History of the Florida Mountain Mines, Owyhee County, Idaho

Victoria E. Mitchell

Staff Report 10-7
August 2010

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

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INTRODUCTORY NOTE

This report was prepared under a cooperative agreement with the State of Idaho, Department of Lands, as part of a project to compile information on inactive and abandoned mines in Idaho. Work on this project included preparing detailed histories of mines of interest to the State of Idaho, as well as compiling additional information on mines on state lands.

The information in this report is taken from published and unpublished sources in the Idaho Geological Survey's mineral property files. Unless otherwise noted, most mine production data are drawn from the U.S. Geological Survey's (USGS) annual volumes on *Mineral Resources of the United States* (1882-1923) and *Minerals Yearbook* (1994 to present), and the equivalent volumes produced by the U.S. Bureau of Mines (USBM), *Mineral Resources of the United States*, 1924-1931, and *Minerals Yearbook*, 1932-1993). Additional information was drawn from the Reports of the Director of the Mint (DotMR), which are particularly useful in the 1880s. State news reports from the weekly issues of the *Engineering and Mining Journal* (E&MJ) were particularly useful in filling in the period of the late 1880s and the 1890s. Information on underground workings and mine equipment is from the above sources and 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 drawn from the annual reports prepared by the companies for the State Inspector of Mines, when available; 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 were searched for in the Idaho Geological Survey's (IGS) annual reports on mining and minerals in Idaho (from 1984 to present) or from similar reports produced by the Survey's predecessor, the Idaho Bureau of Mines and Geology (IBMG) from 1975 to 1984. Other published sources are referenced in the text. A complete bibliography is included at the end of the report. Where direct quotations are taken from source materials, the original spelling and grammar are preserved.

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History of the Florida Mountain Mines, Owyhee County, Idaho

Victoria E. Mitchell[1]

INTRODUCTION

The Florida Mountain mines are in the Silver City Range of the Owyhee Mountains in southwestern Idaho (Figures 1, 2, and 3). Major openings into the mines are along Blue Gulch in sec. 36, T. 4 S., R. 4 W. Other significant openings are in secs. 1 and 12, T. 5 S, R. 4 W., and sec. 7, T. 5 S., R. 3 W., across the crest of Florida Mountain to Long Gulch. When the mines were operating, workings extended through Florida Mountain from the Dewey tunnel near the mouth of Blue Gulch in the northwest corner of sec. 36, T. 4 S., R. 4 W., to the lowest Trade Dollar tunnel in the northwest corner of sec. 7, T. 5 S., R. 3 W.

In the deepest workings, granodiorite hosts the Florida Mountain deposits. Basalt contains the vein in the intermediate workings, and rhyolite hosts the upper workings. A persistent basalt dike follows the Trade Dollar vein through the granodiorite and merges with the basalt flows on the fifth level of the mine (Figure 4). The principal veins follow a set of fractures that strike N. 15-30º W. and strike 75-80º W. (Piper and Laney, 1926). The rhyolites in the Florida Mountain region are high-temperature ash-flow tuffs (Ekren and others, 1984).

GEOLOGY

Granitic rocks underlie Florida Mountain (Figure 5, 6, and 7). In 1897, Lindgren (1900) made the first detailed study of the geology and mineral deposits in the region around Silver City. About the granitic rocks, he noted (Lindgren, 1900, p. 17-18):

> The rock is a normal granite, rich in alkalies and silica, poor in lime and magnesia. It is decidedly more acidic than ordinary granite from the area north of Snake River, but very similar to the rock from the Warren mining district. The fresh rock is of light-gray color, consisting of white or reddish feldspar, gray quartz grains, and foils of primary muscovite and biotite, the latter often of greenish color. The average grain is 4 mm., though larger porphyritic feldspar crystals, up to 3 cm. in diameter, often appear. As

[1]Idaho Geological Survey, Main Office at Moscow, University of Idaho, Moscow.

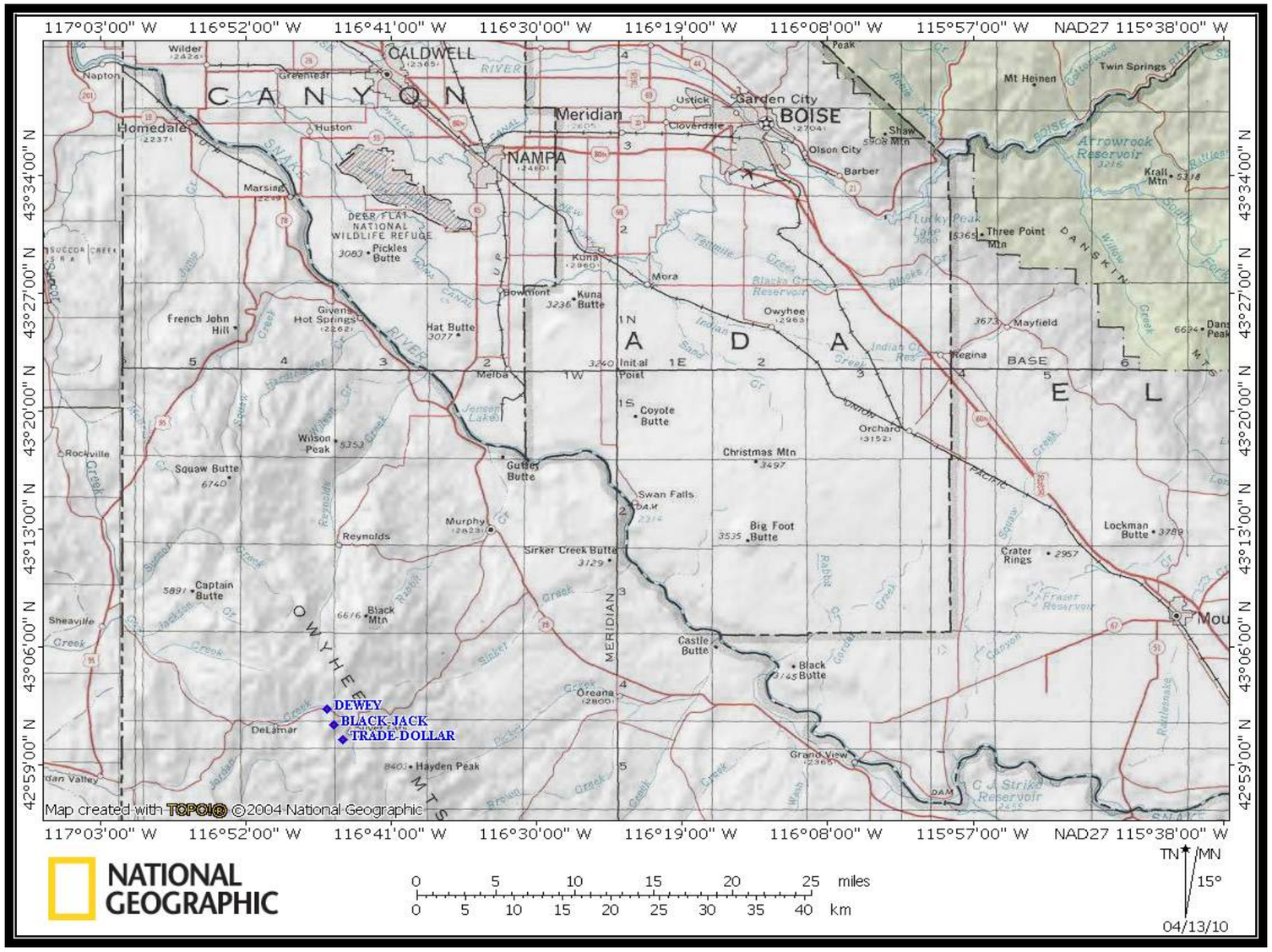


Figure 1. Location of the Florida Mountain mines in relation to Boise (National Geographic Society TOPO! map). Notice the location of Swan Falls on the Snake River, where the Trade Dollar Consolidated Mining Company's electric power plant was located.

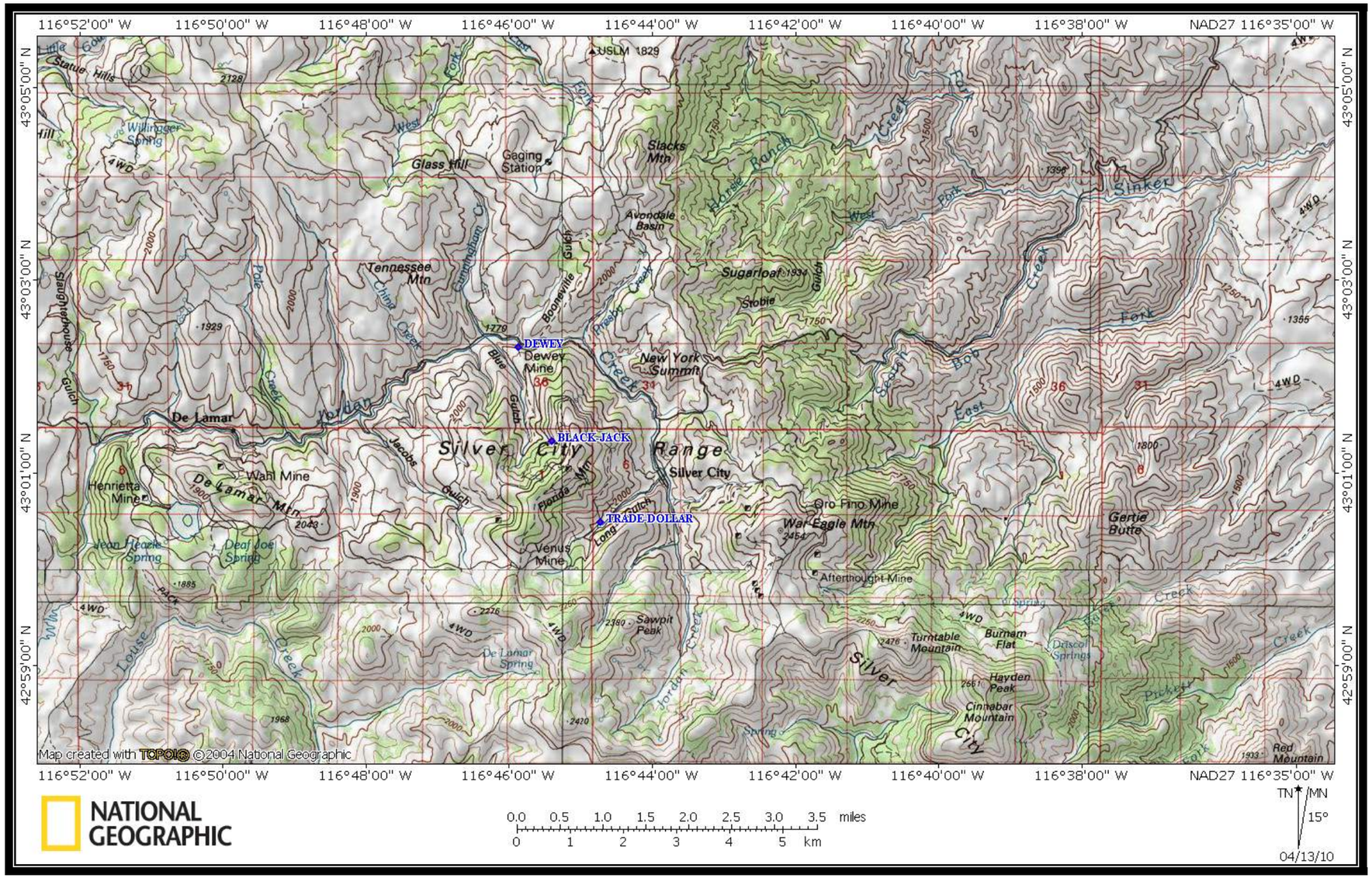


Figure 2. Location of the Blue Gulch-Florida Mountain area in relation to the surrounding area (National Geographic Society TOPO! map). The DeLamar Mine is to the west and the War Eagle Mountain mines area is to the east of Florida Mountain.

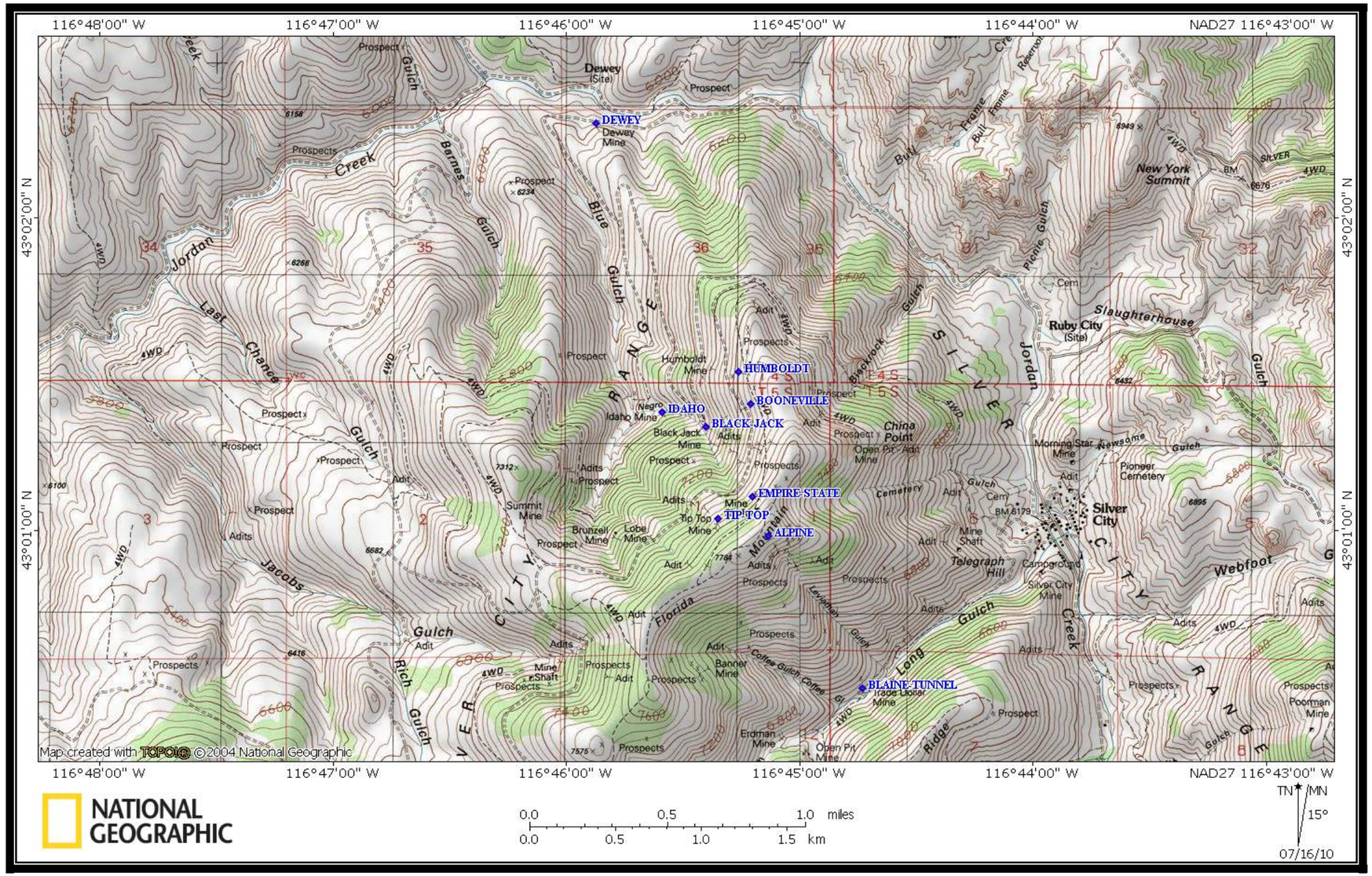


Figure 3. Location of a few of the many tunnels on Florida Mountain and in the Blue Gulch drainage (National Geographic Society TOPO! map). At its high point around 1907, the Trade Dollar Consolidated Mining Company had over 132,000 lineal feet of workings, for which the Florida Mountain tunnel at Dewey was the major haulage level and for which Dewey was the major milling site.

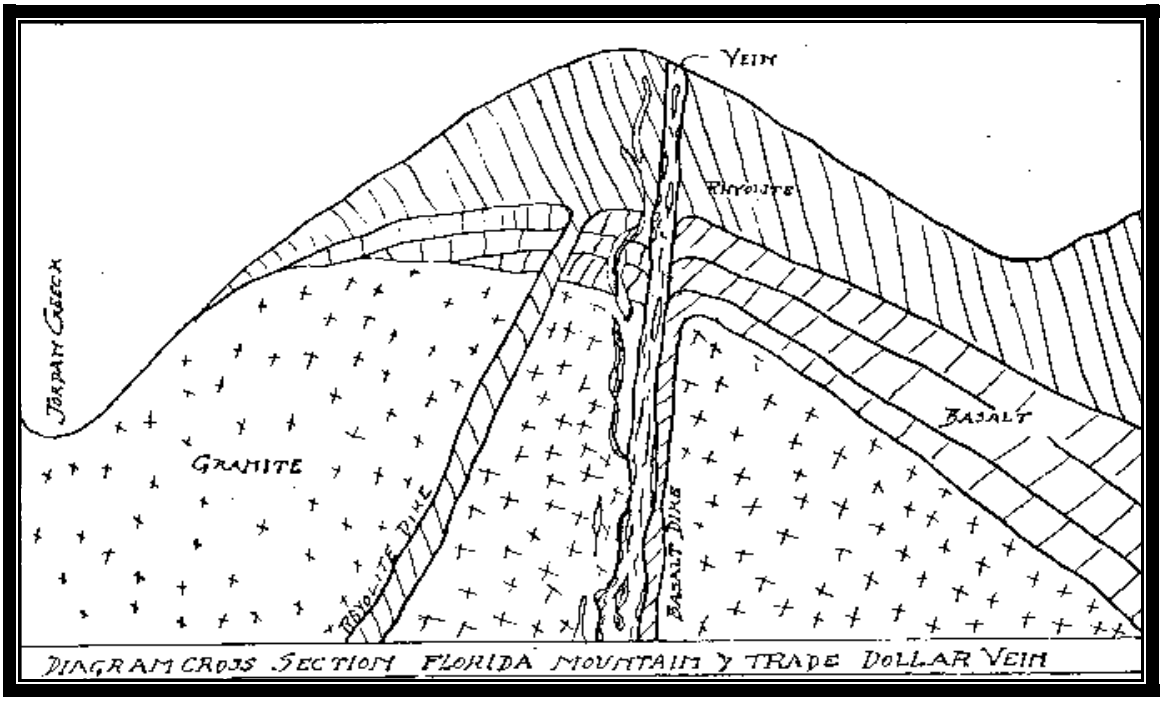


Figure 4. Sketch of a cross section of the geology through Florida Mountain approximately along the line of the Trade Dollar Consolidated Mining Company's tunnels (p. 125 from Bell, R.N. 1907, Eighth Annual Report of the Mining Industry of Idaho for the Year 1906). The view is to the east.

