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DELINEATION OF THE SHINARUMP
PINCHOUT BY DRILLING, CLAY GULCH,
SAN JUAN COUNTY, UTAH

By Elmer S. Santos

Trace Elements Memorandum Report 565

UNITED STATES DEPARTMENT OF THE INTERIOR
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Geology and Mineralogy

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DELINEATION OF THE SHINARUMP PINCHOUT BY DRILLING,
CLAY GULCH, SAN JUAN COUNTY, UTAH*

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October 1956

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*This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

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DELINEATION OF THE SHINARUMP PINCHOUT BY DRILLING, CLAY GULCH, SAN JUAN
COUNTY, UTAH

By Elmer S. Santos

ABSTRACT

The results of diamond-drill exploration for the Shinarump member of the Chinle formation in Clay Gulch, San Juan County, Utah, indicate that between Clay Gulch and exposures along Red House Cliffs, about 2 miles east, a dominantly continuous blanket of the Shinarump member wedges out northeast of a line trending N. 15° W. It is likely that this boundary of the Shinarump member continues northward below younger formations capping the Red Rock Plateau and is the same as that mapped in Red and White Canyons 20 miles to the north. Ore deposits occur along this boundary in the White Canyon area.

INTRODUCTION

Purpose and scope

Diamond drilling in Clay Gulch, (also known as Mike's Canyon) San Juan County, Utah, was undertaken to determine the trend of the eastern limit of the Shinarump member of the Chinle formation between Clay Gulch and the Red House Cliffs, 2 miles to the east (fig. 1). This drilling was a part of the Roving Rig drilling project and was preparatory to a more extensive program of exploration for the eastern limit of the Shinarump member in a much larger region between White Canyon and the San Juan River (fig. 1). Because Government drilling activities have been replaced by those of private industry, the more extensive program

was set aside. Sufficient data were collected from private sources to amplify the data collected by diamond drilling in Clay Gulch. The work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

Nine holes totaling 1,932 feet were drilled on approximately 2,500- to 5,000-foot centers in Clay Gulch on a line beginning about 1-1/4 miles north of the San Juan River and extending northeastward about 5 miles along and near the bottom of Clay Gulch (fig. 1). A description of the core from these holes is included in the appendix of this report. Additional information was obtained from geologists of the U. S. Geological Survey who examined outcrops of the Shinarump member along the Colorado River and in White Canyon. Several private companies furnished the results of their drilling on Red Rock Plateau.

Location and access

The little-known country lying north of the San Juan River and near its confluence with the Colorado River is a highland area that has been called Red Rock Plateau (Gregory, 1938; and fig. 1). Some of the formations that underlie this area crop out on the east edge of the plateau along a high eastward-facing escarpment called the Red House Cliffs. Drainage from this highland area is through narrow steep-walled canyons. The northern portion of the area is drained by Moki Canyon into the Colorado River. The southern part of the area is drained by Castle Wash and Clay Gulch southward to the San Juan River. Clay Gulch is parallel to, and about 2 miles west of, the southern end of the Red House Cliffs.

Clay Gulch is remote, but is accessible by truck or airplane. It is reached by traveling south along 40 miles of dirt road that starts from Utah Highway 95, a quarter of a mile west of the entrance to the Natural Bridges National Monument. The last 23 miles of this road are maintained only by ranchers and prospectors and are in poor condition. Five miles of access road in the bottom of Clay Gulch was destroyed by floods shortly after drilling ceased in the area. Blanding, Utah, the nearest town where supplies may be purchased is approximately 88 miles distant and is at least 5 hours by road from the mouth of Clay Gulch. A small airstrip near the mouth of Clay Gulch has been used as an emergency landing field.

The canyon of Clay Gulch is about 1-1/2 miles wide and 1,000 feet deep. The upper 300 feet of the canyon walls are near-vertical cliffs of sandstone. The lower slopes are mostly covered by talus blocks and landslide debris. Altitudes range from approximately 3,600 feet above mean sea level along the San Juan River at the mouth of Clay Gulch, to 5,500 feet above mean sea level at the top of Mike's Mesa, the highest point in the area. Although the area is arid, violent rainstorms occur, particularly during July, August, and September. Potable water must be brought from long distances.

GENERAL GEOLOGY

Sedimentary rocks of Triassic and Jurassic age are exposed in Clay Gulch; the oldest rocks are chocolate-brown mudstone of the Moenkopi formation of Early and Middle(?) Triassic age; the youngest rocks are

massive red-brown sandstone of the Navajo sandstone of Jurassic and Jurassic(?) age (table 1). The Wingate sandstone, the Kayenta formation, and the Navajo sandstone are shown on figure 1 as the Glen Canyon group. Unconsolidated deposits of Quaternary age consist of landslide debris and talus.

