STUDIES RELATED TO WILDERNESS
WILDERNESS AREAS

JARBIDGE WILDERNESS, NEVADA

GEOLOGICAL SURVEY BULLETIN 1439

Mineral Resources of the Jarbidge Wilderness and Adjacent Areas, Elko County, Nevada

By R. R. COATS, R. C. GREEN, *and* L. D. CRESS,
U.S. GEOLOGICAL SURVEY, *and* L. Y. MARKS, U.S. BUREAU OF MINES

With a section on INTERPRETATION OF AEROMAGNETIC DATA
By W. E. DAVIS, U.S. GEOLOGICAL SURVEY

STUDIES RELATED TO WILDERNESS—WILDERNESS AREAS

GEOLOGICAL SURVEY BULLETIN 1439

An evaluation of the mineral potential of the area

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1977

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, *Secretary*

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

Library of Congress Catalog Card No. 77-91036

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington, D. C. 20402
Stock Number 024-001-03018-7

STUDIES RELATED TO WILDERNESS

WILDERNESS AREAS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, certain areas within the National Forests previously classified as "wilderness," "wild," or "canoe" were incorporated into the National Wilderness Preservation System as wilderness areas. The act provides that the Geological Survey and the Bureau of Mines survey these wilderness areas to determine the mineral values, if any, that may be present. The act also provides that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. Mineral surveys constitute one aspect of the suitability studies. The act also directs that the results of such surveys are to be made available to the public and submitted to the President and Congress. This bulletin reports the result of a mineral survey of the Jarbidge Wilderness and certain adjacent study areas, Elko County, Nevada.

CONTENTS

ILLUSTRATIONS

TABLES

MINERAL RESOURCES OF THE JARBIDGE WILDERNESS AND ADJACENT AREAS, ELKO COUNTY, NEVADA

By R. R. COATS, R. C. GREENE, and L. D. CRESS, U.S. GEOLOGICAL SURVEY, and L.Y. MARKS, U.S. BUREAU OF MINES

SUMMARY

The Jarbidge Wilderness and adjacent areas studied for this report comprise an isolated highland region that sits astride the divide between the Snake and Humboldt River drainages, in the north-central part of Elko County, Nev. The greater part of the surface is underlain by volcanic rocks and volcanic-sedimentary rocks ranging in age from Eocene to Miocene; these rest unconformably on Paleozoic and Mesozoic sedimentary rocks and Mesozoic plutonic rocks. A major unconformity beneath the Tertiary rocks dips gently northward. Dominant structures in the older prevolcanic rocks are imbricate thrust faults; cutting both younger volcanic rocks and older sedimentary rocks are north-northwest-trending high-angle faults that, together with other faults of diverse trends, outline the Jarbidge Mountains horst.

The Jarbidge mining district extends into the northwest part of the Jarbidge Wilderness. More than $10 million worth of gold and silver production is recorded between 1910 and 1949 for the district. All production came from the west vein system, which is about 1 mile (1.6 km) west of the wilderness. Gold and silver mineralization, however, occurs in the east vein system, in the northwest part of the wilderness. Surface sampling in the vicinity of old inaccessible adits identified no resources in the east vein system, although gold-bearing veins in prospects along the east vein system have been described. Undiscovered gold and silver resources may occur at depth below the crest of the Jarbidge Mountains.

During 1957, more than 1,000 tons (907 tonnes) of barite ore was produced from the Wildcat mine, which is located a few hundred feet south of the study area in sec. 20, T. 44 N., R. 59 E. Barite veins have been prospected in Paleozoic sedimentary rocks in the southeastern part of the study area, near the confluence of Camp Creek and the North Fork of Camp Creek. In this vicinity about 90,000 tons (82,000 tonnes) of paramarginal resources averaging about 90 percent $BaSO_4$ have been estimated on or near the inactive Thirsty Boy and Camp Creek claim groups. Additional exploration might disclose ore grade (92 percent $BaSO_4$) bodies. Other veins of barite are in the calcareous Paleozoic rocks in the headwaters of Camp Creek and Sun Creek; some barite occurrences have been found in various Tertiary rocks, and barite is a minor constituent of the gold veins at Jarbidge.

Gold, silver, copper, and antimony have been produced from vein deposits in the Charleston district, about 2 miles (3 km) west of the southwest corner of the Jarbidge Wilderness. Barite is a minor constituent of veins in the same district, but none is known to have been produced. The vein deposits are the source of gold in placers that were mined about a century ago and from time to time in recent years. The vein deposits appear to be spatially related to a probably Jurassic pluton that ranges in composition from diorite to granodiorite; many of the veins are in late Paleozoic calcareous rocks. A small stock on the North Fork of Cottonwood Creek, in the study area, seems to lack associated significant mineralization in the largely quartz-rich clastic Paleozoic rocks that lie west of it. The rocks that are concealed by later volcanic rocks to the northeast of the stock could be mineralized.

West of the wilderness, along the contact of the Coffeepot stock of quartz monzonite in the Jarbidge quadrangle, contact metasomatic deposits of molybdenian scheelite are estimated to have yielded a few hundred units of tungstic oxide (WO_3) between 1942 and 1956. (One unit equals 20 pounds (8.6 kg) of tungstic oxide.) The probability of similar deposits within the wilderness appears to be small. The aeromagnetic map suggests that the Coffeepot pluton does not extend eastward in the subsurface beneath the wilderness.

The distribution of known lode gold deposits in the Jarbidge mining district indicates that the East Fork of the Jarbidge River is the only stream in the study area along which placer gold deposits are likely to be found. Reconnaissance sampling indicates that the average value of gold (at $150 per troy oz, or $4.88 per g) in the placer deposits of streams that drain mineralized areas is less than 8 cents per cubic yard (0.02 g/m^3). Samples of gravel from Slide and Camp Creeks and West Marys River contained no recoverable gold.

Petroleum has not been produced in eastern Nevada from Paleozoic rocks, even where structures appear much more favorable than those in parts of the wilderness where Paleozoic rocks are exposed. The probability of the occurrence of oil or gas beneath the wilderness is regarded as very small. No coal has been found in the wilderness or adjacent study areas.

No hot springs were observed in the wilderness study area during the course of this work. The lack of hot springs and the fact that all known volcanic rocks are older than 10 million years suggest that the geothermal resources are negligible.

INTRODUCTION

LOCATION, GEOGRAPHIC SETTING, AND ACCESS

The Jarbidge Wilderness is in north-central Elko County, Nev., a few miles south of the Idaho state line and west of U.S. 93, which connects Wells, Nev., with Twin Falls, Idaho (fig. 1). The wilderness, as indicated on the geologic map (pl. 1), is adjacent to the Jarbidge mining district on the east; the boundary follows, for a distance of 5 miles (8 km), the crest of the Jarbidge Range, which here trends about N. 15° W. from Marys River Peak to Jarbidge Peak. The productive part of the Jarbidge mining district lies to the west of this crestline; from Jarbidge Peak northeastward the wilderness boundary follows the drainage divide separating the drainage basins of Jack and Dave Creeks from that of Fall Creek. Some underground exploration has been done at mines in the head

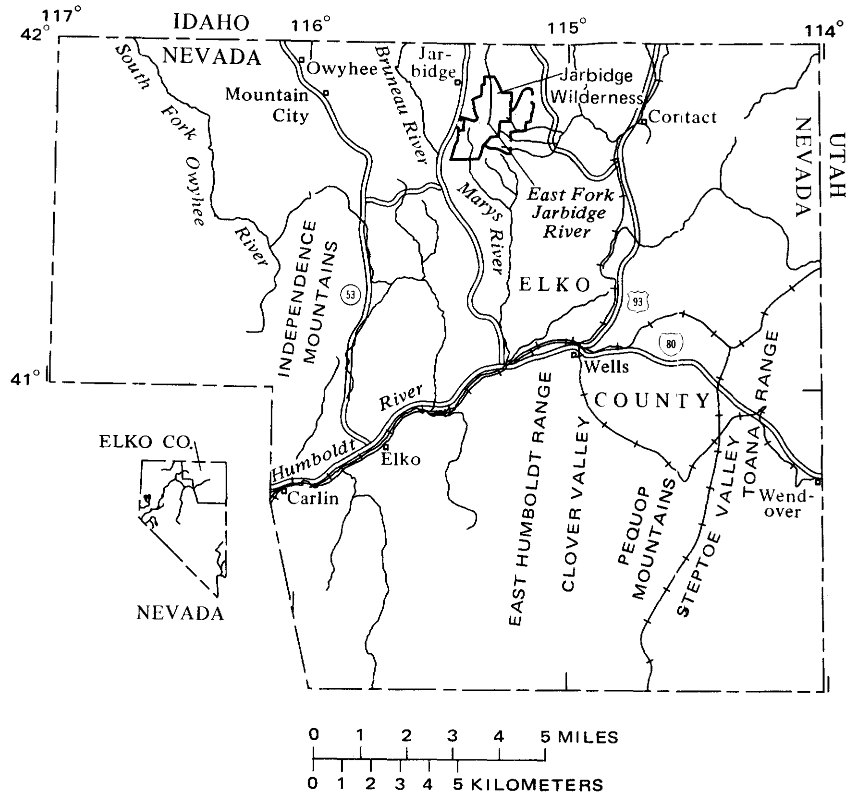


FIGURE 1.—Location of Jarbidge Wilderness (solid line) and additional areas studied (dashed lines).

of Jack Creek (Schrader, 1923, p. 69). Just south of the southern boundary of the study area, on the ridge between T Creek and Draw Creek, one mine has produced a small amount of barite ore.

The Jarbidge Mountains comprise an isolated highland area that sits astride the divide between the Snake River drainage to the north and drainage tributary to the Humboldt River to the south. The Jarbidge Wilderness covers about 98 square miles (252 km^2) and includes all of the highest summits of the Jarbidge Range. The mineral survey included not only the Jarbidge Wilderness but also wilderness study additions amounting to 47 square miles (122 km^2), most of which is on the east and southeast side of the Jarbidge Wilderness (pl. 1). The northernmost part of the wilderness includes the drainage basin of the East Fork of the Jarbidge River, which drains northward, joins the Jarbidge River a few miles north of the Idaho line, and thence flows northwestward to join the Bruneau River, a tributary of the Snake

River. The southeast side of the wilderness is drained through several rugged canyons occupied by the South Fork of Canyon Creek, Goat Creek, the North, Middle, and South Forks of Cottonwood Creek, Camp Creek, and Sun Creek. They are tributary to the South Fork of Salmon Falls Creek, another tributary of the Snake River. The southern part of the study area is drained by Wildcat Creek, Basin Creek, and other tributaries of Marys River, a tributary of the Humboldt River. The extreme southwestern part of the study area is drained by several forks of Willow Creek, a tributary of the Bruneau River.

The summits of the Jarbidge Wilderness are among the highest in Elko County. For a distance of 5 miles (8 km) along the Jarbidge Range the peaks range in height from 10,166 feet (3,100 m) to 10,839 feet (3,300 m); the lowest pass is at about 9,550 feet (2,910 m). Two other peaks, on the east side of the East Fork of the Jarbidge River, attain altitudes of more than 10,000 feet (3,045 m). The highest peaks have been the sites of alpine glaciation; cirques on their north and east sides are still fresh, and some contain almost perennial snowbanks. South of the Jarbidge quadrangle, the highest peaks are somewhat lower, and evidence of glaciation is scant; glacial moraines are sporadic in the headwaters of Marys River and Camp Creek.

The wilderness is accessible by horse trails that connect with improved gravel or dirt roads that are open from approximately mid-June to mid-October. The northeast corner can be reached from the county road that connects Rogerson, Idaho, to Jarbidge, using a good gravel road from a point east of Three Creek, Idaho, to Pole Creek Ranger Station, thence by trail down Slide Creek and Cottonwood Creek. Access to the northwestern sector is from Murphys Hot Springs, on the East Fork of the Jarbidge River, by poor dirt roads that lead southward on the plateau surface, generally called Big Island, to a point north of Sawmill Ridge, whence a trail leads down Three-Day Creek to the junction of Slide Creek and the East Fork of the Jarbidge River. From a point on the county road, 2 miles (3.2 km) south of Jarbidge, a road continues up the Jarbidge River 2.1 miles (3.4 km), to the mouth of Snowslide Gulch, where the road has been blocked by earthslides for several years. The road extends beyond the slides another 2 miles (3.2 km) to Perkins cabin (abandoned) and may still be passable, as it was in 1956, for four-wheel-drive vehicles to a point in the valley just west of the Norman mines. From the head of the road, a trail leads over a pass into the East Fork of the Jarbidge River and thence either down the East Fork or southward over a pass into the drainage of Camp Creek. From a point on the Jarbidge-Charleston Road, in sec. 6, T. 44 N., R. 58 E., jeep and pack trails lead over Seventy Six Creek and its west fork and thence over a pass into the valleys of Willow Creek and Marys River. From a point on the Charleston-O'Neill Basin Road (not shown on pl. 1), about a mile north of the Marys River bridge, a poor jeep road extends northward up Marys River valley to a point 1 mile (1.6 km) south of the wilderness boundary, and a trail extends thence up Marys River. Other trails lead up Willow Creek and the Middle Fork of Willow Creek from the southern boundary. On the southeast margin, poor mine-access roads extend from the National Forest boundary, in secs. 3 and 4, T. 43 N., R. 59 E., up Draw Creek and the ridge west of it, nearly to the wilderness boundary, in the northwest part of sec. 20, T. 44 N., R. 59 E., but no developed trails connect wilderness trails with this point. A pack trail extends from the road end, just north of the Wildcat Guard Station, northward across Sun Creek into Camp Creek, where it connects with trails from Marys River, Cottonwood Creek, and the East Fork of the Jarbidge River. Minor stub roads and jeep trails enter the area proposed for inclusion in the wilderness between Sun and Canyon Creeks.

The climate of the Jarbidge Wilderness is that characteristic of the eastern Great Basin in this latitude and at these altitudes. Annual precipitation may be 20 inches (500 mm) in the higher altitudes, less at lower altitudes. Temperatures seldom rise above 90°F (31°C) in the summer and may fall rarely to -30°F (-36°C) in winter. Much snow in winter is drifted by westerly winds and accumulates on the east and north sides of ridge crests.

Vegetation types are strongly exposure controlled. Most of the more extensive groves of trees are on the north and east sides of ridges. Perhaps half the total area of the wilderness is tree covered; the rest supports big-sage (*Artemisia tridentata*) and various forbs. The trees at the cold timberline, near 10,000 feet (3,045 m), are limber pine, characteristically distorted and dwarfed by wind stress; alpine fir forms extensive groves that extend to somewhat lower altitudes. Fir forests in the wilderness have not been logged; mine timbers were cut in areas outside the wilderness. Groves of aspen are common; mountain mahogany attains unusually large dimensions in many of the less accessible canyons where few trees have ever been cut. Alder, juniper, and many shrubs are common in the stream valleys. The alpine meadows above 8,000 feet (2,400 m) are bright with flowers of many species of plants during the brief summer season. The modern flora of the area has been reviewed briefly by Axelrod (1966, p. 3).

PREVIOUS STUDIES

The development of the mining industry in the Jarbidge mining district resulted in two early Geological Survey reports on the district (Schrader, 1912, 1923). More recently, the Jarbidge quadrangle, which includes about half of the study area, was described in a brief report (Coats, 1964). Some references to discussions, more recent than those of Schrader, of gold mining in the part of the Jarbidge district outside the wilderness are in Granger, Bell, Simmons, and Lee (1957, p. 83).

PRESENT STUDIES

Investigations by the U.S. Geological Survey were based on a review of earlier studies, unpublished official records, and on fieldwork by R. R. Coats, R. C. Greene, Leland D. Cress, and D. B. Crocker between July 10 and September 1, 1972.

Fieldwork consisted principally of geologic mapping and geochemical sampling of rocks and stream sediments. The geologic map (pl. 1) is a compilation of the Jarbidge quadrangle (Coats, 1964), which was checked and modified, and of additional mapping at a scale of 1:24,000 of the rest of the study area, done during this investigation; plate 1 was compiled at a scale of 1:48,000. Hundreds of miles of foot traverses were made; a helicopter was used to transport fieldmen to and from the end points of their traverses. Common rock types and especially all visibly altered rocks that might possibly be associated with metallization were both sampled and analyzed. Stream sediments were sampled from the mouths of tributaries of all the principal streams to obtain maximum feasible localization of any geochemical anomalies. The streamlets thus sampled generally have high gradients and low mid-summer flows; 2-4 oz (100 g) of relatively fine sediments were collected and sent to a mobile laboratory; only the minus 80-mesh (0.177-mm) size was analyzed. Selection of the finer fraction for analysis was based on the premise (Hawkes and Webb, 1962, p. 257) that the heavy metals derived from weathering of ore deposits tend to be absorbed from solution on the finer, especially on the clayey, fraction of the stream sediment. In a few samples, the fine material was so scanty that the sample size was less than optimum, thus diminishing the sensitivity of the analytical method. No systematic attempt was made by the Geological Survey to sample developed prospects or to take systematic samples of placer gravels that would be adequate for quantitative estimation of gold content, as these aspects were covered by personnel of the U.S. Bureau of Mines. Samples collected from mineralized rock were highly selective in order to obtain analytical results on the best material present without regard to the total quantity of material represented by the sample.

Bureau of Mines investigations began with a search of available literature and Elko County mining claim records by Lawrence Y. Marks in the spring of 1972. Marks and Jon W. Delony examined claimed and mineralized areas between July 12 and August 2, 1972. Marks and Donald B. Kennedy completed the field study and mining claim search from July 14 to 27, 1973. Approximately 3 man-months were spent by Bureau of Mines personnel in fieldwork.

Fieldwork involved about 100 miles (160 km) of foot traverses. Horses and helicopters were used to transport men and equipment to and from remote prospects. All known mines and prospects were sampled, mapped, and evaluated.

D. C. Holt concentrated and analyzed placer samples. Most of the other analytical work was directed by H. H. Heady, U.S. Bureau of Mines, Reno, Nev. Paul McIlroy furnished production cost estimates for barite mining.

ACKNOWLEDGMENTS

The Geological Survey and the Bureau of Mines wish to acknowledge the cooperation received from personnel of the Forest Service, Humboldt National Forest, in particular, Vern L. Thompson, Forest Supervisor, Henry S. Lee, Branch Chief, Recreation and Lands, and District Ranger Robert Easton. Survey personnel are especially grateful for the opportunity to make use of office space at the Mahoney Ranger Station, near Jarbidge. George Urdahl, the local representative of the Forest Service, and many other residents of Jarbidge extended friendly cooperation.

Paleontologists R. C. Douglass, John W. Huddle, Mackenzie Gordon, Jr., and Ellis Yochelson, of the Geological Survey, have furnished invaluable information on the ages of the sedimentary rocks.

GEOLOGIC APPRAISAL

By R. R. Coats, R. C. Greene, and L. D. Cress

GEOLOGIC SETTING

The rocks of the Jarbidge Wilderness and adjoining areas are Paleozoic sedimentary rocks (mostly quartzite, chert, limestone, and siltstone), Triassic marine sandstone and shale, Jurassic diorite, and Tertiary volcanic rocks and volcanogenic sedimentary rocks ranging in composition from rhyolite to basalt. Quaternary surficial deposits, including alluvial material, colluvium, landslide deposits, and glacial till are widespread.

The preeminent structural feature of the Jarbidge Wilderness is a horst of Paleozoic and Mesozoic rocks that are capped by Tertiary rocks. The trend of the horst is a little west of north; it is widest at the south end, south of the wilderness boundary, and narrowest at the north. The unconformable contact between pre-Tertiary and Tertiary rocks declines toward the north. The structure is complicated by numerous thrusts in the pre-Tertiary rocks and high-angle faults that cut both the pre-Tertiary and Tertiary rocks.

ROCKS

PROSPECT MOUNTAIN QUARTZITE

The Prospect Mountain Quartzite of Early Cambrian age is a widespread unit in northeastern Nevada. It is not exposed in the wilderness but has been recognized in the Jarbidge River valley and on Copper Mountain, a few miles outside the boundaries of the wilderness, and certainly extends beneath the younger rocks exposed in the wilderness. The principal lithologic type is a massive white glassy tan-weathering quartzite with thin interbeds of mica schist or phyllite. A minimum thickness of about 1,500 feet (450 m) was found in the Jarbidge quadrangle (Coats, 1964, p. M5); Bushnell (1967, p. 10) estimated a minimum thickness of 3,500 feet (1,050 m). Part of this thickness includes schist, quartzite, and hornfels that have been regarded by Coats (1964, p. M3) as Precambrian(?). The angular discordance between the typical Prospect Mountain and the Precambrian(?) rocks is small.

POGONIP LIMESTONE

The Pogonip Limestone was originally considered a Lower Ordovician formation (King, 1878, p. 187–195). The formation was raised to group status by Merriam and Anderson (1942, p. 1682). In the Jarbidge Wilderness, however, the limestone was not subdivided, and therefore the formation name, Pogonip Limestone, has been retained here. The Pogonip occurs in the valley of Camp Creek from about 1 mile (1.6 km) west of the junction of Camp Creek with the Right Fork, down to the junction of Camp Creek and its North Fork.

The principal lithologic type is a massive laminated gray coarsely crystalline limestone, with minor amounts of secondary chert. Fossils are sparse, perhaps because of recrystallization, but generically unidentifiable trilobites have been found and a large gastropod is fairly common.[1] The formation is a cliff former. The base of the formation is not exposed in the wilderness. Pre-Tertiary rocks locally are thrust over the Pogonip; elsewhere, Tertiary rocks unconformably overlie it. The lack of any base or stratigraphic top and absence of recognizable marker beds make it impossible to estimate total thickness; the exposed thickness is probably about 1,400 feet (430 m).

The Pogonip Limestone contains veins, veinlets, and wallrock replacement bodies of barite. At the Camp Creek prospects, near the junction of Camp Creek and its north fork, the veins are as much as 20 feet (6 m) thick.

The nature of the rocks on which the Pogonip rests is not clear, as they are not exposed in this area. A short distance to the northeast, in the vicinity of Elk Mountain, Mathias (1959) mapped rocks of the Cambrian and Ordovician Systems. These rocks include the Hamburg Limestone of Middle Cambrian age, the Upper Cambrian Dunderberg Shale and Windfall Formation, and the Ordovician Eureka Quartzite. Mathias estimated the thickness of the Hamburg Limestone at 320 feet (100 m), the Dunderberg Shale at 215 feet (70 m), the Windfall Formation at 1,260 feet (385 m), and the Eureka Quartzite at 250 feet (80 m). As reported by Mathias, the Eureka Quartzite rests unconformably on the Upper Cambrian strata; hence all the Lower and Middle Ordovician strata, partly represented by the Pogonip Group on Camp Creek, were never deposited or were removed by erosion (or thrusting) at Elk Mountain.

VALMY FORMATION

The Valmy Formation is one of the thickest and most widespread early Paleozoic units of the western assemblage (Roberts and others, 1958, p. 2816) in northeastern Nevada. The total thickness of the Valmy in the type area was estimated at more than 7,000 feet (2,100 m). The rocks in the Jarbidge Wilderness that are assigned to the Valmy Formation are more than 1,000 feet (300 m) thick and are not wholly assignable to either part of the Valmy recognized by Roberts, Hotz, Gilluly, and Ferguson (1958). Regionally, the Valmy Formation consists of light-gray to black quartzite that typically is massive and structureless; generally black, gray, or gray-green chert; gray or black siliceous shale; and some greenstone. In the Jarbidge Wilderness, the Valmy

[1] Ellis L. Yochelson examined these fossils and reported (written commun., June 11, 1974) that at least one of the gastropods is a *Palliseria*, which he suggested is from the lower part of the Antelope Valley Limestone. This formation is in the upper part of the Pogonip Group.

Formation crops out in the headwaters of Marys River and of Basin Creek to the south. The Valmy overlies a thrust fault and underlies either a thrust or an erosional surface.

The dominant lithology of the Valmy in the Marys River valley is that of a chert-siltstone sequence; the chert and siltstone are interbedded with dark shale and are nearly flat lying in the cliffy exposures on the north side of Marys River (fig. 2). The chert and siltstone are rich in sponge spicules and radiolaria, none of which has been identified. Similar chert is common in the Marys River Basin and in the valley of Sun Creek. Poorly exposed Valmy Formation just west of the eastern boundary, in secs. 8 and 17, T. 44 N., R. 59 E., has a considerable fraction of dark-gray massive quartzite, but most of the quartzite is seen only as isolated boulders.

Barite veins, as much as 30 feet (9 m) thick, occur in the Valmy at the Wildcat Barium mine, on the southern border of the study area.

SANDY AND LIMY SEDIMENTARY ROCKS

The rocks included in this sedimentary unit can be divided into four facies; the interrelations of these facies are not everywhere certain, and nowhere were normal depositional contacts clearly

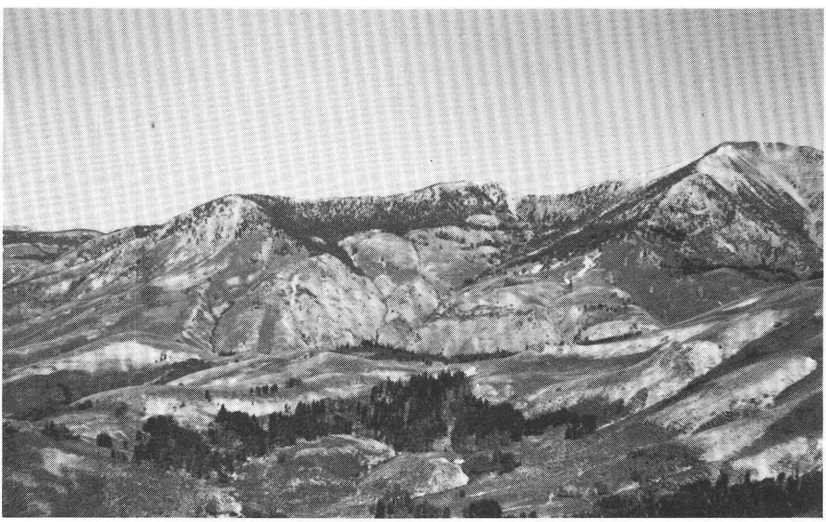


FIGURE 2.—Headwaters of Marys River and Marys River Basin. Most of subdued slopes in middle distance are underlain by Triassic marine sedimentary rocks. In the distance, on far side of Marys River canyon, gray cherts of the Valmy Formation are thrust over Triassic sedimentary rocks on the Marys River thrust. The high peak of Marys River Peak, to right of center, is composed of Jarbidge Rhyolite. View north-northwest.

demonstrated. We have recognized a limestone and shale facies, a calcareous siltstone facies, a quartz arenite facies, and a siliceous and argillaceous siltstone facies. The structural relations commonly suggest a series of imbricate thrust plates, cut by numerous high-angle faults. Identifiable fossils are not common, but those collected have been assigned ages ranging from Late Mississippian to Early Permian. Most of the rocks are Pennsylvanian and are approximately equivalent in age to the Oquirrh Group.

