Mineral Resources of the Uncompahgre Primitive Area Colorado

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STUDIES RELATED TO WILDERNESS—PRIMITIVE AREAS

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An evaluation of the mineral potential of the area

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STUDIES RELATED TO WILDERNESS PRIMITIVE AREAS

Pursuant to the Wilderness Act (Public Law 88–577, Sept. 3, 1964) and the Conference Report on Senate bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines are making mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System. Areas classed as "primitive" were not included in the Wilderness System, but the act provided that each primitive area should be studied for its suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This bulletin reports the results of a mineral survey in the Uncompahgre primitive area, Colorado. The area discussed in the report corresponds to the area under consideration for wilderness status. It is not identical with the Uncompahgre Primitive Area as defined because modifications of the boundary have been proposed for the area to be considered for wilderness status. The area that was studied is referred to in this report as the Uncompahgre primitive area.

This bulletin is one of a series of similar reports on primitive areas.

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STUDIES RELATED TO WILDERNESS—PRIMITIVE AREAS

MINERAL RESOURCES OF THE UNCOMPAHGRE PRIMITIVE AREA, COLORADO

By R. P. Fischer and R. G. Luedke, U.S. Geological Survey, and M. J. Sheridan and R. G. Raabe, U.S. Bureau of Mines

SUMMARY

A study of the mineral resources of the Uncompahgre primitive area, Colorado, was made in 1966 and 1967 by the U.S. Geological Survey and the U.S. Bureau of Mines. The area is in the intensively mined, highly productive northwestern part of the rugged San Juan Mountains of southwestern Colorado. Ouray, a historic mining town, is in the approximate center of the primitive area; Telluride, Silverton, and other small mining towns are nearby.

The primitive area, enclosing about 130 square miles, is covered mainly by rocks of Tertiary age, mostly of volcanic origin but including some intrusive igneous rocks; in places, sedimentary rocks of Mesozoic and Paleozoic ages and metamorphic and igneous rocks of Precambrian age are also exposed. All these rocks have been structurally deformed and extensively fractured, and many of the fractures have been filled with veins and pipelike deposits containing precious and base metals.

Since the 1870's, mines in the Uncompahgre primitive area and a border zone about 1½ miles wide around it have yielded about $332 million worth of minerals, mostly gold, silver, copper, lead, and zinc, but including a small amount of bismuth, fluorspar, iron, tungsten, and uranium ore and some sand and gravel. Possibly some antimony, arsenic, and cadmium have been recovered as byproducts at the smelters treating ores mined in this area. Occurrences of barite, gypsum, limestone, manganese, molybdenum, and various clay minerals are known, but these probably have little or no potential value. None of the fossil fuels (coal, gas, and oil) has been produced from the area, and it is unlikely that any fuel resources of significance occur.

A search of official records in 1966 revealed about 4,000 patented claims and more than 700 unpatented claims in and near the Uncompahgre primitive area. Mining and prospecting have been done at several places in recent years. The Idarado Mining Co., part of whose ores are mined from within the primitive area, currently is Colorado's principal producer of gold, silver, copper, and lead. The Camp Bird mine of Camp Bird, Colorado, Inc., is wholly within the primitive area and is currently yielding a moderate amount of ore; the value of its total production is more than $50 million. Lesser output has come from some 80 smaller

mines in either the primitive area or the 1½-mile border zone. In 1965 mines in Ouray and San Miguel Counties—mostly mines in and near the primitive area—yielded nearly $9½ million worth of gold, silver, copper, lead and zinc, which was 32 percent of the total Colorado production of these metals in that year.

Ore reserves of precious and base metals in deposits in and near the area total about 8.5 million tons, which, at the current rate of mining, represents about a 10-year supply of ore. The resource potential for these metals is probably several times larger.

The approximate southwestern two-thirds of the primitive area occupies part of one of the most intensively mineralized regions in the United States. Insofar as mineral potential is a factor, this area is not suitable for inclusion in the National Wilderness Preservation System. The mineral potential of the northern one-third of the primitive area is difficult to evaluate because of a lack of geologic information at depth. Mineral deposits may occur in this part of the primitive area at depth beneath thick Tertiary volcanic flows and Quaternary sediments, but they would be both difficult and costly to find.

INTRODUCTION

The Uncompahgre primitive area described in this report includes the officially designated Uncompahgre Primitive Area, which covers 69,253 acres (about 108 sq. mi.) and as established in 1932, and the adjacent study areas, which cover about 22 square miles and were added in 1966. The primitive area is mainly in the southern part of Ouray County but includes parts of Hinsdale, San Juan, and San Miguel Counties, Colo. It occupies parts of eight 7½-minute quadrangles. Modern topographic maps at a scale of 1:24,000 are available for seven of these quadrangles; for the eighth, only the substandard Montrose 30-minute sheet at 1:125,000 scale is available (fig. 1). The area is in the Uncompahgre National Forest, the boundary of which forms much of the south edge of the primitive area. It is irregular in shape and is divided into two parts by a narrow corridor of excluded land that extends along the Million Dollar Highway (U.S. Route 550) south from Ouray.

The Uncompahgre primitive area is partly in the intensively mined, highly productive mining region of the northwestern San Juan Mountains. Ouray, Telluride, Silverton, and Lake City serve as local centers to the mining and other industries of the area. Ridgway, about 10 miles north of Ouray, is the nearest railhead. Montrose, about 35 miles north of Ouray, and Durango, about 80 miles south of Ouray, are the principal business centers and supply points for most of the region.

The terrain in the primitive area is spectacularly rugged and is dominated by sharp peaks, broad basins or amphitheaters, and deep, steep-walled canyons. Most of the area is between 9,000 and 13,000 feet in altitude; three peaks are more than 14,000 feet in altitude. An appreciable part of the area is above timberline (about 11,500 ft). Despite

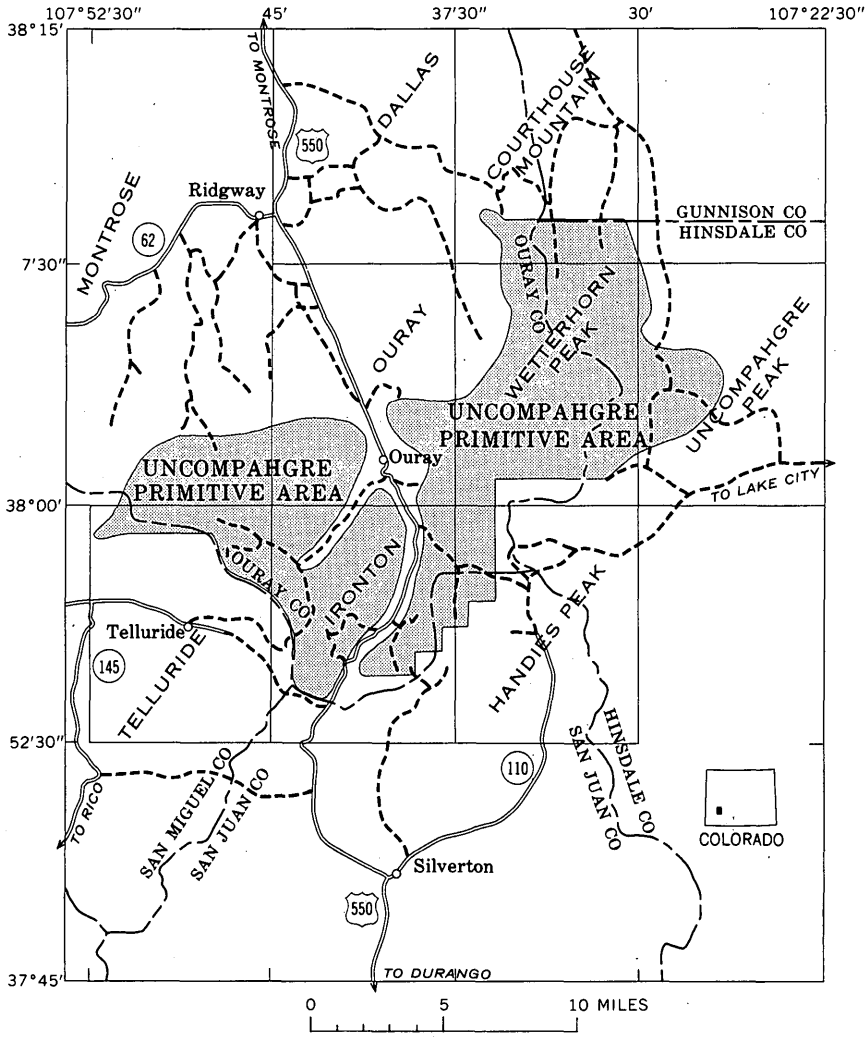

FIGURE 1.—Index map showing location of the Uncompahgre primitive area, topographic quadrangles, and main and secondary roads.

the rugged topography much of the area in the Ouray, Telluride, Ironton, and Handies Peak quadrangles (fig. 1) is accessible by trails to the numerous old mines and prospects; many of these trails are traveled by tourists in four-wheel-drive vehicles during the summer months. Parts of the area in the Wetterhorn Peak, Uncompahgre Peak, and Courthouse Mountain quadrangles and a part north of the Telluride quadrangle are almost inaccessible except for a few jeep and horse trails.

The area has an alpine climate. Summer temperatures are moderate to cool, and afternoon thundershowers are common. Winters are long and moderately cold with considerable snow. Patches of snow remain throughout the year in sheltered spots. In places, snowslides are common in the winter and spring and create a hazard to life and property.

Not much timber remains in the southern part of the area, where years ago the intensive mining and prospecting consumed most of the supply, but lumbering is done in some parts of the northern section.

Many studies have been made and published on the mining and geology of the region, but only a few are mentioned here. Henderson (1926) reviewed the history of mining and production. Early work by the U.S. Geological Survey was published in folio reports by Cross and Purington (1899), Cross, Howe, and Ransome (1905), and Cross, Howe, and Irving (1907), and other studies were summarized by Cross and Larsen (1935) and Larsen and Cross (1956). Geologic studies in the 1930's and 1940's in parts of the primitive area were reported by Burbank (1940, 1941) and Kelley (1946). More recently, three detailed geologic maps on modern topographic bases have been published for the Ouray, Ironton, and Telluride quadrangles (Luedke and Burbank, 1962; Burbank and Luedke, 1964, 1966). A summary of the geology and ore deposits of the region is also to be published shortly by W. S. Burbank and R. G. Luedke.[1]

The present report is based on a review of these earlier studies and other official records and on the fieldwork by the authors. In July and August 1966 Fischer, assisted by Brian D. Vaughn, sampled mine dumps and rocks in the Ouray, Telluride, Ironton, and Handies Peak quadrangles; in the same months, Luedke, assisted by Steven G. Meyers and Mario Suarez R., mapped the geology and sampled rocks and stream sediments in the Wetterhorn Peak, Uncompahgre Peak, Courthouse Mountain, and Montrose quadrangles. Luedke continued this work in August 1967 and was assisted by Steven J. Malone. Sheridan and Raabe visited various mines and prospects in August and September 1966 and sampled mine dumps and stream sediments in parts of the area. The geologic map (pl. 1) that accompanies this report was compiled from the published maps of the Ouray, Ironton, and Telluride quadrangles (Luedke and Burbank, 1962, and Burbank and Luedke, 1964, 1966, respectively); from the 1966–67 mapping by Luedke; and from earlier mapping (unpublished) by Luedke and Burbank in the Handies Peak quadrangle.

Grateful acknowledgment is extended to various officials in the Denver offices of the U.S. Forest Service and the U.S. Bureau of

[1] In "Ore deposits of the United States, 1963–1967" (Graton-Sales volume) being published by Am. Inst. Mining Metall. Petroleum Engineers (AIME); in press.

Land Management and to R. B. Stotelmeyer, U.S. Bureau of Mines, Socorro, N. Mex., for assistance in compiling claim records; to the statistical staff of the U.S. Bureau of Mines, Denver, and G. A. Franz, Deputy Commissioner of Mines, Colorado Bureau of Mines, for information on mining production and history; to Burt Tucker, Forest Supervisor, and Charles McConnell, Recreation and Lands Staff Officer, U.S. Forest Service, Delta, and Ray Urbon, District Ranger, U.S. Forest Service, Montrose; and to T. C. Hedlund, Assistant Manager, and staff, Idarado Mining Co., and William Wentworth, Manager, and staff, Federal Resources Corporation, and also owners and lessees of other mines in the area, for assistance during the fieldwork.

GEOLOGY AND MINERAL RESOURCES

By R. P. Fischer and R. G. Luedke, U.S. Geological Survey

GEOLOGY

The Uncompahgre primitive area is in the northwestern part of the San Juan Mountains, which consists of a domal uplift of old rocks on which a thick pile of volcanic rocks accumulated during Tertiary time. The region has been subjected to four major periods of deformation and erosion: one in Precambrian time, one at the end of the Paleozoic Era, one during Late Cretaceous or early Tertiary time, and the last in the middle to late part of the Tertiary Period. Intrusive igneous activity occurred at three different times: one in the Precambrian, one in the Late Cretaceous or early Tertiary, and the last during the waning stages of volcanic activity in middle to late Tertiary time. Deformation concurrent with the last two events of igneous intrusion caused many fractures, along which mineralizing solutions rose to form ore deposits. Since middle to late Tertiary time the region has been subjected to extensive erosion, which carved the present rugged mountains; in places this erosion cut through the volcanic rocks, exposing the older rocks. It also exposed many ore deposits, both in the volcanic rocks and in the older ones. In places, however, some ore deposits may be concealed by patches of unconsolidated rocks that accumulated during Quaternary time. The rock units exposed in the Uncompahgre primitive area are listed in table 1 and are briefly described in text.

PRECAMBRIAN ROCKS

Rocks of Precambrian age underlie the primitive area, but they are exposed only along the Uncompahgre River and its tributary, Red Mountain Creek, south of Ouray (pl. 1). Except for diabase and

granite dikes and sills, the exposed rocks are quartzite and slate that make up the Uncompahgre Formation. They were folded, faulted, and truncated by erosion before being covered by Paleozoic sedimentary rocks.

TABLE 1.—*Generalized table of rock units in the Uncompahgre primitive area*

Era	Period	Rock units	
Cenozoic	Quaternary	Alluvium, glacial debris, talus, and so on.	
	Tertiary	Intrusive stocks and dikes.	
		Potosi Volcanic Group.	
		Silverton Volcanic Group.	
		San Juan Formation.	
		Telluride Conglomerate.	
	Tertiary or Cretaceous.	Intrusive stocks, laccoliths, dikes, and sills.	
Mesozoic	Cretaceous	Mancos Shale.	
		Dakota Sandstone.	
	Jurassic	Morrison Formation.	
		Wanakah Formation	"Marl" member.
			Bilk Creek Sandstone Member.
			Pony Express Limestone Member.
		Entrada Sandstone.	
	Triassic	Dolores Formation.	
Paleozoic	Permian	Cutler Formation.	
	Pennsylvanian	Hermosa Formation.	
		Molas Formation.	
	Mississippian	Leadville Limestone.	
	Devonian	Ouray Limestone.	
		Elbert Formation.	
Precambrian		Uncompahgre Formation and intrusive dikes and sills.	

PALEOZOIC ROCKS

Paleozoic rocks are divided into several formations, but they are shown as a single unit on plate 1. They crop out near Ouray and Telluride, in Ironton Park, and near Ramshorn Ridge along Cow Creek. Exposures near Ouray show that the Paleozoic formations pinch out eastward along a narrow north-trending zone through the middle of the primitive area (fig. 2), owing to erosion before Tertiary rocks were deposited.

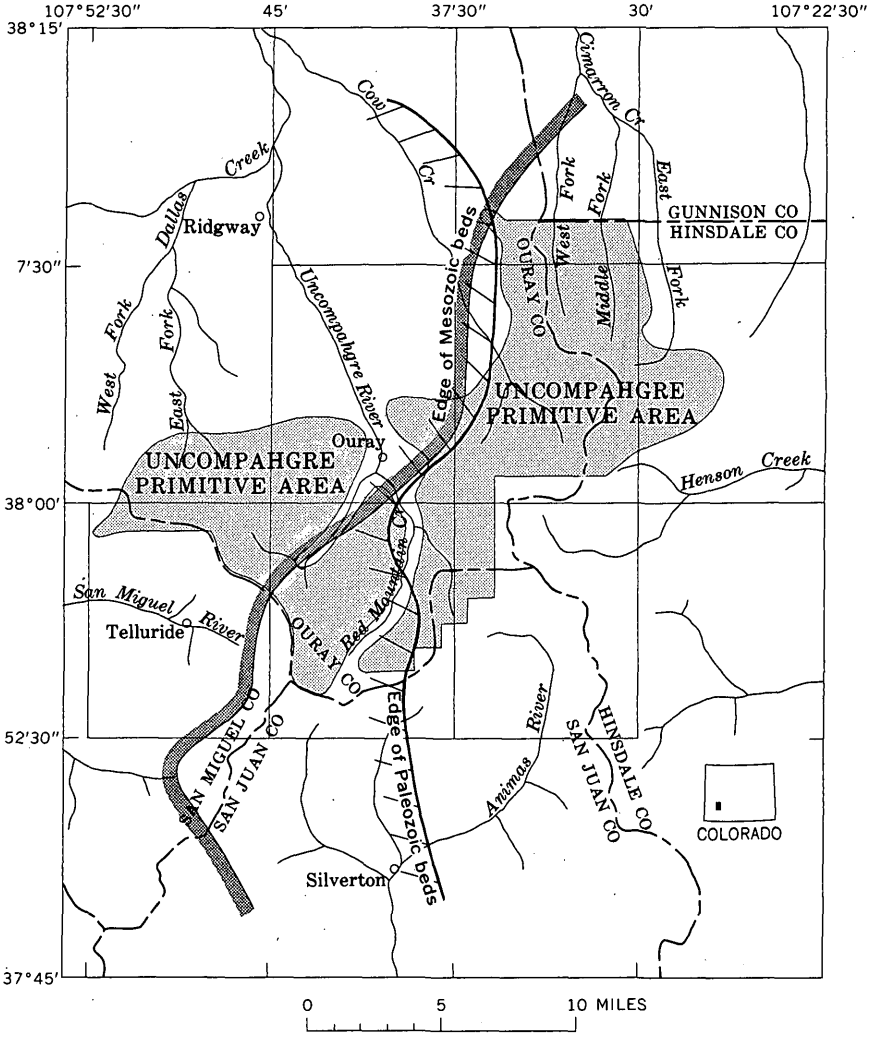

FIGURE 2.—Approximate eastern erosional edge of Paleozoic and Mesozoic sedimentary beds in the Uncompahgre primitive area and adjoining country.

The Elbert Formation of Devonian age is the oldest Paleozoic unit exposed in the Uncompahgre primitive area. It is composed of 30–50 feet of thin-bedded green, buff, or gray calcareous shale, sandy limestone, and impure sandstone. This formation is gradational with the overlying Ouray Limestone of Devonian age. The Ouray averages about 70 feet thick, and it consists mainly of gray, buff, or white dolomitic limestone with some shaly partings.

The Leadville Limestone of Mississippian age lies conformably on the Ouray Limestone. The Leadville ranges in thickness from 180 to 235 feet. It is dominantly a massively bedded cliff-forming gray fine- to coarse-grained dolomitic limestone, but it also contains some sandy or cherty beds and limestone breccias with red shale seams.

The Molas Formation of Pennsylvanian age consists of 40–60 feet of lenticular beds of shale, sandstone, and conglomerate; most of these beds are red but a few are green or gray. The formation is soft and weathers to a poorly exposed slope. The Molas is uncomformable on the underlying Leadville but is comformable and gradational with the overlying Hermosa Formation, also Pennsylvanian. The Hermosa has a maximum thickness of about 1,450 feet near Ouray. It consists of thin to thick lenticular beds of greenish-gray or red shale, sandstone, and conglomerate and some fossiliferous limestone. These beds form conspicuous cliffs and ledges.

The Cutler Formation of Permian age is composed of red shale, sandstone, and conglomerate in beds that are thin to thick and lenticular and that crop out as discontinuous cliffs and slopes. In outcrop near Ouray the top of the Cutler is marked by a profound angular unconformity, and the thickness of the formation ranges from 0 to 2,000 feet. This unconformity was formed by erosion resulting from deformation and mountain building near the end of the Paleozoic Era.

MESOZOIC ROCKS

The several formations of Mesozoic age in the primitive area are shown as a single unit on plate 1. These rocks crop out in the vicinity of Ouray and Telluride and along Cow Creek. Like the Paleozoic rocks, they also thin and disappear in an easterly direction, but the edge of the pinchout trends more to the northeast through the primitive area than do the edges of the Paleozoic units (fig. 2).

The Dolores Formation of Triassic age averages about 80 feet in thickness near Ouray and consists predominantly of thin-bedded to massive mudstone and sandstone containing thin layers of conglomerate and limestone. These rocks are mainly brownish red but locally are mottled red and white. The formation crops out as slopes and cliffs.

The Entrada Sandstone of Jurassic age contrasts with the under-

lying and overlying formations because of its uniform lithology and color. It is a light-colored sandstone, 45–80 feet thick, that crops out as a single unit, either as a cliff or as a steep slope. The Entrada is unconformable with the underlying Dolores and conformable with the overlying Wanakah Formation. The Wanakah, also of Jurassic age, averages about 100 feet in thickness and consists of three lithologically distinct units, each about equally thick. The lower unit, the Pony Express Limestone Member, is composed of dark-colored limestone that is generally thin and unevenly bedded, some black shale, and in places remnants of nodular gypsiferous shale. Originally, more gypsum probably was present in the Pony Express, but much of it may have been leached shortly after deposition, causing a crinkling and brecciation of the limestone and shale beds. The middle unit, the Bilk Creek Sandstone Member, is a soft fine-grained light-colored sandstone containing some shaly partings. The upper unit of the formation is generally referred to as the "marl" member; it is composed of reddish-brown limy mudstone and siltstone and a few thin beds of standstone and limestone. The limestone beds of the Pony Express commonly crop out as cliffs or steep slopes, but the middle and upper units of the Wanakah Formation are generally covered or are poorly exposed in a slope. The Wanakah is unconformably overlain by the Morrison Formation, the uppermost Jurassic formation in the area. The lower half of the Morrison contains a few thin limestone beds, but it is composed mostly of lenticular layers of light-colored sandstone interbedded with red mudstone; these layers are commonly 20–30 feet thick. The upper half of the Morrison is dominantly varicolored mudstone but also has some thin sandstone and limestone beds. Some of the thicker sandstone beds in the formation form cliffs, and the other beds form slopes. Except along its erosional edge, the formation is about 700 feet thick.

The Dakota Sandstone of Cretaceous age unconformably overlies the Morrison Formation and ranges from 40 to 175 feet in thickness. It comprises three units, but the lower and upper units, both of which are interbedded dark shale and soft sandstone, are either absent or inconspicuous in some places. The middle unit, which forms conspicuous cliffs, consists of hard light-colored sandstone, in part conglomeratic, with some thin shale beds that are gray to black and carbonaceous. The contact between the Dakota and the overlying Mancos Shale, also of Cretaceous age, is generally conformable. The Mancos is composed of soft black shale. It was originally a few thousand feet thick in the primitive area, but it was largely removed by erosion following deformation in early Tertiary time, and, where present, its thickness in the area now ranges from 0 to about 1,000 feet.

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ROCKS OF LATE CRETACEOUS OR EARLY TERTIARY AGE

Rocks of Late Cretaceous or early Tertiary age exposed in and near the primitive area comprise the intrusive igneous bodies in Paleozoic and Mesozoic sedimentary beds near Ouray and Ramshorn Ridge (pl. 1). They occur mainly as nearly concordant laccoliths and sills injected between beds, especially along the Dakota-Mancos contact, but they also include discordant dikes and the stock at The Blowout, which is the local name applied to a conspicuous erosional scar cut into a patch of soft brightly colored altered rocks on the east side of the Uncompahgre River canyon just north of Ouray. Most of these rocks are porphyritic granodiorite, but a few are clastic dikes that contain no igneous material, although they are probably related in time and origin to the igneous activity.

After or during the intrusion of these Upper Cretaceous or lower Tertiary rocks, the region was uplifted. Erosion completely removed the Mesozoic and Paleozoic rocks from the eastern part of the primitive area and exposed Precambrian rocks. The intrusive rocks and the earlier sedimentary rocks near Ouray were beveled, and younger Tertiary rocks were deposited on this surface. Figure 3 is a diagrammatic cross section, from west to east through the primitive area, that shows these relations.

CENOZOIC ROCKS

Rocks of Cenozoic age cover most of the Uncompahgre primitive area. They are shown by three patterns on plate 1.

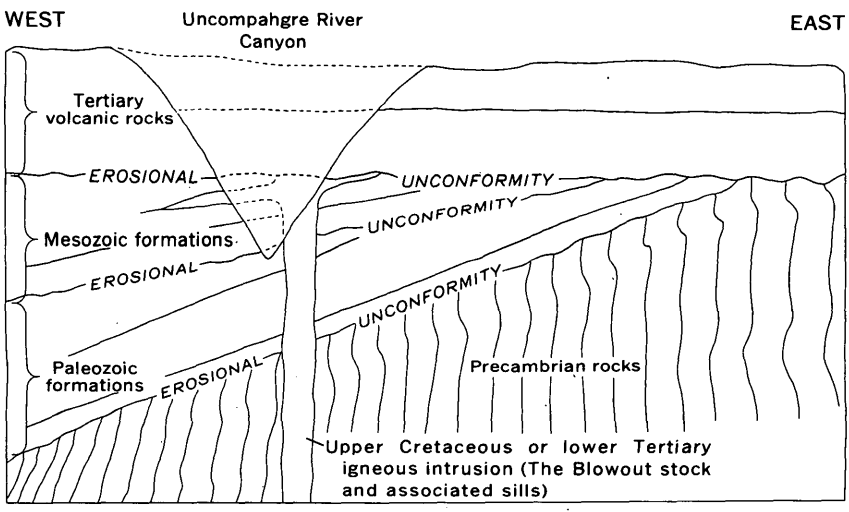

FIGURE 3.—Major geologic relations through the Ouray area.

One pattern shows the intrusive igneous rocks of Late Cretaceous or early Tertiary age (described above) and also the intrusives of middle to late Tertiary age (described here). However, the intrusive bodies of these two ages are distinguished by separate patterns in figure 4. The intrusive igneous rocks of middle to late Tertiary age consist of stocks, plugs, and dikes of mafic to silicic composition. The two largest intrusive bodies exposed are the Mount Sneffels–Stony Mountain stock along the north edge of the Telluride quadrangle and the stock near the head of Cow Creek in the Wetterhorn Peak quadrangle. Each stock is accompanied by an array of radial dikes. The poorly exposed stock between East and Middle Forks Cimarron Creek may also be fairly large, and it is also surrounded, at least in part, by radial dikes (pl. 1 and fig. 4). Several discordant bodies, probably smaller than the stocks, occur along the edges of the San Juan volcanic depression and the Silverton cauldron (fig. 4). Small plugs, some of which occupy volcanic vents, occur in the vicinity of the Red Mountains.

The second pattern representing Cenozoic rocks shown on plate 1 includes the Telluride Conglomerate and a thick volcanic sequence consisting of the San Juan Formation, the Silverton Volcanic Group, and the Potosi Volcanic Group. These rocks are older than, and intruded by, the middle to late Tertiary igneous rocks described above.

The Telluride Conglomerate—the Tertiary sedimentary unit beneath the volcanics—consists of pebbles, cobbles, and boulders of many rock types in a sandy and silty matrix. The materials comprising the Telluride were derived by erosion from highlands, mostly to the southeast, and deposited locally around the flanks of these highlands. The unit ranges considerably in thickness in the primitive area; it is as much as a few hundred feet thick in places and absent elsewhere. These variations are due partly to the irregular erosional surface on which it was deposited and partly to erosion of the unit itself.

The San Juan Formation is the lowest unit in the thick volcanic sequence. It is composed mainly of volcanic debris of intermediate, or andesitic, composition; it accumulated in part as airborne ejecta from explosive eruptions and in part as material moved as mudflows and by streams. Some lava flows are also present. These rocks are characteristically gray or greenish gray with shades of red, purple, and blue. The irregular thickness of the unit is due to the uneven surface on which it lies, to the vagaries of volcanic eruption, and to erosion during and after its accumulation. Maximum thickness in the area is a few thousand feet. The volcanoes that contributed most of the material in the San Juan Formation were probably south of the primitive area.

The Silverton Volcanic Group is the middle unit in the volcanic sequence. It consists of numerous lava flows, flow breccias, tuffs, and

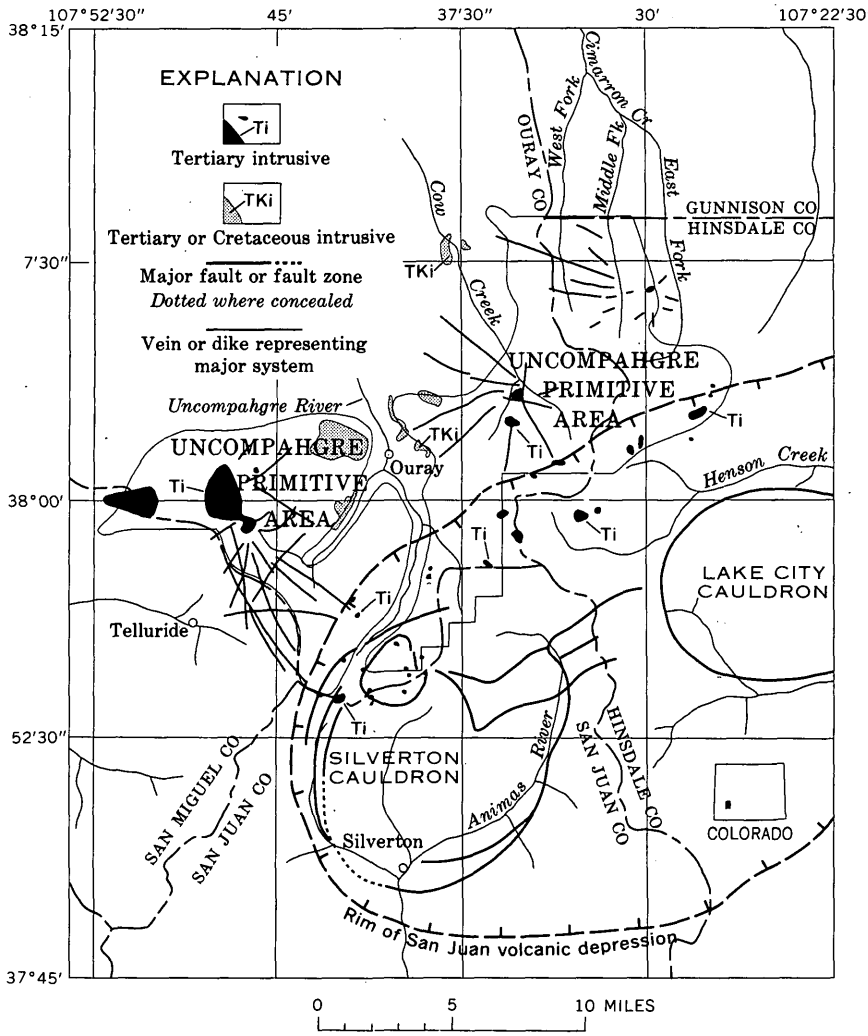

FIGURE 4.—Major structural features and intrusive igneous bodies in and near the Uncompahgre primitive area. (Modified from report by W. S. Burbank and R. G. Luedke; see footnote 1, p. C4.)

welded ash-flow tuffs, all of varied composition ranging from silicic to mafic. These rocks are generally dark colored. They were derived from volcanoes scattered through the large area of the San Juan volcanic depression, generally southeast of the primitive area (fig. 4). These rocks are a few thousand feet thick in the depression but are thin or absent farther northwest.

The Potosi Volcanic Group, the uppermost volcanic unit in the primitive area, is composed almost entirely of light-colored welded

ash-flow tuffs of silicic composition. It occurs only as remnants on the higher peaks in the western and northern parts of the primitive area, but in some of these places it is at least 1,000 feet thick. The Potosi rocks are related to the development of the Silverton and Lake City cauldrons (fig. 4).

The third map pattern representing Cenozoic rocks (pl. 1) depicts Quaternary deposits consisting of unconsolidated glacial debris, landslide material, talus and related veneer on slopes, and alluvium along the present stream valleys. The Quaternary deposits also include a few small bodies of manganese-rich travertine precipitated from hot springs at Ouray and some iron-rich material, commonly referred to as bog iron ore, deposited by springs in the vicinity of the Red Mountains and Uncompahgre Peak.

STRUCTURE AND GEOLOGIC HISTORY

Rather complete descriptions of the structure and geologic history of the San Juan region have been given in the reports cited, so only the structures and geologic events significant to ore deposits in and near the Uncompahgre primitive area are reviewed here.

The exposed Precambrian quartzites and slates in the northwestern part of the San Juan region have been folded and faulted and intruded by silicic to mafic igneous masses, and many of the structures so formed are favorable for the localization of valuable minerals. However, the Precambrian rocks were deeply eroded before they were covered by younger rocks, and the only known mineral concentration of possible economic significance and of probable Precambrian age is an occurrence of uranium in beds of slate about 2 miles south of Ouray (Burbank and Pierson, 1953, p. 3). On the other hand, ore-bearing solutions of later periods of mineralization rose along fractures in the Precambrian rocks and possibly formed concentrations of valuable minerals in these rocks at various places in the primitive area. Several occurrences of this type have been prospected in the exposed Precambrian rocks south of Ouray, and the vein at the Dunmore mine has yielded some ore (Kelley, 1946, p. 363).

In late Paleozoic time the area east of Ouray was moderately uplifted, and part or all of the Paleozoic formations were removed by erosion from the eastern half of the Uncompahgre primitive area. As far as known, this deformation was not accompanied by any igneous activity nor any mineralization. However, zones of weakness that developed in the vicinity of Ouray due to this flexing may have influenced the localization of igneous intrusion and mineralization in the Late Cretaceous or early Tertiary (Burbank, 1940, 1947b).

In Late Cretaceous or early Tertiary time this region was again uplifted, and the Paleozoic and Mesozoic sedimentary rocks were folded and faulted and were intruded by granodiorite magma to form the laccoliths, dikes, and sills centered about a stock in The Blowout near Ouray (pl. 1). Many of the fractures related to this period of deformation trend eastward, and some were mineralized at a late stage in this period of igneous activity. Subsequent erosion removed much of the sedimentary cover and exposed many of the intrusive bodies and veins near Ouray. North of the primitive area the Telluride Conglomerate, which lies on this erosion surface, locally contains a little gold of possible placer origin, perhaps derived from the erosion of the Upper Cretaceous or lower Tertiary ore bodies in the Ouray area (Burbank, 1940, p. 201). The intrusive bodies and veins near Ramshorn Ridge on Cow Creek (pl. 1) also belong to this period of igneous activity. Other intrusive bodies and veins of the same period might be buried beneath the cover of the younger volcanic rocks in this general part of the primitive area.

In middle to late Tertiary time the San Juan region was the site of intensive volcanism and deformation. Several thousand feet of volcanic rocks accumulated upon the Telluride Conglomerate or the early Tertiary erosion surface, and this accumulation was accompanied by the development of major subsidence structures, mostly southeast of the primitive area (fig. 4). Earliest to form and largest in size—15 by 30 miles—was the San Juan volcanic depression, or cauldron, upon which the later Silverton and Lake City cauldrons, each about 10 miles across, were superimposed (Burbank and Luedke [2]). Repeated regional uplift and subsidence of crustal blocks resulted in high-angle fractures that form the ring-fault zones of the cauldrons and other fractures both within and outside the cauldrons. During the waning phases of volcanic activity, some vertical pipelike structures, which contain volcanic breccias and igneous intrusive rocks, developed in the Red Mountains area. Also during this time igneous intrusions formed the Mount Sneffels–Stony Mountain, Cow Creek, and Cimarron Creek stocks and associated dikes and the various discordant bodies of igneous rock along the edges of the San Juan volcanic depression and the Silverton cauldron. Late in the period of volcanic activity and mainly after the intrusive phase, much of the primitive area and adjacent country to the south and east was subjected to widespread rock alteration and ore deposition.

The rocks along most fractures in the area show the altering effects of hydrothermal solutions that moved along the fractures. These solutions generally introduced pyrite and commonly either altered some

[2] See footnote 1, p. C4.

of the rock minerals to clay minerals or introduced clay minerals. At the surface the effect of this alteration is enhanced by yellow or red staining due to the oxidation of the pyrite. Most of this hydrothermal alteration probably occurred before ore deposition, and in many places the pre-ore alteration probably sealed the fractures. Minor movements along the fractures during the waning stage of deformation opened these seals in places, allowing local access to the ore-bearing fluids. Although actual relations are indeed much more complex, this simple picture helps to explain why many ore bodies are small, even though they are rich in grade, and why the ore minerals are restricted to parts of some veins.

Large parts of the area have been affected by a more pervasive alteration than that along the veins. Large patches of solfatarically altered rock occur in areas of intense deformation, especially in the Red Mountains area. These rocks are bright yellow or red, as are the altered rock along fractures, so that individual fractures commonly are not conspicuous in these areas. Propylitic alteration, generally manifested by a greenish cast to the rocks, is perhaps more widespread, though certainly less obvious, than the solfataric alteration. Rock samples taken during this study and classified as "altered" mostly are of the solfatarically altered type. They commonly contain anomalous though generally small amounts of ore metals that occur either in minerals disseminated through the rock or along minute, inconspicuous fractures.

Geologic events in the area since ore deposition have been largely destructive, though generally helpful to the prospector—stream and glacial erosion have removed hundreds of feet of cover and have exposed many veins and ore bodies. On the other hand, the varied surficial materials undoubtedly cover ore deposits in some places.

SAMPLING AND ANALYTICAL RESULTS

To appraise the mineralized character of the Uncompahgre primitive area and various parts of it, several hundred samples were collected and analyzed to supplement the well-known record of past and present mining activities. The samples were classified into several types. The classifications are described next, and analytical results are given in tables 2 and 3. Sample locations are shown on plate 2.

Vein and mineralized material.—Samples of vein and mineralized material consisted mainly of the ore and accessory minerals and gangue, and which occur either as vein filling or as impregnations of country rock. Most were grab samples from dumps of mines and prospects; a few were chip-channel samples across veins. These samples weighed about 1–5 pounds, and each consisted of about 20–100

fragments, or chips, about one-half inch across. They were taken to obtain data on the chemical characteristics of the deposits and the geographic distribution of the ore metals and trace elements, but they are not appropriate for calculating monetary values of the dumps or veins from which they were taken.

Altered rock.—Samples of altered rock represent the discolored country rock that occurs in large patches and along veins. The samples consisted of small chips or fragments from rock exposures or mine dumps and small pebbles or chips from cobbles in the beds of streams that drain patches of altered rock; the samples weighed from 1 to 10 pounds. They were taken to determine whether valuable metals are dispersed in the altered rocks and whether trace elements are distributed in broad zonal patterns that might aid in appraising the primitive area.

Unaltered rock.—Samples of unaltered rock, or inconspicuously altered rock, were taken from places remote from known ore deposits, from places near patches of altered rock, and from points near or next to veins. Much of the so-called unaltered rock contains sparsely disseminated pyrite, and even veinlets of metallic and gangue minerals are present in places near known ore deposits; the obvious veinlets were excluded from these samples. The samples of unaltered rock also ranged from one to several pounds in weight and consisted of numerous small pieces. They were taken for comparison with the samples classed as altered and mineralized.

Stream sediment.—Samples of stream sediment were grab samples of fine material, mostly sand and silt but some mud, taken from the beds of streams. Each sample weighed about 1 pound. Most of these samples were taken from streams that drain areas containing few if any known veins, in the search for element anomalies that might indicate unknown deposits or resources. Few sediment samples were taken from streams draining those parts of the area that have been mined, for the known veins, and especially material from the dumps, would have contaminated the streams and masked any anomalies that might indicate undiscovered deposits.

Miscellaneous.—Samples classified as miscellaneous are described by footnotes in table 3. They consist of various materials that could not be logically grouped with the types of samples described above.

