

History and Economic Geology of the Blackstone Mine

Another Butte in Southern Idaho?

In November 1930, Robert N. Bell, M.E., economic geologist and former Idaho Inspector of Mines, published a [research article](#) in which he described a “genetic blood relationship” or nearly identical geological characteristics between the Butte, Montana Mining District and the Blackstone Mine, located in southern Idaho’s Volcano Mining District.¹ At the time, Butte was the largest producer of copper in the world. Its total production of copper, silver, and gold would exceed \$175 billion at today’s prices.

The Butte district lies on the southwest edge of the [Boulder batholith](#), a magma chamber of about 2,200 square miles. The Blackstone and Volcano Mining District are located on the southwest edge of the [Idaho batholith](#), a magma chamber covering 15,400 square miles, roughly seven times the size of the Boulder [batholith](#). Located miles below the surface, these huge chambers are the primary source of precious metals in their respective ore bodies. Both properties feature granite formations with the same weathered and disintegrated surfaces.

Common history

The Blackstone property also shares Butte’s dominant characteristic of highly altered eruptive granite and quartz [monzonite](#) traversed by lean quartz pyrite veins of silver, gold, and copper carbonates. Other common traits include manganese [gossans](#) of silver, associated with the presence of [aplite](#), [rhyolite](#), and quartz [porphyry](#).

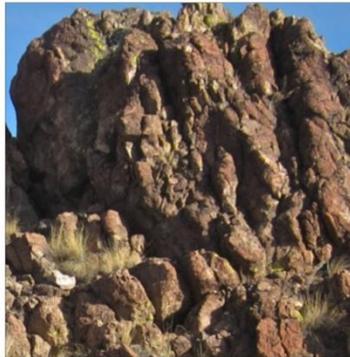
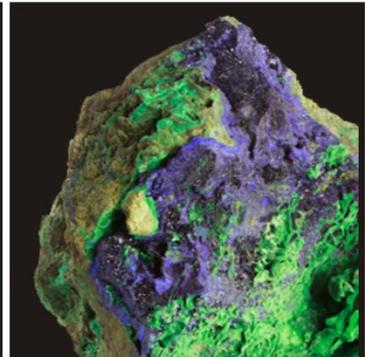
About 5,000 feet east of the Blackstone where the Volcano mineral belt intersects the floor of the Camas Prairie valley, a series of closely parallel quartz veins and mineralized porphyry [dikes](#) are exposed above the surface. A small vein mined from a 200 foot tunnel reportedly produced a shipment of 30 tons of ore with average values of 320 ounces of silver and .06 ounces of gold per ton. At 2013 prices, that shipment would be valued at approximately \$225,000.²

The Butte district’s great [siliceous](#) rhyolite dikes are evidence of deep-seated magmatic activity that deposited metallic mineral values. The same types of rhyolite dikes are equally conspicuous at the Blackstone. The largest amount of magmatic activity is located. [Outcroppings](#) are readily visible along the 7,500 granite ridge that traverses the property. A five-foot wide vein in one of the surface exposures assayed at 50 lbs. copper, 14.5 ounces silver, and .04 ounces of gold per ton.

ORE BUTTE MINING DISTRICT



ORE BLACKSTONE MINE



OUTCROP BUTTE DISTRICT



OUTCROP VOLCANO DISTRICT

¹ Robert N. Bell, “Another Butte in Southern Idaho?” *Mining Truth*, Vol. 15, No. 19 (November, 1930): 6-14.

² A lessee developing the Blackstone’s open pit in 1985 encountered similar small veins, one to three feet in width, assaying as high as 700 ounces of silver per ton. Polished sections of the ore, analyzed at the University Of Idaho School Of Mines, revealed native silver inside the lattice of oxidized chalcopyrite, validating Bell’s and other geologists’ opinions that the Blackstone ore body not only emulates that of the Butte district, its roots originate as intrusions from the Idaho batholith.

ANOTHER BUTTE IN SOUTHERN IDAHO?

Volcano Mining District in the Heart of a Productive Agricultural Area has Received Little Attention from State and U.S. Geologists

Robert N. Bell, M.E.
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Boise, Idaho

Mining Truth
November, 1930

Can the Butte copper district be duplicated? The answer to the above question by an experienced Montana geologist familiar with the history of Montana's famous copper camp would be a decisive "no," and he would be right unquestionably, for as a matter of experience in metal mining development, there are no exact duplicates in nature as nature abhors a straight line.