The limestone and shale facies has the widest distribution in the region and covers the greatest time span. In the wilderness it is exposed on the south side of Camp Creek; south of the wilderness, in the study area, it is exposed in the headwaters of Sun Creek. South of the study area it is exposed in the headwaters of Draw Creek, T Creek, and the ridge between them. The limestone forms beds a few inches to 6 feet (0.1–2 m) thick with thinner interbeds of shale. Most of the limestone is micritic to calcarenitic; the calcarenite is commonly quartzose. Brachiopods and fusulinids are sparse; most of the fossils identified are conodonts, which range in age from latest Mississippian (Chesterian) to latest Pennsylvanian or possibly earliest Permian.

The calcareous siltstone facies has been recognized in the valley of Sun Creek, south of the boundary of the Jarbidge Wilderness, but within the study area. The principal rock type is a massive to thin-bedded pale-gray calcareous siltstone.

The quartz arenite facies is composed of massive white- to maroon-weathering medium-grained quartz arenite and orthoquartzite. It crops out in the valley of Camp Creek, the ridge between Camp and Sun Creek, the ridge between Sun Creek and Marys River Basin, and, outside the wilderness, on the ridge between T Creek and Draw Creeek. In the valley of Camp Creek, the quartz arenite facies is principally pearl-gray fine-grained quartz-cemented quartzite and siltstone, largely massive and unbedded but with a few beds as much as 1 foot (0.3 m) thick of conglomerate with dark-gray quartzite and chert fragments in a pale-gray quartzite matrix. The fragments are generally less than 1 inch (2.5 cm) in size and mostly angular, but a few are rounded. In a few places, crystalline barite replaces small limestone lenses (up to 6 X 2 in. (15 X 5 cm)) and rare, poorly preserved shell fragments in quartzite. The quartz arenite facies is a cliff-forming unit. In one locality small fusiform cavities in the quartz arenite have been filled with kaolinite. These are thought to be molds of fusulinids; the fossils dissolved and the cavities were filled with kaolinite, which is the cementing material in this rock.

A fourth facies of this unit, which presents greater lithologic contrast, is present on the North Fork of Cottonwood Creek in the part of the study area east of the Jarbidge Wilderness. Here, it crops out in an area of less than a half a square mile (1.3 km^2). Neither top nor bottom of the section is exposed. The rocks are moderate dark gray (N4 in the rock color chart) siliceous and argillaceous siltstone. Some of the siltstones are apparently tuffaceous, but epiclastic material predominates. Several localities in which brachiopod molds are present were examined by Mackenzie Gordon, Jr., of the Geological Survey, in September 1974. He reported (oral commun.) that the brachiopods are crurithyrids and that the unit is best correlated with the Rib Hill Sandstone of Early Permian age.[2] Because this age may overlap the age of the youngest beds of the limestone and shale unit, the difference in lithology and the nature of the fossils that are present suggest a substantially different facies, which in turn may imply that the rocks are parts of differing structural blocks; the Rib Hill equivalent may be allochthonous here.

RESERVATION HILL FORMATION

The Reservation Hill Formation, of Pennsylvanian(?) and Permian(?) age, was named (Coats, 1969, p. A26-A27) for exposures on Reservation Hill in the Mountain City and Owyhee quadrangles. In the type locality, the principal rock type is a fine-grained dolomitic sandstone or siltstone that is pale gray on fresh fracture. It weathers creamy white to an especially distinctive pale reddish brown (10R 6/4). The formation includes thick, uninterrupted sequences in which siltstone beds, ½-2 inches (1-5 cm) thick, alternate rhythmically with thinner phyllite beds. This part of the formation generally weathers to smooth featureless slopes in the study area, although some cliffy outcrops are present in the type locality. The exposures are on both sides of the North Fork of Cottonwood Creek in the SE¼ sec. 9 and the NE¼ sec. 16, T. 45 N., R. 60 E.

In the type locality the formation also includes metagraywacke, graphitic phyllite, metachert, meta-andesite, and siliceous dolomitic limestone lenses. The rocks seem to be more metamorphosed in the Mountain City and Owyhee quadrangles than in the Jarbidge Wilderness study area, probably because of the proximity of the large granodioritic and quartz monzonitic

[2]Three collections of fossils from the rocks of this unit, apparently overlying the Rib Hill equivalent, were reported by Bruce Wardlaw and Mackenzie Gordon, Jr., (written commun., 1975) to be equivalent, or probably equivalent, either to the upper part of the Grandeur Member of the Park City Formation or the Meade Peak Member of the Phosphoria Formation of Idaho.

intrusive bodies in the Mountain City and Owyhee quadrangles. Neither in the type locality nor in the wilderness were any fossils found in the formation.

The contact in the study area with the upper Paleozoic sandy and limy sedimentary rocks is a high-angle fault that seems to dip toward the Reservation Hill Formation, suggesting that the Rib Hill-like facies of the sandy and limy sedimentary rocks probably dropped from a structurally higher position. Whether the Reservation Hill is autochthonous on the other rocks or is a part of a thrust plate, as it is in the Mountain City quadrangle, is uncertain.

UNDIFFERENTIATED MARINE SEDIMENTARY ROCKS

Triassic rocks, herein termed undifferentiated marine sedimentary rocks, were first recognized in this part of Elko County by Clark and Stokes (1956) and later described in more detail by Clark (1957, p. 2204 and 2205). He described the rocks as yellow-brown sandstone interbedded with shale and overlain by shale, limestone, sandstone, and pebble conglomerate. Coash (1967, p. 15) emphasized the presence of yellow siltstone. In 1971 Ralph D. Kraetsch, of Standard Oil of California (oral commun., 1971), found small poorly preserved ammonites in a red-weathering sideritic limestone bed in the Mount Velma quadrangle. N. L. Silberling (oral commun., 1971) was able to say only that these fossils could be Early Triassic.

Triassic rocks in the wilderness are rather similar to those in the Mount Velma quadrangle. They are generally a monotonous series of rhythmically interbedded yellow-brown-weathering sandstone and shale; the predominant bed thicknesses are in the range of 2–6 inches (5–15 cm). Fossils have not been found in this unit in the wilderness.

The Triassic rocks crop out in the wilderness and adjacent study areas in the upper basin of Marys River, in the headwaters of Camp Creek, and Sun Creek (fig. 3). Apparently they rest unconformably on the Valmy Formation and on the upper Paleozoic sandy and limy sedimentary rocks. In the headwaters of Marys River they underlie tectonically the cherts of the Valmy Formation; in the headwaters of Camp and Sun Creeks they appear to be thrust over the Valmy as well.

DIORITE

In northern Elko County, plutons of Jurassic and Cretaceous age are widespread (Coats and others, 1965; Coats and McKee, 1973).

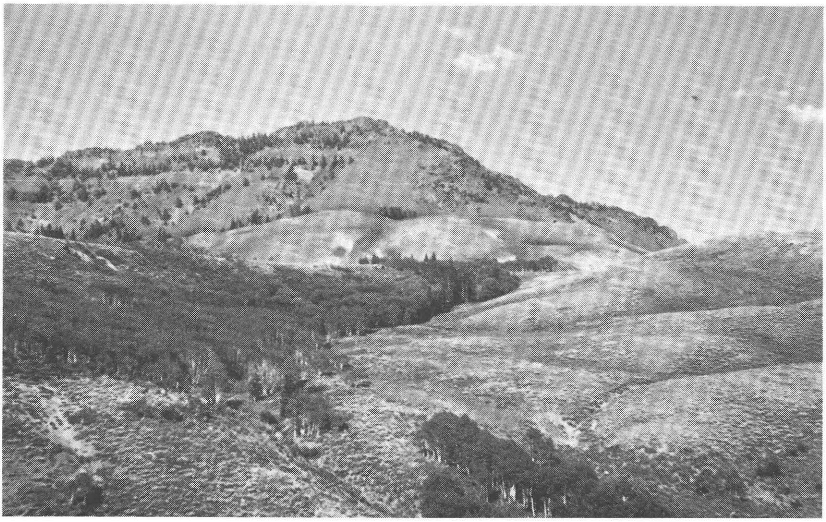


FIGURE 3.—Marys River Basin. Cliffy skyline of successive flows of Jarbidge Rhyolite, overlying light-colored even slopes of dacitic ignimbrite of Wildcat Creek. Slopes in foreground are underlain by Triassic sedimentary rocks. View east.

The Jurassic plutons, with the exception of the Contact pluton, are generally smaller, more equidimensional, and more mafic in composition; the Cretaceous plutons tend to be larger and elongated toward the east.

The Coffeepot, or Bruneau River, pluton (Bushnell, 1967, p. 19) is one of the relatively large silicic probably Cretaceous plutons. It crops out in the southwestern part of the Jarbidge quadrangle, a short distance west of the wilderness, but the aeromagnetic data (see section on "Interpretation of Aeromagnetic Data") suggest that it is not present beneath the volcanic rocks of the wilderness or adjacent study areas.

The only plutonic rock that crops out in the study area is a small pluton of diorite in sec. 16, T. 45 N., R. 60 E. The maximum exposed dimension is about a quarter of a mile (0.4 km). The boundaries are in part faults and in part are overlapped by younger rocks, so it is probable that the pluton is somewhat larger beneath the Tertiary cover; however, the aeromagnetic signature indicates that the mass is not extensive. The diorite is inequigranular, fine to medium grained, and medium gray; the mafic minerals include pale augite, hypersthene, light-green hornblende, and biotite, pleochroic from reddish brown to pale yellow. Biotite is notably poikilitic, a common trait among the Jurassic plutons of this area.

The plagioclase is zoned from An_{43} to An_{28}. Anhedral quartz and potassium feldspar are also present. The accessories include apatite, zircon, and ilmenite.

DACITIC IGNIMBRITE OF WILDCAT CREEK

The dacitic ignimbrite of Wildcat Creek is best exposed at Wildcat Creek, about 1 mile (1.6 km) west of the Wildcat Guard Station near the southeast corner of the study area. In the wilderness and adjacent study area, it is exposed in the window on the North and Middle Forks of Cottonwood Creek; on Camp Creek and its Right Fork, near the junction; on the headwaters of Marys River and in Marys River Basin, to the south (fig. 3). It is typically composed of one or more massive welded tuffs ranging in color from very light pinkish gray to medium gray. Originally, the rock was dominantly vitric, but vapor-phase alteration has converted most of the glass to aggregates of sanidine and tridymite. The percentage of phenocrysts is variable, and the kinds of minerals present also differ from place to place, suggesting that more than one eruptive unit is present. The volume percent of phenocrysts ranges from 1 to 20. Quartz, sanidine, and sodic plagioclase are common, but their proportions differ from place to place. Biotite and, in a few places, hornblende can be recognized; the vapor phase alteration may have destroyed most of the mafic minerals, but their proportion was probably low at the time of eruption. The unit differs conspicuously from the widespread Jarbidge Rhyolite (discussed subsequently) in the nature of the mafic minerals and the small proportion of phenocrysts, as well as in the presence of vitroclastic structure, a consequence of its ignimbritic origin. Locally, small amounts of andesite are present near the base, and dike feeders to these have been mapped (pl. 1).

TUFF, SEDIMENTARY ROCKS, AND BASALT

Tuff, sedimentary rocks, and basalt, as mapped in the Jarbidge quadrangle (Coats, 1964, p. M7–M10), include the Dead Horse Tuff, the Meadow Fork Formation, the Seventy Six Basalt, and the Danger Point Tuff, all mapped here as a single unit (pl. 1). The rocks are described separately, even though they have been combined into one map unit for simplicity.

The Dead Horse Tuff is chiefly a crystal-vitric tuff; small amounts of volcanic sandstone and platy to papery tuffaceous shale, which is locally limy, are included. The color ranges from pale gray or pale chocolate brown to creamy white and locally green. The tuffaceous rocks are predominantly biotite rhyolite. The essential minerals in the rhyolitic members are quartz, sanidine, biotite, and oligoclase; accessories include magnetite, apatite, zircon, garnet, and allanite(?). The glass has uniformly been devitrified. In the Jarbidge quadrangle and the northwestern part of the Marys River Basin NW quadrangle, outside the wilderness, fossil leaves have been collected and described by Axelrod (1966). A single potassium-argon determination on biotite from a tuff bed in the Dead Horse Tuff, some distance stratigraphically above the fossil leaf locality (Coats, 1964, p. M7), gave an age date of 39.9 m.y. (million years), or late Eocene.

The Meadow Fork Formation rests conformably on the Dead Horse Tuff and is overlain unconformably by younger rocks. The maximum thickness measured is about 1,300 feet (400 m). Most of the rocks are poorly sorted conglomerate and tuffaceous conglomerate. Clasts are principally granite and pinkish granitized quartzite; others include phyllite, tactite, and mica schist. The tuffs are apparently dacitic, with considerable noncognate material.

The Meadow Fork Formation has been recognized in the wilderness both northeast and southwest of Marys River Peak, and in the headwaters of Marys River southeast of Marys River Peak, but the thickness diminishes at a high rate southward from Marys River Peak.

Although all the gold veins of the Jarbidge mining district cut the Jarbidge Rhyolite (see section on "Jarbidge Rhyolite"), the work of Marks, in connection with this report, has shown that mineralization, presumably epigenetic, has also occurred in the Meadow Fork Formation in the wilderness on the west flank of Marys River Peak (see p. 55, this report). This silver mineralization, in an area far to the south of the main center of mineralization, suggests that the Meadow Fork Formation may be more highly mineralized in the Jarbidge mining district, although no evidence of prospecting in that formation was seen there by Coats during the mapping that led to his earlier report (Coats, 1964). It was, however, noted at that time (Coats, 1964, p. M8) that the Meadow Fork has been hydrothermally altered, with the development of fluorite in the basin north of Marys River Peak, in the wilderness, and of adularia and fluorite in Bonanza Gulch. The Meadow Fork Formation is also present in the Pavlak mine, described by Schrader (1923), but so far as is known, the Meadow Fork in the Pavlak mine was never tested for mineralization. The Meadow Fork Formation is also present in the cirque basin northeast of Cougar Peak and may underlie a large part of the Jarbidge mining district, over most of which no rock older than the Jarbidge Rhyolite is exposed at the surface or in underground workings.

The Seventy Six Basalt is dominantly a black to dark-gray medium- to fine-grained porphyritic alkali olivine basalt. Phenocrysts of plagioclase make up a maximum of 33 percent of the rock and a minimum of less than 1 percent; in any large exposure, some plagioclase phenocrysts that range in size from ½ to 6 inches (10–150 mm) are present. The most strikingly porphyritic phase of the basalt is exposed in a roadcut on the Elko-Jarbidge road, south of the boundary of the Jarbidge quadrangle, and outside the wilderness area. The composition of the phenocrysts has been determined as An_{68} by index of refraction. The texture is subophitic; irregular plates of purplish titanaugite include grains of olivine, labradorite, magnetite, ilmenite, and apatite. Patches of mesostasis are made up of biotite and orthoclase. Elsewhere, the groundmass is glassy, and the clinopyroxene is in rude sheafs and clusters of fibers, with chains of magnetite crystals. Olivine is altered to chlorite, serpentine, antigorite, and nontronite.

Within the Jarbidge Wilderness, the Seventy Six Basalt crops out in the cirques northeast of Cougar Peak, between Cougar Peak and Marys River Peak, west and southwest of Marys River Peak, and in Marys River Basin, east of Marys River. Exposures in the high cirques show that it intrudes the Meadow Fork Formation as dikes, sills, and a laccolith, as much as 200 feet (60 m) thick, as on the northeast shoulder of Cougar Peak (fig. 4). In the Marys River Basin, exposures are commonly surrounded by landslides, probably derived from the Danger Point Tuff. The exposures in Marys River Basin and in Copper Basin are relatively fresh, but those in the vicinity of Marys River Peak and Cougar Peak are somewhat chloritized, as a result of hydrothermal alteration associated with gold mineralization near the crest of the Jarbidge Range.

No date has been obtained on the Seventy Six Basalt from this area, but plagioclase phenocrysts from a correlative basaltic lapilli tuff in the Mountain City quadrangle gave an age of 22.9 ± 3 m.y. (J. C. Von Essen, written commun., 1969). This corresponds to an age of latest Oligocene or earliest Miocene.

The Danger Point Tuff is glassy volcanic debris of andesitic to rhyolitic composition; the glass is largely altered to montmorillonite, and the swelling of the montmorillonite on hydration causes rapid slumping of exposed surfaces and many landslides in areas underlain by the tuff. The unit was named by Coats (1964, p. M10) for exposures at Danger Point, in the valley of Coon Creek, west of the wilderness. The tuff is poorly exposed, especially in the wilderness, but the large area of landslide material at about the

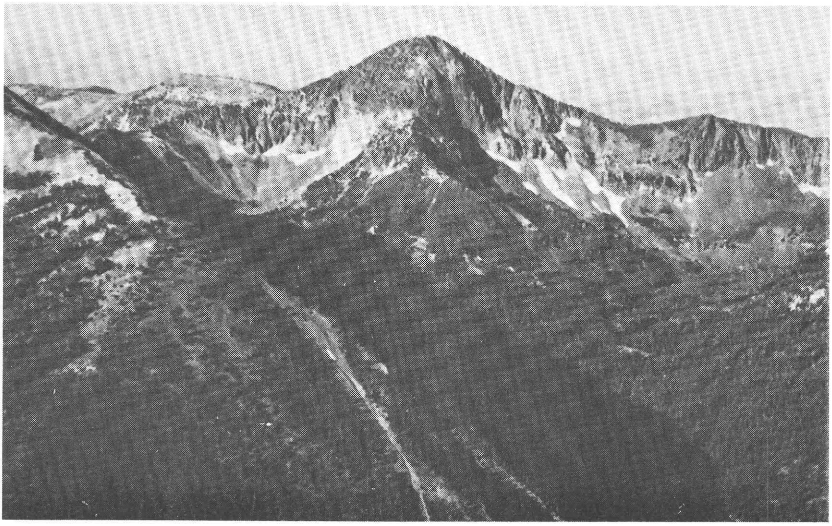


FIGURE 4.—Cougar Peak. Summit of peak is made up of Jarbidge Rhyolite; cliffs of black rock directly below and to right of peak are of Seventy Six Basalt, here present as a laccolithic intrusion in the Eocene and Miocene(?) sequence of tuff, sedimentary rock, and basalt. View west. Photograph by R. N. Coats, used by permission.

appropriate stratigraphic interval in Marys River Basin, near the south boundary of the wilderness, is inferred to reflect a considerable thickness of the Danger Point. As much as 300 feet (90 m) of the tuff has been mapped in Williams Creek basin, just north of the southern boundary of the wilderness, and east of Marys River.

Most of the beds in the tuff are internally structureless; in some places, zones rich in angular to well-rounded boulders of quartzite, chert, schist, and hornfels are present. These coarse boulders suspended in the fine structureless clayey volcanic material are considered to be evidence for a mudflow origin of the Danger Point Tuff, at least in part; the uppermost, rhyolitic part of the tuff, directly below the Jarbidge Rhyolite, may have been emplaced as an air-fall tuff; it is devoid of accidental xenoliths.

JARBIDGE RHYOLITE

The Jarbidge Rhyolite is one of the most widespread volcanic units in northern Elko County; the unit, or its lithologic and probable time correlatives, has been recognized from the Utah line as far west as the north end of the Independence Valley, and from the Idaho line southward to the East Humboldt Range. It includes flows, tuffs, and welded tuffs of rhyolitic composition, but the unit as mapped is almost entirely composed of flows. A few intercalated beds of coaly material were recognized in the Jarbidge mining camp (Coats, 1964, p. M10). Schrader (1923, p. 14) described lignitic shale and sandstone interbedded in the rhyolite sequence. Unconsolidated ash-fall tuffs are local; in a very few places rocks showing the collapsed shard structure typical of welded tuffs were recognized. Such structure elsewhere may have been destroyed by devitrification and hydrothermal alteration, and it is possible that welded tuffs make up a somewhat larger part of the Jarbidge Rhyolite than the internal structure of the rock would indicate. Where the lower contact of massive rhyolites can be examined, as in the cliffs along the east side of Copper Basin, west of the wilderness, irregularities of the lower surface and the lack of the unconsolidated zone at the base suggest that these are lava flows. Tuff-breccias, locally present, may have developed by brecciation of flow fronts, overridden by the massive main part of the flows.

The rhyolite ranges from pale bluish gray to yellowish gray and oxidizes to shades of brown and red; greenish and purplish tints are local. The glassy rocks are black to dark gray and locally greenish gray. The rocks are characterized by a large proportion of quartz phenocrysts, as much as 5 mm across, that are mostly rounded or corroded but are in part euhedral; by sanidine crystals that are slightly smaller and less numerous; and by somewhat rarer phenocrysts of oligoclase-andesine. A few of the glassy samples contain pigeonitic clinopyroxene. Nontronite pseudomorphs after pyroxene(?) or fayalite(?) are common. Biotite and hornblende or recognizable pseudomorphs after them are extremely rare. Accessories include zircon, apatite, ilmenite, magnetite, and pale-pink garnet; apparently secondary topaz was found in a single section from a specimen collected outside the wilderness.

Locally, a propylitic type of alteration, characterized by the development of epidote and chlorite, has given a dull luster and a greenish-gray color to the rhyolite. More commonly, the groundmass and phenocrysts of both plagioclase and sanidine have been replaced by adularia and, locally, by clay minerals. Rocks with this type of alteration are characterized by light colors, with a variable degree of brown to reddish staining from the development of iron oxides and hydroxides. Clayey alteration has locally dulled the luster of the feldspar phenocrysts.

The thickness of the Jarbidge Rhyolite has not been precisely determined because the top has not been recognized, marker beds are scarce, and the formation is cut by numerous high-angle faults. The base of the formation, where it rests on older Tertiary rocks and Cretaceous quartz monzonite, is well exposed near the west edge of the Jarbidge quadrangle, west of the wilderness. There, a minimum of about 1,500 feet (460 m) is present in a section with few faults. The original thickness may have been about 2,000 feet (600 m). Reliable attitudes can be obtained only by mapping depositional contacts or by measuring attitudes of interbedded tuffs; the dips are very low, generally less than 15°.

Two age dates have been determined on sanidine from the Jarbidge Rhyolite, both on samples from areas isolated from the area mapped in the wilderness. One of these was on a sample collected on Meadow Creek in the Rowland quadrangle by D. I. Axelrod and determined for him by Geochron, Inc. (Coats, 1964, p. M11) at 16.8±0.5 m.y. The other sample was collected from the basal vitrophyre of the Jarbidge Rhyolite, at a point about 2 miles (3.2 km) north of Wildhorse, Nev., in the Wildhorse quadrangle. J. F. Evernden determined (Evernden and others, 1964, p. 194) an age of 15.4 m.y. on sanidine from this sample.

Although these ages are from flows in discrete areas that may have been erupted at different times from the Jarbidge Rhyolite in the type area, they are consistent with the average age (14 m.y.) of two samples of adularia from the Jarbidge mining district, determined by Silberman (Silberman and McKee, 1974, p. 70). Also, the adularia-bearing veins cut the rhyolite. These data suggest the Jarbidge Rhyolite is middle Miocene in age.

The Jarbidge Rhyolite was apparently erupted through dikes and relatively small necks. The dikes in the wilderness trend generally a little west of north; they are as much as 1½ miles (2 km) long and as much as 300 feet (100 m) wide. Dikes cut all the older rocks, and some cut the earlier flows of the Jarbidge Rhyolite. Dikes have been mapped in the headwaters of Marys River, the East Fork of the Jarbidge River, and the headwaters of Camp Creek; doubtless, many others are present, particularly those that cut the flows of the Jarbidge Rhyolite.

VOLCANIC AND SEDIMENTARY ROCKS

Volcanic and sedimentary rocks of Miocene age are mainly exposed in the Jarbidge quadrangle, on the northeast margin of the wilderness, and on the east and southwest margins of the study area. They are younger than the unconformity that bevels the Jarbidge Rhyolite and the gold and silver veins and are not mineralized. In the Jarbidge quadrangle the formations into which this unit has been divided are, from oldest to youngest, the Gods Pocket Dacite, the Pole Creek Dacite, the Slide Creek Gravel, the Jenny Creek Tuff, and the Cougar Point Welded Tuff (Coats, 1964, p. M11-M14). The three oldest formations were assigned a Pliocene(?) age, and the two youngest a Pliocene age. Subsequently an age date of 12.2±0.8 m.y. on the Cougar Point from the Owyhee quadrangle, about 40 miles (60 km) to the west, was determined by Obradovich (Coats and Stephens, 1968, p. 1083) on sanidine, using the potassium-argon method. Although this age was formerly assigned to the Pliocene, it is now considered to be late Miocene (Berggren, 1972). Consequently, all the rocks older than the Cougar Point that lie above the Jarbidge Rhyolite must also be late Miocene in age.

The Gods Pocket Dacite is a sequence of flows and minor tuffs; the Pole Creek Dacite, a group of vitrophyric dacite domes; the Slide Creek Gravel, an unconsolidated poorly sorted generally coarse gravel; the Jenny Creek Tuff, largely dacitic or rhyodacitic air-fall tuff; and the Cougar Point Welded Tuff, an ignimbritic sequence. All of these formations are described in detail by Coats (1964, p. M11-M14).

QUATERNARY DEPOSITS

TERRACE GRAVEL AND GLACIAL OUTWASH

The terrace gravel includes alluvial deposits that are obviously related to modern streams but are now some distance above them. The areal distribution of the mapped bodies of gravel does not appear to be systematic but rather the result of the accidental preservation of small bodies in a few places. Material exposed at the surface is commonly coarse, with some boulders 1 foot (0.3 m) in diameter; locally, in streambanks and roadcuts, finer material is exposed. Most of the deposits are relatively thin, but the small deposit on the East Fork of the Jarbidge River is about 200 feet (60 m) thick.

Glacial outwash in most places cannot be distinguished from the terrace gravel. Residual cobbles on the surface of bodies mapped as outwash are much smaller than the largest boulder in the glacial moraines, and the sorting is considerably better.

GLACIAL MORAINE AND LANDSLIDE DEPOSITS

Glacial moraines of at least three distinct stages have been recognized in the Jarbidge quadrangle (Coats, 1964, p. M18). Deposits of the two latest of these are present in the Jarbidge Wilderness. Moraines belonging to the older of these two stages lie in heads of valleys where the typical cirque form is now modified by talus aprons, or in valleys with typical mature fluvial form, commonly with bedrock gorges and pinacles suggesting a long period of time since the glaciation. Typical examples are in the bottom of East Fork valley, west of Gods Pocket Peak, and in the head of Marys River, east of West Marys River.

The youngest moraines are in U-shaped valleys. Terminal moraines still retain their original form, and postglacial erosion of bedrock is slight. The cirque form is preserved at the heads of many of these valleys, for example, those of Cougar Creek, Fall Creek, the East Fork of the Jarbidge River, and West Marys River. Most of the youngest glaciers originated in cirques incised into rhyolite, and therefore rhyolite boulders are the commonest glacial material. Rhyolite, unless hydrothermally altered, is highly resistant to weathering, and therefore it was not feasible to use the degree of weathering of the boulders as a basis for discriminating between glacial deposits of different ages. Some glacial deposits in the Jarbidge quadrangle are stained red by weathering of pyritic rhyolite boulders, but this character is inconstant and depends more on source area than age of glaciation.