Because of the hundreds of prospects and mines in the primitive area, most of which are currently idle and inaccessible, it was not practicable to sample and appraise deposits individually. Instead, work was focused on obtaining information to appraise the relative mineral potential of the several geographic parts of the area. Sampling was also done to seek undeveloped or unknown deposits that differ geologically from those that have been productive.

In general, the analyses of the samples only corroborated the geographic distribution of ore and trace elements already known from the production-record and the mineralogic studies described in published literature. Tin is the only element that has a well-defined distribution pattern recognizable solely from the analytical data. Except for minor traces in the Ouray area, detectable amounts of tin are restricted to the Red Mountains area and a zone extending northeastward from it (fig. 10 and p. C39). Although less well defined, a distribution pattern similar to that of tin is evident for samples in which copper predominated over lead (fig. 9 and p. C35).

The data used in appraising parts of the primitive area, and those that might represent anomalies of possible interest to the mining industry, are presented in the following sections on geographic subdivisions of the primitive area and individual mineral commodities. There they are discussed within the context of geologic relations that permit some understanding of their possible significance.

Many samples show anomalous amounts of precious or base metals in altered rocks, but none is rich enough to be of commercial interest. Although it is unlikely that large low-grade deposits of commercial value are exposed but undiscovered in the altered rocks in the primitive area, this possibility cannot be completely eliminated, for it was not possible to sample thoroughly all patches of altered rock in the area during this investigation.

MINERAL RESOURCES

Mines in the Uncompahgre primitive area and within about 1½ miles of the area boundaries have yielded about $332 million worth of metals, mostly gold, silver, copper, lead, and zinc. This represents about 10 percent of the total metal production of Colorado and nearly one-half the total metal production of the San Juan Mountains region. Figure 5 shows the areas of mines and prospects in the San Juan Mountains region and the Uncompahgre primitive area.

In 1965, mines in Ouray and San Miguel Counties—mostly mines in and near the primitive area—yielded $9,437,919 worth of these precious and base metals, or 32 percent of the total Colorado production of these metals that year.

Known precious- and base-metal ore reserves in the operating mines in and adjacent to the primitive area are estimated to total several million tons, or about a 10-year supply at the current rate of mining. The resource potential along the currently productive veins, both horizontally from the present mine workings and below them, and along other veins that have been productive in the past, is judged to be at least a few times greater than the known reserves. In addition,

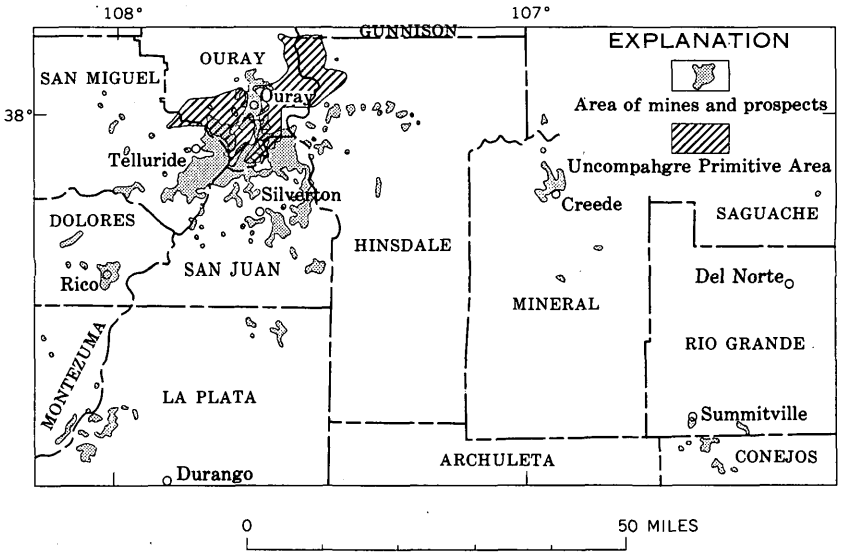

FIGURE 5.—Areas of mines and prospects in the San Juan Mountains region and the Uncompahgre primitive area. (Modified from Fischer and others, 1946.)

in parts of the area the geologic relations strongly suggest the presence of undiscovered deposits like those that have been mined. Furthermore, relations in other parts of the area suggest that hitherto-unsuspected mineral occurrences may exist; these may or may not be of economic significance, and their existence can be determined only by intensive study and exploration. No sizable portion of the primitive area an be considered to be without mineral potential.

Mines and quarries in and near the primitive area have yielded, in addition to the precious- and base-metal output, a small output of bismuth, tungsten, and uranium ores, fluorspar, bog iron ore, and sand and gravel. The supply of sand and gravel is large, and this material will continue to be used, but probably only to satisfy local demand. Available supplies of bog iron ore are moderate, and those of bismuth, tungsten, uranium, and fluorspar are probably small. Antimony, arsenic, and cadmium probably have been recovered as byproducts at smelters treating ores mined in this area, but the future of this recovery depends on the continued production of the major metallic commodities. Occurrences of barite, gypsum, limestone, manganese, molybdenum, and various clay minerals are known in the area, but in light of the present industrial requirements and the supplies available from other sources, the known occurrences in the primitive area probably have little potential value. None of the fossil fuels (coal, gas, and oil) has been produced from the area, and it is unlikely that any fuel resources of significance occur in the area.

Mineral resources are next described and appraised by geographic parts of the primitive area and also by individual commodities. This arrangement results in some repetition, but it will be convenient for reference. The data and interpretations presented are based on published and unpublished information obtained during earlier work, mainly by W. S. Burbank and R. G. Luedke, plus the analytical results for the samples taken in 1966 and 1967.

Considering all aspects of mineral resources in and near the Uncompahgre primitive area, the authors believe that insofar as mineral potential is a factor, the approximate southwestern two-thirds of the primitive area is not suitable for inclusion in the National Wilderness Preservation System. The mineral potential of the northern one-third of the primitive area is difficult to evaluate because of a lack of geologic information at depth. Mineral deposits in this part of the primitive area probably are concealed beneath thick Tertiary volcanic flows and Quaternary sediments and might be difficult and costly to find.

OURAY AREA

The Ouray area occupies the south half of the Ouray quadrangle (fig. 6). Deposits in it have yielded about $10 million worth of ore, mainly from about a dozen mines. Most of the ore deposits in the area are of Late Cretaceous of early Tertiary age, and they occur mainly as veins along east-trending fractures, but they also form some tabular or irregularly shaped ore bodies. Beds of Mesozoic age, particularly limestone and breccia in the Pony Express and sandstone beds in the Dakota and Entrada and the lower part of the Morrison, were favored sites for ore deposits. The granodiorite stock exposed in The Blowout, near Ouray, was a conspicuous center of mineralization. The stock and the adjacent country rock are intensively altered, and a zoned pattern of ore types partly encircles it. Four types, in outward-progressing zones, were reported by Burbank (1947b, p. 413): "(1) magnetite-pyrite ores containing a little copper and gold; (2) pyritic ores containing copper and gold; (3) pyritic base-metal ores containing native gold, with gold and silver tellurides; and (4) siliceous and baritic ores containing silver, lead, and zinc, but commonly little gold." The approximate boundary between zones 3 and 4 is shown as the edge of central area of gold mineralization in figure 7; these two zones have been the most productive.

Although The Blowout was pictured as the center of these mineral zones, Burbank also recognized a westward component of movement of rising ore-bearing solutions and rock fragments in the veins and clastic dikes north and northeast of Ouray. This permitted his interpretation that an intrusive zone extended eastward from The Blow-

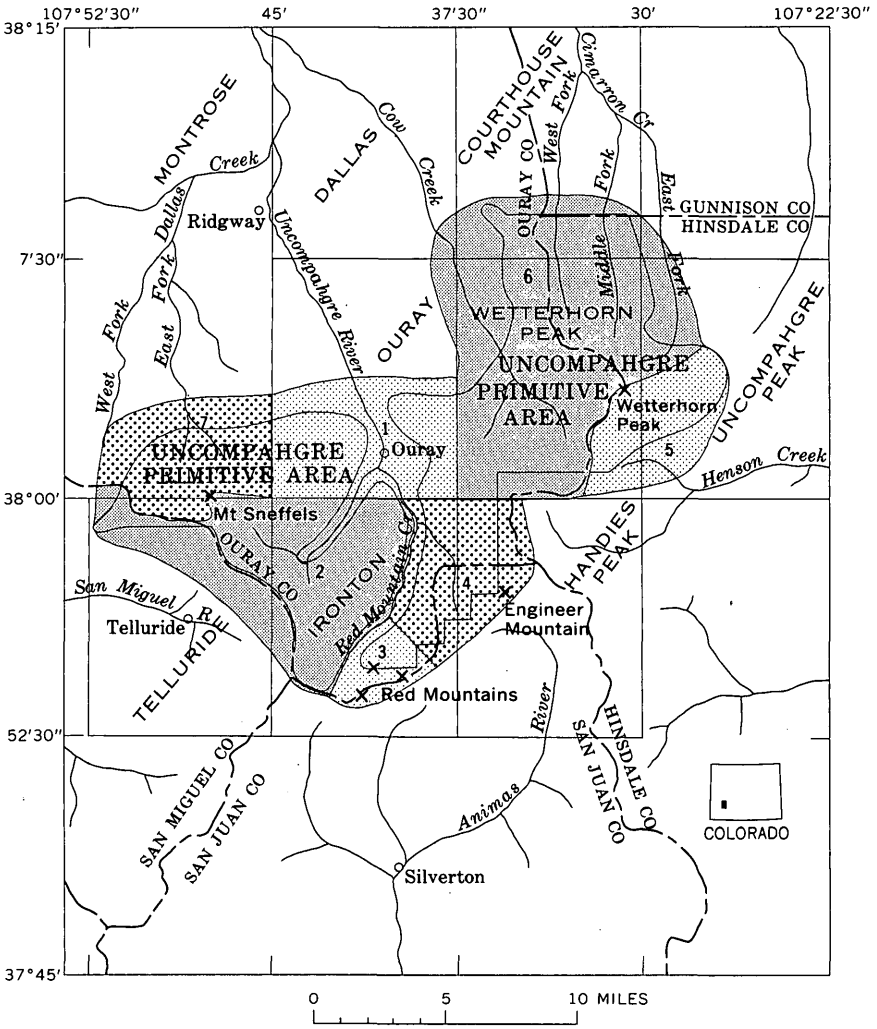

FIGURE 6.—Geographic subdivisions of the Uncompahgre primitive area and adjacent country. 1, Ouray area; 2, Mount Sneffels-Red Mountain Creek area; 3, Red Mountains area; 4, Engineer Mountain-Red Mountain Creek area; 5, Wetterhorn Peak–Henson Creek area; 6, Cow Creek and Cimarron Creek area; and 7, Dallas Creek area.

out (fig. 7), and that the westerly moving solutions actually originated at depth from some place along this intrusive zone rather than at The Blowout. Principal host rocks for the type of ore taken from the mines along the east side of the Uncompahgre River valley should be present in this inferred zone of igneous activity, for the erosional edge of the Mesozoic and Paleozoic formations probably is 2–3 miles east

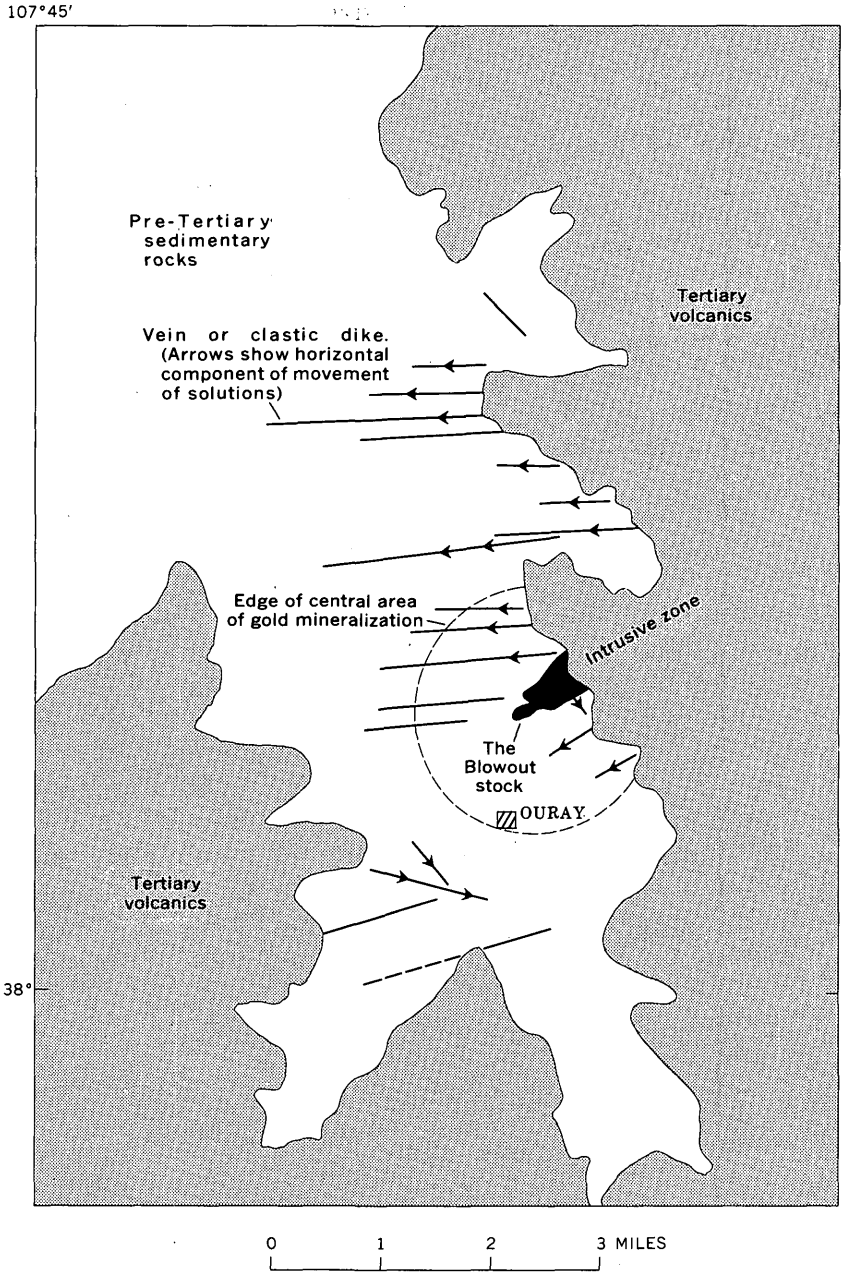

FIGURE 7.—Relations of mineralization to The Blowout stock, Ouray area (generalized). (Modified from Burbank, 1947b, fig. 9.)

of their outcrop along the valley. If fractures and other structures favorable for the localization of ore are also present along this intrusive zone, economically important resources—perhaps containing as much metal as has been won from the mines nearby or even more—might be buried beneath the Tertiary volcanics in this part of the primitive area. These inferred resources are deeply buried, however, and they would be costly to find and mine, so they may not become available except under economic conditions more favorable for mining than those in 1967. Burbank (1940) carefully analyzed the geologic factors that influence ore localization in the Ouray area and made rather detailed suggestions for prospecting.

Although exploration on the south side of The Blowout has not been as fruitful as that to the north, where the Wanakah and American Nettie mines were developed into large producers, samples (table 2) taken from the Dakota Sandstone about 1 mile south of The Blowout suggest that more sampling of the Dakota is justified.

The samples shown in table 2 that contain the most gold and silver, namely AAC–281 and –282 and ADG–077, –078, and –083, are from the Dakota Sandstone, where the formation is cut by inconspicuous veins consisting virtually of boxwork veinlets of quartz and small quartz crystals. The sandstone and vein quartz is only slightly to moderately stained brown, and metallic sulfide minerals, such as pyrite and copper, lead, and zinc sulfides that commonly are abundant along ore-bearing veins in the primitive area, are inconspicuous or absent, at least at the surface. Spectrographic analyses of these samples (table 2) show a low content of copper and zinc and only a small amount of lead; iron is also relatively low in most of these samples. On the other hand, these samples show a low but anomalous content of mercury, molybdenum, and bismuth, and some of the samples have anomalous amounts of tin, tungsten, arsenic, and antimony. No silver minerals were recognized, and the gold is probably very fine grained; some of the silver and gold may occur as telluride minerals.

The samples listed above indicate that the rock is hardly rich enough in gold and silver to support a profitable mining operation, but the inconspicuous nature of the veins from which these samples come and the lack of abundant sulfide minerals that are commonly associated with gold and silver mineralization in the area suggest that possibly this type of occurrence has not been clearly recognized, and more exploration might be justified. If nothing more, these samples give additional evidence that the Dakota Sandstone, and perhaps sandstone beds in other formations as well, are lithologically and structurally favorable for localizing gold and silver in this area, and thus offer a resource potential in occurrences other than those that have been productive.

TABLE 2.—*Analyses of samples of Dakota Sandstone from south of The Blowout*

Sample	Chemical (ppm)						Semiquantitative spectrographic [1] (ppm)												Sample description
	Au [2]			Au [3]	Ag [3]	Hg [4]	Au	Ag	Cu	Pb	Zn	Mo	Sn	W	As	Bi	Cd	Sb	
AAC-281	2.9	3.4	1.7	2.0	-------	0.4	<10	3	30	700	<300	70	<10	<100	<200	30	<20	<100	Altered sandstone.
AAC-282	7.0	45	6.4	6.1	60	2.5	<10	30	70	1,500	700	300	15	<100	<200	300	<20	<100	Do.
ADG-066	<.02	-----	----	<.03	-------	.24	N	2	70	300	1,500	10	N	N	N	N	N	N	Granodiorite porphyry sill.
ADG-067	<.02	-----	----	<.03	-------	<.01	N	1	50	70	300	N	N	N	N	N	N	N	Unaltered black shale just below granodiorite porphyry sill.
ADG-068	.03	-----	----	<.03	-------	<.01	N	2	30	70	300	L	N	N	N	N	N	N	Sandstone, light gray, medium-grained, slightly quartzitic.
ADG-069	<.02	-----	----	<.03	-------	.03	N	N	30	20	N	L	N	N	N	N	N	N	Sandstone, light gray, medium-grained, unaltered.
ADG-070	<.02	-----	----	<.03	-------	<.01	N	N	30	10	N	N	N	N	N	N	N	N	Sandstone or siltstone, dark gray, fine-grained, unaltered.
ADG-071	<.02	-----	----	.2	-------	.06	N	3	30	10	N	20	N	N	N	N	N	N	Sandstone, light gray, stained yellow, medium grained.
ADG-072	.2	-----	----	<.03	-------	.05	N	N	30	30	300	N	N	N	N	N	N	N	Sandstone, light gray, stained yellow quartz veinlets.
ADG-073	.2	-----	----	.3	-------	.30	N	5	30	300	N	15	N	N	N	L	N	N	Sandstone and limestone, gray, stained yellow.
ADG-074	<.02	-----	----	<.03	-------	<.01	N	.5	50	70	300	L	N	N	N	N	N	N	Granodiorite porphyry sill.
ADG-075	<.02	-----	----	<.03	-------	<.01	N	.7	30	15	N	L	N	N	N	N	N	N	Sandstone, dark gray, fine-grained, unaltered.
ADG-076	<.02	-----	----	<.03	-------	<.01	N	N	20	15	N	5	N	N	N	N	N	N	Sandstone, dark gray, fine-grained, with quartz veinlets.
ADG-077	5.0	-----	----	8.3	80	2.0	15	70	30	2,000	300	500	15	50	L	200	N	150	Vein quartz, porous, occurs in boxwork structure; from prospect dump.
ADG-078	1.8	-----	----	2.5	35	>6.0	N	50	30	1,000	200	300	N	50	N	100	N	100	Sandstone, veined by porous, boxwork quartz; from prospect dump.
ADG-079	.02	-----	----	<.03	-------	.03	N	1	30	70	N	10	N	50	N	N	N	N	Sandstone, unaltered; chips from along 50 feet of outcrop.
ADG-080	.02	-----	----	<.03	-------	.05	N	.5	20	20	N	30	N	N	N	N	N	N	Sandstone, unaltered but slightly yellow-stained, with quartz veinlets.
ADG-081	<.02	-----	----	<.03	-------	.03	N	.5	70	30	N	L	N	N	N	N	N	N	Sandstone somewhat altered (bleached), quartzitic.
ADG-082	.02	-----	----	<.03	-------	.03	N	L	20	100	N	20	N	N	N	N	N	N	Conglomeratic sandstone bed, unaltered.
ADG-083	14.0	-----	----	12.8	75	1.9	20	70	200	1,500	300	2,000	20	50	700	700	N	700	Vein quartz, porous, occurs in boxwork structure; from prospect dump.
ADG-084	.06	-----	----	.1	-------	.34	N	1	30	300	N	70	N	N	N	15	N	N	Sandstone, unaltered except for red and yellow surface stains.
ADG-085	.06	-----	----	.05	-------	.08	N	.5	30	30	N	7	N	N	N	L	N	N	Sandstone, fine-grained, bleached(?) and yellow-stained at surface.
ADG-086	.3	-----	----	.6	-------	.14	N	.5	20	<10	N	5	N	N	N	L	N	N	Sandstone, unaltered.
ADG-087	<.02	-----	----	.2	-------	.04	N	1.5	20	100	N	30	N	N	N	15	N	N	Do.

[1] Spectrographic analyses by K. J. Curry and E. L. Mosier. Spectrographic limit of semiquantitative determination: Au, 10 ppm; Ag, 0.5; Zn, 200; Mo, 5; Sn, 10; W, 50; As, 200; Bi, 10; Cd, 20; and Sb, 100. N, not detected; L, detected, but below the limit of semiquantitative determination.

[2] Atomic-absorption spectrometry by W. L. Campbell, G. W. Dounay, R. F. Hansen, H. D. King, Elizabeth Martinez, R. L. Miller.

[3] Fire-assay atomic absorption spectrometry by W. D. Goss, Claude Huffman, Jr., L. B. Riley, and T. L. Yager.

[4] Instrumental mercury determination by J. G. Frisken, K. R. Murphy, and A. J. Toevs.

In addition to The Blowout and the intrusive zone that extends northeast of it, one or more centers of Late Cretaceous or early Tertiary mineralization might also be buried in this part of the primitive area or nearby. Burbank (1947b) recognized a southeasterly component of movement of the rising mineralized solutions in some veins southwest of Ouray (fig. 7), which suggests the possibility of another center of mineralization west of Ouray, although this may be only a weak offshoot of the major center at or near The Blowout. The intrusive granodiorite body exposed near Ramshorn Ridge along Cow Creek, about 8 miles north of The Blowout, can also be interpreted as a separate center of intrusive activity, although it also could be merely an offshoot of the intrusive activity centered at or near The Blowout. The Cow Creek intrusive is accompanied by a few veins containing the silver-bearing base-metal type of ore, especially near the mouth of Oban Creek.

MOUNT SNEFFELS-RED MOUNTAIN CREEK AREA

The Mount Sneffels-Red Mountain Creek area mainly occupies the northeastern part of the Telluride quadrangle and the northwestern part of the Ironton quadrangle (fig. 6), including ground in San Miguel County adjacent to the primitive area. Many of the veins and mine workings in this ground cross the primitive-area boundary. About $300 million worth of ore has been won from several dozen mines in this area, particularly from such famous mines as the Camp Bird, Smuggler Union, and Tomboy. Mining activity in recent years has been dominated by the operations of the Idarado Mining Co. and Camp Bird, Colorado, Inc., two of the larger metal-mining companies in Colorado. Several smaller mines have operated as well.

Hundreds of veins are exposed in this area. Many are strong, some extending for 2–4 miles (pl. 1). Most veins trend northwestward and are radial to the Silverton cauldron, but a few strike eastward or northeastward; most of them dip steeply. Quartz and calcite are the abundant gangue minerals, with some manganese carbonate and silicate, fluorite, and barite in places. The common sulfides—pyrite, sphalerite, galena, and chalcopyrite—are the abundant metallic minerals. Copper- and silver-bearing sulfosalts of antimony and arsenic occur in places, but most of the silver is in galena. Gold occurs free in association with a late-stage quartz.

Most of the ore mined has come from veins in the San Juan Formation, but in recent years some ore-bearing veins in the Idarado mine have been followed into the sedimentary beds beneath the volcanic rocks. The ore in the San Juan Formation mainly occurs as a

vein-filling; wallrock impregnation and replacement is common in some beds in the underlying sedimentary rocks.

Burbank (1947c, p. 424) made the following appraisal of the area:

> As the Telluride and Sneffels districts are fairly well developed by underground workings, some freedom may be allowed in estimating the proportion of undeveloped ground remaining beneath ore shoots that have already produced appreciably in excess of $1,000,000. Assuming the Telluride erosion surface as the bottom, undeveloped ground beneath the principal ore shoots amounts to about 40 percent of total ground from the tops of the mined ore shoots to the Telluride erosion surface. This means roughly 60 percent depletion of the most favorable ground. But if partly developed and possibly favorable ground is added to this, the depletion of the districts is nearer 50 percent. Furthermore as less than 20 percent of the total vein length of the stronger veins is actually developed at all and as some ore shoots are known to extend below the Telluride erosion surface, there remains also some opportunity for discovery of ore shoots not indicated either by underground or surface developments. The tonnages in undepleted favorable ground would amount to 20 or 30 million tons, not allowing for selective mining. While these figures do not by any means represent an exhausive consideration of individual ore bodies and the economic factors involved in their development, they give from the geologic viewpoint a rough estimate of the future of the district as compared to its past.

Even though there has been continuous mining in the area since Burbank made this appraisal, concurrent exploration has maintained a satisfactory level of ore reserves. In particular, the recent development of large reserves along some veins in beds beneath the volcanic rocks enhances the chances of deep ore along other veins and makes Burbank's estimate of resources a minimum one.

RED MOUNTAINS AREA

The Red Mountains area is in the vicinity of the Red Mountains, in the southern part of the primitive area (fig. 6). It is along the northwest edge of the Silverton cauldron and contains some vein deposits along the ring-zone fractures, but these have not been nearly as productive as the pipelike deposits on and within the ring zone. Total production from the pipelike deposits has probably exceeded $10 million, mostly from very high grade silver-copper or silver-lead ores.

The pipelike deposits were intensively mined during the 1880's and into the middle 1890's, when most operations ceased coincident with a drop in the price of silver. At that time perhaps some mines were virtually exhausted, but low-grade ore probably remained in some of the mines and possibly blind and undiscovered high-grade ore shoots lay within reach of the old mine workings—no reliable records were published regarding the ore reserves and potential resources of these old mines when they were shut down. Today, the remaining potential of these old mines can be determined only by exploration and rehabili-

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tation, which would be costly and technically difficult. Nevertheless, for purposes of appraising the primitive area, some resources are assumed to remain in deposits that were once productive. In addition, geologic evidence strongly suggests the existence of undiscovered deposits of this type in the Red Mountains area and possibly to the northeast. This evidence, which is briefly reviewed below, does not permit a quantitative appraisal of the area at present but does suggest that the area deserves additional study.

In appraising the Red Mountains area, Burbank (1947d, p. 430–431) stated:

> The future of the district appears to be dependent upon economical methods of developing and treating fairly large bodies of rock that contain irregularly distributed ore and also in devising some method of prospecting for hidden ore chimneys of which a considerable number may remain. The discovery of the Lark pipe on the Cement Creek side of Red Mountain within the last few years has served to focus attention on the weakness of surface indications above some ore bodies. Because of the small diameter of many higher-grade ore bodies, some scarcely more than a few tens of feet across, and because of the widespread general alteration of the rocks some geochemical methods of prospecting may possibly prove applicable.

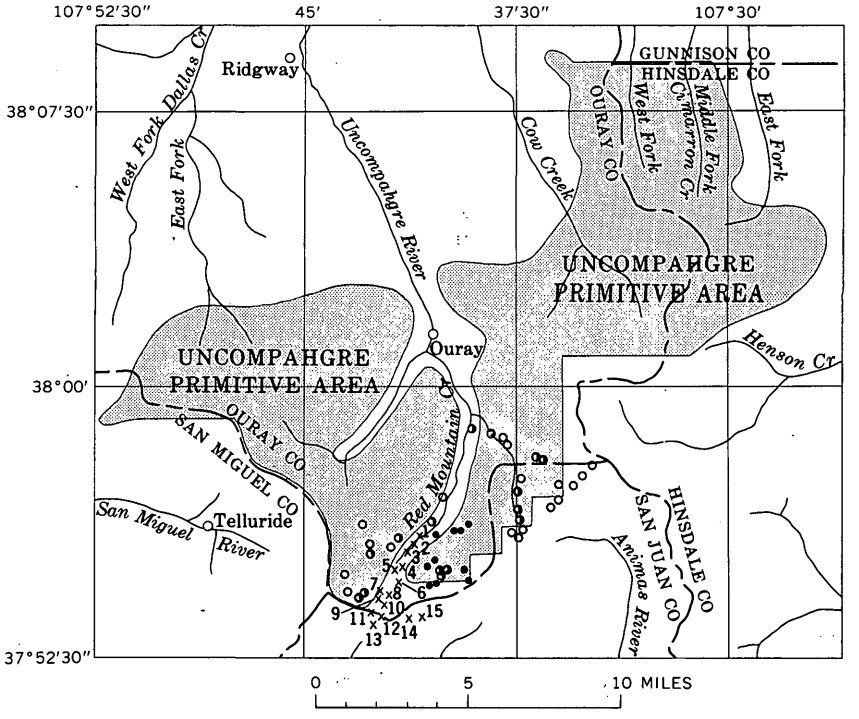
The pipelike deposits are different in several characteristics from the more common vein deposits in the primitive area. They are irregular but roughly elliptical in outline; their horizontal dimensions are small compared with their vertical extent of hundreds of feet. Ore bodies are small in tonnage but rich in grade. The ore is distinctively gray, and on old mine dumps it has a noticeable but unidentified odor. Ore minerals consist mainly of silver-bearing copper and lead sulfosalts of arsenic and antimony and the common base-metal sulfides, all generally fine grained. They are mixed with, and perhaps replace, pyrite, which is abundant and dominantly fine grained. Gangue minerals are sparse except for clay minerals that either were introduced with the ore or are alteration products of the host rock. Many of these deposits are associated with small irregularly shaped bodies of rhyolite or latite porphyry and are partly or wholly enveloped by intensively silicified country rock. Burbank (1941) described those deposits in more detail and suggested that they were formed by fumarolic activity in breccia or volcanic pipes connected by relatively open passageways to the surface at the time of mineralization and that relatively high-temperature and low-pressure conditions in the pipes limited the precipitation of metallic minerals to a rather narrow range of a few thousand feet below that surface. Ore bodies in the known deposits are restricted to an altitude range of about 9,000–11,500 feet.

Most of the productive pipelike deposits occur in a belt less than 1 mile wide and about 4 miles long that trends northeastward from Red Mountain Pass nearly to Ironton. This type of mineralization,

however, is more widespread than the production record would imply. A few of these deposits occur east of the belt. Furthermore, ore of the pipelike type, along with the more typical vein-filling type of ore, is found on the dumps of many mines and prospects that follow typical veins in a zone bordering the Red Mountains area to the northwest, north, and northeast (fig. 8). Commonly, the pipe-type ore and the vein-filling ore are piled separately on the dumps, which suggests that these two types of ore occurred in separate bodies along the veins. Thus, pipelike deposits, probably small but high in grade, would seem likely to be present at various places in the Red Mountains area and to the northeast. Both Ransome (1901) and Burbank (1941) recognized the greater extent of the pipe-type mineralization beyond the productive belt of pipe deposits.

In the Red Mountains area some geologic factors limited the effectiveness of the surface-type exploration done by the old-time prospector. Surface rocks in the area have been intensively altered. Red is the most prevalent color of the altered rocks, hence, the name "Red Mountains," but rocks altered yellow and white are also common. Because of this pervasive alteration, the veins and especially the pipelike deposits are not conspicuous at the outcrop, except where the pipelike deposits are associated with intrusive bodies or masses of silicified rock. Furthermore, surficial material covers much of the bedrock along Red Mountain Creek, and perhaps as much as one-third of the ground in the 1- by 4-mile belt of productive pipelike deposits. In the upper parts of the Red Mountains, where bedrock is better exposed, many bodies of intrusive rock and patches of silicified rock like those associated with the productive deposits crop out. These have been prospected at the surface, but the results did not encourage the early prospectors to continue exploration at depth. Most of these occurrences, however, are above 11,500 feet in altitude, the approximate upper limit of sulfide ore in the known deposits. If Burbank's idea of the origin of the pipelike deposits, as outlined above, is correct, perhaps these outcrops of intrusive and silicified rocks are along the parts of volcanic pipes that were too close to the surface at the time of mineralization for ore to form, but ore might be present at depth along these pipes.

The search for undiscovered pipelike deposits in the Red Mountains area requires different prospecting techniques than those that were available to the early prospectors. Perhaps modern geochemical or geophysical methods can be applied fruitfully. Geophysical exploration methods were not tried in the area during the present study, but the analytical results obtained from the sampling done (table 3), and from earlier work by Burbank and Luedke, suggest that geochemical techniques have promise.



EXPLANATION

×10
Productive deposit generally classified as the "pipe-type"

•
Deposits yielding samples dominantly of "pipe-type" material

⊙
Deposit yielding samples of "pipe-type" and "vein-type" material

○
Deposit yielding samples of "vein-type" material in the vicinity of the Red Mountain area

PIPE-TYPE DEPOSITS

1. Colorado Boy
2. Silver Bell
3. Paymaster, White Cloud, American Girl
4. Cora Belle, Guston, Robinson
5. Yankee Girl
6. Genesee-Vanderbilt
7. National Belle
8. Copper King, Charter Oak
9. Hero (Lake)
10. Enterprise, Hudson, St. Lawrence
11. Koehler Tunnel, Longfellow
12. Congress, Carbon Lake
13. St. Paul
14. Galena Queen
15. Lark

FIGURE 8.—Productive deposits generally classified as the pipe type in the Red Mountains area and other nearby deposits yielding similar mineralized material or material of the vein type.

Samples of the pipelike type of mineralized material differ in average elemental composition from samples of the vein-filling type of material from nearby veins. Silver and copper are slightly more abundant in the samples of the pipe-type material than in the vein type,

but lead and zinc are more abundant in the vein-type material. Among the elements that commonly occur in minor amounts in precious- and base-metal deposits of hydrothermal origin, antimony, arsenic, bismuth, mercury, and tin are slightly more abundant in samples of pipe-type material, whereas cadmium, manganese, and molybdenum are more abundant in veins. Aluminum, cobalt, chromium, nickel, niobium, titanium, and vanadium occur in nature mainly as major or minor constituents in rocks, rather than as concentrations in most hydrothermal ore deposits. All these elements are more abundant in the pipelike material than in the vein-filling material, which supports other geologic evidence that the pipelike material mainly replaces the host rock. In contrast, the vein material is composed of introduced gangue and metallic minerals.

The occurrence and associations of arsenic in ores and gangues of pikelike deposits in the Red Mountains area have been described in previous reports (Ransome, 1901; Burbank, 1941; Burbank and Luedke, 1961). Selected localities in the area were therefore sampled by W. S. Burbank and R. G. Luedke in 1965 to test comparative abundance of arsenic in country rock and pipelike deposits. Definite arsenic anomalies were noted at the pipelike deposits, which suggest that geochemical testing for arsenic in a solfatarically altered environment is a useful prospecting technique for deposits of this type.

ENGINEER MOUNTAIN–RED MOUNTAIN CREEK AREA

The Engineer Mountain–Red Mountain Creek area includes the northeastern part of the Ironton quadrangle and the northwestern part of the Handies Peak quadrangle (fig. 6). Burbank (1947e, p. 438) estimated the output of the area during 1874–1941 at about $2 million worth of silver, gold, lead, copper, and zinc, and he stated, "The area as a whole deserves more recognition as a potential source of low-grade base and precious metal ores than would be indicated by the past production * * *." The area has yielded some ore since 1941, and some exploration work was being done in it in 1966 and 1967.

Hundreds of veins are exposed in the area. Most trend northward or northeastward; a few trend eastward. Some are well defined and extend for several thousand feet, but others are much shorter in horizontal extent and occur as swarms along fracture systems. The known ore has a considerable vertical range, both stratigraphically and in altitude—it occurs in Precambrian rocks, the San Juan Formation, and the Silverton Volcanic group, and from an altitude of about 9,000 feet near the mouth of Red Mountain Creek to nearly 13,000 feet on Engineer Mountain. Most high-grade ore bodies, however, are relatively small; few have been found that extend more than a few hundred

feet horizontally or vertically (Kelley, 1946, p. 330). Some larger irregularly shaped masses of lower grade ore have been found.

The ore mainly fills veins, but locally it replaces or impregnates wallrocks, and a few deposits occur in breccia dikes and plugs (Kelley, 1946, p. 316). Quartz is the principal gangue mineral, although barite and the silicate and carbonate of manganese are also present. The ore consists of the common base-metal sulfides, silver-bearing sulfosalts, and gold; base metals and precious metals commonly occur in separate ore shoots.

Although records left from early mining operations are too incomplete to permit a quantitative appraisal of the metalliferous resources of the Engineer Mountain–Red Mountain Creek area, many small but high-grade ore bodies of the type that have been mined are assumed to remain undiscovered in the area. Such resources are believed to be present, though undiscovered, because vein and fracture systems are abundant; some veins extend for several thousand feet horizontally; ore deposition occurred over a large vertical and stratigraphic range; and only a relatively small part of the known veins have been explored by mine workings. The potential of the area as a source of low-grade ores, as suggested by Burbank, can be determined only by extensive subsurface exploration and sampling. The topography in parts of the area would permit driving long haulage adits that would intersect numerous veins at considerable depths below the vein outcrops and many of the old mine workings on these veins, which would facilitate the mining of any ore found.

WETTERHORN PEAK–HENSON CREEK AREA

The Wetterhorn Peak–Henson Creek area occupies the southeastern part of the Wetterhorn Peak quadrangle and southwestern part of the Uncompahgre Peak quadrangle (fig. 6). Altitudes in this part of the primitive area are mostly above 12,000 feet. Bedrock consists of volcanic rocks and several intrusive igneous bodies.

Several uranium occurrences have been prospected and a little uranium ore has come from this part of the area. Deposits of bog iron ore occur in places. Among the samples taken in the primitive area during this study, no elemental anomalies were noted except for a weak molybdenum anomaly indicated by a few stream-sediment samples taken from the south side of Matterhorn Peak (samples 731–735, table 3). Precious- and base-metal ore has been won from mines adjacent to the primitive area near Capital City and along South Fork Henson Creek. Several of these mines have contributed substantially to the total mineral output of Hinsdale County. The Palmetto mine near Engineer Mountain, at the head of South Fork Henson Creek, was being explored in 1967.

COW CREEK AND CIMARRON CREEK AREA

The drainage areas of Cow Creek and the three forks of Cimarron Creek cover the northeastern part of the Uncompahgre primitive area (fig. 6). Access through this part is limited to several trails, mostly in the stream valleys. The terrain at the head of Cow Creek is especially rough and virtually inaccessible. Bedrock consists of middle to late Tertiary volcanic and intrusive rocks, including two stocks that have incompletely developed systems of radial dikes. Much sand and gravel occurs along the main streambeds. Mesozoic and Paleozoic beds are exposed along Cow Creek just outside the primitive area.

The mineral potential of this part of the study area is not well known. Rocks at and near the surface are mineralized at only a few places. Geologic relations permit mineral occurrences at depth, but little or no prospecting work by modern methods has been done.

Although no productive mineral deposits are known to occur within this part of the primitive area, some prospecting and mining have been done on Cow Creek near the mouth of Oban Creek, west of the area, and at the Silver Jack mine along East Fork Cimarron Creek near sample localities 791a and 792a (pl. 2), east of the area. Relatively few veins are exposed, and only three samples of vein and mineralized material were taken. Sample 836, from a prospect near the head of Middle Fork Cimarron Creek, contains considerable gold and silver and anomalous zinc; sample 828, from the head of East Fork Cimarron Creek, contains anomalous lead; and sample 566, from Red Creek, a tributary of Cow Creek, contains anomalous molybdenum (table 3). Stream-sediment samples 753, 827, and 829, collected near the head of East Fork Cimarron Creek, are anomalous in lead and molybdenum. Anomalous amounts of an ore metal or an accessory element were reported in a few other samples of stream sediments or altered or unaltered rocks, but these sample localities are scattered and consequently do not suggest a consistent or meaningful pattern of anomalous concentration. No gold was detected by analyses of concentrates panned from sand and gravel of Middle and West Forks Cimarron Creek, but a very small amount was detected in concentrates panned from East Fork Cimarron Creek and Cow Creek, below the place of mining on each stream (Fischer and Fisher, 1968).