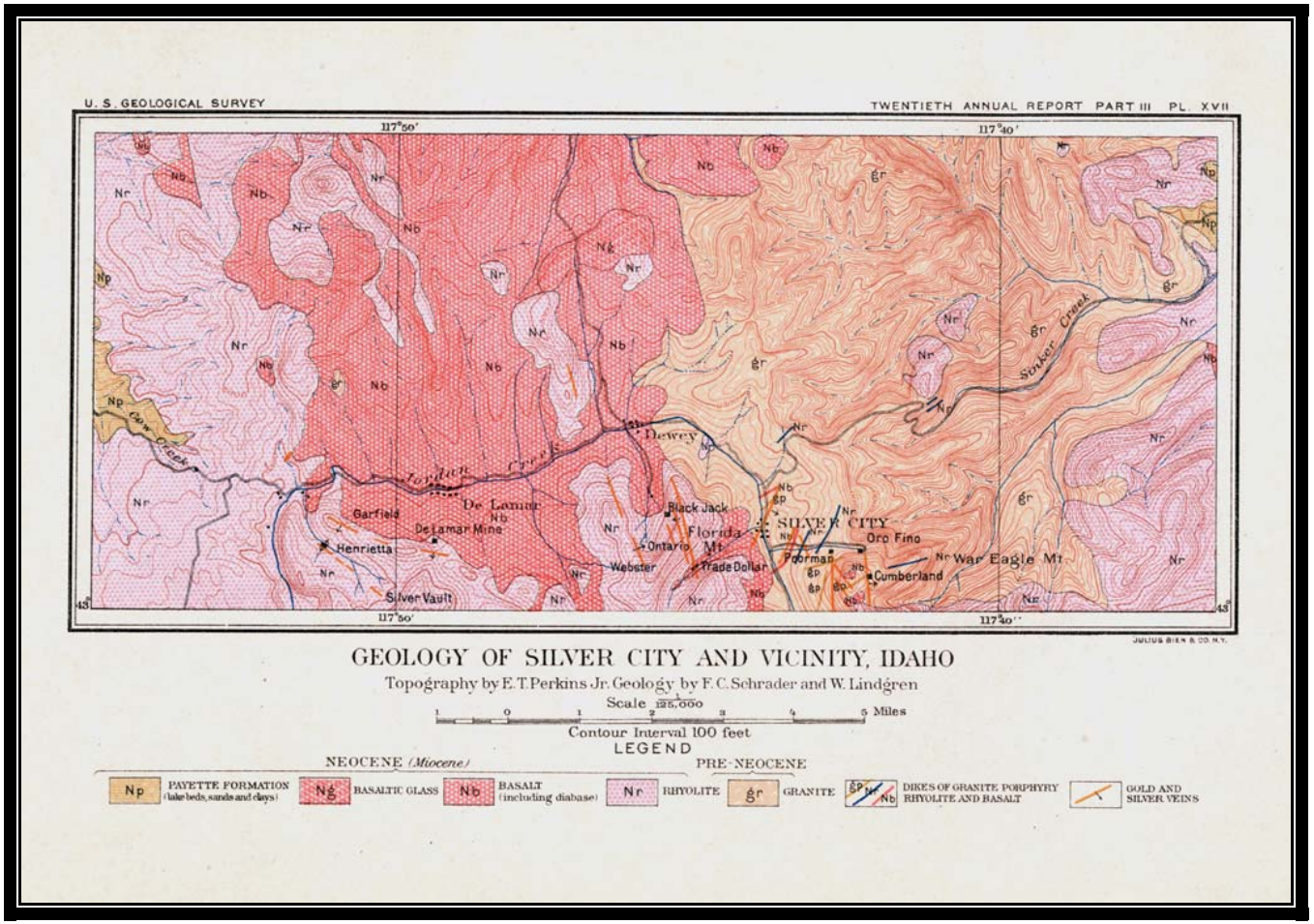


Figure 5. Geology of the area around Silver City (Plate XVII from Lindgren, 1900). This is the earliest geologic map of this area. Compare it with Figures 6 and 7.

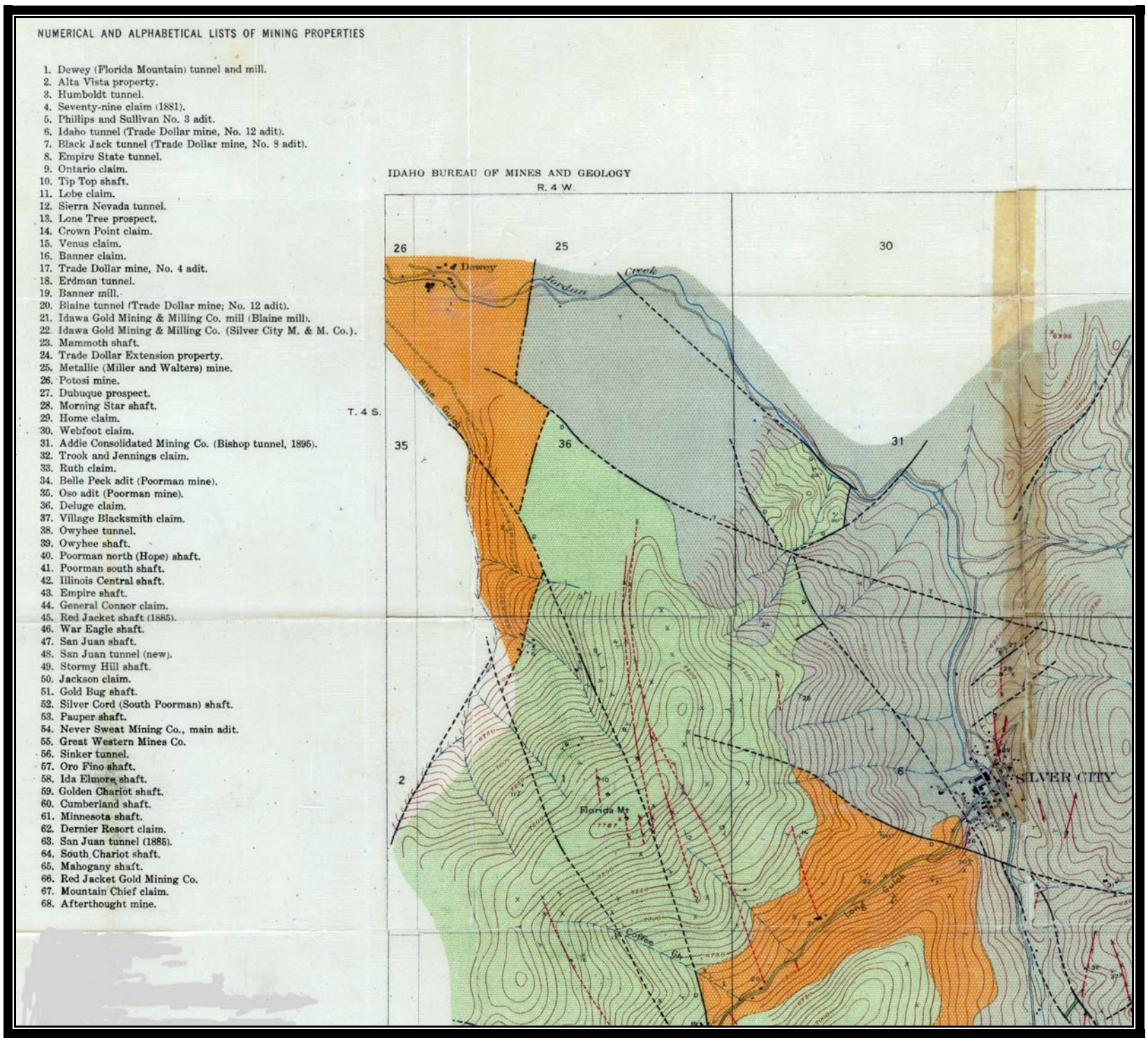
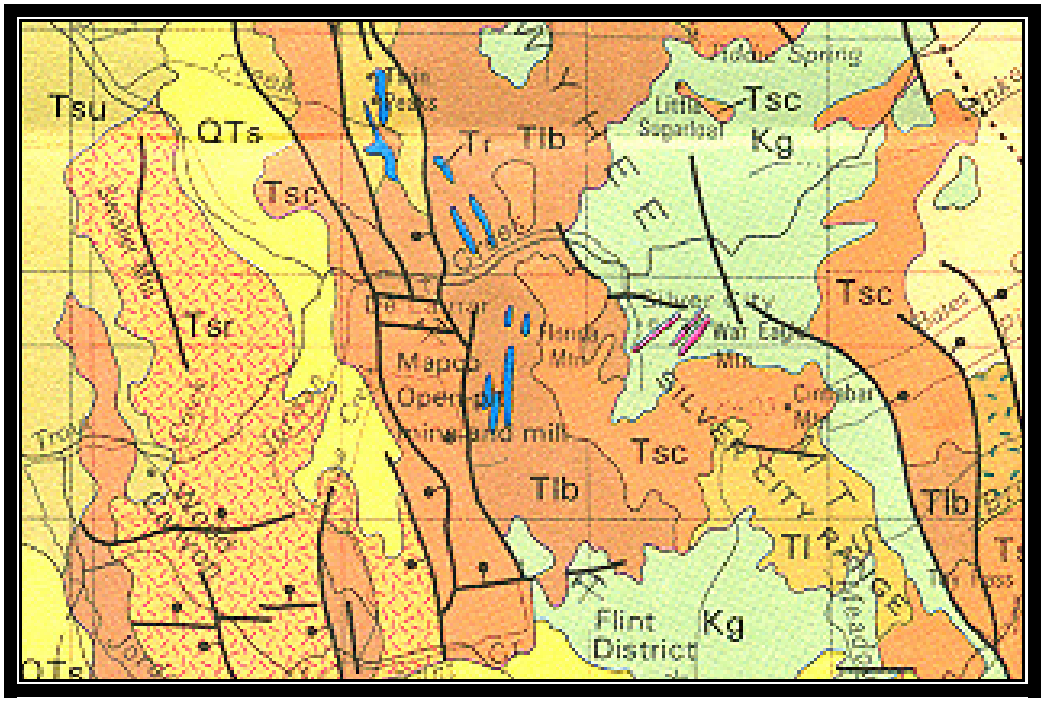


Figure 6. Geology of the Florida Mountain area (northwest corner of Plate II from Piper and Laney, 1926). Patterned light green = rhyolite; patterned orange = rhyolite; patterned blue-gray = granodiorite. Solid or dashed red lines = gold- and silver-bearing veins; solid and dashed black lines are faults, with the letter “D” marking the downthrown side. Some of the mines listed along the left margin of the map are not in the Florida Mountain area.



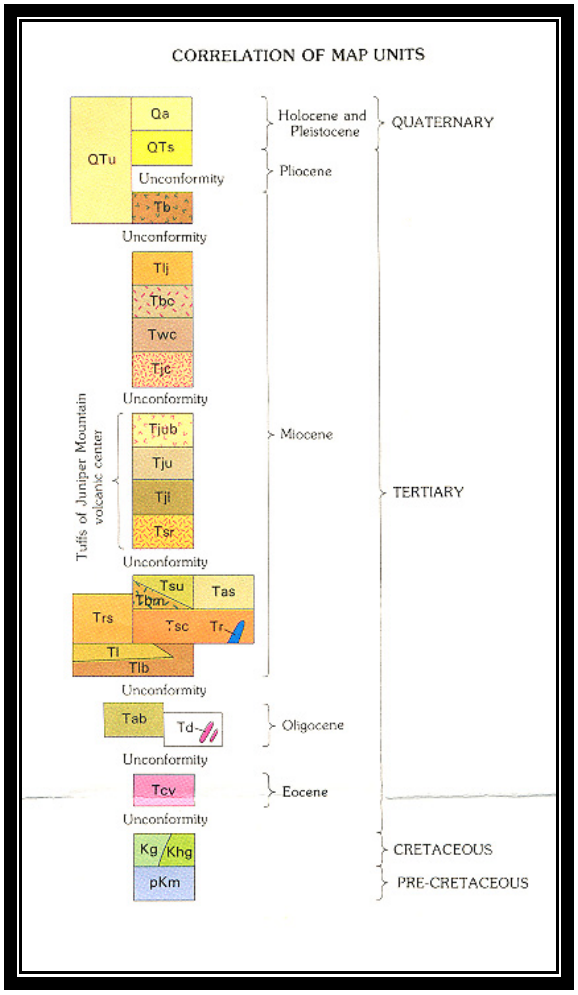


Figure 7. Geologic map of Florida Mountain and vicinity (Ekren and others, 1984). The rocks on Florida Mountain are: Kg – granitic rocks; Td – dikes (pink lines); Tlb – basalt; Tsc – rhyolite of Silver City Range; and Tr – intrusions (heavy blue lines).

seen under the microscope, it contains abundant, often slightly crushed quartz grains, interlocking in shape; smaller grains may be included in feldspar crystals. Muscovite is always present in large, straight foils. Biotite occurs usually in smaller quantity, frequently decomposed to chlorite. Orthoclase is abundant; a few grains of microcline also occur. A plagioclase with narrow striation, thick prismatic form, and rarely showing Carlsbad twins, is never absent, but appears in varying quantities; it is sometimes rimmed with a little micropegmatite. The optical determinations were not satisfactory, but it is in all probability oligoclase. The feldspars show some secondary muscovite and in places a little calcite. A few crystals of zircon were noted. The granite weathers easily, covering the ridges with a coarse sand.

Piper and Laney (1926, p. 15-16) described the granitic rocks as follows:

Granite and its allied igneous types crop out over an extensive region about Silver City. The area of intrusives traced on the map of War Eagle and Florida mountains (PI. II [Figure 6]) is the southern tip of a mass of granitoid rocks, 25 miles long and 10 miles wide, which trends northward beneath an interrupted cover of basalt and rhyolite (24c: areal geology map [reference and map omitted]), and finally plunges beneath the Snake River plains. . . .

Outcrops of the granodiorite are invariably parted into regular polygonal blocks by persistent sets of intersecting fractures resulting from the diastrophism to which the region has been subjected. Usually one or another of these fracture sets is more perfectly developed than the others, so that a marked and unusually perfect sheeting results. Locally, where a topographic slope cuts across the strike of the sheeting, the effect is that of a truncated sedimentary series [Figure 8]. Erosion, working rapidly along the fracture planes, produces here and there serrated ridges and castellated and buttressed topographic forms which, although somewhat unusual, are quite characteristic of the region. Over most of the granodiorite area, however, rapid disintegration of the coarse-grained rocks has smoothed the slopes with a mantle of sandy debris.

PETROGRAPHIC CHARACTERISTICS

Normal phase.-The typical unaltered granitoid rock is medium- to coarse-grained, light gray, and wholly crystalline. The individual grains are of unequal size, but average 0.15 to 0.20 inch in diameter. The hand specimen is characterized by a great abundance of quartz, and small amounts of biotite (black mica) and muscovite (white mica). There is a decided tendency toward porphyritic texture, phenocrysts of potassic feldspar attaining here and there a maximum dimension of 1¼ inches. Purely megascopic examination would probably classify the type as a true granite.

The microscope shows, however, that the rock differs markedly from a typical granite. The essential minerals, in the order of their crystallization, are muscovite and biotite, plagioclase, potassic feldspars, and quartz. Biotite, usually the more abundant of the two types of mica, occurs in scattered tabular forms, partly resorbed during the crystallization of the plagioclase. Muscovite forms individual foils or is interlaminated with biotite. The dominant feldspar is oligoclase-andesine (Ab_3 An_1)[?], which occurs in stout and elongate euhedral prisms and mutually interfering forms and constitutes fully 45 per cent of the whole. The larger sections are characterized by zonal extinction, and in many cases enclose small crystals of quartz and mica. Carlsbad twinning combined with the usual albite or polysynthetic type is common, and one crystal was noted in which twinning according to both the Carlsbad and Baveno laws is combined with the polysynthetic. The potassic feldspars, microcline and orthoclase occur as large pseudo-phenocrysts whose outline is controlled by the arrangement of the older oligoclase crystals; frequently, however, they approach true crystal form. In the aggregate these minerals amount to about 15 per cent of the rock, although their habit makes any estimate of relative abdundance [sic] uncertain; microcline is the more abundant of the two. They are invariably micropoikilitic, that is they enclose microscopic crystals of quartz and oligoclase, many of which are partly resorbed. Quartz, fully 35 per cent of the average granitoid type, makes up anhedral masses of interlocking grains. Undulatory extinction and fracturing are always present, and speak of the

Figure 8. Dipping joints in the granitic rocks impart a bedded appearance to the rocks (Figure 10 from Asher, 1968).

diastrophism which the rocks have suffered. Frequently the potassic feldspar and nearby oligoclase are partly bordered by micropegmatite, a phenomenon which indicates that the potassic feldspar and quartz crystallized, at least in part, at the same time. Magnetite and apatite are invariably present and are usually accompanied by zircon with or without rutile, octahedrite (?), or titanite. Of these accessory minerals, all but magnetite are characteristic of the more acid igneous rocks.

Asher (1968, p. 16-17) noted the following about the granitic rocks:

Hand Specimen Descriptions

In hand specimen the typical granitic rock is medium- to coarse-grained with granular texture. Mineral grains range from 0.3 cm to 1.0 cm in size, and minerals are about equal in size in a given specimen. In some specimens there are larger than average euhedral orthoclase crystals, and the rock has a porphyritic texture. Minerals observable in hand specimen are quartz, orthoclase, plagioclase, biotite and muscovite. Plagioclase is dominant over orthoclase in most specimens examined, but in some they are about equal in amount. The bulk of the rock is granodiorite but at places it is quartz monzonite or granite. Thin sections support this conclusion.

Light gray to white is the dominant color of the granitic rocks; because of their distinctive color and weathering characteristics they stand out clearly on air photos.

Thin Section Description

Petrographic study shows the rock to be a biotite granodiorite; however, the rock has a range in composition and at places it is quartz monzonite or granite. Medium grain hypidiomorphic granular texture is characteristic. Quartz makes up an estimated 30 percent of the minerals in the rock; the quartz shows undulatory extinction and occurs in distinct grains or as poikilitic inclusions in the feldspars. Orthoclase makes up about 30 percent of the total mineral grains and about 15 percent of the total feldspar. Orthoclase occurs as anhedral grains; myrmekitic intergrowths with quartz, and poikilitic inclusions of quartz in the orthoclase are common. Microcline occurs but it is not abundant. Oligoclase-andesine plagioclase (An27 to An33) makes up to 40 to 45 percent of the rock and about 65 percent of the total feldspar. Albite and carlsbad twins are common. The plagioclase grains are in subhedral forms; inclusions of quartz, potassium feldspar (perthite) and biotite are seen along some cleavage planes.

Biotite is an estimated 15 percent of the rock. It occurs as irregular grains and shreds and along cleavages in the feldspars. Muscovite is in most specimens but in the normal rock, biotite is the principal mica. Apatite, zircon, and magnetite are accessory minerals. No amphibolites were identified.

The above description is taken as typical, but in some samples orthoclase and plagioclase are about equal and the rock is a quartz monzonite; muscovite may be as abundant as biotite in some specimens.

This rock is similar to the two-mica granite of the southern lobe of the Idaho batholith described by Kiilsgaard and others (2001).

After the granodiorite was emplaced, it was exposed to the surface and eroded to a topography of rounded hills and moderate relief (Piper and Laney, 1926). In Miocene time, a number of basalt flows covered the area (Ekren and others, 1984). The current thickness of the basalt depends on the original topography and on subsequent erosion (Piper and Laney, 1926). Lindgren (1900, p. 118-119) described these rocks as follows:

The basalt forms heavy volcanic flows, which ordinarily rest on granite. It occupies large areas, chiefly west of Dewey and north and south of De Lamar, though also outcropping on the lower northern slopes of Florida Mountain. A small patch, underlain by a little tuff, covers the very summit of War Eagle Mountain. The topographic forms of the basalt areas consist of long, sloping ridges, rising 1,500 feet above Jordan Creek. The ridges are of dark-brown, somber color, relieved by patches of grass and willows. Both on the slope toward De Lamar and northward toward Democrat—a stage station 5 miles north of

Dewey—the basaltic ridges show roughly terraced outlines, indicating the existence of three or four heavy distinct flows. In some large outcrops thinner flows may be noted. The thickness of the flows is uncertain on account of the unknown slope of the bed rock, but the exposures indicate that it exceeds 1,000 feet. Besides, a well, 975 feet deep, has been bored at De Lamar, all the way through black lava. At the depth mentioned a black clay was encountered and a flow of water amounting to a few miner's inches, with a temperature of 120° F. The total thickness of the basaltic flows is thus probably nearly 2,000 feet.

The basalts are medium-grained to dense black or greenish rocks, composed in the main of labradorite, augite, and ilmenite, with or without olivine. The structure varies greatly. Some of them are holocrystalline granular rocks, with size of grain from 0.5 to 2 mm.; others are dense, sometimes vesicular, and contain more or less glass. The two kinds are connected by transitions.

The granular basalts correspond closely to some diabases. Their microscopic structure is normal and needs but brief comment. The spaces between the lath-shaped crystals of labradorite are filled with slightly brownish augite, producing what is termed "diabasic" or "ophitic" structure. There is much ilmenite, usually in tabular or acicular form. Some varieties near the Trade Dollar mine show large porphyritic labradorites. Others, occurring more rarely, contain large porphyritic augites filled with small laths of labradorite. In some cases a little glass remains pressed in between the grains. From this type transitions lead to glassy basalts, consisting of augite grains, magnetite and ilmenite, and small feldspar needles, often with fluidal structure, all these constituents being cemented by varying quantities of brownish glass. Olivine is often, but by no means always, present. Of the different facies, the holocrystalline (diabasic) prevails. In some measure this may be due to the fact that the flows were heavy and the rate of consolidation was, as a rule, slow. The small area west of Silver City is composed almost entirely of holocrystalline granular rock. . . .