Broad experience teaches that there is an individuality to every mining district and in fact to almost every separate ore body in a district. It has been pointed out, however, by such authorities as Dr. Spurr and other noted geologists, that there is a genetic or blood relationship or type characteristic among mining districts and ore deposits, especially in the Cordilleran area of the west, which should have some value in an economic forecast based on surface outcrop and shallow development conditions if such conditions are of sufficient strength, and evidence closely comparable to magmatic activity.

Butte's Unique Position

The Butte district probably carries the highest concentration of copper values of any district in the world in a similarly constricted area. Its production of copper and other metals during the past fifty years is said to have exceeded two billion dollars and is unique in this respect as well as in many others, especially in the primary character of its predominant ore: chalcocite.

For many years Butte was the only important productive copper ore district in the world whose enclosing formation was eruptive granite. This formation is now the source of more than half the copper production of the United States.

The outstanding characteristic of the Butte granite or quartz monzonite is its local association with a zone or belt of later igneous differentiates, originally of basic andesite formations, but more conspicuously with siliceous dike rocks in association with the ore bodies.

In forecasting the development of another mineral district star of the Butte magnitude, the writer recognizes that he is dealing with very shallow phases of raw material, but believes that this material is of such blood relationship to the surface expressions of the Butte ore deposits as to justify this comparison.

Surface Was Unattractive

The Butte district in Montana is situated within the southwest edge of the main lobes of the Boulder granite batholith - a magma chamber of 2,200 square miles in exposed surface area. The surface evidence of the great ore bodies at Butte was decidedly unattractive.

The general formation of highly altered and disintegrated eruptive granite or quartz monzonite was traversed by lean quartz pyrite veins carrying low silver values and a little copper carbonate stain.

These together with the manganese gossan veins of the old silver mines are associated with strong dikes of aplite, rhyolite and quartz porphyry and in only one instance, I believe, did commercial copper exhibit a surface outcrop crest.

To plant a new industrial unit of the capacity of Montana's great copper camp practically in the lap of the productive agricultural area of Southern Idaho is a consummation devoutly to be wished, and a forecast not devoid of material substance.

The Idaho district under consideration in this forecast is known as the Volcano Mining District. It is situated in Camas and Elmore Counties in south central Idaho within fifteen miles of the Union Pacific Railway at Glenn's Ferry on the south and within five miles of the branch terminal of the same line at Hill City on the north.

In spite of its attractive comparison with Butte conditions, the Volcano district has so far escaped the attention of the U.S. Geological Survey and Idaho Bureau of Mines and Geology, except in its outlying edges.

One of the old reports on the geology and water resources of the Snake River Valley by Russell covers the rhyolite feature of Mount Bennett at the west end of the district, and a recent paper by the State Bureau on ground water for irrigation on Camas Prairie by Piper is confined to the artesian water possibilities of the valley, with little reference to the general geology of its borders other than their magmatic and volcanic character.

Geologically this district is located at the extreme southern edge of the magma chamber known as the Idaho granite batholith, which has ten times the volume of the Boulder Batholith in Montana, with an exposed surface area conservatively estimated at 22,000 square miles.

The granite formation of this district shows the same characteristically weathered and disintegrated surface as does the Butte district, with occasional patches of wind carved, weathered bouldery and monolithic pillars of harder formation.

Parallels Flat Valley

This interesting mineral district lies parallel to the broad flat-floored intermountain valley of Camas Prairie, a notable dry farming wheat section of Southern Idaho, ten miles broad and thirty miles long. Viewed from one of the grain fields in the valley, the mineral belt looks like a low weathered granite ridge rising to an elevation of a thousand feet above the valley floor, within a distance of a mile and a half. Its straight east-west contour and fairly uniform northern slope suggests a false scarp of regional proportions.

The northern slope of the ridge is scored by numerous short shallow erosion channels, usually carrying springs and patches of brushwood such as willows and quaking aspen. Several of these shallow gulleys are without doubt roughly north and south lines of cross faulting as they conspicuously displace the vein.

The elevation of the valley floor opposite the central part of the mineral belt is 5,200 feet and along the crest of the ridge 6,200 feet above sea level.

Area's Geology Described

Following the crest of this ridge which is in reality the southern edge of a remnant plateau area, varying from a mile to two miles broad, the disintegrated granite formation over approximately a mile in width and for a N. 70° E. strike length of five or six miles, is conspicuously traversed by a close set series of nearly vertical aplite dikes of equal proportion in size to the Butte formations of this character, then by a series of more or less cellular quartz pyrite veins.