Clay Gulch is on the west flank of the Monument upwarp, a large elongate dome which extends from near Kayenta, Ariz., northward to near the junction of the Colorado and Green Rivers in southeastern Utah.

RESULTS OF DIAMOND DRILLING

U. S. Geological Survey drill holes in the Clay Gulch area penetrate the lower part of the Chinle formation and the upper part of the Moenkopi formation. The basal Shinarump member of the Chinle formation was recognized where it was cored in the drill holes; but strata above this basal member are grouped simply as "undifferentiated" Chinle formation. The lithologic descriptions of these formations are based largely on studies of drill core from nine drill holes in Clay Gulch.

The Moenkopi formation consists mainly of chocolate-brown mudstone. This color has been altered to grayish-green for a few inches to as much as 4 feet below the contact with the overlying Chinle formation. The chocolate-brown mudstone in the core from this area does not contain mica flakes along bedding planes as does mudstone in the core from the Deer Flat area 40 miles to the north.

The Shinarump member of the Chinle formation is a poorly sorted medium-fine- to very coarse grained crossbedded arkosic sandstone that locally contains abundant gray interstitial mudstone and mudstone

Table 1.--Formations exposed in the Clay Gulch area.

System	Group	Formation	Member	Thickness (feet)	Character
Jurassic and Jurassic(?)	Glen Canyon Group	Navajo sandstone		300+	Massive crossbedded light-colored sandstone with some lenses of gray limestone.
Jurassic(?)		Kayenta formation		200-230	Irregularly bedded red, gray, and lavender sandstone, siltstone, and clay pebble conglomerate.
Triassic		Wingate sandstone		310-340	Massive crossbedded reddish-brown and tan sandstone. Locally forms vertical cliffs.
	Chinle formation	Undifferentiated	784-1018	Reddish-orange sandstone and siltstone, variegated mudstone, and lenticular beds of light-gray sandstone.	

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Table 1.--Formations exposed in the Clay Gulch area.--Continued.

System	Group	Formation	Member	Thickness (feet)	Character
Triassic		Chinle formation	Shinarump	0-50	Lenticular-bedded light-gray arkosic sandstone contains gray mudstone pebbles and seams; gray interstitial mud; pyrite; carbon; and silicified logs.
		Moenkopi formation		260-336	Chocolate-brown mudstone altered to greenish gray at the contact with the overlying Shinarump member. Mottled greenish gray at the contact where the Shinarump member is absent.

pebbles. The Shinarump member is 50 feet thick near the confluence of Clay Gulch and the San Juan River. Northeastward the member becomes thinner and wedges out about 6 miles north of the San Juan River. Locally, sulfides and carbonaceous material are common minor accessories in the Shinarump member, but the abundance of these accessories also decreases northward as the member becomes thinner.

The lower part of the undifferentiated Chinle formation was penetrated in all the drill holes in Clay Gulch. It is composed of light-gray mudstone locally interbedded with lenticular units of fine- and medium-grained sandstone. In the southern part of Clay Gulch these strata rest on gray sandstone and conglomerate of the Shinarump member, but in the northern part of Clay Gulch, beyond the limit of the Shinarump member, they rest upon mottled gray-green and brown mudstone of the Moenkopi formation. Fine-grained lenticular units of undifferentiated Chinle sandstone rest, in places, upon conglomerate and coarse sandstone of the Shinarump member.

As seen in exposures along the San Juan River and the southeastward facing Red House Cliffs, the Shinarump member becomes thinner northward and wedges out (fig. 1). In Clay Gulch the Shinarump member thins northward from 50 feet at the mouth of Clay Gulch to less than 1 foot in drill hole CG-8. In drill hole CG-9 the Shinarump member is absent. The projected trend of the boundary of the Shinarump member from the wedge-edge on Red House Cliffs to the inferred wedge-edge between drill holes CG-8 and CG-9 is about N. 15° W.

REGIONAL TREND OF PINCHOUT OF SHINARUMP MEMBER OF CHINLE FORMATION

Data from measured sections along the Colorado River and from drill holes north of Moki Canyon and on Nakai Dome suggest that the entire western part of the Red Rock Plateau is underlain by the Shinarump member of the Chinle formation. J. H. Stewart and others (written communication) of the U. S. Geological Survey report a thickness of 195 feet of Shinarump at the Rincon on the Colorado River and a thickness of 120 feet is known from a hole drilled on Nakai Dome. Privately drilled holes along the Colorado River north of Moki Canyon penetrate up to 66 feet of Shinarump. These data suggest that the boundary between continuous and discontinuous Shinarump extends under the Red Rock Plateau from the Clay Gulch area northeastward to Red and White Canyons (fig. 1), where it was mapped by A. L. Trites, Jr., and others (written communication).