Buried mineral deposits, if they exist, might be either of Late Cretaceous or early Tertiary or of middle to late Tertiary age. The exposed veins along Cow Creek are associated with the Ramshorn Ridge igneous intrusive bodies of Late Cretaceous or early Tertiary age—the same age as the intrusive bodies and associated ore deposits in the Ouray area. Possibly other veins of this same age of mineralization are buried beneath the younger volcanic rocks east of Cow Creek. However, even

if such veins exist under the primitive area, the host rocks probably would be the Precambrian, for the Paleozoic and Mesozoic beds are probably eroded from this part of the area (fig. 2). There is no basis for appraising the favorableness of the Precambrian as a host rock for ore in this area. Mineral deposits of middle to late Tertiary age might be associated with the two igneous stocks and radial dike systems exposed in the area, one near the head of Cow Creek and the other in Porphyry Basin between Middle and East Forks Cimarron Creek. These stocks are of the same age and similar in habit to the Mount Sneffels-StonyMountain stock in the highly mineralized Mount Sneffels-Red Mountain Creek part of the primitive area. Absence of vein deposits and anomalous concentrations of ore metals and accessory elements in the surface rocks near the Cow Creek and Porphyry Basin stocks strongly suggests that this intrusive activity was not accompanied by ore-bearing solutions; nevertheless, the existence of mineral deposits at depth cannot be disregarded.

DALLAS CREEK AREA

The drainage area of East and West Forks Dallas Creek lies mainly in the Montrose qradrangle, west of Ouray (fig. 6). The part of this drainage area in the Uncompahgre primitive area is mainly a steep north-facing slope, largely covered by glacial and landslide debris, though volcanic and intrusive rocks are exposed in the highest parts (pl. 1). Several veins on the northeast and west sides of Mount Sneffels have been prospected, and ore has been shipped from a few small mines. Exploratory work was being done in this part of the area in 1967.

Samples of vein and mineralized material from several of these veins contain appreciable amounts of lead and zinc, some silver and gold, and anomalous amounts of molybdenum, arsenic, and antimony. Samples of altered rocks show anomalous amounts of some of these elements, as do the samples of pan concentrates and stream sediments from East Fork Dallas Creek. Exposed veins are not as abundant on the north and west sides of Mount Sneffels as they are on the south and east sides, but some are present and sufficiently mineralized to encourage exploration. There is no feasible way to sample and appraise the parts of this area covered with surficial material.

INDIVIDUAL MINERAL COMMODITIES

The general distribution of individual mineral commodities—including elements that have been commercially important, those that might have economic potential, and those that might be significant as geologic guides in exploration and appraisal—are described next. The information is based on the ore-production records, mineralogic studies, and the analytical data shown in table 3.

COMMODITIES OF RECORDED PRODUCTION

GOLD

The Uncompahgre primitive area and mines within about 1½ miles of the area boundary have yielded a total of about $115 million in gold, or about 35 percent of the value of the total mineral production. The Mount Sneffels-Red Mountain Creek area has been the most productive part of the primitive area. Burbank (1941) described in detail the distribution of gold ore, its mineralogic associations and paragenetic relations, and its localization in this part of the area. In 1965 Ouray and San Miguel Counties yielded $1,043,805 in gold, mostly from deposits in the Mount Sneffels-Red Mountain Creek area. This represented about 80 percent of the total gold produced from Colorado that year. The Ouray area, particularly the deposits within about 1 mile of The Blowout, is the second most important part of the primitive area in total gold production. Burbank (1940) described in detail the deposits in this area also. Of the rest of the gold produced from the primitive area, most has come from the Red Mountains and Engineer Mountain-Red Mountain Creek areas (Burbank, 1941; Kelley, 1946), but the records of production are too incomplete to determine accurately which of these two has been more important.

Most of the gold in the Uncompahgre primitive area occurs as free gold in quartz veins that contain a little pyrite. Copper minerals are fairly abundant with gold in the Ouray area, and some occur with gold in other parts of the primitive area. Gold telluride minerals are reported in the Ouray area.

A small amount of gold has been recovered by placer operations from the San Miguel and Uncompahgre Rivers, which drain the parts of the primitive area known to be intensively mineralized. Analyses of pan concentrates from these streams show that the sand and gravel contains gold worth from about 1¢ to 30¢ per cubic yard (10–300 parts per billion). Analyses of similar samples taken from Cow Creek, Dexter Creek, and East Fork Cimarron Creek had a gold content ranging from a few tenths of a part per billion to a few parts per billion—only about a tenth to a hundredth of that in the sand and gravel from the San Miguel and Uncompahgre Rivers. Samples from Cow, Dexter, and East Fork Cimarron Creeks show that the gold content in these streams is too low to support a placer operation but that the stream drainage areas expose some gold-bearing rocks. Some vein mineralization is known in each of these drainage areas. No gold was detected in concentrates from other samples of the same type taken from Middle and West Forks Cimarron Creek and from East and West Forks Dallas Creek. The absence of gold suggests that the rocks exposed in these drainage areas contain little or no gold. No

veins have been mined in these drainage areas except near Mount Sneffels at the head of East Fork Dallas Creek. (See samples 388, 425, and 426, vein and mineralized material, table 3.)

SILVER

The value of silver produced from the primitive area and its perimeter totals about $70 million, or about 21 percent of the value of the total mineral production. Like gold, the bulk of the silver has come from the Mount Sneffels-Red Mountain Creek part of the primitive area. The 1965 production of silver from Ouray and San Miguel Counties was valued at $677,574, most of which came from the Mount Sneffels-Red Mountain Creek area. This amount represents 25 percent of the total silver produced in Colorado that year. In total production the Red Mountains area probably has exceeded the Ouray area slightly, but each area has yielded several million dollars' worth of silver. Silver produced from the Engineer Mountain-Red Mountain Creek area is considerably less but still substantial.

Silver occurs mainly in galena, the lead sulfide, and, as such, it does not form a distinct silver mineral. In the pipelike deposits in the Red Mountains area, however, silver occurs mainly in the copper and lead sulfosalts as silver sulfides and sulfosalts. Some silver accompanies the gold in the Ouray area probably mainly as silver and silver-gold tellurides. A little silver was detected in samples of altered rocks in various places in the primitive area, but most of these occurrences are near the Red Mountains. Even a few samples classified as unaltered contain detectable silver (table 3).

LEAD

Lead production from the various parts of the primitive area probably has much the same pattern as silver production, for silver mainly accompanies lead. Total lead production from the area is valued at about $60 million. In 1965 lead produced from Ouray and San Miguel Counties was worth $2,758,468, most of which came from the Mount Sneffels-Red Mountain Creek area. This represents 39 percent of the total lead produced in Colorado that year. Lead occurs mainly as the sulfide, galena, though in the pipe deposits in the Red Mountains area it also occurs in sulfosalt minerals.

ZINC

Zinc produced from the primitive area amounts to about 16 percent of the total value of mineral production, or about $53 million. The bulk of this has come from the Mount Sneffels-Red Mountain Creek area. The value of zinc produced in Ouray and San Miguel Counties in 1965 was $3,502,620, or about 22 percent of the Colorado total for the year. The principal ore mineral of zinc is sphalerite, the sulfide.

COPPER

The San Juan Mountains region is not primarily a copper-rich province. Nevertheless, about $33 million worth of copper has been won from the primitive area, representing about 10 percent of its total mineral production. The 1965 yield of copper from Ouray and San Miguel Counties was valued at $1,454,444, or about 54 percent of the total Colorado production of this metal. By far the largest part of the copper obtained from the primitive area came from the Mount Sneffels-Red Mountain Creek area, where copper sulfides are intimately associated with the lead and zinc sulfides. Considerable copper is present in some gold ore in the Ouray area, in some silver ore in the Red Mountains area, and in the ore from some mines in the Engineer Mountain-Red Mountain Creek area.

The copper content of the mineralized, altered, and unaltered samples collected during this study of the primitive area varies too widely from sample to sample to yield a meaningful distribution pattern. A study of copper-lead ratios, however, gave an interesting pattern of zonal arrangement (fig. 9). In the Ouray area copper predominates over lead in the vicinity of The Blowout, and lead predominates in the surrounding area, as Burbank (1941) recognized. Lead also predominates in most samples from the Mount Sneffels-Red Mountain Creek area and in many samples in other parts of the primitive area. Nevertheless, copper predominates in numerous samples taken from a northeasterly trending belt that extends from the Red Mountains area, through the Engineer Mountain-Red Mountain Creek area, and to the head of East Fork Cimarron Creek. This belt corresponds roughly to the northwest rim of the San Juan volcanic depression (fig. 4), which suggests that the predominance of copper is structurally controlled. This belt might also suggest that mineral deposits of the type in the Red Mountains area are buried in its northeastern part.

BISMUTH

A small production of bismuth ore in 1901 was reported by Struthers (1902) from an unidentified mine in Ouray County; almost certainly this mine is in the primitive area or in its 1½-mile perimeter. In addition to this specifically reported producton of bismuth, probably some bismuth has been recovered as a byproduct by smelters treating ores mined in the Uncompahgre primitive area; no record of this is available. The resources of bismuth are probably very small. Bismuth is rather widely but erratically distributed in vein deposits in the primitive area as a whole, but in the Red Mountains area it is slightly more abundant in the pipelike deposits than in the nearby veins.

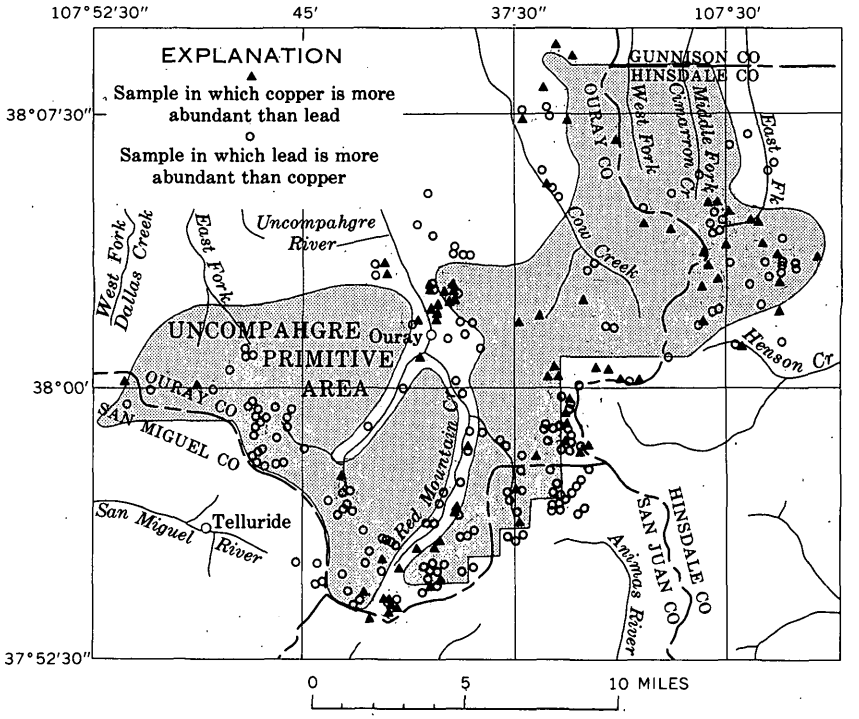


FIGURE 9.—Distribution of representative samples of vein and mineralized material, altered rock, and unaltered rock in which copper or lead predominate over one another.

FLUORSPAR

About 1,500 tons of fluorspar ore was shipped from the Barstow mine near Red Mountain Pass during World War I and shortly afterward (Cox, 1945). At this mine, fluorite, the ore-mineral of fluorspar, is an abundant gangue mineral. Small amounts of fluorite were also seen at scattered deposits in the primitive area during this study. No analyses for fluorine were made, and its general distribution pattern is not known. Resources are probably small in the primitive area.

IRON

Deposits of limonite, an iron oxide, commonly accumulate by precipitation from iron-rich spring waters in high mountain valleys in Colorado. They are generally called bog iron ores, and in places they have been mined for use as a soil conditioner, a pigment, or an iron ore. Moderate-sized deposits of this material occur near Uncompahgre Peak and the Red Mountains, and those near the Red Mountains have been mined on a small scale. Other iron oxides, mainly magnetite

and hematite, occur in concentrations in vein deposits in the primitive area, but all of them are probably too small to be of economic significance.

SAND AND GRAVEL

Moderately large deposits of sand and gravel occur along the Uncompahgre River below Ouray and in West and Middle Forks Cimarron Creek, and small patches of sand and gravel occur elsewhere in the general area. Some of this material has been used locally for construction and for surfacing roads, but no record of the tonnage used is available. This material will continue to be used, but only locally.

TUNGSTEN

According to Belser (1956), tungsten ore has been shipped from the Dunmore and Connie mines south of Ouray. No production figures were given, but the tonnage shipped is probably small. Belser also reported the occurrence of tungsten minerals in the Albert mine. All three mines are on the Dunmore vein. A sample (086, table 3) of vein and mineralized material taken from the dump of a small mine on the Dunmore vein between the Dunmore and Connie mines showed 5,000 ppm (parts per million) tungsten. Belser also reported the occurrence of tungsten minerals in the Montana mine, in San Miguel County on the edge of the primitive area. A sample of vein and mineralized material taken from the dump of the Carbonate King mine on Red Mountain No. 2 showed 1,000 ppm tungsten (sample 259, table 3), and four samples of Dakota Sandstone and vein material (samples ADG–077, –078, –079, and –083, table 2) near Ouray showed 50 ppm tungsten. The Dunmore vein has a tungsten resource potential, but it cannot be appraised quantitatively without extensive work; the other known occurrences probably are of little or no consequence in the resource potential of the area.

URANIUM

Several uranium-bearing occurrences have been found near Uncompahgre Peak, and one, on the Beth claim, has yielded a small amount of uranium ore. In these occurrences the uranium minerals are along veins or fractures in the marginal parts of small bodies of rhyolite porphyry intruded into the Tertiary volcanics (Roger C. Malan, U.S. Atomic Energy Commission, written commun. 1967). The resource potential of these occurrences is probably small.

Burbank and Pierson (1953) described four other types of uranium occurrences in the Uncompahgre primitive area. One consists of radioactive minerals with pyrite impregnating sheared and drag-folded zones in black slate of Precambrian age along the Uncompahgre River

canyon south of Ouray. A second type of radioactive occurrence is in bituminous shaly beds at the base of the Pony Express Limestone Member in the Pony Express mine near Ouray. The other two types of occurrences are in the Red Mountains area; one consists of pitchblende along veinlets and fractures in the pipe-type deposits, and the other of sooty pitchblende with pyritic veins in the belt of faulting that borders the Silverton cauldron. All these occurrences appear to be low in uranium content, and none has been intensively prospected.

ELEMENTS OF ECONOMIC POTENTIAL OR GEOLOGIC INTEREST

ANTIMONY, ARSENIC, AND CADMIUM

Antimony, arsenic, and cadmium, as well as bismuth, are commonly recovered as byproducts of smelting copper, lead, and zinc sulfide ores. Probably some of these elements have been recovered from ores mined in the Uncompahgre primitive area, but there is no specific record of this. Conceivably, small bodies of ore rich in minerals containing one or more of these elements might be mined and shipped from deposits in the primitive area. Geographically, the richer concentrations of these elements are widely but rather erratically distributed in the deposits in the primitive area.

BERYLLIUM

In the samples collected from the Uncompahgre primitive area, beryllium averages about 1 ppm in stream sediments and in unaltered rocks but less than 1 ppm in altered rocks and vein and mineralized material. In general, the samples of altered and unaltered rocks in the area between Mineral Point and Uncompahgre Peak contain the most beryllium but only have an average content of about 1.5 ppm. There also seems to be a slight concentration, ranging from 1 to 3 ppm, in the quartz veins near Mineral Point.

COBALT AND NICKEL

Both cobalt and nickel are lower in amount in samples of vein and mineralized rocks than in other types of samples; both are slightly enriched in stream sediments.

MOLYBDENUM

Molybdenum is more abundant in samples of vein and mineralized material than in any other group of samples; it obviously was introduced with the ore metals in hydrothermal solutions. Molybdenum is more abundant in samples taken near The Blowout than from other parts of the Ouray area, probably indicating that the temperatures of mineralization were higher near The Blowout. Elsewhere in the primitive area, samples containing molybdenum are widely but rather

erratically distributed. Molybdenum may be useful in guiding geochemical exploration in the primitive area, but no evidence was found to indicate concentrations having a resource potential.

TIN

Tin has no apparent economic significance in the primitive area, but that which is present has a distribution pattern that is better defined relative to geology than that of any other minor element. It is clearly related to the introduction of ore metals into deposits, for detectable amounts of tin are virtually restricted to samples of vein and mineralized material. Tin is much more abundant in the pipelike deposits than in the veins; hence, most of the tin is in the Red Mountains area. In this area, however, even the vein deposits contain more tin than they do elsewhere, and even a few samples of altered rock are tin bearing. Tin was also detected in a few samples of vein material in the vicinity of Mineral Point and near The Blowout near Ouray (fig. 10). Samples with detectable tin have much the same distribution as do the samples in which copper predominates over lead (fig. 9).

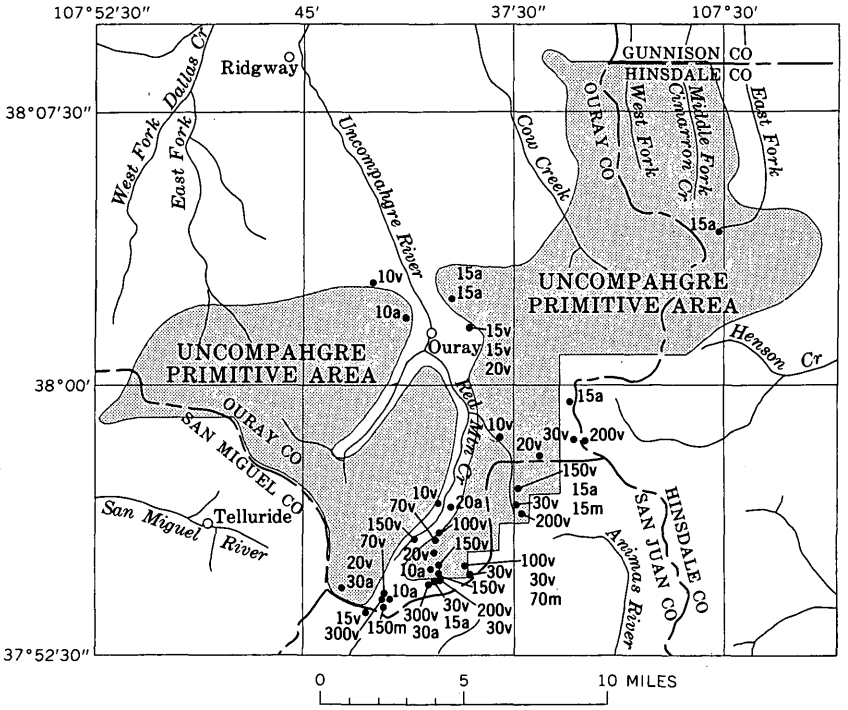


FIGURE 10.—Distribution of samples containing detectable amounts of tin. Numbers indicate the reported tin content, in parts per million. Letters indicate the type of sample: v, vein and mineralized material; a, altered rock; and m, miscellaneous.

ECONOMIC APPRAISAL

By M. J. Sheridan and R. G. Raabe
U.S. Bureau of Mines

CLAIM COVERAGE AND MINE WORKINGS

PATENTED CLAIMS

According to Bureau of Land Management records, the first mining claim patent in what is now the Uncompahgre primitive area was issued in 1876 for the Saxon claim, San Juan County, in protracted sec. 3, T. 42 N., R. 7 W., New Mexico principal meridian. The claim is near Silver Creek, a tributary of the Uncompahgre River. Since that date several thousand claims have been patented in Hinsdale, Ouray, San Juan, and San Miguel Counties. Plate 3 shows about 4,000 patented claims. The primitive area alone contains more than 2,000 patented lode, placer, tunnelsite, and millsite locations.

The patented claims shown on plate 3 cannot be located accurately on modern maps, because of inaccuracies in the early surveys. Plate 3 is not intended to show the exact location of any individual claim; rather, it is intended to illustrate the number and distribution of claims in and near the primitive area.

UNPATENTED CLAIMS

In the 90 years of mining activity in the vicinity of the Uncompahgre primitive area, a vast number of unpatented claims have been located. A complete search of courthouse records of the four counties was beyond the scope of this study. For this report two categories of claims were identified: (1) claims for which affidavits were filed for the purpose of recording annual labor performed during the previous assessment year, September 1, 1964–August 31, 1965, and (2) claims so recently located that assessment work and corresponding affidavits of labor would not have been legally required as of the date of the search. Although this procedure fails for several reasons to identify an unknown number of unpatented claims, more than 700 unpatented locations were disclosed within the primitive area and the 1½-mile perimeter. About 500 of these claims cover fractions within patented groups; others overlap or lie so close to patented claims that plotting their locations would contribute little to the overall concept of claim coverage. A few unpatented claims within patented groups are shown on plate 3 to illustrate fractional coverage; about 150 other unpatented claims are sufficiently isolated to warrant showing them on the map.

Most descriptions of unpatented claims are vague; at best their locations and orientations can only be approximated. An on-the-ground search for claim corners in areas of heavy claim density would require an inordinate expenditure of both time and funds.

RELATIONSHIP OF UNDERGROUND MINE WORKINGS TO THE PRIMITIVE-AREA BOUNDARY

Many mine workings in the primitive area are connected to the surface by openings outside the area. Because of extreme topographic relief (fig. 11), most of these openings are in the canyon bottoms along two narrow corridors of excluded land; one splits the area into two parts and is occupied by Red Mountain Creek, the Uncompahgre River, and U.S. Highway 550 (fig. 12), and a second branches from the first near Ouray and extends southwestward along Canyon Creek and State Highway 361 to the Camp Bird mine (pl. 2). Beyond Camp Bird, Highway 361 becomes secondary road No. 26 (fig. 13) and continues into the primitive area along Sneffels Creek to the Revenue mine and other higher properties. The southwest boundary of the Uncompahgre primitive area, which coincides with the St. Sophia Ridge divide between Ouray and San Miguel Counties, is crossed at several points by underground workings. Although the portals of many of these workings are outside the primitive area in San Miguel County, they serve mines that are wholly or partly within the proposed wilderness.

HISTORY AND PRODUCTION

EARLY ACTIVITIES

Since the discovery of gold in Arrastre Creek near Silverton in 1870, the area described by Burbank (1947a) as the San Juan region, made up of about 12,000 square miles and including some 50 mining districts, had produced about $725 million in gold, silver, copper, lead, and zinc through 1965. This amount represents about 30 percent of the total value of these metals recovered in Colorado during the same period. Value of production from the primitive area plus that from a 1½-mile perimeter zone totals around $332 million. Were the zone extended a few miles farther southward and eastward, the dollar value of base- and precious-metal production would approach the $725 million total for the region.

Although the Uncompahgre primitive area is best known for its base- and precious-metal production, minor tonnages of bismuth (Struthers, 1902), fluorspar (Cox, 1945), iron, tungsten (Belser, 1956), and uranium ores have been produced from mines within the area. Rhodonite (manganese silicate) associated with base- and precious-metal ores occurs in minor amounts in veins in the Uncompahgre primitive area and in potentially important quantities in deposits within 2 miles of the proposed primitive boundary (Agey and others, 1962; Young, 1966). Several occurrences of uranium minerals associated with base- and precious-metal ores and iron-manganese hot-springs deposits have been reported in the area (Burbank and Pierson, 1953).

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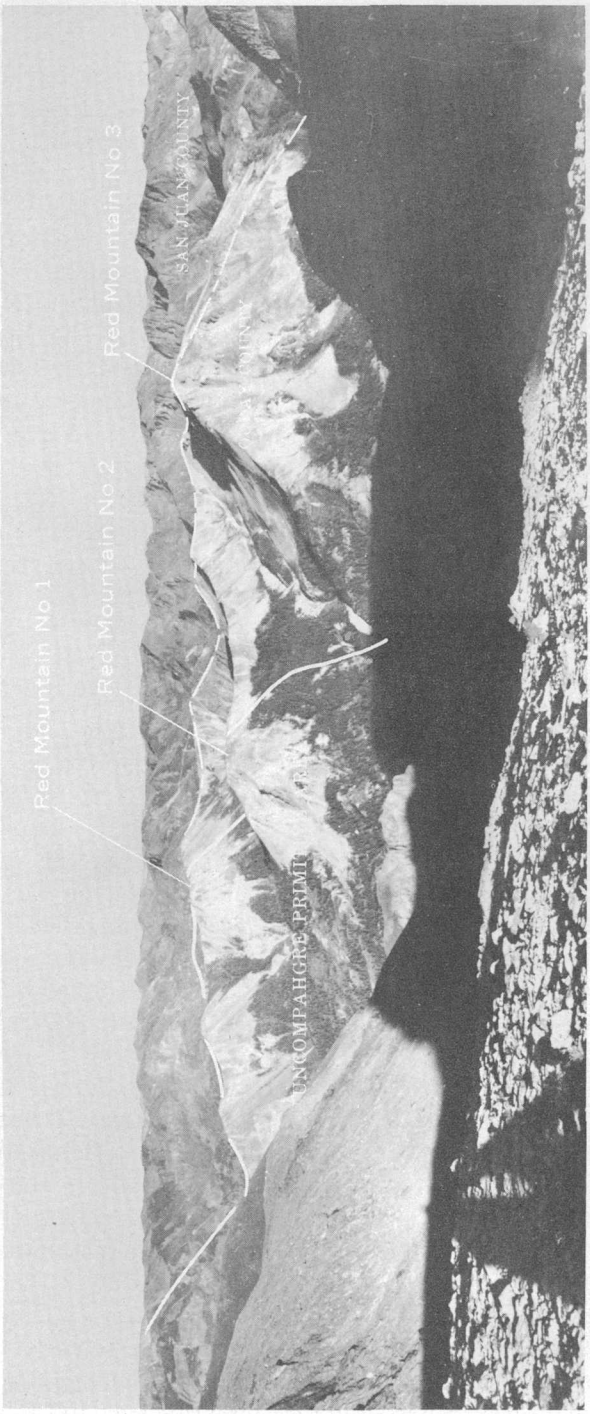

FIGURE 11.—View eastward from an altitude of 13,365 feet, near Imogene Pass within the Uncompahgre primitive area, Ouray County. Foreground is vertically over parts of the Coronado, Barstow, St. Paul, and Camp Bird veins. Shown are Red Mountain Creek (in shadow), Red Mountain Peaks, part of the primitive area boundary, and part of the Ouray–San Juan County line.

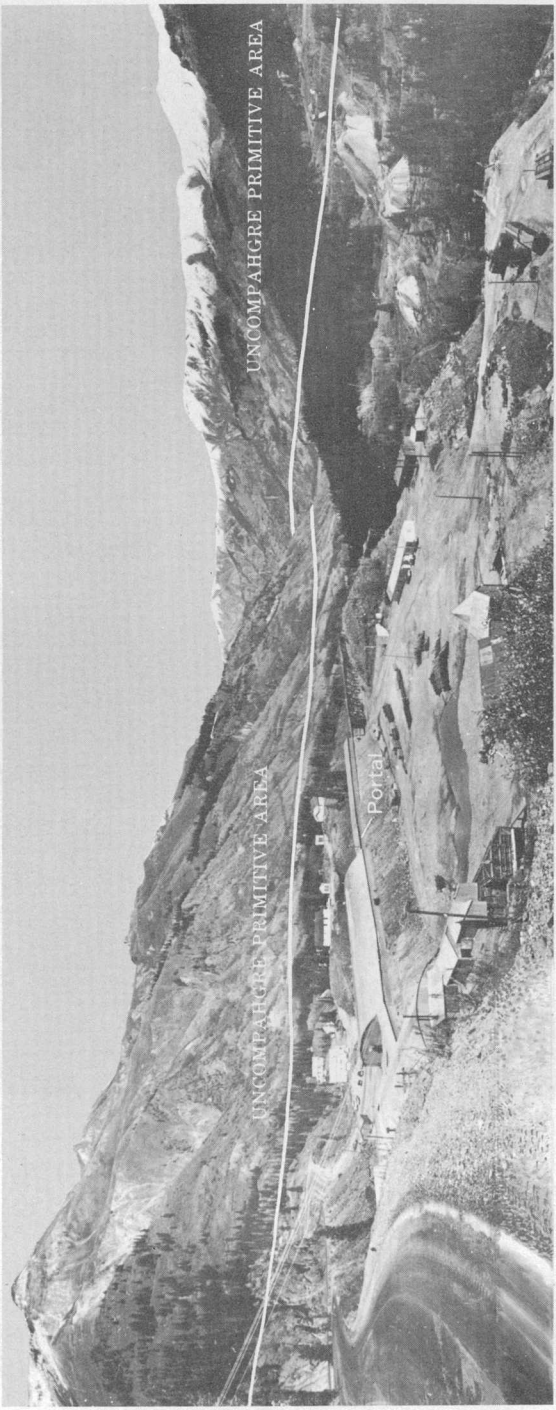

FIGURE 12.—Idarado Mining Co. surface plant at portal of the Treasury tunnel along Red Mountain Creek and U.S. Highway 550, Ouray County. Idarado's Treasury tunnel 800-ton-per-day mill operated at this site until 1958 and was subsequently dismantled. View is to the north, toward Ouray.

FIGURE 13.—Secondary road No. 26 along Sneffels Creek, Ouray County. Part of the Camp Bird surface plant at the portal of the 14th level tunnel is visible on the canyon floor.

The approximate proportional value of metal production from mines within the area is gold, 35 percent; silver, 21 percent; copper, 10 percent; lead, 18 percent; and zinc, 16 percent. The 1965 proportions were gold, 11 percent; silver, 6 percent; copper, 16 percent; lead, 30 per-

cent; and zinc, 37 percent. This change in the relative proportions of recoverable metals is the result of increasing base-metal and decreasing gold and silver content of the ores with depth and technical advances in extractive metallurgy.

The history of mining in the San Juan region is not unlike that of other metal-producing areas of the Western States. The first mining activity was characterized by many producers mining high-grade gold-silver-lead ores from the shallow oxidized zones of veins and breccia pipes. As higher grade, near-surface ores were depleted, production became increasingly dependent on a few producers that were capable of developing and exploiting deeper, more complex ores. In 1910, 35 mines in the area produced about 500,000 tons of ore worth $6.4 million, 85 percent of which was in gold and silver values. In 1965 nine mines [3] produced about 380,000 tons of ore worth $9.4 million, 18 percent of which was in gold and silver values. Consolidation of smaller mining companies by major corporations has been a principal factor in sustaining a high level of base- and precious-metal production.

Intermittent but significant production from individual properties in the area has fluctuated (fig. 14) with rate of discovery, depth, and cost of mining, changing metal prices,[4] and the proximity of ore-treatment facilities (King and Allsman, 1950). Prior to 1885 the bulk of metal output was from pipe deposits, such as the Yankee Girl, Orphan Boy, National Belle, Silver Bell, Congress, and San Antonio mines. By 1895 additional pipe deposits, such as the Guston, Robinson, Gennessee-Vanderbilt, St. Lawrence, and Hudson mines, and important vein deposits located near the Ouray–San Miguel County line, such as the Liberty Bell, Virginius, Revenue, Tomboy, and Smuggler Union mines, were in production. By 1900 mines to the north in the vicinity of Mineral Point and Engineer Mountain, including the Polar Star, Michael Breen, Palmetto, Mountain Queen, Old Lout, and Frank Hough, had shipped ores yielding about $2 million mostly in gold and silver (Kelley, 1946). With increasing discoveries and development of vein deposits, the Liberty Bell, Revenue, Smuggler Union, Tomboy, Argentine, Cincinnati, and Camp Bird mines dominated the metal output through 1925.

[3] Four of these nine mines produced 200 tons or less.

[4] After the U.S. Treasury Department ceased its policy in July 1967 of maintaining silver at $1.29 an ounce, the price had risen 70 percent to $2.39 by March 1968. Though their rise has not been as spectacular as that for silver, prices for base metals have shown steady increases of about 25 percent since the early 1960's. The impact on the domestic mining industry of the March 1968 Amendment of the U.S. Treasury Department Gold Regulation permitting producers to sell and export gold freely has not, at this writing, been fully evaluated.

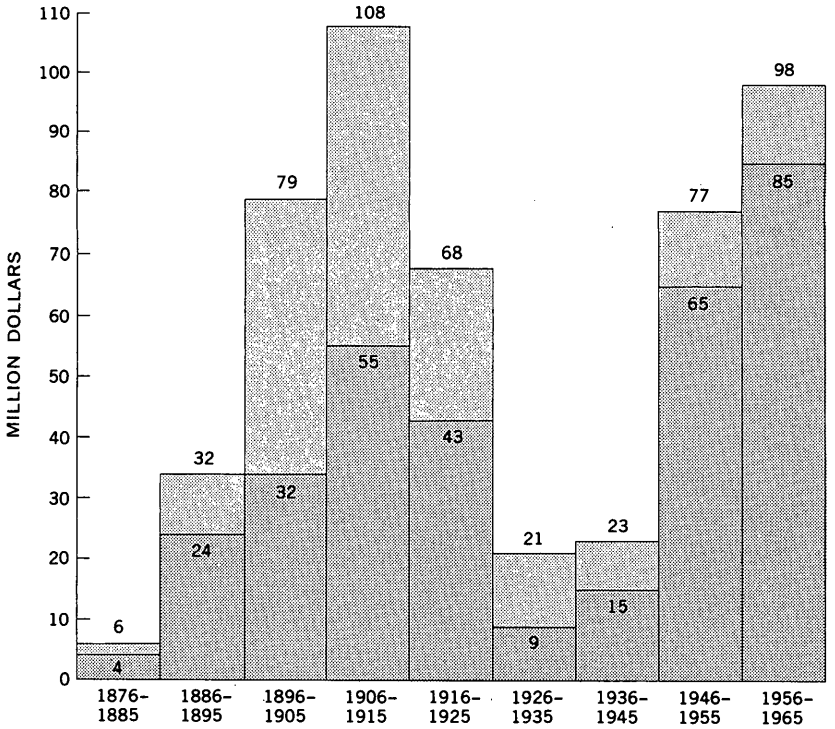

FIGURE 14.—Value of gold, silver, copper, lead, and zinc production from the Uncompahgre primitive area and the 1½-mile perimeter zone. Dark pattern indicates actual value; light pattern indicates computed value at 1965 prices.

HISTORY OF ORE-TREATMENT PLANTS SERVING THE SAN JUAN REGION

Ores from the San Juan region have supported several local captive and custom concentrating mills and custom smelters at Lake City, Silverton, Ouray, Rico, and Durango, Colo. San Juan ores have also contributed to the input of smelters at both Pueblo and Leadville, Colo., and custom mills and smelters in Utah, Montana, and Texas (King and Allsman, 1950).

The Lake City, Silverton, Ouray, Rico, and Pueblo smelters were fairly small, short-lived operations and all had closed by the early 1900's. The Durango smelter, however, operated for nearly 50 years, the last 30 years under the ownership of the American Smelting and Refining Co. The mining industry of the San Juan region was virtually dependent on this reduction facility. However, declining base-metal and silver prices and the resultant reduced mine output precipitated

the closing of the ASARCO Durango plant in 1930. This eliminated the last local market for direct-shipping ores and concentrates from the San Juan region and necessitated their diversion, at increased shipping costs to ASARCO's Leadville plant or to out-of-State smelters. The closing of the Leadville plant in 1960 left Colorado without base- or precious-metal custom smelting facilities.

LOCAL CUSTOM MILLING FACILITIES

Loss of the Durango smelter augmented demand for custom milling of the San Juan region ores. In 1935 the daily capacity of the Shenandoah-Dives Mining Co. mill near Silverton was expanded to 700 tons from 500 tons to handle company-owned and custom ores. This plant was acquired by Standard Metals, Inc., in 1959 and continued to accept limited tonnages of custom ores, some of which were produced from mines in or near the Uncompahgre primitive area. Since 1965, however, the Shenandoah mill has processed only company-owned ores from the Sunnyside and Mayflower mines which are, respectively, 2 and 10 miles southeast of the primitive area.

In 1931 a 120-ton-per-day custom flotation mill was constructed at Ouray and, under the management of G. A. Franz, operated variously as the St. Louis Independent Smelting & Refining Co., Banner American Mining & Milling Co., G. A. Franz, Inc., and General Ore Reduction Co. About 3 years were required by mine operators to increase custom shipments from an initial 30 tons per day to an average of 120 tons per day, with summer stockpiling at the mill permitting year-round operation. In 1946 the plant was purchased by the American Zinc, Lead & Smelting Co. of St. Louis. American Zinc, treating company-owned and custom ores, expanded mill capacity to 350 tons per day and operated the plant until 1952, when it was shut down and later dismantled. The 1952 annual report of American Zinc, Lead & Smelting Co. explained that discontinuance of the operation resulted from prevailing low metal prices and failure to develop new ore reserves at company-owned mines. During its 20-year term of operation, this mill figured significantly in the overall economy of the San Juan region.

The following mines in the primitive area and perimeter zone have shipped to the Shenandoah-Dives mill at Silverton or to the Banner–American Zinc mill at Ouray. Asterisks identify mines located wholly or partly within the Uncompahgre primitive area. Certain of these producers also shipped direct-smelting ores to Colorado or out-of-State smelters.

Agnes*
Altoona*
Andrus*
Atlas*
Auxiliary*
Banner American*
Bachelor*
Beaver*
Belcher
Belfast*
Black Girl
Blackstone
Camp Bird Extension*
Cimarron
Connie*
Dunmore*
Highland Chief*
Hoffman
Hoosier Girl*
Ida L.*
Japan-Flora
Kaemmerling*
Kentucky Giant*
Koehler
Lark
Lost Day*
Lucky Jack
Meldrum*
Memphis
Michael Breen*
Mineral Farm*
Mogul
Monarch*
Monte Christo*
Monument
Mountain King*
Mountain Queen
Newsboy
Paymaster
Polar Star
Pony Express*
Portland*
Pride of Bonita
Revenue*
San Antonio
Senorita
Silver Bell*
Silver Coin*
Silver Ledge
Syracuse*
Terrible Queen*
Tomboy
Trust Ruby*
Wedge*
Yankee Boy*
Yankee Girl*

DIRECT-SHIPPING ORES

Listed below are mines in the primitive area and perimeter zone which have produced ores of sufficient grade to warrant shipment directly to Colorado or out-of-State smelters. Asterisks identify mines located or wholly or partly within the Uncompahgre primitive area. Because of known inadequacies of pre-1900 records, this list must be considered only reasonably complete.

Adelia
Alaska*
Alma*
Amador*
American Nettie*
Balm of Gilead*
Belcher
Benack*
Ben Butler
Bill Young
Blue Eagle*
Bonanza King
Bradley
Brazillion*
British Queen
Calliope
Carbon Lake
Cashier
Chapman*
Chief Ouray*
Chrysolite*
Columbia
Congress
Courthouse
Dauntless*
Dynamo
Early Bird*
Emperor Wilhelm
Engineer
Evening Star
Frank Hough
Forrest*
Frisco Tunnel
Galena Queen
Galty Boy
Genessee-Vanderbilt*
Governor*
Grand Mogul
Greyhound*
Guadalupe*
Guston*
Henrietta
Hercules*
Hero
Hidden Treasure
Highland Lassie*
Hope
Humbolt*
Jackpot*
J. I. C.*
Joe and John
Jonathan*
Klondike
Kremlin*
Last Chance*
Lillie
London
Longfellow*
Maid of the Mist*
Mammoth
Minnie B.*
Mother Cline*
Mountain Monarch*
Mountain Queen
North Star*
O. & N.*
Old Lout*
Ophir Group*
Ores & Metals*
Oyama*
Palmetto
Palmyra*
Patsy*
Pickett
Plutus*
Poughkeepsie*
Red Cloud
Red Mountain*
Rico*
Robinson*
Rollo
Saint Paul
San Juan Chief
Saxon*
Schofield*
Scotch Girl*
Silver Link
South Dakota*
Speedwell*
Stanley*
Sunset*
Sutton
Tempest
Thistledown
Union
U.S. Mint*
Vermillion
Wanakah*
Woodstock*
Wyoming

CURRENTLY PRODUCING MINES

Since 1953 virtually the entire mine output (fig. 14) from the area has been produced by two companies: the Idarado Mining Co. and Camp Bird, Colorado, Inc.