One of these, the Revenue, while it may not make Daly's original snake -the Anaconda- look like an angle worm in comparison, is to say the least a very worthy duplicate of that noted mineral outcrop, and consists in this instance of an opaque white quartz vein, in places intensely brecciated to a boxwork silica expression that is from forty to eighty feet wide in almost continuous low outcrops above the plateau surface for a distance of two miles, with short intermissions of siliceous banded shear zone structure and intensely sheared and sericitized granite walls.

This great vein is succeeded in the central cross-section under discussion by a highly altered and intensely mineralized quartz porphyry or feldspar porphyry dike or stock that is 180 feet wide, its exact petrographic determination being difficult on account of the highly mineralized condition of the surface outcrop, which carries bands of light spongy gossan several feet wide with considerable copper carbonate staining and giving light values in silver up to three or four ounces.

Chalcopyrite Near Surface

This is succeeded by three narrower quartz filled fissures. One of them, with a continuous outcrop of 1,000 feet, is five to ten feet wide and in some shallow surface pit development has afforded specimen values in small kidneys of clean chalcopyrite ore of \$80 per ton in copper, gold and silver.

This series, a few hundred feet farther south, is succeeded by a parallel dike of igneous rock that is probably a basaltic andesite, and again by other parallel dikes up to fifty feet thick of rhyolite or quartz porphyry. The whole series is cut at an oblique angle by occasional cream colored narrow dikes of fine grained aplite two to three feet wide.

A little farther west on this interesting belt, the rhyolite appears as a surface flow or capping to the copper-bearing quartz veins and dikes over a short stretch of their course. These formations together with remnant patches of basalt indicate former extensive coverage of the formation that has been removed by erosion.

As rhyolite dikes are so conspicuously associated with the Butte ore bodies, whatever their function may have been in connection with the primary supply of the ore solutions, it is interesting to record the occurrence of this type of igneous rock in the district under discussion, which occurs in such volume as

to make the rhyolite butte for which the famous Montana copper camp was named, together with its continuous dikes and flows, look like a small knot on a big log by comparison.

Possible Influence of Dikes

The Butte geologists give little credence to the influence of the Butte rhyolites, one way or another, on the ore deposition of that district. A more liberal view of this particular item of Butte geology is worth considering, as these great siliceous dikes were doubtless stokers and conditions to the ore bearing granite wall rocks of the district, and probably are responsible in a measure at least for the conditioning and faulting of the granite formation.

They also evidence a silex condition of differentiation and liquid flux and phase of deep-seated magmatic activity, that seems to be favored by the authorities to be one of the essential factors of final segregation of metallic mineral values prior to their ascent as gases or other solutions into the fissure courses in which they are deposited as ore bodies.

In this respect the Volcano district ore zone has a superior advantage over the Butte district.

The rhyolites of the Volcano district are most conspicuously exhibited at the west end of the belt in the round-topped summit of Mt. Bennett, that has an elevation of 6,700 feet and is made up entirely of immense rhyolite dikes. Mt. Bennett probably constitutes one of the principal centers of eruption and extrusion of this class of siliceous magmatic slags which forms a belt of these acid lavas eight miles wide and thirty miles long by probably 10,000 feet in vertical cross section. These rocks by reason of their hard resistant character comprise the more prominent outcrop formation along the plateau area of the mineral belt, whose general surface is covered with a deep mantle of coarse sandy soil supporting rich growth of wild grasses and sagebrush and is largely fenced and covered by enlarged dry-farm homesteads on which the mineral rights are reserved to the government.

Watching Butte Since 1884

The writer first visited the Butte district in Montana in the spring of 1884 when its surface conditions were not so badly scarred as at present. He has since had repeated opportunity to note these conditions of the Montana camp, both at the surface and underground, and is highly impressed with the similarities of this Idaho district, not only of the mother magma formation but also of the conspicuous comparative character of its later intrusive vein and dike conditions.

The Blackstone Group

There is very little development in the Volcano district on which to base a forecast of similar phenomenal ore development at depth to that which resulted at Butte from similar shallow surface tests and outcrop conditions.

One of the few shallow prospect developments of this Idaho district is an old discovery near the west end of the mineral zone, known as the Blackstone Mine, which was located forty years ago by two noted jurists of Idaho - the late Joseph J. Rich of Paris, Idaho, and Hon. James H. Hawley of Boise.