SUMMARY AND CONCLUSION

Nine holes were drilled on 2,500- to 5,000-foot centers on a line along and near the bottom of Clay Gulch. These holes penetrated the lower part of the Chinle formation, including the Shinarump member, and the underlying Moenkopi formation. The Shinarump member was found to wedge out about 6 miles north of the San Juan River between drill holes CG-8 and CG-9. A line connecting the wedgeout of the Shinarump member on outcrop along Red House Cliffs with its inferred position between the two drill holes trends about N. 15° W. Data from private drilling and from outcrops along the Colorado River indicate that most of the western part of the

Red Rock Plateau is underlain by the Shinarump member and that the eastern limit of the Shinarump member trends northeastward from the Clay Gulch area and is the same as that mapped in Red and White Canyons. The proximity of ore deposits to the boundary of the Shinarump member in White and Red Canyons has led to the suggestion that ore deposits are localized along this boundary. Location of the eastern limit of the Shinarump member under Red Rock Plateau determines a probable northeastward-trending belt of ground favorable for prospecting by private industry. The depth to the ore-bearing Shinarump member in the area between Red Canyon and Clay Gulch exceeds 1,000 feet.

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APPENDIX

The following is a description of the core from nine holes drilled in Clay Gulch. Wentworth's size classification is used in the description of the sandstone units.

1. Section in diamond-drill hole CG-1.

	Depth (feet)	Thickness (feet)
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated		
Chinle formation and plugged to	76.0	---
6. Mudstone, light-gray.	81.8	5.8
Total undifferentiated Chinle formation	---	81.8
Shinarump member:		
5. Sandstone, light-gray, medium fine-, medium-, and coarse-grained, contains abundant gray mudstone pebbles and gray interstitial mudstone. Pyrite scattered sparsely throughout the unit, but locally concentrated around carbonaceous seams.	99.8	18.0
4. Sandstone, light-gray, medium fine- and fine-grained, sparse interstitial material.	119.3	19.5
3. Sandstone, light-gray, medium- and coarse-grained, sparsely scattered pyrite. Bottom 0.8 foot is very hard and contains abundant carbon.	122.3	3.0
Total Shinarump member.	---	40.5

	Depth (feet)	Thickness (feet)
Moenkopi formation:		
2. Mudstone, gray.	125.4	3.1
1. Mudstone, reddish-brown	130.6	5.2
Total incomplete Moenkopi formation. . .	---	8.3
Total depth.	---	130.6

2. Section in diamond-drill hole CG-2

Chinle formation:

Shinarump member:

Hole collared in undifferentiated		
Chinle formation and plugged to	163.5	---
7. Sandstone, light-gray, medium fine-grained, some pyrite and carbon. Contains a 5-foot bed of gray mudstone and quartz pebbles.	178.5	15.0
6. Sandstone, gray, medium- and medium coarse-grained, thin carbonaceous films along bedding planes, some pyrite .	185.8	7.3
5. Mudstone pebble conglomerate, light-gray, contains few quartz pebbles	189.1	3.3
4. Mudstone, light-gray, some pyrite in fractures.	191.3	2.2
3. Sandstone, light-gray, fine-grained, hard.	194.7	3.4
Total Shinarump member.	---	31.2

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	Depth (feet)	Thickness (feet)
Moenkopi formation:		
2. Mudstone, greenish-gray, some pyrite in fractures.	197.5	2.8
1. Mudstone, reddish-brown	201.2	3.7
Total incomplete Moenkopi formation. . .	---	6.5
Total depth	---	201.2
3. Section in diamond-drill hole CG-3		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle		
formation and plugged to		
	170.0	---
6. Mudstone and siltstone, light-gray.	172.3	2.3
Total incomplete undifferentiated		
Chinle formation		
		172.3
Shinarump member		
5. Sandstone, light-gray, medium-and coarse-		
grained, contains abundant gray mudstone		
pebbles and films, some pyrite and carbon . .	180.6	8.3
4. Sandstone, light-gray, fine-grained, clean.		
Brecciated zone containing abundant pyrite		
and carbon 1 foot from base	187.3	6.7
3. Sandstone, gray, medium and very coarse		
grained, contains abundant gray mudstone		
pebbles, abundant carbon and some pyrite. . .	194.2	6.9
Total Shinarump member		21.9
Moenkopi formation:		
2. Mudstone, greenish-gray	198.2	4.0
1. Mudstone, reddish-brown	202.7	4.5
Total incomplete Moenkopi formation . . .		8.5
Total depth		202.7