CAMP BIRD, COLORADO, INC.

The Camp Bird mine, 6 miles southwest from Ouray, has a long and successful history dating back to 1877. The first claims staked reportedly were the Gertrude and Una (pl. 3), which, along with several additional claims, became Allied Mines Co. Allied's holdings and additional claims in Imogene Basin were acquired and consolidated about 1896 into Camp Bird Mining Co. by Thomas F. Walsh. Between 1896 and 1902 Walsh's company reportedly produced gold-silver-copper-lead ore worth about $4 million. In 1903, Camp Bird, Ltd., a British company, acquired the Camp Bird mine. Under the technical direction of engineer John Hays Hammond and geologist J. E. Spurr, names destined to become synonymous with worldwide success in the mineral industry, the mine developed into one of the most lucrative operations in its era (fig. 15). In 1925 the property was leased to the Camp Bird Leasing Co., which operated the mine and the remodeled 100-ton-per-day mill (King and Allsman, 1950) under the name King Lease, Inc., until 1956, when the operation reverted to Camp Bird, Ltd. Anticipating augmented production from newly developed ore, the company, operating as Camp Bird, Colorado, Inc., constructed a 500-ton-per-day mill (fig. 16), which was completed in 1960. In 1962 the company acquired the Revenue-Virginius Corp. which held adjacent formerly producing mines, including the Revenue, Cumberland, Wheel of Fortune, and Terrible (pl. 3).

Federal Resources Corp. purchased Camp Bird, Colorado, Inc., in 1963 and, as of 1968, operates the mine and mill and conducts exploration on company-owned and leased properties for additional ores tributary to the present plant.

The holdings of Camp Bird, Colorado, Inc., in addition to the new milling facilities, include 225 patented and 39 unpatented lode, placer, millsite, and tunnelsite claims, nearly all of which are within the Uncompahgre primitive area. Value of production from the Camp Bird and Revenue-Virginius properties totals about $50 million, some 90 percent of which has been mined from deposits in the proposed wilderness area. Approximately 85 percent of the value of this production is credited to gold and silver; the rest is credited to base metals.

Access to veins under development at both the Camp Bird and Revenue properties is by crosscut haulage and drainage adits driven

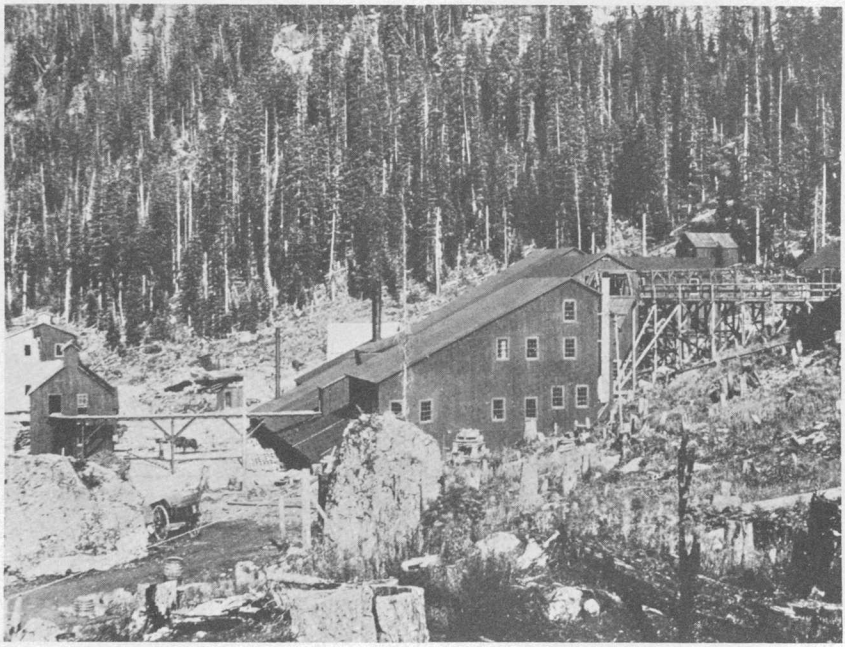

FIGURE 15.—Original stamp-amalgamation mill at Camp Bird, about 1903. Ore was transported to this plant, altitude 9,822 feet, by way of aerial tramway.

at successively lower altitudes as mining depth increased. The lowest haulage adit at Camp Bird (fig. 16), the 14th level, is more than 11,000 feet long and intersects the mine workings about 2,000 feet below the apex of the Camp Bird vein. The Revenue group of claims is served by the 8,000-foot-long Revenue tunnel (fig. 17), which also intersects the principal veins about 2,000 feet below their outcrops. Total length of underground workings in the Camp Bird and Revenue-Virginius properties exceeds 25 miles. In both mines most of the ore is extracted by shrinkage stoping. Base-metal concentrates containing gold and silver are shipped by truck and rail to custom smelters in Montana and Utah.

In 1945–46 the U.S. Bureau of Mines diamond drilled seven holes, totaling about 4,000 feet, to determine the presence of commercial ore below the 14th level of the Camp Bird mine. The targets of this exploration were vein intersections in the previously unexplored Telluride Conglomerate underlying the known Tertiary volcanic host rocks of the 14th and upper levels. Two holes intersected the Camp Bird vein at the base of the Telluride Conglomerate and indicated the presence of a large body of low-grade zinc ore; three holes intersected the structure but failed to cut commercial ore; two holes were

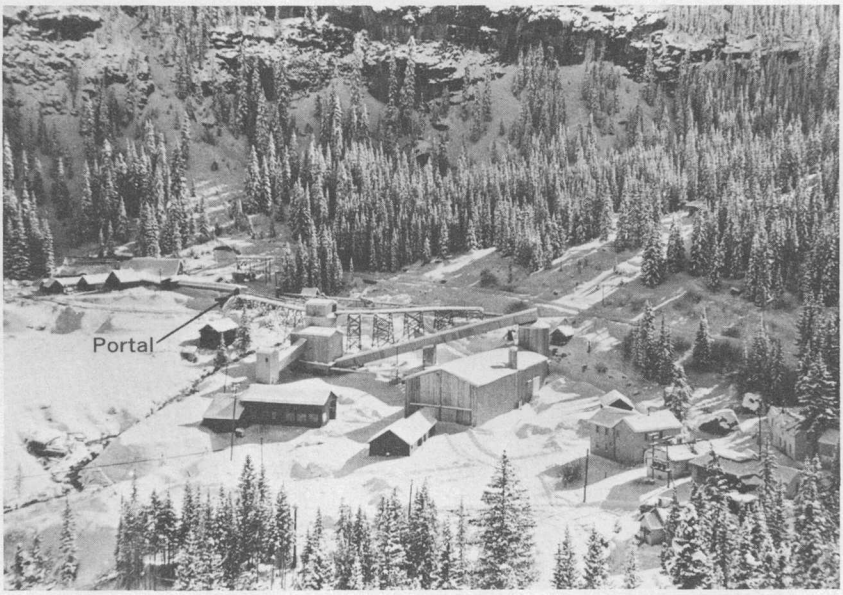

FIGURE 16.—Present Camp Bird 500-ton-per-day amalgamation-flotation mill and surface plant at the portal of the 14th level tunnel; altitude, 9,822 feet. More than 25 miles of mine workings connected to the tunnel are within the primitive area.

lost before reaching their objectives (Deshayes and Young, 1948). The 1962 biannual report of Camp Bird, Ltd., stated that indicated ore reserves of the Camp Bird vein totaled 361,000 tons containing 0.10 ounce of gold and 5.05 ounces of silver per ton, 5.94 percent lead, 0.34 percent copper, and 3.84 percent zinc. Reserves of the Virginius mine were estimated at more than 1 million tons of minable ore. The Cumberland mine, of the Revenue group, was reported to have a potential for large tonnages of minable ore. Federal Resources Corp. announced in their 1967 semiannual report that the Camp Bird operation still has a high-tonnage medium-grade potential for continuity of operation in the future.

IDARADO MINING CO.

Idarado Mining Co. was formed in 1939 by Newmont Mining Corp., Sunshine Mining Co., Callahan Lead & Zinc Co., and Colorado interests to acquire the assets of San Juan Metals Corp. of New York. The San Juan Metals holdings consisted of about 60 patented claims covering the Handicap and Barstow mines, and the Treasury tunnel group of claims (pl. 3), as well as the Treasury tunnel 300-ton-per-day mill, 11 miles south of Ouray. Subsequently, the company acquired the Black

FIGURE 17.—Portal of the Revenue tunnel and site of the former Revenue mill in Sneffels Creek; altitude 10,670 feet. Entire scene is within the Uncompahgre primitive area.

Bear and Imogene claim groups, and by 1942 Idarado held 228 contiguous claims in both San Miguel and Ouray Counties, within and outside the Uncompahgre primitive area.

As a result of a study by the U.S. Bureau of Mines, the Metals Reserve Company in 1942 leased the property for 5 years and obtained a $1.3 million Reconstruction Finance Corporation loan to reopen and extend the 5,500-foot Treasury tunnel an additional 6,300 feet to a point 1,100 feet below the Black Bear mine. The Black Bear vein was intersected within the Uncompahgre primitive area after extending the tunnel 3,000 feet. The tunnel was driven the remaining 3,300 feet by drifting on the vein; this work disclosed excellent metal content and width. In 1944 Idarado liquidated all Government obligations, proceeded with mine development and Treasury tunnel mill rehabilitation, and was in production by 1945. Mill capacity was expanded to 800 tons per day in 1946. In 1953 Idarado purchased the stock of Tom Boy Gold Mines, Inc., and Telluride Mines, Inc., which included the Smuggler Union, Montana, Tomboy, Liberty Bell, and other operating mines and the 800-ton-per-day Pandora mill (fig. 18) at Telluride. Both mills

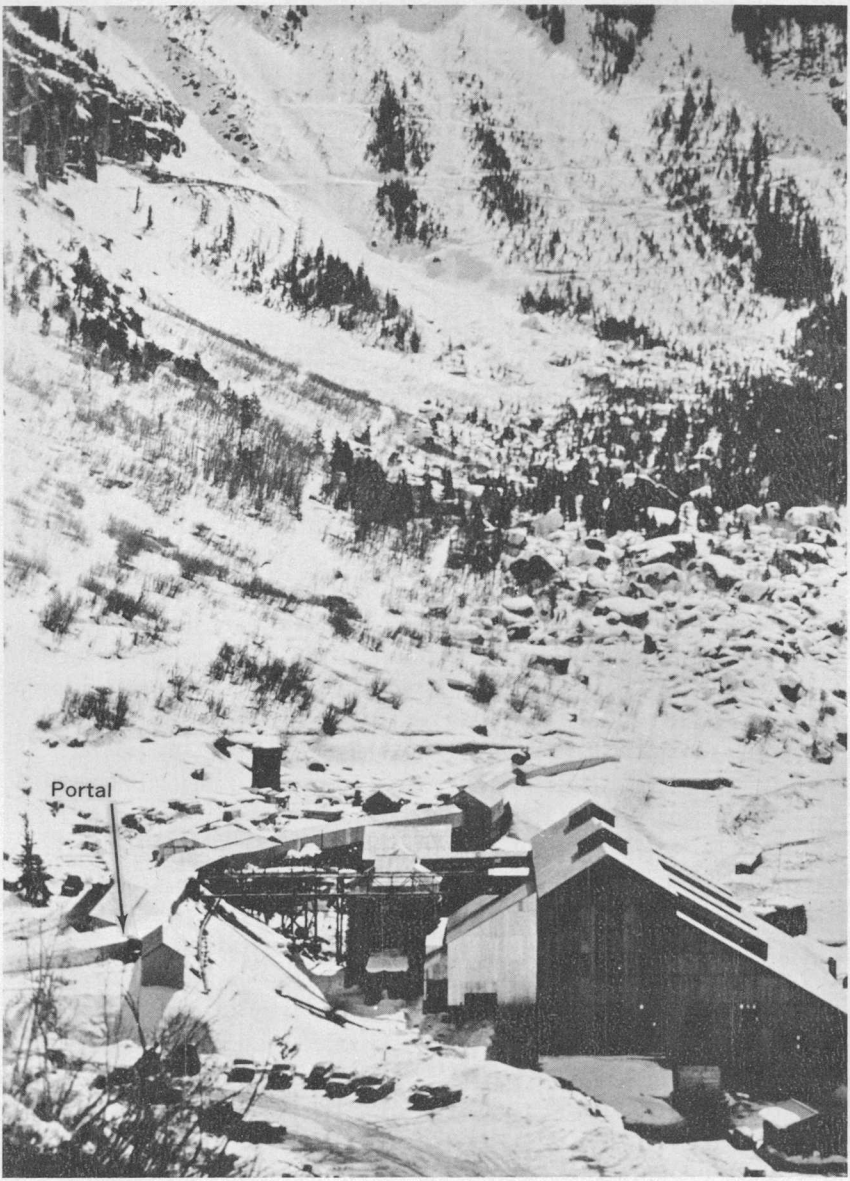

FIGURE 18.—Pandora mill of the Idarado Mining Co. at the portal of the Mill Level tunnel, Telluride, San Miguel County. Altitude 9,060 feet. More than 90 miles of underground workings, partly within the primitive area, connect this portal with the Treasury tunnel portal (fig. 12) nearly 6 miles away.

were operated until 1956 when the Treasury tunnel plant, at altitude 10,620 feet, was placed on standby and all ore was diverted to the newly rebuilt Pandora mill (Tatman, 1964) at an altitude of 9,060 feet. In 1960 the company purchased the neighboring Atlas Mining Co. and by 1965 had expanded the Pandora mill capacity to 1,700 tons per day. As of 1968 the Pandora mill handles the entire output of the Idarado operation through the Mill Level tunnel.

About half the claims held by Idarado are in the Uncompahgre primitive area, and the rest lie within 2 miles of the boundary. Access to the productive part of the mine is through the Treasury tunnel (fig. 12) in Ouray County, and the Mill Level tunnel (fig. 18) in San Miguel County, the portals of which are about 6 miles apart. Underground workings on all levels connecting the Ajax-Smuggler, Tomboy, Liberty Bell, Alma, Virginius, Pandora, Flat, Japan, Flora, Cross, Amsborough, and Black Bear veins total around 90 miles (Hillebrand, 1957).

The 1967 annual report of Newmont Mining Corp. states that, in 1967, Idarado Mining Co. produced 438,000 tons of ore containing 0.04 ounce of gold and 2.33 ounces of silver per ton, 2.49 percent lead, 0.75 percent copper, and 4.32 percent zinc. In that year the company was Colorado's leading producer of gold, silver, copper, and lead and ranked second in production of zinc. In recent years the proportion of Idarado ore produced from that section of the mine lying within the Uncompahgre primitive area has ranged from 20 to 40 percent. All mining is by shrinkage stoping from slusher sublevels (Hilander, 1961). The 1,560 feet of depth gained by exclusive use of the Mill Level tunnel permits gravity transfer of the entire mine output through ore passes to the Mill Level tunnel, for haulage to the Pandora mill. Gold-silver bullion was shipped to the Denver Mint prior to the Treasury Gold Regulation of April 1968. Base-metal concentrates are shipped to custom smelters in Texas, Utah, Washington or Montana.

In the past, ore from the Idarado and nearby properties has been mined from the Tertiary volcanic rocks—San Juan Formation, Silverton Volcanic Group, Potosi Volcanic Group. Diamond drilling from the Mill Level tunnel altitude, which in 1967 was the lowest level of development, has intersected excellent ore widths in previously unexplored sedimentary rocks below the volcanic section (Hedlund, 1966). The Idarado Mining Co. maintains a measured 10-year reserve of about 4 million tons of ore, according to the 1967 annual report of the the Newmont Mining Corp.

RESERVES AND POTENTIAL

METALS AND MINERALS

In 1967 the U.S. Bureau of Mines published an evaluation of United States reserves of base- and precious-metal ores (Everett and Bennett, 1967). From detailed data on which that evaluation was based, ore reserves of 54 mines or groups of mines in and near the primitive area have been determined to total about 8,500,000 tons averaging 0.05 ounce of gold and 7 ounces of silver per ton, 0.6 percent copper, 2.5 percent lead, and 2.8 percent zinc. About half of this ore lies within the primitive area.

Potentially significant quantities of rhodonite ores ranging from 7 to 28 percent and averaging about 8 percent manganese could be produced, under an emergency pricing program, from mines within 2 miles of the proposed wilderness area (Agey and others, 1962; Young, 1966). Inferred tungsten reserves in 13 mines within and in the general vicinity of the area were estimated in 1945 to be about 70,000 tons containing 1.3 percent tungsten trioxide (WO_3) (Belser, 1956). Part of this reserve is in the Uncompahgre primitive area. Reserves of ores of fluorspar and uranium have not been determined.

The continued success of the mining industry in the San Juan region has resulted from consolidation of individual mines or groups of mines into relatively large operating units by corporations capable of providing the financing needed to develop ore reserves sufficient to justify mill construction and to maintain sustained output. Further consolidation, which could involve independent properties within the area, is within the realm of possibility.

The 20-year record of operation of the Banner American–American Zinc custom mill attests to the importance of a local outlet for San Juan Mountain area ores tributary to a central point. Results of a recent survey of metal-refining opportunities in Arizona, Colorado, New Mexico, and Utah, where the Imperial Smelting Process could be used (U.S. Dept. Commerce, 1965), indicate that the prospects for future production from the Uncompahgre area are good if metal prices maintain present or higher levels and if adequate milling facilities can be provided. The Colorado State Bureau of Mines is currently attempting to interest the metal industry in constructing custom milling plants in four mineral districts in the State. One recommended location is Ouray or the Denver and Rio Grande Western railhead at Ridgway, 10 miles to the north.

In 1965 the State of Colorado Mining Industrial Development Board published a detailed study (Walvoord, 1965) that evaluates the economic feasibility of construction and operation of a custom bulk-sulfide flotation upgrader followed by a leach-solvent extraction

plant for metal separation and electrolytic-cyanide-cement copper refining for recovery of base and precious metals and cadmium and cobalt. Site selection was made on the basis of (1) historical record of metallic ore production, (2) available reserves and resources to insure raw-material supply, and (3) present ore production. Of four areas considered, the San Juan region was selected, with suggested plant location at Ridgway. By shipping to such a facility, present major mine-mill operations and small producers alike would realize savings from lower cost metallurgical processing and lower freight rates. The U.S. Bureau of Mines Salt Lake City Metallurgy Research Center is actively engaged in the design and improvement of hydrometallurgical-electrolytic techniques on which this process is based (George and others, 1967).

LEASING ACT MINERALS

Coal prospecting permits have been issued by the Bureau of Land Management in T. 46 N., Rs. 6 and 7 W., Gunnison County, about 5 miles north of the north boundary of the Uncompahgre primitive area. Most permits are held by the Kemmerer Coal Co., of New York City which is currently drilling in this area for proof of discovery required to validate permits. The nearest mines from which coal is produced as of 1968 are in the vicinity of Paonia and Somerset, about 50 miles north of the proposed wilderness area.

Several oil and gas leases were issued between 1948 and 1963 in T. 45 N., R. 8 W., and noncommercial quantities of gas were discovered in secs. 1 and 2 about 5 miles northwest of the primitive area. The nearest active oil and gas lease as of 1968 is in secs. 21 and 28, T. 46 N., R. 8 W., about 9 miles northwest of the primitive area.

GOVERNMENT ACTIVITIES

The Government has provided several forms of assistance to mine operators to increase production and establish reserves of strategic and critical minerals and metals. Among the programs that have been of benefit to mining in the primitive area and immediate vicinity in the past were that of the Metals Reserve Company procurement program in cooperation with the War Production Board during World War II; the Access Road Program; and the Defense Minerals Exploration Administration (DMEA) program under the Defense Production Act. In 1958 the Office of Minerals Exploration was established to provide Government financial assistance in exploration for domestic mineral resources, and to administer both contracts in force and certified projects remaining from the exploration program under the Defense Production Act.

Under the Access Road Program, funds were authorized for construction or improvement of roads to numerous mining properties in

San Juan, Ouray, and San Miguel Counties. Mines in or near the primitive area which warranted this assistance were the Mountain Queen, Connie, North Star, Genessee, Lark, Lead Carbonate, Lost Day, Michael Breen, Red Mountain, and St. Paul. Funds for exploration, rehabilitation, or development under the Strategic War Materials Act, the Defense Production Act, or through the facilities of the Metals Reserve Company were allotted to the following mines or mining companies located in the area: Idarado Mining Co. and Camp Bird Leasing Co. and to the Joe and John, Henrietta, Lead Carbonate, Galty Boy, Adams, Bachelor, Bimetallist, Mineral Farm, and Dunmore mines. In the summer months of 1943–46, U.S. Bureau of Mines engineers examined about 80 mines and prospects in the Poughkeepsie, Upper Uncompahgre, and Mineral Point districts of Ouray and San Juan Counties (Hazen, 1949). In 1948–50 the investigation progressed to exploratory diamond drilling by the Bureau (Hild and Rose, 1959) on the Seven Thirty, Red Rodgers, Short Stop, Canandaigua, Queen Ann, and Cashier deposits (fig. 19). During 1967 the Office of Minerals Exploration (OME) approved exploration contracts on the Great Eastern, Mountain Top-Terrible Three, and Palmetto mines (pl. 3) and has considered applications for mineral exploration assistance on several others in or near the primitive area.

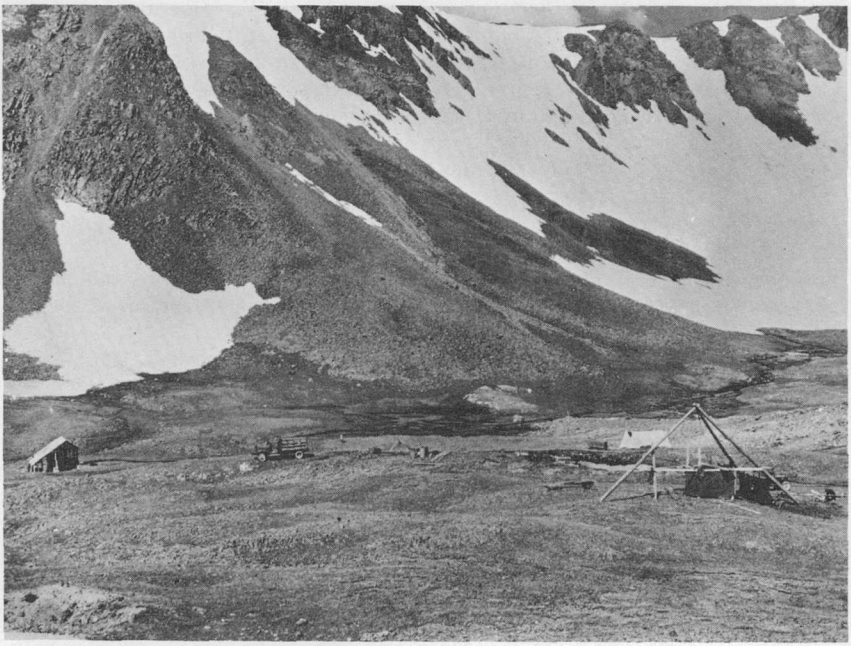

FIGURE 19.—Bureau of Mines diamond drilling of the Cashier vein, Ross Basin, San Juan County, one-half mile south of the Uncompahgre primitive area, 1959.

319-968 O—68——5

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TABLE 3

TABLE 3.—*Analyses of samples from*

[Semiquantitative spectrographic analyses were made by Nancy M. Conklin, K. J. Curry, C. L. Forn, D. J. Grimes, J. C. Hamilton, Jr., E. L. Mosier, J. M. Motooka, Harriet G. Neiman, T. A. Roemer, and A. L. Sutton, Jr. Gold analyses were made by atomic-absorption spectrometry by G. T. Burrow, W. L. Campbell, G. W. Dounay, W. D. Goss, R. F. Hansen, S. I. Hoffman, H. D. King, J. D. Mensik, R. L. Miller, M. S. Rickard, V. E. Shaw, J. A. Thomas, and J. E. Troxel. Mercury analyses were made by the vapor detector method by C. L. Forn, J. G. Frisken, S. I. Hoffmann, V. D. James, Jr., W. W. Janes, K. R. Murphy, S. L. Noble, and A. J. Toevs.

Spectrographic analyses are reported to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, and so forth, which represent approximate midpoints of group data on a geometric scale. The assigned group for semiquantitative results will include the

	Semiquantitative spectrographic analyses													
	(percent)			(ppm)										
Sample	Al	Fe	Si	Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Vein and mineralized material								
001	3	3	>10	150	1,000	30,000	<1	<10	7,000	70	5	<1	300	3,000
006	.3	7	1.5	70	<200	70,000	<1	<10	7,000	70	<3	1	150	3,000
007	.7	1.5	>10	30	<200	15,000	<1	<10	7,000	<50	<3	1	70	700
008	7	3	>10	3	<200	700	<1	<10	1,500	<50	<3	1	30	7,000
018	2	1	>10	20	<200	150	<1	<10	700	<50	<3	1.5	150	3,000
020	1.5	3	>10	7	<200	700	<1	<10	30,000	<50	7	3	20	15,000
022	.3	3	>10	1,000	<200	30	<1	300	10,000	70	7	<1	7,000	700
024	.3	7	>10	700	<200	30	<1	150	5,000	500	30	1.5	7,000	300
025	.7	1.5	>10	70	<200	70	<1	30	30,000	300	7	1	2,000	1,500
027	.3	3	>10	70	<200	70	<1	30	10,000	700	30	<1	30,000	700
028	.15	7	>10	100	<200	15	<1	300	150	300	30	<1	5,000	150
029	.3	1.5	>10	30	<200	200	<1	70	150	<50	<3	<1	30	150
031	.7	.7	>10	7	<200	30,000	<1	<10	15,000	<50	<3	1	300	700
032	1.5	5	>10	70	<200	150	<1	30	3,000	150	7	3	3,000	1,000
033	.7	3	>10	1,000	<200	70	<1	<10	3,000	700	3	1	30,000	300
038	7	>10	>10	70	<200	150	<1	200	300	<50	<3	70	1,000	70
040	3	7	>10	150	70,000	700	<1	70	300	<50	3	15	70,000	<50
044	2	>10	>10	150	10,000	300	<1	300	70	<50	30	15	70,000	<50
057	1.5	>10	>10	150	3,000	30,000	<1	300	70	<50	15	15	10,000	100
058	1.5	1.5	>10	50	<200	300	<1	30	3,000	300	7	1.5	3,000	700
059	1.5	1.5	>10	15	<200	200	<1	15	1,500	150	7	1.5	1,500	700
061	7	3	>10	7	<200	300	<1	<10	1,500	<50	10	7	70	7,000
077	.7	7	>10	700	<200	70	<1	1,500	300	500	7	7	1,000	700
078	5	3	>10	500	<2,000	15,000	<1	30	700	<50	<3	15	70	1,500
082	2	7	>10	300	<2,000	5,000	<1	30	50,000	200	<3	1	10,000	700
083	.1	7	>10	200	3,000	10,000	<1	50	10,000	1,000	<3	1.5	20,000	150
084	.3	>10	>10	70	<2,000	100	<1	50	1,500	1,000	10	1.5	5,000	500
085	3	>10	>10	20	<2,000	200	<1	50	1,000	<50	7	15	300	700
086[3/]	1	5	>10	20	<2,000	150	<1	<10	700	100	7	5	500	500
088	.5	.7	>10	<1	<2,000	100	<1	<10	50	<50	<3	15	20	300
089	1	7	>10	50	<2,000	300	<1	<10	300	100	3	3	300	700
090	1.5	3	>10	700	<2,000	150	<1	10	20,000	200	<3	2	3,000	1,000
091	.7	7	>10	150	<2,000	100	<1	15	700	200	3	1.5	5,000	700
094	.2	>10	>10	200	<2,000	50	<1	100	500	<50	10	2	5,000	200
095	.2	7	>10	20	<2,000	150	<1	50	150	300	5	2	5,000	200
097	.5	>10	>10	500	7,000	500	<1	10	500	1,000	15	1	5,000	300
099	.5	>10	>10	200	2,000	50	3	<10	200	300	10	1	3,000	200
100	.3	>10	>10	200	3,000	30	<1	20	500	150	15	1.5	5,000	300
101	1.5	1	>10	<1	<2,000	150	<1	<10	>100,000	<50	<3	10	50	5,000
102	3	2	>10	<1	<2,000	1,000	<1	<10	>100,000	<50	<3	2	15	7,000
103	1	.5	>10	2,000	<2,000	>100,000	<1	<10	3,000	50	15	1	7,000	1,000
104	.5	.3	>10	1,000	<2,000	>100,000	<1	<10	1,500	50	<3	1.5	3,000	300
105	.7	2	>10	30	<2,000	1,500	<1	<10	20,000	100	3	1.5	1,000	1,500

1/ All gold values between 0.02 and .09 ppm are shown in parentheses. Most of these reported values probably mean that gold is present in the sample, but some can mean false readings due to instrumental interference.

the Uncompahgre primitive area

quantitative value about 30 percent of the time. These data should not be quoted without stating these limitations.

—, not looked for; <, less than the amount shown; >, more than the amount shown. Where these symbols are used the amount shown is the lower or upper limit of semiquantitative determination. Some elements are reported at one lower or upper limit of determination for some samples and at different limits for other samples, because of different sensitivities of the different instruments used for analyses.

The following elements were looked for and not found or were found only in amounts normal for rocks of the type sampled and, hence, were not judged to be significant: B, Ga, La, Li, Pd, Pt, Ta, Tl, Zr]

	Semiquantitative spectrographic analyses--Continued (ppm)												Chemical analyses (ppm)		Location by quarter of quadrangle 2/
Sample	Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Au 1/	Hg	
								Vein and mineralized material							
001	30,000	70	<10	<3	30,000	<100	<10	300	1,500	30	30	7,000	1.1	0.59	Ne Te.
006	>100,000	<3	<10	<3	70,000	<100	<10	2,000	15	<7	70	7,000	.1	.41	Do.
007	3,000	70	<10	<3	1,500	<100	<10	150	150	15	15	1,500	1.4	.11	Do.
008	700	30	<10	<3	700	<100	<10	30	3,000	150	15	300	(.08)	.21	Do.
018	700	30	<10	<3	15	<100	<10	30	1,500	30	15	300	.9	.02	Do.
020	15,000	15	<10	3	300	<100	<10	70	1,500	30	30	1,500	.1	.36	Do.
022	700	15	<10	<3	70,000	2,000	<10	15	200	10	<10	>100,000	1	.96	NW Ir.
024	700	30	<10	<3	30,000	700	<10	15	700	15	<10	>100,000	1	.19	Do.
025	3,000	<3	<10	<3	70,000	<100	<10	50	500	15	<10	30,000	.3	.34	Do.
027	700	30	<10	<3	>100,000	<100	<10	30	300	15	<10	>100,000	.8	.35	Do.
028	150	150	<10	<3	30,000	<100	<10	7	150	7	<10	30,000	1	.42	Do.
029	7	15	<10	<3	1,500	<100	<10	7	70	<7	<10	300	.1	.26	Do.
031	3,000	150	<10	<3	700	<100	<10	300	300	15	<10	2,000	(.08)	.42	Do.
032	70,000	15	<10	<3	7,000	<100	<10	15	700	30	30	2,000	.3	.57	Do.
033	700	30	<10	<3	20,000	150	<10	10	300	15	<10	70,000	6.5	1.2	Do.
038	7	7	15	<3	3,000	300	70	700	3,000	150	10	7,000	.5	4.1	SW Ir.
040	7	3	<10	3	1,500	700	300	700	2,000	70	<10	700	.8	High	Do.
044	15	7	10	30	700	1,500	<10	200	1,500	30	<10	15,000	1	24.5	Do.
057	10	7	10	7	700	500	150	500	2,000	30	15	300	1.9	30	SE Ir.
058	700	7	<10	<3	70,000	<100	<10	15	700	15	<10	>100,000	.1	.44	SW Ir.
059	300	70	<10	<3	15,000	<100	<10	30	700	15	10	30,000	.3	.44	Do.
061	700	300	<10	3	1,500	<100	<10	70	3,000	70	30	1,000	.2	.15	Do.
077	500	300	<10	3	>100,000	<100	<10	7	1,000	15	10	>100,000	.1	.42	Do.
078	20	3	10	<3	7,000	500	<10	500	3,000	150	10	<200	.2	.50	SE Ir.
082	70	10	<10	<3	30,000	700	<10	150	500	15	<10	70,000	1.2	.13	Do.
083	2,000	7	<10	<3	30,000	200	<10	150	30	<7	<10	>100,000	1.6	1	Do.
084	3,000	500	<10	<3	70,000	<200	<10	70	150	10	<10	>100,000	(.06)	.05	NE Ir.
085	200	100	<10	10	1,500	<200	<10	15	1,500	70	15	2,000	.08	.26	Do.
086	15,000	50	20	15	7,000	<200	<10	15	700	30	<10	15,000	.4	.40	Do.
088	100	<3	<10	10	70	<200	<10	30	5,000	15	20	<200	<.02	.09	Do.
089	1,500	30	<10	<3	5,000	<200	<10	10	1,000	30	<10	15,000	.1	.10	Do.
090	20,000	50	<10	<3	50,000	200	10	20	500	15	<10	30,000	7.4	.08	Do.
091	20,000	20	<10	<3	50,000	<200	<10	7	500	15	<10	50,000	.9	.22	Do.
094	200	100	<10	20	5,000	<200	<10	10	500	7	<10	10,000	1	.22	NW H. P.
095	1,000	50	<10	5	3,000	<200	20	10	700	7	<10	>100,000	.2	.12	Do.
097	300	<3	<10	3	20,000	1,500	<10	15	150	15	<10	>100,000	1.3	.45	Do.
099	100	20	<10	3	3,000	700	<10	7	50	10	<10	30,000	.9	.26	Do.
100	150	<3	<10	3	7,000	1,500	<10	5	70	10	<10	20,000	3	.26	Do.
101	1,500	<3	<10	3	50	<200	<10	500	200	15	<10	<200	<.02	.08	NE Ou.
102	1,000	10	<10	5	30	<200	<10	300	1,000	20	<10	<200	(.02)	.04	Do.
103	1,000	<3	<10	5	5,000	5,000	<10	5,000	500	20	<10	1,500	(.04)	.45	Do.
104	2,000	<3	<10	<3	15,000	1,500	<10	30,000	150	7	<10	5,000	.1	.90	Do.
105	30,000	5	<10	3	2,000	<200	<10	50	300	7	<10	20,000	(.08)	.22	SE Ou.

2/ Telluride quadrangle, Te.; Ironton, Ir.; Handies Peak, H. P.; Ouray, Ou.; Montrose, Mo.; Wetterhorn Peak, W. P.; Uncompahgre Peak, U.P.; Courthouse Mountain, C. M.; Dallas, Da.