Landslides are widespread in the Jarbidge Wilderness. Most of them are facilitated by the presence of resistant jointed formations, such as the Jarbidge Rhyolite or the Cougar Point Welded Tuff, overlying weak and commonly clayey volcanic ash, such as the Danger Point Tuff and the Jenny Creek Tuff. A few landslides appear to have been facilitated by glacially oversteepened slopes in locally weakened argillized zones in the Jarbidge Rhyolite. Most landslides occur in the valleys of the East Fork of the Jarbidge River, the valley of West Marys River, and Marys River Basin. In several places landsliding has occurred at two distinct periods of time; the older landslides are more dissected, retain fewer undrained depressions, and commonly cap ridges where the underlying rock is easily eroded. The younger have a rougher topography, retain more undrained depressions, and commonly are closely confined to present valleys. In at least one place outside the wilderness, glacial till rests upon older landslide deposits, suggesting that slides were more prevalent at or slightly before the beginning of glaciation, during a period of high rainfall.

Alluvium and Talus

Most alluvium is confined to relatively thin bodies of coarse poorly sorted unconsolidated gravel and sand along the present streams; the upper surface is generally no more than 6–8 feet (2–3

m) above normal high water. Schrader (1923, p. 15) reported that the alluvium in the flat north of Jarbidge is no more than 14 feet (4.2 m) thick. An attempt was made to mine the alluvium here; generally, the depth of alluvium where no prospecting has been done can only be inferred. In several places, some of the wider bodies of alluvium result from the obstruction of streams by landslides.

Alluvial cones, found at the mouths of many steep gulches, have been combined on plate 1 with talus that mantles steeper cliff faces because the cones and talus grade into one another laterally on the steepest slopes. The talus is composed of boulder-sized angular fragments. The resistant Paleozoic rocks and the Jarbidge Rhyolite are principal sources of talus, together with the harder units in the Miocene volcanic and sedimentary rocks.

COLLUVIUM AND ROCK GLACIERS

Various thicknesses of colluvium are widespread in the wilderness, especially on the more readily disintegrated rocks, particularly the Triassic sedimentary rocks and the less indurated volcanic rocks. It has been mapped only where thick enough to obscure bedrock contacts. Colluvium is prevalent on north-facing slopes, where snow lies later in the summer and growth of vegetation is favored by the greater amount of moisture retained in the soil and by lower insolation.

Several of the cirques in the east side of the Jarbidge Mountains contain rock glaciers, particularly those cirques at the heads of Fall and Cougar Creeks. Some glaciers are still active. All except one are of the lobate type as defined by Wahrhaftig and Cox (1959, p. 389) and range in width, as measured along the cliff slope at the head, from 1,500 to 8,000 feet (460 to 2,400 m) and in length (downslope) from 200 to 500 feet (60 to 150 m). The only tongue-shaped rock glacier lies in a cirque on the northeast side of Cougar Peak and is 1,500 feet (460 m) long and 700 feet (215 m) in maximum width. Its source appears to be a shear zone on the side of Cougar Peak that has apparently furnished coarse debris at a higher rate than the average exposure of Jarbidge Rhyolite. Some lobate rock glaciers northeast of the Matterhorn have coalesced to form an incipient tongue-shaped rock glacier. All the rock glaciers in the Jarbidge Mountains are made up largely of coarse debris that contains angular blocks as much as 4 feet (1.2 m) across. Water from the small rock glacier in the cirque southeast of Jarbidge Peak drains into a pond that has the milky discoloration characteristic of streams draining active glaciers, suggesting that this rock glacier may be slightly active. Some lobate rock glaciers at lower altitudes and on south-facing cliff walls support scattered vegetation of alpine perennial plants. In a few places, near the lower limit of rock-glacier development, inactive rock glaciers have collapsed, leaving basins between talus slopes and the outer ridge of the rock glaciers. The resulting landforms are indistinguishable from protalus ramparts.

STRUCTURE

PRE-JURASSIC DEFORMATION

The structures of the Jarbidge Wilderness and vicinity are either pre-Jurassic or post-Cretaceous in age. Pre-Jurassic deformation is confined to the Paleozoic and Triassic rocks and has no counterpart in the younger rocks. The principal type of deformation in the pre-Jurassic rocks is low-angle overthrusting that involves rocks of early Paleozoic to Triassic age. The Marys River thrust is the major thrust; it crops out on both sides of the upper valley of Marys River, south of the Jarbidge quadrangle, and in most of its exposed outcrop it places Ordovician Valmy Formation over the undifferentiated Triassic sedimentary rocks (fig. 3). In the valley of Marys River, over a distance of about 1 mile (1.6 km), the Triassic rocks consistently strike about N. 55° E. and dip northwest at angles ranging from 24° to nearly vertical. The Triassic rocks are considered autochthonous in the valley of Marys River and in Marys River Basin. The direction of movement of the upper plate of this thrust was probably from northwest to southeast.

Another thrust, perhaps a major one, is the Camp Creek thrust, exposed in the valley of Camp Creek, in secs. 3 and 4, T. 44 N., R. 59 E. It thrusts late Paleozoic limy and sandy rocks over the Ordovician Pogonip Limestone. The Pogonip is here regarded as autochthonous. Further southeast, in the upper valley of Sun Creek and in the valleys of Draw Creek and T Creek, outside the study area, the Valmy and the Triassic and late Paleozoic sedimentary rocks are in an imbricate complex of small thrust plates.

The relative ages of the Camp Creek and Marys River thrusts cannot be determined with certainty, but because the lower plate of the Marys River thrust is Triassic and the lower plate of the Camp Creek thrust is Ordovician Pogonip, and both are considered to be autochthonous, the Camp Creek thrust is inferred to be older (pre-Triassic) and structurally lower than the Marys River thrust. An upper limit for the age of the thrusting is suggested by the observation, in the study area and elsewhere in the region, that Jurassic intrusive rocks are not involved in the thrusting. This inference involves an extrapolation, as none of the mapped thrusts approach the small pluton of Jurassic diorite in the study area.

POST-CRETACEOUS DEFORMATION

The post-Cretaceous structures are high-angle faults that cut the Tertiary rocks. Some of these have not been directly observed but are inferred from the abrupt changes in thickness of some of the Tertiary units; orientation remains uncertain. The oldest Tertiary unit in the area is the dacitic ignimbrite of Wildcat Creek. The unit has a maximum exposed thickness of about 600 feet (185 m) in Marys River Basin but does not appear in the Jarbidge or Elk Mountain quadrangles.

The distributions of several units that make up the Eocene and Miocene(?) tuff, sedimentary rocks, and basalt are also restricted. The Dead Horse Tuff and Meadow Fork Formation are quite thick in the southern part of the Jarbidge quadrangle but wedge out a few miles south of the southern boundary (Coats, 1964, p. M22). The Seventy Six Basalt and Dead Horse Tuff seem to be restricted to that part of the Wilderness west of the westernmost third R. 59 E.

The Tertiary volcanic rocks are cut by numerous faults, nearly all of which, judging from their surface traces, are very steeply dipping. Few faults are directly exposed. For those that displace contacts, some idea of the direction and amount of displacement can be obtained, but these factors commonly are suggested only by topographic lineaments visible on aerial photographs and by associated rock alteration and occasional lithologic contrast on the ground. The principal trends of the high-angle faults that cut the Jarbidge Rhyolite and the Miocene volcanic and sedimentary rocks that lie above it range from north to N. 20° W., from east to N. 70° E., and from N. 35° to 40° E. All of the faults that cut these formations whose displacement is known are high angle; the downthrown side is not systematically restricted to one side of the high-angle faults of any of the major trends.

The Jarbidge Mountains are roughly a horst; no single fault can be recognized as either the east or west boundary fault, for the locus of maximum displacement shifts from one fault to another, commonly along cross-faults but also by warping of the intermediate block. The Jarbidge Mountains horst widens from the vicinity of Cougar Peak southward to a point north of the southeast boundary of the study area near the head of Sun Creek, where it is about 4 miles (6.4 km) wide. The horst continues southward beyond the mapped area, narrowing by convergence of the north-trending faults forming the west boundary and the north-northeast-trending faults forming the east boundary, to the south boundary of the Marys River Basin NE. quadrangle. It continues a few miles farther south, but the structurally high block in its extreme southwest margin is topographically low and lies in the valley of Marys River.

The high-angle faults are of economic importance because all the mineral deposits of the study area are found in them. This has long been known to be true of the gold and silver veins of Jarbidge, which generally trend north to northwest (Schrader, 1923, p. 27). We found the barite deposits of the wilderness also along these faults. Major barite bodies fill fissures, along which, locally, small amounts of wall rock may have been replaced.

INTERPRETATION OF AEROMAGNETIC DATA

By W. E. Davis, U.S. Geological Survey

During the summer of 1967, the U.S. Geological Survey made an aeromagnetic survey of the Jarbidge Mountains to help evaluate the mineral potential of the area. Total-intensity magnetic data were obtained by means of a continuously recording fluxgate magnetometer flown at a barometric elevation of 9,000–12,000 feet (2,700–3,600 m), depending upon local topography. Flight lines were oriented east-west and spaced about 1 mile (1.6 km) apart. The magnetic data were compiled at a scale of 1:48,000 with contour intervals of 10 and 50 gammas relative to an arbitrary datum (pl. 1). No laboratory measurements of rock magnetic properties were made.

The aeromagnetic map shows a complex of small discontinuous anomalies with amplitudes generally less than 100 gammas. A maximum magnetic relief of about 200 gammas occurs in the southern part of the area. Elsewhere the relief is less and may be as much as 100 gammas. Most of the anomalies are bounded by high magnetic gradients, whose horizontal extent indicates that their sources are exposed or lie near the ground surface. Some of the variations in magnetic intensity across the mountains are probably caused partly by a topographic effect.

In the northern part of the area, a small magnetic minimum lies over the ridge between East Fork Jarbidge River and Dave Creek. The bounding magnetic gradients indicate that the source of the feature lies near the ground surface. Very likely the anomaly is caused by remanent magnetization in the Cougar Point Welded

Tuff that caps the ridge. The minimum suggests that these rocks are inversely polarized and their direction of total magnetic intensity is antiparallel to the earth's magnetic field. A higher intensity that is probably caused by rhyolitic rocks surrounds the minimum. Small magnetic maxima to the north and over Sawmill Ridge to the south are attributed to rhyolite flows or tuffs.

Jarbidge Peak is marked by a minor magnetic low, probably a result of an abnormally directed magnetization in volcanic rocks near the peak. Low magnetic intensity also occurs over mountain slopes east of Jarbidge Peak, Jumbo Peak and Square Top, and southeast of the Matterhorn. The low intensity here is attributed to topography and to the nonmagnetic effect of thick glacial moraine and talus deposits.

To the southeast, a triangular positive anomaly lies between Prospect Peak and Marys River Peak. The anomaly includes the tuff, sedimentary rocks, and basalt unit near Emerald Lake and on the ridge east of Cougar Peak, and the rhyolitic rocks on the Matterhorn and Cougar Peak and on Slide Rock Ridge. The principal source of the anomaly is probably the Seventy Six Basalt, which forms a laccolithic sill about 200 feet (60 m) thick just east of Cougar Peak. This rock, like most basalt, has a relatively high content of ferromagnetic iron oxide minerals.

Magnetic gradients to the east indicate that moderate intensity is expressed by the rhyolitic rocks on Gold Peak and Divide Peak and on the lower mountain peaks and slopes southwest of Cottonwood Creek.

A broad zone of low magnetic intensity that is partly outlined by the 2,650-gamma contour extends north from Gods Pocket Peak. Dacitic flows near Gods Pocket Creek and along the ridge to the east are considered to be the dominant source of the southern part of the zone. The southern minimum suggests that rocks north of the peak are reversely polarized. North of Slide Creek, welded tuff, dacite, and gravel deposits contribute to the low-intensity zone. In the northwest part, a small minimum occurs over Biroth Ridge. This anomaly is probably caused by the welded tuff that caps much of the ridge. Similar rocks may be the main source of small narrow magnetic minimums along the east flank of the zone. The zone includes part of the Jarbidge rhyolite sequence, but the presence of these rocks does not seem to be obvious magnetically. Perhaps they have lower magnetic susceptibility than most rhyolitic rocks elsewhere. To the east, intensities of about the same magnitude indicate that similar rhyolitic rocks occur along the upper reaches of Middle Fork and North Fork Cottonwood Creek and South Fork Canyon Creek. Part of the low intensity here may be caused by topography.

A negative anomaly occurs over welded tuff and talus deposits near Canyon Creek Pockets in the northeast corner of the area. Reversed or abnormally directed remanent magnetization in the tuff probably is the main source of this anomaly. Magnetic gradients indicate a weak magnetic response for similar tuffaceous rocks exposed along the east margin of the area.

Near the east border of the wilderness area, a magnetic maximum lies between the North Fork of Cottonwood Creek and Goat Creek. The anomaly occurs over part of the Jarbidge Rhyolite sequence and the older sedimentary strata and intrusive rocks. This feature is attributed to a body of diorite that intruded sedimentary rocks near the North Fork. The high point of the anomaly lies to the northeast of the outcrop of the diorite and underneath an unknown thickness of Jarbidge Rhyolite, which has been faulted down against the diorite and Paleozoic rocks. We interpret this extension as suggesting that the diorite mass continues to the northeast, beneath the Jarbidge Rhyolite.

To the southwest, a weak magnetic high lies over the mountains between Cottonwood Creek and North Fork Camp Creek. Induced magnetization in volcanic rocks along the crest of the mountains seems to be the source of the high. Remanent magnetization in part of the rhyolite sequence very likely causes the adjoining sharp magnetic minimum to the southeast.

Low magnetic relief occurs over the older sedimentary rocks that crop out near Camp Creek and underlie mountains to the south. A small positive anomaly on the north edge of the outcrop area may indicate the presence of ignimbrite.

In the southeast part of the wilderness area, a nose in the contours indicates a magnetic low that trends northwestward between Wildcat and Sun Creeks. The Gods Pocket Dacite and extensive deposits of landslide material probably account for most of the low. The nonmagnetic effect of sedimentary rocks along upper Sun Creek contributes to the low intensity.

A small negative anomaly that is attributed to landslide deposits and welded tuff occurs over the upper reaches of Wildcat Creek. West of this feature, a weak magnetic high and an adjoining low are associated with different rocks bordering a northeast-trending fault zone. The high occurs over rhyolitic rocks on the southeast side of the fault. The low marks sedimentary rocks involved in a thrust northwest of the fault. Lack of a stronger magnetic response for the rhyolitic rocks suggests that the volcanic sequence near the head of the creek and to the south is not very thick.

On the west edge of the area, a minor magnetic low occurs near Fox Creek Peak. The low seems to be an edge effect of rhyolite flows on the peak. Rhyolitic rocks on the neighboring peak to the south and along the mountain crest to the southeast are expressed by a positive anomaly. Very likely these rocks possess strong induced magnetization.

In the southwest part of the area, a small high-gradient magnetic minimum occurs over the mountain crest between Seventy Six Creek Pasture and Lost Draw. This feature is part of a narrow zone of low intensity that extends southwestward over the crest of the mountains to the area boundary. The low intensity is probably caused by remanent magnetization in rhyolitic rocks along the mountain crest. The low intensity may result from strong deformation, or it may represent a different part of the rhyolite sequence.

Another change in the magnetic properties of the volcanic sequence is indicated by the narrow high east of Willow Creek. The high is associated with rhyolitic rocks along a mountain crest. Apparently these rocks have greater magnetic susceptibility than those to the west.

To the east, an irregular magnetic pattern indicates small variations in total intensity resulting from susceptibility contrasts between rhyolitic rocks, and ignimbrite and tuff, sedimentary rocks and basalt near Marys River, upper Basin Creek and Williams Creek.

The intense deformation in parts of the area seems to be reflected in the magnetic pattern. In these localities, the variations in the total intensity are related mostly to magnetic property contrasts between igneous rocks and sedimentary rocks and deposits. There do not seem to be any extensive magnetic lows that represent large zones of alteration in which metallic mineral deposits may occur along major fault zones. None of the anomalies has sufficient amplitude to represent a large deposit of magnetite lying at shallow depths in the study area.

MINERAL RESOURCES

By R. R. Coats, R. C. Greene, L. D. Cress, and L. Y. Marks

In appraising the mineral resource potential of the Jarbidge Wilderness and adjacent areas, the Geological Survey was responsible for geological and geochemical exploration, including the search for previously unrecognized mineral occurrences. Special consideration was given to recognition of mineral occurrences that early prospectors may have overlooked or were unable to detect or recognize, or could not market.

COMMODITIES CONSIDERED

The principal commodities found in the wilderness and adjacent areas described in this report, and in neighboring areas, are gold, silver, tungsten, antimony, and barite. None of these, however, are known to have been produced in the Jarbidge Wilderness except barite, which has been produced from the southern part of the study area. About 434,000 troy oz (13,500 kg) of gold and 1,280,000 troy oz (39,800 kg) of silver, the combined value of which at the time of production exceeded $10 million, came from mines within 2 miles (3.2 km) of the study area between 1910 and 1949 (Granger and others, 1957, fig. 3). More than 1,000 tons (907 tonnes) of barite was produced in 1957 from the Wildcat Barium mine, in the southern portion of the study area (Horton, 1963). An unknown, perhaps substantial, amount of placer gold estimated as perhaps 300 oz (9 kg) before 1900 by Johnson (1973, p. 14), totaling perhaps 500 oz (15 kg), was mined in the Charleston district, southwest of the wilderness. Total lode production from the Charleston district from 1932 to 1937 was 1,322 tons (820 tonnes) of ore, with a content of gold, silver, copper, and lead valued in all at $10,518 (Granger and others, 1957, p. 32). Lawrence (1963, p. 44) reported a production from one property of 30 or 40 tons (27 or 35 tonnes) of antimony ore in 1907, for a net return of $60. Coats (1964, p. M24) estimated a total production of a few hundred units (1 unit equals 20 lb or 8.5 kg of WO_3) of molybdenian scheelite from contact metasomatic deposits along the eastern margin of a granodiorite body in the Jarbidge quadrangle to the northeast of the Charleston district. Most of the mines were shallow open pits, and in some, only the material softened by weathering was mined.

The first claims were staked in the Jarbidge mining district by D. A. Bourne in 1909. Exaggerated reports of his discovery brought in about 1,500 prospectors, and more than 500 claims had been filed by mid-April 1910. Most prospectors left the district before May 1910. Development and consolidation of the best mining properties increased the population of Jarbidge to about 1,200 in early 1911, but it dwindled to less than 300 by 1920. Elkoro Mines Co., a subsidiary of the Yukon Gold Co., built a 100-ton-per-day mill (91 tonnes) in 1918. A total of eight mills had been constructed in the district by 1920 (Schrader, 1912, 1923).

Most gold and silver ore was produced by Elkoro Mines Co., principally from the Long Hike, North Star, Starlight, and O. K. claim groups. Large-scale mining was suspended in 1932 because the ore gave out. Subsequent attempts to renew mining failed (Granger and others, 1957).

METHODS OF STUDY

SIGNIFICANT VALUES

If the term "significant" is to be used precisely, it should be used to mean an anomalous value that may be related to economic mineralization. An anomalous value is defined by Hawkes and Webb (1962, p. 27, 30) as one above the threshold, or upper limit, of normal background fluctuation. Hawkes and Webb suggested that for a normal distribution, the threshold be taken as the mean plus twice the standard deviation. Examination of the tables of results indicates that many of the variates show a strongly skewed distribution, better fitted by a log-normal distribution than by a normal distribution. If this is true, the geometric mean is a more meaningful value than the arithmetic mean.

The geometric mean is the antilogarithm of the sum of the logarithms of all the analytical values, and the geometric deviation is the antilogarithm of the standard deviation of the logarithm of all the values. Then for a log-normal distribution, the threshold value is taken as the antilog (log geometric mean plus twice the log of the geometric deviations), or

$$\text{Threshold value} = (\text{Geometric mean})\,(\text{Geometric deviation})^2$$

During earlier work in the Jarbidge quadrangle (Coats, 1964), the following samples of some of the volcanic rocks were collected and analyzed by gravimetric (barium) or quantitative spectrographic methods (beryllium, copper, chromium, molybdenum, nickel, lead, and tin). The sensitivities of the methods used at that time were about as follows, in parts per million: Pb, 10; Sn, 4; Be, 1. Gold, silver, and mercury were not determined on these samples. Copper and molybdenum were determined on two, nickel and chromium on only one rock type. The numbers shown in parentheses are the number of determinations on separate samples averaged to arrive at the figures shown.

[n.d. = not determined]

	Ba	Be	Cu	Cr	Mo	Ni	Pb	Sn
Seventy Six Basalt	900	---	30	25	---	10	---	n.d.
Jarbidge Rhyolite (3)	800	5	n.d.	n.d.	n.d.	n.d.	50	12
Robinson Creek Dacite (3)	1,000	3	(1)50	n.d.	(1)8	n.d.	23	11
Cougar Point Welded Tuff	800(2)	5(10)	n.d.	n.d.	n.d.	n.d.	34(10)	5(10)

Some of the samples of bedrock taken during the work in 1972 are believed to represent unaltered material, which is useful in giving data on the background levels of the several elements of interest. Not all the formations sampled in the study area could be sampled in nearby areas where they were certainly free of epigenetic mineralization. This is especially true of the Pogonip Limestone and of some facies of the sandy and limy sedimentary rocks.

Samples numbered JC001 to JC009 were taken from rocks, or stream sediments, in areas outside the study area in order to furnish some background data on the element content of unaltered rocks and stream sediments derived from them.

GEOCHEMICAL EXPLORATION

Stream-sediment samples were collected from both perennial and ephemeral streams during the study. All major streams were traversed, and in order to give best localization of analytical results, samples were collected from tributaries just above their mouths (see pl. 2). Many tributaries are very small, and quantities of sediment available were not always sufficient, after sieving, to give the optimum sample size of minus 80 mesh material. Therefore, the precision of the analysis is less for these samples. A collection of 247 stream-sediment samples was analyzed.

All major ridges and many minor ones were traversed, and samples of veins and altered or mineralized rock were collected and analyzed. In a collection of 164 samples of rocks, veins, and soils, only two were soils; therefore soils have been included with rocks and veins in the table and maps of sample distribution.

All samples were analyzed for 31 elements by the six-step semiquantitative spectrographic method (table 1). Also, samples were analyzed for gold and silver by atomic absorption methods, for mercury and selenium by instrumental methods (only selected samples analyzed for selenium), for arsenic and antimony by chemical methods, and for fluorine by a specific ion method. Selected samples were analyzed chemically for barium sulfate.

GOLD AND SILVER

The data from atomic absorption and spectrographic analyses do not suggest the presence of any substantial unexplored deposits of gold or silver. The samples taken by the Bureau of Mines on known veins and alteration zones are evaluated in the section on "Economic Appraisal"; also, some samples taken by the Geological Survey were from veins and alteration zones in the area near the crest of the Jarbidge Mountains.

Gold has not been listed in table 1 because of the small number of samples in which gold was found. None of the samples collected by the Geological Survey in 1972 had contents of gold of 1 ppm (part per million) or more. Six of the samples, as indicated in the following list, had gold contents between the lower limit of detectability (0.05 ppm) and 1 ppm:

	Au (ppm)
JC030	0.05
JC044	.05
JD072	.05
JD077	.2
JD104	.7
JL033	.55

Because of the severely censored distribution of gold contents, only six samples out of 411 being above the lower limit of detection, no statistically valid conclusions regarding its distribution can be drawn. All the gold was obtained in samples from veins, or areas of altered or mineralized rock.

The distribution of analytical values for silver is not as severely censored as those for gold. The lower limit of detectability by the atomic absorption method is 0.5 ppm. Fifteen samples (table 1) have 0.5 ppm; six samples have more than this amount. Again, the number of samples is so small that statistically valid conclusions cannot be drawn.

Figure 5 indicates that most of the significant silver values are from samples taken near the crest of the Jarbidge Mountains; most of them are from known veins or alteration zones. A few samples are from the Paleozoic sedimentary rocks in the southern part of the wilderness, and one sample (72JD104) of copper-stained quartz, with 33 ppm silver, was collected from a dump of a small slumped prospect pit in the Jurassic diorite.

For silver in stream sediments, the geometric mean (G.M.) is 0.595 ppm. The geometric deviation (G.D.) is 1.36. The threshold value, (G.M.) $(G.D.)^2$, is 1.1 ppm. No values for stream sediments sampled by the Geological Survey reach this threshold; hence none can be considered significantly anomalous. (For converting oz. per ton to ppm see table 2.)

MERCURY

Mercury commonly forms a primary dispersion halo in the vicinity of ore bodies of other metals (Hawkes and Webb, 1962, p. 72–73). For this reason, the geochemical samples collected by the Survey were analyzed for mercury by a sensitive instrumental technique.

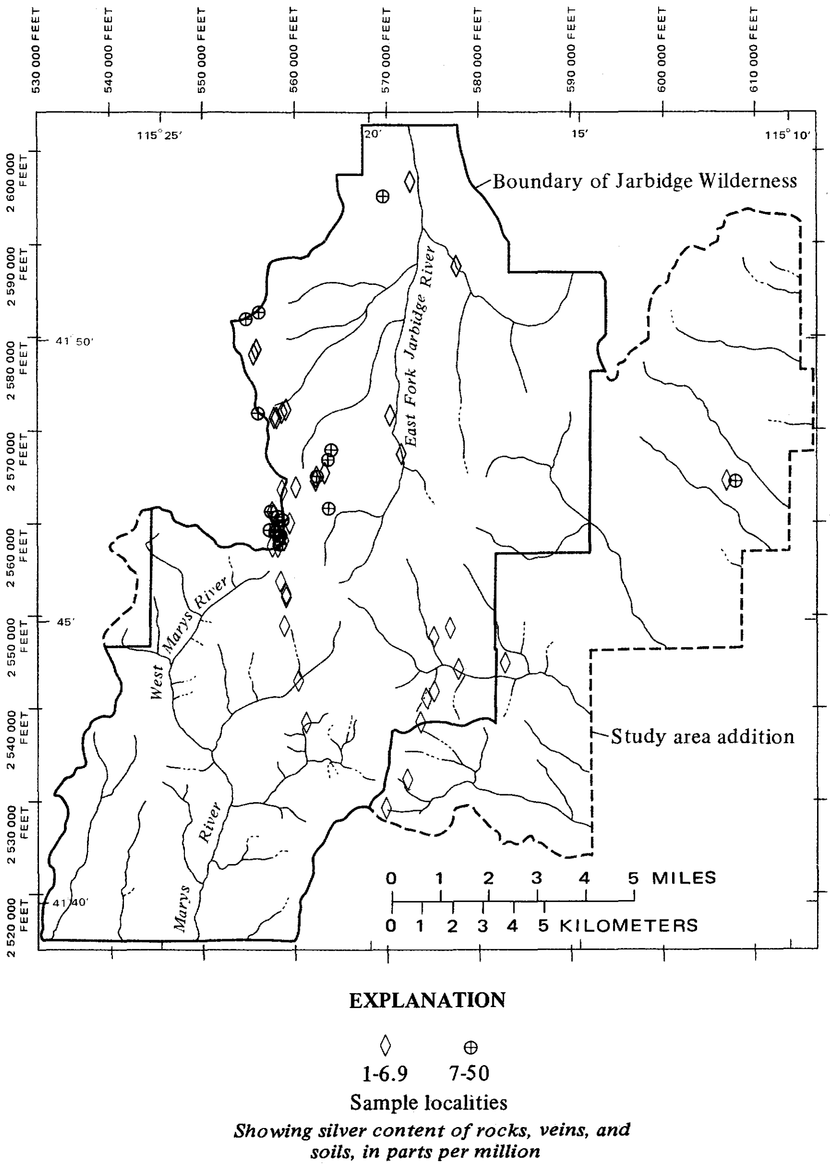


FIGURE 5.—Localities of samples taken in the Jarbidge Wilderness and adjacent areas containing anomalous quantities of silver.