No analyses have been made of the fresh basalt; it is believed that the composition is normal. The basalt near the veins is more or less intensely altered; away from them it is usually very fresh.

About the basalt, Piper and Laney (1926, p. 22) noted:

An adequate source of the extrusion for the great volume of basaltic lavas cannot be satisfactorily established. Basalt dikes, usually from three to ten feet wide and traceable for 1,500 feet or more in some instances, abound in the granite adjacent to the crystalline flow rocks, and especially in the tuffs of the Flint district. Some of these dikes are directly connected with the bodies of lava and are the obvious loci of some of the extrusion. In view of the great extent and uniform character of the flows, however, it is almost inconceivable that the comparatively small known dikes could be the only source. The wide distribution and great thickness of the coarse-bedded tuff demand, moreover, a vent or vents of a higher order of magnitude than these dikes. It is the writers' belief that the basaltic tuffs and flows were extruded from major vents located in the region about Silver City but now concealed by younger rocks, and that the dikes are minor if not inconsequential sources.

PETROGRAPHY

The mineralogical composition and texture of the basalts present no unusual features. The most abundant of the flow rocks are porphyritic with recognizable lath-like and tabular feldspar phenocrysts as much as 0.6 inch long, held in a fine-grained dark gray matrix. Thin sections identify the phenocrysts as laths of andesine-labradorite or labradorite (Ab_3An_4), usua1ly with slight marginal resorption. The ground mass has typical ophitic texture with andesine-labradorite (Ab_lAn_l) microlites interlacing through a matrix of diallage[1] accompanied by hexagonal euhedra and acicular or tabular grains of ilmenite. Olivine may or may not be present but is lacking in the majority of slides. The fine-grained phase does not differ markedly in composition and texture from the groundmass of the porphyritic type. A very small amount of dark colored glass occurs in a few slides and the texture leans toward

[1]A green or brownish-black variety of augite in the form of platelike crystals.

the intersertal. The rocks from the narrow basalt dikes are often fine-grained and cannot be distinguished in the thin section from the flow rocks of similar megascopic appearance.

Asher (1968) described the rocks above the granodiorite as the basalt-latite unit. The basalts in this unit were described as follows (Asher, 1968, p. 33-34):

> The basalts range from porphyritic to dense fine-grained olivine basalts. In the porphyritic varieties clear feldspar laths are conspicuous in a dense felted groundmass containing olivine. The porphyritic varieties are grayish black on a fresh surface. The rocks weather grayish orange to dark yellowish brown. The fine-grained varieties are characterized by felted texture. They are greenish black on a fresh surface, and weather brownish gray. . . .
>
> In thin section the basalts display intergranular to intersertal texture. Hyalo-ophitic to pilotaxitic texture is observed in a few specimens. The feldspar minerals are labradorite or bytownite. In porphyritic rocks the large plagioclase laths range from An50 to An75; most are about An60. In some sections the plagioclase laths have sharp boundaries, in others they are embayed and corroded by the surrounding groundmass. Calcite may be developed along cleavage planes.
>
> Pyroxene, probably augite, is abundant in some sections. Plagioclase sieves the pyroxene grains in coarse-grained specimens, in fine-grained specimens the pyroxene occurs as intergranular fragments interstitial to small feldspar laths. Chlorite developed from the pyroxene is common.
>
> Olivine is an abundant to minor constituent. In most sections it is subordinate to pyroxene. It occurs as grains interstitial to pyroxene and plagioclase in specimens displaying intergranular texture. In porphyritic rocks, large, discrete grains of olivine rimmed by iddingsite can be observed. In many sections the olivine is altered to chlorite and opaque granules of iron oxide.
>
> Dark brown to yellowish glass is interstitial to plagioclase and pyroxene in some specimens. The groundmass of the basalt is glassy to a fine-felted mass of feldspar and pyroxene grains with interstitial olivine. Alteration products and accessory minerals include chlorite, calcite, iddingsite, iron oxides and pyrite.

Overlying both the granitic rocks and the basalts is a thick sequence of rhyolites. Since these rocks were first examined, geologic thought about them has changed from rhyolite flows to remobilized high-temperature welded ash-flow tuffs (Ekren and others, 1984). Lindgren's (1900, p. 120-121) original description of these rocks is as follows:

> The rhyolite is a lava rich in silica, which flowed out over the earlier basalt and over the granite. On Florida Mountain the thickness of the rhyolite flows is 1,200 feet, on Cinnabar Mountain nearer 2,000 feet, while in many places its depth may be much less. The lava, when molten, is of a thick, viscous character; the flows poured out over an irregular surface and moved slowly; all this contributes to make the thickness of the flows variable in a high degree. Where the rhyolite is fresh its surface forms are characterized by abrupt, rocky bluffs, shown, for instance, at Cinnabar Mountain and on Jordan Creek northwest of the Henrietta mine. Where softened by alteration the rock forms long, sloping ridges, such as Florida Mountain.
>
> In appearance the rhyolite is very similar to the majority of Western areas of that rock. It is compact, hard, and resistant to weathering, more rarely vesicular. Its color is grayish, greenish, yellowish, or brownish in different shades, varying greatly and abruptly. The phenocrysts are small, consisting of quartz and sanidine, more rarely oligoclase. The very fine-grained groundmass is often streaky and banded by fluidal structure, rarely purely glassy. Tuffaceous rhyolite, including basalt fragments, occurs a mile northwest of Dewey. Brecciated forms are also common; for instance, in the Chautauqua tunnel near De Lamar.
>
> Practically all of the varieties belong to the structural group of felsophyric rhyolite. Hydrothermal alteration has affected the rhyolite over large areas. Thus it is very difficult to obtain fresh rocks near De Lamar or on Florida Mountain. The rhyolite is here soft, earthy, or silicified, or filled with pyrite. . . . Under the microscope the fresh rhyolite proves to be

> entirely normal. The phenocrysts preserve the usual appearance. Biotite or hornblende is generally absent. The groundmass is seldom microcrystalline, nearly always cryptocrystalline, very frequently filled with small spherulites, and showing banded structure of alternating lighter and darker brownish streaks. Rhyolite glass occurs in specimens from the small area 4 miles east of Dewey. No absolutely fresh rhyolite has been analyzed. It appears, however, to be an entirely normal rock.
>
> *Rhyolite dikes.*—The vents through which the rhyolite was erupted are exposed at many places, both in granite and in basalt. One of the most interesting is the neck in granite 1½ miles above Dewey, toward Silver City. It is of roughly triangular cross section, with sides about 1,000 feet long. It was probably one of the main vents for the eruption which covered Florida Mountain. . . . Rhyolite dikes in basalt are exposed near the contact of the two rocks north of the Trade Dollar mine.

Under the heading "Extrusive rocks," Piper and Laney (1926, p. 27) noted about the rhyolites:

> The lower part of the column predominates in the thin-banded porphyritic rocks, and the breccias and spherulitic flows occur for the most part above them. The uppermost part of the series, which may be separated from the earlier flows by an unconformity, consists of coarse, massive breccias and spherulitic flows containing scattered lenticular masses of black vitrophyre and capped by a heavy flow of the same rock. Approximately 1,000 feet of rhyolite is exposed in Florida Mountain.

Asher (1968, p. 36), calling the unit the Silver City rhyolite, commented: "Most of the Silver City rhyolite is composed of welded ash-flow tuffs, but there are some air-fall tuffs and rhyolite flows." Pansze (1975) subdivided the rhyolite into several units, both tuffs and lava flows, and also identified a number of domes as sources for the rhyolites. Ekren and others (1984, p. 17-18) described the rhyolites as high-temperature remobilized ash-flow tuffs. The rocks on and near Florida Mountain appeared as follows:

> Flow-layered and, for the most part, hydrothermally altered white and light-gray rhyolites cap the Silver City Range on Florida Mountain and a broad area south of War Eagle Mountain (pl. 1 [Figure 7]). In places these capping rhyolites are at least 300 m thick. Nearly all the exposed rocks contain only 1-2 percent phenocrysts of quartz, alkali feldspar, and plagioclase that rarely exceed 1 mm in length. Three locally preserved vitrophyres in the range south of Silver City, which occur at the base, middle, and near the top of the rhyolite section, provided most of the thin sections for this study and indicate breaks or partial breaks in cooling. Stated another way, the vitrophyres indicate that there were significant pauses during the massive rhyolite eruptions. Whether or not the pauses were of sufficient duration to cause complete cooling breaks is unknown. Modally, the three vitrophyres show only slight variations. The lowest vitrophyre, which rests on an uneven surface developed on the latite-basalt sequence and locally on granite, contains 2 percent phenocrysts that consist of 27 percent quartz, 20 percent plagioclase, and nearly 50 percent alkali feldspar. . . . The middle rhyolite vitrophyre contains 1.6 percent phenocrysts that consist of 44 percent quartz, 32 percent alkali feldspar, and 19 percent plagioclase; mafic pseudomorphs constitute about 5 percent of the phenocrysts and appear to be after pyroxene and biotite. The third vitrophyre contains 1 percent phenocrysts that consist of subequal amounts of quartz, alkali feldspar, and plagioclase. The three vitrophyres appear to be representative of the bulk of the rhyolite section–at least we found no rocks in our reconnaissance mapping that were obviously different. A single sample, for example, from devitrified rhyolite low in the section on Cinnabar Mountain yielded a mode that is a good match for the lowest rhyolite vitrophyre just described. No samples were collected from the mostly highly altered rhyolite on Florida Mountain, which, according to Pansze (1975, p. 30), includes welded tuff breccia. . . .
>
> All rhyolites capping the Silver City Range appear to have normal magnetic polarity.

Ore Deposits

Lindgren (1900, p. 160-161) had the following to say about the veins on Florida Mountain:

> The granite is but little altered even near the veins. The rhyolite is silicified near the vein, and somewhat altered in the same manner all over the mountain. The basalt is converted to secondary chlorite, quartz, and calcite.
>
> The veins are developed by long tunnels near the base of the mountain; in the Black Jack and Trade Dollar mines shafts several hundred feet deep have been sunk in these tunnels. The strike of the veins is about N. 20° W.; their dip is usually very steep toward the west. They are narrow, but straight and well defined, the Black Jack being traceable for over 1½ miles, the Mammoth (shown on PI. XVII [Figure 5]) probably farther. The croppings are not prominent, and can be traced only by excavations. The Tip Top and Ontario contain much soft talcose material (chiefly sericite), which is probably crushed and altered rhyolite, but the majority of the veins show a sharply defined gangue of quartz or quartz and orthoclase (valencianite), frequently with excellent comb structure. They are narrow, rarely reaching 2 feet, and often close down to a seam.
>
> The ore consists of finely divided argentite, chalcopyrite, and a little galena and zinc blende. Native gold and silver also occur. The sulphides are present in small quantities, but are very rich. The value is chiefly in silver; the gold in the Black Jack amounts to $8 per ton,[2] and in the Trade Dollar it is less. The average silver contents are 45 ounces per ton. Near the surface native gold was more abundant, probably on account of the oxidation of the ore above the water level. The Ontario and Tip Top, with comparatively shallow workings, are reported to carry more gold than silver. Free gold is probably always present to some extent, but a large part of it appears to be in intimate connection with chalcopyrite and can not be saved by amalgamation.
>
> The veins of Florida Mountain are of special interest, as they cut through granite as well as basalt and rhyolite. The Black Jack vein, the one most extensively developed in the Black Jack and the Trade Dollar mines, shows these relations well and is in other respects very remarkable. Considered as a whole it is a straight fissure, in strike as well as in dip. In rhyolite it is apt to be wider than in granite or basalt, and may splinter into a number of stringers, which always, however, keep well together. In basalt it is narrow, and frequently closes down to a seam. In granite it lies on either or both sides of the basalt dike mentioned, which it closely follows. It is always sharply separated from the basalt by a clay gouge, but may be frozen to the granite. In basalt and granite it is a typical filled fissure, with frequent comb structure. In rhyolite it sometimes makes a composite vein and may be accompanied by some altered rhyolite sufficiently rich to be classed as ore. The throw along the fissure is clearly indicated. The hanging wall has evidently moved downward and northward for 40 feet, about 40° from the horizontal, relatively to the foot wall, a normal fault having thus taken place.
>
> The ore is sufficiently described above. There is no material difference in its value and composition in basalt, rhyolite, and granite, but the quantity is greatest in the granite along the dike, less in the rhyolite, and least in the basalt. The presence of orthoclase (valencianite) as an important gangue mineral in the vein is a most unusual feature and should be especially emphasized. It is equally abundant in granite, basalt, and rhyolite. The ore bodies are apparently very irregular, but have a tendency to form vertical bodies or bodies dipping slightly northward on the plane of the vein.

Piper and Laney (1926, p. 116-119) described the deposits on Florida Mountain as follows:

---

[2]The price of gold was set at $20.67 per ounce.

VEIN SYSTEM

The veins of Florida Mountain constitute a set of roughly parallel fractures which usually strike N. 15º-30º W. and dip 75º-80º W. The northward extensions of the veins trend more nearly due north, as shown by the geologic map (Pl. II [Figure 6]), and dips are locally vertical or steep toward the east. . . . The most westerly of the larger veins is the Banner (Pl. II [Figure 6], No. 16), which may be traced northward from Long Gulch more than half a mile. Approximately 3,000 feet east of the Banner lies the Trade Dollar-Black Jack vein, which may be followed from Blaine tunnel (Pl. II [Figure 6], No. 20) northward across the summit of the mountain for more than a mile. Two veins, the Alpine (Pl. II [Figure 6], No. 12) and the Empire State (Pl. II [Figure 6], No. 8), lie west of the Trade Dollar and branch from it. Theoretical consideration suggests that these two veins occupy fractures opened by secondary stresses acting in the hanging wall of the Trade Dollar vein fissure, and that they should not be expected to extend northward. Unfortunately the veins are difficult to trace at the surface, and there is some doubt as to the plotting shown by the map (Pl. II [Figure 6]); the pattern of underground workings (Pl. XIII [Figure 9]) suggests the junction indicated, although the localities were not accessible to the writer, and nothing is known in detail of the relations of one vein to the others. Less extensively developed veins are the Tip Top (Pl. II [Figure 6], No. l0), Lone Tree (Pl. II [Figure 6], No. 13), Crown Point (Pl. II [Figure 6], No. 14), and Metallic or Miller and Walters (Pl. II [Figure 6], No. 25). Others are opened by the many prospect pits, but a detailed discussion of all is not warranted.

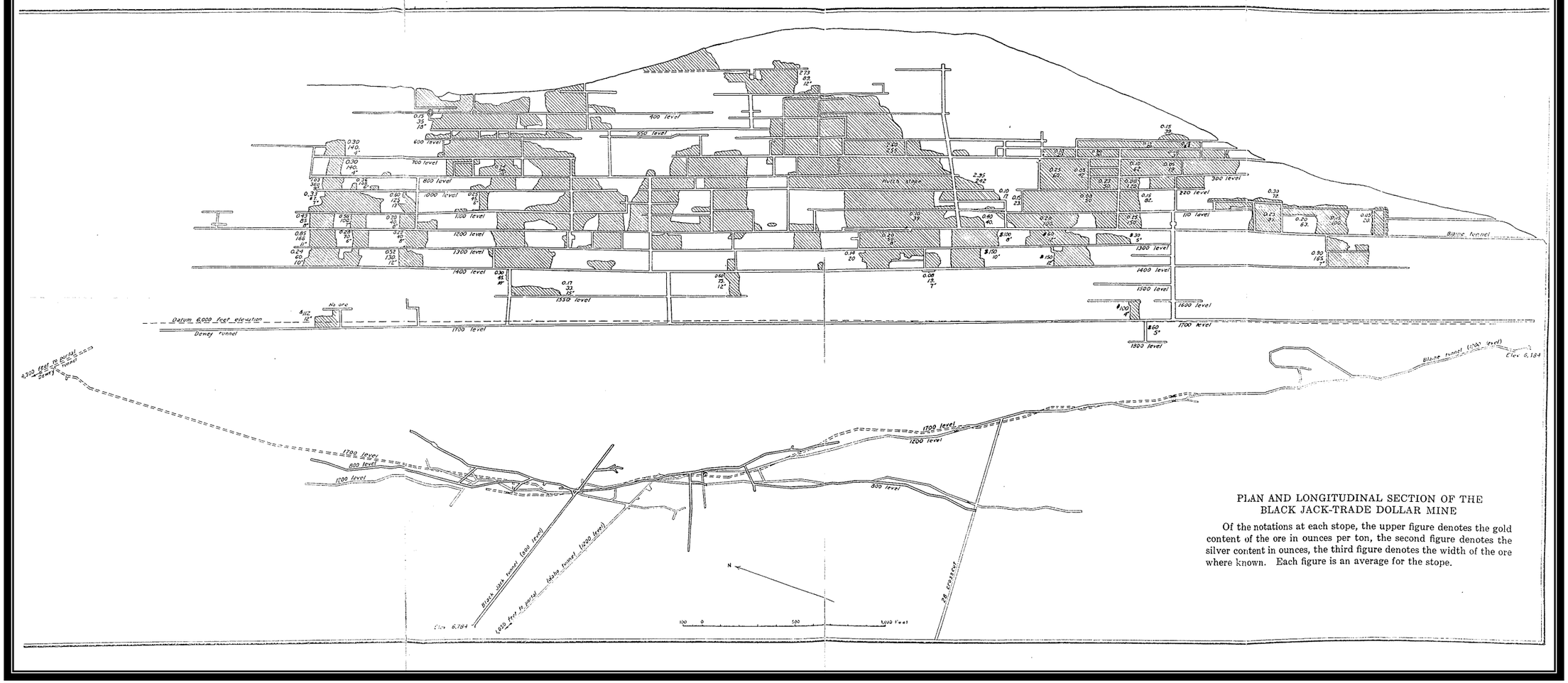
The Trade Dollar-Black Jack vein has been explored more fully than any of the others and may logically be described as a type. In the lower levels of the mine the vein almost invariably follows the basalt dike, . . . and shows from a few inches to 255 feet of quartz, either on the hanging or the footwall. Locally a band of vein matter occurs at both. The vein filling is separated from the dike by a clayey selvage but in many places is tightly 'frozen' to the granite wall. In the overlying basalt the vein may be either a single filled fissure with both walls sharply drawn, or a vein breccia filled by quartz, valencianite, and other mineral species. As a single filled fissure it may vary from a mere seam to six inches wide; as a vein breccia its width may attain three feet, of which not more than 12 inches in the aggregate represents vein-filling. In the vein breccias the enclosed fragments of basalt are highly chloritized and frequently quite soft. In the rhyolite, which lies upon granite and basalt alike, the vein ranges from 3 to 16 feet, and averages 4 feet wide. The vein matter consists of many narrow stringers of quartz and valencianite separated by bands of intensely altered rhyolite. The entire width may constitute medium-grade ore. The walls may be sharply defined by a band of vein-filling, or they may be very indefinite, or even indistinguishable. The altered rhyolite which encloses and parts the veins, disintegrates rapidly under the influence of the weather, and the vein croppings become indistinct zones within which abundant fragments of quartz and valencianite occur in the debris. As a result the veins are traceable at the surface only by extensive trenching.

ORES

The dominant non-metallic mineral of the veins of Florida Mountain is quartz, usually massive, although some of it shows excellent crystallinity. The pseudomorphic type may be present also. Valencianite is abundant in the veins locally, especially in their southern portions; cellular calcite occurs in the Banner vein . . . sericitic clay, much of which is the species beidellite (leverrierite), forms the entire vein filling locally, accompanies comb quartz here and there, and fills the voids of the cellular calcite from the Banner vein. Other less abundant non-metallic minerals of the ores are epodite [epidote], chlorite, fluorite, and the iron phosphate vivianite.

The metallic species include the native metals gold and silver; the silver minerals cerargyrite, argentite, naumannite (the silver selenide), proustite, pyrargyrite, polybasite, and stephanite (?); as well as the non-argentiferous species pyrite, chalcopyrite (and its products of oxidation), sphalerite, galena, jamesonite (?), and the lead selenide clausthalite. . . .

A relatively small portion of the ores, recovered near the surface in the early days of the mine's history, carried a large content of native gold. At slightly greater depths the ores carried an increasingly large content of wire silver, of native gold, and of argentite (?). These, however, were not typical of the ore deposit as a whole and were in large part the result of enrichment by supergene agents. Unfortunately, the inaccessibility of the workings has made it impossible to obtain satisfactory specimens from which the downward extent of enrichment



PLAN AND LONGITUDINAL SECTION OF THE BLACK JACK-TRADE DOLLAR MINE

Of the notations at each stope, the upper figure denotes the gold content of the ore in ounces per ton, the second figure denotes the silver content in ounces, the third figure denotes the width of the ore where known. Each figure is an average for the stope.