The Blackstone Group, consisting of five claims patented many years ago and idle since the patent was issued, carries a sheared quartz fissure richly stained with manganese oxide and copper carbonate. It was developed by a short crosscut tunnel at a face depth of 100 feet where the oxidized condition still

prevailed but disclosed some fair sized kidneys of chalcopyrite ore which together with the richer carbonate materials is said to have afforded three small carload shipments of hand-picked ore that gave smelter returns of 15% copper and \$20 per ton in gold and silver. These old workings are long since caved and the evidence of values is the surface outcrop cuts where a vein of green and black stained shelly quartz five feet wide gives average values of 2.5% copper and \$5 gold and silver per ton.

Shaft at the Opportunity

About a mile west of this development, the Opportunity Mine has a vertical shaft 150 feet deep on a siliceous copper carbonate and manganese stained shear zone 10 to 20 feet wide, which exhibits the same deep oxidation as was common in the early history of the Butte mines. This dry shaft revealed no sulphide mineral but gave a gradual increase in the associated silver values in the gangue of the vein. A band of soft, sooty manganese on the hanging wall at the shaft bottom, six inches wide, gave an assay of 5% copper, 12 ounces silver and 60¢ gold per ton.

Extending east on the zone from this point for a distance of three miles, the numerous outcrops carry shallow prospect pits, in no place exceeding thirty feet in depth.

The thirty-foot prospect shaft of the Revenue Group of claims is now badly caved but its dump ore from a five foot quartz vein exhibits selected specimens of hard quartz containing pyrite, chalcopyrite and occasionally coarse crystals of both galena and sphalerite. The lead-zinc association is found at several other shallower prospect pits on this and other quartz veins of the zone.

Tunnel Cut Rich Silver

At the extreme east end of the mineral belt where it strikes the flat floor of the Camas Prairie valley, a series of closely parallel quartz veins and mineralized porphyry dikes outcrop conspicuously above the surface. On one of the smallest of these veins, some very rich silver ore was found and a shallow tunnel was extended in 200 feet a number of years ago. This tunnel is now caved and inaccessible, but is reputed to have marketed small shipments of from five to thirty tons of crude ore carrying 200 to 500 ounces of silver per ton, with several dollars gold.

There is a good sized dump of cobbings at the portal of this old tunnel that gives assay sample values of 60 ounces of silver from a brown stained granular quartz with corroded segregations of soft chalcopyrite, and the walls of a caved discovery shaft ten feet deep on the same vein exhibit stringers of quartz and brown hematite.

One of these stringers several inches wide gives an assay sample result of 110 ounces silver and \$10 gold per ton, and in harder quartz bands some scattered crystals of chalcopyrite and a blue sulphide material, probably argentite.

Development Now Under Way

The most promising and important development on this interesting belt is now underway and is likely to shortly reveal its economic possibilities within a few months. This development is on the Revenue Group of claims, covering the central section of the mineral zone for a distance of a mile and a half over its most conspicuous quartz and copper stained porphyry outcrops. It consists of a crosscut tunnel starting at an elevation of about 600 feet above the valley bottom, in one of the more favorable erosion channel depressions.

The tunnel is now 1300 feet long, will shortly penetrate the big Revenue quartz vein at the face depth of 400 feet, and will be continued across the system for an additional 800 feet.

The accompanying cross section of the formation penetrated by this tunnel is of keenest interest, and while the maximum depth to be obtained under the mineralized outcrop is comparatively shallow, it is to be expected that an unaltered sulphide condition of the veins, as indicated by their gossany outcrops, may be anticipated, in a degree at least, by reason of the fact that the tunnel has been very wet since it was started.

The first 400 feet of the course of the tunnel from the portal is through rotten, decomposed, blue granite of fairly coarse texture, and a thin section of this rock gives the following: "Orthoclase and quartz inclose euhedral plagioclase crystals. Biotite, hornblende, magnetite and a little augite are accessories. The feldspars are somewhat cloudy."

Tunnel Cuts Dike Series

This granite is succeeded along the course of the tunnel with an equal volume of aplite dike formation alternating with bands of altered granite, as shown in the section. One of these aplite dikes is 150 feet broad and intensely brecciated, so much so as to involve heavy timbering and spiling for that distance.

At the 750-foot station, an aplite dike was intersected about 150 feet wide, carrying a hanging wall band five feet wide that had been intensely fractured and its fine network of fracture or shrinkage planes completely saturated with molybdenite, giving the rock a general blue cast. This dike is succeeded by another zone of granite, and again another fifty foot aplite dike, extremely siliceous and fine grained, resembling quartzite to the unaided eye, was passed through and again altered granite was encountered.