	Depth (feet)	Thickness (feet)
4. Section in diamond drill hole CG-4		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle formation and plugged to	130.5	---
6. Mudstone, variegated, red and light-gray, interbedded with sandy ripple-laminated siltstone.	135.7	5.2
5. Mudstone and siltstone, interbedded, light- gray. Siltstone ripple-laminated, contains mica flakes oriented parallel to bedding . .	161.0	25.3
4. Mudstone, siltstone, and sandstone, inter- bedded, light-gray and gray. Sandstone is fine- and very fine grained.	205.3	44.3
3. Sandstone, light-gray, fine-grained, contains abundant gray mudstone pebbles, some pyrite and carbon	239.2	33.9
Total incomplete undifferentiated Chinle formation.		239.2
Shinarump member:		
2. Sandstone, light-gray, medium- to coarse- grained, poorly sorted, contains abundant gray and black mudstone pebbles, pyrite and carbon	249.2	10.0
Total Shinarump member.		10.0

	Depth (feet)	Thickness (feet)
Moenkopi formation:		
1. Mudstone, top 0.7 foot greenish gray, bottom reddish-brown	251.0	1.8
Total incomplete Moenkopi formation		1.8
Total depth		251.0
5. Section in diamond-drill hole CG-5		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle formation and plugged to	203.5	---
6. Mudstone, gray	204.5	1.0
5. Sandstone, light-gray, medium-, medium fine- and coarse-grained, contains pyrite and white interstitial mud	233.5	29.0
4. Mudstone, bluish-gray.	263.5	30.0
Total incomplete undifferentiated Chinle formation		263.5
Shinarump member:		
3. Sandstone, light-gray, medium fine-grained, sparse interstitial material	267.9	4.4
2. Sandstone, light-gray, medium coarse-grained contains some gray mudstone pebbles.	271.0	3.1
Total Shinarump member		7.5

	Depth (feet)	Thickness (feet)
Moenkopi formation:		
1. Mudstone, top 1.8 feet greenish-gray bottom reddish brown . . . . .	.273.5	2.5
Total incomplete Moenkopi formation. .		2.5
Total depth.		273.5
6. Section in diamond-drill hole CG-6		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle formation and plugged to. . . . .	.217.2	---
5. Mudstone and siltstone, red . . . . .	.237.3	20.1
4. Mudstone, light-gray. . . . .	.241.1	3.8
3. Mudstone, siltstone, and sandstone, inter- bedded, light-gray. Sandstone fine- and very fine grained . . . . .	.254.7	13.6
Total incomplete undifferentiated Chinle formation		254.7
Shinarump member:		
2. Sandstone, light-gray, fine- and medium fine-grained . . . . .	.256.2	1.5
Total Shinarump member		1.5
Moenkopi formation:		
1. Mudstone, top 2.2 feet greenish-gray, bottom reddish-brown . . . . .	.261.2	5.0
Total incomplete Moenkopi formation. .		5.0
Total depth.		261.2

	Depth (feet)	Thickness (feet)
7. Section in diamond-drill hole CG-7		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle		
formation and plugged to		
204.0		---
Contacts between undifferentiated Chinle		
formation and the Shinarump member of the		
Chinle, and between the Shinarump member,		
and the Moenkopi formation were not deter-		
mined in the plug-bit cuttings.		
Moenkopi formation:		
1. Mudstone, reddish-brown.		
194.0		10.0
Total incomplete cored Moenkopi formation		10.0
Total depth		204.0
8. Section in diamond-drill hole CG-8		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle		
formation and plugged to		
230.0		---
3. Mudstone, light-gray		
232.3		2.3
Total undifferentiated Chinle		
formation		232.3
Shinarump member:		
2. Sandstone, light-gray, medium-grained,		
some gray mudstone pebbles		
232.9		0.6
Total Shinarump member.		0.6