Figure 9. Plan and cross section through the Black Jack and Trade Dollar Mines (Plate XIII from Piper and Laney, 1926).

can be determined. An indirect solution of the problem is afforded in part by the following longitudinal section of the Black Jack-Trade Dollar vein (Pl. XIII [Figure 9]), upon which the average precious metal content of the ore extracted from individual stopes is shown as comp1etely as the available data permits. There is a marked increase in the number of parts of silver to each unit weight of gold from the upper levels to the lowest, but the increase is by no means uniform. On the contrary, this gold:silver ratio varies but little below the tenth level and the increase occurs in the higher workings. If the downward change in tenor of the ore is due wholly to supergene processes, as is almost certainly true, this condition suggests an approximate lower limit of their activity. It is to be regretted that suitable production data are not available for the entire stoped area, in order that this lower limit could be precisely drawn. Moreover, ore specimens obtained from the twelfth level, Alpine vein, Trade Dollar mine are made up almost entirely of hypogene or primary minerals. It must be concluded, therefore, that the deep exploratory work on Florida Mountain was below the zone of activity of surface or supergene agents, and that the primary ores should continue downward without great change in tenor.

Silver has been many times more plentiful than gold in the normal ore, the ratio of gold to silver by weight being 1 to 138.6 for the total recorded production of the Trade Dollar-Black Jack mine. This is by far the highest known average ratio for any ore deposit of the Silver City region; and in small bodies of high-grade ore it was even higher. From the material that is available for study, it seems that the deeper ores carry a small but approximately constant amount (usually one or two per cent) of the non-argentiferous sulphides, chalcopyrite, galena, sphalerite, and pyrite, together with a variable quantity of the rich silver minerals, of which the selenide, naumannite, is by far the dominant species. Much less abundant are the other silver minerals, argentite, proustite, pyrargyrite, polybasite, and cerargyrite. The lead selenide, clausthalite, occurs very sparsely and usually with the ores rich in naumannite. These metallic species are in large part strictly hypogene or primary and are contemporaneous with certain stages in the formation of the vein matter.

History of the Florida Mountain Mines

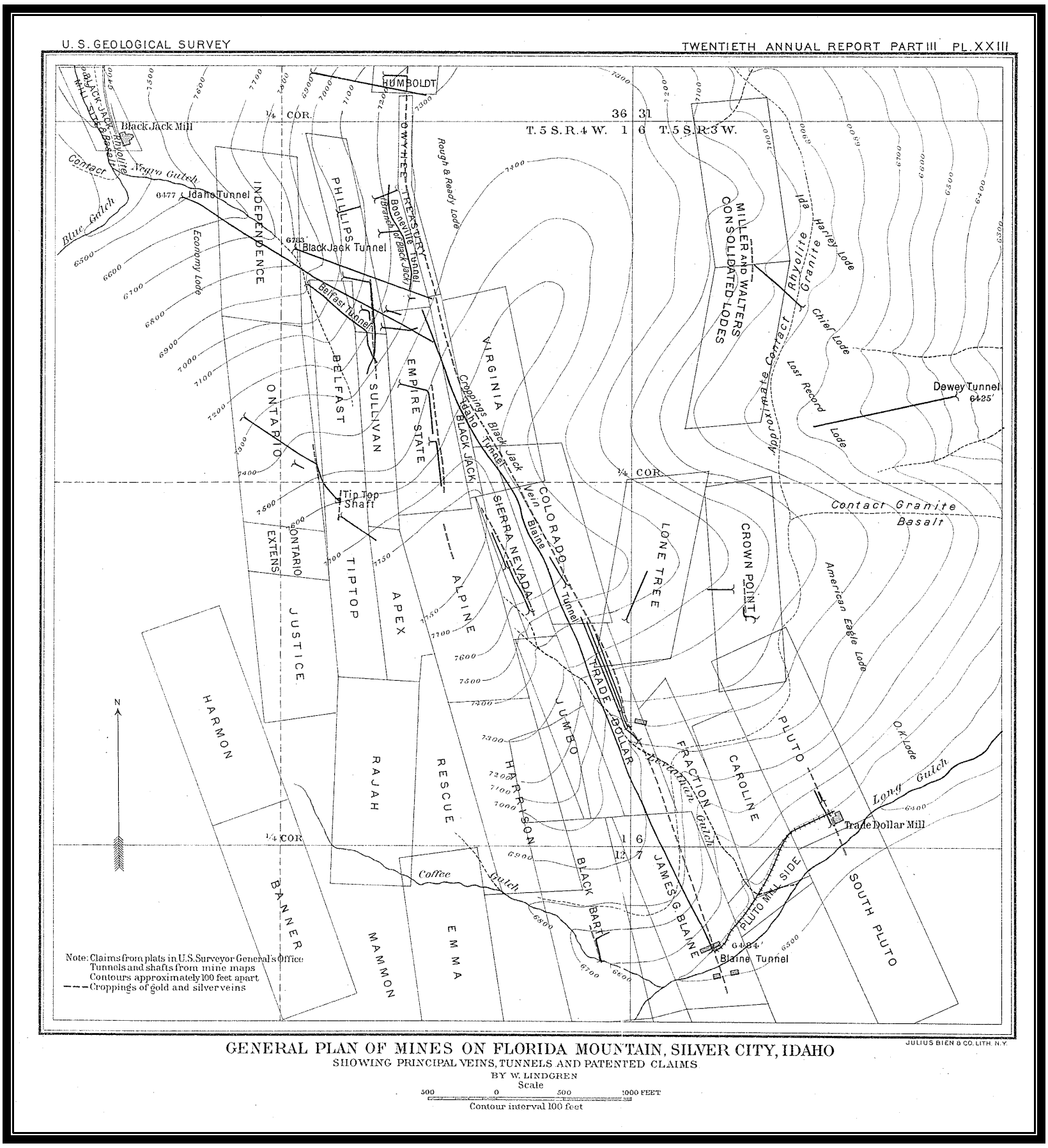
Introduction

A party led by a prospector named Jordan discovered placer gold some distance below De Lamar in 1863. For the next two years, placers were heavily worked along Jordan Creek and its tributaries, including a tributary called Blue Gulch that drained off Florida Mountain. Soon the richest placers were exhausted, and the miners began working the nearby veins, including those on Florida Mountain (Lindgren, 1900). Placers continued to be worked in Blue Gulch into the 1870s.

Black Jack Mine

The Black Jack Mine is on the northern slope of Florida Mountain. The main openings for the mine at the time of Lindgren's (1900) visit were the Black Jack tunnel and the Idaho tunnel (Figures 3 and 10). Although Lindgren mentions that the upper tunnels had been abandoned, he does not name them. At that time, the property consisted of the following patented claims: Black Jack, Virginia, Empire State, Phillips, Sullivan, Belfast, and Independence (Lindgren, 1900).

The Black Jack vein was one of the early discoveries on Florida Mountain and was worked from 1865 to 1875. (See Table 1 for companies and individuals operating at the mine.) Operations from 1875 to 1889 were intermittent and by lessees (Lindgren, 1900). From 1882 to 1884, the mine produced good milling ore. In 1883, twenty-five men worked



GENERAL PLAN OF MINES ON FLORIDA MOUNTAIN, SILVER CITY, IDAHO
SHOWING PRINCIPAL VEINS, TUNNELS AND PATENTED CLAIMS
BY W. LINDGREN
Scale
500 0 500 1000 FEET
Contour interval 100 feet

JULIUS BIEN & CO. LITH. N.Y.

Figure 10. Patented claims across the summit of Florida Mountain in 1897, with the major workings shown as heavy solid lines (Plate XXIII from Lindgren, 1900). Dashed heavy lines are the outcrops of the principal veins. The majority of these workings were the properties of the Idaho and Pittsburgh Mining and Milling Company (Black Jack Mine) or the Trade Dollar Mining and Milling Company (Trade Dollar Mine). Two years later, the Black Jack and the Trade Dollar were consolidated into a single operation.

Table 1. Companies and individuals operating at Florida Mountain. Information is taken from company reports to the Idaho Inspector of Mines, from data reported on the Idaho Secretary of State's website, and from other references cited at the end of the report. Mines are listed in the order discussed in the text.

Company Name	Officer	Date Incorporated	Charter Forfeited	Year(s) at Mine
Companies and Individuals operating at the Black Jack Mine.				
unknown discoverer	—[1]	—	—	1865-(?)[2]
unknown lessees	—	—	—	1875-1889
Idaho and Pittsburgh Mining and Milling Company	Frederic Irwin, manager	3 June 1985	1 December 1912	1889-1899
Trade Dollar Consolidated Mining Company	James Hutchinson, superintendent	31 December 1894	14 January 1920	1899-1917
Companies and Individuals operating at the Trade Dollar Mine.				
unknown discoverer	—	—	—	—
unknown owners	—	—	—	(?)-1891
Trade Dollar Mining and Milling Company	James Hutchinson, superintendent	31 December 1894	1899	1891-1899
Trade Dollar Consolidated Mining Company	James Hutchinson, superintendent	1899	2 January 1911	1899-1911
Swan Falls Power Company[3]	Frederic Irwin, superintendent	2 January 1911	14 January 1920	1911-1917
Florida Mountain Mines Co.	M.A. Isaacs, president	25 Mar 1918	1 Dec 1921	1917-1923(?)
Robert J. Goodwin (lessee)	—	—	—	(1921)[2]
Empire Mines Co.	Peter Steele, President-Manager	15 Sep 1923	20 Jul 2009 (in good standing)	1923-
unknown lessees	—	—	—	1923-1926
Hoosier Leasing Company	Charles A. Hackney, president	16 November 1926	30 November 1935	1926-1929

Table 1 (continued). Companies and individuals operating at Florida Mountain.

Company Name	Officer	Date Incorporated	Charter Forfeited	Year(s) at Mine
Trade Dollar Leasing Company	M.M. Hanson, president	11 September 1928	30 November 1931	1928-1929
Jim Daly	—	—	—	1929-(?)
Western Mines, Ltd. (Goldsil Mines, Inc.)	Samuel E. Chaney, president	8 December 1934	30 November 1936	1934-1936
unknown operators	—	—	—	1938, 1941
Brunzell and Williams	—	—	—	1954
Companies and individuals operating at the Florida Mountain Tunnel				
possible original operator	—	—	—	1894-1897
Florida Mountain Mining and Milling Company	—	—	—	1897-1899
Trade Dollar Consolidated Mining Company	James Hutchinson, superintendent	1899	2 January 1911	1899-1917

[1]Information not present in Idaho Geological Survey's files.
[2]No data found on precise date range.
[3]Name change.

at the mine, and the ore was hauled to Leonard's mill. The mine continued to produce good ore in 1884.

The Idaho and Pittsburgh Mining and Milling Company bought the Black Jack Mine in 1889. The company started a long cross-cut at what would become the No. 8 level of the mine, but struck a barren section of the vein and did not find ore until 1891 (Lindgren, 1900). In over 1,000 feet of tunnel, neither of the two veins found were rich enough to pay. After drifting on one of the veins with discouraging results, the main tunnel was pushed forward until it struck a 3-foot vein which yielded ore valued at $96 per ton in early 1891 (E&MJ).

In 1893, a large force of miners were drifting south on the vein. The mill was running steadily. A 200-ton ore house that had been put up in late 1892 was full by mid-February 1893. By early April, 400 additional tons of ore, which had been mined from the drifts and a raise, was stored at the mill (E&MJ). According to the April 22, 1893, issue of E&MJ (vol. 55, no. 16, p. 374):

> The large ore house at this mine is filled to its utmost capacity, and 400 tons more are stored on the dumping platform at the mill. This ore has all been taken from the drifts and raises. This ore, which is considered second-class, is estimated to run about $140 per ton. A load of the higher grade, which is sacked, went out to the railroad, completing another car for shipment, and runs about $800 per ton. The drift on the ledge is now in the third shoot, and the character of the ore is fully equal to that in those that were passed through.

By the beginning of May 1893, nearly 1,000 tons of ore were piled up and waiting for vanners[3] to be put in the mill. This was apparently done by mid-July, when the mill was working at full capacity. About 70 percent of the value of the ore was saved in the concentrates, which were shipped to smelters in the Denver area. A reservoir was built in Blue Gulch to provide water all year. The mine closed in late July 1893 because the price of silver was low, but reopened in October, employing fifty to sixty men. The ore was reported to carry a high enough percentage of gold to make it profitable to work, even with the low silver prices. In October, the company let a contract to drive a tunnel from the mill to the lowest workings of the mine, a distance of about 1,500 feet. The tunnel was planned for drainage and to be the main working level of the mine (E&MJ).

The January 6, 1894, issue of E&MJ (vol. 57, no. 1, p. 14) contained further information about the new tunnel being driven from the mill:

> The contract for driving the Idaho cross-cut ahead, which will eventually tap the Black Jack ledge 300 ft. below the eighth level was let to R. B. Anderson and Charles Webb, of Idaho City, who are now pushing work on the same. This tunnel will be, when completed, 1,400 ft. long. Connections will soon be made in the sixth level for air. At present they are forcing air into the mine with a fan.

The mine employed about sixty men during the first half of the year. The mill was closed for a week in May for repairs, but the mine continued to make steady shipments of bullion. In late August, the Black Jack crosscut struck 12 inches of good ore that was supposed to be a spur of the main Black Jack vein. In September, the company let a contract for extending the Black Jack tunnel l,000 feet. The contract price was reported to be $6.50 per foot with the

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[3]A vanner is a device which concentrates ore by the combined action of flowing water and oscillatory motion. The ore is carried up an inclined, continuous belt down which the ore pulp and wash water flow.

company furnishing compressed air for the drills. The mine and mill ran steadily for the rest of the year, bringing in more than enough money to cover expenses (E&MJ).

In June 1895, E&MJ reported that the Idaho tunnel struck a "large ore body." The July 27, 1895, issue of E&MJ (vol. 60, no. 4, p. 86) contained the following description of the mine and its operation:

> The Black Jack Mine, owned by this company, is worked through the 800-ft. level cross-cut, the different levels being connected by upraises and chutes, down which the ore is dumped to that cross-cut through which it is run out to the surface. In 1892, the company secured the Idaho tunnel, then in about 200 ft., and commenced driving it for the ledge, which it cut at a point 306 ft. deeper than the 800-ft. cross-cut. The Idaho tunnel is in 2,158 ft., cross-cutting the vein on which drifts are being driven in both directions. It also cuts two or three promising ledges before reaching the vein in which prospecting tunnels will eventually be driven. It is intended to connect the Idaho tunnel with the 800-ft. level by an upraise, and when this is completed all the ore from the mine will be delivered through this tunnel to the mill. The exhaust system of ventilation is used successfully in the Idaho tunnel, keeping the air perfectly pure throughout its entire length. . . . The mine and mill together employ about 75 men.

In February 1896, the Idaho and Pittsburg Mining and Milling Company negotiated the purchase the Phillips and Sullivan Group. The vein on these claims was west of, and parallel to, the Black Jack vein and had already been cut by the tunnels opening the Black Jack Mine (E&MJ). Although it was not reported, these negotiations were successful, as Lindgren (1900, p. 136) listed the claims as part of the Black Jack property. Also in February, the raise from the Idaho tunnel, started at a distance of 2,150 feet from the mouth of the tunnel, broke into the upper level. The raise was 306 feet long. In early October, the mine and mill were running at full capacity, employing 112 men. The mill was crushing about 1,000 tons of ore per month (E&MJ). The December 5, 1896, issue of E&MJ (vol. 62, no. 23, p. 542) noted this important development:

> The Blaine tunnel of the Trade Dollar Group, driving north, and Idaho tunnel of the Black Jack group, driving south, have been connected, thereby making an opening clear through Florida Mountain. The Blaine tunnel is 4,317 ft. in length and the Idaho tunnel 3,200 ft., making a total of 7,517 ft. or nearly one and one-half miles. The tunnel cuts the mountain at a depth of 1,200 ft.

By June 1897, the Black Jack Mine had been in continuous operation for four years. The latest development was sinking a shaft from the 1,200 level (Idaho tunnel) to open deeper levels of the mine. Ninety men were employed at the mine. In July, the mill was closed for its annual overhaul and a larger compressor was installed. This was a 14 x 14½ x 18 inch[4] Ingersoll-Sergeant compressor to provide power for drills and a 30-horsepower underground hoist. By the end of October, the company was working on the station at the 100 foot level of the new shaft. Sinking on the shaft was scheduled to resume as soon as the station was completed (E&MJ).

By the end of February 1898, the new 35-horsepower Fraser & Chalmers hoist was moving the cage in the shaft from the Idaho level. The shaft was projected to cut the vein on the 200 foot level (E&MJ).

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[4]The diameters of the low-pressure and the high-pressure cylinders and the length of the piston's stroke, in the duplex compressor.

In late April 1899, the mine shut down because of a heavy flow of water on the lowest level. The shaft was down 220 feet. The company planned to install heavier pumping machinery. For the previous ten years, the mine was reported to have been a steady dividend payer. In August, a rumor surfaced that the Black Jack was about to be consolidated with the connecting Trade Dollar Mine. By early October, the Black Jack had been sold to the Trade Dollar Consolidated Mining Company. The combined properties of the new company were to be developed by a long tunnel (the Florida Mountain tunnel) 300 feet under the Black Jack's deepest workings (E&MJ).

Trade Dollar Mine

The Trade Dollar Mine was on the south slope of Florida Mountain along the same vein worked by the Black Jack Mine (Figures 3, 6, and 10). The workings extended from the summit of Florida Mountain to Long Gulch. At the time of Lindgren's (1900, p. 140) visit, the property consisted of the following patented claims: Colorado, Trade Dollar, Blaine, Blaine Extension, Jumbo, Black Bart, Pluto, South Pluto, Caroline, and Fraction.

The 1882 DotMR noted that the Leviathan was worked on a lease. It was reported to be on the same ledge as the Empire State (one of the patented claims of the Black Jack Mine) and probably was an old name for a part of the Trade Dollar Mine that was located in Leviathan Gulch. The Leviathan was an old location in 1882, and in that year it produced "considerable" ore, which yielded gold of a high degree of fineness. In 1883, the drift on the Leviathan was continued north, attaining greater depth on the vein. Fair milling ore was placed on the dump.

In 1891, the mine was bought by the Trade Dollar Mining and Milling Company. In mid-April, the mine had two levels driven on the vein 70 vertical feet apart. According to the May 2, 1891, issue of E&MJ (vol. 51, no. 18, p. 527):

> The upper tunnel is now in about 370 feet, and work has had to be suspended for want of timbers. A chimney of ore about 70 feet long has been cut, but seems to have pinched out about 60 feet from the present face. This chimney is now being stoped, and in one place the miners are up some 30 feet. The ledge is nearly two feet wide and contains from 2 to 10 inches of rich white quartz full of brittle silver, which assays from 400 to 1,000 ounces of silver per ton . . . . One hundred and twenty-five sacks of this ore are now piled up at the mine and probably a car load will be ready for shipment by the time the road is open.

The face of the lower tunnel was still 150 feet from a winze sunk from the upper level. The vein on this level was wider and much lower grade. This tunnel, possibly the Blaine tunnel, was being driven by contract.

By January 1893, the Blaine tunnel was 2,075 feet long and was driven by three eight-hour shifts. Stoping was done in two different places, one of which had 12 inches of $250 ore. Even so, all the milling ore had to be hoisted by hand, and it was impossible to keep the mill supplied with enough ore for continuous operations (E&MJ). (See Table 2 for total production from Trade Dollar and Black Jack mines.) The February 18, 1983, issue of E&MJ (vol. 55, no. 7, p. 158) described the progress on the Blaine tunnel:

> The tunnel is now in 2,400 ft. and making about 7 ft. progress per day. The company is stoping in two different places in the tunnel, one on the Blaine ledge and one on the Trade Dollar ledge. The former is 90 ft. in length, the ledge is 2½ ft. in width, from 4 to 10 ins. of which, on the footwall, assays $160 per ton. The latter stope is 60 ft. in length, and

Table 2. Production of gold and silver from the Black Jack-Trade Dollar Mine (Piper and Laney, 1926). Data are from the Trade Dollar Mining and Milling Co. and the Trade Dollar Consolidated Mining Co.