3/ Sample 086 contains 5,000 ppm W. All other samples contain less than 100 ppm W.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Vein and mineralized material--Continued								
106	0.5	0.5	>10	2,000	<2,000	70,000	<1	<10	5,000	100	<3	2	1,000	1,500
107	.5	1	<10	300	<2,000	500	<1	<10	150	300	3	3	500	300
108	1.5	>10	>10	300	<2,000	30,000	<1	100	700	70	50	7	1,000	500
109	.5	>10	>10	500	<2,000	500	<1	150	50	150	30	3	1,500	700
110	.5	>10	>10	30	<2,000	100	<1	15	700	150	200	3	200	300
111	1.5	>10	>10	50	<2,000	100	<1	30	3,000	200	150	15	50,000	3,000
112	2	>10	>10	20	<2,000	150	<1	10	70,000	<50	70	30	10,000	15,000
113	.5	>10	>10	30	<2,000	70	<1	20	15,000	70	70	2	3,000	3,000
114	7	7	>10	<1	<2,000	1,000	1	<10	30,000	<50	10	30	30	15,000
115	3	>10	>10	5	<2,000	2,000	<1	<10	10,000	<50	150	20	3,000	7,000
116	2	7	>10	1,500	<2,000	>100,000	<1	<10	1,000	<50	3	10	500	500
118	2	2	>10	10	<2,000	700	<1	<10	15,000	<50	3	7	30	5,000
122	.3	>10	>10	200	3,000	150	<1	10	50	100	3	2	5,000	300
123	.5	7	>10	1,500	<2,000	100	<1	<10	500	700	3	5	3,000	700
124	1	3	>10	1,500	<2,000	50,000	<1	<10	1,500	300	7	3	2,000	1,500
125	1	.5	>10	5	<2,000	500	1	<10	20,000	<50	3	3	50	1,500
126	.3	7	>10	7,000	2,000	30,000	<1	70	70,000	300	7	15	50,000	2,000
131	2	3	>10	20	<2,000	1,000	<1	<10	1,000	<50	3	1.5	15	2,000
134	5	>10	>10	<1	<2,000	3,000	<1	<10	500	<50	<3	1.5	200	3,000
136	1	1.5	>10	100	<2,000	>100,000	1	<10	30,000	150	3	2	1,000	3,000
141	1.5	2	>10	5	<2,000	1,500	<1	<10	300	<50	<3	2	150	1,000
143	3	1.5	>10	1	<2,000	700	<1	<10	500	<50	<3	3	50	2,000
145	2	>10	>10	15	<2,000	1,500	<1	50	700	<50	50	20	2,000	3,000
147	2	7	>10	3	<2,000	100	<1	15	500	<50	7	2	200	1,500
149	5	7	>10	<1	<2,000	300	<1	<10	500	<50	<3	3	1,000	2,000
150	1	>10	>10	2	<2,000	7,000	<1	10	200	<50	30	3	2,000	1,500
151	1.5	>10	>10	5	<2,000	150	<1	<10	1,500	<50	150	15	10,000	1,500
152	3	>10	>10	15	<2,000	150	<1	<10	2,000	<50	50	1	30,000	2,000
156	1.5	>10	>10	<1	<2,000	150	<1	<10	500	<50	10	15	100	1,500
157	2	5	>10	20	<2,000	5,000	<1	<10	5,000	100	5	7	200	1,500
158	1	5	>10	150	5,000	>100,000	<1	<10	2,000	500	<3	2	300	1,500
159	1	7	>10	20	7,000	2,000	<1	<10	3,000	70	5	1.5	700	1,500
161	.3	5	>10	500	5,000	70,000	<1	<10	2,000	700	<3	1	500	700
162	1	3	>10	100	<2,000	70,000	<1	<10	10,000	70	3	1.5	150	1,500
163	.3	5	>10	300	3,000	>100,000	<1	<10	7,000	200	<3	1	500	1,500
167	2	3	>10	3,000	<2,000	700	<1	<10	>100,000	100	5	10	5,000	2,000
169	1	3	>10	100	<2,000	70,000	<1	<10	50,000	300	3	2	200	5,000
173	1	3	>10	1,500	<2,000	1,000	<1	<10	10,000	200	5	1	5,000	1,000
174	.7	1	>10	1,500	10,000	3,000	<1	<10	3,000	100	7	1.5	3,000	700
175	1	1.5	>10	2,000	5,000	200	<1	<10	500	200	3	5	5,000	500
178	1.5	2	>10	150	30,000	150	<1	<10	1,500	100	3	15	300	1,000
179	1	3	>10	200	20,000	50	<1	<10	300	100	5	<1	500	300
181	1	5	>10	700	30,000	7,000	<1	<10	7,000	<50	3	2	1,000	2,000
182	1	5	>10	300	20,000	150	<1	<10	3,000	70	<3	1.5	700	1,000
183	1.5	2	>10	500	10,000	100	<1	<10	5,000	70	3	2	700	1,500
184	1	2	>10	2,000	<2,000	100	<1	<10	5,000	500	5	2	7,000	1,000
186	1	5	>10	1,500	<2,000	70	<1	<10	3,000	300	7	3	5,000	1,000
188	3	>10	>10	7	<2,000	300	<1	<10	15,000	<50	70	15	1,500	5,000
189	2	3	>10	2	<2,000	1,000	<1	<10	10,000	<50	5	7	200	2,000
192	3	7	>10	2	<2,000	700	<1	50	15,000	<50	10	20	5,000	10,000
193	3	3	>10	<1	<2,000	700	<1	<10	10,000	<50	<3	10	200	3,000
195	1	2	>10	50	<2,000	500	<1	30	3,000	<50	<3	1	100	500
199	2	2	>10	30	<2,000	3,000	<1	<10	700	<50	<3	15	10,000	1,500
200	.1	.3	.5	<1	<2,000	70	<1	<10	>100,000	<50	<3	1	50	2,000
201	.5	3	>10	.500	2,000	>100,000	<1	<10	7,000	1,000	<3	3	500	200
202	.7	.7	>10	20	<2,000	1,500	<1	<10	1,000	<50	<3	2	500	300
203	1	.7	>10	500	<2,000	>100,000	<1	<10	200	500	<3	5	700	500
204		2	>10	700	5,000	10,000	<1	<10	<100,000	<50	<3	10	50,000	7,000
205	.5	>10	>10	20	<2,000	50,000	<1	100	700	<50	150	3	1,000	700
207	.7	>10	>10	1,500	2,000	1,500	<1	1,500	500	500	5	3	>100,000	300

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
									Vein and mineralized material--Continued						
106	10,000	3	<10	<3	20,000	200	<10	1,000	70	<7	<10	20,000	1.0	0.80	SE Ou.
107	500	<3	<10	3	>100,000	300	<10	15	200	7	<10	>100,000	.5	.40	Do.
108	500	100	<10	10	30,000	200	<10	300	500	300	<10	20,000	17	.24	Do.
109	700	200	<10	15	20,000	200	<10	15	200	30	<10	50,000	6	.40	Do.
110	100	100	<10	20	5,000	<200	<10	7	200	7	<10	30,000	.7	.45	Do.
111	200	<3	<10	20	1,500	<200	<10	15	700	30	10	20,000	13	.20	Do.
112	3,000	<3	<10	20	70	<200	<10	100	700	30	10	<200	3	.03	Do.
113	1,000	70	<10	10	2,000	<200	<10	15	150	<7	<10	15,000	4	.15	Do.
114	500	<3	10	15	70	<200	<10	200	3,000	150	50	<200	(.06)	.03	Do.
115	300	20	<10	20	50	<200	<10	100	1,000	100	20	<200	6	.04	Do.
116	500	<3	<10	5	30,000	500	<10	2,000	700	30	30	1,500	.3	.13	Do.
118	200	10	<10	<3	70	200	<10	50	1,000	50	10	<200	.7	.06	Do.
122	70	<3	<10	5	70,000	2,000	<10	7	200	<7	<10	20,000	.3	1.1	Do.
123	15,000	20	<10	5	70,000	1,500	<10	10	300	15	<10	>100,000	1.2	1.1	Do.
124	20,000	3	<10	5	>100,000	200	<10	200	500	20	<10	50,000	.3	.11	Do.
125	500	3	<10	3	200	<200	<10	20	300	<7	<10	300	<.02	.18	NE Ou.
126	7,000	<3	<10	15	15,000	1,500	<10	500	1,000	7	<10	20,000	1.3	1	SE Ou.
131	200	<3	<10	<3	100	<200	<10	30	700	30	<10	<200	.1	.04	Do.
134	70	30	<10	<3	200	<200	<10	200	1,500	50	<10	300	(.06)	.08	Do.
136	10,000	7	<10	3	30,000	<200	<10	7,000	500	20	10	20,000	.2	.70	Do.
141	70	500	<10	<3	300	1,500	<10	100	700	30	70	<200	(.04)	.40	Do.
143	100	100	<10	<3	30	<200	<10	30	1,500	50	15	<200	<.02	.08	Do.
145	1,000	10	<10	20	15	<200	<10	50	1,000	70	30	<200	.8	.04	Do.
147	150	30	<10	<3	300	<200	<10	30	1,000	100	10	<200	.2	.05	Do.
149	100	70	<10	<3	100	<200	<10	30	1,500	50	10	<200	(.06)	.22	Do.
150	1,000	20	<10	10	1,000	<200	<10	30	500	50	10	2,000	.6	.50	Do.
151	100	70	10	15	15	<100	<10	30	1,500	30	15	300	.6	.10	Do.
152	200	300	<10	10	20	<200	<10	70	700	70	70	500	1.3	.12	Do.
156	50	70	<10	5	<10	<200	<10	15	1,500	50	10	<200	(.02)	.35	Do.
157	15,000	<3	<10	5	3,000	<200	<10	150	1,000	70	<10	20,000	.2	.20	NE Te.
158	100,000	5	<10	<3	30,000	700	<10	10,000	200	15	<10	50,000	(.06)	1.8	Do.
159	30,000	7	<10	3	2,000	<200	<10	150	700	30	15	10,000	.1	.50	Do.
161	70,000	15	<10	<3	70,000	1,000	<10	1,000	70	<7	<10	>100,000	.5	1.6	Do.
162	30,000	15	<10	<3	20,000	<200	<10	700	2,000	30	<10	5,000	.4	.40	Do.
163	100,000	10	<10	<3	15,000	300	<10	5,000	100	<7	<10	20,000	.8	.50	Do.
167	5,000	<3	<10	5	20,000	2,000	<10	500	3,000	70	10	5,000	3	.30	Do.
169	30,000	<3	<10	<3	20,000	300	<10	2,000	3,000	30	10	30,000	.1	.30	Do.
173	20,000	50	<10	<3	30,000	1,500	<10	50	2,000	20	<10	50,000	9.6	14	NW Ir.
174	3,000	10	<10	<3	>100,000	2,000	<10	30	2,000	10	<10	30,000	.7	.40	NE Te.
175	500	50	<10	3	30,000	3,000	<10	20	3,000	30	<10	50,000	12	.50	Do.
178	10,000	50	<10	3	10,000	500	<10	15	1,500	30	10	15,000	1.6	1.1	Do.
179	200	20	<10	3	>100,000	1,500	<10	15	500	20	<10	15,000	1	.35	Do.
181	10,000	30	<10	3	>100,000	700	<10	100	700	30	<10	5,000	1	.28	Do.
182	50,000	20	<10	3	30,000	500	<10	30	500	15	<10	10,000	.6	.35	Do.
183	10,000	100	<10	3	10,000	700	<10	15	500	30	<10	15,000	40	.20	Do.
184	7,000	150	<10	<3	>100,000	5,000	<10	30	700	30	<10	>100,000	1.6	.55	Do.
186	10,000	30	<10	5	>100,000	700	<10	10	1,000	30	<10	70,000	1.4	.18	Do.
188	700	20	<10	7	300	<200	<10	100	1,000	50	15	300	.6	.08	SE Ou.
189	500	30	<10	3	200	<200	<10	70	1,000	30	10	200	.1	.13	Do.
192	700	50	<10	15	70	<200	<10	100	1,500	50	20	200	.3	.15	Do.
193	300	20	<10	<3	100	<200	<10	70	1,000	30	20	200	(.08)	.16	Do.
195	100	20	<10	<3	200	<200	<10	15	500	5	<10	700	.4	.20	Do.
199	200	<3	<10	<3	70	<200	<10	70	700	15	<10	500	.1	.20	SW Ou.
200	700	<3	<10	<3	30	<200	<10	300	20	<7	<10	<200	.5	.18	Do.
201	200	200	<10	3	>100,000	200	10	1,000	200	5	<10	>100,000	(.08)	1	Do.
202	70	20	<10	<3	1,500	<200	<10	15	500	5	20	10,000	6	.50	Do.
203	30	100	<10	<3	30,000	200	<10	15,000	300	10	<10	50,000	<.02	1	Do.
204	20,000	<3	<10	<3	700	5,000	<10	500	500	15	<10	2,000	(.04)	.65	SW Ou.
205	1,500	<3	<10	<3	300	<200	<10	500	200	7	<10	3,000	(.02)	.45	SE Ou
207	150	<15	<10	10	20,000	>10,000	<10	20	300	7	<10	>100,000	.9	2.6	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Vein and mineralized material--Continued								
208	3	5	>10	15	<200	200	<1	30	7,000	<50	3	15	1,500	3,000
209	.3	>10	>10	150	2,000	150	<1	300	<50	150	<3	2	5,000	30
210	1.5	5	>10	15	<200	200	<1	15	3,000	<50	<3	15	1,500	1,500
211	1	7	>10	30	<2,000	50,000	<1	50	<50	<50	3	1.5	300	200
213	3	3	>10	5	<2,000	500	<1	<10	300	<50	5	3	70	1,500
215	1	1	>10	7	<2,000	2,000	<1	<10	>100,000	<50	<3	15	200	15,000
218	.5	>10	>10	150	<2,000	100	<1	200	15,000	300	30	1	10,000	700
219	.7	5	>10	50	<2,000	100	<1	30	2,000	500	3	1.5	5,000	700
221	.7	7	>10	70	<2,000	100	<1	70	5,000	500	15	2	3,000	1,000
227	3	7	>10	70	<2,000	700	<1	30	200	<50	5	5	3,000	2,000
228	>10	7	>10	15	<2,000	2,000	<1	10	70	<50	10	15	500	10,000
229	.5	7	>10	150	7,000	500	<1	50	100	200	<3	1.5	10,000	300
236	2	5	>10	700	30,000	70,000	<1	1,000	700	<50	3	10	30,000	700
240	>10	>10	>10	100	20,000	2,000	<1	300	100	<50	7	5	30,000	500
241	7	>10	>10	100	50,000	300	<1	200	70	70	10	7	70,000	20
242	.7	5	>10	300	<2,000	1,000	<1	200	3,000	300	3	2	30,000	500
248	.5	>10	>10	100	<2,000	30,000	<1	100	500	100	10	1.5	7,000	200
250	.5	7	>10	300	<2,000	>100,000	<1	50	200	200	3	1	10,000	150
252	.5	>10	>10	200	7,000	300	<1	700	300	<50	5	1	30,000	100
253	.5	7	>10	200	<2,000	700	<1	100	300	500	5	1.5	3,000	200
254	.7	1	>10	30	<2,000	150	<1	<10	50,000	200	<3	1.5	150	150
256	.3	2	>10	30	<2,000	70	<1	<10	2,000	700	<3	1	1,000	700
258	1.5	>10	>10	15	<2,000	300	<1	70	700	<50	15	1.5	100	1,500
259[4]	.7	>10	>10	700	50,000	>100,000	<1	700	70	<50	<3	3	30,000	100
263	1	3	>10	1	<2,000	5,000	<1	<10	500	<50	<3	2	150	700
265	2	3	>10	3,000	<2,000	200	<1	15,000	500	<50	3	7	2,000	500
270	5	>10	>10	500	50,000	500	<1	500	300	<50	15	30	70,000	100
272	3	>10	5	150	<2,000	300	<1	70	300	<50	7	15	2,000	100
274	3	7	>10	2	<2,000	500	<1	<10	1,000	<50	15	30	150	1,000
276	3	7	>10	100	30,000	15,000	<1	50	500	200	3	15	30,000	100
277	3	2	>10	30	<200	1,000	<1	15	700	300	7	15	700	1,500
279	2	>10	>10	20	<2,000	300	<1	100	70	<50	15	5	700	150
281	3	1.5	>10	3	<200	200	<1	30	300	<20	<3	15	30	700
282	.7	1.5	>10	30	<200	100	<1	300	700	<20	<3	3	70	700
283	1	3	>10	150	<2,000	150	<1	150	3,000	1,000	7	2	5,000	700
284	1.5	5	>10	150	<2,000	200	<1	20	3,000	700	10	2	3,000	700
288	1.5	>10	>10	200	<2,000	70	<1	30	20,000	300	70	1	20,000	500
289	1	>10	>10	300	<2,000	30	<1	300	20,000	200	100	1	30,000	500
294	2	5	>10	20	<2,000	200	<1	50	200	<50	5	5	500	1,000
297	1.5	2	>10	<1	<2,000	100	1	<10	>100,000	<50	<3	15	50	700
299	.5	>10	>10	20	<2,000	30	<1	50	500	<50	10	2	1,000	150
302	.5	>10	>10	100	<2,000	30	<1	70	500	<50	<3	3	5,000	200
304	3	2	>10	3	<2,000	10,000	<1	<10	30,000	<50	7	10	100	10,000
306	.7	5	5	300	<2,000	150	<1	<10	20,000	1,500	3	1	1,500	10,000
308	1	3	>10	200	<2,000	200	<1	<10	10,000	700	20	1	3,000	5,000
310	1	2	>10	30	<2,000	200	<1	<10	20,000	300	20	1	7,000	2,000
312	.7	3	>10	300	<2,000	200	<1	300	30,000	500	70	1	30,000	700
314	.7	5	>10	70	<2,000	50	<1	70	20,000	700	10	7	3,000	1,500
319	1	7	7	500	<2,000	30	<1	500	70,000	500	7	5	70,000	3,000
321	.7	7	5	100	<2,000	100	<1	<10	3,000	1,000	50	2	50,000	1,000
324	.3	3	>10	200	<2,000	700	<1	<10	300	1,000	<3	1.5	3,000	150
326	.7	>10	>10	1,000	10,000	70	<1	<10	<50	300	<3	1	700	200
328	.5	>10	>10	500	<2,000	200	2	<10	20,000	150	<3	1	1,500	300
330	.3	3	>10	1,000	<2,000	150	<1	<10	500	700	<3	1	1,000	150
332	.3	3	>10	300	2,000	30	<1	10	150	500	3	1	5,000	150

[4] Sample 259 contains 1,000 ppm W. All other samples contain less than 100 ppm W.

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Vein and mineralized material--Continued							
208	700	20	<10	3	700	<100	<10	50	700	30	15	1,500	(.04)	.40	SE Ou.
209	20	<3	<10	3	5,000	300	<10	7	150	<7	<10	30,000	20	2.4	Do.
210	150	20	<10	<3	7,000	<100	<10	70	300	30	<10	3,000	.3	.40	Do.
211	70	30	<10	<3	300	<200	<10	300	500	20	<10	1,500	.7	.14	Do.
213	30	10	<10	3	300	<200	<10	20	1,500	30	15	500	(.04)	.15	Do.
215	3,000	<3	<10	3	200	<200	<10	700	300	15	10	300	.4	.12	SW Ir.
218	700	300	<10	<3	>100,000	<200	<10	30	500	10	<10	70,000	1.3	.30	Do.
219	2,000	30	<10	<3	70,000	<200	<10	10	1,000	15	<10	>100,000	(.08)	.10	Do.
221	20,000	20	<10	<3	50,000	<200	<10	7	700	15	<10	>100,000	(.02)	.30	Do.
227	500	30	<10	3	30,000	700	<10	20	1,500	100	<10	15,000	(.06)	.26	SE Ir.
228	300	20	10	3	7,000	200	<10	70	5,000	150	15	5,000	(.04)	.40	Do.
229	150	30	<10	<3	5,000	300	<10	5	300	15	30	70,000	.2	.26	Do.
236	50	3	<10	3	>100,000	2,000	150	1,500	1,500	70	<10	3,000	.3	1.3	Do.
240	10	<3	<10	3	2,000	1,500	70	1,000	1,500	70	<10	3,000	.9	1.8	Do.
241	10	<3	10	5	5,000	1,000	100	500	3,000	100	<10	10,000	(.08)	2.8	Do.
242	700	<3	<10	3	70,000	700	150	150	700	20	<10	70,000	.1	.14	NW H. P.
248	50	30	<10	7	15,000	<200	30	300	500	15	<10	30,000	.7	.50	NE Ir.
250	30	15	<10	<3	30,000	1,000	<10	7,000	100	7	<10	30,000	.4	.50	Do.
252	30	<3	<10	5	3,000	1,500	200	30	200	7	<10	10,000	1.6	.50	NW H. P.
253	150	20	<10	<3	20,000	<200	<10	15	200	10	<10	>100,000	1.3	1.2	SE Ir.
254	500	50	<10	<3	50,000	<200	<10	20	150	10	<10	50,000	(.04)	.26	SW H. P.
256	700	30	<10	<3	70,000	<200	<10	5	50	7	<10	>100,000	(.08)	.40	Do.
258	1,500	100	<10	3	500	<200	<10	10	700	20	<10	2,000	<.02	.10	NW H. P.
259	700	<3	10	<3	15,000	1,000	150	1,000	700	15	<10	1,000	.5	2	SE Ir.
263	30	5	10	<3	50	<200	<10	100	3,000	20	15	<200	<.02	.20	Do.
265	100	30	<10	<3	>100,000	700	20	150	3,000	70	10	1,000	.1	1.2	Do.
270	5	<3	<10	10	2,000	1,000	300	200	2,000	150	<10	200	.6	1.2	Do.
272	7	<3	<10	5	>100,000	<200	<10	300	1,500	70	<10	200	.5	1	Do.
274	20	7	<10	15	2,000	<200	30	200	3,000	150	20	500	<.02	.09	Do.
276	30	<7	<10	3	3,000	1,500	200	500	1,500	100	<10	70,000	(.06)	.45	Do.
277	70	7	15	3	10,000	100	30	300	2,000	100	15	>100,000	(.02)	7.5	Do.
279	50	150	<10	10	2,000	<200	<10	20	500	30	<10	5,000	.6	.50	SE Ou.
281	50	70	30	<3	700	100	<10	15	3,000	30	15	<200	1.7	.4	Do.
282	70	300	15	<3	1,500	<100	15	15	700	15	10	700	6.4	2.5	Do.
283	500	15	<10	<3	>100,000	<200	<10	10	700	15	<10	>100,000	.2	.09	SW Ir.
284	700	20	<10	<3	>100,000	<200	<10	10	700	15	<10	>100,000	.3	.11	Do.
288	700	<30	<10	<3	30,000	<200	<10	15	500	10	<10	70,000	8.5	.08	Do.
289	1,500	<20	<10	<3	20,000	<200	<10	20	200	<7	<10	50,000	3.3	.06	Do.
294	150	700	10	<3	3,000	<200	10	20	2,000	50	20	2,000	.2	.08	NE Ir.
297	30	10	<10	3	70	<200	<10	30	500	20	10	<200	<.02	.14	Do.
299	30	3	<10	10	300	<200	<10	<5	200	<7	15	700	(.02)	.10	Do.
302	100	10	<10	3	1,000	<200	<10	100	200	20	<10	700	.3	.06	Do.
304	50,000	<3	<10	5	1,000	<200	<10	200	1,500	100	15	2,000	(.06)	.04	SW Ir.
306	10,000	<3	<10	3	>100,000	700	<10	50	300	10	20	>100,000	(.02)	.20	Do.
308	15,000	50	<10	<3	>100,000	<200	<10	50	500	20	<10	>100,000	.5	.04	Do.
310	20,000	20	<10	<3	30,000	<200	<10	30	300	15	<10	30,000	3	.11	Do.
312	10,000	7	<10	<3	50,000	<200	<10	50	200	7	<10	70,000	8.7	.04	Do.
314	7,000	15	<10	3	>100,000	<200	<10	50	300	20	<10	>100,000	.3	.03	SE Te.
319	15,000	<3	<10	3	70,000	<200	20	150	200	20	<10	50,000	.4	.08	SW Ir.
321	7,000	5	<10	3	>100,000	200	<10	10	500	7	<10	>100,000	<.02	.14	Do.
324	150	50	<10	<3	>100,000	1,000	<10	10	200	7	<10	>100,000	.2	.14	NW H. P.
326	100	10	<10	<3	1,000	700	<10	<5	150	10	<10	20,000	6	.22	Do.
328	15,000	5	<10	<3	7,000	<200	<10	30	<2	10	10	30,000	6	.16	Do.
330	500	200	<10	<3	70,000	300	<10	<5	150	10	<10	70,000	5.8	.24	Do.
332	150	10	<10	<3	15,000	2,000	<10	15	100	10	<10	70,000	1.7	.24	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
				Vein and mineralized material--Continued										
335	1.5	1	>10	1,500	<2,000	70	1.5	<10	150	100	<3	1.5	3,000	500
338	1	1.5	>10	70	>2,000	70	<1	20	500	150	5	1.5	700	200
341	.5	2	>10	50	<2,000	100	<1	50	100	<50	<3	1	200	150
344	.7	3	>10	150	<2,000	50	<1	500	200	<50	<3	1.5	300	500
347	.5	3	>10	200	<2,000	7,000	<1	150	200	200	3	<1	2,000	200
354	.7	2	>10	700	<2,000	50	<1	<10	150	150	<3	1	500	150
358	1	1.5	>10	10	2,000	70	<1	<10	700	<50	<3	1	30	500
361	.7	2	>10	15	<2,000	150	<1	<10	100	<50	<3	1	50	500
363	1.5	.05	>10	15	<2,000	70	<1	50	200	<50	<3	1	30	500
370	.7	2	>10	100	2,000	50	<1	100	200	150	<3	1	200	300
372	2	.07	>10	10	<2,000	150	<1	<10	200	<50	<3	3	50	700
374	1.5	.05	>10	70	<2,000	70	1	<10	300	<50	<3	1.5	20	500
376	.5	.2	>10	1,000	<2,000	30	<1	20	500	300	<3	1	1,000	100
379	2	7	>10	100	<2,000	50	<1	300	150	<50	7	2	2,000	150
382	5	1.5	>10	5	<2,000	200	1	<10	200	<50	<3	10	30	1,000
384	2	1	>10	1	<2,000	200	<1	<10	700	<50	<3	3	20	1,000
386	.7	2	>10	700	<2,000	70	<1	<10	300	50	<3	1	200	7,000
388	1.5	5	>10	30	<2,000	30,000	<1	<10	20,000	200	5	10	150	700
396	1.5	7	>10	300	2,000	150	<1	50	1,500	200	15	7	10,000	500
400	.3	7	>10	15	2,000	300	<1	<10	>100,000	<50	10	15	150	10,000
401	.7	1.5	>10	15	<2,000	>100,000	<1	<10	2,000	<50	5	10	200	700
403	1	>10	>10	100	100,000	70,000	<1	50	500	<50	10	10	70,000	1,000
404	1	>10	>10	200	30,000	70,000	<1	100	500	<50	10	3	50,000	100
408	5	>10	7	15	30,000	500	<1	100	200	<50	5	15	70,000	100
409	1	3	>10	30	<2,000	150	<1	<10	5,000	<50	<3	10	200	500
413	1	3	>10	150	<2,000	300	<1	200	3,000	500	20	1.5	10,000	700
414	1.5	3	>10	200	<2,000	300	<1	200	5,000	300	20	1.5	10,000	1,500
415	1	3	>10	200	<2,000	70	<1	70	50,000	700	10	1	5,000	700
425	---	15	---	100	<200	>5,000	1	<10	20,000	70	15	10	150	7,000
426	---	10	---	70	1,000	>5,000	<1	<10	15,000	70	15	70	200	5,000
493	---	7	---	<.5	<200	300	<1	<10	15,000	<20	20	10	15	10,000
494	---	15	---	<.5	<200	1,500	<1	<10	<500	<20	70	10	30	2,000
498	---	10	---	<.5	<200	1,500	<1	<10	1,500	<20	15	15	30	7,000
510	---	10	---	<.5	<200	2,000	1	<10	30,000	<20	15	20	70	7,000
548	---	.7	---	<.5	<200	200	<1	<10	>200,000	<20	<5	<5	10	7,000
554	---	3	---	<.5	<200	1,500	1	<10	100,000	<20	5	<5	50	10,000
566	---	7	---	<.5	<200	1,500	<1	<10	20,000	<20	15	30	70	10,000
570	---	7	---	<.5	<200	150	<1	<10	5,000	<20	5	10	20	200
573	---	.3	---	<.5	<200	30	<1	<10	200,000	<20	5	10	5	500
574	---	3	---	<.5	<200	700	<1	<10	>200,000	<20	<5	5	5	3,000
575	---	5	---	70	1,000	200	<1	<10	7,000	<20	15	50	70	<200
578	---	7	---	300	<200	150	<1	<10	20,000	300	15	<5	>20,000	<200
579	---	.3	---	7	<200	200	1	<10	7,000	<20	5	<5	3,000	200
581	---	3	---	70	<200	100	<1	<10	>500	<20	5	<5	1,500	300
584	---	1	---	50	<200	1,000	<1	<10	500	300	15	<5	5,000	500
585	---	1.5	---	200	<200	150	<1	30	500	300	15	<5	>20,000	<200
606	---	.7	---	15	<200	30	<1	<10	100,000	<20	<5	<5	300	500
607	---	2	---	150	<200	150	<1	150	20,000	>500	<5	<5	15,000	300
715	>10	7	>10	<1	<2,000	1,000	1.5	<10	50,000	<50	30	30	100	30,000
720	7	2	>10	<1	<2,000	150	1.5	<10	500	<50	<3	3	70	150
722	7	<10	7	1,000	100,000	300	1.5	1,000	7,000	<50	50	20	>100,000	700
723	3	7	>10	30	<2,000	500	<1	10	3,000	<50	15	5	500	15,000
725	.7	.7	>10	7,000	<2,000	300	<1	<10	5,000	1,000	7	2	3,000	700
807	7	7	>10	<1	<2,000	700	1	<10	20,000	<50	30	7	50	3,000
809	7	3	>10	30	<2,000	700	<1	<10	>100,000	<50	3	10	700	15,000
810	7	3	>10	15	<2,000	1,500	<1	<10	1,500	<50	15	30	150	1,500
824	7	3	>10	<1	<2,000	500	<1	<10	70,000	<50	5	15	7	30,000
828	7	7	>10	<1	<2,000	3,000	1	<10	1,000	<50	<3	7	50	10,000
836	1	1	>10	1,500	1,500	15,000	<1	1,500	700	<50	3	2	70	150
862	3	.7	>10	<1	<2,000	100	3	<10	700	<50	<3	1.5	20	150