In a petrographic determination of this fresh phase of the aplite, according to thin section studies, the rock was found to consist essentially of quartz, orthoclase and a little albite, with beautiful spherulites around the corroded quartz phenocrysts and zone of micropegmatitic structure.

Big Vein 100 Feet Ahead

It is expected that the big north vein of the series, forty to eighty feet wide, will be encountered within 100 feet of the present face of the tunnel if its dip of a few degrees from the vertical exhibited in its surface outcrop is maintained at this depth.

The contacts of these aplite dikes with the granite vary from an irregular intermeshing of the two formations to distinct talc gouge partings.

The tunnel has been wet overhead since the first big brecciated aplite dike was cut, and occasional big rushes of water were encountered after passing through the talcy contact gouges. The back of the tunnel dries as the face advances, which, however, continues wet, and the tunnel drain is now carrying approximately thirty gallons a minute of water flow.

These conditions evidence the probable upper surface of the ground water circulation but should mean some unaltered sulphide conditions when the big quartz vein and its parallel highly mineralized porphyry dike are encountered.

May Be Largely Pyrite

It is to be expected that these sulphides will be largely pyrite, but should have commercial association of chalcopyrite mineral and probably some zinc and lead, judging from the shallow pit development in the surface outcrop of these ore bearing fissures.

If the development at this level should reveal associated chalcocite mineral, the identification of the zone as a geologic blood relation of the Butte district in Montana will be substantially completed and will justify the economic forecasts of its probable great economic importance for more extensive and deeper development.

The Revenue Group of claims is owned by the Consolidated Mines Syndicate, a development enterprise supported entirely by widespread public stock subscription. Frank E. Johnesse, First National Bank Building, Boise, Idaho is manager.

The company owns three other properties in other Idaho districts, on all of which extensive preliminary development work has been performed, and some large ore resources proven on each property. Mr. Johnesse has the reputation of getting more results in underground work for the money obtained from his stockholders than is common from such speculative development investments.

Eight Men Now Working

The present Revenue tunnel was started last January. It is 5x7 in the clear inside the timber portion. It is equipped with a portable two-drill compressor, and the camp consists of a blacksmith shop, cook shanty, dining room and a frame bunk house for the accomodation of ten men. A crew of eight men is now employed.

The tunnel carries an 8-inch galvanized ventilation pipe with an elbow and a vertical standpipe thirty feet high at the portal. A small jet of compressed air is injected into the standpipe at the elbow and gives excellent ventilation at the face, exhausting powder gasses in about fifteen minutes after a round. This simple contrivance has been fully effective so far and may be of interest to other enterprises of this nature.

The overall cost of the tunnel to date has averaged \$13.00 per foot. The cost was increased by the 150-feet of ground encountered, some of which had to be breast boarded and top spiled with short lengths of track iron.

The cost is a credit to the operator and emphasizes the altered character of the formation encountered, which is a favorable augury of the general geological conditions of the ore-bearing zone and is comparable to the conditions encountered at shallow depths in Butte. The character of the ore occurrence to be shortly proven by this interesting piece of development is awaited with keenest interest and anticipation.

— R.N. Bell, M.E.
Boise, Idaho

**REPORT ON THE REVENUE GROUP OF LODE MINING CLAIMS IN THE
VOLCANO MINING DISTRICT
ELMORE COUNTY, IDAHO**

January 3, 1932

Frank E. Johnesse, M.E.
Consulting Geologist
Boise, Idaho

Editor's note

The original text from which this report was drawn contains several obsolete references to costs of constructing power lines, maintaining camp accommodations, etc. Because these references and cost estimates are well over 50 years old and no longer have any relevance to the geology or mineralogy of the area, they have been omitted.

Property

This property is situated in Section 20, 21, and 22, T.2S., R.11E., B.M., in the Volcano Mining District, Elmore County, Idaho, 10 miles southwest of Hill City, Idaho, a station of the Camas Prairie branch of the O.S.L. Railroad, at an altitude of 6,200' above level. This group of eleven claims embraces an area of a little over 180 acres of lode claim locations, as per the accompanying map which was constructed from plats of preliminary surveys made by the owners of the three merged properties included in the group.

History

The Volcano District has been known since 1870 when prospectors in search of gold and silver discovered that it contained many strong mineral bearing outcrops. Numerous old prospect holes bear evidence of their search for rich pockets of these precious metals, but the ore proved to be mostly of a milling grade which, due to the high cost of milling and lack of transportation facilities, did not prove attractive at the time.