Year	Weight in Fine Ounces		Value			Value of silver per fine ounce	Ratio of Au to Ag by wt.
	Gold	Silver	Gold	Silver	Total		
1865-91	19,300	1,335,000	$400,000	$1,500,000	$1,900,000	$1.156	—
1892	2,000	200,000	$41,500	$174,000	$215,500	$0.87	—
1893	2,000	200,000	$41,500	$156,000	$197,500	$0.78	—
1894	5,100	720,000	$105,500	$454,000	$559,500	$0.63	—
1895	4,900	695,000	$101,000	$442,000	$543,000	$0.65	1 to 166.7
1896	6,100	635,000	$126,000	$432,000	$558,000	$0.68	107.5
1897	6,000	625,000	$124,000	$375,000	$499,000	$0.60	121.5
1898	7,100	805,000	$147,000	$475,000	$622,000	$0.59	126.2
1899	11,750	1,075,000	$243,000	$645,000	$888,000	$0.60	108.3
1900	11,300	1,163,000	$233,500	$722,000	$955,501	$0.62	93.7
1901	10,500	1,210,000	$217,000	$726,000	$943,000	$0.60	116.7
1902	6,150	781,000	$127,000	$414,000	$541,000	$0.53	125.2
1903	5,600	690,000	$116,000	$372,500	$488,700	$0.54	123.0
1904	7,050	738,500	$145,500	$428,000	$573,500	$0.58	103.4
1905	8,500	1,422,000	$175,500	$867,000	$1,042,500	$0.61	178.5
1906	8,250	1,242,000	$170,500	$845,000	$1,015,500	$0.68	168.2
1907	4,650	653,000	$96,000	$431,000	$527,000	$0.66	139.1
1908	3,050	642,000	$63,000	$340,000	$403,000	$0.53	212.0
1909	2,900	519,000	$60,000	$269,000	$329,000	$0.52	189.4
1910	380	71,200	$7,900	$38,400	$46,325	$0.54	—
Totals	**132,580**	**15,421,700**	**$2,741,400**	**$10,105,900**	**$12,847,525**	**—**	**138.6**

> the ledge is 2 ft. in width, about 6 ins. of which assays $150. The ledge in the present face is 6 ft. wide. Something over 400 ft. farther will have to be run to cut the rich shoot of ore encountered in the upper workings of the Trade Dollar. Teams are now hauling ore from the Trade Dollar mine to the mill.

In late March, the Blaine tunnel was nearing completion (E&MJ). This contradicts Lindgren's (1900) report that the Blaine tunnel was completed in 1891. In late March or early April, 230 tons of ore was milled. This material yielded four bars of bullion valued at $4,694 and 7,899 lbs. of concentrates worth $26,000. The Blaine stope was showing 4-6 inches of $100 ore, and the Trade Dollar stope had 8-12 inches of $140 ore. In October, the mine was shut down, and the decisions about the mine's future were in the hands of company directors in Chicago and Pittsburgh. The mine reopened before the end of the year, but operated only with a small workforce mining rich ore (E&MJ).

In January 1894, the company bought a group of adjacent claims – the Sierra Nevada, Standard, and Colorado – for $65,000. The Sierra Nevada was estimated to have produced at least $300,000 of gold, and the veins on all three claims were large. In February, the No. 3 tunnel was extended by contract into ground recently purchased from Dan Feour (E&MJ). Other February work was described by the February 24, 1894, issue of E&MJ (v. 57, no. 8, p. 182):

> The adit tunnel[5] is also being extended north on the vein. A force is employed with the Burleigh drill,[6] at a point about 1,100 ft. from the mouth of the adit tunnel where they are following the vein, which was lost when the tunnel was driven. Something like 300 ft. will have to be driven to again enter the tunnel, but when completed will shorten the tunnel by about 500 ft. They are now in about 40 ft., and have a small streak of pay. About 20 men are employed at the mine, working three shifts of eight hours each.

In early May, the face of the tunnel cut a large body of valuable ore. Citing an article in the *Silver City Avalanche*, the May 12, 1894, issue of E&MJ (v. 57, no. 19, p. 446) noted:

> The foot wall is solid granite and the hanging wall porphyry, both firm and smooth, and from 5 to 6 ft. of ledge matter intervening. There are fully 2 ft. of solid quartz in the face, which will mill from 300 to 400 oz. of silver per ton. In the short line air drills are being worked and connections will be made within a day or two, which will shorten the tunnel about 500 ft. Miners are at work in the 170-ft. level and are sending down ore. A force of ore-sorters is working on the dump, sacking rich rock for shipment. The tram from the tunnel to the mill is being shoveled out and put in shape for running ore. Wm. Rickenberg, who has been put in charge of the mill, is now engaged in getting it in shape for a long run. Mr. Rickenberg will experiment with a steam ejector for running the slime from the tanks into the pans.

The adit continued in 2 feet of good ore for the rest of the month, although loose ground required close timbering of the workings. In May, about sixty men worked the mine and mill (E&MJ). In June, again referring to the *Silver City Avalanche*, the June 16, 1894, E&MJ (v. 57, no. 24, p. 565) described a unique ventilation system called a "water blast":

> Water is taken from a ditch and conducted through 2½-in. pipe through winzes to the No. 3 level, a perpendicular distance something over 100 ft. From this point a horizontal pipe extends to the face of the drift. The water flowing through the vertical pipe creates a suction

---

[5]The Blaine tunnel.

[6]One of the earliest types of compressed-air-driven rock drills.

> in the horizontal pipe. This blast can be extended through winze D to the adit tunnel, 405 ft. below, and as many connections put in as may be necessary to produce perfect ventilation throughout the mine. At present it is used only in No. 3, where it works well.

In June, both the No. 3 tunnel and the Blaine tunnel were being advanced into the Feour ground. The face of the Blaine tunnel was in 2 to 3 feet of ore, most of which was stripped and left standing on the footwall. The face of the No. 3 tunnel located a "nice streak of ore." In addition to this development work, enough ore was mined to keep the mill running steadily. By early July, the company employed eighty men at the mine and mill. The mill processed about 22 tons-per-day (tpd). The company shipped about $5,000 in bullion and 10 tons of rich concentrates for the month ending July 20. Work at the face of the Blaine tunnel was discontinued for a few days to started stopes on the Feour chute of ore. In August, the company began work on a new tramway system designed to carry ore directly from the mine to the mill. To protect it from snowslides, the new tramway was also timbered over and covered with waste rock where it crossed the gulch. A two-spigot, V-shaped box classifier[7] was used in the mill to separate the heavy pulp[8] from the lighter pulp; each grade flowed onto different vanners. The mine and mill ran steadily through the end of 1894 (E&MJ).

The Trade Dollar shipped a full carload of concentrates on January 20, 1895. The mine and mill ran at full capacity, which the new covered tramway made possible. In January, the Blaine tunnel was over 3,600 feet long, and the No. 4 tunnel was being driven to intersect the Blaine stope. Figure 11 shows the Blaine tunnel and Trade Dollar mill when it was visited by Lindgren in the summer of 1897. The ore throughout the mine was of high grade. In July, the company located the Blaine Extension claim, south of the Blaine claim (Figure 10), and development found some ore which assayed $8 in gold[9] with some silver. Also recently located was the Fraction claim, which had not been sufficiently developed to determine its value. In the Blaine tunnel, a new three-compartment raise had been started from the face of the tunnel to connect with the No. 3 tunnel (Figure 12) some 400 ft. above (E&MJ). The September 28, 1895, issue of E&MJ noted the Trade Dollar and Black Jack groups had been sold to a syndicate of New York and Denver parties; however, later information does not support this report. Based on an article in the *Silver City Avalanche*, the November 2, 1895, issue of E&MJ (v. 60, no. 18, p. 425) described the current work at the mine:

> Supplies of every kind are being laid in for extensive work. The adit tunnel drift has been started up again and is now breaking into a body of ore, the face showing strong pay-streaks upon both walls. The new upraise is now about 180 ft. above the adit tunnel, and is 4 x 12 ft. in size, constructed of 4 x 12 in. planks, and of three compartments. At the 110-ft. level an offset of about 2 ft. (or half the width of the chutes) is made for convenience and safety. The ladder-way is constructed with stations at intervals of about 25 ft., thereby insuring security to the miners. A hand-blower has been put in at the foot of this upraise which keeps the air in the face of the tunnel good. The mill will soon close down for a short time to make preparations for winter, including the putting in of hot-air pipes to heat the mill.

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[7]A classifier is a device for sorting particles based on differences in behavior in a fluid, usually water.

[8]A mixture of ground ore and water capable of flowing like a fluid.

[9]At a gold price of $20.67 per troy ounce.

Figure 11. Trade Dollar Mine and mill on Florida Mountain, looking northwest (Plate XVIIIB from Lindgren, 1900). The large dump in the left foreground is from the Blaine tunnel.

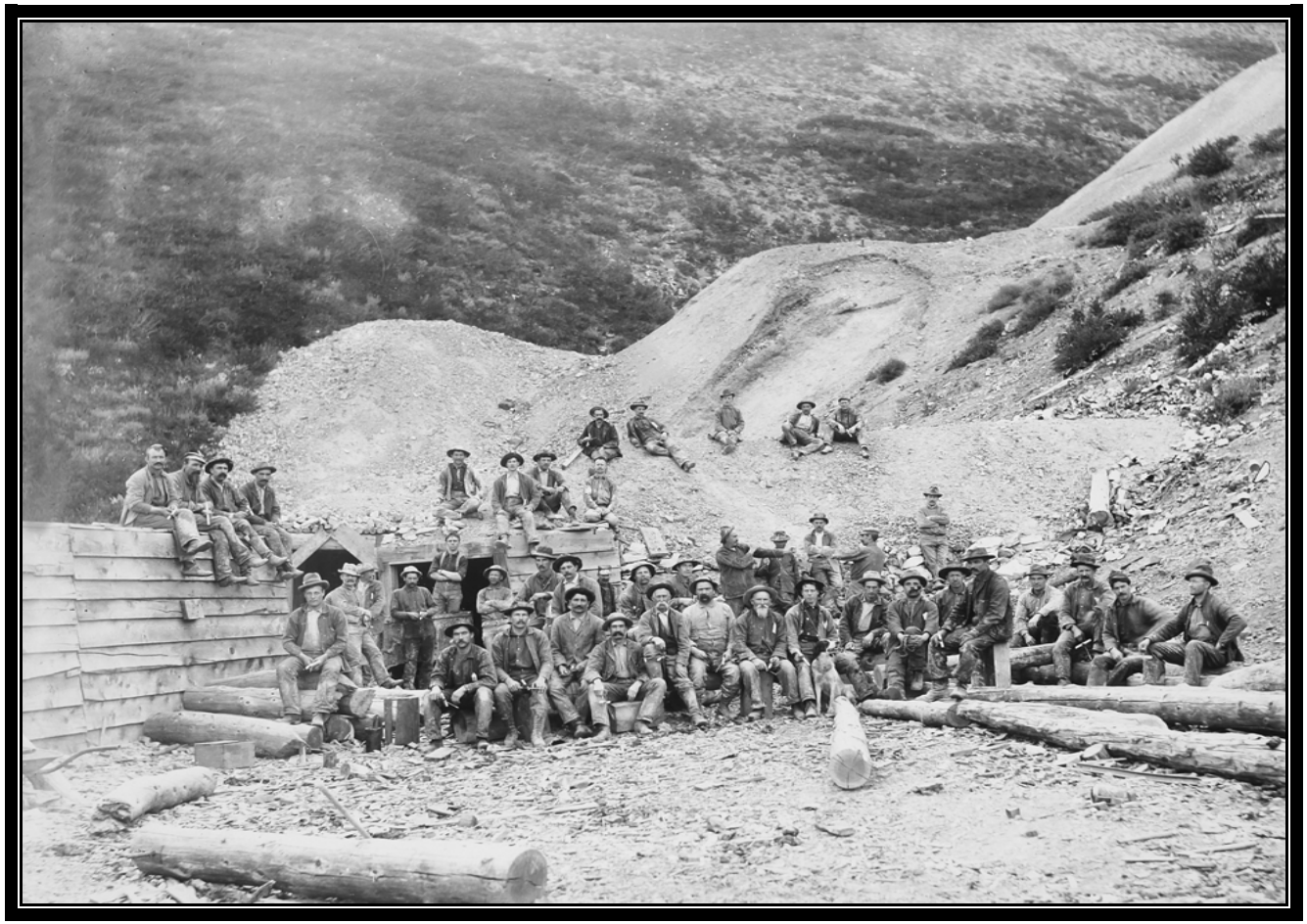

Figure 12. Entrance to the Trade Dollar No. 3 tunnel, with forty-five miners posed in front of it (Idaho State Historical Society photograph 60-120-7).

In March 1896, a large strike almost under the apex of Florida Mountain was made in the Blaine tunnel, which was 4,300 feet long. Previously, the tunnel opened several distinct ore chutes from which the mine's large gold and silver production had come. About 3,000 feet from the entrance of the Blaine tunnel, a shaft was sunk. In May, the Trade Dollar shipped seven bars of bullion. The mine employed over one hundred men per month and shipped a carload of concentrates every month. Work started in May to grade the site for a new mill at Booneville, four miles below Silver City. In June, a "big strike" was made in the No. 3 tunnel. The pay streak was 8 inches wide, and the 2½-foot vein was good milling ore. The Blaine tunnel had been in a rich chute of ore for 300 feet. In August, the company secured a bond on the Alpine group, adjacent to its property, and planned to develop it. During September, the mine produced two carloads of concentrates and fifteen bars of bullion. In addition, a carload of rich smelting ore was shipped. The total output of September was estimated at about $115,000. A complete electric light and power plant was immediately planned (E&MJ). The October 24, 1896, issue of E&MJ (v. 62, no. 17, p. 397) reported the value of the car of smelting ore:

> TRADE DOLLAR.-Probably the richest carload of ore ever received in Denver, Colo., by the State Ore Sampling Works, is the ore from this mine in the De Lamar mining district, a short distance below Silver City. The ore was sampled and ran 41.12 oz. gold and 5,936.32 oz. silver to the ton. The car weighed 22,846 lbs., or a little less than 11½ tons, and the net value was $50,438.87, an average of $1,465 per ton.

Near the end of 1896, the Blaine tunnel of the Trade Dollar Group and the Idaho tunnel of the Black Jack group connected, as noted above, making an opening clear through Florida Mountain at a depth of 1,200 feet (E&MJ).

In May 1897, the company put into service a new 15-horsepower Rendrie & Bolthoff hoist at a station 2,000 feet underground. The power was supplied by an air compressor plant at the mouth of the Blaine tunnel. In August, rumors circulated about a pending deal for the Trade Dollar Mine, the Black Jack Mine, and the property of the Florida Mountain Mining Company (see below). The Trade Dollar had been examined by the manager and the consulting engineer of the Bunker Hill & Sullivan Mining & Milling Company, but if this was the basis of the rumor, the deal did not go through. By late October, the underground shaft was down about 265 feet and nearing the contact with the granite. The mine laid in supplies for the winter.

By May 1898, the Trade Dollar included five miles of tunnels. The Blaine tunnel was 3,854 ft. long. Mill equipment included a Blake crusher, ten 950-1b. quick-drop stamps, four Frue vanners, and six Fraser & Chalmers amalgam pans. Dividends were projected to amount to nearly $500,000 that year. In early July, E&MJ reported that the mine and mill operated regularly and the output was large. Miners at 150 and 300 feet below the Blaine tunnel level drifted on small streaks of good ore (E&MJ).

The April 1, 1899, issue of E&MJ reported that the Trade Dollar Mining and Milling Company planned to increase its stock from 500,000 shares of par value $5 to 800,000 shares in order to purchase the Florida Mountain Mining and Milling Company. The name of the corporation was changed to the Trade Dollar Combined Mining Company. Florida Mountain's property consisted of twenty claims and a well equipped mill at Dewey. James Hutchinson, of Silver City, was the mine manager. In August, a 12,000-foot-long tunnel was being driven through Florida Mountain from Dewey to the Trade Dollar mine workings. By October, the Trade Dollar Combined Mining Company had purchased the Black Jack Mine and the company changed its name to the Trade Dollar Consolidated Mining Company.

Purchase of the Black Jack gave the Trade Dollar Consolidated about 8,000 feet on the vein. The long tunnel from Dewey, which would pass 300 feet under the Black Jack's deepest workings, was being driven to develop the property (E&MJ).

In February 1900, the Black Jack No. 12 (Idaho) tunnel was being driven into the Trade Dollar property to reach the grade of the Blaine tunnel (Figure 13) . The company planned to be able to use either the Black Jack mill (Figures 14, 15, and 16) on the north end of this tunnel or the Blaine mill on the south end. Mules were used for tramming in the Black Jack. In July, the engine in the Blaine mill was wrecked due to negligence by the engineer, causing the mine and mill to close for a month (E&MJ). Meanwhile, the company began construction of an electrical power dam on the Snake River at Swan Falls. The July 28, 1900, issue of E&MJ (v. 70, no. 4, p. 107) described the project:

> A rock island, about 300 ft. wide, stands in the center of the river, affording ample abutments for a dam. As the river is about 1,200 ft. wide here, each of the 2 portions of the dam will be about 450 ft. long. On the right-hand channel the dam is to be of solid masonry. The spillway will be through the left-hand channel where a rock filled crib dam will be constructed, giving a permanent head of 17 ft. and furnishing 12,000 H. P. At the present time only 2,000 H. P. will be installed, which will be used by the Trade Dollar Company at its mines in Silver City. . . .
>
> The electrical machinery is being furnished by the Westinghouse Company, of Pittsburg, and the hydraulic machinery by the Morgan, Smith Company, of York, Pa. The Mountain Electric Company, of Denver, Colo., is putting in the electrical equipment. About 1,400,000 lbs. of cement and 600,000 ft. of lumber are being used in the construction of the dam.

In October 1900, new ore was located at a depth of 1,500 feet. Starting at the town of Dewey (Figures 17 and 18), the Florida tunnel was 2,600 feet long and a few hundred feet short of the Trade Dollar vein. The tunnel was 500 feet below the mine's deepest workings. In early December, one of the turbines for the Swan Falls power plant was installed and three more turbines were in transit. Over half the poles for the transmission line were up, and the accompanying wire was strung (E&MJ).

Although the power plant was supposed to be operational by January 1, 1901, the construction process did not run smoothly. The problems were described in the February 23, 1901, issue of E&MJ (v. 71, no. 8, p. 254):

> Some difficulty has been experienced at the Swan Falls power plant in completing the crib dam through the main channel of the Snake River. In laying out the work it was decided to complete the concrete or power side of the dam first, and when everything else was ready to close the main channel, about 60 ft. wide on the Owyhee side. The concrete dam is now completed, the power house erected, and the machinery nearly all in place. The crib dam, which has a total length of 424 ft., is also finished with the exception of the 60-ft. channel which probably averages 20 ft. in depth. The plan adopted is to construct cribs, fill them with rock and lower them on guides, but a crib is often washed out while being lowered. Consulting Engineer Johnstone, of Chicago is now at the dam and the work of filling the channel will be carried on both day and night. The big plant is expected to be completed and formally started on March 4th at the Blaine Mill in Silver City.

By April, the dam was finished and the power plant was nearing completion. The company was waiting for the electrical machinery needed to supply power for the air compressor at the Dewey tunnel and mill. By early May, electric power from the Swan Falls plant was being used at the Blaine mill, the Black Jack mill, and in the Florida tunnel. The Florida tunnel was 4,000 feet long and was soon to get an electric locomotive for hauling mine cars.

Figure 13. Crews from both the day and the night shifts in front of the Blaine tunnel, 1900 (Idaho State Historical Society photograph 596).

