and near the lead-silver replacement veins in the adjacent Leadville mine, a relation that suggests that they represent the same mineralizing episode, in early Tertiary time. The granite was brecciated before alteration, as a result of thrust faulting that carried it over the adjacent limestone; the scattered limestone blocks probably were incorporated in it during thrusting. It is essentially a fault breccia, probably near the base of an imbricate thrust slice that has been fragmented further by postalteration steep faulting along the range front of the Beaverhead Mountains (Ruppel, 1968). The mineralizing solutions that formed the Leadville replacement deposits seem likely also to have pervasively entered the shattered granitic rocks and to have been responsible both for the nearly complete hydrothermal alteration and for the introduction of the disseminated metallic sulfide minerals.

The shattered and hydrothermally altered granite and limestone contain disseminated fine-grained pyrite and even finer grained steel galena and secondary cerussite and limonite. Assays of channel samples (T.H. Kiilsgaard, written commun., 1970) suggest that the lead content ranges from 0.1 percent or less to as much as 5.5 percent, averaging about 1 percent. Silver is not as evenly distributed as lead, probably because of secondary alteration. Most commonly only 0.05-0.5 oz of silver per ton is present, but in a few places the silver content ranges from 1 to 3 oz per ton. Assays on sulfide concentrates (Bell, 1920, p. 61) suggest similar ore values, about 0.5-0.6 oz of silver for each 1 percent of lead, and suggest that the traces of gold also present are associated with the pyrite, because they were lost in concentrates of lead minerals alone.

Burritt (1920, p. 5) described the ore soon after the mine was opened:

Kimmel Mine: The ore found in the Kimmel mine differs somewhat from the ore of the Leadville mine. The same mud or talc seam as present in the Leadville is found in the Kimmel, but the underlying ore, in grey lime is absent, its place being occupied by a deposit of iron. This is due to the Kimmel being located upon the downthrow side of the fault which occurs between the two mines. In this faulting displacement between the two mines, the grey lime has been displaced downward upon the Kimmel side of the fault and when reached will probably be found to contain the same ore as in the Leadville mine. The dissemination of the silver-lead ore in the quartz porphyry seems to become heavier as the work is carried north. This finely grained argentiferous galena is disseminated throughout large areas of the quartz porphyries; the precipitation being heavier along some lines than along others. The assay map, plate 2 [omitted], will show the lines of greatest precipitation. I estimate that the block of ground lying between the portal of drift No. 1 to face of drift, with the exception of a few lean streaks, has sufficient values to mill at a profit. The vein along the seam will very likely develop commercial ore bodies the same as is found in the Leadville mine, but at greater depth [emphasis in original].

The 1919 IMIR (p. 58-59, 61) described the first year’s work on the mine:

Adjoining the Sunset to the west the Kimmel Mine development was the sensation of the year in Lemhi County, and presents at this time the earmarks of a big thing in lead-silver values. This property, with the adjoining Sunset Mine to the east and
the Baby Joe group to the west, which also has very considerable preliminary development and some good ore showings, is situated on what is locally known as the Leadville contact by reason of the relative age and similarity to the Leadville ore formations of Colorado. This contact is traceable along the foot of the main Rocky Mountain slope where it joins the broad, flat valley of the Lemhi River for 10 miles, with a succession of interesting surface manifestations of lead ore. . . .

The small limestone bed . . . is intensely fractured and shattered and its upper side replaced by shoots of lead carbonate and lences of clean steel galena in the Sunset Mine. In looking for a continuation of similar values on the same contact to the west, Mr. Kimmel found considerable low grade carbonate ore, but was dissatisfied with his results and penetrated the lower contact, where he found low values of lead in the porphyry. He continued his cross-cut and the values increased. This cross-cut has been extended back into the porphyry almost directly away from the underlying lime contact to the north 300 feet and from this cross-cut three diagonal cross-cuts striking northwest have been driven. These openings are in intensely shattered soft porphyry gangue carrying a very uniform dissemination of fine grained iron sulphide and still finer steel galena exhibiting a body of mineralized ground whose shape and dimensions are still undetermined but now totalling 300 feet in length with a maximum width of 180 feet. It is unlikely this great body of material will all pay to work unless its gold values help, but it is possible that the northwest half of the ground may afford paying concentrating values in clean lead-silver mineral on a big scale milling operation. There are no other minerals observable to the eye in the whole mass except steel galena and iron pyrite. A concentrate test of the combined sulphides is reported to have yielded 30 per cent lead, 20 ounces silver and $9.00 gold per ton, and on separation of the lead from the iron 60 per cent lead with 40 ounces silver and $1.50 gold. The diagonal cross-cuts show patches several feet thick of more silicious ground carrying 3 to 10 per cent lead and, while the development was too limited at the time of my visit in October to say that this is one of Idaho’s likely new bonanzas in lead-silver mineral, the showing, to say the least, has a flattering prospect to that end and a decidedly interesting new type of disseminated porphyry lead occurrence.

