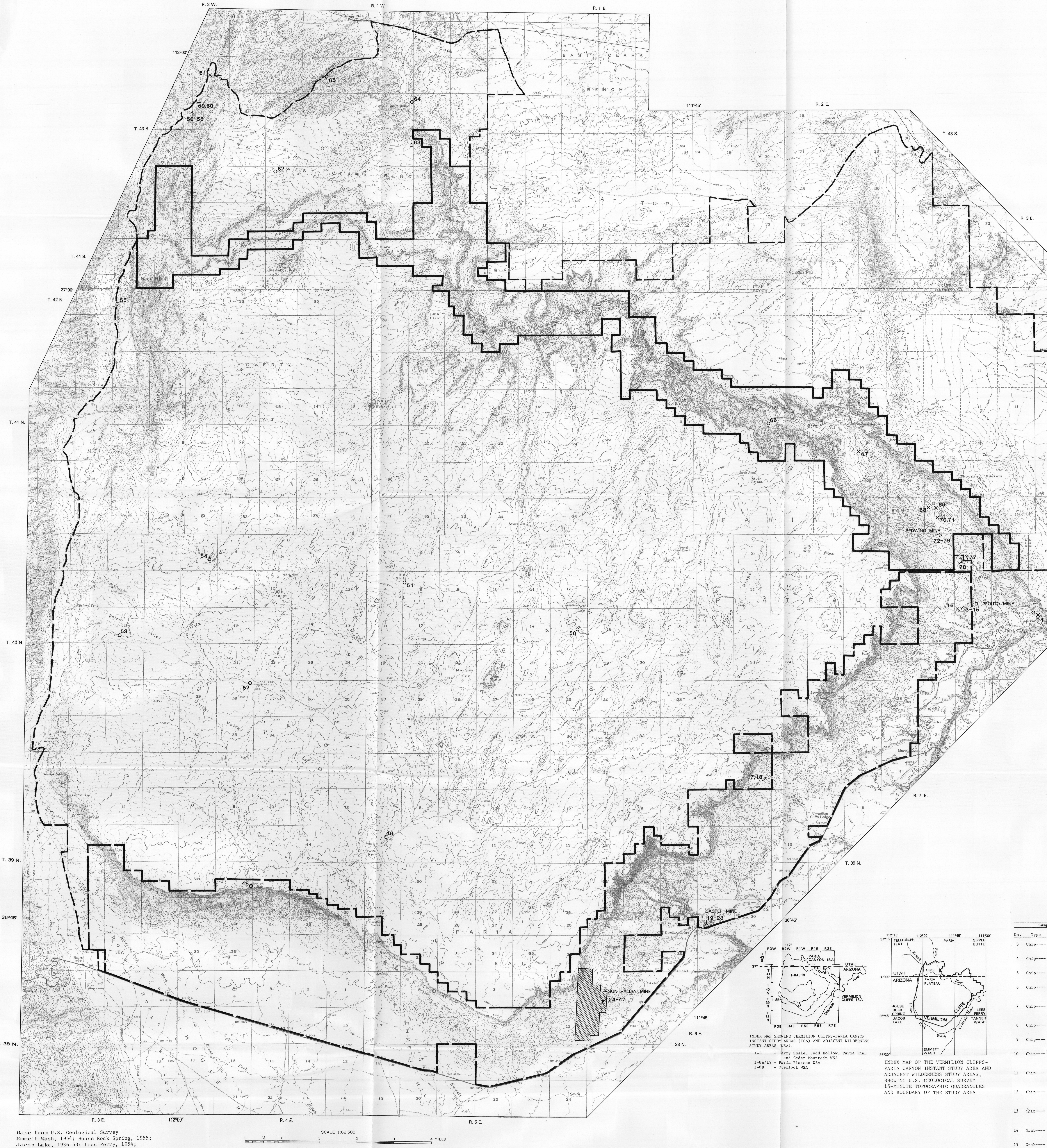
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED BY THE U.S. GEOLOGICAL SURVEY AND THE U.S. BUREAU OF MINES
FOR THE U.S. BUREAU OF LAND MANAGEMENT

MISCELLANEOUS FIELD STUDIES
MAP MF-1475-C
VERMILION CLIFFS-PARIA CANYON ISA



Base from U.S. Geological Survey
Emmett Wash, 1954; House Rock Spring, 1955;
Jacob Lake, 1936-53; Lees Ferry, 1954;
Nipple Butte, 1953; Paria Plateau, 1954;
Paria, 1956; Tanner Wash, 1954;
Telegraph Flat, 1954

INDEX MAP SHOWING VERMILION CLIFFS-PARIA CANYON INSTANT STUDY AREAS (ISA) AND ADJACENT WILDERNESS STUDY AREAS (WSA).