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
									Vein and mineralized material--Continued						
335	70	7	<10	<3	10,000	3,000	<10	20	700	30	<10	15,000	0.5	0.50	NW H. P.
338	100	10	<10	<3	2,000	700	<10	10	300	15	<10	20,000	.6	.26	Do.
341	70	30	<10	3	1,000	200	<10	15	300	7	<10	10,000	.2	.30	Do.
344	70	30	<10	<3	1,000	200	<10	30	200	20	10	10,000	.4	.10	Do.
347	100	10	<10	3	10,000	700	<10	30	100	<7	<10	30,000	1.3	.20	Do.
354	70	7	<10	<3	1,500	300	<10	7	200	10	<10	20,000	6.8	.10	Do.
358	100	15	<10	<3	200	<200	<10	10	200	10	<10	3,000	.2	.08	Do.
361	150	20	<10	<3	2,000	<200	<10	7	150	15	<10	1,000	.3	.03	Do.
363	70	10	<10	<3	500	<200	<10	15	700	15	<10	<200	.2	.70	Do.
370	1,000	15	<10	<3	700	500	<10	10	300	7	<10	15,000	3.3	.06	Do.
372	200	5	<10	<3	700	<200	<10	30	1,500	15	10	<200	.2	.03	Do.
374	200	200	<10	<3	70	<200	<10	10	500	20	<10	<200	.4	.60	Do.
376	1,000	15	<10	<3	70,000	700	<10	5	2	<7	30	70,000	6.1	.15	Do.
379	100	30	<10	5	3,000	500	<10	20	700	15	<10	3,000	1.2	.02	Do.
382	100	20	10	<3	500	<200	<10	50	2,000	70	15	<200	<.02	.06	Do.
384	500	30	<10	<3	50	<200	<10	20	1,000	20	10	<200	(.06)	.02	Do.
386	200	10	<10	<3	5,000	<200	<10	5	200	10	<10	10,000	3.4	.18	Do.
388	20,000	<3	<10	5	10,000	200	<10	500	700	30	<10	15,000	.3	.26	SE Mo.
396	10,000	<3	<10	7	>100,000	5,000	<10	100	200	15	<10	30,000	1.4	2.6	NW W. P.
400	15,000	10	<10	15	2,000	<200	<10	70	70	20	<10	300	.6	1.6	Do.
401	150	7	<10	10	7,000	200	<10	1,000	200	15	<10	200	1.2	1.3	Do.
403	50	<7	<10	15	1,000	3,000	100	700	1,500	20	<10	300	1.1	1.6	SE Ir.
404	50	<10	<10	15	1,000	3,000	30	1,500	300	15	<10	300	.8	.65	Do.
408	30	<10	<10	5	300	500	30	300	2,000	70	<10	500	.1	.45	Do.
409	500	70	<10	5	30,000	<200	<10	50	500	15	30	2,000	.1	.10	SE Ou.
413	2,000	30	<10	3	>100,000	<200	<10	30	300	15	<10	>100,000	.7	.04	NW Ir.
414	3,000	15	<10	<3	>100,000	<200	<10	30	700	15	<10	70,000	10	.08	Do.
415	1,000	50	<10	<3	>100,000	200	<10	30	300	20	<10	>100,000	.6	.11	Do.
425	>5,000	20	10	15	>20,000	150	<10	700	1,500	100	15	10,000	.4	1	SE Mo.
426	>5,000	20	<10	30	15,000	1,000	<10	2,000	3,000	150	15	10,000	.1	1.3	Do.
493	3,000	5	15	20	200	<100	<10	<50	7,000	200	30	1,000	<.02	.12	NE Te.
494	>5,000	5	15	5	500	<100	<10	50	5,000	150	15	1,500	<.02	.14	Do.
498	300	10	20	20	50	<100	<10	50	10,000	300	10	<200	<.02	.07	Do.
510	500	<5	20	15	70	<100	<10	1,000	10,000	300	30	<200	<.02	>6	SW W. P.
548	1,500	<5	<10	<2	15	<100	<10	500	700	30	70	<200	<.02	.22	NW W. P.
554	3,000	15	15	15	300	<100	<10	700	2,000	30	15	<200	<.02	.12	Do.
566	700	15	20	30	50	<100	<10	1,500	5,000	300	30	<200	<.02	.06	Do.
570	150	<5	20	10	50	<100	<10	150	5,000	200	30	<200	<.02	1.6	Do.
573	3,000	<5	<10	5	30	300	<10	150	150	70	<10	<200	<.02	.18	Do.
574	5,000	5	<10	7	200	<100	<10	700	300	30	20	<200	<.02	.12	Do.
575	300	500	15	30	1,500	150	<10	<50	3,000	300	10	<200	.8	2.2	Do.
578	200	70	10	30	>20,000	500	<10	50	150	20	<10	>10,000	.2	.22	SW U. P.
579	500	20	10	5	1,000	<100	<10	<50	150	10	<10	3,000	(.03)	.11	Do.
581	100	15	<10	10	>20,000	100	<10	<50	300	30	<10	500	.1	1.5	Do.
584	500	150	<10	7	20,000	150	<10	<50	700	50	<10	>10,000	2.4	.18	Do.
585	150	150	<10	20	>20,000	300	<10	<50	20	10	<10	>10,000	11	.50	Do.
606	>5,000	50	<10	15	2,000	<100	<10	150	150	10	15	700	(.06)	.07	Do.
607	2,000	70	10	2	>20,000	150	<10	<50	700	20	70	>10,000	.6	.65	Do.
715	1,000	<3	15	15	300	<100	<10	700	7,000	300	50	<200	<.1	.45	SE W. P.
720	100	<3	10	<3	300	<100	<10	150	1,500	70	10	<200	(.04)	.60	NW H. P.
722	100	500	20	20	2,000	10,000	200	3,000	7,000	500	30	1,500	1.3	---	Do.
723	700	30	10	7	100	<100	<10	70	3,000	70	30	500	(.04)	.55	SW U. P.
725	200	<3	<10	<3	>100,000	500	<10	15	500	15	<10	>100,000	3	.55	Do.
807	500	<3	10	15	30	<100	<10	150	5,000	150	50	<200	<.02	.80	NW W. P.
809	10,000	7	<10	7	1,500	300	<10	70	150	20	15	300	.2	1.8	Do.
810	150	10	10	15	3,000	100	<10	70	3,000	150	20	<200	(.06)	.66	Do.
824	700	<3	10	5	10	<100	<10	150	1,500	30	30	<200	<.02	.04	SW C. M.
828	70	<3	15	<3	300	<100	<10	700	3,000	150	30	<200	<.02	.08	NE W. P.
836	15	<3	10	3	30	300	<10	500	1,500	10	<10	300	4.2	.80	Do.
862	700	<3	<10	<3	<10	<100	<10	10	70	30	10	<200	<.02	.15	NW H. P.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Vein and mineralized material--Continued								
868	3	3	>10	70	<2,000	150	<1	30	300	70	7	10	500	300
871	7	3	>10	<1	<2,000	50	<1	<10	1,500	<50	15	30	150	700
875	3	3	>10	>1	<2,000	200	<1	<10	15,000	<50	10	15	150	15,000
877	1	<10	<10	300	300	150	<1	1,500	700	150	30	7	700	70
891	.7	>10	7	500	100,000	70	<1	30	300	<100	20	2	>100,000	30
892	5	7	>10	3	<2,000	300	<1	<10	1,500	70	20	15	300	300
902	.1	.07	.2	<1	<2,000	10	<1	<10	>100,000	<50	<3	<5	3	700
						Altered rock								
002	>10	7	>10	<1	<200	700	<1	<10	30,000	<50	15	<1	15	15,000
003	7	3	>10	<1	<200	1,000	<1	<10	30,000	<50	10	<1	15	15,000
004	7	3	>10	<1	<200	1,000	<1	<10	15,000	<50	15	<1	30	15,000
005	7	5	>10	<1	<200	1,000	<1	<10	15,000	<50	15	<1	15	15,000
009	7	7	>10	<1	<200	700	<1	<10	10,000	<50	15	10	2	15,000
010	7	3	>10	<1	<200	1,000	<1	<10	7,000	<50	3	7	15	7,000
011	5	3	>10	<1	<200	300	<1	<10	3,000	<50	10	10	15	15,000
012	3	3	>10	<1	<200	150	<1	<10	3,000	<50	30	3	15	7,000
013	5	3	>10	<1	<200	2,000	<1	<10	10,000	<50	15	3	15	15,000
014	3	3	>10	<1	<200	700	<1	<10	1,500	<50	10	3	15	15,000
015	5	3	>10	<1	<200	1,000	<1	<10	10,000	<50	7	7	7	15,000
016	3	3	>10	<1	<200	150	<1	<10	3,000	<50	15	15	7	7,000
017	3	3	>10	<1	<200	500	<1	<10	5,000	<50	15	3	15	15,000
019	3	3	>10	2	700	150	<1	<10	500	<50	15	3	7	3,000
021	3	3	>10	<1	<200	300	<1	<10	2,000	<50	7	7	15	7,000
026	.7	3	>10	2	<200	200	<1	<10	2,000	<50	3	1.5	70	7,000
030	3	3	>10	2	<200	500	<1	<10	700	<50	7	7	30	3,000
034	3	7	>10	<1	<200	700	<1	<10	3,000	<50	10	15	70	7,000
035	3	3	>10	<1	<200	1,000	<1	<10	15,000	<50	15	15	70	7,000
036	5	3	>10	<1	<200	2,000	<1	<10	1,500	<50	<3	15	30	3,000
037	5	5	>10	<1	<200	300	<1	<10	30,000	<50	20	15	30	15,000
039	3	1	>10	<1	<200	300	<1	<10	700	<50	<3	15	30	<50
041	3	1.5	>10	<1	<200	300	<1	<10	150	<50	7	15	150	50
042	7	2	>10	<1	<200	150	<1	<10	300	<50	<3	15	100	70
045	7	2	>10	<1	<200	700	<1	<10	7,000	<50	15	15	150	15,000
046	5	2	>10	<1	<200	700	<1	<10	10,000	<50	15	15	70	15,000
047	5	1.5	>10	<1	<200	700	<1	<10	7,000	<50	7	15	30	7,000
048	7	3	>10	<1	<200	300	<1	<10	30,000	<50	15	30	70	15,000
049	7	3	>10	<1	<200	300	<1	<10	15,000	<50	15	3	30	15,000
050	3	3	>10	<1	<200	1,000	<1	<10	15,000	<50	10	3	30	15,000
051	3	3	>10	<1	<200	300	<1	<10	5,000	<50	7	20	50	15,000
052	5	3	>10	<1	<200	700	<1	<10	500	<50	7	30	30	15,000
053	7	2	>10	<1	<200	500	<1	<10	700	<50	7	30	70	20,000
054	7	3	>10	<1	<200	150	<1	<10	3,000	<50	15	30	70	15,000
055	7	1.5	>10	<1	<200	300	<1	<10	300	<50	7	30	30	3,000
056	3	1.5	>10	<1	<200	1,500	<1	<10	1,500	<50	7	15	70	3,000
060	7	2	>10	<1	<200	700	<1	<10	3,000	<50	3	15	30	15,000
062	7	3	>10	<1	<200	700	<1	<10	7,000	<50	15	30	70	15,000
063	7	3	>10	<1	<200	1,000	<1	<10	15,000	<50	10	30	50	15,000
064	7	3	>10	<1	<200	1,000	<1	<10	3,000	<50	15	15	30	15,000
065	7	3	>10	<1	<200	700	<1	<10	3,000	<50	15	15	70	15,000
066	7	1.5	>10	<1	<200	300	<1	<10	700	<50	15	15	50	15,000
067	7	3	>10	<1	<200	700	<1	<10	7,000	<50	10	30	30	15,000
068	7	3	>10	<1	<200	300	<1	<10	1,500	<50	15	15	30	7,000
069	7	3	>10	<1	<200	700	<1	<10	10,000	<50	15	1.5	70	20,000
070	>10	3	>10	<1	<200	1,000	<1	<10	10,000	<50	7	30	30	15,000
071	>10	3	>10	<1	<200	700	<1	<10	7,000	<50	<3	30	30	15,000
072	>10	1.5	>10	<1	<200	1,500	<1	<10	7,000	<50	5	3	30	7,000
073	7	3	>10	<1	<200	700	<1	<10	7,000	<50	5	1.5	70	15,000
074	>10	3	>10	<1	<200	1,000	1.5	<10	7,000	<50	15	30	70	15,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
									Vein and mineralized material--Continued						
868	50	150	<10	3	2,000	<100	<10	30	1,500	70	20	3,000	0.2	0.30	NW H. P.
871	3,000	<3	10	3	30	<100	<10	15	3,000	150	15	<200	<.02	.09	Do.
875	1,500	<3	10	10	15	<100	<10	150	3,000	70	30	<200	<.02	.04	Do.
877	50	7	<10	30	10,000	1,500	30	300	1,500	30	<10	15,000	.6	.06	Do.
891	70	<3	<10	30	5,000	3,000	15	1,000	700	150	15	1,500	32	High	SW Ir.
892	70	<3	10	3	500	<100	<10	500	3,000	70	10	15,000	.3	.16	Do.
902	1,500	<3	<10	<3	<10	<100	<10	100	30	<7	<10	<200	<.02	.10	SE W. P.
									Altered rock						
002	700	3	10	<3	50	<100	<10	700	3,000	150	30	300	(.06)	.20	NE Te.
003	700	<3	<10	<3	15	<100	<10	300	3,000	70	30	300	<.02	.15	Do.
004	700	<3	<10	<3	10	<100	<10	500	3,000	100	30	300	<.02	.33	Do.
005	700	<3	<10	<3	10	<100	<10	700	3,000	150	30	300	<.02	.25	Do.
009	700	<3	10	3	30	<100	<10	300	3,000	150	30	<200	(.04)	.12	Do.
010	300	<3	10	<3	70	<100	<10	700	3,000	150	15	<200	(.04)	.48	Do.
011	700	<3	<10	<3	15	<100	<10	150	3,000	150	15	<200	(.04)	.48	Do.
012	700	<3	<10	3	20	<100	<10	30	3,000	70	20	<200	(.04)	.13	Do.
013	1,000	<3	<10	3	15	<100	<10	100	3,000	70	30	<200	(.04)	.12	Do.
014	700	<3	<10	3	10	<100	<10	150	3,000	150	15	<200	(.04)	.26	Do.
015	700	<3	<10	3	10	<100	<10	500	3,000	150	15	<200	(.06)	.40	Do.
016	300	<3	<10	<3	10	<100	<10	30	3,000	70	20	<200	(.08)	.31	Do.
017	700	<3	<10	<3	<10	<100	<10	150	3,000	150	30	<200	(.04)	.20	Do.
019	200	3	10	3	70	<100	<10	15	3,000	150	30	700	.2	.16	Do.
021	700	<3	<10	3	200	<100	<10	100	3,000	70	15	300	<.02	.33	Do.
026	500	15	<10	<3	700	<100	<10	30	3,000	150	15	300	.1	.32	NW Ir.
030	300	15	<10	3	500	<100	<10	20	3,000	70	15	300	(.04)	.38	Do.
034	1,000	7	10	7	70	<100	<10	70	1,500	70	30	300	(.02)	.34	SW Ir.
035	1,500	3	10	15	30	<100	<10	200	3,000	150	30	300	(.02)	.13	Do.
036	70	3	10	<3	15	<100	<10	150	3,000	150	15	<200	.1	.26	Do.
037	1,500	<3	10	15	15	<100	<10	300	3,000	150	30	<200	(.08)	.34	Do.
039	3	<3	<10	<3	300	<100	<10	300	1,500	150	<10	<200	(.08)	.58	Do.
041	3	<3	10	7	30	<100	<10	150	2,000	150	15	<200	(.08)	.77	Do.
042	7	<3	10	<3	30	<100	10	150	3,000	150	30	<200	(.02)	.42	Do.
045	700	<3	10	7	15	<100	<10	150	1,500	150	30	<200	(.04)	.32	Do.
046	700	<3	10	7	15	<100	<10	150	2,000	100	30	<200	<.02	.32	Do.
047	300	<3	10	3	300	<100	<10	150	2,000	70	20	<200	<.02	.23	Do.
048	1,000	<3	10	15	15	<100	<10	300	3,000	150	30	<200	<.02	.25	Do.
049	700	<3	10	7	15	<100	<10	200	3,000	150	30	<200	<.02	.12	Do.
050	700	<3	<10	3	70	<100	<10	150	2,000	70	30	<200	<.02	.20	Do.
051	700	<3	<10	7	10	<100	<10	70	2,000	100	30	<200	<.02	.48	Do.
052	300	<3	<10	7	10	<100	<10	30	3,000	150	30	<200	(.02)	.40	Do.
053	70	<3	<10	15	10	<100	<10	30	3,000	150	15	<200	(.02)	.27	Do.
054	300	<3	<10	30	10	<100	<10	30	3,000	150	20	<200	(.02)	.16	Do.
055	20	<3	<10	7	30	<100	<10	30	3,000	150	30	<200	(.02)	.50	Do.
056	70	3	10	3	30	<100	<10	150	2,000	70	15	<200	(.02)	.25	Do.
060	700	7	10	<3	300	<100	<10	150	3,000	150	30	<200	<.02	.29	Do.
062	700	3	10	15	500	<100	<10	150	3,000	150	30	700	<.2	.69	Do.
063	700	<3	10	7	150	<100	<10	700	3,000	150	30	<200	.1	.32	Do.
064	700	<3	10	7	100	<100	<10	200	3,000	150	20	300	(.04)	.58	Do.
065	700	<3	10	7	150	<100	<10	70	3,000	150	30	<200	(.02)	.26	Do.
066	1,000	<3	10	5	300	<100	<10	30	2,000	70	15	<200	.1	1.3	Do.
067	1,500	<3	10	7	200	<100	<10	150	3,000	150	30	300	(.02)	.43	Do.
068	150	<3	10	7	150	<100	<10	20	3,000	70	30	<200	<.02	.51	Do.
069	1,500	<3	<10	<3	150	<100	<10	200	3,000	100	30	300	<.02	.49	Do.
070	700	3	10	10	300	<100	<10	500	3,000	150	30	<200	<.02	.23	Do.
071	300	3	10	3	70	<100	<10	300	3,000	150	30	<200	<.02	.23	Do.
072	700	15	10	<3	70	<100	<10	300	1,500	70	30	<200	<.02	.48	Do.
073	700	<3	<10	<3	150	<100	<10	150	3,000	100	20	<200	<.02	.48	Do.
074	1,500	<3	10	15	70	<100	<10	300	3,000	150	30	300	<.02	.38	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Altered Rock--Continued								
075	3	3	>10	<1	<200	500	<1	<10	3,000	<50	15	7	30	15,000
076	7	3	>10	<1	<200	700	<1	<10	7,000	<50	15	15	70	15,000
079	3	3	>10	30	<200	1,500	<1	<10	300	<20	3	7	70	3,000
080	7	3	>10	1	<200	1,500	<1	<10	700	<20	15	10	70	15,000
081	7	3	>10	<1	<200	700	<1	<10	1,500	<20	7	15	70	7,000
087	3	5	>10	70	<200	300	1.5	<10	3,000	<20	15	10	150	15,000
092	7	3	>10	1	<200	1,500	1.5	<10	3,000	<20	7	15	30	15,000
096	5	1.5	>10	3	<200	300	<1	<10	10,000	<20	7	10	70	10,000
098	5	2	>10	50	<200	700	<1	<10	700	<20	7	7	70	5,000
119	5	1.5	>10	2	<200	700	1	<10	3,000	<20	10	15	30	5,000
121	5	3	>10	<1	<200	700	1	<10	7,000	<20	15	7	3	3,000
129	7	1.5	>10	<1	<200	700	1	<10	700	<20	<3	1.5	20	5,000
130	5	3	>10	<1	<200	1,000	<1	<10	300	<20	<3	1.5	30	3,000
132	7	5	>10	<1	<200	300	<1	<10	2,000	<20	<3	1.5	70	3,000
133	5	1	>10	1	<200	500	<1	<10	500	<50	<3	1	50	3,000
135	7	3	>10	<1	<200	700	<1	<10	3,000	<20	7	30	150	10,000
137	3	3	>10	<1	<200	1,500	<1	<10	700	<20	7	3	1,500	3,000
138	>10	1.5	>10	<1	<200	1,500	1	<10	500	<20	5	3	70	3,000
139	3	1.5	>10	<1	<200	10,000	<1	<10	300	<20	<3	7	30	3,000
140	5	1.5	>10	<1	<200	3,000	<1	<10	300	<20	5	3	150	3,000
142	3	7	>10	<1	<200	300	<1	10	700	<20	15	15	300	7,000
144	1.5	3	>10	<1	<200	300	<1	<10	300	<20	<3	15	300	2,000
146	5	1.5	>10	<1	<200	700	<1	<10	500	<20	<3	7	70	3,000
153	7	3	>10	<1	<200	700	<1	<10	15,000	<20	3	1	150	7,000
155	3	1.5	>10	<1	<200	700	1	<10	7,000	<20	3	15	300	10,000
160	2	3	>10	3	500	70	<1	<10	1,500	<20	7	3	70	1,500
164	3	5	>10	<1	<200	700	<1	<10	5,000	<20	15	7	30	7,000
165	7	3	>10	<1	<200	1,500	<1	<10	5,000	<20	7	3	7	15,000
166	3	1.5	>10	3	500	1,000	<1	<10	1,500	<20	<3	1.5	15	3,000
168	3	5	>10	<1	<200	700	<1	<10	10,000	<20	7	30	30	15,000
170	3	3	>10	<1	<200	1,500	<1	<10	7,000	<20	15	7	30	7,000
171	7	3	>10	<1	<200	1,500	<1	<10	2,000	<20	15	7	7	7,000
172	7	3	>10	<1	<200	500	<1	<10	700	<20	15	15	15	7,000
177	7	.7	>10	<1	<200	700	<1	<10	700	<20	<3	1	7	3,000
185	7	3	>10	15	700	150	<1	<10	2,000	<20	7	1.5	70	3,000
187	3	2	>10	<1	<200	700	<1	<10	3,000	<20	3	15	200	5,000
191	5	3	>10	<1	<200	700	<1	<10	3,000	<20	7	15	300	10,000
196	2	2	>10	1	<200	150	<1	<10	300	<20	7	15	15	2,000
197	.3	1	>10	5	<200	30	<1	<10	200	<20	<3	1.5	15	150
198	2	3	>10	15	<200	150	<1	<10	300	<20	5	15	30	700
206	3	1.5	>10	1	<200	3,000	<1	15	3,000	<20	7	7	150	3,000
212	3	3	>10	15	<200	700	<1	15	1,500	<20	<3	5	150	3,000
214	3	1.5	>10	3	<200	150	1.5	<10	1,500	<20	<3	7	30	1,500
216	5	3	>10	<1	<200	3,000	1.5	<10	20,000	<20	15	30	150	30,000
217	7	3	>10	<1	<200	1,500	<1	<10	15,000	<20	15	20	70	15,000
220	5	3	>10	<1	<200	700	<1	<10	30,000	<20	7	3	30	15,000
222	7	1.5	>10	2	<200	700	<1	<10	1,500	<20	3	3	30	7,000
224	7	7	>10	1	<200	1,500	1.5	<10	3,000	<20	15	7	70	15,000
226	7	7	>10	<1	<200	300	3	<10	300	<20	15	30	300	7,000
231	7	1.5	>10	<1	<200	500	<1	<10	700	<20	<3	15	10	1,500
232	7	3	>10	<1	<200	500	<1	<10	1,000	<20	<3	15	15	3,000
233	5	1	>10	<1	<200	300	<1	<10	700	<20	<3	15	15	700
234	5	7	>10	<1	<200	300	<1	<10	1,000	<20	<3	15	15	1,500
235	7	3	>10	<1	<200	500	1.5	<10	1,500	<20	7	15	30	15,000
237	7	1.5	>10	2	<200	1,500	<1	<10	700	<20	7	15	70	7,000
238	3	1.5	>10	<1	<200	300	<1	<10	700	<20	<3	15	15	300
239	7	3	>10	<1	<200	3,000	<1	<10	300	<20	15	15	30	3,000
243	7	3	>10	7	<200	1,000	<1	30	3,000	<20	7	7	300	7,000
245	7	3	>10	2	<200	700	<1	<10	1,500	<20	5	10	150	7,000
246	7	2	>10	2	<200	700	<1	<10	300	<20	<3	7	30	3,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Altered Rock--Continued							
075	1,000	<3	<10	<3	150	<100	<10	30	3,000	70	15	500	(0.02)	0.34	SW Ir.
076	1,000	3	10	7	70	<100	<10	150	3,000	150	30	<200	(.02)	.60	Do.
079	300	3	15	<3	1,500	<100	<10	70	3,000	100	15	<200	(.02)	.45	SE Ir.
080	7,000	<3	15	7	300	<100	<10	50	2,000	100	30	700	<.02	.22	Do.
081	300	<3	15	3	70	<100	<10	70	3,000	150	20	<200	<.02	.20	Do.
087	700	15	30	15	700	100	<10	30	7,000	150	30	1,500	.2	.45	NE Ir.
092	700	30	15	3	300	<100	<10	70	3,000	150	15	300	(.02)	.30	NW H. P.
096	500	7	10	3	70	<100	<10	70	3,000	100	15	<200	(.04)	.28	Do.
098	300	7	10	<3	300	<100	<10	70	3,000	150	15	<200	.5	.20	Do.
119	200	15	10	7	30	<100	<10	150	3,000	70	30	<200	<.02	.40	SE Ou.
121	700	7	10	3	15	<100	<10	150	1,500	70	30	<200	<.02	.08	Do.
129	70	15	<10	<3	70	<100	<10	30	1,500	30	15	<200	(.02)	.08	Do.
130	50	15	10	<3	<10	<100	<10	30	1,500	30	15	<200	(.04)	.10	Do.
132	70	15	10	<3	<10	<100	<10	50	1,500	30	15	<200	(.06)	.08	Do.
133	50	200	<10	<3	50	<200	<10	15	1,500	50	15	<200	(.04)	.05	Do.
135	300	3	15	5	<10	<100	<10	150	1,500	70	30	<200	.1	.26	Do.
137	150	150	10	<3	30	<100	<10	70	1,500	70	30	<200	(.04)	.14	Do.
138	30	300	10	<3	30	<100	<10	150	1,500	70	30	<200	.3	.08	Do.
139	30	50	10	<3	15	<100	15	150	1,500	70	50	<200	(.04)	.14	Do.
140	30	50	10	<3	70	<100	15	70	1,500	70	15	300	(.04)	.15	Do.
142	300	50	10	7	70	<100	<10	30	1,500	70	30	300	(.08)	.24	Do.
144	150	3	10	3	<10	<100	<10	15	1,500	30	15	<200	(.04)	.26	Do.
146	70	30	15	<3	300	<100	<10	30	3,000	70	15	<200	(.04)	.09	Do.
153	200	15	10	<3	10	<100	<10	700	2,000	30	30	<200	.2	.15	Do.
155	200	<3	10	7	10	<100	<10	150	1,500	30	15	<200	(.06)	.20	Do.
160	300	3	10	3	500	100	<10	30	2,000	70	15	1,500	(.04)	.40	NE Te.
164	700	3	15	3	150	<100	<10	50	3,000	150	30	700	<.02	.14	Do.
165	700	3	15	<3	20	<100	<10	300	3,000	70	30	<200	<.02	.06	Do.
166	150	30	15	<3	30	<100	<10	30	1,500	70	15	<200	3	.13	Do.
168	1,500	3	15	7	70	<100	<10	70	3,000	150	30	<200	(.02)	.30	Do.
170	1,500	3	15	3	50	<100	<10	70	2,000	70	30	300	<.02	.20	Do.
171	300	3	30	3	30	<100	<10	150	3,000	100	30	<200	<.02	.08	Do.
172	150	3	20	3	30	<100	<10	70	3,000	150	30	<200	(.02)	.10	Do.
177	100	<3	30	<3	15	<100	<10	30	1,000	15	30	<200	<.02	.13	Do.
185	3,000	7	15	<3	3,000	150	<10	30	3,000	70	30	300	<.02	.35	Do.
187	300	15	15	3	30	<100	<10	70	1,500	50	15	<200	(.06)	.20	SE Ou.
191	300	15	10	7	100	<100	<10	70	2,000	70	30	<200	.1	.17	Do.
196	700	<3	10	7	70	<100	<10	15	1,500	30	15	300	<.02	.05	Do.
197	7	<3	<10	3	30	<100	<10	7	300	7	<10	<200	<.02	.14	NE Ir.
198	70	3	10	3	300	<100	<10	30	1,500	30	30	300	(.04)	.40	Do.
206	1,500	7	<10	3	70	<100	<10	70	1,500	30	20	700	.2	.40	SE Ou.
212	300	7	15	<3	700	<100	10	30	1,500	30	20	700	3.8	.20	Do.
214	300	3	15	3	150	<100	<10	30	1,500	30	20	300	(.04)	.50	Do.
216	3,000	3	15	30	300	<100	<10	300	1,500	70	30	700	<.02	.22	SW Ir.
217	1,500	<3	20	15	15	<100	<10	150	3,000	150	30	<200	<.02	.20	Do.
220	3,000	7	15	<3	150	<100	<10	150	2,000	70	15	700	<.02	.18	Do.
222	150	3	20	<3	150	<100	<10	70	3,000	70	20	<200	<.02	.17	Do.
224	1,500	7	15	7	300	<100	<10	150	3,000	150	30	700	<.02	.38	NE Ir.
226	150	10	20	20	30	<100	<10	30	1,500	70	30	<200	<.02	.14	Do.
231	30	<3	15	<3	30	<100	<10	300	1,500	100	30	<200	<.02	.18	SE Ir.
232	150	<3	15	<3	70	<100	<10	300	1,500	100	30	<200	<.02	.09	Do.
233	30	<3	<10	<3	30	<100	<10	300	1,500	150	15	<200	<.02	.08	Do.
234	30	7	<10	<3	30	<100	<10	150	2,000	70	15	<200	<.02	.24	Do.
235	700	7	15	3	300	<100	<10	150	3,000	150	30	<200	<.02	.35	Do.
237	150	3	15	3	700	<100	<10	150	3,000	100	15	<200	<.02	.17	Do.
238	15	<3	<10	<3	70	<100	<10	150	1,500	150	15	<200	<.02	.12	Do.
239	30	5	15	15	30	<100	<10	100	3,000	150	30	<200	<.02	.20	Do.
243	700	15	15	<3	700	<100	15	70	1,500	70	15	300	<.02	.40	NW H. P.
245	1,500	3	20	<3	1,500	<100	<10	50	3,000	150	30	700	<.02	.50	NE Ir.
246	300	<3	15	<3	700	<100	<10	30	1,500	70	15	<200	<.02	.10	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Altered rock--Continued								
247	7	3	>10	<1	<200	700	<1	15	3,000	<20	5	7	70	7,000
249	7	3	>10	1	<200	700	<1	<10	3,000	<20	7	7	70	7,000
251	3	1.5	>10	3	<200	700	<1	<10	700	<20	3	3	70	1,500
255	7	1.5	>10	<1	<200	500	2	<10	3,000	<20	3	15	70	7,000
257	7	3	>10	2	<200	300	<1	<10	700	<20	3	15	30	7,000
260	7	.7	>10	2	<200	700	<1	15	3,000	<20	<3	15	30	1,500
261	7	.5	>10	<1	<200	700	<1	<10	1,500	<20	<3	15	7	7,000
262	7	1.5	>10	<1	<200	700	<1	<10	1,500	<20	<3	15	7	7,000
264	7	3	>10	2	<200	300	<1	<10	1,500	<20	7	15	30	2,000
266	7	1.5	>10	<1	<200	500	<1	<10	700	<20	3	7	30	3,000
268	3	.7	>10	<1	<200	700	<1	<10	1,500	<20	<3	15	7	1,500
269	3	1	>10	<1	<200	700	<1	<10	1,500	<20	<3	20	15	700
271	3	1	>10	2	<200	700	<1	30	300	<20	<3	30	15	30
273	7	1.5	>10	3	<200	500	<1	10	700	<20	<3	30	70	150
275	7	2	>10	<1	<200	700	<1	<10	1,500	<20	7	30	30	3,000
278	7	3	>10	<1	<200	1,000	<1	<10	3,000	<20	3	15	15	15,000
280	7	3	>10	<1	<200	700	3	<10	700	<20	7	30	150	3,000
286	7	3	>10	<1	<200	700	<1	<10	1,500	<20	3	7	30	7,000
290	7	3	>10	<1	<200	1,000	<1	<10	1,500	<20	<3	3	7	15,000
292	7	3	>10	<1	<200	1,000	<1	10	1,500	<20	<3	15	70	15,000
295	>10	3	>10	1	<200	700	<1	15	1,500	<20	7	15	30	15,000
296	7	3	>10	<1	<200	1,000	<1	<10	1,500	<20	7	15	70	15,000
298	7	3	>10	<1	<200	300	1.5	15	2,000	<20	7	70	30	15,000
300	3	3	>10	15	<200	150	<1	30	30,000	<20	7	30	150	30,000
301	>10	5	>10	<1	<200	1,500	<1	<10	7,000	<20	7	7	15	15,000
303	.7	7	3	2	<200	30	<1	<10	70,000	<20	15	15	3,000	70,000
305	7	3	>10	1	<200	700	1.5	<10	3,000	<20	7	15	70	15,000
307	7	3	>10	<1	<200	700	1.5	<10	7,000	<20	15	15	70	15,000
309	7	1.5	>10	2	<200	700	<1	<10	1,500	<20	<3	2	70	7,000
311	7	2	>10	7	<200	1,000	<1	<10	700	<20	<3	3	300	7,000
313	5	3	>10	2	<200	1,500	<1	<10	3,000	<20	15	7	300	7,000
315	1.5	2	>10	2	<200	150	<1	<10	70,000	50	7	15	200	3,000
316	7	3	>10	<1	<200	700	<1	<10	3,000	<20	7	15	70	15,000
317	7	3	>10	<1	<200	700	<1	<10	1,500	<20	7	15	50	10,000
318	3	3	>10	<1	<200	300	<1	<10	3,000	<20	7	15	30	15,000
320	5	7	>10	2	<200	700	<1	30	3,000	<20	15	30	1,500	7,000
322	7	3	>10	1	<200	700	<1	<10	7,000	<20	10	7	700	10,000
323	3	7	>10	<1	<200	150	<1	<10	30,000	<20	15	30	150	15,000
325	7	3	>10	7	<200	300	<1	30	1,500	<20	7	7	150	7,000
327	7	1.5	>10	2	<200	150	<1	<10	700	<20	3	3	15	7,000
329	7	3	>10	7	<200	700	1.5	<10	1,500	<20	5	7	70	15,000
331	5	2	>10	7	<200	300	<1	<10	1,500	<20	5	7	30	7,000
333	3	1.5	>10	7	<200	150	<1	<10	700	<20	5	7	70	3,000
336	7	1.5	>10	15	<200	150	<1	<10	300	<20	<3	7	100	3,000
339	7	1.5	>10	7	<200	150	<1	<10	700	<20	<3	7	70	3,000
342	3	1.5	>10	15	<200	150	1.5	70	300	<20	<3	7	70	3,000
345	3	3	>10	15	<200	150	1.5	150	300	<20	<3	7	70	3,000
348	5	1.5	>10	7	<200	150	<1	<10	200	<20	<3	7	30	5,000
355	5	1.5	>10	3	<200	150	<1	15	300	<20	<3	7	30	3,000
359	7	1.5	>10	1	<200	300	<1	<10	300	<20	<3	7	7	7,000
362	7	3	>10	2	<200	700	<1	<10	300	<20	<3	3	15	7,000
369	7	3	>10	<1	<200	1,500	<1	<10	700	<20	<3	7	15	7,000
371	5	1.5	>10	2	<200	150	1.5	<10	300	<20	<3	7	30	3,000
373	7	1.5	>10	<1	<200	700	<1	<10	700	<20	<3	7	20	7,000
375	3	.7	>10	5	<200	150	<1	15	300	<20	<3	5	20	3,000
377	7	1.5	>10	2	<200	100	1.5	<10	300	<20	<3	7	7	7,000
380	7	1.5	>10	<1	<200	150	<1	<10	500	<20	3	10	15	3,000
383	>10	3	>10	<1	<200	1,500	<1	<10	1,500	<20	<3	15	30	15,000
385	7	3	>10	7	<200	700	<1	<10	700	<20	3	15	15	7,000
387	7	2	>10	3	<200	700	1.5	<10	700	<20	5	7	15	7,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Altered rock--Continued							
247	700	7	20	<3	300	<100	<10	150	3,000	70	30	<200	<0.02	0.12	NE Ir.
249	3,000	3	15	3	700	<100	<10	70	3,000	70	15	700	<.02	.18	Do.
251	150	3	15	<3	1,500	<100	<10	30	1,500	30	15	500	<.02	.22	Do.
255	700	7	15	<3	700	<100	<10	100	3,000	70	30	300	<.02	.20	SW H. P.
257	700	70	20	<3	1 500	<100	<10	30	3,000	70	15	300	(.02)	.14	Do.
260	70	<3	20	<3	700	<100	<10	300	3,000	150	15	<200	<.02	.09	SE Ir.
261	30	3	15	<3	30	<100	<10	150	3,000	100	30	<200	<.02	.10	Do.
262	15	15	15	<3	70	<100	10	150	3,000	150	30	<200	<.02	.20	Do.
264	300	<3	15	<3	300	<100	<10	500	3,000	100	15	<200	<.02	.34	Do.
266	30	<3	15	<3	150	<100	<10	300	3,000	150	30	<200	<.02	.14	Do.
268	15	<3	10	<3	300	<100	<10	300	3,000	150	30	<200	<.02	.50	Do.
269	15	<3	10	<3	500	<100	<10	300	3,000	150	15	<200	<.02	.14	Do.
271	7	3	<10	<3	700	<100	30	300	2,000	150	<10	<200	<.02	.26	Do.
273	7	<3	15	<3	700	<100	<10	300	3,000	150	30	300	<.02	.34	Do.
275	30	7	15	7	700	<100	15	300	3,000	150	30	300	<.02	.24	Do.
278	500	<3	15	<3	150	<100	<10	300	3,000	150	30	300	<.02	.24	NE Ir.
280	300	15	15	3	150	<100	<10	30	2,000	70	15	700	<.02	.34	SE Ou.
286	300	3	30	<3	150	<100	<10	150	7,000	150	30	<200	<.02	.08	SW Ir.
290	300	<3	15	<3	70	<100	<10	300	5,000	150	30	<200	<.02	.06	Do.
292	700	5	15	<3	700	<100	<10	300	3,000	150	30	<200	<.02	.15	NE Ir.
295	500	70	20	<3	300	<100	<10	150	7,000	200	30	<200	<.02	.30	Do.
296	300	15	15	7	100	<100	<10	150	3,000	150	30	<200	<.02	.14	Do.
298	150	3	20	15	70	<100	<10	30	3,000	70	30	<200	(.02)	.04	Do.
300	1,500	7	15	7	700	<100	20	15	3,000	30	30	300	(.06)	.14	Do.
301	700	<3	15	<3	70	<100	<10	150	5,000	150	30	<200	<.02	.18	Do.
303	7,000	<3	<10	15	300	<100	<10	30	300	30	15	1,500	<.02	.30	Do.
305	1,500	7	15	5	700	<100	<10	70	3,000	150	30	300	<.02	.20	SW Ir.
307	1,500	3	15	15	1,500	<100	<10	150	3,000	150	30	1,500	<.02	.10	Do.
309	700	15	20	<3	700	<100	<10	30	1,500	70	20	300	(.02)	.10	Do.
311	700	7	20	<3	1,500	<100	<10	30	1,500	70	20	300	(.06)	.24	Do.
313	1,500	70	15	7	1,000	<100	<10	70	3,000	70	30	1,500	.2	.50	Do.
315	7,000	15	<10	7	500	<100	<10	300	1,500	10	20	1,500	.1	.10	SE Te.
316	700	3	20	7	70	<10	<10	70	3,000	150	30	<200	<.02	.12	SW Ir.
317	300	3	20	7	30	<100	<10	150	3,000	150	30	<200	(.02)	.10	Do.
318	700	<3	20	7	30	<100	<10	150	3,000	70	30	<200	(.02)	.35	Do.
320	2,000	3	15	10	3,000	150	30	30	3,000	150	30	2,000	(.02)	.26	Do.
322	3,000	7	30	<3	1,500	<100	<10	100	3,000	70	30	1,500	<.02	.12	Do.
323	1,500	3	10	15	300	<100	<10	150	3,000	150	30	300	<.02	.12	Do.
325	3,000	7	15	<3	1,500	<100	<10	30	3,000	70	30	1,000	(.02)	.15	NW H. P.
327	700	7	15	<3	300	<100	<10	30	3,000	70	30	700	(.02)	.30	Do.
329	700	<3	15	<3	70	<100	<10	30	3,000	150	30	<200	(.06)	.40	Do.
331	700	7	15	<3	500	<100	<10	30	2,000	70	30	1,500	.1	.30	Do.
333	150	7	10	<3	500	100	<10	30	3,000	70	15	700	.1	.20	Do.
336	150	3	20	<3	700	100	<10	150	3,000	150	30	1,500	(.04)	.22	Do.
339	150	7	15	<3	700	<100	<10	70	3,000	150	15	700	(.08)	.24	Do.
342	150	15	15	<3	1,500	150	<10	70	1,500	70	15	<200	.4	.30	Do.
345	300	7	15	<3	1,000	<100	<10	100	3,000	150	15	300	.1	.30	Do.
348	150	15	15	<3	300	<100	<10	30	3,000	150	15	<200	(.06)	.20	Do.
355	150	15	15	<3	700	<100	<10	30	3,000	150	15	<200	.3	.26	Do.
359	300	7	20	<3	300	<100	<10	30	1,500	50	20	700	<.02	.20	Do.
362	700	7	20	<3	150	<100	<10	70	3,000	70	30	<200	.1	.26	Do.
369	700	<3	20	<3	150	<100	<10	150	3,000	70	30	<200	<.1	.10	Do.
371	300	7	20	<3	150	<100	<10	30	2,000	70	30	<200	<.02	.07	Do.
373	700	5	30	<3	150	<100	<10	70	3,000	70	30	<200	<.02	.11	Do.
375	300	15	10	<3	300	<100	<10	30	1,500	70	15	<200	(.04)	.24	Do.
377	300	15	15	<3	150	<100	<10	30	3,000	70	15	<200	(.02)	.30	Do.
380	150	7	15	<3	150	<100	<10	30	3,000	30	15	300	<.02	.15	Do.
383	2,000	<3	15	<3	30	<100	<10	150	3,000	150	30	<200	<.02	.06	Do.
385	700	15	15	<3	1,500	<100	<10	70	3,000	70	30	1,500	(.04)	.32	Do.
387	500	15	15	<3	150	<100	<10	30	3,000	70	20	<200	<.02	.20	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Altered rock--Continued								
389	3	3	>10	15	500	150	<1	<10	7,000	50	15	30	150	7,000
391	3	1.5	>10	1	<200	70	<1	<10	5,000	50	7	15	70	3,000
392	>10	3	>10	<1	<200	1,500	<1	<10	30,000	<20	7	15	15	15,000
393	3	1.5	>10	<1	200	30	<1	<10	70,000	<20	3	7	7	700
394	7	1.5	>10	<1	<200	1,000	<1	<10	3,000	<20	3	3	70	3,000
395	7	1.5	>10	<1	<200	1,000	2	<10	15,000	<20	7	7	70	15,000
397	3	3	>10	<1	<200	150	1.5	<10	1,500	<20	7	15	15	7,000
398	7	2	>10	<1	<200	700	<1	<10	1,500	<20	5	15	30	700
399	3	1.5	>10	<1	<200	1,500	<1	<10	1,500	<20	5	3	30	300
402	3	1.5	>10	3	<200	2,000	<1	15	300	<20	3	15	70	300
406	7	1.5	>10	<1	<200	700	<1	<10	700	<20	<3	15	20	7,000
407	3	2	>10	<1	<200	300	<1	<10	700	<20	<3	15	30	3,000
410	3	7	>10	<1	<200	700	<1	<10	7,000	<20	15	7	30	1,500
411	3	1.5	>10	<1	<200	500	<1	<10	15,000	<20	7	15	30	1,500
412	7	3	>10	<1	<200	700	<1	<10	3,000	<20	7	15	30	10,000
424	---	3	---	<0.5	300	50	1	<10	15,000	<20	10	30	100	7,000
490	---	1.5	---	<.5	<200	700	1	<10	500	<20	<5	<5	30	5,000
491	---	1.5	---	<.5	<200	700	1	<10	500	<20	<5	<5	30	3,000
495	---	5	---	.7	<200	150	<1	<10	2,000	<20	10	7	50	3,000
497	---	7	---	<.5	<200	300	<1	<10	500	<20	5	5	30	3,000
499	---	10	---	<.5	<200	1,000	<1	<10	20,000	<20	30	15	50	7,000
513	---	7	---	<.5	<200	700	<1	<10	15,000	<20	15	10	30	15,000
517	---	3	---	<.5	<200	1,500	<1	<10	10,000	<20	<5	7	30	3,000
518	---	5	---	<.5	<200	1,500	<1	<10	10,000	<20	<5	30	30	5,000
519	---	5	---	<.5	<200	1,500	<1	<10	10,000	<20	<5	70	30	5,000
524	---	7	---	<.5	<200	1,000	<1	<10	15,000	<20	15	30	30	10,000
527	---	5	---	<.5	<200	1,000	<1	<10	15,000	<20	15	7	30	10,000
529	---	3	---	<.5	<200	1,000	1	<10	5,000	<20	<5	<5	15	5,000
531	---	.7	---	<.5	<200	1,000	<1	<10	2,000	<20	<5	<5	15	7,000
532	---	1	---	<.5	<200	1,000	<1	<10	3,000	<20	<5	<5	20	700
535	---	2	---	<.5	<200	1,500	<1	<10	3,000	<20	5	7	30	10,000
536	---	7	---	<.5	<200	1,000	<1	<10	500	<20	<5	20	100	5,000
538	---	7	---	<.5	<200	50	<1	<10	10,000	<20	<5	7	7	7,000
539	---	5	---	<.5	<200	1,000	<1	<10	15,000	<20	5	5	30	10,000
541	---	1	---	<.5	<200	700	<1	<10	700	<20	<5	5	10	7,000
542	---	1.5	---	<.5	<200	1,500	<1	<10	500	<20	<5	30	20	1,000
543	---	3	---	<.5	<200	1,500	<1	<10	500	<20	5	30	15	5,000
544	---	7	---	<.5	<200	1,000	1	<10	15,000	<20	15	30	200	15,000
546	---	2	---	<.5	<200	700	<1	<10	50,000	<20	7	70	20	7,000
549	---	2	---	.7	<200	700	1	<10	15,000	<20	10	70	300	10,000
551	---	5	---	<.5	<200	1,000	1.5	<10	15,000	<20	5	7	30	5,000
555	---	2	---	<.5	<200	700	1	<10	15,000	<20	5	<5	30	3,000
558	---	7	---	<.5	<200	200	<1	<10	15,000	<20	10	7	20	700
560	---	5	---	<.5	<200	700	<1	<10	7,000	<20	15	7	15	700
563	---	7	---	<.5	<200	1,500	<1	<10	20,000	<20	15	7	20	7,000
564	---	5	---	<.5	<200	1,500	<1	<10	15,000	<20	15	30	20	7,000
565	---	1.5	---	.5	<200	1,000	3	<10	15,000	<20	15	70	30	5,000
567	---	7	---	<.5	<200	1,500	<1	<10	10,000	<20	15	10	15	10,000
569	---	3	---	<.5	<200	100	<1	<10	1,000	<20	5	7	20	300
572	---	5	---	<.5	<200	150	1.5	<10	500	<20	15	10	10	1,000
576	---	.15	---	.7	<200	20	<1	<10	200,000	<20	>5	5	<5	20,000
580	---	2	---	10	<200	1,000	1	<10	1,500	<20	7	7	500	5,000
582	---	3	---	7	<200	1,000	1	<10	2,000	<20	5	70	300	5,000
583	---	7	---	<.5	<200	1,500	<1	<10	30,000	<20	30	200	70	30,000
588	---	1	---	<.5	<200	150	10	<10	5,000	<20	>5	<5	<5	700
589	---	7	---	<.5	<200	1,000	2	<10	15,000	<20	20	7	30	15,000
590	---	1	---	<.5	<200	150	15	<10	1,500	<20	>5	<5	<5	700
591	---	2	---	<.5	<200	1,000	2	<10	7,000	<20	10	5	15	2,000
592	---	2	---	<.5	<200	700	2	<10	15,000	<20	7	5	10	2,000
593	---	7	---	<.5	<200	1,000	<1	<10	15,000	<20	15	10	30	7,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Altered rock--Continued							
389	3,000	3	<10	15	7,000	200	<10	70	2,000	100	30	7,000	<0.02	0.80	SE Mo.
391	700	150	10	3	1,500	200	<10	30	1,500	70	15	5,000	<.02	.90	Do.
392	700	5	15	3	30	<100	<10	700	3,000	150	30	<200	<.02	.14	Do.
393	700	<3	<10	<3	30	<100	<10	70	1,500	50	15	<200	<.02	.20	Do.
394	300	3	30	<3	70	<100	<10	200	1,500	30	30	<200	<.02	.42	NW W. P.
395	700	3	15	3	30	<100	<10	500	1,500	70	30	<200	<.02	.20	Do.
397	3,000	7	15	10	300	<100	<10	70	1,500	30	15	1,500	(.02)	.13	Do.
398	150	<3	<10	<3	100	<100	<10	70	2,000	70	15	<200	<.02	3.80	Do.
399	150	<3	<10	<3	30	<100	<10	70	1,500	50	15	<200	<.02	1.20	Do.
402	30	7	15	<3	700	<100	<10	300	3,000	70	10	<200	<.02	.40	SE Ir.
406	100	10	15	<3	150	<100	<10	700	3,000	150	30	<200	<.02	.20	Do.
407	150	7	15	<3	70	<100	<10	300	2,000	70	15	<200	<.02	.26	Do.
410	700	15	<10	15	300	<100	<10	70	1,500	70	30	300	<.02	.15	NW Ir.
411	700	7	<10	7	150	<100	<10	30	1,500	30	15	<200	<.02	.40	Do.
412	700	15	15	<3	300	<100	<10	150	3,000	150	30	300	<.02	.32	SW Ir.
424	1,500	<5	<10	30	200	100	<10	<50	5,000	15	20	300	<.02	---	SE Mo.
490	150	<5	10	3	100	<100	<10	100	3,000	100	20	<200	<.02	---	NW Te.
491	150	<5	15	2	30	<100	<10	100	3,000	15	20	<200	<.02	---	SE Mo.
495	3,000	70	10	2	300	<100	<10	<50	5,000	20	15	1,500	<.02	---	NE Te.
497	70	<5	10	2	10	<100	<10	100	3,000	70	15	<200	<.02	---	Do.
499	700	<5	<10	30	15	<100	<10	1,500	5,000	100	30	<200	<.02	---	SW W. P.
513	700	<5	<10	10	10	<100	<10	700	5,000	100	30	<200	<.02	.07	Do.
517	150	<5	<10	5	20	<100	<10	700	3,000	70	15	<200	<.02	.07	NE W. P.
518	70	<5	10	5	20	<100	<10	1,000	3,000	50	15	<200	<.02	<.01	Do.
519	100	<5	<10	3	15	<100	<10	700	3,000	100	15	<200	<.02	.04	Do.
524	700	<5	10	20	20	<100	<10	1,500	5,000	100	30	<200	<.02	.14	SW W. P.
527	700	<5	10	3	15	<100	<10	700	5,000	100	30	<200	<.02	.12	Do.
529	100	<5	15	3	30	<100	<10	300	2,000	30	20	<200	<.02	.04	Do.
531	30	<5	20	3	30	<100	<10	200	1,500	<10	15	<200	<.02	.04	Do.
532	100	<5	20	5	50	<100	<10	500	1,500	<10	20	<200	<.02	.09	Do.
535	300	<5	<10	10	30	<100	<10	500	3,000	70	15	<200	<.02	.04	SE Mo.
536	70	<5	15	2	20	<100	<10	50	5,000	70	15	<200	<.02	.34	Do.
538	2,000	<5	<10	2	30	<100	<10	3,000	3,000	70	30	<200	<.02	.07	NW Te.
539	700	<5	<10	7	15	<100	<10	1,500	5,000	100	30	<200	<.02	<.01	SE Mo.
541	100	<5	10	7	20	<100	<10	300	3,000	50	15	<200	<.02	<.01	NW U. P.
542	20	<5	20	3	200	<100	<10	700	5,000	100	15	<200	<.02	<.01	Do.
543	70	<5	10	10	30	<100	<10	500	3,000	70	15	<200	<.02	.07	Do.
544	700	<5	<10	30	10	<100	<10	300	5,000	100	30	<200	<.02	.07	NW W. P.
546	700	<5	<10	20	<10	<100	<10	500	3,000	70	15	<200	<.02	.09	Do.
549	500	<5	10	30	30	<100	<10	500	3,000	70	20	<200	<.02	.09	Do.
551	700	5	<10	3	70	<100	<10	1,000	2,000	30	15	<200	<.02	.09	Do.
555	500	<5	15	7	20	<100	<10	50	2,000	30	15	<200	<.02	.14	Do.
558	700	<5	<10	7	10	100	<10	50	5,000	100	20	<200	<.02	.12	Do.
560	1,000	<5	<10	20	10	100	<10	50	5,000	100	20	<200	<.02	1.30	Do.
563	1,000	<5	<10	10	20	<100	<10	2,000	5,000	100	20	<200	<.02	.04	Do.
564	500	<5	<10	15	15	<100	<10	1,500	5,000	100	20	<200	<.02	<.01	SW C. M.
565	500	<5	<10	20	500	<100	<10	2,000	5,000	100	30	300	<.02	.65	Do.
567	500	<5	<10	10	15	<100	<10	700	3,000	100	20	<200	<.02	.01	NW W. P.
569	150	<5	<10	3	20	100	<10	300	3,000	70	20	<200	<.02	.50	Do.
572	1,500	<5	<10	20	70	<100	<10	<50	1,500	20	10	500	<.02	.09	Do.
576	700	<5	<10	<2	150	<100	<10	150	150	10	<10	<200	<.02	.04	Do.
580	200	20	10	7	500	100	<10	<50	5,000	100	20	200	(.04)	<.01	SW U. P.
582	200	5	10	10	700	<100	<10	200	5,000	100	15	500	.75	<.01	Do.
583	1,500	<5	<10	70	15	<100	<10	1,500	7,000	150	30	1,500	<.02	<.01	Do.
588	700	15	50	3	30	<100	<10	70	1,000	<10	10	<200	<.02	<.01	SE W. P.
589	100	<5	10	30	20	<100	<10	1,000	5,000	150	20	<200	<.02	<.01	Do.
590	700	<5	50	2	30	<100	<10	70	1,000	<10	15	<200	<.02	<.01	Do.
591	500	<5	10	5	15	<100	<10	500	2,000	70	15	<200	<.02	<.01	Do.
592	500	<5	<10	3	15	<100	<10	300	2,000	50	15	<200	<.02	.04	Do.
593	700	<5	<10	15	30	<100	<10	1,500	5,000	100	30	<200	<.02	.07	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Altered rock--Continued								
594	---	3	---	<0.5	<200	1,000	3	<10	15,000	<20	10	7	30	3,000
595	---	3	---	<.5	<200	300	2	<10	7,000	<20	<5	<5	7	3,000
596	---	1	---	<.5	<200	100	15	<10	15,000	<20	5	5	10	700
597	---	7	---	<.5	<200	700	1	<10	20,000	<20	30	15	70	20,000
598	---	7	---	<.5	<200	700	<1	<10	20,000	<20	15	30	50	15,000
600	---	7	---	<.5	<200	700	1	<10	15,000	<20	20	30	50	10,000
604	---	7	---	.7	<200	300	1	<10	2,000	<20	15	<5	20	5,000
605	---	5	---	<.5	<200	1,000	1	<10	15,000	<20	10	10	30	10,000
614	---	1.5	---	<.5	<200	700	<1	<10	1,000	<20	<5	<5	15	2,000
700	>10	3	>10	<1	<200	1,000	1.5	<10	15,000	<20	15	30	70	10,000
701	>10	2	>10	<1	<200	700	1.5	<10	3,000	<20	7	3	50	3,000
702	>10	5	>10	<1	<200	500	<1	<10	1,500	<20	<3	20	50	300
703	5	1.5	>10	<1	<200	100	<1	<10	700	<20	<3	7	70	300
704	>10	3	>10	<1	<200	1,000	1.5	<10	10,000	<20	5	7	30	10,000
705	>10	5	>10	<1	<200	2,000	1.5	<10	20,000	<20	15	7	50	30,000
707	>10	7	>10	<1	<200	1,500	1.5	<10	70,000	<20	15	30	70	15,000
709	>10	7	>10	<1	<200	1,000	1.5	<10	50,000	<20	20	20	15	30,000
711	>10	5	>10	<1	<200	1,000	1.5	<10	30,000	<20	15	2	30	15,000
712	>10	5	>10	<1	<200	1,500	1.5	<10	30,000	<20	15	10	10	15,000
714	>10	3	>10	<1	<200	700	1.5	<10	3,000	<20	7	3	15	3,000
717	>10	2	>10	<1	<200	1,500	<1	<10	700	<20	5	10	10	7,000
718	>10	1.5	>10	<1	<200	1,000	1.5	<10	700	<20	<3	<1	7	3,000
719	7	3	>10	<1	<200	700	1.5	<10	700	<20	<3	30	15	7,000
721	>10	7	>10	<1	<200	300	1.5	10	10,000	<20	50	30	500	30,000
737	>10	3	>10	<1	<200	1,000	1.5	<10	30,000	<20	7	5	30	7,000
738	.3	5	>10	<1	500	1,000	<1	<10	500	<20	<3	2	150	150
739	>10	7	<10	<1	<200	1,000	1.5	<10	20,000	<20	10	7	100	15,000
740	.7	.7	>10	<1	<200	500	<1	<10	1,500	<20	<3	7	15	700
741	.7	1.5	>10	<1	<200	150	<1	10	2,000	<20	15	7	50	3,000
742	>10	3	>10	<1	<200	300	<1	<10	3,000	<20	<3	7	50	7,000
743	>10	1.5	>10	<1	<200	1,500	1	<10	300	<20	<3	2	5	20,000
744	>10	2	>10	<1	<200	1,000	<1	7	700	<20	<3	7	15	10,000
747	>10	3	>10	<1	<200	700	1.5	<10	5,000	<20	10	3	30	15,000
748	>10	.7	>10	<1	<200	1,500	1.5	<10	3,000	<20	<3	2	5	7,000
749	>10	5	>10	<1	<200	1,000	1.5	<10	15,000	<20	<3	7	50	15,000
750	>10	5	>10	<1	<200	1,500	1.5	<10	15,000	<20	10	7	50	20,000
751	>10	7	>10	<1	<200	1,000	1.5	<10	7,000	<20	7	7	20	15,000
752	>10	7	>10	<1	<200	1,500	1.5	<10	3,000	<20	10	7	30	30,000
762	>10	7	>10	<1	<200	2,000	<1	<10	3,000	<20	7	20	10	20,000
770	7	7	>10	<1	<200	700	<1	7	1,500	<20	3	7	50	20,000
774	>10	3	>10	<1	<200	1,500	1.5	<10	1,500	<20	7	15	30	15,000
775	>10	7	>10	<1	<200	1,000	<1	<10	1,500	<20	7	30	30	3,000
778	>10	7	>10	<1	<200	2,000	1	<10	1,500	<20	15	10	70	7,000
781	>10	7	>10	<1	<200	1,500	1	<10	7,000	<20	5	30	30	3,000
783	>10	5	>10	<1	<200	1,000	1	<10	20,000	<20	7	15	30	15,000
784	>10	5	>10	<1	<200	1,000	1	<10	50,000	<20	15	15	50	30,000
785	7	1.5	>10	<1	<200	150	20	7	3,000	<20	<3	<1	1	2,000
786	7	1.5	>10	<1	<200	1,500	15	7	3,000	<20	<3	3	3	10,000
787[5]	7	.7	>10	<1	<200	300	70	<10	15,000	<20	<3	<1	3	1,500
791	>10	7	>10	<1	<200	1,500	<1	<10	10,000	<20	7	7	15	30,000
792	>10	3	>10	<1	<200	1,500	<1	<10	700	<20	<3	10	20	7,000
799	>10	7	>10	<1	<200	3,000	<1	<10	30,000	<20	15	30	20	7,000
800	>10	7	>10	<1	<200	3,000	<1	<10	30,000	<20	15	30	30	15,000
801	>10	7	>10	<1	<200	1,500	<1	<10	50,000	<20	15	70	30	15,000
803	>10	3	>10	<1	<200	200	1.5	<10	3,000	<20	5	15	20	10,000
806	5	7	>10	<1	<200	200	1.5	<10	2,000	<20	5	20	7	5,000
811	3	3	>10	15	200	30,000	<1	15	1,500	<20	15	15	300	1,500
813	>10	7	>10	<1	<200	3,000	1	<10	30,000	<20	10	15	15	1,500
817	>10	7	>10	<1	<200	1,500	1.5	<10	30,000	<20	15	15	30	1,000
818	>10	7	>10	<1	<200	2,000	1	<10	30,000	<20	15	20	50	15,000