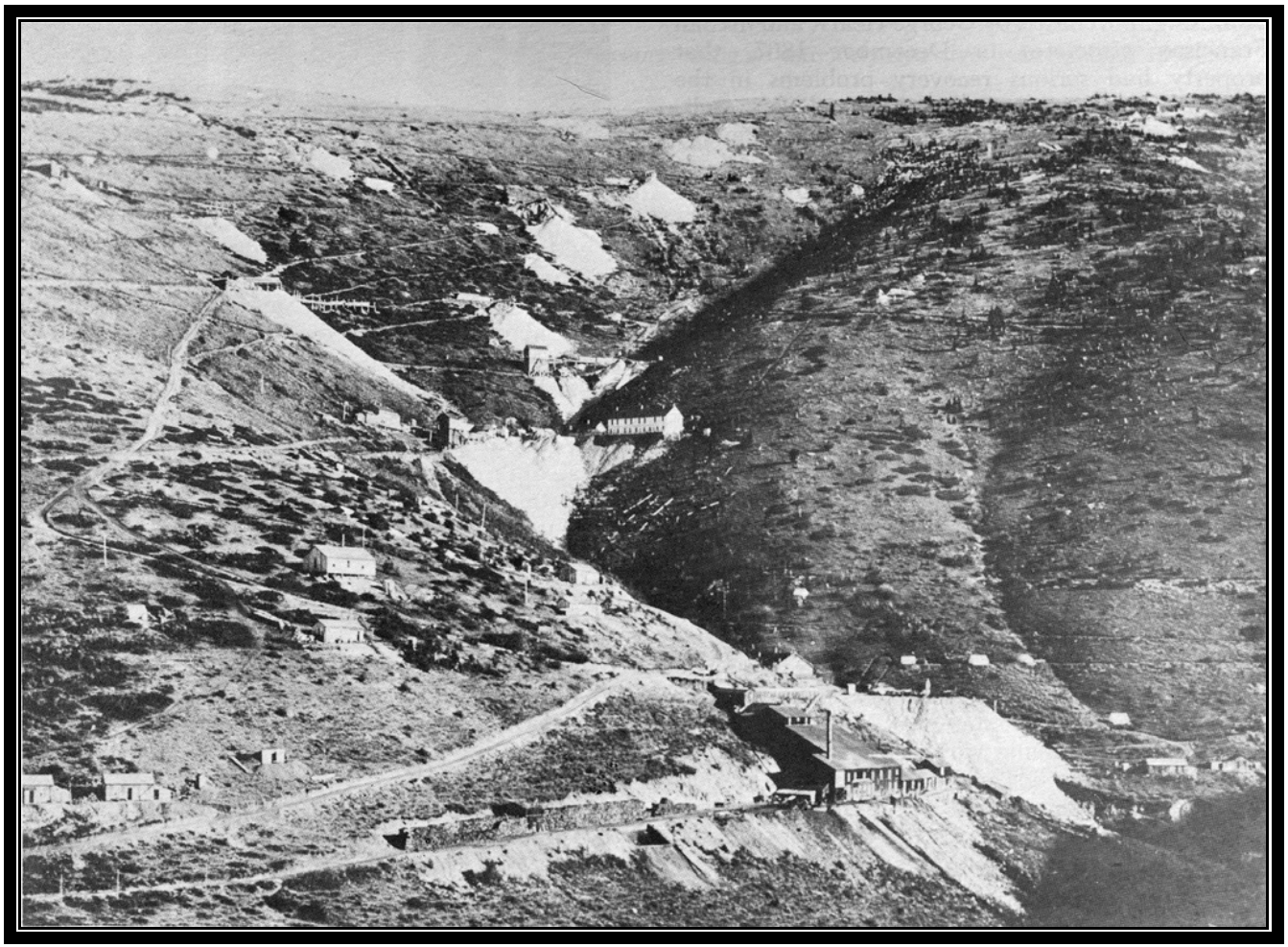

Figure 14. Black Jack Mine and mill, with workings extending up the side of Florida Mountain (p. 46 from Wells, 1983).

Figure 15. Black Jack Mine and mill buildings, with a number of dumps continuing up the side of Florida Mountain (Idaho State Historical Society photograph 60-120-11). Note the snowshed covering the tracks leading from the Idaho tunnel to the upper level of the mill.

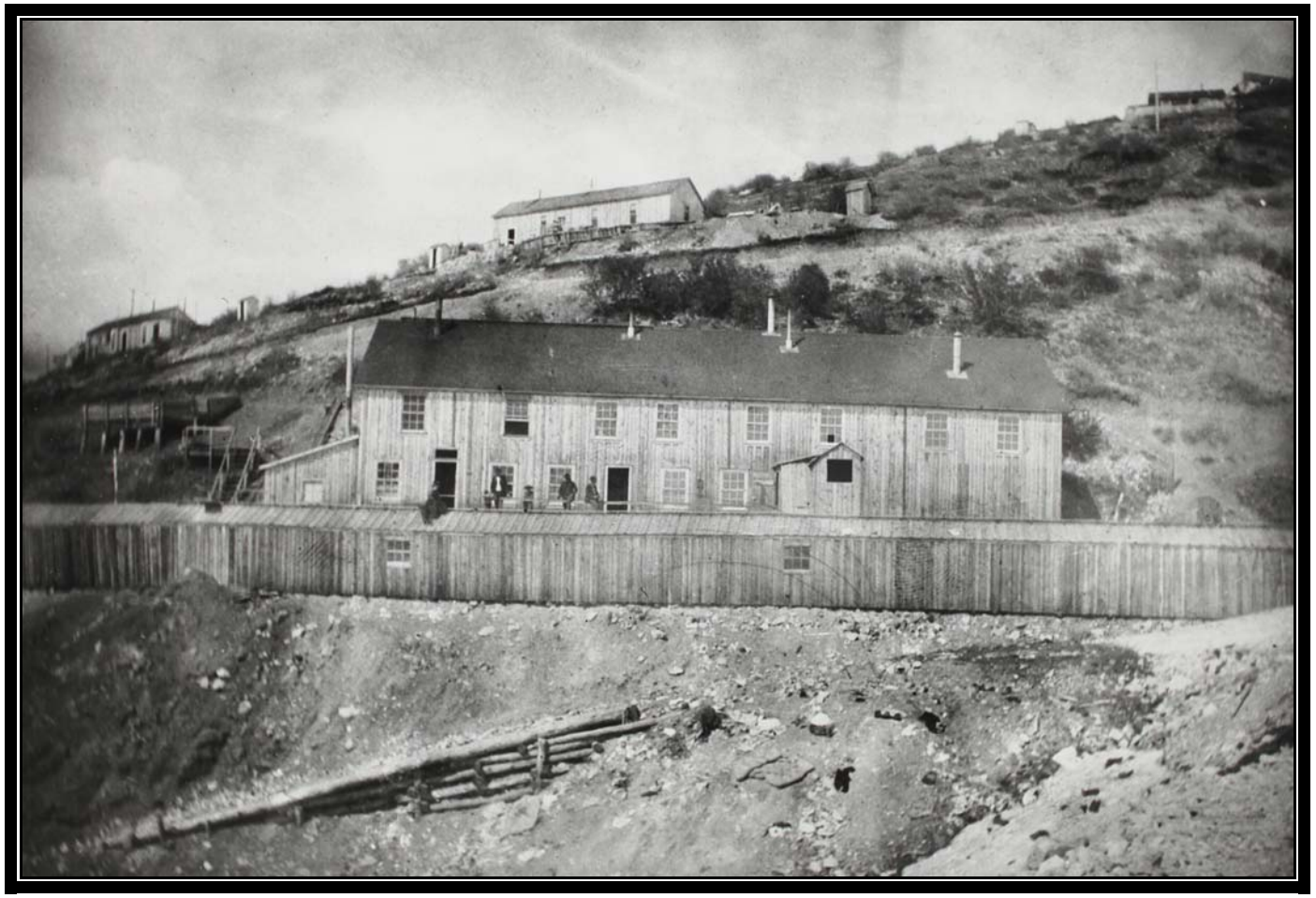

Figure 16. Black Jack bunkhouse and other mine buildings on Florida Mountain (Idaho State Historical Society photograph 74-81-7). Note the snowshed in the foreground.

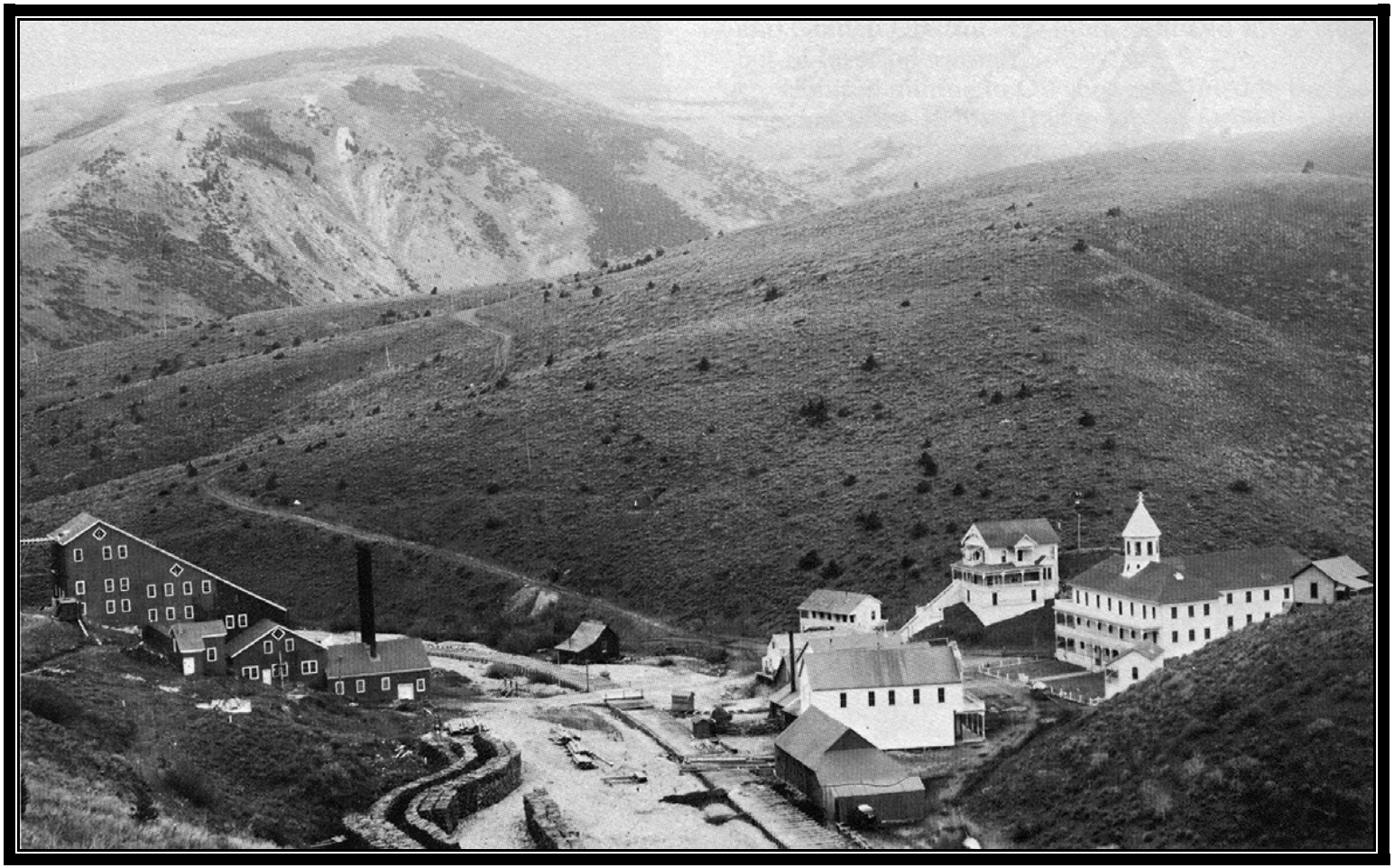

Figure 17. Dewey mill (left) and Dewey Hotel (right), looking northwest (c. 1900; top of p. 47 from Wells, 1983).

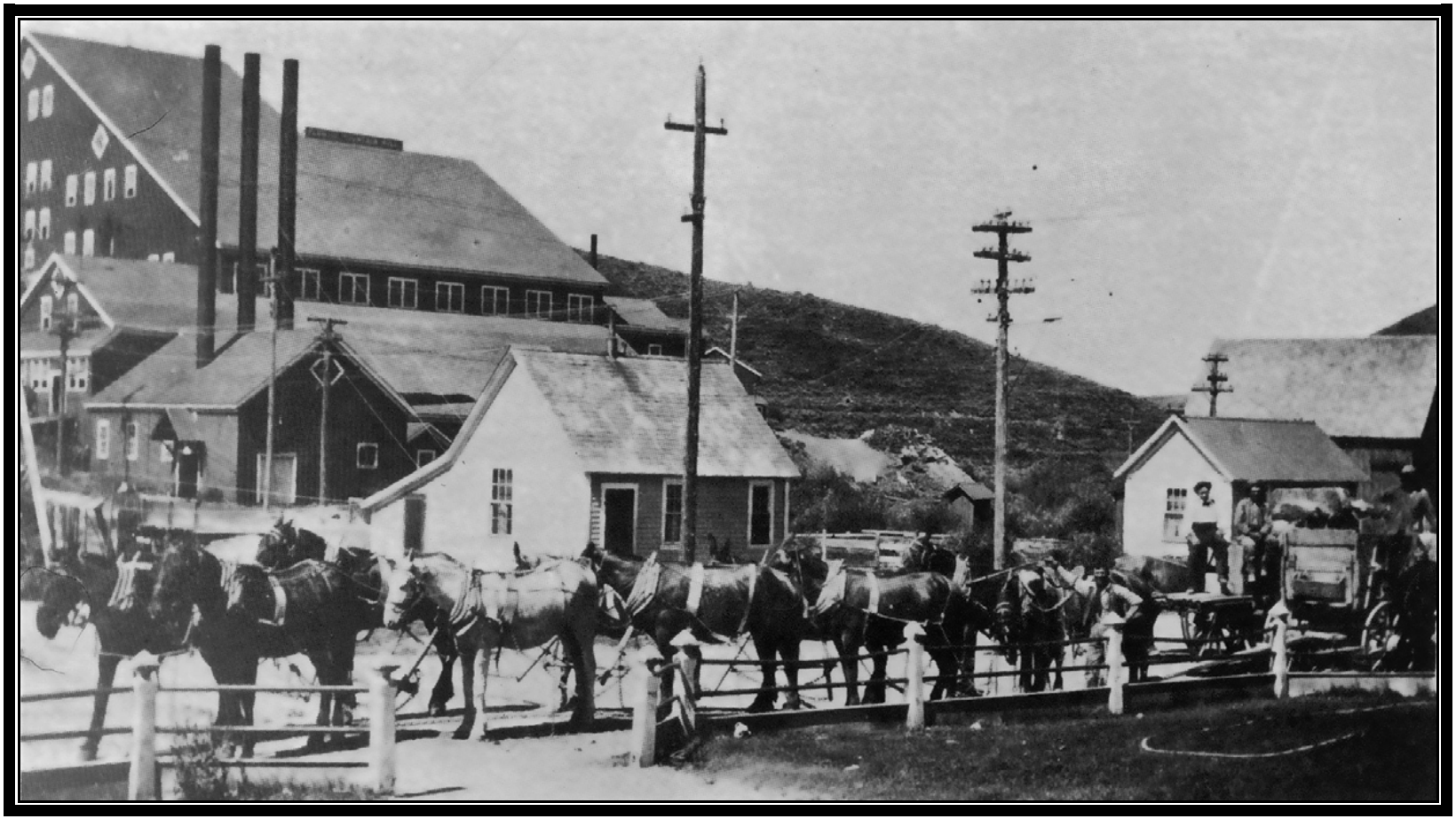

Figure 18. W.H. Dewey's freight team, with the Dewey mill in the background (bottom of p. 47 from Wells, 1983).

Plans also called for providing electric power to the main working station at the Black Jack shaft, which was over 2,000 feet from the mouth of the Idaho Tunnel that connected it with the surface near the Black Jack Mill. By the end of October, compressed air plants at the mine provided about 225 horsepower for drilling, pumping, hoisting, and other necessary functions (E&MJ). The December 21, 1901, issue of E&MJ (v. 72, no. 25, p. 831) described the Florida tunnel and its relationship to the rest of the Trade Dollar operation:

> The Florida tunnel when completed, will be about 3 miles long; it has a double track and is about 8 ft. in the clear; 3 8-hour shifts are employed, using 2 machines in the breast. Electricity, the motive power, is obtained from Snake River plant. The tunnel is now in about 6,000 ft., and should strike the Trade Dollar and Black Jack veins some time next summer. The large stamp mill at Dewey will treat the ore; it is a combination mill using 2 sets of Frue vanners. It is said to save as high as 88 per cent of the assay values. The company has 2 other mills in operation, one at the Black Jack and the other at the Blaine. Between 200 and 300 miners are employed, the rate of wages is $3 per day for miners, and $3.50 for sinking and machine men. The property is owned by Pittsburg, Pa., men. J. M. Guffey is head of the concern, and James Hutchinson is general manager with residence at Dewey; his son Joseph Hutchinson is superintendent.

In 1902, the Florida tunnel was completed, striking the vein 700 feet below the previous lowest working level. Frederic Irwin replaced James Hutchinson as manager in November (IMIR). The 1903 IMIR (p. 114-115) contained a lengthy description of the property:

> The Trade Dollar Consolidated Company's property consists of the Trade Dollar, Black Jack and Booneville mines, combined under one operation. They were worked as three separate properties prior to the consolidation and are operated entirely through adit tunnels, all of which are connected underground and are on the same vein system all through, and an idea of the extent of this remarkable mining development will be conveyed by the statement that the property has at the present time fifteen miles of actual track in service, in addition to the extensive vertical connections between the levels.
>
> This property has been brought into excellent physical condition under the present management and is producing some of the richest ore of its history from some of its deepest levels.
>
> The Trade Dollar vein, passing through the full length of all these properties, has produced $10,000,000 to date. The main ore course is a persistent fissure that comes up through the granite and penetrates two great dome shaped overflows of basalt and rhyolite. A small dike of basalt accompanies the vein in the granite and is doubtless the vent through which the extensive surface sheet was fed.
>
> The main ore channel is quite constant. It is also accompanied by numerous spurs and parallel stringers that frequently attain commercial proportions and have produced an important tonnage of rich ore.
>
> The width of the ore mined in this property varies from one foot to ten feet, and in one stope the space broken down for a short distance was twenty feet wide, from which bands of rich ore had to be sorted out and the balance left in the stope for filling.
>
> The value of the ore now sent to the mill ranges from ten dollars to one hundred dollars per ton, while small streaks of shipping ore occur that are carefully sorted out and run several thousand dollars per ton.
>
> The ore minerals consist essentially of silver sulphides, chalcopyrite and traces of galena, all of which is rich in gold and silver in a proportion of about one-fourth gold and three-fourths silver.
>
> The shipping ore sorted out runs between two thousand dollars and three thousand dollars per ton. Some of this character of ore recently mined from some of the lowest levels was richly set with bunches of coarse wire silver in soft cavities of disintegration strongly indicating a condition of secondary enrichment due to the deep circulation of surface water,

an important indication that the true unaltered ore of the vein still remains at some indefinite depth, and that all the rich pages of the property's history have not yet been written.

The ore of this mine is now all brought out of the big Florida Mountain adit tunnel and is dumped directly into the twenty-stamp mill at Dewey, where the bulk of the values are saved by direct vanner concentration of the pulp from the batteries. The tailings are treated without further grinding in amalgamating pans and settlers. The extraction is ninety-four per cent of the gross value of the ore. The mill has a daily capacity of forty-seven dry tons, and the cost of treatment is four dollars per ton, including power.

The Florida Mountain tunnel is a splendid adit now being run on the strike of the main vein. It is eight feet wide and seven feet high, already eighty-nine hundred feet long, and is rapidly approaching a point under the north end of the old stopes, and is designed to pass entirely under the Florida Mountain at a maximum depth of one thousand seven hundred feet. It has already passed some very promising virgin ground that justifies cross-cutting and further development. It is expected to undercut sufficient ore reserves under the known ore bodies of the higher levels to keep the mill busy for several years, and at the same time establish a new surface to sink from, by which the vein may be conveniently explored to considerable depth below the drainage level of Jordan Creek, where new horizons of rich mineralization is one of the possibilities to be anticipated.

This company gives constant employment to a force of about two hundred and fifty men. The mine at this date has fully two hundred per cent more ore blocked out than it had when the present management took charge a little over a year ago and the grade of the ore has been materially improved during that period. The whole mining and milling plant is run by electric power supplied by the company's own power plant at Swan Falls on the Snake River. This power is lavishly used for furnishing light for the mine and light and heat for the buildings, as well as motive power for the machinery.