I-6 - Ferry Swale, Judd Hollow, Paria Rim, and Cedar Mountain WSA
I-8A/19 - Paria Plateau WSA
I-8B - Overlook WSA

INDEX MAP OF THE VERMILION CLIFFS-PARIA CANYON INSTANT STUDY AREA AND ADJACENT WILDERNESS STUDY AREAS, SHOWING U.S. GEOLOGICAL SURVEY 15-MINUTE TOPOGRAPHIC QUADRANGLES AND BOUNDARY OF THE STUDY AREA

STUDIES RELATED TO WILDERNESS
Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Vermilion Cliffs-Paria Canyon Instant Study Area and adjacent Wilderness Study Areas, Coconino County, Arizona, and Kane County, Utah.

INTRODUCTION

The Vermilion Cliffs-Paria Canyon Instant Study Area and adjacent Wilderness Study Areas are mostly in Coconino County, Ariz., but extend into Kane County, Utah. The area studied in this report encompasses about 560 mi^2 (1,450 km^2). The study area includes the established Paria Canyon Primitive and Vermilion Cliffs Natural Areas between U.S. Highways 89 and 89A.

The Paria Plateau is the dominant topographic feature in the area, bounded by the dropoff of the nearly vertical Vermilion Cliffs on the east, south, and west, and cut by the gorges of Kaibab Gulch and Paria River Canyon to the north. North of the Kaibab-Paria drainage, the plateau loses its identity, and the upland surface consists of variously named benches. Upland altitudes range from about 4,600 ft to more than 7,600 ft (1,400 m to 2,300 m), and the lowest point in the study area is 3,116 ft (950 m) at Lees Ferry, Ariz., on the Colorado River. From Lees Ferry the sheer Vermilion Cliffs increase from about 1,200 ft (370 m) to nearly 2,000 ft (about 600 m) near the southeast corner of the Paria Plateau, then decrease westward to about 800 ft (250 m) along the south side of the Plateau and virtually disappear northward along House Rock Valley. A break in the cliffs occurs where Corral Valley joins House Rock Valley, and this break affords the major road access to the Paria Plateau (an area of about 325 mi^2 (850 km^2)). Farther north the cliffs reappear as a ragged sequence of steep slopes and ledges as much as 900 ft (275 m) high that continues for more than 30 mi (50 km) to the north as the east wall of House Rock Valley and Coyote Valley.

The Paria Plateau and the flats north of the Kaibab-Paria canyons form a rolling upland that slopes gently northward at about 100 ft/mi (20 m/km). Bedrock is at or near the surface almost everywhere, and soil is thin and sandy; windblown sand is the common surficial material. All the streams on the plateau and the northern benches are ephemeral; Kaibab Gulch and some of the spring-fed streams that drain the Vermilion Cliffs are intermittent or perennial only in very short stretches. The only permanent stream is Paria River, and it occasionally has only a subsurface flow near its mouth.

MINING ACTIVITY

Most mining activity along the Vermilion Cliffs has taken place for uranium in the Chinle Formation. In this area there are a few old mines, the largest of which is the Sun Valley Mine southwest of Cliff Dwellers Lodge; from this mine, production was reported of a few hundred tons of uranium ore, having average grade of about 0.28 percent U_3O_8. Several tons of ore have been shipped from the El Pequito Mine, about 2 mi (3 km) west of Lees Ferry. There also are a few scattered prospects in Paria Canyon and in the northern part of House Rock Valley. The only known current activity is some sporadic exploration at the Sun Valley Mine.