[5] Sample 787 contains 300 ppm W. All other samples contain less than 100 ppm W.

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Altered rock--Continued							
594	200	<5	<10	7	30	<100	<10	700	3,000	50	20	<200	<0.02	<0.01	SE W. P.
595	150	150	10	2	20	<100	<10	300	2,000	50	15	<200	<.02	.35	Do.
596	700	10	50	3	30	<100	<10	70	1,000	<10	10	<200	<.02	.04	Do.
597	2,000	<5	10	20	30	<100	<10	1,000	5,000	150	30	<200	<.02	.20	Do.
598	1,000	<5	<10	20	15	<100	<10	1,500	3,000	150	15	<200	<.02	<.01	Do.
600	1,000	<5	<10	20	15	<100	<10	1,000	3,000	150	20	<200	<.02	.04	Do.
604	100	5	<10	7	70	<100	<10	50	5,000	70	20	<200	<.02	.15	SW U. P.
605	2,000	<5	<10	10	150	<100	<10	300	3,000	70	15	300	<.02	.05	Do.
614	70	<5	10	3	20	<100	<10	100	2,000	<10	15	<200	<.02	.08	Do.
700	300	<3	15	3	300	<100	<10	300	5,000	150	30	<200	<.02	.6	SW W. P.
701	150	<3	15	2	50	<100	<10	150	3,000	30	30	<200	<.02	.82	Do.
702	20	10	10	<3	30	<100	<10	500	5,000	200	20	<200	<.02	.46	Do.
703	30	5	15	<3	30	<100	<10	200	3,000	30	15	<200	<.02	.72	Do.
704	70	3	20	<3	30	<100	<10	300	5,000	150	50	<200	(.02)	1.15	Do.
705	500	7	10	3	20	<100	<10	700	5,000	150	30	<200	(.06)	.74	Do.
707	3,000	<3	10	15	30	<100	<10	500	7,000	300	70	<200	(.04)	.56	Do.
709	1,500	<3	10	3	15	<100	<10	700	7,000	300	30	<200	<.02	.32	Do.
711	1,000	<3	10	<3	50	<100	<10	700	3,000	100	30	<200	<.02	.30	Do.
712	700	<3	15	3	30	<100	<10	1,000	3,000	150	30	<200	<.02	.10	Do.
714	100	<3	15	3	15	<100	<10	100	3,000	50	30	<200	<.02	.28	Do.
717	200	<3	15	<3	20	<100	<10	70	7,000	500	30	<200	<.02	.50	NW H. P.
718	50	5	30	<3	30	<100	<10	300	3,000	20	30	<200	(.02)	.14	Do.
719	70	<3	10	3	20	100	<10	150	5,000	150	15	<200	(.04)	.40	Do.
721	1,000	<10	15	15	30	<100	<10	70	7,000	300	50	<200	(.02)	.65	Do.
737	500	<3	10	3	50	<100	<10	150	2,000	70	30	<200	<.02	.14	SW U. P.
738	30	15	20	<3	70	<100	<10	150	5,000	<7	15	<200	<.02	.80	Do.
739	300	<3	15	<3	20	<100	<10	700	5,000	150	30	<200	<.02	.32	Do.
740	20	<3	15	<3	30	<100	<10	300	3,000	100	15	<200	<.02	.28	Do.
741	1,000	5	10	5	70	<100	<10	500	3,000	70	30	<200	<.02	.18	Do.
742	150	7	10	<3	30	<100	<10	300	3,000	70	15	<200	<.02	.08	NE W. P.
743	150	5	20	<3	30	<100	<10	150	2,000	30	50	<200	<.02	.09	SW U. P.
744	30	7	15	<3	200	<100	15	300	5,000	150	50	<200	<.02	.10	NE W. P.
747	700	3	10	3	15	<100	<10	200	3,000	70	30	<200	<.02	.18	SW U. P.
748	50	<3	15	<3	30	<100	<10	150	2,000	15	30	<200	<.02	.09	Do.
749	150	<3	10	<3	20	<100	<10	3,000	3,000	150	30	<200	<.02	.08	Do.
750	100	<3	15	3	20	<100	<10	1,000	7,000	200	50	<200	<.02	.14	NW U. P.
751	150	<3	15	3	20	<100	<10	1,000	7,000	150	30	<200	<.02	.09	Do.
752	1,000	<3	15	7	30	<100	<10	700	5,000	150	30	<200	<.02	.14	Do.
762	700	<3	10	3	20	<100	<10	200	3,000	150	15	<200	<.02	.09	Do.
770	1,000	<3	10	3	30	<100	<10	300	3,000	150	15	<200	<.02	.14	Do.
774	1,000	3	20	3	30	<100	<10	1,000	3,000	70	30	<200	<.02	.10	Do.
775	100	<3	10	3	100	<100	<10	700	3,000	150	30	<200	<.02	.22	Do.
778	300	<3	15	3	15	<100	<10	500	3,000	70	30	<200	<.02	.09	SE W. P.
781	100	<3	15	3	15	<100	<10	500	3,000	70	20	<200	<.02	.14	Do.
783	100	<3	10	3	15	<100	<10	700	5,000	150	30	<200	<.02	.09	Do.
784	1,000	<3	10	7	15	<100	<10	700	7,000	150	50	<200	<.02	.08	Do.
785	3,000	10	100	<3	10	<100	<10	70	700	7	15	<200	<.02	.18	Do.
786	3,000	<3	15	<3	30	<100	<10	150	2,000	30	30	<200	<.02	.20	Do.
787	70,000	15	70	<3	30	<100	<10	1,000	700	15	70	<200	<.02	.06	Do.
791	1,000	<3	15	3	30	<100	<10	700	5,000	200	30	<200	<.02	.05	NW U. P.
792	70	5	30	<3	30	<100	<10	150	3,000	150	20	<200	(.08)	.04	Do.
799	300	<3	15	10	20	<100	<10	1,000	3,000	150	30	<200	<.02	.04	NW W. P.
800	700	<3	10	15	15	<100	<10	1,000	3,000	150	30	<200	<.02	.03	Do.
801	1,500	<3	10	15	15	<100	<10	1,000	5,000	200	30	<200	<.02	.20	Do.
803	500	<3	15	7	20	<100	<10	70	3,000	70	70	<200	<.02	.03	SE Da.
806	7,000	<3	15	15	70	<100	<10	70	2,000	30	30	700	<.02	.09	NW W. P.
811	1,500	15	7	15	3,000	150	<10	150	1 500	50	10	700	.4	1.8	Do.
813	700	<3	10	5	20	<100	<10	1,000	5,000	150	30	<200	<.02	.05	Do.
817	700	<3	10	15	15	<100	<10	1,000	5,000	150	50	<200	<.02	.04	SW C. M.
818	1,000	<3	15	15	15	<100	<10	700	5,000	150	30	<200	<.02	.05	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Altered rock--Continued								
822	>10	7	>10	<1	<200	700	<1	<10	30,000	<20	15	30	30	20,000
825	>10	3	>10	<1	<200	1,500	<1	<10	1,000	<20	<3	10	7	15,000
826	>10	7	>10	<1	<200	1,500	<1	<10	15,000	<20	10	7	20	15,000
830	>10	5	>10	<1	<200	700	<1	<10	2,000	<20	<3	7	70	7,000
831	>10	2	>10	<1	<200	300	1	<10	700	<20	<3	7	7	7,000
832	3	1.5	>10	<1	<200	700	<1	7	500	<20	<3	5	30	300
833	>10	5	>10	<1	<200	700	<1	<10	30,000	<20	15	30	70	20,000
834	>10	1.5	>10	<1	<200	1,000	<1	<10	1,500	<20	<3	30	15	7,000
835	>10	3	>10	<1	<200	1,500	<1	<10	50,000	<20	7	30	30	15,000
840	>10	3	>10	3	<200	1,500	<1	<10	30,000	<20	15	3	15	15,000
843	>10	3	>10	<1	<200	2,000	1.5	<10	15,000	<20	3	15	15	7,000
853	7	3	>10	<1	<200	500	2	<10	1,500	<20	3	3	15	5,000
857	>10	7	>10	<1	<200	700	<1	<10	30,000	<20	30	5	70	30,000
838	7	1	>10	<1	<200	500	1.5	<10	15,000	<20	<3	1.5	5	7,000
859	>10	7	>10	<1	<200	700	1.5	<10	30,000	<20	15	30	700	15,000
860	7	1.5	>10	<1	<200	2,000	2	<10	20,000	<20	<3	2	15	10,000
861	>10	5	>10	<1	<200	1,500	1.5	<10	30,000	<20	15	15	70	15,000
863	7	1.5	>10	<1	<200	700	<1	<10	1,500	<20	<3	2	7	3,000
864	7	3	>10	<1	<200	700	1.5	<10	1,000	<20	5	3	15	3,000
865	>10	3	>10	<1	<200	500	1.5	<10	20,000	<20	10	20	30	30,000
872	>10	7	>10	<1	<200	2,000	1	<10	30,000	<20	20	30	100	30,000
873	7	3	>10	<1	<200	300	1	<10	15,000	<20	10	15	70	30,000
874	7	7	>10	<1	<200	150	1	<10	7,000	<20	30	7	70	15,000
876	7	7	>10	<1	<200	700	<1	<10	30,000	<20	15	70	150	30,000
878	5	.7	>10	<1	<200	70	1.5	10	300	<20	<3	1.5	70	1,500
879	>10	1.5	>10	<1	<200	1,500	<1	<10	700	<20	<3	10	5	3,000
880	>10	3	>10	<1	<200	1,500	<1	<10	1,500	<20	7	7	30	3,000
883	7	1.5	>10	3	<200	1,000	<1	<10	700	<20	<3	7	15	3,000
884	7	1.5	>10	5	<200	500	1.5	<10	300	<20	3	7	30	3,000
885	7	1.5	>10	<1	<200	3,000	1.5	<10	1,500	<20	<3	15	7	3,000
886	7	7	>10	<1	<200	500	1	<10	50,000	<20	15	30	30	3,000
889	7	1.5	>10	<1	<200	1,500	1.5	<10	300	<20	<3	3	7	7,000
893	3	3	>10	2	700	150	<1	<10	1,500	<20	10	7	1,500	300
898	7	3	>10	<1	<200	700	<1	<10	15,000	<20	15	30	30	15,000
899	7	3	>10	<1	<200	700	<1	<10	15,000	<20	15	10	70	30,000
900	7	1.5	>10	<1	<200	1,000	1	<10	15,000	<20	3	1.5	7	7,000
901	7	3	>10	<1	<200	700	1	<10	3,000	<20	10	<1	15	3,000
904	7	1.5	>10	<1	<200	1,000	1.5	<10	15,000	<20	3	3	15	7,000
905	>10	7	>10	<1	<200	700	1	<10	30,000	<20	20	30	70	30,000
915	7	1.5	>10	<1	<200	1,500	<1	<10	3,000	<20	<3	<1	7	5,000
916	7	.7	>10	<1	<200	1,000	<1	<10	3,000	<20	<3	<1	7	5,000
917	7	2	>10	<1	<200	1,000	<1	<10	3,000	<20	<3	3	7	10,000
918	7	1.5	>10	<1	<200	1,000	<1	<10	3,000	<20	<3	2	15	7,000
919	7	1.5	>10	<1	<200	1,000	1	<10	3,000	<20	3	<1	7	3,000
921	7	.7	>10	<1	<200	500	1.5	<10	1,500	<20	<3	<1	3	1,500
923	>10	1.5	>10	<1	<200	1,000	1	<10	3,000	<20	3	1.5	15	3,000
926	>10	7	>10	<1	<200	1,000	1	<10	30,000	<20	15	3	70	30,000
927	7	.7	>10	<1	<200	70	15	<10	7,000	<20	<3	<1	2	2,000
937	>10	3	>10	<1	<200	2,000	<1	<10	15,000	<20	5	1.5	7	7,000
940	>10	7	>10	<1	<200	1,000	1	<10	50,000	<20	30	10	70	30,000
						Unaltered rock								
093	7	5	>10	<1	<2,000	1,000	1	<10	50,000	<50	10	50	3	20,000
127	7	7	>10	<1	<200	1,500	<1	<10	50,000	<20	15	7	50	15,000
128	7	7	>10	<1	<200	1,500	<1	<10	30,000	<20	15	15	30	15,000
148	>10	5	>10	<1	<2,000	1,500	1	<10	7,000	<50	7	5	500	10,000
154	>10	5	>10	<1	<2,000	1,000	1	<10	30,000	<50	3	3	200	10,000
176	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	5	1.5	10	7,000
190	>10	5	>10	<1	<2,000	1,000	1	<10	30,000	<50	10	15	50	15,000
194	>10	5	>10	<1	<2,000	700	1	<10	30,000	<50	15	15	70	15,000
223	7	5	>10	<1	<2,000	700	1	<10	30,000	<50	7	5	30	10,000
225	7	5	>10	<1	<2,000	700	1	<10	20,000	<50	15	7	20	10,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Altered rock--Continued							
822	700	<3	7	10	10	<100	<10	700	5,000	300	30	<200	<0.02	1.0	SW C. M.
825	100	<3	10	<3	30	<100	<10	500	5,000	150	20	<200	<.02	0.05	NW U. P.
826	700	<3	10	3	7	<100	<10	200	3,000	150	30	<200	<.02	.06	Do.
830	70	30	15	<3	200	<100	<10	700	5,000	150	30	<200	(.04)	.04	NE W. P.
831	50	3	10	<3	30	<100	<10	700	3,000	150	30	<200	<.02	.05	Do.
832	30	<3	10	<3	70	<100	<10	150	3,000	50	15	<200	(.02)	.19	Do.
833	1,000	<3	15	15	10	<100	<10	150	3,000	150	70	<200	<.02	.04	NW U. P.
834	30	<3	<10	<3	15	<100	<10	150	3,000	70	15	<200	(.02)	.03	NE W. P.
835	700	<3	<10	7	15	<100	<10	300	3,000	70	30	<200	(.02)	.05	Do.
840	300	<3	15	3	20	<100	<10	1,000	3,000	150	30	<200	<.02	.55	Do.
843	30	<3	20	3	30	<100	<10	700	3,000	70	20	<200	<.02	.20	Do.
853	300	<3	15	3	20	<100	<10	150	1,500	30	20	<200	<.02	.05	SW U. P.
857	1,000	<3	10	15	15	<100	<10	500	5,000	150	30	<200	<.02	.07	NW H. P.
858	300	<3	15	<3	30	<100	<10	200	1,000	15	30	<200	<.02	.05	Do.
859	1,000	<3	15	15	30	<100	15	300	7,000	300	70	<200	<.02	.16	Do.
860	300	<3	15	<3	30	<100	<10	3,000	1,500	30	20	<200	<.02	.05	Do.
861	700	<3	15	2	30	<100	<10	700	5,000	300	30	<200	<.02	.08	Do.
863	30	3	15	<3	30	<100	<10	100	1,500	50	20	<200	<.02	.07	Do.
864	150	<3	10	3	30	<100	<10	150	2,000	70	30	<200	<.02	.10	Do.
865	700	<3	10	7	20	<100	<10	150	3,000	150	30	<200	<.02	.06	Do.
872	1,500	<3	10	15	30	<100	<10	500	7,000	300	70	<200	<.02	.05	Do.
873	700	<3	10	7	15	<100	<10	100	3,000	70	20	<200	<.02	.07	Do.
874	3,000	<3	10	15	15	<100	<10	20	5,000	150	30	<200	<.02	.12	Do.
876	1,500	<3	10	15	30	<100	<10	300	7,000	300	30	<200	<.02	.18	Do.
878	70	<3	15	<3	300	<100	<10	70	1,000	10	15	<200	(.02)	.10	Do.
879	300	<3	15	<3	200	<100	<10	150	5,000	150	30	<200	<.02	.10	Do.
880	500	<3	15	2	70	<100	<10	70	5,000	150	30	<200	<.02	.08	Do.
883	700	50	10	<3	700	<100	<10	50	3,000	70	15	<200	(.04)	.14	Do.
884	150	700	10	<3	2,000	<100	<10	150	3,000	70	15	1,500	(.02)	.40	Do.
885	150	7	10	<3	70	<100	<10	70	3,000	70	15	<200	<.02	.10	Do.
886	1,000	<3	10	15	30	<100	<10	300	7,000	150	30	<200	<.02	.09	Do.
889	50	<3	10	<3	20	<100	<10	100	3,000	70	20	<200	.3	.04	Do.
893	20	<3	10	3	500	<100	<10	500	3,000	70	10	<200	(.06)	.66	SW Ir.
898	1,500	<3	15	7	30	<100	<10	500	5,000	150	30	<200	(.02)	.10	SE W. P.
899	1,500	<3	10	15	20	<100	<10	300	3,000	150	30	<200	(.02)	.04	Do.
900	300	<3	10	<3	30	<100	<10	700	1,500	30	30	<200	<.02	.03	Do.
901	300	<3	15	3	30	<100	<10	70	1,500	70	15	<200	<.02	.08	Do.
904	150	<3	10	<3	30	<100	<10	700	1,500	20	20	<200	(.06)	.05	Do.
905	700	<3	10	15	15	<100	<10	500	5,000	300	30	<200	<.02	.08	SW W. P.
915	150	<3	10	<3	20	<100	<10	150	1,500	15	15	<200	(.04)	.04	NW U. P.
916	300	<3	10	<3	30	<100	<10	150	1,500	15	15	<200	<.02	.09	SW U. P.
917	150	<3	10	<3	30	<100	<10	200	1,500	30	30	<200	(.04)	.04	Do.
918	200	<3	10	<3	30	<100	<10	150	1,500	15	30	<200	<.02	.03	Do.
919	300	<3	15	<3	20	<100	<10	150	1,500	15	15	<200	<.02	.03	Do.
921	70	<3	15	<3	15	<100	<10	70	1,500	15	30	<200	<.02	.03	Do.
923	7,000	<3	10	2	30	<100	<10	500	1,500	30	30	<200	(.04)	.04	Do.
926	700	<3	10	3	10	<100	<10	1,000	3,000	300	50	<200	<.02	.06	Do.
927	700	3	70	<3	30	<100	<10	50	700	<7	15	<200	<.02	.05	Do.
937	700	<3	15	<3	30	<100	<10	700	3,000	70	30	<200	<.02	.05	NE W. P.
940	1,000	<3	10	15	15	<100	<10	1,000	5,000	300	30	<200	<.02	.20	Do.
								Unaltered rock							
093	3,000	3	10	10	15	<200	<10	200	3,000	150	30	<200	(.02)	.15	NW H. P.
127	700	<3	10	10	15	<100	<10	700	3,000	200	30	<200	<.02	.24	SE Ou.
128	700	<3	10	7	15	<100	<10	700	3,000	150	30	<200	<.02	.10	Do.
148	150	50	10	<3	10	<100	<10	500	1,500	70	30	<200	(.06)	.40	Do.
154	300	5	<10	<3	<10	<100	<10	700	1,500	30	30	<200	(.08)	.71	Do.
176	700	<3	10	<3	20	<100	<10	200	2,000	50	30	<200	(.04)	.09	NE Te.
190	700	3	10	7	15	<100	<10	500	3,000	150	20		(.04)	.16	SE Ou.
194	700	3	10	7	15	<100	<10	500	3,000	150	20	<200	(.08)	.10	Do.
223	1,500	<3	15	3	10	<100	<10	200	3,000	70	20	<200	<.02	.07	SW Ir.
225	3,000	3	<10	3	50	<100	<10	150	3,000	100	30	<200	<.02	.20	NE Ir.