For mercury in rocks, veins, and soils, the geometric mean of 161 analytical values is 0.112 ppm, and the geometric deviation is 3.74. The threshold value may be taken then, assuming a log-normal distribution, as approximately 1.5 ppm. An alternative approach

TABLE 2.—*Conversion of parts per million to percent and to ounces per ton, and vice versa*

[Conversion factors: 1 lb avoirdupois = 14.583 ounces troy; 1 ppm = 0.0001 percent = 0.0291667 ounces troy per short ton = 1 gram per metric ton; 1 ounce per ton (Au or Ag) = 34.286 ppm = 0.0034286 percent]

Parts per million to percent to ounces per ton			Ounces per ton to percent to parts per million		
Ppm	Percent	Ounces per ton	Ounces per ton	Percent	Ppm
0.01	0.000001	0.0003	0.01	0.00003	0.3
.02	.000002	.0006	.02	.00007	.7
.05	.000005	.0015	.05	.00017	1.7
.10	.00001	.003	.10	.00034	3.4
.20	.00002	.006	.20	.00069	6.9
.30	.00003	.009	.30	.00103	10.3
.40	.00004	.012	.40	.00137	13.7
.50	.00005	.015	.50	.00171	17.1
.60	.00006	.017	.60	.00206	20.6
.70	.00007	.020	.70	.00240	24.0
.80	.00008	.023	.80	.00274	27.4
.90	.00009	.026	.90	.00309	30.9
1.0	.0001	.029	1.0	.00343	34.3
10.0	.001	.292	10.0	.03429	342.9
20.0	.002	.583	20.0	.06857	685.7
50.0	.005	1.458	50.0	.17143	1,714.0
100.0	.01	2.917	100.0	.34286	3,429.0
500.0	.05	14.583	500.0	1.71	17,143.0
1,000.0	.10	29.167	1,000.0	3.43	34,286.0
10,000.0	1.00	291.667	10,000.0	34.29	342,857.0

to deciding on the threshold value, to be used when analytical values show considerable scatter (Hawkes and Webb, 1962, p. 31), is to estimate the threshold value as that value exceeded by no more than 2½ percent of the total number of observations. With this approach, only the upper four values can be considered anomalous. The map (fig. 6) shows by different symbols the geographic distribution of samples having from 0.3 to 4 ppm and from 5 to more than 10 ppm.

Sample numbers JC001-003 and 005-010 (table 1), which are probably almost unmineralized rocks of various types, have a mean mercury content of about 0.1 ppm. The sample of Jarbidge Rhyolite has a content of about 0.06 ppm, which is close to the mean for igneous rocks (Hawkes and Webb, 1962, p. 369); the mean for limestones and sandstones is considerably less. The samples having relatively high mercury contents are too few to permit valid conclusions, but their geologic distribution suggests that some

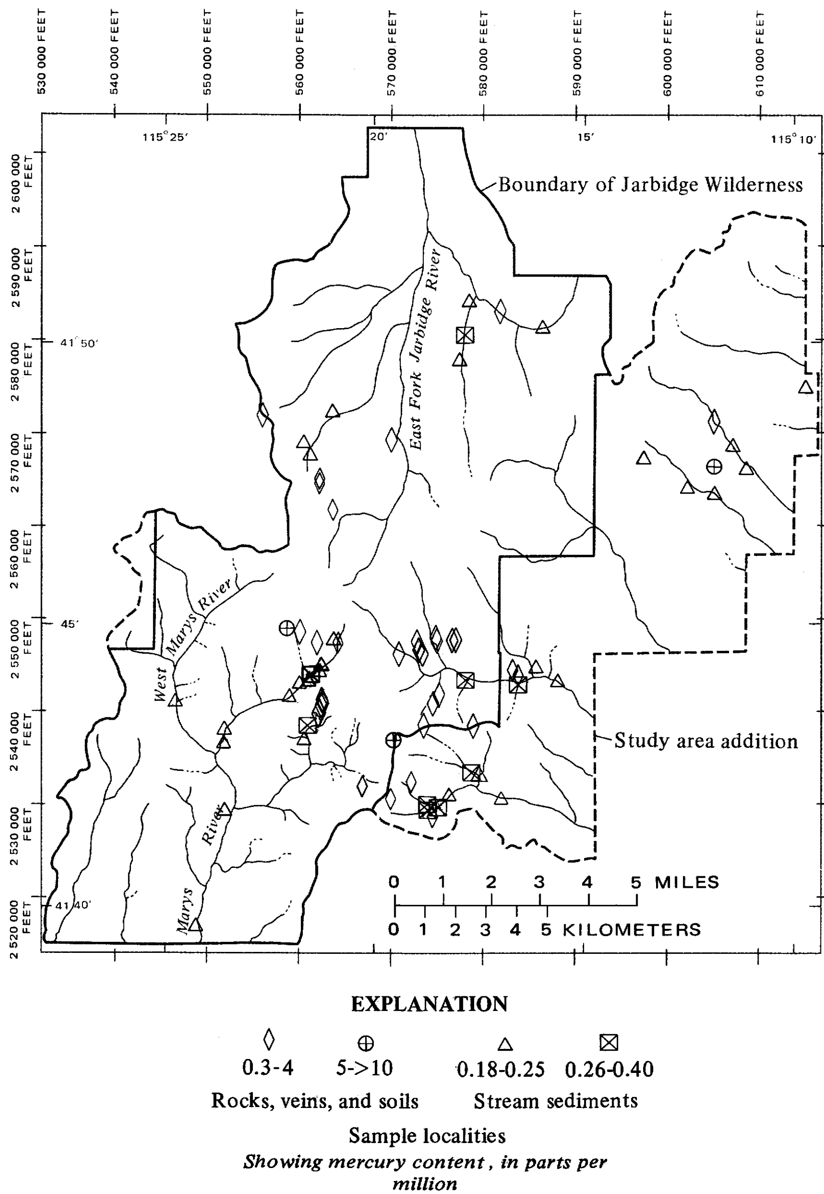


FIGURE 6.—Localities of samples taken in the Jarbidge Wilderness and adjacent areas containing anomalous quantities of mercury.

mercury is probably associated with epigenetic mineralization in the Jarbidge Rhyolite and perhaps also with the base-metal and silver mineralization found near the diorite stock. Additional, more closely spaced samples collected near the stock would be required to test this possibility.

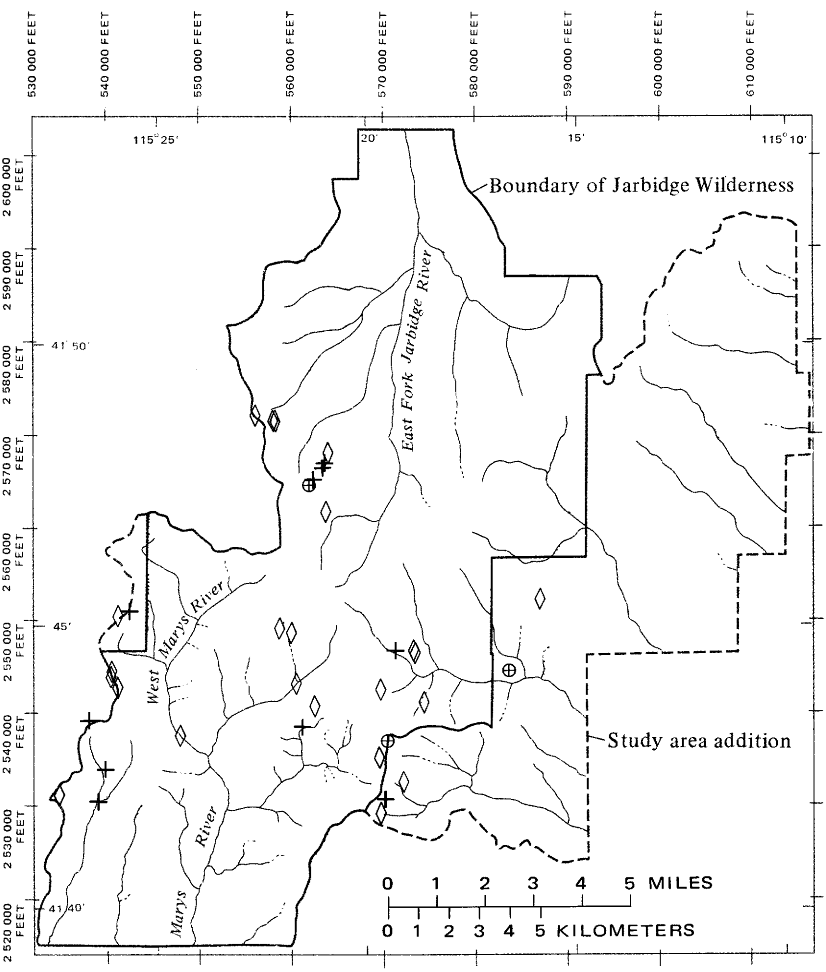
For mercury in stream sediments, the distribution more nearly approaches a log-normal one. The geometric mean is 0.104 ppm, and the geometric deviation is 1.76 because the extreme values are not as high as for rocks, veins, and soils. The plot on log-normal probability paper indicates, by its straightness, the approach to a log-normal distribution. The median value, the point where the curve crosses the 50 percent ordinate, is 0.86 ppm. The plot (fig. 6) shows the geographic distribution of samples having more than 0.1 ppm. The threshold value, calculated as (geometric mean) (geometric deviation)^2, is 0.183 ppm. If the threshold value is taken as that which would exclude 97.5 percent of the results, then it should be 0.25 ppm, and smaller values are not significant.

MOLYBDENUM

In the geological exploration of the wilderness and vicinity, no molybdenum minerals were noted, but semiquantitative spectrographic analysis revealed that 23 samples had molybdenum concentrations in excess of 5 ppm and that the concentrations were as high as 200 ppm (fig. 7; table 1). As the average abundance of molybdenum in granitic rocks is about 1.3 ppm and in shales about 2.6 ppm (Parker, 1967, table 19), these concentrations are geochemically highly significant. The fact that they occur in rocks as young as the Jarbidge Rhyolite suggests either that the molybdenum was a constituent of the rhyolite when it was erupted or that it has been epigenetically emplaced in the rhyolite from some underlying source, presumably the silicic igneous body that is the source of the Jarbidge Rhyolite. The presence of molybdenum in some of the older rocks that underlie the Jarbidge Rhyolite suggests that the second hypothesis may better account for the presence of the molybdenum. The lack of any observed molybdenite in the area indicates that the molybdenum mineral present near the surface is probably ferrimolybdite, an inconspicuous mineral that resembles several common minerals of oxidized deposits, and more study would be necessary to determine whether the low-level concentrations of molybdenum here reported indicate a potential for the discovery of economic molybdenum deposits. None of the samples approaches ore grade.

COPPER

The geographic distribution of samples of rocks, veins, soils, and stream sediments having copper contents considered to be



EXPLANATION

+ 5-6   ◊ 7-70   ⊕ 100-500

Sample localities

Showing molybdenum content of rocks, veins, and soils, in parts per million

FIGURE 7.—Localities of samples taken in the Jarbidge Wilderness and adjacent areas containing anomalous quantities of molybdenum.

anomalous is shown in figure 8. Samples with contents below 100 ppm are not plotted but are listed in table 1.

The geographic distribution, considered in conjunction with the rock type, as shown in table 1, suggests that two sorts of anomalies

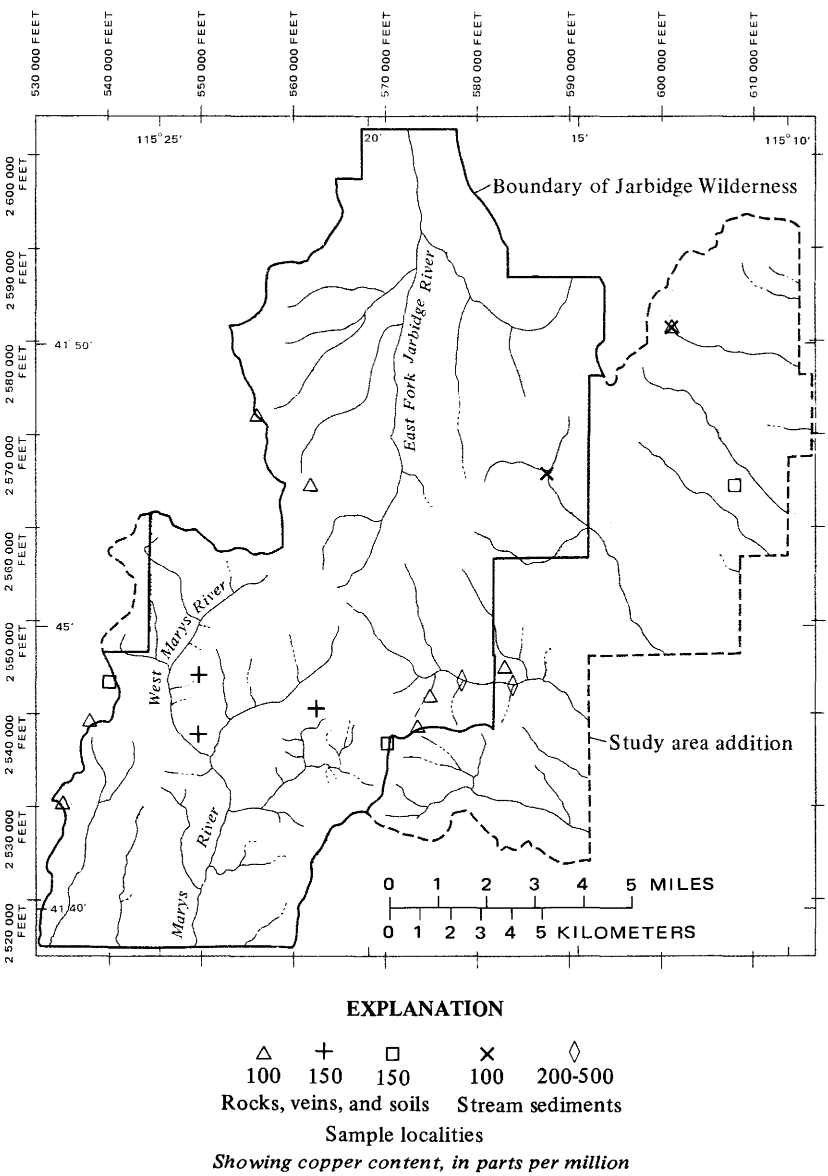


FIGURE 8.—Localities of samples taken in the Jarbidge Wilderness and adjacent areas containing anomalous quantities of copper.

are present. Sparse, widely scattered, and slightly anomalous samples are present in veins or altered zones in the Jarbidge Rhyolite, but many samples from known gold-silver veins of the Jarbidge type are not anomalous in copper. No epithermal copper deposits of Tertiary age are known in this part of Nevada, and it does not seem probable that these anomalous samples are related to economic mineralization.

A single sample of a fragment of copper-stained quartz vein from the dump of a small prospect pit in diorite had more than 20,000 ppm of copper. No quartz was seen in place, and the diorite is not extensively altered. The same sample had 33 ppm of silver. The lack of further extensive prospecting on this vicinity tends to confirm our judgment that this occurrence is not economically significant.

In the valley of Camp Creek and vicinity, a number of samples of barite or other vein material in the sandy and limy sedimentary rocks had anomalous copper contents. The two highest stream-sediment values were also found in the valley of Camp Creek, in the same area. It is uncertain whether the high values in this area may reflect syngenetic copper in the sandy and limy sedimentary rocks or epigenetic mineralization of pre-Tertiary age. Much more closely spaced sampling would be necessary to answer this question.

The threshold value, above which copper contents are to be regarded as anomalous, depends on the method of determination. The numerical values of the copper content were determined on 155 samples of rocks, veins, and soils. The geometric mean of the copper content is 22.87 ppm. The geometric deviation of the distribution is 2.67. The threshold of significance using these figures is 167 ppm. Approximately nine samples would be considered anomalous, using this criterion. The 97.5 percent cutoff (which would be appropriate for a normal distribution) would come at about 175 ppm copper. A plot on log-normal probability paper, however, suggests that the median copper content of all the samples, including those below the lower limit of detectability, would be about 13 ppm and the threshold of significance would be about 130 ppm.

For copper in stream sediments, the geometric mean of the results on 244 samples is 23.4 ppm. The geometric deviation is 2.29. The threshold of significance, using these figures, is about 123 ppm. Two sample analyses exceed this value. If the cutoff is taken at the value exceeded by 2.5 percent of the samples, then about six samples would qualify, and the cutoff value would be just below 100 ppm. The geographic distribution of the anomalous stream-sediment samples corresponds to that for rocks, veins, and soils.

BERYLLIUM AND FLUORINE

Determinations of beryllium and fluorine were sought because the wilderness area lies on the margin of the Shoshone Province (Coats, 1956; Coats and others, 1963, p. 942; Coats and others, 1962, p. 964; Shawe, 1966), which is characterized by a higher than average beryllium content in Tertiary volcanic rocks and in which deposits of the Spor Mountain type (Staatz, 1963) might be expected. At Spor Mountain, the presence of carbonate xenoliths, according to Shawe (1966, p. C206), is possibly one of the critical localizing factors; however, these xenoliths were found to be totally lacking in the Jarbidge area. It should be noted, in addition, that Staatz and Griffitts (1961, p. 946) and Staatz (1963, p. M35), while recognizing the importance of the calcite content of the tuff at Spor Mountain, attached more importance to the porosity and permeability of the tuff and presence of faults that served as solution channelways.

Beryllium contents found in the stream sediments derived from areas of rhyolitic rocks and of Paleozoic limy sediments in the Jarbidge study area were generally less than the average of 5.5 ppm (Vinogradov, in Parker, 1967, p. D13) for felsic granites and granodiorites. It is unlikely that any beryllium deposits are present in the wilderness. Fluorine, which is an element commonly associated with beryllium (Coats and others, 1962, p. 967), is generally present in amounts that are, at best, less than the median for rhyolitic rocks, which is 520 ppm (Coats and others, 1963, p. 947). It is possible that fluorine is present as topaz in some parts of the Jarbidge Rhyolite (Coats, 1964, p. M11). Fluorite was seen in one sample of the Meadow Fork Formation (p. 00) in the Jarbidge quadrangle (Coats, 1964, p. M8). It is unlikely that economic deposits of fluorspar occur in the wilderness or the study area adjacent.

Barium

Both bedrock and stream-sediment samples were analyzed spectrographically for barium; the distribution of anomalous samples is shown on figure 9.

For barium in stream sediments, the geometric mean is 867 ppm, and the geometric deviation is 1.48. The threshold value then would approximate 1,900 ppm. If the cutoff value is taken as that value exceeded by 2.5 percent of the analyses, this would be approximately 2,000 ppm.

For barium in rocks, veins, and soils, the distribution is skewed but apparently approaches a log-normal one more closely than a normal one. The distribution is censored, the higher values being eliminated from the computation of the mean and deviation because the spectrographic method gives no numerical values

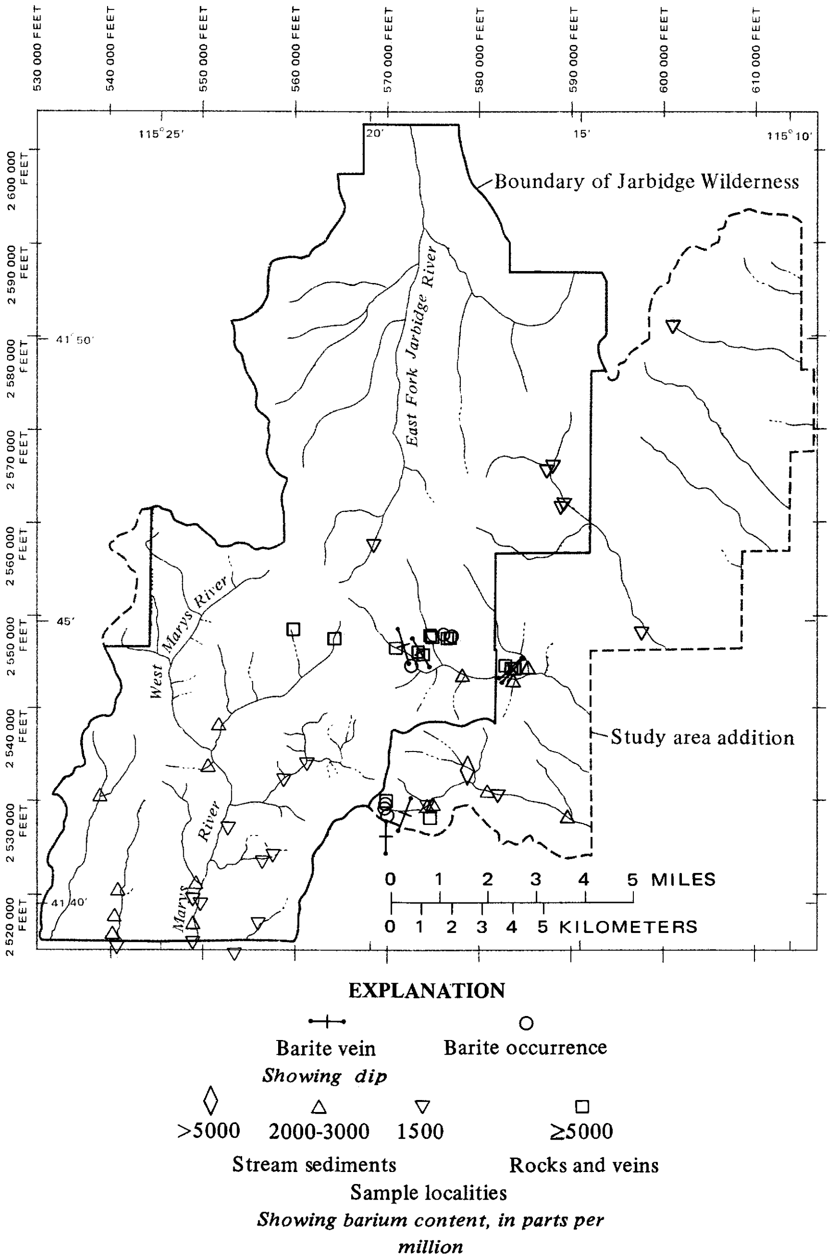


FIGURE 9.—Localities of samples taken in the Jarbidge Wilderness and adjacent areas with anomalous quantities of barium and occurrences of barite.

above an upper limit of 5,000 ppm. The geometric mean of 146 determinations is 562 ppm; the geometric deviation is 2.57. These values produce a threshold of significance of about 3,720 ppm.

A sample of vitric Jarbidge Rhyolite (72JC003) contains 700 ppm barium; other presumably unmineralized igneous rocks from this area have contents as high as 1,500 ppm. Hawkes and Webb (1962, p. 360) suggested 860 ppm as an average value for felsic igneous rocks. Barium is presumably a primary constituent of K-feldspar, which is abundant in the felsic volcanic rocks of the study area, and weathers slowly under the cool arid climatic conditions. It is probable that the observed content of barium in the stream sediments is largely due to barium-bearing K-feldspar, at least up to the level of the geometric mean.

Figure 9 shows clearly that anomalous quantities of barium are confined to a distinct belt with a generally northeast trend. On the map, occurrences of barite are shown as circles, except for veins of mappable linear extent. The anomalously high samples of rocks, veins, and soils are mostly from the Paleozoic sandy and limy sedimentary rock unit; fewer and smaller occurrences are in the dacitic ignimbrite of Wildcat Creek; and very few occurrences of barite were recognized in the Jarbidge Rhyolite. The relatively high values for barium found geochemically in the Jarbidge Rhyolite are mostly from the southern part of the study area, in the same general area where barite deposits are known in the Paleozoic formations. Barite is known in the gold-quartz veins of the Jarbidge mining district, where these cut Jarbidge Rhyolite. It is inferred that the high values found in the geochemical sampling are the results of epigenetic mineralization.

The reason for the difference in the barium content of the Jarbidge Rhyolite in the southern and northern parts of the wilderness is more obscure. Original differences in the content of the magma when erupted seem unlikely but cannot be excluded in the absence of an adequate number of analyzed samples of unaltered rhyolite from various parts of the area. The nature of the barite occurrences in the Paleozoic formations, especially the Paleozoic siltstone and limestone sequence in which the barite is obviously epigenetic, suggests that the barite veins may be hydrothermal and perhaps related to the diorite intrusions that cut the Paleozoic rocks in the study area and in adjacent areas to the east and west. If this hypothesis is correct, the areal differences in barium content in the Jarbidge Rhyolite and other Tertiary rocks are the result of epigenetic processes, and the high-barium areas may reflect barium transported and redeposited from underlying barium deposits in the Paleozoic rocks. Prospecting through unknown but generally considerable thicknesses of the Tertiary rocks, however, in the hope of finding barite deposits in underlying Paleozoic rocks, does not seem economically attractive.

The known presence of barite veins in the area led us to suspect that stream-sediment sampling would be an efficient means for prospecting for barite vein deposits. We found, however, that barium is a widely dispersed element, apparently being present in the Jarbidge Rhyolite at a level of several hundred parts per million and thus raising the background high enough so that the reliability of the barium determinations as a means of locating barium deposits is in some doubt.

Barite is a rather soft mineral, which breaks down readily when it is a constituent of stream sediments; consequently, the barium results did not permit us to pinpoint any barium deposits not known to us from our geologic work. Perhaps a more closely spaced sampling program would find barium determinations useful.

Most of the stream sediments with high barium content are plainly derived from known nearby bedrock occurrences; one exception is the stream-sediment sample taken in the study area near the center of section 15, about 1 mile (1.6 km) northwest of Wildcat Guard Station, which had the highest barium content of any stream-sediment sample. The presence of a barite vein in the vicinity is strongly suggested, but the analytical work was not available in time to permit search for the source.

The reliability of spectrographic analysis of the finer fraction of stream sediments as an indicator of anomalous barium concentrations of possible economic significance is impaired by the high background level of barium, captured (Rankama and Sahama, 1950, p. 126) in the feldspar of the felsic igneous rocks. Despite the softness of barite, the use of spectrographic analysis of the finer sediments for barium might be rendered more reliable if the finer fraction of the stream sediments were concentrated by heavy liquids before analysis (Hawkes and Webb, 1962, p. 261-262).