The Webster Mine, about 1.5 miles east of this group, consisting of a small vein of copper/silver ore, has had limited development, and has produced several car loads of high grade ore from a shallow depth. It has not been developed below the water level, is on the strike of the south vein of the Revenue group, and is the easterly extension of same.

The Blackstone Mine, about 2.5 miles west in the same mineral belt and having the same general geological occurrence, has been developed to a depth of about 60' exposing a 6.5' vein of high grade silver/gold ore, carrying a little copper. A 200' shaft has been sunk on the Opportunity vein, which is nearby in the same district and has the same general occurrence. The vein at this depth is still oxidized, but is strong, well defined, and carries average values across 5.5' of 7 ounce silver, \$2.60 in gold, and a little copper. This is considered a good showing under existing conditions, and will no doubt carry good copper values in the sulphide zone.

Veins and Development

The outcrop of three well defined veins and a strong porphyry dike are visibly traceable throughout the entire length of the group. These veins are nearly parallel and strike north 50° east, and have an apparent dip of about 65° to the northwest. The outcrop of the north vein, which is very prominent, and in places stands up boldly for several feet above the surface, will average from 16' to 80' wide; the middle or Divide vein from 4' to 6' wide; and the south or Revenue vein from 10' to 16' wide. The mineralized porphyry dikes lying between the two main quartz veins are from 59' to 300' wide, and can be traced on the surface for 6,000'. They have about the same general strike and dip as the quartz veins. The surface development is limited to the several shafts and cross-cuts shown on the blueprint, none of which are more than 35' in depth.

The driving of the proposed tunnel has been under way the past 2 years and is now in a distance of 1400'. It is 5.5' by 8', and has already penetrated the first or north vein where it was found to carry the disseminated iron and copper sulphides by the geophysical test and surface outcrop.

Geology

This mineral zone follows the apex of a granite range of mountains about 20 miles in length and from 5 to 7 miles wide, lying between the Snake River Valley and Camas Prairie, being separated by the latter from the main Sawtooth-Teton ranges. It has an east and west course and a main elevation of about 6,000' above sea level. This range is flanked on the south by sedimentary rocks forming the River Valley. Camas Prairie on the north is covered by a lava flow which skirts the foothills forming the North Slope of the range. The general formation of this mineral zone, which is from 1 to 2 miles in width, is a dark greyish, coarse-grained granite, which differs somewhat in appearance from that composing the range in which it occurs. This is interspersed with dikes of aplite, a light cream colored, fine grained granite, from 20' to over 200' wide. These dikes follow the general foliation paralleling the range, and the vein system is likewise parallel. It occurs as contacts between the granite and aplite dikes, usually on the north side of the dikes. These can be readily traced by the outcrop as they are harder and have resisted disintegration better than the coarser-grained granite in which they occur.

The slick and well-defined walls of the several veins developed in the camp give evidence of extensive plain faulting. With depth, the veins assume a more or less banded structure, and usually carry several inches of kaolinite or talc on either wall. The main water level as indicated by the general topography and climate conditions, should be anywhere from 75' to 200'. On this particular group, it is probably in neighborhood of 100'.

The gangue matter in the veins is principally quartz and sericite, and the oxidation products are limonite, hematite, pyrolusite, manganite and wad. The pyrolusite is strong in all the veins in the oxidized zone. The undecomposed ores are made up of chalcopyrite, pyrite and galena, but principally of the former. Of the gold and silver values, the ratio is 80% silver to 20% gold, with the percentage changing in favor of the gold with depth, and containing more or less copper and lead values. On the whole, geological conditions are very similar to that of the Butte District in Montana.

The south or Revenue Vein is a lively looking iron stained quartz extensively honeycombed and showing some little copper and lead stain. It crops boldly, like a stone wall in places. The surface cropping carries low silver-gold values on the average, while in places they are quite pronounced. A 14' shaft revealed some specimens of copper sulphides carrying high silver values encased in a hard strata of

unaltered quartz. It is an exceptionally promising looking vein and will undoubtedly carry the original copper sulphides in abundance below the zone of oxidation.

The Divide vein which shows only on the Divide and Tip Top claims is similar to the Revenue, but shows less iron stain and honeycombed conditions. It crops less boldly although it is easily traced and where opened is 9' wide. One foot of the opening is somewhat altered, with lead and copper sulphides evenly disseminated and carrying about 1 ounce of silver for each unit, along with lead, copper and a little gold to the ton.