A detailed report on the mine's operation for the year, presumably written by the mine's manager (Anonymous, 1903) noted that the Florida Mountain tunnel advanced 1,331 feet during the year. The five mules used for haulage along the length of the tunnel were scheduled to be replaced by an electric tram at a great savings in cost. While driving the 1300 level (which was 400 feet above the Florida Mountain tunnel), a 15-foot-long patch of ore was found that assayed $2,533 per ton. Exploration was extended northward in the Booneville ground on the 600 and 800 levels. The Booneville stopes yielded a significant amount of ore, but as in the rest of the mine, a lot of rock had to be broken to get the ore. Many of the upper Alpine stopes were difficult to work because the country rock was hard and the pay streak was narrow (6-8 inches). When worked by hand, these stopes barely produced five cars of ore a day, but when worked with small machine drills, the stopes produced an average of fifteen cars of ore with the same number of men. (Table 3 summarizes the mine and mill operations for 1903 to 1910.)

The 1904 IMIR noted the Trade Dollar produced larger profits and a far better grade of ore than in the previous few years. The following excerpt (E&MJ, v. 77, n. 22, p. 885) from an article on the Silver City mining area described the property:

The Trade Dollar Consolidated Mining Company, of which Mr. Frederic Irwin, of Dewey, is manager, owns the principal part of Florida mountain, having continuous workings entirely through the mountain from Jordan creek on the north side to Blaine Gulch on the south side. This group results from the consolidation of the Trade Dollar, Black Jack and Booneville mines, which were formerly operated under separate ownership. Florida mountain is granite, but with a capping of porphyritic rock. The principal vein of the group strikes nearly north-south, having a dip to the west, or in a direction opposite to the dip of veins on War Eagle. From this main vein there are many spurs and diverging veins, making a wide zone of mineralization. This mineral belt is opened through five systems of adits and levels from the surface, the highest of these being 700 ft. below the apex of the mountain and the lowest 1,700 ft. below it, giving a vertical face of 1,000 ft. between the highest and lowest planes of development, and these are connected by vertical workings. The five systems are

Table 3. Summary of the mining and milling operations at the Trade Dollar Mine for the years from 1903 to 1910 (Piper and Laney, 1926). Original data was taken from the annual reports of the mine manager of the Trade Dollar Consolidated Mining Company.

Year	Tons Mined	Cost Per Ton			Precious Metal Content of Ore Per Ton			Percentage Recovery	
		Mining	Milling[1,2]	General	Oz. Gold	Oz. Silver	Total Value	Gold	Silver
1903	15,744	$14.44	$4.07	$6.76	—	—	$30.68	94.2	
1904	17,494	$13.98	$2.92	$5.12	—	—	$31.63	94.7	
1905	17,673	$14.29	$2.99	$4.71	0.198	54.9	$37.58	93.3	93.5
1906	17,427	$15.09	$2.83	$3.01	0.192	44.0	$33.89	93.8	93.2
1907	15,998	$17.37	$3.17	$3.67	0.309	41.1	$33.55	93.3	91.4
1908	14,455	$17.77	$3.40	$4.70	0.196	49.4	$30.25	87.9	91.3
1909	9,905	$20.75	$3.44	—	0.333	46.6	$31.12	81.0	95.0
1910	701	—	—	—	—	—	$41.50	—	—
Totals and Averages	109,397	$16.24	$3.12	$4.66	0.246	47.2	$32.67	89.9	92.9

[1]Cost of power, generated in the company's hydroelectric plant on the Snake River at Swan Falls, is not included for the years 1904-1909.
[2]Average for the years 1904-1909 only.

known as the Trade Dollar upper workings, Booneville upper workings, Blaine, Black Jack and Dewey. The last named is, more properly, the Florida mountain tunnel, which starts about 35 ft. above the bed of Jordan creek, at Dewey, runs southeasterly 4,400 ft., striking the main vein at this point and running thence southerly 5,600 ft , chiefly along the strike of the vein. This level is connected by a 500-ft. raise with the Blaine level, which enters the mountain from the south side. The Florida Mountain tunnel receives all the ore from the levels above it, being the channel through which the ore is hauled out to the mill at Dewey. The principal tonnage now comes from the Alpine, on the 700-ft. level; the Booneville, at 800 ft.; the Black Jack and Blaine at the 1,300-ft. levels. The ore from the Alpine and Booneville levels is in the porphyry capping, all below these levels being in the granite. The gangue is a quartz and porphyritic gouge in the upper levels, but becomes more granitic in the lower levels. The values are in silver and gold, the silver being almost entirely in the form of argentite. The gold is carried in a fine-textured chalcopyrite.

The ore is delivered from the 'tunnel' direct to the crusher floor of the mill; the mule haulage in the adit is to be supplanted soon by electric haulage. The mill handles 50 tons of ore per day, the equipment consisting of crusher, 20 stamps, 12 vanners, 10 amalgamating pans and five settlers. The concentrates produced are high-grade, containing 70 per cent of the entire mill-saving in gold and silver, comprising silver sulphides and copper-iron sulphides carrying most of the gold. The recovery of the finely divided particles of gold and silver in the amalgamating pans brings the total recovery up to 94 per cent of the assay value of the ore. In the latter work about 20 flasks of quicksilver per month are used. The mill machinery, compressors and other machinery are operated by electric power, transmitted from this company's power plant at Swan Falls on the Snake river, 28 miles from Dewey. The current is transmitted as a three-phase system over No. 4 copper wires at 20,000 volts, and is transformed to 480 volts by nine 37.5 kw. transformers at Dewey. The power is transmitted at the original voltage to Silver City, and to the Blaine and Black Jack levels, where there are also transformers. The company employs a force of 250 men on the property.

Electric haulage replaced the mules in the Florida Mountain tunnel in July, saving the company $20 per day in operating costs (Anonymous, 1904). In September, electric motors were installed in the mill. A 75-horsepower motor was used to operate the stamps, the rock breaker, and the vanners; a 100-horsepower motor was used for the pans and settlers; and a 10-horsepower motor ran the machine shop. A new ore house with larger capacity bins was built above the mill (E&MJ). The four-compartment raise from the 1700 level (the Florida Mountain tunnel) was completed to the 1400 level during the year. A large portion of the development work during the year failed to find any new ore, but one significant discovery was on the new 1000 level. This level was driven north 266 feet and was in ore for most of its length (Anonymous, 1904).

Compared to the terse 1904 report, the 1905 IMIR (p. 97-98) contained a glowing report of the Trade Dollar Mine and, especially, the Dewey tunnel and mill:

Trade Dollar Consolidated Mine.–The Trade Dollar Consolidated vein enjoyed one [of] the banner years of its history in the matter of production, and it is probably in better physical condition today, with more ore blocked out ahead, than it ever has been since the consolidation or before.

The company continues to carry a force of 225 men in mine and mill. There was over 8,000 feet of straight development work accomplished during the year, in addition to the ore production, and a reserve of high grade mineral blocked out and undercut that guarantees the continued operation of the mill for two years ahead. In addition to this, an extensive area of probably very productive territory was proven.

Dewey Tunnel.–The great Dewey Tunnel of the Trade Dollar Consolidated property is now in 11,300 feet from the mill level with a maximum face depth of 1,700 feet, and the rich values of the mine have been developed down as low as this level. Electric power is employed in the operation of this mine and mill in almost every department, and its application is reduced to a fine system.

> The milling costs have been reduced to $2.99 per ton, with a saving of 93 $^{4}/_{10}$ per cent. The ore is a white quartz, containing copper-iron pryrites [sic] and silver-sulphide minerals. The proportion of values is about $^{3}/_{4}$ silver to $^{1}/_{4}$ gold. The plant is of 20-stamps, wet crushing and concentrating, which saves about $^{3}/_{4}$ of the values, and the tailings are amalgamated in pans and settlers without further grinding and by the addition of a little blue stone,[10] salt and mercury with steam heat. About $^{2}/_{3}$ of the value are saved in the concentrates which are shipped to the smelters, and the average value of the ore treated during the year was something over $30 per ton.
>
> The great tunnel on this mine has proved a big success in facilitating its drainage and economical operation, together with demonstrating the continuity of the ore to great depth. It is true that as far as the vein has been explored at this deep level the ore shoots are not so continuous as in some of the levels above, but they nevertheless show a connection of rich mineral through to this level and afford a new drainage surface to sink from with the prospect of a remineralization and more extensive distribution of mineral at still greater depth, as was experienced in the great Bunker Hill drain tunnel in Shoshone County.

Anonymous (1905) was slightly less optimistic, listing most of the year's ore discoveries in places near existing stopes. Little ore was discovered on the lowest level (the Florida Mountain – or Dewey – tunnel), and nothing located there suggested any reason to look below that level for ore. According to the USGS (1905), the total extraction of precious metals was 93.5 percent. About two-thirds of the values were shipped to the smelter as concentrates, while the rest was recovered as bullion.

The 1906 IMIR (p. 123-126) contained an even more extensive and optimistic description of the mine:

> *The Trade Dollar Consolidated Mine*.–This reliable old producer has continued to yield its precious values with the regularity of clock work, and in spite of the scarcity of labor and the extraordinary amount of personal attention demanded by its manager, Mr. Frederick Irwin, in connection with the expansion of the company's great power plant at Swan Falls, the rich ore reserves in the mine are still maintained at such magnitude as to warrant the continued operation of its twenty stamp mill for several years ahead besides making its normal great output for the current year.
>
> This property employed an average of about two hundred and eight men, who were made happy during the fall by a general advance in wages all through.
>
> This is one of the oldest eight hour shift mines in the State, and the former rate of three dollars per day for miners has been raised to $3.50 and $3.75 for machine miners, $3.25 for hand work, timbermen $3.75, laborers $3.00, engineers $3.75, motormen $3.50, electricians $4.00, blacksmiths $4.00, carpenters $4.00. Wood at this camp costs $10.00 per cord, mine timbers twenty cents per foot, lumber $40.00 per thousand, and freight from the railway $12.00 per ton.
>
> This property carries one of the most extensively developed veins in the State. Its total development aggregates eighty thousand lineal feet (of which five thousand five hundred eighty-five feet was run in 1906). The principal feature of this development is a succession of cross-cut and adit tunnels with underground connections that have been carried entirely through Florida Mountain for a distance of over two miles. The main avenue is a long drain tunnel extending from the mill back under the main workings that is now thirteen thousand feet in length and gains a vertical depth under the highest crest of the vein of seventeen hundred feet. This tunnel is equipped for electric haulage and through it all the ore is delivered to the mill at a very nominal cost, and it has opened up to convenient means of exploring some extensive virgin stretches along the course of the vein that are affording handsome results. All the power requirements of this extensive mining and milling operation are supplied from the company's power plant at Swan Falls, which is furnished at a very low

[10]Blue stone is hydrated copper(II) sulfate($CuSO_4 \cdot 5H_2O$).

cost, and, in fact, is a principal feature of the successful extraction and treatment of the ore, as the cost of steam power in this district is practically prohibitive.

All the active development of this mine is kept up in elegant shape and every reasonable precaution for the protection of the men is taken.

The drain tunnel makes a dry mine and affords excellent ventilation all through, excepting in new headings, which are supplied with electrically driven fans, and the operation affords a desirable place for men to work.

The Trade Dollar vein is a very interesting deposit of tertiary age. The actual pay course from which its great record of production has been made, amounting to over twelve million dollars, does not exceed a foot in width, but has been remarkably persistent in both length and depth. It is probably the only productive vein in the State that cuts a basalt formation in its course. The wall rock at the cropping of this rich fissure is rhyolite. At a little further depth it passes through a sheeted deposit of basalt, and passes on down into the underlying granite formation which forms the core of the mountain. The accompanying sketch aptly illustrates this condition [Figure 4].

Trade Dollar Vein.–The basalt herewith described is of the Columbia variety and of a little earlier date than the recent black basalt of the Snake River plain. The ore is a comby white quartz and is accompanied below the basalt sheet by a persistent narrow dike of the same formation, which is unquestionably the vent of the great surface flow of this rock and was subsequently a conduit of hot silicious waters carrying rich gold and silver values, accompanied with a deposition of argentite and chalcopyrite, which occurs in crustified lines, particularly along the borders of the quartz fillings next to the walls of the fissures. Segregations of pure argentite occur that contain bonanza values. The writer handled a specimen of this mineral in one of the deeper levels last fall that weighed several pounds and contained seventy per cent of its weight in silver and very high values in gold.

The company's power plant at Seven Falls [sic] on the Snake River has recently been greatly increased in capacity and a transmission line built to convey the juice for commercial power development to Nampa, Caldwell and Boise. This power is also supplied to the other mines of the Silver City district, and is a boon to their economical development, as the country is practically devoid of timber and the cost of wood or coal for steam makes its use prohibitive.

The Trade Dollar is still good for a long life of profitable production, from its present appearance; with a new drainage level to sink from which makes its development to great depth possible, and the property affords an excellent example of up to date mining and milling practice.

The ore is treated in a twenty stamp wet crushing mill [Figure 19] using direct concentration on Wilfley tables and Frue vanners which recovers about seventy-five per cent of its values. A total saving of ninety-four per cent of the gold and silver value of the ore is made at a total cost of two and 90-100 dollars [$2.90] per ton, and the difference between the concentration recovery and the total saving is gained by working the tailings in amalgamating pans and settlers without further grinding by the addition of mercury, together with a little blue stone and salt with steam heat. The average value of the ore as it goes into the mill ranges from thirty to forty dollars per ton of which about three-fourths is silver and one-fourth gold. The concentrates which are shipped to the smelters run something over two thousand dollars per ton.

During 1906, the company stoped 141,804 square feet of ledge area to produce 17,426.74 tons of ore with an average value of $32.90 per ton. The cost of mining was $15.10 per ton. This was about 246 tons less than was mined the previous year. The company also did over 2,500 fewer feet of development work, a deficiency which was attributed to a shortage of miners from May until November; the increase of wages on November 1 alleviated the shortage (Anonymous, 1906). About 750,000 ounces of silver were produced during the year (Bell, 1907).

The 1907 IMIR (p. 144-146) discussed the economics of the operation at considerable length:

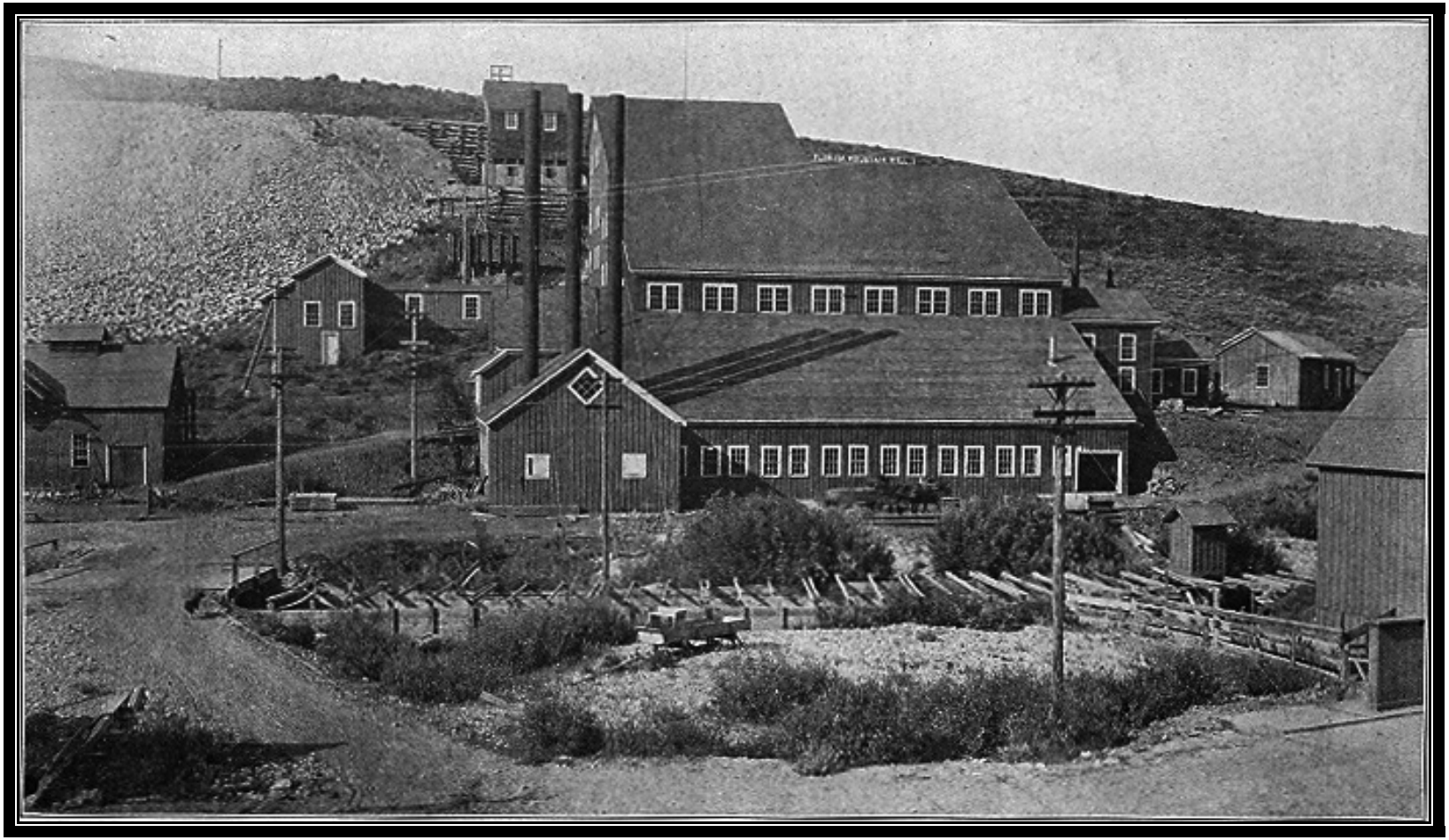

Figure 19. Dewey mill (opposite p. 128 from Bell, R.N., 1907, Eighth Annual Report of the Mining Industry of Idaho for the Year 1906).

The Trade Dollar Mine.–The Trade Dollar Mine was kept in steady operation throughout the year and is now carrying a full force of 225, all told. This is one of the most extensively developed and best conditioned mines in the State. . . . The mining costs are high, which is due to the fact that the pay streaks, while rich, are usually narrow and their extraction often involves a lot of tedious sorting work. The ore occurs as a hard chalcedonic white quartz in a nearly vertical fissure vein that traverses the granite formation of Florida Mountain, and two dome shaped caps of basalt and ryholite [sic] and the main vein is constantly accompanied by a narrow dike of black basalt often reduced to a soft slippery clay gangue, which makes close timbering and filling necessary, and often involves the mining of a space from 5 to 10 feet wide to get a foot or so of high grade ore. In other places, of course, the pay is wider, but it is doubtful if the actual profitable ore exceeds a foot in width on the average. If it could be mined cleanly to this width, its value, of course, would be much higher than the mill feed now used, which itself is considerable.

Parallel with this main vein, at a short distance to the south, a small vein in tight hard granite walls of nearly clean white quartz with crustified lines of rich argentite along its frozen wall margins, has been mined through several levels in shoots ranging from 30 to 200 feet in length, carrying from 6 to 8 inches of pay and involving the necessity of breaking 2½ or 3 feet of hard granite and accompanying barren white quartz to get the creamy borders.

The mine has a total of 132,000 lineal feet of development, of which 5,860 feet were run during the past year. This means an extensive amount of tramming and underground handling. The main opening is the Florida Mountain tunnel, connecting with the mill, 11,000 feet long, and still going. This connects with the extensive intermediate levels, nearly all of which are operated at some point through to within a short distance of the crest of the vein, 1,700 feet above, and it is a wonder that the mining costs are held down as low as they are under such conditions. The motive power all through is by electricity from the company's own plant from Swan Falls, without which it would be practically impossible to operate the mine at a profit. As it is, with close, capable management, a margin of about 20 per cent profit is obtained from the operation. . . .

Electric haulage is used in the main tunnel, and all other power requirements of the enterprise are supplied with electric motive power. Some wood and coal are essential for domestic and limited steam uses in the mill. Coal costs $20.00 per ton and wood $12.00 to $14.00 per cord of a very poor quality. Lumber costs $32.00 per thousand, ordinary stull timber 22 cents to 24 cents per foot, and the cost of freight and supplies from the railway to mine is 60 cents per hundred pounds. Seventy-six thousand nine hundred and seventy-five pounds of Hercules powder was used during the year in the mining operation, of which one-third was 60 per cent and two-thirds 40 per cent nitroglycerine. . . .

The property is a combination of three mines, including the Trade Dollar, Black Jack and Florida Mountain mines and was taken over by the present manager, Mr. Frederic Irwin, in 1902, as a worked-out proposition, and has since, by a series of bold and venturesome moves in developing old areas of territories that have been passed up as exhausted and extending the big drainage tunnel been made to yield precious bullion to the gross value of something over $2,500,000, and the property still maintains considerable vitality and the definite prospect of continued productiveness for some time into the future, unless increasing operating costs should continue and crowd the margin of profit too closely.