In several places, both in the southwestern part of the wilderness and less notably in the northeastern part, stream-sediment samples had barium contents of 1,500-2,000 ppm in places where known bedrock could only be Jarbidge Rhyolite. There are several possible explanations for this distribution. We favor the hypothesis that minor veinlets of barite, like some that have been seen near the head of Marys River in the Jarbidge Rhyolite, are present in these areas. Another possibility, much less probable, is that a few veins of substantial size may be present in these areas. A third, still less likely, possibility is that some unknown barium-bearing mineral may be present in the Jarbidge Rhyolite in these areas.

ECONOMIC APPRAISAL

By L. Y. Marks

METHODS OF EVALUATION

Reports of previous studies dealing with mineral resources in or near the study area were used as background information for the economic appraisal. County records were searched to determine the location of all mineral properties in the area. Data on production, history, reserves, and the geology were obtained. Bureau of Mines personnel visited each place for which the description of a mining location was specific enough to warrant a field investigation, and mines, prospects, and mineralized outcrops were examined, mapped, and sampled. Most underground workings were inaccessible, and many samples were taken from nearby outcrops and mine dumps. Deposits were classified according to the probability that they could be mined under present or anticipated economic conditions. Tonnage and grade of deposits were estimated partly from sample analyses and measurements and partly from reasonable geologic projection. Production costs were estimated by comparison with similar operating properties.

SAMPLING AND ANALYTICAL TECHNIQUES

One hundred twenty-two lode samples and 16 placer samples were collected by Bureau of Mines personnel. Lode samples were assayed for gold and silver, and some selected samples were analyzed spectrographically for other valuable metals. Barite ($BaSO_4$) vein material was analyzed for $BaSO_4$ and impurities. All samples were checked for radioactivity and fluorescence. Gravel deposits along the East Fork Jarbidge River and near the head of West Marys River were tested by reconnaissance panning for gold and other heavy detrital minerals. Most placer samples were screened to minus one-eighth inch (3.2 mm) or transported to the laboratory intact to prevent loss of fine gold particles in panning. A few samples were roughly concentrated in the field with a pan and further cleaned on a laboratory-size Wilfley table. Recoverable gold in table concentrates was amalgamated. The mineral composition of selected black sand concentrates was determined.

MINERAL COMMODITIES AND ECONOMIC CONSIDERATIONS

Principal mineral commodities in the Jarbidge study area are barite, gold, and silver. Barite veins occur in and near sedimentary strata in the southeastern part of the study area, notably near the headwaters of Camp and Sun Creeks. Gold- and silver-bearing quartz-adularia veins are present in rhyolite porphyry along the western margin of the Jarbidge study area, particularly along the west flank of the Jarbidge Mountains. Some placer gold occurs in alluvial deposits derived from veins in rhyolite of the Jarbidge Mountains.

The following sections contain some generalizations to familiarize the reader with ore values, production costs, and markets. Production costs have a wide range and may differ twofold or threefold for different deposits. Where large high-grade ore bodies are found near the surface, unit production costs are relatively low. Costs for mining a 100,000-ton (91,000-tonne) barite lode deposit by open-pit methods probably would be about $5 per ton ($5.5 per tonne). Transportation of 200–300 miles (320–480 km), however, could triple the total production costs.

GOLD AND SILVER

The average price of gold was $180 per troy oz ($5.79/g) in February 1975 (Eng. and Mining Jour., 1975). The average silver price was $4.36 per troy oz ($0.14/g) in February 1975 (Eng. and Mining Jour., 1975). Both gold and silver are in short supply, and demand for them is high. Ore would need to average 0.2 oz gold or 8 oz silver per ton (6 g gold or 250 g silver per tonne) at February 1975 prices to be mined by underground methods from small lode deposits at a profit. None of the samples from the study area approached minable grade on the basis of gold and silver values. Placer gold deposits in the study area are considered too small and too low grade to be mined at a profit.

BARITE

The principal source of barium and its compounds is barite ($BaSO_4$). The petroleum industry used 77 percent of the barite produced in 1971; it is added to drilling mud as a weighting agent. Other uses for barite are production of glass, paints, rubber, and chemicals. The average price of imported crude-drilling mud-grade barite was about $20 per short ton ($22 per tonne) (Fulkerson, 1971). The average price of ground and crushed barite of similar grade was about $26 per short ton ($29 per tonne). Crude barite of chemical and glass grade sold for an average of $24 per short ton ($26 per tonne). Highly refined barite sold for as much as $78 per short ton ($86 per tonne). Actual prices for barite are negotiated on the competitive market, and the prices cited are only a general guide.

Barite for drilling mud must be finely ground, contain at least 92 percent $BaSO_4$, be free of soluble salts, and the specific gravity must be 4.2 or higher. Chemical- and glass-grade barite must have at least 94 percent $BaSO_4$ and no more than 1 percent each of Fe_2O_3 and $SrSO_4$.

Since 1972 Nevada has led the nation in domestic barite production, producing 761,000 short tons in 1974. Eastern Nevada barite is currently being shipped to Salt Lake City, Utah, and Texas for processing. The center for processed barite in Nevada is Battle Mountain, where three mills are currently operating.

MINING CLAIMS

The northwestern part of the study area is in the Jarbidge mining district. Elko County records show that about 600 mining claims have been staked in the study area; none are patented. About 20 are placer claims.

Under Nevada State Mining Laws (secs. 517.40 and 517.230), claim maps must be filed with the County Surveyor through the County Recorder's office. No maps had been filed for the claims included in this study as of July 1, 1973.

MINES, PROSPECTS, AND MINERALIZED AREAS

Gold- and silver-bearing quartz-adularia veins occur principally in two major northerly trending systems in the Jarbidge mining district (Schrader, 1923, p. 24–25). The west vein system, about 1 mile (1.6 km) outside the study area, was the source of all recorded gold and silver production. The east vein system extends along the west edge of the wilderness from the Altitude area and southward to the Norman area (fig. 10).

No mineral production has been recorded from any property in the Jarbidge Wilderness, but 1,000 tons of barite was produced from the southern portion of the study area. Numerous prospects were explored during the 1920's when mines west of the wilderness were producing gold and silver ore, but very little prospecting has been done in recent years. Prospectors concentrated their efforts along the main ridge of the Jarbidge Mountains; most recent prospect workings were found near Camp Creek, where barite veins were tested by pits and trenches.

Areas in which claims are located were visited by Bureau of Mines personnel and examined to determine their mineral potential. Sites where one or more samples were taken from prospect workings, outcrops, or gravel bars are shown in figure 10.

GOLD AND SILVER LODES

Prospects near the west boundary of the Jarbidge study area are

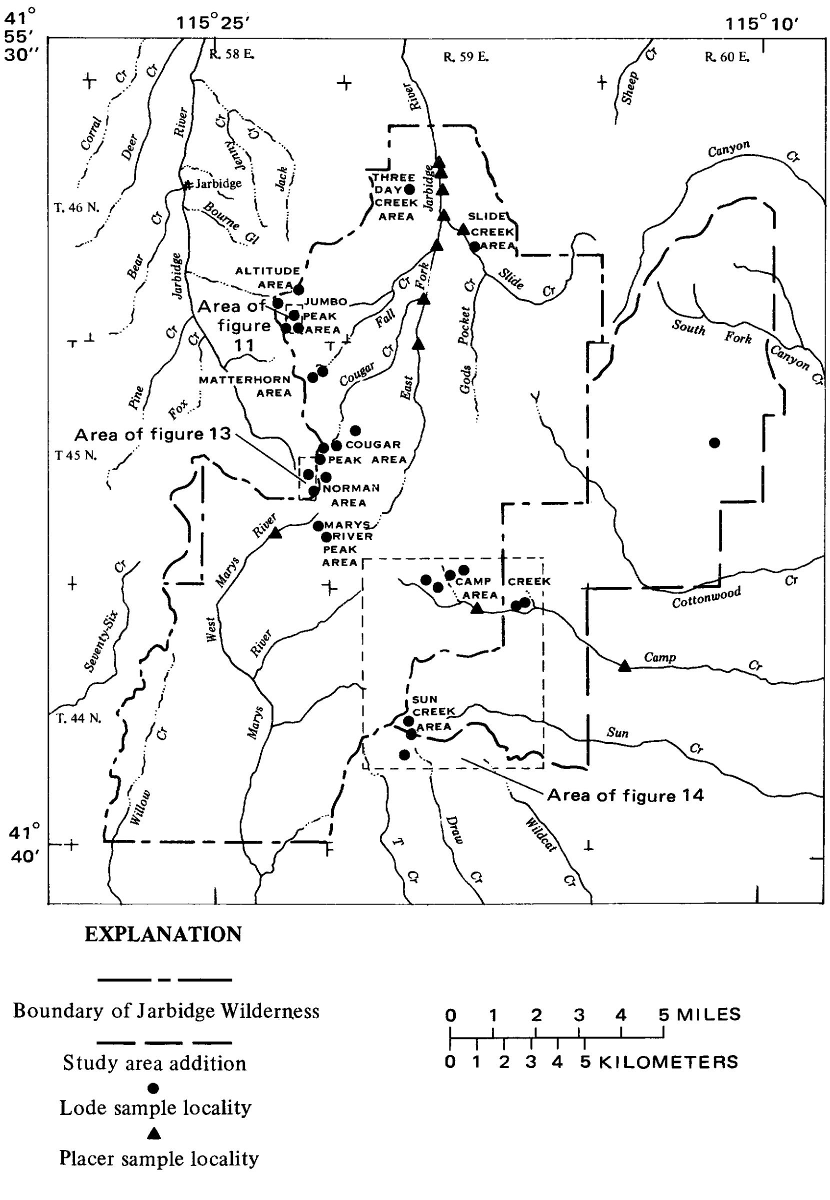


FIGURE 10.—Index map showing localities where one or more Bureau of Mines samples were taken.

described from north to south. They probably are on the east vein system described by Schrader (1923) and were explored for gold and silver, principally between 1910 and 1932.

ALTITUDE AREA

The portal of the Altitude adit is about 1,000 feet (305 m) outside the Jarbidge Wilderness (fig. 10; pl. 1). The adit is caved and inaccessible, but underground workings probably extended southerly into the wilderness area. The property has no record of production, but Schrader (1923, p. 69) reported that "the production has been small***." Country rock is rhyolite porphyry, part of the Jarbidge Rhyolite, but rock glaciers and talus cover much of the surface near the portal.

Schrader (1923) reported that the prospect, formerly called the Howard-McCoy mine, was worked by the Jarbidge-Buhl Mining Co. and that an electric powerline and wagon road had been installed by 1921. Underground work continued through the spring of 1922, when lack of funds caused suspension of operations. Underground workings, developing the Altitude and Windy veins, are said to have totaled about 2,000 feet (610 m) in length. According to Schrader (1923, p. 72), "the veins are from 3 to 16 feet wide," and "for a length of 140 feet the opened portion of the Windy vein is said to have carried $14 ore and locally ore that averaged more than $100 to the ton." The price of gold was $20.67 per oz, or $0.665 per gram at that time.

The underground workings mentioned by Schrader (1923) are currently inaccessible. The only surface expressions of the Altitude or Windy veins found on the ridge south of the Altitude portal in 1972 were sparse silicified veinlets no wider than 6 inches (15 cm) and iron oxide stain on some fractures in the rhyolite porphyry. Three prospect pits, 5–10 feet (1.5–3 m) long, were sampled on that ridge, which extends eastward from Jarbidge Peak. Two grab samples, J22A and J22C, of vein material contained a trace of gold, and the third sample of vein material, J22B, had 0.03 oz gold per ton (1.03 g per tonne); no silver was detected in J22C. Sample J22B contained 0.1 percent lead, and sample J22A 0.04 percent lead; both contained a trace of copper.

Apparent small production from the Altitude prospect indicates that gold and silver deposits did not occur in sufficient grade and volume to be mined in 1922.

The Altitude and Windy veins were reported (Schrader, 1923, p. 72) to have been traced several miles southward. A high-angle iron-stained alteration zone trends southward across the ridge that extends eastward from Jumbo Peak. Perhaps the groups of veinlets sampled at the surface near Jumbo Peak and at the Norman prospects (fig. 10) are on extensions of these structures.

JUMBO PEAK AREA

Prospectors explored the ridge that extends easterly from Jumbo Peak and the cirque to the north (fig. 11). These old workings are

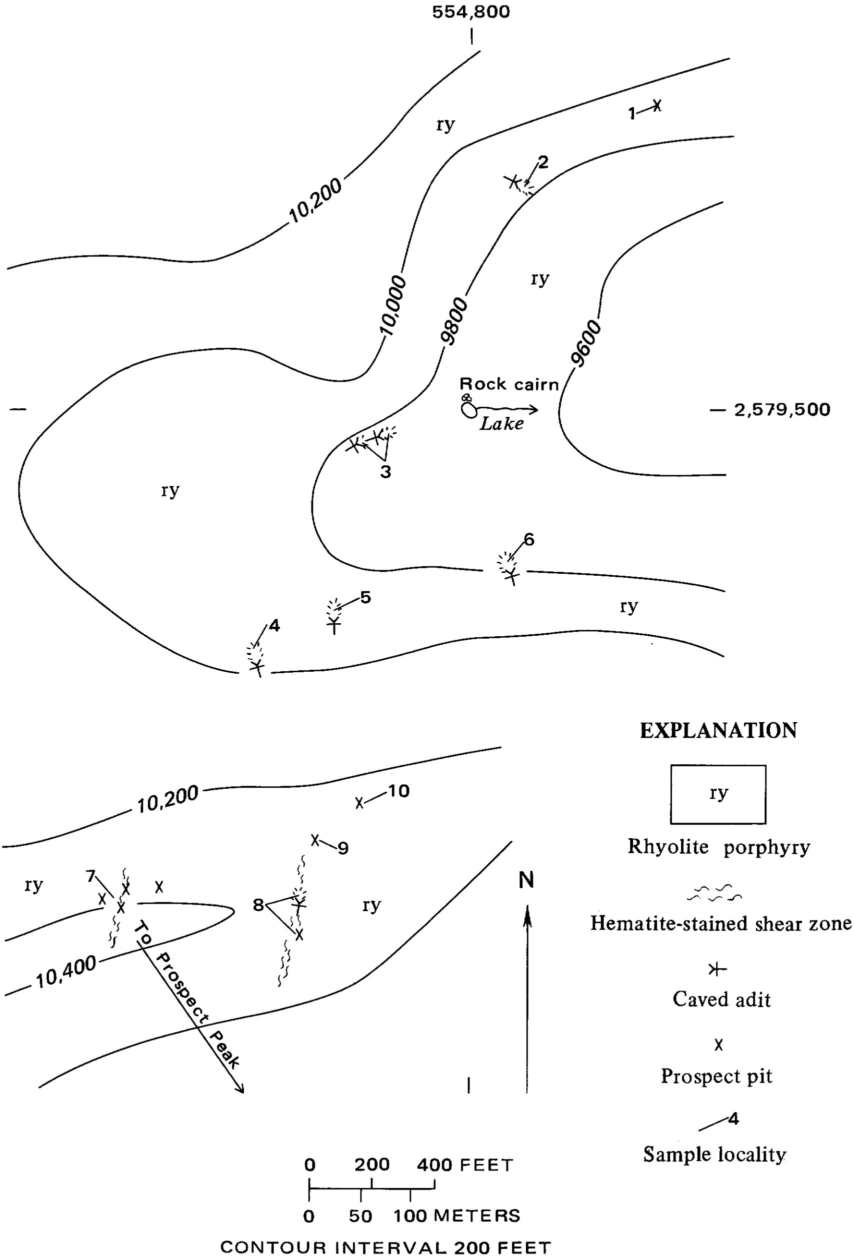


FIGURE 11.—Prospects in Jumbo Peak area (Tr = trace, N = none detected).

inside the Jarbidge Wilderness and may be on the Morning Star property described by Schrader (1923, p. 76 and pl. V, XX). Several claims located in June through December 1967 by D. E. Armstrong cover the prospect area. In September 1968, they were sold to the Old Rhyolite Mining Co. No recent activity was noted.

The Jarbidge Rhyolite at the area consists of light-gray rhyolite porphyry that weathers to light tan. The porphyry is cut by a few quartz veinlets as much as one-fourth inch (6.4 mm) thick and limonitic- and hematitic-stained shear zones that strike N. 15° E. to N. 15° W. and dip nearly vertical in a zone about 500 feet (150 m) wide. The zone can be traced northward about 3,000 feet (900 m) to the Altitude mine area and may be the Altitude or Windy vein described by Schrader (1923).

Eight pits and seven caved adits occur along this shear zone (fig. 12). The adits are inaccessible, but the size of the dumps suggests a total of about 600 feet (180 m) of underground workings.

Schrader (1923, p. 76) reported that the Morning Star vein is supposed to be the southward continuation of the Windy vein and that it intersects the Altitude vein at the Morning Star mine. He wrote that the Morning Star vein "contains 1 foot of $12 ore in the footwall side, and its remaining 6 feet averages about $3.50 to the ton." The price of gold was $20.67 per troy oz ($0.665 per g) at that time. Surface grab samples predominantly from dumps taken in 1972 (fig. 11) did not contain significant amounts of gold or silver.

MATTERHORN AREA

Three obscure prospect pits about 5 feet (1.5 m) in diameter were

Sample No. Map	Sample No. Field	Sample Type	Gold (ounce per ton)	Silver (ounce per ton)	Copper[1] (percent)	Copper[1] (percent)
1	J25F	Grab - -	Tr	N	- -	- -
2	J25E	- - do- -	Tr	N	0.01	0.02
3	J25A	Composite[2]	Tr	N	.01	.02
4	J25D	Select	Tr	N	.01	.02
5	J25C	Grab - -	Tr	N	- -	- -
6	J25B	- - do- - -	Tr	N	- -	- -
7	J24A	Composite	Tr	Tr	Tr	.01
8	J24B	- - do- -	Tr	Tr	- -	- -
9	J24D	Grab - -	Tr	0.2	- -	- -
10	J24C	- - do- -	Tr	.1	Tr	.01

[1] Semiquantitative spectrographic analysis.
[2] 0.02 percent tin by spectrographic analysis.

FIGURE 11.—Continued.

found on the narrow ridge that extends east from Matterhorn (fig. 10; pl. 1). Country rock is light-gray partly bleached to white coarse rhyolite porphyry with a few quartz veinlets as much as eight-tenths inch (2 mm) wide. Streaks of limonitic stain that trend N. 20° W. are possibly the result of alteration along a steeply dipping shear zone about 5 feet (1.5 m) thick. The shear zone probably is a continuation of the similar zone (Altitude or Windy vein?) that is exposed farther north at the Jumbo Peak and Altitude prospects. Samples of iron oxide stained porphyry (J33A-35A) from these pits contained 0.2 oz silver per ton (6.9 g per tonne) but no detectable gold. Potential for the development of a minable deposit seems to be small.

Cougar Peak area

Prospect pits and outcrops were examined on the ridge south of Cougar Peak and on the spur that extends eastward from Cougar Peak to Prospect Peak (fig. 10). This area is 1-3 miles (1½-5 km) north of where the Norman prospect trail crosses the divide between the Jarbidge River and the East Fork of the Jarbidge River. Country rock is gray rhyolite porphyry of the Jarbidge Rhyolite; quartz and other vein material are scarce.

Four prospect pits, one caved adit, and five outcrops were sampled. The pits are 5-10 feet (1.5-3 m) long. The size of the dump

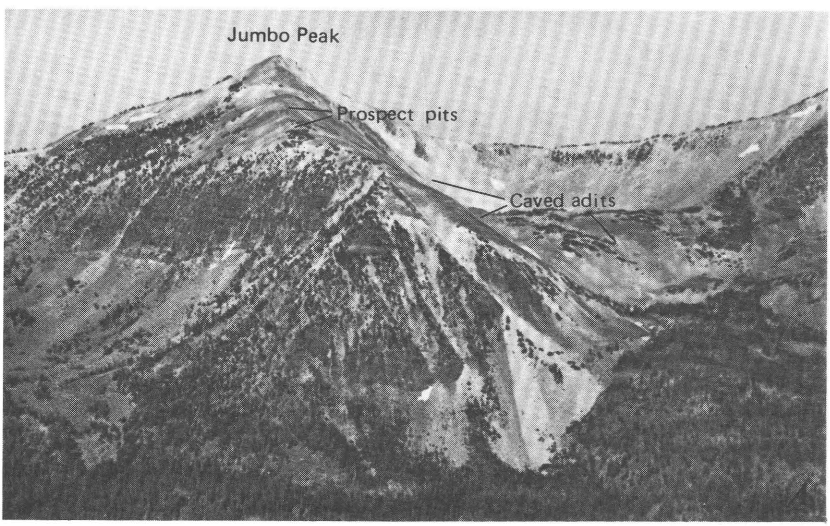


FIGURE 12.—East side of Jumbo Peak, showing position of some prospect pits and caved adits on slope of Jumbo Peak. All bedrock exposed is part of Jarbidge Rhyolite; some lighter colored areas are zones of rock alteration. Photograph by R. N. Coats, used by permission.

suggests the adit was only about 20 feet (6 m) long. Eight samples (J14A-J21A) of rhyolite and vein material were taken. Seven samples contained 0.2-0.5 oz silver per ton (6.9-17 g per tonne), most samples had 0.01-0.04 percent lead and a trace of copper, and each contained a trace of gold.

NORMAN AREA

The Norman group comprises the Gray Rock, Lake, Summit, Tibo, Wasp, and Yellowjacket claims, located between July 1910 and November 1914. Part of the prospect was restaked as the Paradise Nos. 1 and 2 claims in November 1957, and other claims were located by D. E. Armstrong in the same area between June and December 1967. The prospect is just west of the Jarbidge Wilderness (fig. 10).

Bedrock is Jarbidge Rhyolite, which consists of light-gray to bleached nearly white fine-grained porphyritic rhyolite. Quartz-rich veins, which average about 1 inch (2.5 cm) thick and are a maximum of 14 inches (36 cm) thick, are plentiful. They occur in systems at least 5 feet (1.5 m) wide. Many fractures are hematite and limonite stained. Veins in the north area (fig. 13) strike N. 20° W. and dip nearly vertically. Talus conceals the attitude of veins in the area of the main adits. An outcrop in the south area (fig. 13, sample 14) contains quartz veinlets that strike N. 20°-35° W. and dip steeply northeast. The distribution of adits and pits indicates the prospectors followed a major north-trending structure.

The two east-trending main adits are caved, but the sizes of the dumps suggest that the workings totaled about 1,500 feet (460 m). In the north area, dumps at a caved adit and an 8-foot-long (2.4 m) open adit with a caved winze indicate a total of about 170 feet (52 m) of underground workings, and three caved adits in the south area probably totaled only about 30 feet (9 m).

All samples (table, fig. 13) contained a trace of gold, but silver content averaged 0.25 oz per ton (8.6 g per tonne). Copper and lead contents were negligible.

The surface samples do not indicate any mineral resources that could be mined under current or anticipated economic conditions. Schrader (1923, p. 66-68), however, reported that the adits exposed a mineralized zone up to 50 feet (15 m) thick and that at two places the vein contained 2 feet (0.6 m) averaging $23 per ton ($25 per tonne) and 4 feet (1.2 m) averaging $8 per ton ($8.80 per tonne). The gold price was $20.67 per troy oz ($0.66 per g) at that time. He also described a copper and silver sulfide body in one adit. The southward projection of this mineralized zone would enter the

Jarbidge Wilderness, but no significant concentration of silver or gold has been found in that area.

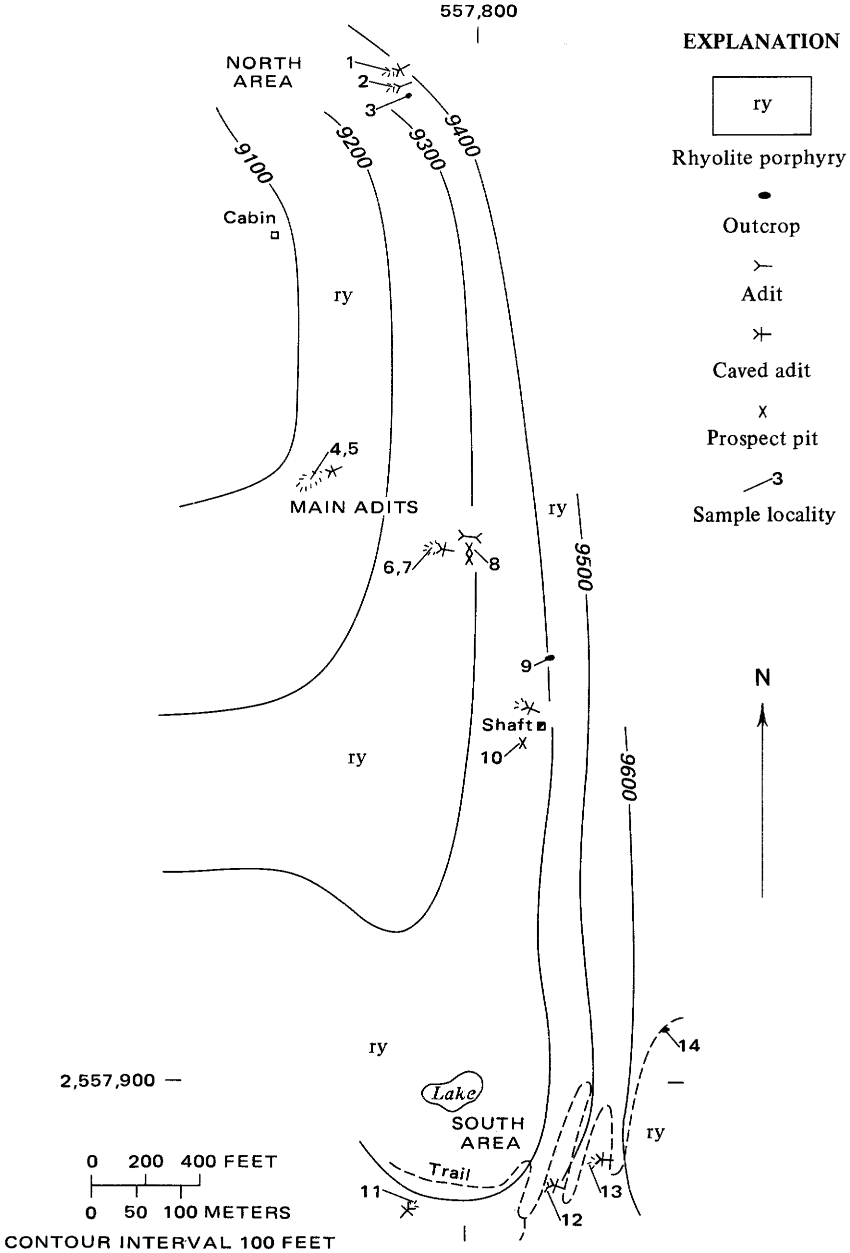


FIGURE 13.—Prospects in Norman area (Tr = trace, N = none detected).