TABLE 3.—*Analyses of samples from the*

	Semiquantitative spectrographic analyses													
	(percent)			(ppm)										
Sample	Al	Fe	Si	Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Unaltered rock--Continued								
230	7	5	>10	<1	<2,000	300	<1	<10	700	<50	3	15	50	30,000
267	7	>10	>10	<1	<2,000	500	<1	<10	50,000	<50	20	5	50	20,000
285	>10	7	>10	<1	<2,000	700	<1	<10	30,000	<50	15	10	10	15,000
287	>10	7	>10	<1	<2,000	1,000	1	<10	30,000	<50	15	30	50	15,000
291	>10	5	>10	<1	<2,000	700	<1	<10	20,000	<50	10	10	20	10,000
293	>10	7	>10	<1	<2,000	1,500	1	<10	20,000	<50	15	20	20	10,000
334	7	5	>10	200	<2,000	1,000	<1	<10	1,500	<50	3	7	30	7,000
337	>10	5	>10	<1	<2,000	500	1.5	<10	3,000	<50	15	10	30	15,000
340	>10	7	>10	<1	<2,000	3,000	1.5	<10	3,000	<50	10	10	20	10,000
343	>10	5	>10	2	<2,000	2,000	1	<10	10,000	<50	10	7	10	15,000
346	>10	7	>10	<1	<2,000	2,000	1	<10	10,000	<50	15	15	50	15,000
349	>10	7	>10	<1	<2,000	2,000	1	<10	10,000	<50	20	15	70	20,000
350	>10	7	>10	<1	<2,000	3,000	1	<10	2,000	<50	7	15	70	10,000
351	>10	2	>10	<1	<2,000	3,000	1	<10	700	<50	<3	15	7	10,000
352	>10	5	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	15	70	20,000
353	>10	7	>10	<1	<2,000	2,000	1	<10	50,000	<50	20	15	100	20,000
356	>10	7	>10	<1	<2,000	5,000	1	<10	20,000	<50	20	15	50	20,000
357	>10	5	>10	<1	<2,000	2,000	1.5	<10	3,000	<50	7	5	30	7,000
360	>10	5	>10	<1	<2,000	2,000	1	<10	1,500	<50	5	5	10	10,000
364	5	1	>10	7	<2,000	150	<1	30	500	<50	<3	3	50	1,000
365	7	.7	>10	<1	<2,000	100	<1	10	700	<50	<3	5	10	1,500
366	7	1.5	>10	2	<2,000	150	2	<10	500	<50	<3	5	10	7,000
367	7	1.5	>10	<1	<2,000	1,500	1.5	<10	500	<50	<3	3	7	5,000
368	>10	3	>10	<1	<2,000	3,000	1	<10	700	<50	<3	5	10	7,000
378	>10	3	>10	<1	<2,000	2,000	<1	<10	2,000	<50	5	10	10	7,000
381	7	1.5	>10	<1	<200	150	1.5	<10	700	<20	<3	15	15	7,000
390	>10	>10	>10	<1	<2,000	1,000	<1	<10	70,000	<50	30	20	100	30,000
492	---	10	---	<.5	<200	2,000	1	<10	15,000	<20	10	10	20	7,000
496	---	10	---	<.5	<200	1,000	1	<10	20,000	<20	20	70	200	2,000
515	---	10	---	<.5	<200	1,000	1	<10	20,000	<20	15	5	20	15,000
516	---	7	---	<.5	<200	1,000	<1	<10	15,000	<20	15	10	30	10,000
520	---	5	---	<.5	<200	2,000	1	<10	15,000	<20	15	30	50	5,000
521	---	7	---	<.5	<200	2,000	1	<10	20,000	<20	15	20	50	7,000
526	---	10	---	<.5	<200	1,500	<1	<10	15,000	<20	15	5	20	20,000
528	---	5	---	<.5	<200	2,000	<1	<10	15,000	<20	10	<5	30	10,000
537	---	15	---	<.5	<200	2,000	1	<10	50,000	<20	20	50	50	15,000
540	---	10	---	<.5	<200	2,000	1	<10	20,000	<20	15	15	50	15,000
545	---	15	---	<.5	<200	700	1	<10	50,000	<20	10	5	20	15,000
547	---	10	---	<.5	<200	2,000	1.5	<10	20,000	<20	7	<5	20	15,000
550	---	5	---	<.5	<200	1,500	1	<10	15,000	<20	5	<5	20	10,000
556	---	7	---	<.5	<200	2,000	1.5	<10	20,000	<20	7	<5	50	15,000
601	---	5	---	<.5	<200	200	200	<10	10,000	<20	7	5	10	5,000
609	---	15	---	<.5	<200	2,000	2	<10	50,000	<20	20	15	50	20,000
706	>10	7	>10	<1	<200	1,000	1.5	<10	70,000	<20	15	15	50	15,000
708	>10	7	>10	<1	<200	1,000	1.5	<10	70,000	<20	30	20	20	30,000
710	>10	3	>10	<1	<200	700	1.5	<10	30,000	<20	15	2	20	30,000
713	>10	3	>10	<1	<200	1,000	1.5	<10	15,000	<20	15	7	50	10,000
716	>10	7	>10	<1	<200	1,000	1.5	<10	50,000	<20	70	10	70	30,000
796	>10	7	>10	<1	<200	1,500	<1	<10	30,000	<20	15	70	30	30,000
819	>10	7	>10	<1	<200	1,500	<1	<10	30,000	<20	15	3	70	7,000
820	>10	5	>10	<1	<200	700	<1	<10	30,000	<20	15	15	30	20,000
821	>10	7	>10	<1	<200	1,500	<1	<10	50,000	<20	15	7	30	15,000
881	>10	3	>10	<1	<200	1,000	1	<10	15,000	<20	15	10	30	7,000
882	>10	3	>10	<1	<200	1,000	1	<10	30,000	<20	10	10	30	7,000
887	7	7	>10	<1	<200	700	1.5	<10	50,000	<20	15	30	70	30,000
888	>10	7	>10	<1	<200	500	1.5	<10	15,000	<20	30	30	150	30,000
894	>10	5	>10	<1	<200	2,000	1	<10	15,000	<20	15	10	70	15,000
895	>10	5	>10	<1	<200	2,000	1	<10	15,000	<20	15	15	15	15,000
896	>10	3	>10	<1	<200	700	<1	<10	3,000	<20	7	3	20	7,000
897	>10	7	>10	<1	<200	700	<1	<10	30,000	<20	30	70	70	30,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Unaltered rock--Continued							
230	1,000	3	10	5	15	<100	<10	30	3,000	150	20	<200	<0.02	.21	SE Ir.
267	1,500	<3	<10	10	<10	<100	<10	500	5,000	300	30	<200	(.04)	.54	Do.
285	1,000	3	<10	3	50	<100	<10	300	3,000	150	20	<200	<.02	.06	SW Ir.
287	1,500	3	10	15	20	<100	<10	500	3,000	200	30	<200	(.04)	.12	Do.
291	1,000	<3	15	5	20	<100	<10	300	3,000	150	30	<200	(.04)	.07	Do.
293	1,000	<3	15	7	15	<100	<10	500	3,000	150	30	<200	<.02	.13	NE Ir.
334	700	3	10	<3	50	<100	<10	150	3,000	150	20	<200	8.6	.65	NW H. P.
337	2,000	<3	10	3	15	<100	<10	30	5,000	200	20	<200	(.04)	.06	Do.
340	3,000	5	10	3	20	<100	<10	200	3,000	200	20	<200	(.04)	.09	Do.
343	700	70	10	3	15	<100	<10	300	5,000	200	20	<200	(.06)	.13	Do.
346	2,000	3	10	7	15	<100	<10	200	5,000	200	20	<200	(.04)	.13	Do.
349	3,000	3	10	10	30	<100	<10	200	5,000	200	20	<200	(.08)	.06	Do.
350	1,500	3	10	<3	10	<100	<10	200	5,000	200	20	<200	(.08)	.13	Do.
351	500	<3	10	<3	15	<100	<10	200	5,000	200	50	<200	.1	.11	Do.
352	1,000	3	10	7	15	<100	<10	700	5,000	200	30	<200	(.08)	.46	Do.
353	1,500	<3	10	10	10	<100	<10	1,000	5,000	200	30	<200	<.02	.70	Do.
356	1,500	3	10	10	15	<100	<10	70	5,000	300	30	<200	(.08)	.28	Do.
357	2,000	<3	20	<3	15	<100	<10	150	3,000	100	20	<200	(.02)	.09	Do.
360	7,000	<3	20	<3	15	<100	<10	150	3,000	100	30	<200	(.08)	.16	Do.
364	150	15	15	<3	700	<100	<10	50	2,000	50	15	<200	.2	.49	Do.
365	150	5	15	<3	1,500	<100	<10	70	2,000	50	15	<200	(.08)	.23	Do.
366	300	<3	15	<3	70	<100	<10	30	3,000	70	15	<200	.1	.29	Do.
367	300	10	15	<3	20	<100	<10	50	2,000	50	15	<200	(.08)	.13	Do.
368	500	5	10	<3	100	<100	<10	100	2,000	70	20	<200	(.06)	.12	Do.
378	700	70	10	<3	20	<100	<10	150	3,000	100	20	<200	(.04)	.22	Do.
381	300	3	15	<3	300	<100	<10	30	3,000	70	30	<200	<.02	.12	Do.
390	1,500	<3	10	20	15	<100	<10	1,000	5,000	300	50	<200	(.06)	.35	SE Mo.
492	700	<5	15	2	70	<100	<10	1,000	5,000	150	30	<200	<.02	.03	Do.
496	2,000	<5	15	50	50	<100	<10	1,500	10,000	200	30	<200	<.02	.03	NE Te.
515	1,000	<5	15	3	70	<100	<10	1,000	7,000	200	20	<200	<.02	.04	SW W. P.
516	500	<5	15	5	50	<100	<10	1,000	5,000	150	20	<200	<.02	<.01	SE W. P.
520	1,000	<5	15	20	70	<100	<10	1,000	5,000	100	20	<200	<.02	.03	NE W. P.
521	700	<5	15	15	50	<100	<10	1,500	5,000	200	20	<200	<.02	.04	SW W. P,
526	1,000	<5	15	10	50	<100	<10	1,000	5,000	200	30	<200	<.02	.03	Do.
528	1,000	<5	15	5	70	<100	<10	1,000	3,000	70	20	<200	<.02	<.01	Do.
537	1,000	<5	15	30	50	<100	<10	1,500	7,000	200	50	<200	<.02	.04	NW Te.
540	2,000	<5	15	20	50	<100	<10	1,000	10,000	200	30	<200	<.02	<.01	NW U. P.
545	1,500	<5	15	10	30	<100	<10	500	10,000	200	30	<200	<.02	<.01	NW W. P.
547	1,500	<5	15	10	50	<100	<10	1,500	5,000	100	20	<200	<.02	<.01	Do.
550	1,000	<5	15	7	70	<100	<10	700	5,000	30	20	<200	<.02	<.01	Do.
556	1,000	<5	15	5	50	<100	<10	1,000	5,000	100	20	<200	<.02	<.01	Do.
601	1,500	100	50	15	70	<100	<10	70	2,000	70	10	<200	<.02	<.01	SE W. P.
609	1,000	<5	15	20	50	<100	<10	2,000	10,000	200	30	<200	<.02	<.01	SW U. P.
706	1,500	<3	10	7	20	<100	<10	700	7,000	300	30	<200	(.02)	.46	SW W. P.
708	3,000	<3	10	5	15	<100	<10	700	7,000	300	70	<200	<.02	.34	Do.
710	700	<3	10	<3	20	<100	<10	500	3,000	100	50	<200	<.02	.09	Do.
713	700	<3	15	7	30	<100	<10	700	5,000	150	70	<200	<.02	.40	Do.
716	1,000	<3	10	15	20	<100	<10	1,000	7,000	300	70	<200	<.02	.28	SE W. P.
796	1,000	<3	30	15	15	<100	<10	1,000	5,000	200	30	<200	<.02	.04	SE C. M.
819	1,500	<3	10	7	20	<100	<10	700	7,000	300	30	<200	(.06)	.04	SW C. M.
820	1,000	<3	15	7	20	<100	<10	700	3,000	100	20	<200	<.02	.05	Do.
821	1,000	<3	10	3	20	<100	<10	1,000	5,000	200	50	<200	<.02	.07	Do.
881	1,500	<3	10	5	20	<100	<10	300	5,000	150	30	<200	(.02)	.03	NW H. P.
882	3,000	<3	10	3	20	<100	<10	150	3,000	150	30	<200	(.02)	.05	Do.
887	1,000	<3	10	15	70	<100	<10	500	7,000	150	30	<200	<.02	.26	Do.
888	700	<3	10	20	30	<100	<10	300	7,000	300	70	<200	<.02	.10	Do.
894	1,500	<3	10	5	30	<100	<10	200	3,000	150	30	<200	(.02)	.02	Do.
895	3,000	<3	10	7	20	<100	<10	150	3,000	150	30	<200	(.02)	.03	Do.
896	300	<3	10	3	20	<100	<10	150	2,000	70	15	<200	(.02)	.05	SE W. P.
897	3,000	<3	10	30	30	<100	<10	700	5,000	300	50	<200	<.02	.12	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Unaltered rock--Continued								
903	7	7	>10	<1	<200	700	1	<10	30,000	<20	20	30	70	30,000
906	>10	7	>10	<1	<200	700	1	<10	50,000	<20	30	30	150	30,000
907	.3	7	>10	<1	<200	70	<1	<10	3,000	<20	<3	<1	7	1,500
909	>10	3	>10	<1	<200	1,500	<1	<10	30,000	<20	10	7	15	15,000
910	7	3	>10	<1	<200	1,500	<1	<10	30,000	<20	10	7	15	15,000
911	>10	7	>10	<1	<200	1,000	<1	<10	30,000	<20	15	3	7	15,000
912	>10	5	>10	<1	<200	1,500	1	<10	30,000	<20	15	10	30	7,000
913	>10	7	>10	<1	<200	2,000	<1	<10	30,000	<20	15	15	30	7,000
914	>10	5	>10	<1	<200	1,500	<1	<10	30,000	<20	15	15	15	15,000
922	7	1.5	>10	<1	<200	1,000	1	<10	3,000	<20	3	1.5	5	5,000
924	7	.7	>10	<1	<200	50	15	<10	1,500	<20	<3	<1	2	500
925	>10	7	>10	<1	<200	700	1	<10	30,000	<20	15	7	70	15,000
932	>10	7	>10	<1	<200	2,000	<1	<10	30,000	<20	15	30	30	15,000
935	7	5	>10	<1	<200	2,000	<1	<10	30,000	<20	15	30	15	15,000
936	>10	3	>10	<1	<200	1,500	1	<10	15,000	<20	5	1.5	7	10,000
941	7	3	>10	<1	<200	2,000	<1	<10	10,000	<20	7	1.5	7	7,000
942	7	3	>10	<1	<200	2,000	1	<10	15,000	<20	7	1.5	7	7,000
943	>10	7	>10	<1	<200	1,500	1	<10	30,000	<20	15	15	30	30,000
944	>10	3	>10	<1	<200	3,000	<1	<10	20,000	<20	3	<1	3	7,000
945	7	2	>10	<1	<200	2,000	<1	<10	15,000	<20	3	<1	2	7,000
946	7	3	>10	<1	<200	1,000	<1	<10	30,000	<20	10	7	15	15,000
947	7	7	>10	<1	<200	1,000	<1	<10	30,000	<20	10	7	15	15,000
						Stream sediment								
117	7	7	>10	<1	<200	1,000	<1	<10	50,000	<20	15	15	30	15,000
120	10	7	>10	<1	<200	1,500	<1	<10	50,000	<20	15	15	20	15,000
418	---	7	---	<.5	<200	1,500	1.5	<10	20,000	<20	15	20	30	20,000
421	---	5	---	<.5	<200	1,500	1.5	<10	15,000	<20	10	15	30	20,000
511	---	5	---	<.5	<200	1,000	1	<10	15,000	<20	15	10	30	20,000
512	---	5	---	<.5	<200	1,000	1	<10	20,000	<20	10	10	15	20,000
514	---	5	---	<.5	<200	1,000	1	<10	20,000	<20	10	15	20	20,000
522	---	3	---	<.5	<200	1,000	1	<10	15,000	<20	10	10	20	10,000
523	---	5	---	<.5	<200	1,000	1	<10	15,000	<20	15	15	20	10,000
525	---	5	---	<.5	<200	1,500	1	<10	20,000	<20	10	10	10	15,000
530	---	5	---	<.5	<200	1,500	1	<10	20,000	<20	10	10	30	15,000
533	---	3	---	<.5	<200	1,000	1	<10	20,000	<20	10	10	15	20,000
534	---	3	---	<.5	<200	1,500	1	<10	20,000	<20	15	30	30	20,000
552	---	3	---	<.5	<200	1,000	1	<10	20,000	<20	15	15	7	7,000
553	---	5	---	<.5	<200	1,500	1	<10	15,000	<20	15	20	20	10,000
557	---	3	---	<.5	<200	1,000	1	<10	20,000	<20	10	20	30	10,000
559	---	5	---	<.5	<200	1,000	1	<10	20,000	<20	15	15	30	10,000
561	---	3	---	<.5	<200	1,500	1	<10	30,000	<20	10	15	30	10,000
562	---	3	---	<.5	<200	1,500	1	<10	30,000	<20	10	10	50	10,000
568	---	2	---	<.5	<200	700	1	<10	7,000	<20	7	7	20	7,000
571	---	3	---	<.5	<200	1,000	1	<10	20,000	<20	10	7	7	10,000
577	---	3	---	3	<200	1,000	1.5	<10	10,000	20	10	15	500	10,000
586	---	3	---	<.5	<200	1,000	1	<10	10,000	<20	15	15	70	15,000
587	---	2	---	<.5	<200	700	1	<10	7,000	<20	7	15	70	7,000
599	---	7	---	<.5	<200	1,000	1	<10	30,000	<20	15	20	150	30,000
602	---	5	---	<.5	<200	1,000	2	<10	20,000	<20	20	30	150	20,000
608	---	7	---	<.5	<200	1,000	1	<10	30,000	<20	20	50	150	30,000
610	---	5	---	<.5	<200	1,000	1.5	<10	5,000	<20	20	7	50	7,000
611	---	3	---	<.5	<200	700	1.5	<10	15,000	<20	7	10	50	7,000
612	---	3	---	<.5	<200	1,000	5	<10	7,000	<20	5	5	30	5,000
613	---	3	---	<.5	<200	1,500	1.5	<10	5,000	<20	5	5	30	5,000
724	7	3	>10	<1	<2,000	1,500	2	<10	7,000	<50	7	10	70	5,000
726	5	5	>10	7	<2,000	700	<1	<10	20,000	<50	15	20	100	15,000
727	7	5	>10	<1	<2,000	1,000	1.5	<10	7,000	<50	20	15	50	10,000
728	7	3	>10	<1	<2,000	1,500	1.5	<10	5,000	<50	7	7	30	7,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au 1/	Hg	Location by quarter of quadrangle 2/
								Unaltered rock--Continued							
903	1,500	<3	10	15	30	<100	<10	300	5,000	150	30	<200	(0.02)	0.09	SE W. P.
906	1,500	<3	10	15	20	<100	<10	500	3,000	300	30	<200	.02	.14	Do.
907	70	<3	<10	2	<10	<100	<10	15	300	15	<10	<200	(.04)	.10	Do.
909	700	<3	10	3	15	<100	<10	1,500	3,000	150	20	<200	<.02	.07	Do.
910	300	<3	10	3	15	<100	<10	1,000	3,000	100	20	<200	(.04)	.15	Do.
911	700	<3	10	<3	15	<100	<10	500	3,000	150	30	<200	<.02	.05	Do.
912	300	<3	10	5	15	<100	<10	700	3,000	150	30	<200	<.02	.10	Do.
913	700	<3	10	7	15	<100	<10	1,000	3,000	150	30	<200	(.04)	.13	Do.
914	700	<3	10	5	15	<100	<10	1,000	3,000	150	30	<200	(.04)	.26	Do.
922	200	<3	10	<3	15	<100	<10	150	1,500	15	15	<200	<.02	.02	SW U. P.
924	700	7	70	<3	20	<100	<10	15	300	7	10	<200	(.02)	.03	Do.
925	700	<3	10	5	15	<100	<10	1,000	3,000	150	30	<200	<.02	.04	NW U. P.
932	700	<3	10	15	15	<100	<10	1,000	3,000	150	30	<200	<.02	.09	NE W. P.
935	500	<3	10	3	15	<100	<10	700	3,000	150	30	<200	<.02	.07	Do.
936	500	3	30	<3	30	<100	<10	700	3,000	70	50	<200	<.02	.13	Do.
941	700	<3	15	<3	30	<100	<10	500	3,000	70	30	<200	<.02	.04	Do.
942	700	<3	10	<3	30	<100	<10	700	3,000	30	30	<200	<.02	.06	Do.
943	700	<3	10	15	15	<100	<10	1,000	3,000	150	30	<200	<.02	.08	Do.
944	1,000	<3	10	<3	30	<100	<10	1,000	1,500	30	30	<200	<.02	.04	NW W. P
945	500	<3	15	<3	30	<100	<10	700	1,500	30	30	<200	<.02	.02	Do.
946	500	<3	10	3	15	<100	<10	700	3,000	70	20	<200	<.02	.01	Do.
947	700	<3	15	3	15	<100	<10	700	3,000	150	30	<200	<.02	.03	Do.
								Stream sediment							
117	1,000	<3	10	7	20	<100	<10	70	3,000	150	20	<200	<.02	.10	SE Ou.
120	1,000	<3	10	7	15	<100	<10	70	5,000	200	20	<200	<.02	.10	Do.
418	2,000	<5	<10	10	100	<100	<10	700	5,000	200	20	200	<.02	.24	SE Mo.
421	1,000	<5	<10	10	20	<100	<10	500	3,000	150	20	<200	<.02	.04	Do.
511	2,000	<5	10	10	30	<100	<10	500	5,000	200	30	<200	<.02	.06	SW W. P.
512	1,500	<5	<10	5	20	<100	<10	700	5,000	200	30	<200	<.02	.03	Do.
514	1,500	<5	<10	10	50	<100	<10	700	5,000	200	20	<200	<.02	.02	Do.
522	1,000	<5	10	7	30	<100	<10	700	5,000	150	20	<200	<.02	.03	Do.
523	1,000	<5	10	7	30	<100	<10	500	7,000	200	30	<200	<.02	.04	Do.
525	1,000	<5	10	5	20	<100	<10	1,000	5,000	150	15	<200	<.02	.05	Do.
530	1,500	<5	10	5	50	<100	<10	700	5,000	150	20	<200	<.02	.08	Do.
533	1,500	<5	<10	5	30	<100	<10	700	5,000	150	20	<200	<.02	.05	Do.
534	1,000	<5	<10	10	30	<100	<10	1,000	5,000	200	20	<200	<.02	.03	Do.
552	1,000	<5	<10	10	10	<100	<10	1,000	5,000	200	30	<200	<.02	.05	NW W. P.
553	1,000	<5	<10	15	30	<100	<10	1,000	5,000	200	30	<200	<.02	.08	Do.
557	1,500	<5	<10	10	20	<100	<10	1,000	5,000	200	30	<200	<.02	.04	Do.
559	1,500	7	<10	15	20	<100	<10	1,500	5,000	200	30	<200	<.02	.02	Do.
561	1,500	<5	<10	15	20	<100	<10	1,500	5,000	200	20	<200	<.02	.05	Do.
562	1,500	<5	<10	15	20	<100	<10	1,500	5,000	200	20	<200	<.02	.03	NW W. P.
568	1,000	<5	<10	5	30	<100	<10	300	3,000	150	15	<200	<.02	<.01	Do.
571	1,500	<5	<10	5	20	<100	<10	700	5,000	150	20	<200	<.02	.11	Do.
577	1,500	<5	10	10	2,000	<100	<10	300	5,000	150	20	7,000	<.02	.04	SW U. P.
586	1,500	<5	10	15	70	<100	<10	300	5,000	200	30	<200	<.02	<.01	Do.
587	700	<5	<10	5	70	<100	<10	200	3,000	150	20	<200	<.02	.04	Do.
599	2,000	<5	<10	10	50	<100	<10	700	7,000	200	30	<200	<.02	.02	SE W. P.
602	1,500	<5	<10	15	70	<100	<10	500	7,000	150	30	<200	<.02	<.01	SW U. P.
608	1,500	<5	<10	20	50	<100	<10	700	7,000	300	30	<200	<.02	.04	Do.
610	2,000	<5	<10	5	50	<100	<10	200	5,000	150	20	<200	<.02	.04	Do.
611	1,500	<5	<10	<5	70	<100	<10	300	5,000	150	10	<200	<.02	.02	Do.
612	3,000	<5	<10	<5	30	<100	<10	200	3,000	100	15	<200	<.02	.01	Do.
613	2,000	<5	10	<5	50	<10	<10	150	5,000	100	20	<200	<.02	.01	Do.
724	700	<3	10	3	70	<200	<10	300	2,000	50	20	<200	(.02)	.45	Do.
726	700	5	10	10	50	<200	<10	500	3,000	150	20	<200	<.02	.30	Do.
727	1,000	3	10	10	20	<200	<10	300	3,000	100	20	<200	<.02	.10	Do.
728	700	3	10	5	20	<200	<10	700	3,000	100	20	<200	<.02	.30	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Stream sediment--Continued								
729	7	5	>10	<1	<2,000	700	1.5	<10	2,000	<50	10	7	30	7,000
730	7	5	>10	<1	<2,000	1,000	<1	<10	5,000	<50	20	20	50	7,000
731	7	5	>10	<1	<2,000	1,000	1.5	<10	3,000	<50	10	15	30	10,000
732	7	7	>10	<1	<2,000	1,000	<1	<10	3,000	<50	5	20	30	10,000
733	7	7	>10	<1	<2,000	1,000	<1	<10	3,000	<50	5	10	50	10,000
734	7	3	>10	<1	<2,000	1,000	1	<10	2,000	<50	3	10	30	7,000
735	7	5	>10	<1	<2,000	1,000	<1	<10	3,000	<50	3	15	30	10,000
745	>10	5	>10	<1	<2,000	1,500	1	<10	15,000	<50	15	10	30	15,000
746	7	3	>10	<1	<2,000	1,000	1.5	<10	7,000	<50	10	7	15	10,000
753	7	7	>10	<1	<2,000	700	<1	<10	1,500	<50	5	7	50	10,000
754	7	5	>10	<1	<2,000	1,500	1	<10	3,000	<50	10	15	50	10,000
755	>10	5	>10	<1	<2,000	1,000	1	<10	10,000	<50	15	10	30	10,000
757	7	5	>10	<1	<2,000	1,000	<1	<10	2,000	<50	15	20	50	10,000
758	7	7	>10	<1	<2,000	1,000	1	<10	10,000	<50	15	15	30	15,000
759	7	5	>10	<1	<2,000	1,000	1	<10	15,000	<50	10	20	50	10,000
760	7	5	>10	<1	<2,000	700	1	<10	7,000	<50	15	10	50	10,000
761	7	5	>10	<1	<2,000	1,000	1	<10	5,000	<50	15	10	50	10,000
763	>10	5	>10	<1	<2,000	1,000	<1	<10	20,000	<50	15	15	50	10,000
764	7	5	>10	<1	<2,000	1,000	1.5	<10	20,000	<50	15	15	70	10,000
765	>10	5	>10	<1	<2,000	1,000	1	<10	30,000	<50	15	10	70	15,000
766	>10	7	>10	<1	<2,000	1,000	1	<10	50,000	<50	20	15	50	20,000
767	7	7	>10	<1	<2,000	1,000	1	<10	20,000	<50	15	10	50	15,000
768	3	3	>10	<1	<2,000	500	<1	<10	20,000	<50	10	15	70	10,000
769	>10	5	>10	<1	<2,000	1,000	1	<10	20,000	<50	10	10	30	10,000
771	>10	5	>10	<1	<2,000	700	1	<10	3,000	<50	10	10	70	15,000
772	>10	5	>10	<1	<2,000	1,000	<1	<10	15,000	<50	15	15	50	15,000
773	>10	5	>10	<1	<2,000	1,000	1	<10	7,000	<50	20	15	70	15,000
776	>10	5	>10	<1	<2,000	1,000	1	<10	20,000	<50	15	15	30	10,000
777	>10	5	>10	<1	<2,000	1,000	1	<10	10,000	<50	10	10	50	15,000
779	>10	7	>10	<1	<2,000	700	2	<10	5,000	<50	20	15	150	10,000
780	>10	7	>10	<1	<2,000	1,000	<1	<10	20,000	<50	20	20	50	15,000
782	>10	7	>10	<1	<2,000	2,000	1	<10	10,000	<50	15	10	10	7,000
788	>10	5	>10	<1	<2,000	1,000	1	<10	10,000	<50	15	15	50	10,000
789	>10	5	>10	<1	<2,000	1,000	1	<10	10,000	<50	20	15	50	15,000
790	>10	7	>10	<1	<2,000	1,000	1	<10	10,000	<50	20	15	50	15,000
793	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	10	30	15,000
794	>10	7	>10	<1	<2,000	1,500	1	<10	30,000	<50	20	20	30	15,000
795	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	20	20	30	15,000
797	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	10	10	30	15,000
798	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	10	10	50	20,000
802	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	10	30	20,000
804	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	15	30	15,000
805	>10	7	>10	<1	<2,000	1,500	<1	<10	30,000	<50	15	10	20	15,000
808	>10	5	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	10	30	20,000
812	>10	5	>10	<1	<2,000	1,500	<1	<10	30,000	<50	15	10	30	20,000
814	>10	5	>10	<1	<2,000	2,000	<1	<10	50,000	<50	15	15	30	10,000
815	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	15	70	30,000
816	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	20	20	10,000
823	>10	7	>10	<1	<2,000	1,500	1	<10	20,000	<50	15	15	30	10,000
827	7	3	>10	<1	<2,000	700	<1	<10	1,000	<50	<3	5	70	5,000
829	>10	7	>10	<1	<2,000	700	<1	<10	2,000	<50	5	7	50	15,000
837	>10	5	>10	<1	<2,000	1,500	1	<10	20,000	<50	15	30	30	10,000
838	>10	5	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	20	30	15,000
839	>10	5	>10	<1	<2,000	2,000	<1	<10	30,000	<50	15	20	30	7,000
841	>10	5	>10	<1	<2,000	1,000	1	<10	15,000	<50	15	20	30	10,000
842	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	10	10	20	15,000
844	>10	3	>10	<1	<2,000	3,000	<1	<10	30,000	<50	10	10	20	10,000
845	>10	5	>10	<1	<2,000	2,000	1	<10	30,000	<50	10	15	15	10,000
846	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	30	20	15,000
847	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	10	20	10,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Tl	V	Y	Zn	Chemical analyses (ppm) Au[1]	Hg	Location by quarter of quadrangle [2]
								Stream sediment--Continued							
729	1,000	3	10	5	20	<200	<10	200	3,000	100	20	<200	(0.02)	0.20	SW U. P.
730	7,000	3	10	7	20	<200	<10	200	2,000	100	20	<200	<.02	.28	Do.
731	7,000	7	10	3	30	<200	<10	200	3,000	150	20	<200	<.02	.20	Do.
732	5,000	7	10	3	30	<200	<10	300	3,000	150	20	<200	<.02	.05	Do.
733	5,000	15	10	3	30	<200	<10	300	3,000	150	20	<200	(.04)	.14	Do.
734	3,000	3	15	<3	20	<200	<10	300	3,000	100	20	<200	<.02	.08	Do.
735	300	10	10	3	70	<200	<10	300	3,000	150	20	<200	<.02	.14	Do.
745	1,000	3	15	10	20	<200	<10	500	3,000	100	20	<200	<.02	.09	Do.
746	700	<3	10	5	20	<200	<10	200	2,000	70	20	<200	<.02	.06	Do.
753	300	20	10	3	100	<200	<10	300	3,000	150	20	<200	<.02	.20	NW U. P.
754	500	3	10	3	20	<200	<10	200	3,000	150	20	<200	<.02	.13	Do.
755	700	<3	10	5	20	<200	<10	300	3,000	150	20	<200	<.02	.05	Do.
757	700	5	10	5	20	<200	<10	300	3,000	150	20	<200	<.02	.14	Do.
758	1,000	3	10	10	20	<200	<10	300	3,000	150	20	<200	<.02	.06	Do.
759	700	<3	10	7	15	<200	<10	300	3,000	150	15	<200	<.02	.08	Do.
760	700	3	10	3	20	<200	<10	300	3,000	150	20	<200	<.02	.06	Do.
761	700	5	10	5	20	<200	<10	300	3,000	150	30	<200	<.02	.14	Do.
763	700	<3	10	7	15	<200	<10	700	3,000	150	20	<200	<.02	.04	Do.
764	700	<3	10	10	15	<200	<10	500	3,000	150	20	<200	<.02	.10	SE W. P.
765	700	<3	<10	10	15	<200	<10	700	3,000	150	20	<200	<.02	.05	Do.
766	1,000	<3	10	15	15	<200	<10	1,000	5,000	200	20	<200	<.02	.05	Do.
767	700	<3	10	10	20	<200	<10	700	3,000	150	20	<200	<.02	.09	Do.
768	700	<3	<10	10	15	<200	<10	300	2,000	150	15	<200	<.02	.40	Do.
769	700	<3	<10	5	10	<200	<10	500	3,000	100	20	<200	<.02	.10	Do.
771	700	5	10	5	30	<200	<10	200	3,000	150	20	<200	<.02	.10	NW U. P.
772	1,000	<3	10	10	20	<200	<10	700	5,000	150	20	<200	(.02)	.08	Do.
773	1,000	3	10	15	20	<200	<10	500	5,000	150	20	<200	<.02	.10	Do.
776	1,000	<3	10	10	15	<200	<10	700	5,000	150	20	<200	<.02	.09	SE W. P.
777	700	<3	20	3	20	<200	<10	200	3,000	100	20	<200	<.02	.05	Do.
779	700	5	<10	10	30	<200	<10	300	2,000	100	70	500	<.02	.13	NW U. P.
780	700	3	10	15	20	<200	<10	500	5,000	200	30	<200	<.02	.09	SE W. P.
782	700	5	10	5	20	<200	<10	500	7,000	200	30	<200	<.02	.04	Do.
788	1,000	3	10	10	15	<200	<10	500	3,000	150	20	<200	<.02	.10	NW U. P.
789	1,000	3	10	10	15	<200	<10	500	3,000	150	30	<200	<.02	.08	Do.
790	1,000	3	10	10	20	<200	<10	500	3,000	150	30	<200	<.02	.09	Do.
793	1,000	<3	10	7	15	<200	<10	500	3,000	100	30	<200	<.02	.10	SE C. M.
794	1,000	<3	10	10	15	<200	<10	1,000	5,000	200	30	<200	<.02	.14	Do.
795	1,000	<3	<10	10	15	<200	<10	1,000	5,000	200	30	<200	<.02	.14	Do.
797	1,000	<3	10	5	10	<200	<10	700	3,000	100	20	<200	<.02	.02	Do.
798	700	<3	10	5	15	<200	<10	700	3,000	100	20	<200	<.02	.02	Do.
802	1,000	<3	10	5	15	<200	<10	1,000	3,000	150	20	<200	(.04)	.05	SE Da.
804	1,000	<3	<10	7	10	<200	<10	1,000	3,000	150	20	<200	<.02	.10	SW C. M.
805	700	<3	10	3	15	<200	<10	700	5,000	150	30	<200	<.02	.02	NW W. P.
808	1,000	<3	10	5	10	<200	<10	1,000	3,000	150	30	<200	<.02	.04	Do.
812	1,000	<3	10	5	15	<200	<10	700	5,000	100	30	<200	<.02	.10	Do.
814	700	<3	10	5	15	<200	<10	1,000	5,000	150	20	<200	<.02	.10	SW C. M.
815	1,000	<3	10	15	15	<200	<10	700	5,000	150	30	<200	<.02	.03	Do.
816	1,000	<3	10	10	10	<200	<10	1,000	5,000	200	20	<200	<.02	.14	Do.
823	1,000	<3	10	10	15	<200	<10	1,000	5,000	150	30	<200	<.02	.15	Do.
827	150	15	10	<3	200	<200	<10	300	3,000	100	20	<200	<.02	.26	NE W. P.
829	300	20	10	<3	100	<200	<10	300	3,000	100	30	<200	<.02	.04	Do.
837	700	<3	10	15	20	<200	<10	700	5,000	150	20	<200	<.02	.18	Do.
838	700	<3	10	10	15	<200	<10	1,000	3,000	150	20	<200	<.02	.20	Do.
839	700	<3	10	7	15	<200	<10	1,000	3,000	150	20	<200	<.02	.10	Do.
841	700	<3	<10	10	15	<200	<10	500	3,000	100	20	<200	<.02	.22	Do.
842	700	<3	10	3	15	<200	<10	700	3,000	100	30	<200	<.02	.02	Do.
844	700	<3	10	5	20	<200	<10	1,000	2,000	100	20	<200	<.02	.18	Do.
845	700	<3	10	7	15	<200	<10	1,000	3,000	150	20	<200	<.02	.04	Do.
846	700	<3	10	15	15	<200	<10	700	3,000	150	20	<200	<.02	.05	Do.
847	1,000	<3	10	10	20	<200	<10	700	2,000	100	20	<200	<.02	.05	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Stream sediment--Continued								
848	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	20	20	30	20,000
849	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	20	50	15,000
850	>10	5	>10	<1	<2,000	1,000	1	<10	50,000	<50	15	15	30	20,000
851	>10	5	>10	<1	<2,000	1,000	1	<10	50,000	<50	15	30	30	15,000
852	>10	7	>10	<1	<2,000	1,000	1	<10	50,000	<50	15	20	30	15,000
854	7	5	>10	1	<2,000	1,000	1	<10	3,000	<50	20	15	200	15,000
855	7	5	>10	<1	<2,000	1,000	1	<10	3,000	<50	15	10	70	10,000
856	>10	5	>10	1	<2,000	1,000	2	<10	3,000	<50	20	20	300	15,000
866	>10	5	>10	<1	<2,000	700	1	<10	10,000	<50	10	15	50	15,000
867	7	5	>10	<1	<2,000	700	3	<10	2,000	<50	20	20	300	15,000
869	7	5	>10	<1	<2,000	700	1.5	<10	5,000	<50	15	20	100	15,000
870	7	5	>10	<1	<2,000	700	1.5	<10	3,000	<50	15	15	70	10,000
890	7	5	>10	<1	<2,000	700	1.5	<10	7,000	<50	15	15	70	15,000
908	>10	5	>10	<1	<2,000	1,000	1	<10	30,000	<50	20	20	50	20,000
920	>10	3	>10	<1	<2,000	1,000	1.5	<10	7,000	<50	10	3	30	7,000
928	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	20	30	15,000
929	>10	5	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	20	20	15,000
930	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	20	20	20	15,000
931	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	7	20	15,000
933	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	10	7	20	10,000
934	>10	5	>10	<1	<2,000	3,000	1	<10	20,000	<50	7	3	7	7,000
938	>10	5	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	10	20	15,000
939	>10	5	>10	<1	<2,000	2,000	<1	<10	50,000	<50	15	20	30	15,000
950	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	15	30	15,000
951	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	15	30	15,000
952	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	20	30	15,000
953	7	5	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	20	30	10,000
954	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	10	20	10,000
955	>10	7	>10	<1	<2,000	1,500	1	<10	30,000	<50	20	20	50	20,000
956	7	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	20	30	15,000
957	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	20	20	50	15,000
958	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	10	30	10,000
959	7	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	20	30	15,000
960	7	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	15	50	15,000
961	>10	5	>10	<1	<2,000	1,500	<1	<10	30,000	<50	15	10	20	15,000
962	7	7	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	15	30	15,000
963	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	15	30	15,000
964	7	7	>10	<1	<2,000	1,000	1	<10	50,000	<50	15	15	50	20,000
965	>10	7	>10	<1	<2,000	1,500	1	>10	50,000	<50	15	15	50	15,000
966	>10	7	>10	<1	<2,000	1,000	1	<10	50,000	<50	15	15	50	15,000
967	7	5	>10	<1	<2,000	2,000	1	<10	20,000	<50	10	10	20	10,000
968	>10	5	>10	<1	<2,000	2,000	1	<10	30,000	<50	10	10	20	10,000
969	7	7	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	5	20	10,000
970	>10	7	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	7	20	10,000
971	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	30	30	15,000
972	7	7	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	7	20	10,000
973	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	10	30	15,000
974	>10	7	>10	<1	<2,000	1,500	1	<10	50,000	<50	15	10	20	15,000
975	7	7	>10	<1	<2,000	1,500	1	<10	30,000	<50	20	15	20	15,000
976	>10	7	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	15	20	10,000
977	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	10	5	20	15,000
978	>10	7	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	15	20	15,000
979	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	10	15	20	15,000
980	>10	5	>10	<1	<2,000	1,500	1	<10	50,000	<50	10	15	30	15,000
981	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	10	15	15,000
982	>10	5	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	10	15	15,000
983	7	7	>10	<1	<2,000	1,500	<1	<10	50,000	<50	15	15	20	15,000
984	>10	5	>10	<1	<2,000	2,000	<1	<10	30,000	<50	15	10	15	15,000
985	>10	5	>10	<1	<2,000	2,000	1	<10	70,000	<50	15	15	30	15,000
986	>10	5	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	15	20	15,000

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au1/	Hg	Location by quarter of quadrangle 2/
								Stream sediment--Continued							
848	1,000	<3	10	15	15	<200	<10	1,000	5,000	200	20	<200	<0.02	0.02	NE W. P.
849	700	<3	10	10	15	<200	<10	1,000	3,000	200	20	<200	<.02	.06	SE C. M.
850	700	<3	10	10	15	<200	<10	700	3,000	150	20	<200	<.02	.04	Do.
851	700	<3	10	10	15	<200	<10	700	3,000	200	20	<200	<.02	.13	Do.
852	700	<3	10	10	15	<200	<10	1,000	3,000	200	20	<200	<.02	.05	Do.
854	3,000	3	10	10	500	<200	<10	100	3,000	100	20	1,000	<.02	.18	NW H. P.
855	3,000	5	10	7	200	<200	<10	150	3,000	100	20	1,000	<.02	.20	Do.
856	2,000	5	10	15	200	<200	<10	150	5,000	150	20	1,000	<.02	.20	Do.
866	1,000	3	10	7	30	<200	<10	200	3,000	100	20	<200	<.02	.10	Do.
867	3,000	5	10	15	70	<200	<10	150	3,000	150	20	<200	<.02	.20	Do.
869	1,500	3	10	10	70	<200	<10	70	3,000	150	20	<200	<.02	.20	Do.
870	2,000	<3	10	10	70	<200	<10	150	3,000	100	20	500	<.02	.15	Do.
890	700	<3	10	10	20	<200	<10	300	3,000	150	20	<200	<.02	.08	Do.
908	1,000	<3	10	15	20	<200	<10	700	3,000	200	30	<200	<.02	.17	SE W. P.
920	500	<3	10	3	20	<200	<10	500	2,000	100	20	<200	<.02	.17	SW U. P.
928	700	<3	10	10	15	<200	<10	1,000	3,000	150	20	<200	(.02)	.08	NE W. P.
929	1,000	<3	<10	10	10	<200	<10	1,500	3,000	150	20	<200	<.02	.11	Do.
930	1,000	<3	10	10	20	<200	<10	1,500	5,000	200	30	<200	<.02	.05	Do.
931	1,000	<3	10	5	10	<200	<10	1,000	3,000	150	30	<200	<.02	.05	Do.
933	700	<3	<10	3	15	<200	<10	1,000	3,000	100	20	<200	<.02	.05	Do.
934	700	<3	10	<3	20	<200	<10	1,000	3,000	100	30	<200	<.02	.05	Do.
938	700	<3	10	10	15	<200	<10	1,000	3,000	150	30	<200	<.02	.05	Do.
939	1,000	<3	<10	10	10	<200	<10	1,500	3,000	150	30	<200	<.02	.16	Do.
950	700	<3	<10	10	20	<200	<10	1,000	5,000	150	20	<200	<.02	.20	SE C. M.
951	1,000	<3	10	10	15	<200	<10	1,000	3,000	150	30	<200	<.02	.17	NE W. P.
952	700	<3	10	10	15	<200	<10	1,000	5,000	200	30	<200	<.02	.20	Do.
953	700	<3	10	10	20	<200	<10	1,000	3,000	150	20	<200	<.02	.10	Do.
954	700	<3	10	7	15	<200	<10	1,000	3,000	150	20	<200	<.02	.15	Do.
955	700	<3	<10	15	15	<200	<10	1,000	5,000	200	30	<200	<.02	.19	Do.
956	700	<3	<10	10	15	<200	<10	1,000	5,000	200	30	<200	<.02	.13	Do.
957	1,000	<3	10	15	15	<200	<10	700	5,000	200	30	<200	<.02	.11	Do.
958	1,000	<3	10	7	20	<200	<10	700	3,000	150	30	<200	<.02	.12	Do.
959	1,000	<3	10	10	15	<200	<10	1,000	5,000	200	20	<200	<.02	.11	Do.
960	1,000	<3	10	10	15	<200	<10	1,000	5,000	200	30	<200	<.02	.11	Do.
961	700	<3	10	5	15	<200	<10	1,000	3,000	150	20	<200	<.02	.07	Do.
962	1,000	<3	10	10	15	<200	<10	1,000	3,000	150	20	<200	<.02	.12	Do.
963	700	<3	10	10	15	<200	<10	1,000	5,000	200	20	<200	<.02	.15	SE C. M.
964	1,000	<3	10	10	10	<200	<10	700	5,000	200	30	<200	<.02	.13	Do.
965	1,000	<3	<10	10	15	<200	<10	1,000	5,000	200	20	<200	<.02	.09	Do.
966	1,000	<3	<10	15	15	<200	<10	1,000	5,000	200	30	<200	(.02)	.17	Do.
967	700	<3	10	5	20	<200	<10	1,000	3,000	100	30	<200	<.02	.11	NE W. P.
968	700	<3	10	5	20	<200	<10	1,000	3,000	150	20	<200	<.02	.13	Do.
969	1,000	<3	10	3	20	<200	<10	1,000	5,000	150	30	<200	<.02	.11	Do.
970	700	<3	10	3	20	<200	<10	1,000	5,000	150	30	<200	<.02	.15	Do.
971	700	<3	10	10	10	<200	<10	1,000	5,000	200	30	<200	<.02	.32	Do.
972	1,000	<3	10	3	15	<200	<10	1,000	5,000	200	20	<200	<.02	.15	Do.
973	1,000	<3	10	15	15	<200	<10	1,000	5,000	150	30	<200	<.02	.18	Do.
974	1,000	<3	10	20	50	<200	<10	1,000	5,000	200	30	<200	<.02	.14	Do.
975	1,000	3	10	20	15	<200	<10	1,000	5,000	200	30	<200	<.02	.15	Do.
976	700	<3	10	20	15	<200	<10	1,000	5,000	200	30	<200	<.02	.22	Do.
977	1,000	<3	10	15	10	<200	<10	1,000	3,000	150	30	<200	<.02	.22	Do.
978	1,000	<3	10	15	15	<200	<10	1,000	5,000	200	30	<200	<.02	.17	Do.
979	1,000	<3	<10	10	15	<200	<10	1,000	3,000	150	30	<200	<.02	.18	Do.
980	1,000	<3	10	10	10	<200	<10	1,000	3,000	150	30	<200	<.02	.18	Do.
981	700	<3	10	5	15	<200	<10	700	3,000	150	15	<200	<.02	.17	Do.
982	700	<3	10	5	15	<200	<10	700	3,000	150	20	<200	<.02	.13	Do.
983	700	<3	10	10	15	<200	<10	700	3,000	150	20	<200	<.02	.15	Do.
984	700	<3	10	7	15	<200	<10	700	3,000	150	20	<200	<.02	.19	Do.
985	700	<3	10	7	10	<200	<10	1,000	3,000	150	20	<200	<.02	.24	Do.
986	700	<3	<10	7	20	<200	<10	700	3,000	150	20	<200	<.02	.13	Do.

TABLE 3.—*Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Al	Fe	Si	(ppm) Ag	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Mg
						Stream sediment--Continued								
987	>10	7	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	15	30	15,000
988	>10	7	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	15	30	20,000
989	>10	7	>10	<1	<2,000	2,000	1	<10	30,000	<50	15	15	30	15,000
990	>10	3	>10	<1	<2,000	1,000	1	<10	10,000	<50	10	30	30	10,000
991	>10	7	>10	<1	<2,000	2,000	1	<10	50,000	<50	15	15	30	15,000
992	>10	5	>10	<1	<2,000	1,500	1	<10	30,000	<50	15	10	30	15,000
						Miscellaneous								
023 6/	0.7	>10	3	5	<200	50	<1	<10	700	<20	<3	3	70	1,000
043 7/	.3	>10	.7	<.5	<200	7	<1	<10	70	<20	<3	3	1,000	50
180 6/	1	7	>10	700	20,000	1,500	<1	<10	1,500	70	<3	3	700	1,000
244 8/	1.5	>10	5	20	<2,000	1,000	70	<10	70,000	70	50	3	5,000	1,500
405	.7	>10	2	300	<2,000	70,000	<1	100	<50	<50	30	7	2,000	100
416 9/	---	>20	---	<.5	<200	500	<1	<10	7,000	<20	50	300	100	10,000
417 10/	---	>20	---	.5	<200	1,000	<1	<10	7,000	<20	50	300	100	10,000
420 11/	---	>20	---	<.5	<200	300	<1	<10	10,000	<20	30	100	70	7,000
422 12/	---	>20	---	<.5	<200	1,000	<1	<10	10,000	<20	50	200	70	10,000
423 13/	---	>20	---	<.5	<200	2,000	<1	<10	10,000	<20	50	200	70	7,000
427 14/	---	>20	---	<.5	<200	300	<1	<10	10,000	<20	50	300	100	10,000
603 15/	---	15	---	50	200	500	1	30	7,000	>500	30	10	5,000	3,000
736 7/	.3	>10	1.5	2	<200	30	<1	<10	700	<20	<3	3	20	300
756 7/	.7	>10	.7	<.5	<200	7	<1	<10	50	<20	<3	5	50	100

6/ Iron-rich precipitate from water draining from mine workings.

7/ Iron-rich precipitate from spring; locally this material is commonly called "bog iron ore."

8/ Grab sample of concentrate, dominantly pyrite, from abandoned mill.

9/ Pan concentrate of about 50 pounds of stream sand and gravel.

10/ Pan concentrate of about 20 pounds of stream sand and gravel.

Uncompahgre primitive area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mn	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	Y	Zn	Chemical analyses (ppm) Au[1/]	Hg	Location by quarter of quadrangle [2/]
								Stream sediment--Continued							
987	700	<3	10	10	15	<200	<10	1,000	3,000	150	20	<200	<0.02	0.26	SE C. M.
988	700	<3	10	10	20	<200	<10	1,000	3,000	150	20	<200	<.02	.32	Do.
989	700	<3	10	10	15	<200	<10	1,000	3,000	200	20	<200	<.02	.11	Do.
990	1,500	<3	10	7	20	<200	<10	200	3,000	70	20	<200	<.02	.70	Do.
991	700	<3	10	7	15	<200	<10	1,000	3,000	150	20	<200	<.02	.26	Do.
992	1,000	<3	10	7	15	<200	<10	500	3,000	100	20	<200	<.02	.32	Do.
								Miscellaneous							
023	150	150	<10	<3	300	<100	<10	15	500	15	<10	700	<.3	.38	NW Ir.
043	7	15	<10	<3	30	<100	150	<10	50	30	<10	<200	(.04)	.34	SW Ir.
180	700	30	<10	<3	15,000	1,000	<10	50	1,000	50	<10	15,000	1.6	1.50	NE Te.
244	70,000	<50	<10	20	1,500	<100	15	700	150	10	100	20,000	<.06	1.10	NW H. P.
405	30	<3	<10	30	1,500	1,500	70	1,500	1,500	20	<10	300	.9	1.10	SE Ir.
416	3,000	<5	10	30	100	<100	<10	150	>10,000	2,000	30	1,000	<.02	.07	SE Mo.
417	3,000	<5	10	30	70	<100	<10	200	>10,000	1,500	30	700	<.02	.06	Do.
420	1,500	<5	10	15	70	<100	<10	200	>10,000	1,000	30	500	<.02	<.01	Do.
422	3,000	<5	15	30	30	<100	<10	200	>10,000	1,500	30	700	<.02	.03	NW Qu.
423	1,500	<5	15	30	50	<100	<10	100	>10,000	1,500	30	700	<.02	.04	SW Qu.
427	3,000	<5	10	50	30	<100	<10	150	>10,000	2,000	30	700	<.02	.03	SE Mo.
603	700	100	<10	20	>20,000	150	<10	<100	3,000	70	20	>10,000	2.4	2.50	SW U. P.
736	70	<3	<10	<3	70	<100	<10	10	100	<7	<10	<200	<.02	.14	Do.
756	10	15	<10	<3	<10	<100	<10	700	70	300	<10	<200	<.02	.08	NW U. P.

11/ Pan concentrate of about 70 pounds of stream sand and gravel.

12/ Pan concentrates of about 30 pounds of stream sand and gravel.

13/ Pan concentrates of about 15 pounds of stream sand and gravel.

14/ Pan concentrates of about 25 pounds of stream sand and gravel.

15/ Grab sample of mill tailings.

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