The north vein is much larger than either of the two above mentioned. It is practically all brecciated quartz of a fine grain and along the wall is somewhat of a ribbon structure. It is not so uniformly well mineralized throughout the two other vein, although in places where it is softer and shows more erosion, it carries iron oxides and some copper and lead carbonates. At one place where it extends over onto the High Up claim, a 12' shaft exposes a strong vein, over 16' wide, heavily stained with copper and carrying appreciable values in silver and gold.

The two boldly cropping porphyry dikes between the north and south veins can be easily traced for more than 4,000' in length and from 50' to 300' wide. The capping is of a soft, porous spongy nature heavily charged with iron oxide and pyrolusite. In places it is heavily stained with copper and lead and carries low silver values of 1.5 to 5 ounces to the ton with a little gold in the leached surface capping.

There are at least two heavily vertical cross faults within the end boundaries of the group which show distinctly in the throw of the surface outcrop of the several veins. In view of the encouraging results obtained by the limited development of other veins in the district of like nature, systematic development of this group will undoubtedly terminate in the opening up of a mine of great value. The strong indications of the porphyry dikes alone justify the extensive development now underway.

Between the tunnel level and the surface there should be a zone of secondary enrichment that will yield large quantities of high grade ore.

All these veins are persistent on the strike, which is evidence that they will extend down to a considerable depth. The porphyry dike and north vein promises to develop an immense tonnage of good grade milling ore. The Revenue vein will in all probability produce high grade shipping ore.

Development Plans

To properly prospect and develop this group, good judgment would first suggest sinking on one of the veins where the surface showing is the best. However, it was deemed advisable to drive a tunnel to the first vein. This was done in view of the fact that the nature of the veins is identical with those of the Blackstone, Opportunity and Falun Veins which have all shown up so favorably at depth when developed. Consideration was also given to the fact that the group is situated in the same district and mineral zone as these other claims, and the fact that the topography affords an ideal cross-cut tunnel site.

As a result of this program, the tunnel has, within 1,400', cut the first or north vein at a depth of 400' and will, within 2,160', cut all the veins in the group at approximately the same depth.

Treatment and Possible Tonnage

The character of the ore is such that it will yield a high recovery from simple flotations, requiring no complicated metallurgical process. The several claims show strong for a distance of 3' to 5000' on the surface and should produce an ore tonnage that will supply a reduction plant of large capacity for many years to come.

Conclusion

The potential value of this group of claims lies in its system of exceptionally large veins and the strong probability that the very highly stained gossins or croppings of the sericite porphyry dikes overlie the valuable ore bodies. This conclusion is drawn from the fact that a 32' shaft sunk on a smaller parallel vein revealed lead and copper sulphides of a good grade. While the gossin may be much thicker in the larger veins, there is no doubt that they will show large quantities of commercial ore at a comparatively shallow depth.

In the Butte Mining District no ore of commercial value was found at the surface, and the vein croppings which but slight copper stain with low silver values, were found to extend down to a depth of 100' to as deep as 300' in the extreme. Below this leached or impoverished zone and above the original sulphides, there was always a zone of secondary enrichment making a very high grade ore. The geological occurrence of the vein system of this property is identical with that of the Butte District. A geophysical examination which was made 2 years ago at a cost of \$5,000 indicates large bodies of sulphide ore underlying the leached outcrops. This is a new and scientific method of prospecting by electrical methods that has proven of great value and has been approved by the U.S. Geological Survey.

One very significant indication is the prevalence of pyrolusite (manganese oxide) in the veins of the district. In the famous Butte, Montana and Virginia City, Nevada Districts, where the vein occurrences are of a very similar nature, this usually found led to a valuable ore body and is, in fact, considered an almost infallible sign.

The property bears all the ear marks of a large mine; every indication points to large bodies of commercial ore with depth. Even the big dike carries an iron gossan with lead stain which is a good indication for finding sulphides of commercial value below the oxidized zone, and which the big tunnel now underway will soon determine.

F.E. Johnesse, M.E.

January 3, 1932

[Letterhead]

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To whom it may concern:

This is to say that I am familiar with the general geological and mineral resources of the Volcano District in Elmore County and Camas County, Idaho.

This district is conveniently situated in relation to main line and branch railway transportation, in a foothill country near edge of the enormous eruptive granite batholith of Central Idaho.

Its topographical features are low westward ridges of eruptive granite or quartz monzonite with remnant patches of basalt flows, and while it is a district of relatively low relief, it carries some deep gulches and excellent opportunities for drainage adit development to a depth of several hundred feet on some of main ore bodies or courses.