MARYS RIVER PEAK AREA

Prospect workings on the west flank of Marys River Peak (fig. 10) are on the inactive Silver Giant claim group located in July and September 1939 and relocated in 1960. Country rock is dark-gray to greenish tuffaceous sandstone with a conglomerate bed 3 inches to 5 feet (0.076–1.5 m) thick, part of the tuff-sedimentary rock-basalt unit. The strata strike N. 15° W. and dip 16° NE. Prospectors have explored the zone of conglomerate.

An adit was driven 18 feet (5.5 m) S. 85° E. along the conglomerate zone about 1,500 feet (460 m) due west of Marys River Peak. A 5-foot-long (1.5 m) sample across the face (J32A) and an 18-foot-long (5.5 m) sample along the south wall (J32B) of the adit each contained 0.2 oz silver per ton (6.8 g per tonne) but no detectable gold. A 10-foot-long (3 m) sample (J32C) from an outcrop of the same conglomerate, 135 feet (41 m) to the north, contained 0.1 oz silver per ton (3.4 g per tonne). Samples of conglomerate (J32D) and tuff (J32E), taken from a prospect pit 1,500 feet (460 m) north of the adit, had 0.1 and 0.2 oz silver per ton (3.4–6.8 g per tonne),

Sample No. Map	Sample No. Field	Type	Length (feet)	Description	Gold (ounce per ton)	Silver (ounce per ton)	Copper[1] (percent)	Lead[1] (percent)
1	J12J	Chip	1.5	Across quartz vein system	Tr	0.3	--	--
2	J12I	--do--	4	--do--	Tr	.2	Tr	0.01
3	J12H	--do--	5	--do--	Tr	.2	Tr	.01
4	J12A	Select	--	Vein quartz from stockpile?	Tr	Tr	--	N
5	J12B	Grab	--	Porphyry on dump	Tr	.3	Tr	.01
6	J12C	Select	--	Vein quartz from dump	Tr	.8	Tr	.01
7	J12D	Grab	--	Dump rock	Tr	.2	Tr	.02
8	J12E	--do--	--	Vein quartz in pit	Tr	.2	0.02	.15
9	J12F	--do--	--	Porphyry outcrop with vein quartz	Tr	.3	--	--
10	J12G	--do--	--	Porphyry with vein quartz in pit	Tr	.2	--	--
11	J12K	--do--	--	Dump rock	Tr	.2	--	--
12	J12L	--do--	--	--do	Tr	.2	--	--
13	J12M	--do--	--	--do--	Tr	.3	Tr	.02
14	J13A	--do--	--	Vein quartz in outcrop	Tr	.2	--	--

[1] Semiquantitative spectrographic analysis.

FIGURE 13.—Continued.

respectively. No potential precious metal resource is indicated by the samples because little validity can be attributed to fire assays of low values of silver.

THREE DAY CREEK AREA

Two prospect pits near the head of Three Day Creek (fig. 10) may be on the Belmont group of claims located in May 1910. The group consists of the Belmont, Comet, Eclipse, Friday 13th, Hard Luck, Lost Pick, Margaret, and Mayflower claims. The prospects are near the trail between the East Fork of the Jarbidge River and the head of Dave Creek.

The country rock, which is Jarbidge Rhyolite, consists of light-gray to white rhyolite porphyry. Hairline to one-eighth-inch (3.2 mm)-thick quartz veinlets, most of which are nearly horizontal, cut the country rock at many places. Some open fractures contain quartz crystals up to three-fourths inch (19 mm) long. Iron oxide staining of the rhyolite is common.

One pit is about 20 feet (6.1 m) long and the other about 12 feet (3.7 m). A sample of quartz-rich material (J2A) from a 150-pound (68 kg) stockpile contained traces of gold, silver, and copper. A grab sample of rhyolite porphyry (J2B) from the pits contained 0.7 oz silver per ton (24 g per tonne), 0.02 percent lead, and traces of gold and copper. Potential for the development of a minable deposit is small.

SLIDE CREEK AREA

Several old claim posts near Slide Creek can be found in the 2-mile (3 km) stretch between Gods Pocket Creek and the East Fork of the Jarbidge River (fig. 10), but no workings were found in this area. Most of the claim posts seem to be about 1 mile (1.6 km) upstream from the mouth of Slide Creek. Two rhyolite porphyry samples (J9A and J9B) from exposures near the claim posts each contained 0.02 percent lead and traces of gold and copper. One (J9A) assayed 0.2 oz silver per ton (7 g per tonne). Potential for discovery of a minable deposit is small.

CAMP CREEK AREA

During this study, the Pogonip Limestone and Valmy Formation were sampled in the Camp Creek area for possible submicron gold content. A trace of gold was detected in only one of 58 samples.

GOLD PLACERS

Schrader (1923, p. 77) stated that in the Jarbidge district free gold particles are so small and buoyant that they tend to be carried downstream out of the district. His belief is supported by the fact that no significant placers were worked in the district. Steep and narrow valleys further reduce the likelihood for the occurrence of a workable placer gold deposit. Individual gravel deposits along the streams contain a maximum of 100,000 cubic yards (76,500 m^3); gold values would need to average about $1 per cubic yard (270 mg per cubic meter at $150 per oz) to support a profitable mining operation.

The East Fork of Jarbidge River is the only drainage in the study area that derived its sediments from rocks with known lode gold occurrences. Flood-plain gravel is estimated to average 175 feet (53.3 m) wide and 6½ feet (2 m) thick between the northern boundary of the Jarbidge Wilderness and a point 5½ miles (9 km) upstream. This area contains about 2 million cubic yards (1.5 million m^3) of gravel, but individual deposits range from less than 100,000 to a few thousand cubic yards each. Reconnaissance sampling indicates that gold content of the gravels does not exceed a few cents per cubic yard. Seven of eight reconnaissance sample sites (fig. 10) contained recoverable gold, but the highest value was 21 milligrams per cubic meter (8 cents per cubic yard at $150 per oz).

Cougar and Fall Creeks head in the Jarbidge Mountains where gold occurs in veins. These tributaries of East Fork Jarbidge River have a few tens of thousands of cubic yards of gravel each, mostly within half a mile (0.8 km) of their mouths. Two samples, J6A and J6B, on Cougar Creek near its mouth (fig. 10) had 9.8 and 1.8 milligrams of gold per cubic meter (4 and 0.7 cents per cubic yard at $150 per oz), respectively.

Slide Creek contains about 20,000 cubic yards (15,000 m^3) of gravel within 1 mile (1.6 km) of its confluence with East Fork Jarbidge River, but it originates several miles east of known gold-bearing rocks. Two reconnaissance samples, J10A and J11A, (fig. 10) contained only 0.37 and 0.90 milligrams of gold per cubic meter (0.1 and 0.3 cents per cubic yard at $150 per oz), respectively.

The Marys River drainage has gravel volumes equal to or greater than those on East Fork Jarbidge River. No gold has been discovered in veins within the drainage; however, a gold-bearing vein is said to extend southward from the Norman area into the Marys River drainage (Schrader, 1923, p. 68). No recoverable placer gold was detected in two samples of gravel (J31A and B) from West Marys River (fig. 10). Minable placer gold deposits are not likely to occur along Marys River.

BARITE LODES

Barite veins occur near the headwaters of Camp and Sun Creeks (figs. 10, 14) in the southeastern part of the study area. Most barite veins fill fractures in Paleozoic sedimentary rocks, although some fill fractures in Tertiary volcanic rocks. This mode of occurrence suggests that barite was introduced or remobilized during late Tertiary uplift of the Jarbidge Mountains. One barite deposit near Camp Creek probably is marginally minable under present economic conditions.

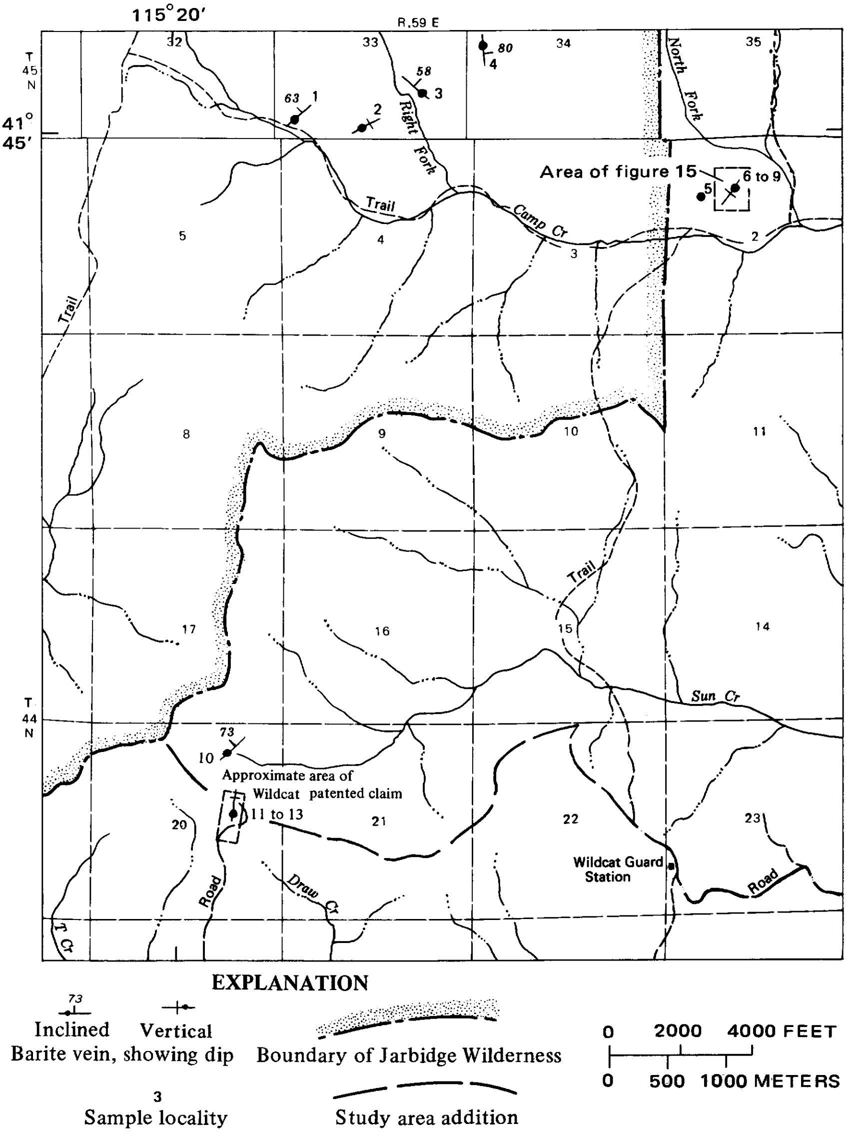


FIGURE 14.—Locations of barite occurrences sampled by Bureau of Mines.

CAMP CREEK AREA

Barite veins at sample locations 1-4 (fig. 14) are within the Jarbidge Wilderness, but localities 5-9 are in an area proposed for addition to the wilderness. The Camp Creek prospect (localities 6-9) is the largest deposit observed and is described in greater detail under the section "Camp Creek prospect."

An outcrop at sample site No. 1 (fig. 14) exposes a 24-foot-long (7.3 m) pod of barite. The pod is as wide as 2½ feet (0.76 m), strikes N. 47° E., and dips 63° NW. in dacitic ignimbrite. No other significant veins were observed at this site.

A poorly exposed barite vein at sample site No. 2 may strike N. 60° E. and dip vertically. The vein is no thicker than 5 feet (1.5 m); its length could not be determined. It traverses an area in which country rock is welded tuff and rhyolite porphyry.

Gray quartzite contains small pods and veinlets of barite at sample locality 3, possibly in a northerly trending high-angle fault zone. The most persistent barite vein is exposed intermittently over 200 feet (61 m) of strike length; maximum thickness is 5 feet (1.5 m). It strikes N. 53° W. and dips 58° NE.

A shear zone at sample locality 4 strikes N. 5° W. and dips 80° NE. in coarse gray rhyolite porphyry. Some barite stringers occur in the bleached shear zone, which is about 50 feet (15 m) wide and contains limonitic gossan masses 20-40 feet (6.1-12.2 m) long.

Sample					
No.		Type	Length (feet)	Description	$BaSO_4$ (percent)
Map	Field				
1	J39A	Chip	24	Along vein outcrop	88.6
2	J38A	--do--	3	--do--	93.5
3	J37A	--do--	22	--do--	84.3
4	J36A	--do--	20	Across shear zone with veinlets	5.4
5	J28A	Select	--	Stockpile at pit	56.6
6	J29A	Chip	5	Across vein outcrop	89.1
7	J29B	--do--	4.5	Across vein in pit	90.3
8	J29C	--do--	25	Across vein pit and outcrop	84.5
9	J29D	--do--	12	--do--	100.0
10	J40A	--do--	1	Across impure calcite vein	.7
11	J41C	--do--	25	Across wall of open pit	92.8
12	J41B	--do--	15	--do--	85.2
13	J41A	--do--	15	--do--	97.1

FIGURE 14.—Continued.

An old pit about 5 feet (1.5 m) in diameter at sample locality 5 is in dark-gray andesitic country rock with thin barite veinlets. A stockpile contains about 100 pounds (45 kg) of impure barite.

Camp Creek prospect

Two pits and a trench, about 2,000 feet (610 m) northwest of the confluence of Camp Creek and North Fork of Camp Creek, are probably on the Camp Creek and Thirsty Boy claim groups (fig. 15). The prospect workings partly expose barite veins that fill

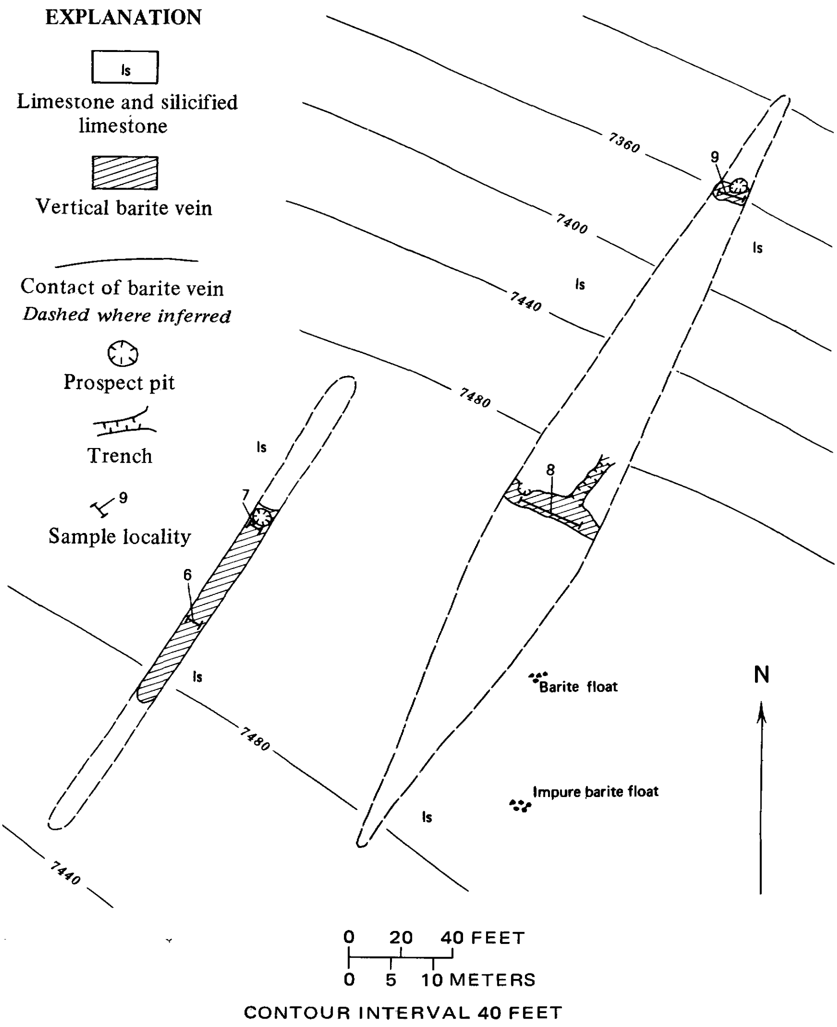


FIGURE 15.—Camp Creek barite prospect.

fractures in limestone and calcareous sandstone. The two major barite veins strike N. 35° E. and dip vertically. The east vein is inferred to have a strike length of more than 300 feet (91 m), with an average thickness of more than 20 feet (6.1 m). It is assumed to persist to a depth of at least 75 feet (29 m). The west vein averages about 7 feet (2.1 m) in thickness and is inferred to be more than 200 feet (61 m) long. It probably persists to a depth of at least 45 feet (14 m). Paramarginal resources[3] averaging 90 percent $BaSO_4$ (barium sulfate) total about 90,000 tons (82,000 tonnes) in the two veins. The weighted average specific gravity of the four samples is 4.21. Additional exploration might disclose the presence of similar volumes of barite with 92 percent or more $BaSO_4$, the marketable grade for drilling mud additive. The average price of drilling-mud-grade unground barite ranged from $22 to $28 per short ton ($24-$31 per tonne) in February 1975 (Eng. and Mining Jour., 1975). Cost estimates for producing barite by open-pit methods at this deposit indicate that unground barite could be delivered to Salt Lake City, Utah, for a price of about $15 per ton ($17 per tonne) or to Battle Mountain, Nev., for a price of about $14 per ton ($15 per tonne). Therefore, barite that meets specifications probably could be mined at a profit.

SUN CREEK AREA

Barite veins occur near the head of Sun Creek in sec. 20, T. 44 N., R. 59 E. More than 1,000 tons (907 tonnes) of barite was produced from the Wildcat Barium mine (fig. 16) in 1957 (Horton, 1963, p. 6). The Wildcat Barium claim is patented (Mineral Survey No. 4876);

[3] Paramarginal resources are subeconomic resources that may be minable under present economic conditions.

Sample No. Map	Sample No. Field	Sample Type	Sample Length (feet)	Description	$BaSO_4$ (percent)	Specific gravity
6	J29A	Chip ---	5.0	Barite vein outcrop --	89.1	4.34 g/cc
7	J29B	--do---	4.5	Barite vein exposed in pit ----------	90.3	4.43 g/cc
8	J29C	--do---	25.0	Barite vein in pit and outcrop ---------	84.5	4.15 g/cc
9	J29D	--do---	12.0	--do------------	100.0	4.20 g/cc

FIGURE 15.—Continued.

American Colloid Co., Skokie, Ill., is the owner. Part of this patented property is within the study area addition.

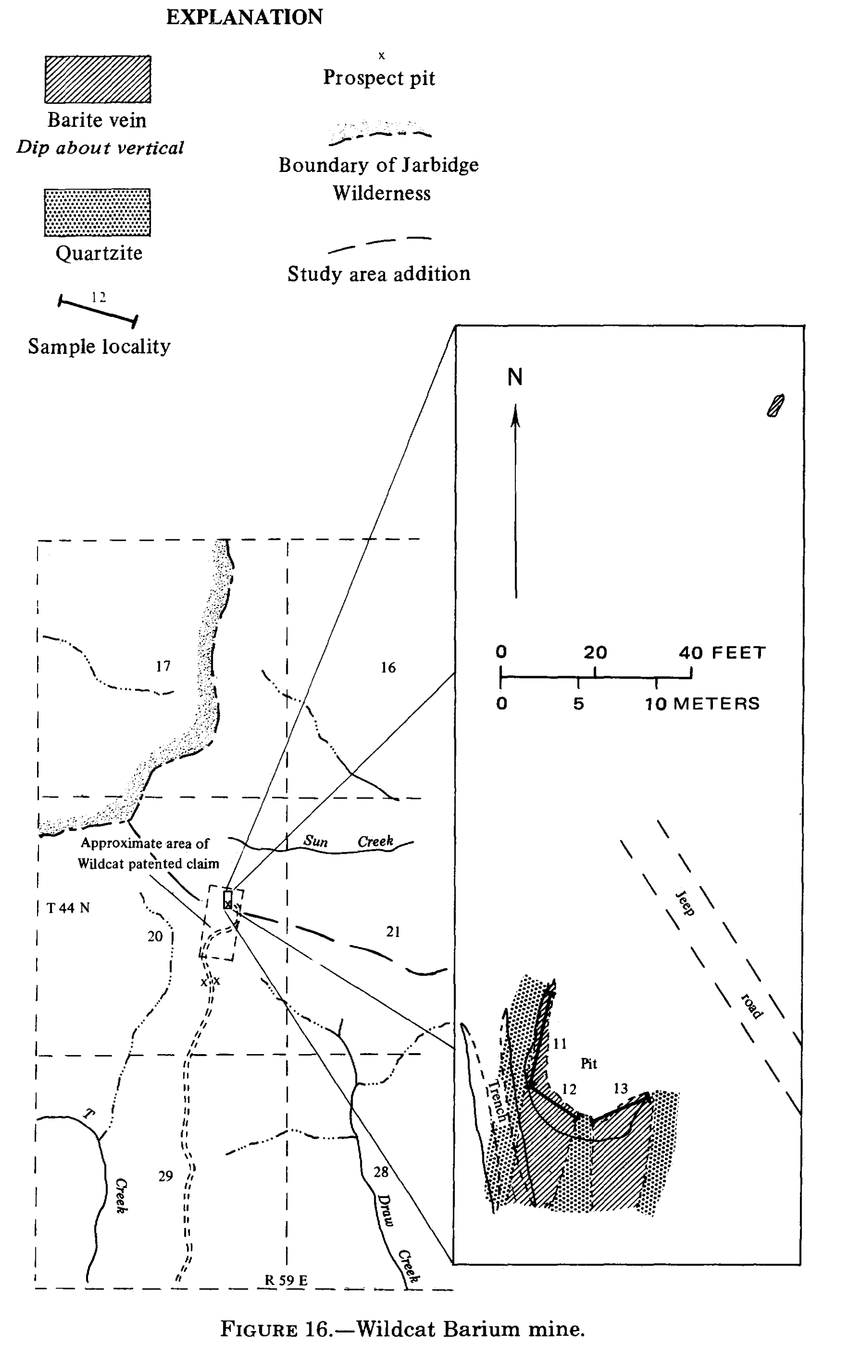


FIGURE 16.—Wildcat Barium mine.

Paleozoic quartzites are cut by northerly trending barite veins that dip nearly vertically in this area. An open pit about 30 feet (9.1 m) wide exposes barite over the entire width, except for a quartzite parting about 5 feet (1.5 m) wide (fig. 17). Average $BaSO_4$ (barite) content in three samples was 92 percent.

REFERENCES CITED

Axelrod, D. I., 1966, The Eocene Copper Basin flora of northeastern Nevada: California Univ. Pubs. Geol. Sci., v. 59, 125 p.

Berggren, W. A., 1972, A Cenozoic time scale—some implications for regional geology and paleobiogeography: Lethaia, v. 5, p. 195-215.

Bushnell, Kent, 1967, Geology of the Rowland quadrangle, Elko County, Nevada: Nevada Bur. Mines Bull. 67, 38 p.

Clark, D. L., 1957, Marine Triassic stratigraphy in eastern Great Basin (Nev.-Utah): Am. Assoc. Petroleum Geologists Bull., v. 41, p. 2192-2222.

Clark, D. L., and Stokes, W. L., 1956, Preliminary survey of Triassic rocks in eastern Great Basin (Nev.-Utah): Am. Assoc. Petroleum Geologists Bull., v. 40, p. 1686-1692.

Coash, J. R., 1967, Geology of the Mount Velma quadrangle, Elko County, Nevada: Nevada Bur. Mines Bull. 68, 20 p.

Coats, R. R., 1956, Uranium and certain other trace elements in felsic volcanic rocks of Cenozoic age in Western United States, *in* Contributions to the geology of uranium and thorium by the United States Geological Survey and Atomic Energy Commission for the United Nations International Conference on Peaceful Uses of Atomic Energy, Geneva, Switzerland, 1955: U.S. Geol. Survey Prof. Paper 300, p. 75-78.

——1964, Geology of the Jarbidge quadrangle, Nevada-Idaho: U.S. Geol. Survey Bull. 1141-M, 24 p.

——1969, Upper Paleozoic formations of the Mountain City area, Elko County, Nevada, *in* Changes in stratigraphic nomenclature by the U.S. Geological Survey, 1967: U.S. Geol. Survey Bull. 1274-A, p. A22-A27.

Coats, R. R., Barnett, P. R., and Conklin, N. M., 1962, Distribution of beryllium in unaltered silicic volcanic rocks of the western conterminous United States: Econ. Geology, v. 57, p. 963-968.

Coats, R. R., Goss, W. D., and Rader, L. F., 1963, Distribution of fluorine in unaltered silicic volcanic rocks of the western conterminous United States: Econ. Geology, v. 58, p. 941-951.

Sample					
No.		Type	Length (feet)	Description	$BaSO_4$ (percent)
Map	Field				
11	J41C	Chip --	25	Barite vein in pit ------	92.8
12	J41B	--do--	15	--do----------------	85.2
13	J41A	--do--	15	--do----------------	97.1

FIGURE 16.—Continued.

Coats, R. R., and McKee, E. H., 1973, Ages of plutons and types of mineralization, northwestern Elko County, Nevada, *in* Geological Survey research 1973: U.S. Geol. Survey Prof. Paper 800-C, p. C165–C168.

Coats, R. R., and Stephens, E. C., 1968, The Mountain City Copper mine, Elko County, Nevada, *in* Ridge, J. D., ed., Ore deposits of the United States, 1933–1967 (The Graton-Sales Volume), vol. 2: New York, Am. Inst. Mining, Metall., and Petroleum Engineers, p. 1075–1101.

Engineering and Mining Journal, 1975, Markets—Nonmetallic minerals: Eng. and Mining Jour., v. 174, no. 11, p. 208.

Evernden, J. F., Savage, D. E., Curtis, G. H., and James, G. T., 1964, Potassium-argon dates and the Cenozoic mammalian chronology of North America: Am. Jour. Sci., v. 262, p. 145–198.

Fulkerson, F. B., 1971, Barite, *in* Minerals Yearbook: U.S. Bur. Mines, v. 1, Metals, Minerals, and Fuels, p. 191-197.

Granger, A. E., Bell, M. E., Simmons, G. C., and Lee, Florence, 1957, Geology and mineral resources of Elko County, Nevada: Nevada Bur. Mines Bull. 54, 190 p.

Hawkes, H. E., and Webb, J. S., 1962, Geochemistry in mineral exploration: New York, Harper and Row, 415 p.

Horton, R. C., 1963, An inventory of barite occurrences in Nevada: Nevada Bur. Mines Rept. 4, 18 p.

Johnson, M. G., 1973, Placer gold deposits of Nevada: U.S. Geol. Survey Bull. 1356, 118 p.

King, Clarence, 1878, United States Geological Exploration 40th Parallel, v. 1, Systematic geology: p. 187–195.

Lawrence, E. D., 1963, Antimony deposits of Nevada: Nevada Bur. Mines Bull. 61, 248 p.

Mathias, D. E., 1959, The geology of the northern part of the Elk Mountains, Elko County, Nevada: Oregon Univ., Eugene, Master's thesis.