The Kimmel Mining Company was organized in 1920 to operate the mine. (See Table 6 for individuals and companies operating at the mine.) In 1921, the company leased the entire mill of the Sunset Mining Company, which consisted of a 4½x13 Hardinge mill and four Wilfley tables. In 1922, the mine produced several lots of first-class lead ore. The company reported to the Idaho Mines Inspector that the company had been consolidated with the Leadore Consolidated Mines Company. However, the latter company was not authorized to do business in Idaho. All three of the Leadville area mines were among the main producers in the district in 1923.

In 1924, the Kimmel and the Leadville mines were consolidated under the control of the Leadore Mines Company. In 1929, the Kimmel shipped first-class sulfide ore to a smelter, but by the following year, all mines in the district were idle. All future reports of activities at the mine were combined with those at the Leadville Mine.

**BABY JOE MINE**

The Baby Joe Mine is about 2,000 feet to the west of the Kimmel adit (Figure 2). Exactly when the mine was discovered is uncertain, but the 1911 IMIR (p. 87) noted the following about the property:

Some deep tunnel work in the Baby Joe property, immediately north of that of the Junction Mines Company, has recently struck the contact at water level and interesting results in a large body of concentrating ore of good grade are anticipated on this property with a little further development. The finding of the water level at this point
Table 6. Companies and individuals operating at the Kimmel 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>Mr. Kimmel</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1918-1</td>
</tr>
<tr>
<td>Kimmel Mining Company</td>
<td>C.W. Gray, president</td>
<td>Jan. 12, 1920</td>
<td>Dec. 1, 1922</td>
<td>1920-1922</td>
</tr>
<tr>
<td>International Engineering</td>
<td>1</td>
<td>June 18, 1924</td>
<td>Nov. 30, 1926</td>
<td>1924-1926</td>
</tr>
<tr>
<td>&amp; Finance Corporation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadore Mines Company</td>
<td>Dr. Oscar Stenberg,</td>
<td>June 2, 1924</td>
<td>Nov. 30, 1926</td>
<td>1924-1926</td>
</tr>
<tr>
<td></td>
<td>president</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ownership and activities from this point on were combined with the Leadville Mine. See Table 2.

1Information not in Idaho Geological Survey's files.
2Leadville and Kimmel Groups.

so near the carbonate ore body of the Junction Mines Company’s group, which, while it will involve some pumping costs with further depth, will practically insure desirable concentrating ore on this group, which, with the addition of milling facilities, will admit of much higher grade shipping products and consequent profits.

The property is not mentioned again until 1919, when the IMIR (1919, p. 61) for that year reported:

The Baby Joe group adjoining the Kimmel to the west has a cross-cut tunnel several hundred feet long that taps the back contact over 100 feet deep and shows stretches of ashy lime and porphyry breccia and gossen ore carrying from 3 to 10 per cent lead in places several feet wide. One hundred tons of 10 per cent ore is on the dump. From this drift a new cross-cut is now being driven into the foot wall porphyry that was 40 feet in length showed a good sprinkling of the combined disseminated galena iron mineral identical in its mode of occurrence with the showing on the adjoining Kimmel development. Situated as it is only 1,300 feet west of the Kimmel tunnel, a continuation of the porphyry ore values through the Kimmel ground and into this mine is strongly indicated.

Hershey (1920, p. 4-8) described the workings and geology of the Baby Joe in detail in a report to Stanley Easton, manager of the Bunker Hill Mining and Concentrating Company:

The main upper tunnel of the Baby Joe mine penetrates detrital slope material for 150 feet and then limestone for 80 feet. Drifts run westward and eastward along the contact with the igneous rock and expose an irregular vein of mineralized material along the contact. It is a brown, black and gray soft porous banded material that is chiefly limonite and quartzose remnants of the altered rock. It was probably formed largely on the limestone side of the contact. It contains lead carbonate or sulphate and an occasional kernel of galena. About 350 feet of driving on the vein yielded 8 or 10 tons of shipping ore. To determine what the remainder of the material carries, Mr. Gwinn took seven samples at wide intervals. They indicate that a shoot 170 feet long may average 5.95% lead and about 2 ozs. silver per ton. I was not favorably impressed with these assays.
because of the character of the vein and did not verbally recommend that the company secure an option on this property; but it now appears that it is the only thing in the district that has sufficient promise to justify your company doing any work on it.

The strongest showing of gossany material extends westward from the cross-cut 90 feet and may vary from 3 to 8 feet thick. Then a fault appears to throw the vein into the hanging [wall] and the remainder of the drift is in igneous rock and a quartzite inclusion with a little galena. Going westward from the cross-cut the gossany streak is fairly continuous for 140 feet but averages narrow. Beyond that there are only isolated bunches along the contact.