In addition to the uranium-mining activity, gold and mercury occurrences have been investigated in a mudstone unit of the Chinle Formation. Prior to 1913, evidently unsuccessful attempts were made to recover gold at Lees Ferry. In 1957, attempts to recover gold about 6 mi (10 km) up the Paria River were also unfruitful. No evidence of recent prospecting was found during the field investigation.

REFERENCE

Phoenix, D. A., 1963, Geology of the Lees Ferry area, Coconino County, Arizona: U.S. Geological Survey Bulletin 1137, 86 p.

EXPLANATION

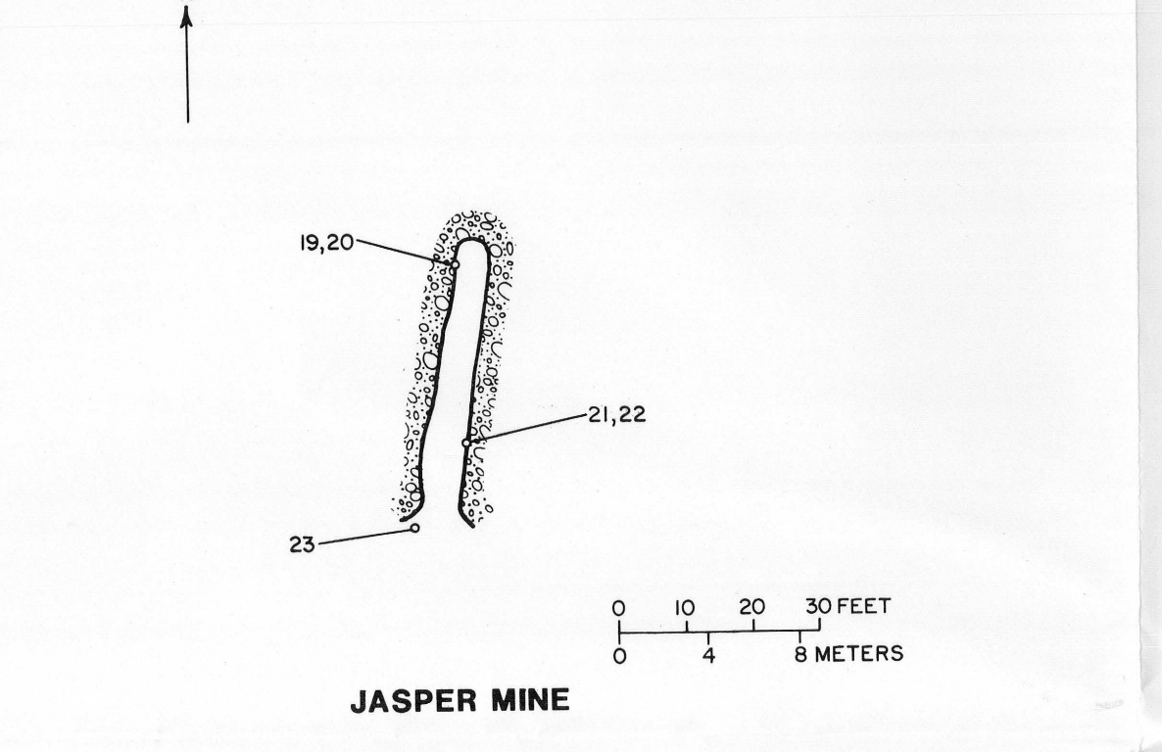
▨ UNPATENTED MINING CLAIMS
▨ SHINARUMP MEMBER, CONGLOMERATE
▨ SHINARUMP STREAM CHANNEL
▨ TRASHY STREAM CHANNEL (SHINARUMP)
SAMPLE LOCALITY, SHOWING NUMBER
- ×67 Prospect pit
- ≻77 Adit
- ⊠34 Raise
- (P)44 Pillar
- ✳14 Stockpile
- ○50 Outcrop
- ○—30 Mine

◩ SHAFT
━━━ APPROXIMATE BOUNDARY OF PARIA CANYON PRIMITIVE AREA
━ ━ APPROXIMATE BOUNDARY OF VERMILION CLIFFS NATURAL AREA
— — - APPROXIMATE BOUNDARY OF VERMILION CLIFFS-PARIA CANYON INSTANT STUDY AREA