The eruptive granite formation of this district is considerably intruded with large zones and dikes of fine grained aplite, large porphyry dikes and quartz filled fissures.

These intrusive mineral bodies carry very attractive values in silver, copper and gold and at one side of the district some decidedly interesting manifestations of lead and zinc, the surface values showing 1% to 2% copper in the form of copper carbonates and oxides associated with 1 to 2 ounces of silver with each unit of copper values.

I think the present maximum development in the district does not exceed 200' below the surface croppings, at which depth a material increase in values has been encountered, but the copper minerals still remain completely oxidized and it is not unlikely that after these strong and persistent ore bearing courses are followed down to permanent water level that a zone of secondary enrichment and primary sulphide copper values will be encountered.

The district is geologically related in age to the famous Butte copper-silver district of Montana, and well warrants, in my opinion, the necessary capital risk to determine its commercial ore bearing possibilities with attractive prospects of big results based on Butte experience under very similar surface conditions.

/s/ Robert N. Bell, M.E.
Economic Geologist & Former Idaho Inspector of Mines

Excepted in its entirety from page 33;
Geology and Mineral Deposits of Part of the Western Half of the Hailey 1⁰x 2⁰ Quadrangle, Idaho
By: Earl H. Bennett

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Volcano Mining District

The heart of the Volcano district is about 5 mi south of Highway 20. Access is by dirt road from the highway. The major property in the district is the Blackstone mine. DeLong (1986) and Allen (1940, 1952) described the geology of the Blackstone and other mines in the district. From 1902 to the present, the Blackstone mine produced 838 ounces of silver and unspecified amounts of lead and copper from 81 tons of ore; the Bowerman group produced 1,416 ounces of silver from 41 tons of ore; and the Index group produced 240 ounces of silver from 60 tons of ore (U.S. Bureau of Mines). None of the mines produced more than a few ounces of gold.

There are two types of ore deposits in the Volcano district (DeLong, 1986). The Revenue and similar mines are in gold bearing quartz veins in complex fracture zones, whereas the Blackstone mine is an epithermal to mesothermal silver telluride, base-metal, manganese oxide deposit. The Bowerman mine has characteristics of both types of deposits (DeLong, 1986). Mineralized rock in the Blackstone open pit is a central stockwork hosted in granodiorite; disseminated mineralization is present outside the stockwork. DeLong (1986) suggested that the gold veins and the stockwork may either be independent of each other or represent different levels of the same system. A number of rhyolite dikes strike east-west across the area and a typical pink granite (biotite granite) of probable Eocene age crops out near the mine.

In 1914, a trial shipment of silver ore was made from the Bower prospect (Bowerman group?) near Hill City, and, in 1915, some silver-gold ore was shipped. There is little record of further development until 1929 when Consolidated Mines Syndicate started driving a tunnel on the Revenue group. According to Bell (1930), the Revenue tunnel penetrated 400 ft of decomposed granite and crossed a series of aplite dikes in decomposed granite. A number of rhyolite dikes and an andesite dike were exposed in the tunnel. The tunnel was 1,400 ft long by 1931, when Consolidated completed an additional 165 ft of workings.

There was little work in 1932, but a small section of tunnel was completed the following year. A 2,000-foot-long tunnel was started in 1936, and work continued sporadically at the mine through 1939. All activity ceased by 1942. In 1948, Apache Mines Company optioned the Blackstone, Volcano, Index group, Mammoth group, Middlesex group, Independence mine, Hoffman mine, and the Revenue mine. There is no record of any substantial development by this company.

The Blackstone claims were located by J.J. Rich and J.H. Hawley [Idaho Governor 1910 – 1912] in the 1890's. According to Bell (1930), the deposit was a "sheared quartz fissure richly stained with manganese oxide and copper carbonate" and was developed by a 100-foot-long tunnel. In 1984, Circa, Inc., began small shipments of concentrates from a mill built at Mountain Home to process about 10,000 tons of ore from the Blackstone open pit that had been mined since 1982. Circa leased the mine from the Blackstone Mining Company. Five men were employed at the mill, and about \$1 million was reportedly spent on the mine and mill. Hambro Resources optioned the property from Circa in 1985 and drilled nine holes at the mine. Richwell Resources conducted more drilling in 1987 at the Blackstone and reportedly found mineralized rock outside of the pit area. The company announced plans for constructing a mill at Fairfield, and a 20-ton-per-day pilot plant was reportedly tested in 1988.