During 1907, the company mined 15,998 tons of ore with an average value of $33.55 per ton. The cost for mining this ore was $17.372 per ton, which was $ 2.277 higher than the cost in 1906. To produce the ore in 1907, 9.25 square feet of vein area per ton of ore was stoped, as opposed to 8.1 square feet the previous year. Development did not open as much new ore as was mined during the year, and reserves were reduced from twenty months of ore at the beginning of the year to sixteen months of ore at the close of the year (Anonymous, 1907). Milling costs did not exceed $3.00 per ton (USGS).

In 1908, the mine operated eleven months (USGS). The interruption in work was caused when the Boise-Caldwell Interurban railway was tied into the mine's electric power plant (E&MJ). The mine produced 14,455 tons of ore from 152,455 square feet of vein area, or 10.5 square feet of vein area per ton of ore. The average value of the ore was $30.25

($4.05 in gold and $26.20 in silver), and mining costs were $19.22 per ton. In spite of doing 6,310 feet of development work (up from 5,860 feet the previous year), the mine had a maximum of twelve months of reserves at the close of the year. Plans called for pushing development work hard and sinking below the 1700 level at the most promising location for locating new ore (Anonymous, 1908).

The 1909 IMIR (p. 83-85) read much like an epitaph for the mine:

> *Trade Dollar Consolidated Mining Company*.—The famous old Trade Dollar mine at Dewey, three miles west of Silver City, with a gross production of about $20,000,000 to its credit, half of which was paid in dividends, has been gradually reducing its force since the middle of the year, owing to its shortage of ore reserves.
>
> This property is extensively developed, having in the neighborhood of 16 miles of underground tunnels, drifts and cross-cuts. The lower tunnel, which was driven from the mill level, is 13,000 feet in length, of which 8,000 feet was driven upon the vein. This elaborate development was only made possible in this district, where fuel and timber is so expensive, by the construction of a power plant at Swan Falls, on Snake River, and the transmission of the electric energy to the mine. All surface works, including the shops, mill, compressor and underground haulage and lighting, is accomplished by this means.
>
> The Trade Dollar vein is an extremely interesting deposit, and the workings elegantly display the geological conditions existing in Florida Mountain. The original granite core of the mountain, eroded to a rounded relief, has been covered by successive igneous overflows, the first of which was basalt. This was eroded on the east slope of the mountain until the granite base was exposed, then followed a second overflow, which consisted of a light colored rhyolite. This, in turn, was eroded to the present surface, exposing the underlying granite in the gulch, south and east of the mountain. Following the last of these overflows was the vein-forming epoch, during which a fissure occurred in the mountain, probably following the old vent, through which the successive igneous flows poured out, which, in turn, has been replaced in part by quartz, carrying metalliferous values.
>
> This dike rock, which remains in the vein, is a basalt, in many places resembling diorite and varies greatly, from a few inches to many feet. In the lower works it is of greater extent than the width of the drift, giving the impression that the drift was driven in basalt instead of a dike included between granite walls. This vein has been driven upon entirely through the mountain in the upper works, showing a wonderful continuity and uniformity in all characteristics.
>
> The ore extracted from the rhyolite zone was of higher value than that which came from the underlying basalt area, and, in turn, the values were lower in the granite zone than in the overlying basalt; in fact, the lower tunnel, which is entirely within the granite area, has very little ore of commercial grade. The vein is as large and well defined and well filled with quartz, but the values are not present, but Mr. Frederic Irwin, the manager, feel that it is well worth the effort of sinking down several hundred feet below this level in the hopes of passing through this barren area, and preparations to this effect have already been made. The company has a well filled treasury and it is undoubtedly good judgment to give the old property, which has been such a faithful producer, another lease on life.

In 1909 the mine produced 9,905 tons of ore with an average value of $31.12 per ton. Of that value, $6.88 was in gold and $24.24 in silver. To produce the ore, 107,275 square feet of vein area were stoped. The principal stopes were worked out by August 1, and 2,709 feet of development work failed to locate any new ore. All the vein area above the 1700 level had been thoroughly explored (Irwin, 1909). For part of the year, the mill was run on the filling from old stopes.

The Trade Dollar Consolidated Mining Company closed the mine in March 1910, but continued to draw income from its dam and power plant (IMIR). On January 2, 1911, the company changed its name to the Swan Falls Power Company. During the year, the only activity at the mine was some minor leasing operations on the mill dump. Lessees operated the Belfast claim of the Trade Dollar Mine in 1912. In 1913, rich ore from the Trade

Dollar's Black Jack claim was treated at the Addie custom mill. No activity was reported in 1914 (USBM).

In 1915, some profitable leases were operated in the upper levels of the Trade Dollar Mine. The company sold the Blaine mill to the Silver City Mining Company, which operated on an adjacent vein. The mill was remodeled as a 25-tpd cyanide mill reported to save 91 percent of the combined values of gold and silver. Some of the ore from the Trade Dollar leases was handled through this mill (IMIR).

Lessees operated the Trade Dollar in 1915 and 1916, although the quantity of ore was less in 1916. Florida Mountains Mines Co. took over the property in 1917. Some rich crude ore and concentrates were shipped during the year. A small amount of gold and silver bullion and concentrates were produced in 1918. The following year, the company shipped concentrates to various smelters (USBM). Some of the work the company did that year and the following year was mining old stope fillings (IGS mineral property files). The mine was the largest producer in the district for the next three years, shipping unusually rich silver concentrate in 1921 (USBM). During that year, the mine was leased to Robert J. Goodwin, who employed an average of three men (IMIR). In 1922, notice was given for a sheriff's sale of the property (Idaho Historical Society MS97).

Empire Mines Co. took over the mine in 1923 (IMIR). The mine was in litigation in 1923, but lessees shipped first-class silver ore. Lessees shipped several lots of silver ore containing some gold in 1924 and one lot of ore in 1925 (USBM). Lessees shipped gold-silver ore in 1926 (Figure 20; USBM). Empire leased the Alpine claims to the Hoosier Leasing Company in November 1926. Hoosier operated its section of the mine through the Blaine tunnel until probably early 1929. In 1928, Empire also leased the lower levels of the mine to the Trade Dollar Leasing Company. This company appears to have worked its area of the mine for less than a year (IMIR; IGS mineral property files). The mine was sold to Jim Daly of Nampa $1,000 for back taxes in 1929[11] (Figure 21; Idaho State Historical Society). In late 1934, Western Mines, Ltd. (later incorporated as Goldsil Mines, Inc.), purchased the Trade Dollar Mine on contract from the Empire Mines Company. In 1935, Goldsil did 520 feet of development work, but only did rehabilitation work the following year. Goldsil forfeited its corporate charter in 1936 without completing purchase of the mine (IMIR; IGS mineral property files). The mine shipped ore in 1934, 1938, and 1941 (USBM).

In 1954, Brunzell and Williams produced gold and silver by amalgamation from the Trade Dollar Mine (USBM).

Florida Mountain Tunnel

Work started on the Florida Mountain tunnel about July 1, 1894. As originally planned, the tunnel was to be about 3,000 feet long and end at the Black Jack Mine. Serious work began about three years later when the Florida Mountain Mining and Milling Company started driving the 7-foot by 8-foot tunnel forward from the site of the Dewey mill. It had double tracks and the sub-drain was 16 inches by 36 inches. By this time, plans called for driving the tunnel 6,700 feet and reaching the vein at a depth of 1,800 feet (E&MJ). The

[11]Despite this sale, Empire Mines Co. continued to act as if it owned the property, as evidenced by the annual IMIRs and by forms submitted to the Idaho Inspector of Mines. Information in the Idaho Geological Survey's mineral property files is not sufficient to resolve this contradiction.

Figure 20. Electric tram on the Trade Dollar dump at Dewey, Idaho, with miners in the ore cars (Idaho State Historical Society photograph 61-6-20).

Figure 21. Dewey mill buildings and mine dump, 1929, when the property was sold to Jim Daly for back taxes (Idaho Historical Society photograph 61-40-2).

June 4, 1898, issue of E&MJ (v. 65, no. 22, p. 681) contained the following description of the Florida Mountain Mining and Milling Company:

> The principal stockholders are Col. W. H. Dewey and his son, E. H. Dewey, of Silver City. The mill at Dewey has 20 1,l50-lb. stamps, 16 Frue vanners, 12 amalgamating pans and a comet crusher,[12] the mill's capacity being over 80 tons daily. A Fraser & Chalmers 12x22x36 in.[13] compound engine provides the power. An Otto tram 6,700 ft. long, connects the mill and mines. The main ledge in the mines is 25 to 30 ft. wide. The pay streak is said to average $30 per ton.

By December 1898, the tunnel was under the Booneville section of the Black Jack Mine. Progress continued into the following year when the Florida Mountain Mining and Milling Company merged with the Trade Dollar Consolidated Mining Company (E&MJ).

Figures 22, 23, 24, 25, 26 and 27 show the site as it appeared when it was visited by an Idaho Geological Survey geologist in 1999. The adit is collapsed and the only structures still standing at the site are ore bins.

Alpine

In 1871, a vein of very rich ore was found on the top of Florida Mountain. Although unnamed, this vein may have been the Alpine. It produced bullion valued at about $3 per ounce, and the mill ore averaged $100 a ton. The title was under a cloud (Raymond, 1873).

In 1895, a rich strike of ore running high in gold was made at the Alpine. A large body of lower grade ore also was present (E&MJ). The September 14, 1895, issue of E&MJ (v. 60, no. 11, p. 258) noted the following:

> A Silver City special says an important mining deal has been consummated. The property involved is the Alpine, Harrison and Little Chief claims on Florida mountain in the Silver City district. Capt. Plummer of the DeLamar Company was the purchaser. The claims were the property of W. N. Nichols and Judge E. Lewis. The sale was negotiated by Dan Feour and John T. Keegan. Nothing has been made public respecting the consideration. These mines are on the main ore zone of Florida mountain, and are located between the Trade Dollar and the Black Jack. Capt. Plummer will take charge at once.

Despite this, "Lewis & Nichols" were still given as the owners when the Trade Dollar Company secured a 90-day extension on its bond on the group two years later. The company opened the Alpine by a crosscut from the Trade Dollar Mine. In August, a mill run of about 11 tons was valued at approximately $100 per ton. In late September or early October, Messrs. Jarvis and Davis purchased W. N. Nichols' interest in the property, and began taking out free milling ore. By mid-October, two shifts were at work on the mine (E&MJ). The November 20, 1897, issue of E&MJ (v. 64, no. 21, p. 616) contained the last report of the Alpine as an independent property:

---

[12] A gyratory crusher with a cone-shaped crusher-head attached to an off-axis, upright spindle inside a circular hopper.

[13] The diameters of the high-pressure and the low-pressure cylinders in the engine and the length of the piston's stroke, in inches.

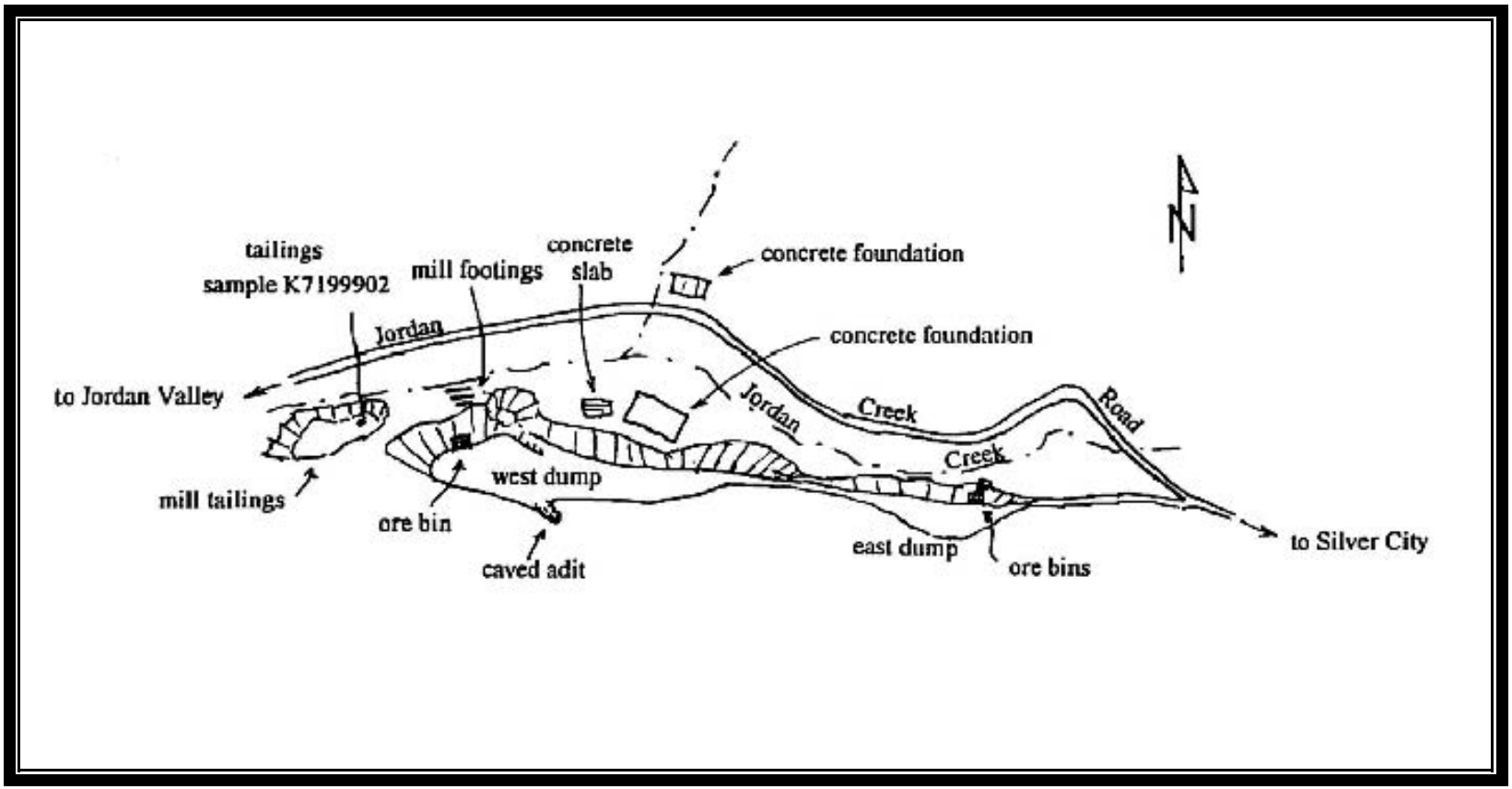

Figure 22. Sketch of the site of the Florida Mountain tunnel and the Dewey mill (Figure 3.1-2 from Kauffman and others, 2010).

Figure 23. Looking southeast at the caved Florida Mountain adit (Figure 3.1-3 from Kauffman and others, 2010).

Figure 24. Looking east along the north side of the main, west portion of the waste dump for the Florida Mountain tunnel (Figure 3.1-4 from Kauffman and others, 2010).

Figure 25. Looking southeast at the rock-wall mill footings for the Dewey mill. The large, west portion of the waste dump extends from the upper right to the center left edge of the picture (Figure 3.1-11 from Kauffman and others, 2010).

Figure 26. Looking north from the top of the Dewey waste dump. Two concrete slabs, one at the mouth of Booneville Gulch across Jordan Creek Road and one on the south side of the creek, were foundations for structures. The remains of another concrete-walled structure is also south of the creek below the dump (Figure 3.1-9 from Kauffman and others, 2010).

Figure 27. Ore bin on the west end of the main waste dump for the Florida Mountain tunnel (Figure 3.1-7 from Kauffman and others, 2010).

> At Silver City November 10th, the Alpine and Harrison lode claims were sold to the Trade Dollar Mining and Milling Company for the reported price of $40,000. The company has had the claims under bond for some time, and has been prosecuting development work on them. James Hutchinson, superintendent of the company, and E. B. McCraig, secretary, the latter representing the Eastern stockholders, met Judge Lewis and William Nichols, owners of the property, and consummated the deal. These claims adjoin the Colorado and Trade Dollar properties on the west. A tunnel taps the Alpine ledge about 250 ft. from the surface and the ledge is also opened by a cross-cut from the Trade Dollar which reaches 700 ft. from the surface. A leading reason for the purchase of the property was the fact that the vein dips to the east, while the dip of the Trade Dollar vein is to the west. It is thought probable that at some point at a great depth the ledges may unite. On the surface they are 500 ft. apart.

Empire State

The Empire State Mine is on the west side of Florida Mountain, overlooking Blue Gulch. In 1871, lessees discovered some very rich ore at the Empire Mine, which probably was the same as the Empire State Mine. The ore paid about $250 a ton when milled (Raymond, 1873). By 1882, it was noted that the country rock at the surface of the Empire State was broken up, but the rock became more solid at depth and the veins were better defined. A drift was run on the vein to connect with an old shaft and winze. Within a short distance of the winze, rich ore was found in the face of the drift. Stoping started when the winze was reached, and considerable good ore was extracted. A substantial ore bin was built to hold the ore. The following year, the mine continued to produce good ore. The vein was worked by eight to ten men. The average width of good ore at the bottom of the shaft and drift remained the same. The ore house contained “considerable ore.” Surface water gave the mine trouble during the year. The Empire State continued operations the following year (DotMR). By 1891 the property was being worked with the Black Jack Mine (E&MJ).

Tip Top

In June 1894, ore was discovered in an open cut which exposed the Tip Top vein for about 12 feet. The quartz vein carried some free gold. A shaft was been started at the discovery (E&MJ). By August, ore was being hauled to the Lincoln mill at Silver City from the property, which was owned by Messrs. Gearhart and Feour. The shaft was 30 feet deep with a drift heading southward. The pay streak was reported to be 15 feet wide, with most of the value in gold. A survey of the next property to the east was made to connect with an old shaft for ventilation. A 30-foot raise was needed for the connection. Later in August, Colonel G. V. Bryan took a bond on the Tip Top. He planned to sink the shaft from 40 feet to 100 feet. At the end of the month, Bryan had taken out “a quantity of ore” and was repairing the old Lincoln mill to process it. By September 4, the mill was refitted and ten stamps were running on Tip Top ore. Plans called for adding ten more stamps when the Frue vanners arrived to treat the discharge from the stamps (E&MJ). The September 29, 1894, issue of the E&MJ (v. 58, no. 13, p. 300) noted the following:

> The equipment of the mill as now used is as follows: Ten stamps; table plates from each battery; four 4-ft. Frue vanners. Four pans and two settlers of the old plant have also been retained in the mill for use in working the concentrates. Ten more stamps are in position ready for dropping as soon as the trial run demonstrates the efficiency of the present process, and four more Frue vanners are on hand ready for setting up.

By the end of September, Colonel Bryan purchased the Miller and Hoffman placer ditch on Florida Mountain and planned to run the Lincoln mill with water power. A line from the mill to the ditch had been surveyed and excavations started for the pipeline. The water supply was the springs at the head of Long Gulch. Bryan also planned to put an electric plant at the mill and run the hoist at the mine with electricity. In October, the Tip Top vein was about 14 feet wide and assayed about $20 per ton in gold. The ore was soft, very clayey, and easily crushed. The Tip Top property and Lincoln mill were reported to have been purchased by "a Wood River party."[14] The mine was running steadily. In December, the mine was showing "large quantities" of low grade gold-bearing ore (E&MJ).

Sinking the main shaft continued in 1895. In late June, a cross-cut on the 300-foot level struck a body of ore about 6 feet wide, which carried $20-$30 per ton in gold with a little silver. In February 1896, a contract was let to extend the Ontario tunnel a distance of about 180 feet to the Tip Top ledge. The Ontario tunnel was parallel to the Tip Top. At the end of March, the crosscut from the Ontario to the Tip Top was making good headway. The crosscut would reach the Tip Top at the bottom of the 300-foot shaft (E&MJ).

In April 1900, the Tip Top (now owned by W. S . Cornick of Salt Lake City) was reported to be bonded to the Trade Dollar Consolidated Mining Company. The Lincoln twenty-stamp was part of the deal. In April 1903, the Banner, Ontario, and Tip Top mines were sold to G. W. Venable of New York City.

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[14]It is not known whether this is a reference to Colonel Bryan or to another, later purchaser.

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