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	Depth (feet)	Thickness (feet)
Moenkopi formation:		
1. Mudstone, top 0.1 foot greenish- gray bottom reddish-brown	233.7	0.8
Total incomplete Moenkopi formation.		0.8
Total depth.		233.7
9. Section in diamond-drill hole CG-9		
Chinle formation:		
Undifferentiated Chinle formation:		
Hole collared in undifferentiated Chinle formation and plugged to.	130.0	---
3. Mudstone, variegated, red, purple, and gray.	150.0	20.0
2. Mudstone and siltstone, gray and purple.	169.3	19.3
Total undifferentiated Chinle formation		169.3
Shinarump member:		
Absent		
Moenkopi formation:		
1. Mudstone, reddish-brown with some greenish- gray mottling at top of unit.	174.5	5.2
Total incomplete Moenkopi formation.		5.2
Total depth.		174.5

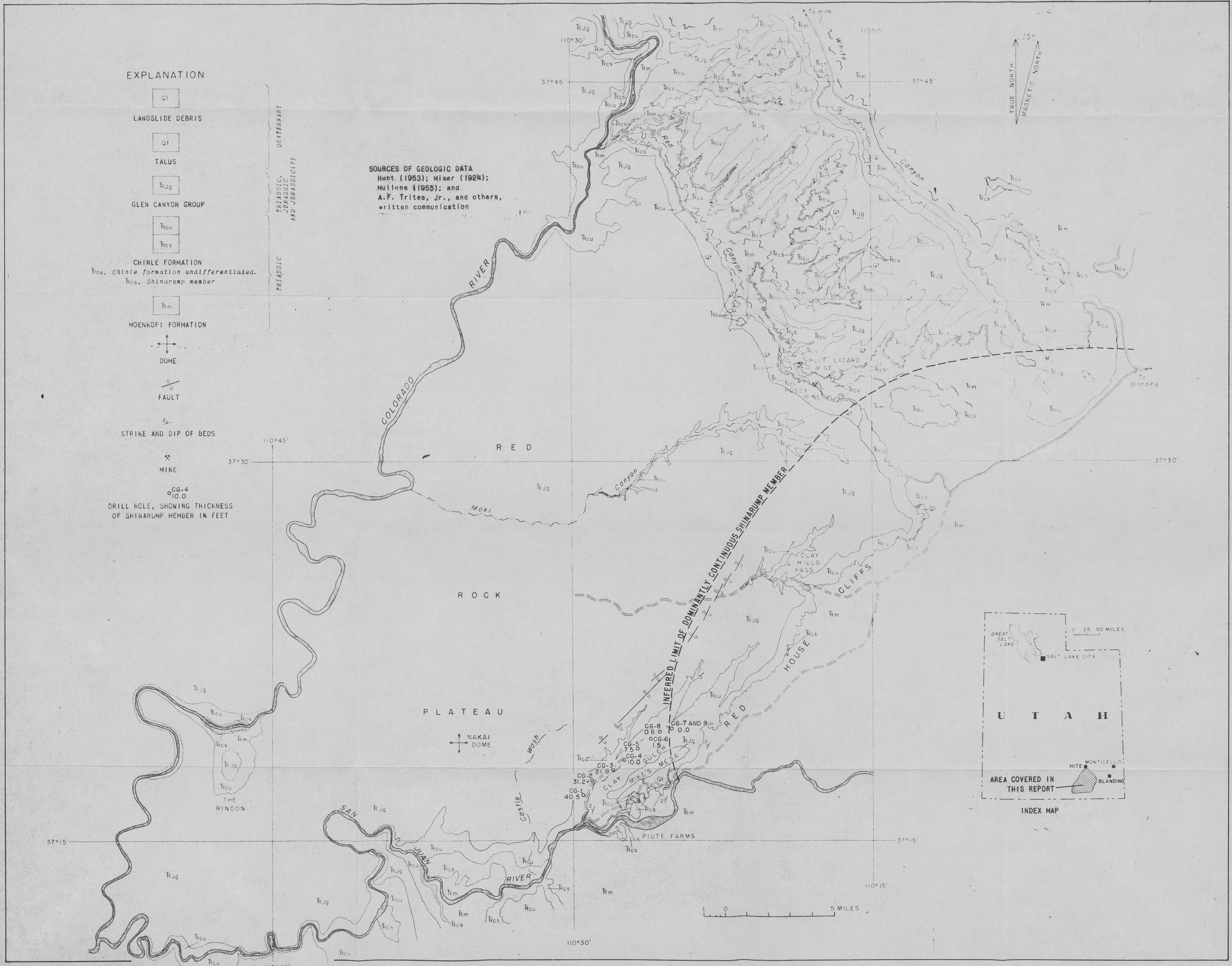


Figure 1.--GEOLOGIC MAP OF THE RED ROCK PLATEAU AND PART OF THE WHITE CANYON AREA, SAN JUAN COUNTY, UTAH