Merriam, C. W., and Anderson, C. A., 1942, Reconnaissance survey of the Roberts Mountains, Nevada: Geol. Soc. America Bull. 53, p. 1675-1727.

Parker, R. L., 1967, Composition of the Earth's crust, Chap. D., *in* Data of geochemistry, 6th ed.: U.S. Geol. Survey Prof. Paper 440-D, 19 p.

Rankama, K. K., and Sahama, T. H., 1950, Geochemistry: Chicago, Ill., Univ. Chicago Press, 912 p.

Roberts, R. J., Hotz, P. E., Gilluly, James, and Ferguson, H. G., 1958, Paleozoic rocks of north-central Nevada: Am. Assoc. Petroleum Geologists Bull., v. 42, p. 2813–2857.

Schrader, F. C., 1912, A reconnaissance of the Jarbidge, Contact, and Elk Mountain mining districts, Elko County, Nevada: U.S. Geol. Survey Bull. 497, 98 p.

——1923, The Jarbidge mining district, Nevada: U.S. Geol. Survey Bull. 741, 86 p.

Shawe, D. R., 1966, Arizona-New Mexico and Nevada-Utah beryllium belts, *in* Geological Survey Research 1966: U.S. Geol. Survey Prof. Paper 550-C, p. C206-C213.

Silberman, M. L., and McKee, E. H., 1974, Ages of Tertiary volcanic rocks and hydrothermal precious-metal deposits in central and western Nevada: Nevada Bur. Mines and Geology Rept. 19, p. 67–72.

Staatz, M. H., 1963, Geology of the beryllium deposits in the Thomas Range, Juab County, Utah: U.S. Geol. Survey Bull. 1142-M, 36 p.

Staatz, M. H., and Griffitts, W. R., 1961, Beryllium-bearing tuff in the Thomas Range, Juab County, Utah: Econ. Geology, v. 56, p. 941-950.

Wahrhaftig, Clyde, and Cox, Allan, 1959, Rock glaciers in the Alaska Range: Geol. Soc. America Bull., v. 70, p. 383–436.

TABLE 1

[Samples collected by the Geological Survey (prefixed Jc, Jp, Jg, or Jl) were analyzed by various methods; in this table columns appear for results on elements that have greatest economic significance. Other elements were found in but a few samples in amounts sufficiently great to warrant reporting, and the values found for these are listed in footnotes to this table. The number following the element symbol is the usual lower limit of determinability, in ppm (parts per million), where unit is not specified, or in percent. Semiquantitative spectrographic determinations: Fe (0.7 percent), Mg (0.02 percent), Ca (0.05 percent), Ti (0.005 percent), Mn(15), Ag (0.5), As (200), Au (10), B (10), Be (1), Bi (10), Cd (20), Co (5), Cr (10), Cu (5), La (20), Mo (5), Nb (20), Ni (5), Pb (10), Sb (100), Sc (5), Sn (10), Sr (100), V (10), W (50), Y (10), Zn (200), Zr (10). Elements determined by instrumental or colorimetric methods include: Au (0.05), Ag (0.5), Se (0.15), Hg (0.02), As (10), Sb (1), and F (50). The lower limit of detectability for gold by the atomic absorption method, if a 10-g sample is used, is 0.05 ppm. Some of the stream sediment samples contained so little coarse material that the sample analyzed was only one-half or one-quarter as large as was desirable. For such samples, the lower limit of detectability is correspondingly raised by a factor of 2 or 4; if gold was undetectable, the listing for gold is given as 0.1 N or 0.2 N, respectively. Values for As and Sb listed in footnotes were determined colorimetrically; Ba was determined chemically in selected samples. The lower limits of the determinative values selected for mention in footnotes were: Spectrographic: Be (6), Nb (30), Pb (200), Sn (20), Sr (1000), V (500), W (100). Instrumental and chemical: Au (1), Se (1), As (200), Sb (50). Cd (20) was not found in any samples. For certain samples, the lower limit of determination of Au by the atomic absorption method was 0.2 ppm. Analysts of Geological Survey samples: Semiquantitative spectrographic, J. Domenico, R. Hopkins, D. Siems, R. Babcock; instrumental and colorimetric, Reinhard Leinz, R. Babcock, C. Smith, J. D. Hoffman, J. R. Hassemer, R. L. Miller, C. A. Curtis, D. Murrey, G. L. Crenshaw. 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 grouped data on a geometric scale. The assigned group for semiquantitative results will include the quantitative value about 30 percent of the time. These data should not be quoted without stating these limitations. N, not found; B, not sought; L, less than lower limit of method; H, interference vitiates reliability of value reported; G, content greater than value given. Bureau of Mines samples (sample numbers prefixed J) were assayed for Au and Ag by fire assay, to the nearest 0.1 troy oz per avoirdupois ton (3.428 g per tonne). Cu and Pb values in Bureau of Mines samples were determined by semiquantitative spectrographic analysis. As indicated in table 1 by the symbol 0.0B, other elements, except Ba, that were determined spectrographically, by atomic absorption, or instrumentally, in the Geological Survey samples were not sought in Bureau of Mines samples. Ba was determined chemically in Bureau of Mines samples of material known to contain barite. Assay work on Bureau of Mines samples was done by H. H. Heady of the Bureau of Mines Reno station. Analytical data, type of materials sampled, and coordinates of sample localities were entered into the U.S. Geological Survey computer data storage system RASS (Rock Analysis Storage System). Rock and stream sediment data are stored on magnetic tape and are available through the U.S. Department of Agriculture, National Technical Information Service (file no. ERT013, 1977). Analytical data for water samples are on file in the National Water Resources Division, Water Quality File, with the U.S. Department of the Interior, Computer Center Division, U.S. Geological Survey, Reston, Virginia]

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*

Sample	X-coordinate (Nevada, E. zone)	Y-coordinate (Nevada, E. zone)	Semiquantitative spectrographic analyses (ppm)					Colorimetric and instrumental analyses (ppm)		Sample description
			Ba	Cu	Cr	Mo	Ni	Ag	Hg	
Rocks, veins, and soils										
72JC001	523600	2567500	20	10	10 N	5 N	5 L	0.5N	0.14	Pros Mtn Quartzite
72JC002	523600	2567500	700	50	100	5 N	20	0.5L	0.14	Qtz-mica schist
72JC003	534050	2554250	700	10	10 L	5 N	5 L	0.5N	0.06	Vitric Jarb Rhy
72JC005	524150	2549500	1000	10	50	5 N	15	0.5	0.06	Tuff, Meadow Fk Fm
72JC006	529500	2549150	700	10	20	5 N	5	0.5N	0.10	Dead Horse Tuff
72JC007	526100	2544150	100	5 L	50	5 N	7	0.5L	0.12	Micritic ls
72JC008	526350	2544400	1000	10	10	5 N	5	0.5N	0.10	Dac ignim Wildcat Cr.
72JC009[1]	526360	2537600	100	150	30	5 N	5	0.5N	0.14	Mass dk gy calcaren
72JC010[2]	551270	2508100	1500	7	70	5 N	15	0.5N	0.10	Hb biot dac ignim
72JC011	551270	2508100	50	5	10 L	5 N	5	0.5N	0.04	Chalced vnlt in same
72JC012	554300	2506740	1000	5	10 L	5 N	5 L	0.5N	0.08	Danger Point Tuff
72JC013	528900	2539520	150	30	50	5 N	10	0.5N	0.16	Limon-std breccia
72JC015	541500	2524500	500	10	30	5 N	15	0.5	0.14	Soil fr rhy
72JC021[3]	562200	2547500	200	15	70	5 N	5	0.5L	0.35	Breccia zone in cht
72JC022[4]	564400	2547640	5000 G	5	10 L	5 N	5 L	0.5N	1.50	Arg silic zone, Jarb Rhy
72JC023	569800	2542600	200	30	50	15	5	0.5L	0.22	Gossan zone
72JC024[5]	570400	2537000	200	200	70	500	5	0.5L	5.00	Fe-oxid std breccia zone
72JC025	567150	2532050	100	70	15	5 N	10	0.5N	0.30	Shear zone in qtzt
72JC026	566600	2540560	700	50	10 L	5 N	5	0.5N	0.18	Shear zone in dacit ignim
72JC027	562500	2539900	700	70	10 L	5 N	5 L	0.5N	0.18	Arg rhy porph dike
72JC028	561900	2535500	1000	30	10	5 N	5 N	0.5N	0.08	Pale pink gy dac ignim
72JC029[6]	563800	2561750	300	20	10 L	50	5 N	0.5L	0.80	Oxid sulfid dac ignim
72JC030[7]	563780	2561700	500	20	10	5 N	5	0.5	0.12	Qtz in silic dac ignim
72JC033	566600	2561000	500	50	20	5 N	15	0.5	0.10	Soil
72JC036	570350	2569500	500	20	10	5 N	5	0.5	0.30	Do.
72JC037	557050	2584950	700	10	10 N	5 N	5 L	0.5N	0.04	Altered Jarb Rhy
72JC038	557000	2585600	700	30	10 N	5 N	5 L	0.5N	0.06	Do.
72JC039	557250	2587500	700	10	10 N	5 N	5 L	0.5N	0.06	Do.
72JC040	559750	2588350	200	15	10 N	5 N	5 L	0.5N	0.04	Arg Jarb Rhy
72JC041	561300	2588250	700	15	10 N	5 N	5 L	0.5N	0.02	Jaros Jarb Rhy
72JC042	568050	2588000	700	15	10 N	5 N	5 L	0.5N	0.04	Arg limon Jarb Rhy
72JC043	571800	2590650	500	20	10 N	5 N	5 L	0.5N	0.02	Jaros Jarb Rhy brec
72JC044[8]	574750	2528900	5000 G	50	10 N	5 N	15	0.5L	0.35	Blk brec vein, 2"
72JC054	601080	2581410	1500	100	10 N	5 N	5 N	0.5N	0.12	Arg limon Jarb Rhy
72JC072	581750	2526460	700	30	10 N	5 N	5 L	0.5N	0.02	Do.
72JC073	570150	2530700	1500	30	10 N	5	5 L	0.5N	0.35	Do.
72JC074	570220	2530150	5000	5	50	5 N	5	0.5N	0.02 N	Limon qtzt with barite
72JC075[9]	570100	2530100	5000 G	15	10	5 N	5 L	0.5N	0.16	Do.
72JC076	569810	2529200	1000	15	10 N	70	5 L	0.5N	0.20	Limon silic Jarb Rhy
72JD031	540000	2545200	500	20	10 L	5 N	5 L	0.5N	0.04	Limon vein, Jarb Rhy
72JD032	540430	2544300	300	7	10 L	10	5 L	0.5N	0.04	Do.
72JD033	540500	2543730	200	200	10	7	5 L	0.5N	0.02	Limon silic zone, Jarb Rhy

72JD034	541200	2542700	100	5	10 L	7	5 L	0.5N	0.02	Limon qtz vein, Jarb Rhy
72JD035	539470	2539200	700	20	10 L	5 N	5 L	0.5N	0.02	Do.
72JD035A	538070	2539100	200	100	10	5	5 L	0.5N	0.04	Qtz vein, Jarb Rhy
72JD036	536900	2535720	500	50	10 L	5 N	5 L	0.5N	0.06	Limon qtz vein, Jarb Rhy
72JD038[10]	534960	2531070	200	70	10	15	5 L	0.5L	0.04	Limon-std Jarb Rhy
72JD039	534900	2530300	500	100	10 L	5 N	5 L	0.5N	0.04	Limon-std Jarb Rhy
72JD040	534700	2527030	200	30	10 L	5 N	5 L	0.5N	0.06	Chlorit alt Jarb Rhy
72JD070[11]	561900	2564580	1000	100	20	200	15	0.5N	0.12	
72JD071	562360	2564950	300	10	20	5 N	5	1.0	0.35	
72JD072[12]	562370	2565150	300	30	10 N	5	5 L	2.0	2.50	
72JD073	563130	2565500	150	30	10 N	5 N	5 L	0.5N	0.18	
72JD074	563270	2565680	1500	5	10 N	5 N	5 L	0.5N	0.10	
72JD075	563480	2565880	1500	5 L	10 N	5 N	5 L	0.5N	0.14	
72JD076	563540	2566500	1000	30	10 N	5	5 L	0.5N	0.10	
72JD077	563600	2566920	700	5	10 N	5	5 L	7.5	0.14	
72JD078	563680	2567300	700	5	10 N	5 N	5 L	0.5L	0.18	
72JD079	563950	2568000	1000	30	10 N	10	5 L	45.0	0.20	
72JD080	569150	2573160	700	5	10 N	5 N	5 L	0.5N	0.16	
72JD081	569100	2573550	700	50	10 N	5 N	5 L	0.5N	0.28	
72JD082	569780	2578600	700	30	10 N	5 N	5 L	0.5N	0.10	
72JD083[10]	570040	2579400	700	30	10 N	5 N	5 L	0.5N	0.10	
72JD084	570100	2550230	700	5	10 N	5 N	5	0.5N	0.08	Blk chalced vn, Jarb Rhy
72JD085	573000	2547550	500	50	10 N	5 N	5	0.5N	0.80	
72JD086	573210	2546750	300	30	10 N	30	5 N	0.5N	3.00	
72JD087	573400	2546400	5000 G	20	10 N	15	5 N	0.5N	1.00	Sulf? in qtzt
72JD088	573800	2546120	5000 G	5 L	10 N	5 N	5 N	0.5N	0.22	Barite in qtzt
72JD091	595500	2567080	1000	20	10 N	5 N	5 N	0.5L	0.10	Limon alt in Jarb Rhy
72JD104[13]	607930	2564500	1000	20000 G	150	5 N	300	33.0	0.18	Qtz vn mat, dump, dio
72JD105[14]	605300	2566600	300	100	30	5 N	5	0.5N	7.00	Vn on flt
72JD106	605220	2566500	700	30	150	5 N	5	0.5N	0.22	Do.
72JD107	605950	2561950	2000	10	10 N	5 N	5	0.5N	0.10	Blk min on lt
72JD108	573100	2544340	500	5 L	70	5 N	5	0.5L	0.16	Blk-gy arglt
72JD109	573500	2546300	3000	10	10 N	5 N	5 L	0.5N	0.16	Dac ignim
72JD110[15]	571250	2546680	5000 G	5	10 N	5	5	0.5N	0.28	Do.
72JD111	571070	2546350	1500	10	10 N	5 N	7	0.5N	0.30	Do., alt
72JD112[16]	540520	2540250	300	20	10 N	5 N	5 L	0.5	0.06	Limon-std silic Jarb Rhy
72JD113[17]	540450	2539670	300	10	10 N	5 N	5 L	0.5N	0.04	Do.
72JD114	540940	2539250	700	20	10 N	5 N	5 L	0.5N	0.02	Do.
72JD115[18]	541500	2538920	30	10	10 N	5 N	5 L	0.5N	0.04	Do.
72JD116	542330	2537880	2000	10	10 N	5 N	5 L	0.5N	0.02 N	Spherulite in Jarb Rhy
72JD117	543670	2536000	1000	15	10 N	5 N	5 L	0.5N	0.06	Limon alt Jarb Rhy
72JD118	544300	2535950	700	5 L	10 N	5 N	5 L	0.5N	0.06	Spherulites in Jarb Rhy

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*—Continued

Sample	X-coordinate (Nevada, E. zone)	Y-coordinate (Nevada, E. zone)	Semiquantitative spectrographic analyses (ppm)					Colorimetric and instrumental analyses (ppm)		Sample description
			Ba	Cu	Cr	Mo	Ni	Ag	Hg	
Rocks, veins, and soils										
72JD119	544800	2535780	1000	50	10 N	5 N	5 L	0.5N	0.06	Qtz vn, limon alt, Jarb Rhy
72JD120	545140	2535440	700	20	10 N	5 N	5 L	0.5N	0.06	Alt Jarb Rhy
72JD121	545300	2535280	700	20	10 N	5 N	5	0.5N	0.08	Sulf? and silic vn, Jarb Rhy
72JD122	545320	2533450	700	10	10 N	5 N	5 L	0.5N	0.10	Alt Jarb Rhy
72JD123	546340	2532890	1000	30	10 N	5 N	5 L	0.5N	0.02 L	Do.
72JD124	546660	2533020	700	30	10 N	5 N	5 L	0.5N	0.10	Do., w chalced vns
72JD125	547350	2532380	100	10	10 N	5 N	5 L	0.5N	0.02	Silic vn, Jarb Rhy
72JD126	549300	2530870	1500	10	10 N	5 N	5 L	0.5N	0.02 N	Blk silic vn, Jarb Rhy
72JD127	549730	2530530	1000	15	10 N	5 N	5 L	0.5N	0.02	Alt Jarb Rhy
72JD128[19]	549420	2529900	700	20	10 N	5 N	5 L	0.5N	0.02 L	Limon silic vn, Jarb Rhy
72JD129	549220	2528950	700	20	10 N	5 N	5 L	0.5N	0.02	Do.
72JD130[20]	574400	2543020	70	7	10 L	5 N	200	0.5L	0.06	Limon alt zone, Pog Ls
72JD131	581440	2553880	150	15	10 N	5 N	5	0.5N	0.02	Alt Jarb Rhy
72JD132[10]	583320	2553280	300	20	10 N	5 N	5 L	0.5N	0.04	Limon alt Jarb Rhy
72JD133	584480	2553370	500	20	10 N	5 N	5 L	0.5N	0.06	Jarb Rhy, qtz vn
72JD134	585470	2553120	700	10	10 N	5 N	5 L	0.5N	0.04	Limon silic vn, Jarb Rhy
72JD135	585780	2552920	1000	15	10 N	5 N	5 L	0.5N	0.02	Wht qtz, vitric Jarb Rhy
72JD136	586280	2552730	700	5	10 N	5 L	5 L	0.5N	0.04	Limon qtz vn, Jarb Rhy
72JD137	587170	2552200	700	15	10 N	10	10	0.5N	0.06	Silic Jarb Rhy
72JD138	587500	2551980	1000	7	10 N	5 N	5 L	0.5N	0.08	Qtz vn, Jarb Rhy
72JD139	588340	2549570	1000	7	10 N	5 N	5	0.5N	0.04	Do.
72JG015	550000	2535850	1000	5	10 L	5 N	5 L	0.5N	0.04	Alt rhy
72JG017	553250	2531820	500	5 L	10 L	5 N	5 L	0.5N	0.02	Alt dacite
72JG031	534200	2515800	1000	10	10 L	5 N	5 L	0.5N	0.04	Alt rhy
72JG032	557900	2557370	700	20	10 L	5 N	5 L	0.5L	0.06	Do.
72JG033	557500	2557170	700	70	10 L	5 N	5 L	0.5N	0.06	Do.
72JG034	557150	2557120	500	70	10	5 N	5 L	0.5N	0.06	Do.
72JG035	556800	2557150	700	15	10 L	5 N	5 L	0.5N	0.04	Do.
72JG036	556520	2557230	500	70	10 L	5 N	5 L	0.5L	0.06	Do.
72JG037	555320	2557450	500	20	10 L	5 N	5 L	0.5N	0.04	Do.
72JG038	551800	2557500	500	50	10 L	5 N	5 L	0.5N	0.04	Do.
72JG039	545100	2561750	200	20	10	5 N	5 L	0.5N	0.04	Do.
72JG040	542380	2550950	300	30	10 L	5	5 L	0.5L	0.04	Do.
72JG041	541270	2550350	300	30	10 L	7	5 L	0.5L	0.04	Do.
72JG042	556340	2547900	2000	10	10	5 N	5 L	0.5N	0.04	Do.
72JG043	552600	2547000	1000	20	10	5 N	5 L	0.5L	0.06	Do.
72JG044	552440	2547240	1000	50	10	5 N	5 L	0.5N	0.24	Do.
72JG045[17]	549540	2544840	1000	7	10	5 N	5 L	0.5L	0.04	Do.
72JG046[17]	549600	2544600	700	15	10	5 N	5 L	0.5L	0.08	Do.
72JG047	549800	2544170	300	150	10 L	5 N	5 L	0.5N	0.04	Do.
72JG048	549900	2537850	2000	150	10 N	5 N	5 L	0.5N	0.04	Do.
72JG049	549900	2537850	2000	7	15	5 N	5 L	0.5N	0.02	Do.

72JG050	550070	2537450	2000	10	10 L	5 N	5 L	0.5N	0.02	Alt rhy
72JG054	563100	2579050	700	5	10 N	5 N	5 N	0.5N	0.22	Do.
72JG090	582950	2544870	5000 G	100	10 N	5 N	5 N	1.0	10.00 G	Do.
72JG091	583550	2544600	5000 G	5 L	10 N	5 N	5 N	0.5N	0.35	Barite vn
72JG092[21]	583700	2544520	5000 G	15	10 N	100	5 N	0.5N	10.00 G	Do.
72JG093	584050	2543950	5000	50	20	5 L	5	0.5N	2.50	Chert
72JG099	574950	2547820	5000 G	10	20	5 N	5 L	1.5	1.50	Barite vn
72JG100	574900	2547950	5000 G	5 L	15	5 N	5 L	0.5N	1.20	Do.
72JG101	574900	2548050	5000 G	5 L	10 N	5 N	5 N	0.5N	0.22	Do.
72JG102	576900	2547800	5000 G	50	15	5 N	5 N	0.5N	2.00	Do.
72JG103	577100	2547750	5000 G	20	10	5 N	5 N	0.5N	0.80	Do.
72JG129[22]	574620	2541050	1500	5	20	7	50	1.0	0.35	Limon silic ls
72JG130	575070	2541830	1500	100	70	5 N	70	1.0	0.30	Do.
72JG131	563450	2526050	700	50	10 N	5 N	5 L	0.5	0.04	Alt rhy
72JG132	561450	2520720	1500	20	10 N	5 N	5 L	0.5N	0.06	Do.
72JG133	560650	2518550	1000	20	10 N	5 N	5 L	0.5N	0.04	Do.
72JL001	562820	2541320	200	20	70	5 N	15	0.5N	2.00	Tuff
72JL002	562850	2541180	300	50	150	5 N	5	0.5N	2.00	Phenox in tuff
72JL003[23]	562580	2540620	2000	100	200	10	20	0.5L	0.35	Qtz vn, cht
72JL011[24]	559900	2548600	1500	7	70	5 N	5	0.5L	0.50	Blk cht
72JL012	559900	2548600	5000 G	15	100	30	5	0.5L	0.40	Barite vn
72JL013[25]	559000	2549000	3000	50	50	30	10	3.0	5.00	Vn gossan, sltst
72JL014	565250	2538800	500	5	10	5 N	5	0.5N	0.04	Silic dac ignim
72JL015	562230	2535480	300	30	10	5 N	5	0.5N	0.04	Do.
72JL016	563580	2533940	300	5 L	10 L	5 N	5 L	0.5N	0.02	Alt rhy
72JL017	561000	2528420	500	20	10 L	5 N	5	0.5N	0.04	Do.
72JL018	558250	2529500	700	15	15	5 N	5	0.5L	0.06	
72JL033[26]	556050	2572020	150	100	10 N	50	5 N	7.0	0.35	Limon gossan, Jarb Rhy
72JL034	557860	2571370	500	50	10 N	5 N	5 L	0.5L	0.06	Py frac, Jarb Rhy
72JL035	558200	2571570	300	50	10 N	70	5 N	2.0	0.12	Gy clay, qtz, pros
72JL036	558280	2571570	300	20	10 N	10	5 N	0.5L	0.06	Red clay, qtz, pros
72JL037	558580	2571840	1000	50	10 N	5 N	5 N	0.5N	0.06	Limon alt Jarb Rhy
72JL038	558910	2572300	30	5 L	10 N	5 N	5 N	0.5N	0.08	Drusy qtz, limon Jarb Rhy
72JL039	559420	2572630	150	15	10 N	5 N	5 L	0.5N	0.04	Sulf, qtz, Jarb Rhy
72JL040[27]	573750	2538520	3000	100	15	5 N	200	1.0	0.55	Gossan, limy sltst
72JL041	579220	2538500	500	30	50	5 N	5	0.5N	0.75	Qtz vn, sltst
72JL047[28]	572400	2532440	700	50	100	15	50	2.5	0.90	Phos cht, ls
72JL056	605200	2571430	700	50	10 N	5 N	5	0.5L	0.40	Alt dac ignim, limon, qtz
J12A	557580	2559460	0 B	100 L	0 B	0 B	0 B	3.5L	0.00 B	
J12B	557580	2559460	0 B	100 L	0 B	0 B	0 B	10.0	0.00 B	
J12C	557850	2559310	0 B	100 L	0 B	0 B	0 B	27.0	0.00 B	
J12D[29]	557850	2559310	0 B	100 L	0 B	0 B	0 B	6.9	0.00 B	

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*—Continued

Sample	X-coordinate	Y-coordinate	Semiquantitative spectrographic analyses (ppm)					Colorimetric and instrumental analyses (ppm)	
	(Nevada, E. zone)		Ba	Cu	Cr	Mo	Ni	Ag	Hg
Rocks, veins, and soils									
J12E	558000	2559310	0 B	200	0 B	0 B	0 B	6.9	0.00B
J12F	558280	2558940	0 B	0 B	0 B	0 B	0 B	10.0	0.00B
J12G	558160	2558670	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J12H	557780	2560910	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J12I	557480	2561210	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J12J	557460	2561280	0 B	0 B	0 B	0 B	0 B	10.0	0.00B
J12K	557700	2557700	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J12L	558210	2557760	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J12M[29]	558370	2557840	0 B	100 L	0 B	0 B	0 B	10.0	0.00B
J13A	558600	2558310	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J14A[30]	558780	2558560	0 B	100 L	0 B	0 B	0 B	3.5N	0.00B
J15A	559190	2560170	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J16A	558620	2560390	0 B	0 B	0 B	0 B	0 B	17.0	0.00B
J17A[7]	558080	2560690	0 B	100 L	0 B	0 B	0 B	10.0	0.00B
J18A[7]	558680	2563690	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J19A[7]	560150	2563940	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J20A[29]	562420	2565080	0 B	100 L	0 B	0 B	0 B	10.0	0.00B
J21A	563170	2565540	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J22A[30]	556130	2582920	0 B	100 L	0 B	0 B	0 B	10.0	0.00B
J22B[31]	554700	2582120	0 B	100 L	0 B	0 B	0 B	10.0	0.00B
J22C	553500	2580540	0 B	0 B	0 B	0 B	0 B	3.5N	0.00B
J23A[29]	553780	2578590	0 B	100 L	0 B	0 B	0 B	3.5N	0.00B
J24A	554890	2578530	0 B	100 L	0 B	0 B	0 B	3.5L	0.00B
J24B	555440	2578510	0 B	0 B	0 B	0 B	0 B	3.5L	0.00B
J24C	555630	2578850	0 B	100 L	0 B	0 B	0 B	3.5	0.00B
J24D	555510	2578710	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J25A[29]	554810	2579720	0 B	100	0 B	0 B	0 B	3.5N	0.00B
J25B	555220	2579360	0 B	0 B	0 B	0 B	0 B	3.5N	0.00B
J25C	554680	2579190	0 B	0 B	0 B	0 B	0 B	3.5N	0.00B
J25D[29]	554450	2579040	0 B	100	0 B	0 B	0 B	3.5N	0.00B
J25E[29]	555250	2585100	0 B	100	0 B	0 B	0 B	3.5N	0.00B
J25F	555640	2580770	0 B	0 B	0 B	0 B	0 B	3.5N	0.00B
J26A[29]	607260	2564610	0 B	100 L	0 B	0 B	0 B	3.5	0.00B
J27A	577800	2544150	0 B	100 N	0 B	0 B	0 B	6.9	0.00B
J28A	582780	2544530	0 B	100 L	0 B	0 B	0 B	0.0B	0.00B
J29A	583560	2544680	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J29B	583580	2544720	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J29C	583690	2544720	0 B	100 L	0 B	0 B	0 B	0.0B	0.00B
J29D	583770	2544850	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J2A	569600	2595350	0 B	100 L	0 B	0 B	0 B	3.5L	0.00B
J2B	569600	2595350	0 B	100 L	0 B	0 B	0 B	24.0	0.00B
J32A	558990	2552320	0 B	0 B	0 B	0 B	0 B	6.9	0.00B