A winze 60 feet west of the crosscut is said to be 75 feet deep, with water 35 feet deep. A winze 50 feet east of the cross-cut is said to be 40 feet deep and have some water. Material on the dump said to have come from these winzes is oxidized.

At the face of the cross-cut tunnel there is a barren quartzite inclusion. In a north cross-cut 60 feet east of the tunnel cross-cut there is a quartzite inclusion that contains some scattered galena and a small seam that would be good ore if in a large body. About 220 feet east of the tunnel, a crosscut extends northeastward about 220 feet. The first 100 feet is in practically barren igneous rock with quartzite inclusions. Then there is a zone 4 feet wide in which galena is associated with several small black gouge seams in the igneous rock. The material between the black seams appears poor but must carry an oxidized lead mineral as the black seams themselves hardly account for the 4% and 5% lead assays Mr. Gwinn got from this zone. Two short drifts have been driven somewhat oblique to the zone. Neither end of the zone is in sight but it seems to me that the mineralization weakens both east and west. At any rate, I have not sufficient confidence in its persistence to recommend driving on it. The remainder of the cross-cut is in the igneous rock partly unoxidized and pyrite-bearing. Occasionally a little galena appears in it and near the face a flat seam in the floor was of good grade, but, of course, far too thin to be commercial. This cross-cut is being extended by your company in the hope of finding bands of low-grade ore like those in the Kimmel mine. I advised Mr. Gwinn to discontinue this work as soon as he can use the men in the lower tunnel. In the meantime the flat seam may lead to something encouraging, but I am skeptical.

About 135 feet lower there is a long tunnel that is being cleaned out by your men. We were able to go into this tunnel about 630 feet, to the foot of a shaft, to which point it is entirely in the detrital slope gravel. The dump indicates that it penetrates black limestone with white calcite seams and finally enters the igneous rock with a little scattered pyrite. Some pieces have irregular bunches of fine-grained pyrite. No galena was seen. I can easily understand that the tunnel may have penetrated the contact at a place where the vein is pinched or even interrupted.

I have no doubt that the large dike of altered igneous rock contains considerable galena, but it may be so scattered as nowhere to constitute orebodies large enough to be commercial. There is nothing on the surface to guide the work of exploration for these galena-bearing bodies. The best way to explore the dike would be to drill a series of diamond-drill holes through the dike, if the material would stand diamond-drilling which, however, I doubt because of the soft nature of much of it. In any case, I am too skeptical of the deposits in the dike and inclusions to recommend exploration in search of them.

That leaves but one thing on the Baby Joe property worth further consideration, namely, the vein at the limestone-igneous rock contact. The approximate apex may be traced with comparative ease across the property a distance of 2400 feet or more depending upon whether a certain apparent bend represents a fault or not; but debris usually so obscures the outcrop that only at a few places can porous limonitic material be seen. However, the igneous [sic] rock and quartzite inclusions near the contact are generally highly iron-stained, suggesting more or less continuous mineralization. What I expect is a series of mineralized lenses scattered along the contact practically all the way across the property. I have no doubt that there is sufficient mineralized material to make a mine so far as tonnage goes, but what I fear is that the mineral in the sulfide zone will be chiefly pyrite, and galena too sparse and scattered. Because of this fear I am not very enthusiastic about the proposition. At the same time I can see the possibility that the presence of much pyrite that oxidized readily may have caused the oxidation and leaching of considerable galena in the gossany material near the surface, so that there is a possibility that the sulphide may contain a higher percentage of lead than assays of the
gossany material suggest. Because of this possibility, and because if you do not work on some prospects of uncertain value, you will never get a new mine and because the existence of the lower tunnel to the contact makes it possible to test this vein at comparatively small expense, I recommend you to continue work under the option somewhat longer.

The tunnel will soon be cleaned out to the contact. My idea is that then you drive on the contact both ways. It is likely that by the time a total distance of 200 or 300 feet has been driven we will have a fair idea of the character of the sulphide ore and whether to continue further driving with a probability of success. Of course, if the vein is largely oxidized at that level it may be necessary to sink a winze on it, but I have hopes that it will be found largely sulphide.

In 1923, several lots of first-class ore were shipped from the Baby Joe. Production was also reported in 1925, as was the discovery of additional lead-silver ore. Discovery of ore was also reported for the following year. From 1921 to 1937, the IMIRs reported that the owner of the Baby Joe Group was W.F. Stone; private ownership of claims was not reported after 1937.

By the 1960s, the Baby Joe was being explored along with the Leadville and Kimmel mines. Melbye (1964) reported a large lead geochemical anomaly over the Baby Joe property, and three drill holes revealed disseminated mineralization. However, the grade was not sufficient to encourage any more exploration.
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