J32B[29]	558990	2552320	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J32C	559010	2552440	0 B	0 B	0 B	0 B	0 B	3.5	0.00B
J32D	558480	2553860	0 B	0 B	0 B	0 B	0 B	3.5	0.00B
J32E	558480	2553860	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J33A[30]	559020	2572460	0 B	160	0 B	0 B	0 B	6.9	0.00B
J34A[29]	558710	2572100	0 B	160	0 B	0 B	0 B	6.9	0.00B
J35A	558100	2571560	0 B	0 B	0 B	0 B	0 B	6.9	0.00B
J36A[29]	576900	2548740	0 B	100 L	0 B	0 B	0 B	3.5	0.00B
J37A	574940	2547400	0 B	100 L	0 B	0 B	0 B	0.0B	0.00B
J38A	573620	2546390	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J39A	571720	2546700	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J40A	570070	2529310	0 B	100 N	0 B	0 B	0 B	3.5	0.00B
J41A	570080	2527890	0 B	100 N	0 B	0 B	0 B	0.0B	0.00B
J41B	570080	2527890	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J41C	570080	2527890	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J4A	573500	2596980	0 B	100 L	0 B	0 B	0 B	3.5N	0.00B
J9A	577780	2587710	0 B	100 L	0 B	0 B	0 B	6.9	0.00B
J9B	578020	2587750	0 B	100 L	0 B	0 B	0 B	3.5L	0.00B

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*—Continued

Sample	X-coordinate (Nevada, E. zone)	Y-coordinate (Nevada, E. zone)	Semiquantitative spectrographic analyses (ppm) Ba	Cu	Cr	Mo	Ni	Colorimetric and instrumental analyses (ppm) Ag	Hg
Stream sediments									
72JC004	534050	2554250	700	15	15	5 N	5	0.5N	0.06
72JC014	552900	2527300	1500	10	30	5 N	10	0.5N	0.08
72JC016	540900	2520300	2000	10	20	5 N	5	0.5N	0.08
72JC017	541280	2519400	1000	15	30	5 N	10	0.5N	0.12
72JC018	540800	2517500	2000	10	20	5 N	7	0.5N	0.04
72JC019	540550	2515680	2000	15	20	5 N	5	0.5N	0.10
72JC020	540900	2514540	1500	15	20	5 N	5	0.5N	0.10
72JC031	564300	2560500	700	70	10	5 N	7	0.5	0.06
72JC032	564890	2561200	700	50	15	5 N	10	0.5	0.04
72JC034	570850	2563150	700	15	10	5 N	7	0.5L	0.24
72JC035	571650	2567600	700	70	15	5 N	7	1.0	0.14
72JC045	574700	2529750	2000	50	30	5 N	15	0.5	0.35
72JC046	574250	2529600	3000	30	30	5 N	15	0.5L	0.35
72JC047	574350	2529950	1500	30	30	5 N	15	0.5L	0.35
72JC048	574800	2530050	1000	50	15	5 N	5	0.5N	0.10
72JC049	576600	2531100	500	20	70	5 N	30	0.5	0.18
72JC050	600850	2583000	500	30	20	5 N	5	0.5L	0.08
72JC051	600880	2582300	1000	20	10 N	5 N	5 L	0.5N	0.08
72JC052	601040	2581900	700	50	10 L	5 N	5 L	0.5N	0.10
72JC053	601100	2581400	1500	100	30	5 N	7	0.5N	0.10
72JC055	601150	2581100	1000	50	10 L	5 N	5 L	0.5N	0.08
72JC056	602010	2580350	1000	5	10 L	5 N	5 L	0.5N	0.06
72JC057	603900	2579400	700	20	30	5 N	7	0.5N	0.16
72JC058	606400	2579500	700	5	15	5 N	7	0.5L	0.12
72JC059	608650	2578900	700	30	20	5 N	10	0.5L	0.14
72JC060	611850	2578850	700	70	30	5 N	10	0.5N	0.12
72JC061	615000	2575000	700	50	30	5 N	10	0.5L	0.20
72JC062	608660	2588700	700	50	20	5 N	7	0.5L	0.16
72JC063	608650	2588280	700	30	15	5 N	5	0.5L	0.14
72JC064	608850	2587140	700	10	15	5 N	5 L	0.5L	0.12
72JC065	610000	2586200	700	30	20	5 N	5	0.5L	0.16
72JC066	610050	2585850	700	15	10	5 N	5 L	0.5N	0.14
72JC067	610220	2585680	700	20	15	5 N	5	0.5L	0.12
72JC068	611100	2585700	1000	10	10	5 N	5 L	0.5N	0.10
72JC069	611250	2585700	700	30	10 L	5 N	5 L	0.5N	0.10
72JC070	612250	2584800	1000	50	15	5 N	7	0.5N	0.10
72JC071	612700	2585000	700	50	20	5 N	7	0.5L	0.14
72JD001	564850	2549050	700	15	10	5 N	5	0.5L	0.10
72JD002	564000	2547870	700	30	50	5 N	10	0.5L	0.22
72JD003	563950	2546400	700	15	70	5 N	20	0.5N	0.14
72JD004	564130	2546000	1000	30	70	5 N	10	0.5N	0.12
72JD005	562750	2545100	700	50	150	5 N	30	0.5L	0.18

72JD006	562600	2544550	700	20	100	5 N	20	0.5N	0.20
72JD007	561500	2544040	1000	30	150	5 N	30	0.5N	0.45
72JD008	561450	2543650	500	20	100	5 N	30	0.5N	0.22
72JD009	560450	2543100	700	50	200	10	50	1.0	0.22
72JD010	559300	2541740	700	20	150	5 N	50	0.5	0.24
72JD011	556080	2541180	700	15	20	5 N	5	0.5N	0.14
72JD012	555900	2540680	1000	10	30	5 N	5	0.5N	0.14
72JD013	555800	2540850	1000	20	10	5 N	5	0.5N	0.14
72JD014	553100	2539500	700	10	20	5 N	5	0.5N	0.04
72JD015	552680	2539150	1000	10	20	5 N	5	0.5N	0.12
72JD016	551850	2538170	2000	10	30	5 N	5	0.5N	0.10
72JD017	552150	2538030	1000	10	15	5 N	5	0.5N	0.18
72JD018	552170	2536660	700	20	20	5 N	5	0.5L	0.18
72JD019	552220	2533450	1000	20	10 L	5 N	5 L	0.5N	0.08
72JD020	552970	2532540	700	15	30	5 N	5	0.5N	0.14
72JD021	557890	2524340	1500	50	10	5 N	5	0.5N	0.08
72JD022	556620	2523690	1500	20	10	5 N	5 L	0.5N	0.10
72JD023	554200	2524000	700	30	30	5 N	7	0.5N	0.10
72JD024	553500	2522920	700	10	30	5 N	7	0.5N	0.12
72JD025	552120	2522450	700	50	30	5 N	7	0.5L	0.10
72JD026	549550	2521150	2000	5	20	5 N	5	0.5L	0.04
72JD027	549220	2519450	2000	15	30	5 N	7	0.5L	0.16
72JD028	549900	2518950	1500	15	30	5 N	7	0.5N	0.08
72JD029	549100	2516850	2000	10	20	5 N	5	0.5L	0.18
72JD030	549100	2515100	1500	15	50	5 N	10	0.5	0.16
72JD041	561280	2568400	700	20	70	5 N	10	0.5L	0.20
72JD042	561100	2568750	700	50	30	5 N	10	0.5	0.22
72JD043	561800	2569900	700	20	30	5 N	10	0.5	0.10
72JD044	563000	2571700	700	20	10 L	5 N	5	0.5N	0.02
72JD045	563900	2572300	300	20	15	5 N	5	0.5	0.22
72JD046	564950	2572300	700	10	10	5 N	10	0.5L	0.04
72JD047	565670	2572750	700	5	15	5 N	15	0.5L	0.12
72JD048	567850	2574680	700	5 L	10 L	5 N	5	0.5N	0.06
72JD049	567700	2575600	1000	50	10	5 N	10	0.5N	0.06
72JD050	568170	2577000	1000	30	15	5 N	7	0.5L	0.06
72JD051	568500	2577900	700	50	10	5 N	5	0.5N	0.12
72JD052	569400	2580560	700	20	15	5 N	7	0.5N	0.11
72JD053	569600	2581600	700	10	20	5 N	15	0.5L	0.12
72JD054	570030	2582100	700	50	20	5 N	15	0.5N	0.20H
72JD055	572200	2582800	700	30	10	5 N	5	0.5N	0.10
72JD056	572100	2583800	700	30	15	5 N	10	0.5L	0.22H
72JD057	589800	2585000	1000	10	10	5 N	5	0.5N	0.08

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*—Continued

Sample	X-coordinate	Y-coordinate (Nevada, E. zone)	Semiquantitative spectrographic analyses (ppm)					Colorimetric and instrumental analyses (ppm)	
			Ba	Cu	Cr	Mo	Ni	Ag	Hg
					Stream sediments				
72JD058	589950	2584650	700	30	10	5 N	5	0.5N	0.12
72JD059	588920	2583030	1000	30	30	5 N	15	0.5N	0.08
72JD060	587150	2581140	700	20	10	5 N	5	0.5N	0.10
72JD061	587300	2581300	700	5	15	5 N	5	0.5N	0.10
72JD062	586500	2581400	700	30	15	5 N	5	0.5N	0.20
72JD063	586250	2580920	700	30	10	5 N	5	0.5L	0.10
72JD064	583430	2580850	700	20	10 N	5 N	5 L	0.5N	0.10
72JD065	583300	2581970	1000	20	10	5 N	5	0.5N	0.08
72JD066	581900	2583270	700	5 L	10 N	5 N	5 L	0.5N	0.30
72JD067	581330	2583700	700	10	10 N	5 N	5 L	0.5N	0.14
72JD068	580050	2584720	700	30	10 N	5 N	5 L	0.5N	0.08
72JD069	580230	2584300	700	50	10 L	5 N	5 L	0.5N	0.06
72JD089	578400	2543480	2000	500	70	5 N	20	0.5	0.30
72JD090	583930	2543000	2000	200	10	5 N	5 L	0.5L	0.30
72JD092	597350	2567070	700	70	10	5 N	5 L	0.5N	0.16
72JD093	597400	2567280	700	100	10 L	5 N	5 L	0.5N	0.22
72JD094	599120	2567730	700	15	10 L	5 N	5 L	0.5N	0.14
72JD095	599830	2567620	700	70	10	5 N	5 N	0.5N	0.06
72JD096	600700	2566170	700	50	10	5 N	5	0.5N	0.08
72JD097	602400	2564430	700	10	10 N	5 N	5 N	0.5N	0.06
72JD098	602300	2564170	700	30	10 L	5 N	5	0.5L	0.20
72JD099	602400	2563800	700	30	20	5 N	5	0.5L	0.14
72JD100	603730	2563600	700	30	10	5 N	5 L	0.5L	0.18
72JD101	605200	2563480	1000	30	20	5 N	5 L	0.5N	0.20
72JD102	607800	2561900	700	30	30	5 N	5 L	0.5N	0.10
72JD103	608040	2560100	700	50	10 L	5 N	5 L	0.5N	0.10
72JG001	554250	2553720	1000	10	20	5 N	5	0.5N	0.10
72JG002	553230	2553400	1000	5	20	5 N	5	0.5N	0.10
72JG003	549400	2550250	1000	5	10	5 N	5	0.5N	0.08
72JG004	550050	2549520	1500	5	15	5 N	5	0.5N	0.08
72JG005	548370	2547720	1000	10	20	5 N	5	0.5L	0.12
72JG006	548750	2547500	700	7	20	5 N	5	0.5L	0.14
72JG007	546250	2545200	1500	20	15	5 N	5	0.5L	0.04
72JG008	545920	2544070	1000	5	20	5 N	5	0.5N	0.08
72JG009	546670	2542720	1500	10	20	5 N	7	0.5L	0.14
72JG010	546050	2541850	1500	5 L	15	5 N	5	0.5N	0.08
72JG011	546950	2541130	1500	10	20	5 N	5	0.5N	0.18
72JG012	548100	2537500	1500	7	15	10	5	0.5N	0.14
72JG013	547900	2537300	1500	10	15	5 N	5	0.5N	0.10
72JG014	548800	2536500	1000	10	15	5 N	5	0.5N	0.16
72JG016	550800	2533820	2000	10	20	5 N	5	0.5N	0.08
72JG018	552300	2529470	1000	7	20	5 N	7	0.5	0.18

72JG019	539700	2533800	1500	10	15	5	5	0.5N	0.12
72JG020	539340	2533500	700	10	10	5 N	5 L	0.5N	0.10
72JG021	538800	2531200	500	10	10	5 N	5	0.5N	0.06
72JG022	538940	2530450	3000	7	20	5	5	0.5N	0.06
72JG023[34]	538540	2530040	700	10	20	5 N	7	0.5N	0.06
72JG025	537900	2528000	300	5	10	5 N	5	0.5N	0.06
72JG027	537400	2524360	500	7	20	5 L	5	0.5N	0.06
72JG028	537000	2523050	1000	15	30	5 N	7	0.5L	0.12
72JG029	535900	2522400	1000	10	20	5 N	7	0.5N	0.04
72JG030	535000	2518200	500	5	10	5 N	5	0.5N	0.06
72JG051	560700	2574450	700	70	15	5 N	5	0.5N	0.10
72JG052[17]	562450	2578000	500	20	15	5 N	10	0.5N	0.30H
72JG053	562600	2577700	700	30	15	5 N	10	0.5N	0.12
72JG055	564750	2579670	700	15	10 N	5 N	5 L	0.5N	0.08
72JG056	567550	2581320	700	70	10 N	5 N	5 L	0.5N	0.12
72JG057	567500	2582550	1500	50	10 N	5 N	5 L	0.5N	0.14
72JG058	569350	2584730	1000	50	10 N	5 N	5 L	0.5N	0.12
72JG059	569650	2585150	1000	5	10 N	5 N	5 L	0.5N	0.09
72JG060	573800	2588400	1000	7	10 N	5 N	5 L	0.5N	0.08
72JG061	573600	2591530	700	5	15	5 N	5	0.5N	0.12
72JG062	577600	2576000	700	10	10	5 N	5 L	0.5N	0.14
72JG063	577600	2577900	700	30	15	5 N	5 L	0.5N	0.18
72JG064	577800	2577800	700	30	30	5 N	5	0.5N	0.24H
72JG065	577900	2580000	700	30	10	5 N	5 L	0.5N	0.12
72JG066[17]	578150	2580900	700	50	20	5 N	7	0.5N	0.30H
72JG067	578250	2582670	700	50	10 N	5 N	5 L	0.5N	0.16
72JG068[17]	578050	2583200	500	10	15	5 N	5	1.0N	0.00B
72JG069	578770	2584270	700	70	10	5 N	5	0.5N	0.20
72JG070[17]	577200	2586550	700	50	20	5 N	5	0.5L	0.02H
72JG071[17]	576800	2587140	300	30	20	5 N	5 L	0.5L	0.02H
72JG072	578000	2587400	1000	70	15	5 N	5	0.5N	0.02H
72JG073	577600	2588300	700	70	20	5 N	10	0.5N	0.02H
72JG074	576450	2589770	1000	30	50	5 N	10	0.5L	0.24H
72JG075	575130	2590600	700	20	30	5 N	7	0.5L	0.24H
72JG076	570400	2569550	700	20	20	5 N	10	0.5	0.14
72JG077	571250	2571470	1000	70	10 L	5 N	5 L	0.5N	0.04
72JG078	571550	2573050	700	5	10	5 N	5 L	0.5N	0.06
72JG079	571550	2575150	1000	50	10	5 N	5 L	0.5L	0.06
72JG080	570700	2575900	700	30	10	5 N	5	0.5L	0.08
72JG081	570600	2571750	700	70	20	5 N	5	1.0	0.14
72JG082	571100	2577650	700	20	10	5 N	5 L	0.5L	0.12
72JG083[17]	571620	2579800	700	50	15	5 N	5	0.5N	0.08

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*—Continued

Sample	X-coordinate (Nevada, E. zone)	Y-coordinate (Nevada, E. zone)	Semiquantitative spectrographic analyses (ppm) Ba	Cu	Cr	Mo	Ni	Colorimetric and instrumental analyses (ppm) Ag	Hg
Stream sediments									
72JG084[17]	571750	2580100	700	30	15	5 N	5	0.5L	0.50H
72JG085[17]	572200	2581720	700	50	10	5 N	5 L	0.5L	0.08
72JG086	573600	2593000	1000	50	15	5 N	5	0.5N	0.20H
72JG087	572700	2596850	700	70	30	5 N	15	1.0	0.30H
72JG088	573700	2596950	700	50	15	5 N	5	0.5L	0.26H
72JG089	573500	2598600	700	20	15	5 N	5 L	0.5N	0.10
72JG094	585300	2544100	3000	30	10 N	5 N	5 L	0.5N	0.18
72JG095	587100	2543830	500	30	10 L	5 N	5 L	0.5N	0.12
72JG096	588230	2543330	700	70	10 L	5 N	5	0.5L	0.18
72JG097	589450	2542450	700	70	10	5 N	10	0.5L	0.16
72JG098	591330	2540000	700	70	10	5 N	5 L	0.5N	0.02
72JG104	588150	2566300	1500	70	20	5 N	5	0.5N	0.08
72JG105	587600	2565800	1500	100	10	5 N	7	0.5N	0.08
72JG106	589050	2562000	1500	10	10 L	5 N	5	0.5N	0.08
72JG107	589200	2562300	1500	15	15	5 N	7	0.5L	0.16
72JG108	590300	2561700	700	5	10	5 N	5 L	0.5N	0.16
72JG109	591850	2559770	1000	15	15	5 N	5 L	0.5N	0.08
72JG110	593650	2557050	700	20	10 L	5 N	5 L	0.5N	0.08
72JG111	594200	2557300	700	10	10 L	5 N	5 L	0.5N	0.12
72JG112	595700	2554500	700	15	20	5 N	5	0.5N	0.12
72JG113	595200	2554220	700	50	15	5 N	5	0.5N	0.16
72JG114	596650	2551970	1000	50	10	5 N	7	0.5N	0.10
72JG115	596250	2551020	1000	30	50	5 N	7	0.5N	0.14
72JG116	597250	2549900	1000	50	30	5 N	5	0.5N	0.12
72JG117	597950	2548270	1500	50	10	5 N	5	0.5N	0.06
72JG118	598050	2547970	1000	50	15	5 N	7	0.5L	0.08
72JG119	601250	2546200	1000	70	15	5 N	5	0.5N	0.12
72JG120	601850	2546200	700	50	15	5 N	7	0.5L	0.16
72JG121	603050	2546370	700	70	50	5 N	15	0.5L	0.06
72JG122	605000	2546600	700	50	30	5 N	15	0.5L	0.10
72JG123	609900	2572250	700	30	15	5 N	7	0.5N	0.06
72JG124	610200	2572550	700	20	10 L	5 N	5	0.5L	0.08
72JG125	611250	2571250	700	70	10	5 N	7	0.5L	0.04
72JG126	611100	2570950	700	50	20	5 N	5	0.5L	0.16
72JG127	612450	2571150	700	70	30	5 N	10	0.5N	0.16
72JG128	615100	2570170	700	70	50	5 N	5	0.5L	0.12
72JG134	556250	2517000	1500	20	10 N	5 N	5 L	0.5N	0.04
72JG135	553650	2513800	1500	10	10 N	5 N	5 L	0.5N	0.02
72JG136	582100	2557650	1000	7	10 L	5 N	5 L	0.5N	0.02
72JG137	584750	2556320	700	15	10 L	5 N	5	0.5N	0.04
72JG138	584920	2555950	500	10	10 L	5 N	5	0.5L	0.16
72JG139	587100	2556250	700	20	10 N	5 N	5	0.5N	0.02

72JG140	588570	2557650	1000	7	10 L	5 N	5	0.5N	0.04
72JL004	562850	2539190	700	20	70	5 N	20	0.5L	0.12
72JL005[35]	561200	2538500	700	30	150	5	50	1.0	0.40
72JL006	560900	2537100	1000	10	50	5 N	15	0.5N	0.18
72JL007	561420	2534300	1500	20	70	5 N	15	0.5N	0.14
72JL008	560000	2532900	700	10	20	5 N	5	1.0N	0.00B
72JL009	558930	2532480	1500	10	20	5 N	7	0.5N	0.12
72JL010	556600	2529800	1000	10	20	5 N	5	0.5	0.08
72JL021	564390	2542170	1000	20	30	5 N	10	0.5N	0.04
72JL022	571350	2558320	700	20	15	5 N	7	0.5N	0.10
72JL023	568700	2557900	1500	15	10 N	5 N	5 L	0.5N	0.06
72JL024	568650	2557870	1500	15	10 N	5 N	5 L	0.5N	0.02
72JL025	568960	2558400	1000	70	10 L	5 N	5	0.5N	0.08
72JL026	569500	2560660	1000	10	10 N	5 N	5 N	0.5N	0.06
72JL027	571000	2563200	700	15	15	5 N	5	0.5N	0.04
72JL028	571190	2563340	700	10	10 N	5 N	5 N	0.5N	0.06
72JL029	571930	2566000	700	20	10 N	5 N	5 N	0.5N	0.04
72JL030	571770	2566050	700	20	10	5 N	5 L	0.5N	0.04
72JL031	571840	2567810	700	30	10 N	5 N	5 N	0.5N	0.06
72JL032	571140	2569300	700	30	10 N	5 N	5 L	0.5N	0.06
72JL042	578980	2533430	5000 G	50	50	5 N	15	0.5	0.35
72JL043	579670	2533200	1000	30	50	5 N	15	0.5	0.20
72JL044	581000	2531040	2000	70	15	5 N	5	0.5L	0.10
72JL045	582270	2530690	1500	50	10 N	5 N	5 N	0.5L	0.22
72JL046	589950	2528180	3000	70	10	5 N	5 N	0.5N	0.12
72JL048	597580	2576090	700	50	15	5 N	5 N	0.5N	0.12
72JL049	597860	2575850	500	50	15	5 N	5	0.5N	0.12
72JL050	598370	2575930	700	50	10 N	5 N	5 N	0.5N	0.10
72JL051	600090	2574700	700	50	10	5 N	5 N	0.5N	0.12
72JL052	601100	2574900	700	70	10 N	5 N	5	0.5N	0.10
72JL053	603820	2574590	700	50	15	5 N	5	0.5N	0.14
72JL054	604910	2571240	700	10	10 L	5 N	5 L	0.5L	0.10
72JL055	604910	2571160	700	10	10 N	5 N	5 L	0.5N	0.10
72JL057	607200	2568540	1000	50	70	5 N	5	0.5L	0.22
72JL058	608770	2566200	700	70	100	5 N	70	0.5L	0.22
72JL059	609300	2566120	700	30	10 L	5 N	5	0.5N	0.10
72JL060	611440	2562470	700	70	30	5 N	10	0.5L	0.10
J10A	576590	2589420	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J11A	574380	2591190	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J1A	573850	2592800	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J1B	573900	2593400	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J1C	573900	2593400	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B

TABLE 1.—*Analyses of rocks, veins, soils, and stream sediments from the Jarbidge Wilderness and adjacent areas*—Continued

Sample	X-coordinate	Y-coordinate	Semiquantitative spectrographic analyses (ppm)					Colorimetric and instrumental analyses (ppm)	
	(Nevada, E. zone)		Ba	Cu	Cr	Mo	Ni	Ag	Hg
			Stream sediments						
J1D	573900	2593400	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J1E	573850	2593400	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J27B	577560	2544110	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J30A	596500	2536540	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J31A	553550	2552920	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J31B	553900	2553450	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J3A	573230	2598340	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J6A	571780	2581800	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J6B	571780	2581800	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J7A	570920	2576000	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B
J8A	573410	2581800	0 B	0 B	0 B	0 B	0 B	0.0B	0.00B

Sample content of elements in parts per million unless otherwise noted:

[1] Sr, 1,000
[2] Co, 20
[3] As, 400
[4] Ba, 5.8 percent
[5] As, 500; Sb, 80
[6] As, 120
[7] Pb, 300
[8] Be, 20; Co, 30; V, 700
[9] Ba, 56.1 percent
[10] Be, 10
[11] Co, 15
[12] As, 200
[13] Se, 12.3; Co, 150; Bi, 15; Co, 150
[14] As, 800; Sb, 250; Se, 15.5
[15] Ba, 3.8 percent; Sb, 100; W, 150
[16] Be, 15
[17] Be, 7
[18] Be, 30
[19] Sn, 70
[20] Zn, 700
[21] Sr, 1,000; As, 100
[22] Zn, 1,000; As, 300
[23] Sr, 1,500; As, 100
[24] Se, 1.3
[25] Se, 24.3
[26] Be, 7; Se, 1.35
[27] Zn, 2,000; As, 2,400; Co, 30
[28] V, 200
[29] Pb, 200
[30] Pb, 400
[31] Au, 1
[32] Se, 1.9
[33] Se, 1.25
[34] Nb, 30
[35] Se, 1.28

*Abbreviations used in descriptions of samples:

Pros	= Prospect	qtz	= quartz	qtzt	= quartzite
Mtn	= Mountain	Jarb	= Jarbidge	rhy	= rhyolite
Fk	= Fork	Fm	= Formation	ls	= limestone
dac	= dacitic	ignim	= ignimbrite	dk	= dark
gy	= gray	blk	= black	calcaren	= calcarenite
hb	= hornblende	biot	= biotite	chalced	= chalcedony
vn	= vein	vnlt	= veinlet	limon	= limonite, limonitic
std	= stained	fr	= from	cht	= chert
arg	= argillized	silic	= silicified	oxid	= oxidized
sulf	= sulfide	sulfid	= sulfidized	jaros	= jarosite
brec	= breccia	chlorit	= chloritic	dio	= diorite
alt	= altered	wht	= white	phenox	= phenocryst
sltst	= siltstone	cr	= creek	Pog	= Pogonip
mass	= massive	flt	= fault	arglt	= argillite

☆ GPO 789-107,