Fire assay (oz/short ton) for silver in selected samples from the Vermilion Cliffs-Paria Canyon Instant Study Area and adjacent wilderness study areas

[n.d., not detected; no gold detected in samples]

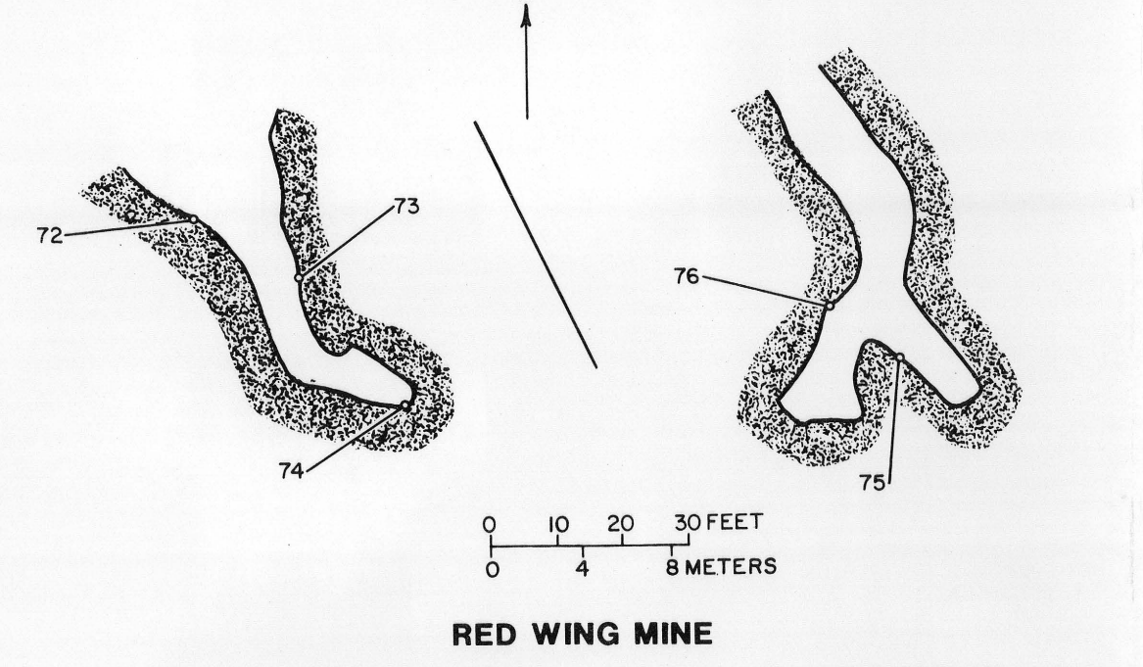
Sample No.	1	2	3	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	27	32	34	39	41	42	44	46	66	67	68	69
	0.1	n.d.	0.2	n.d.	0.1	n.d.	0.2	0.2	0.1	n.d.	0.1	0.1	0.2	n.d.	n.d.	0.2	n.d.	n.d.	0.1	0.2	0.1	n.d.	0.	0.1	0.1	0.1	n.d.	0.1	n.d.	n.d.	0.2



JASPER MINE

Sample			Assay data (in percent)		
No.	Type	Length	U_3O_8	Cu	Remarks
19	Chip----	29 in. (74 cm)	0.018	1.98	Conglomerate, siltstone, and mudstone, minor Cu staining; Moenkopi-Shinarump contact.
20	Chip----	36 in. (91 cm)	n.d.[1]	.065	Conglomerate, mostly quartzite pebbles with coarse sand matrix, poorly sorted; lower Shinarump.
21	Chip----	24 in. (61 cm)	.019	.425	Conglomerate, poorly sorted, Cu staining; Shinarump.
22	Chip----	48 in. (122 cm)	.135	.053	Conglomerate, unconsolidated, poorly sorted, Cu staining; Shinarump.
23	Chip----	16 in. (41 cm)	.085	.425	Siltstone, buff; Moenkopi-Shinarump contact, sample taken in Moenkopi.

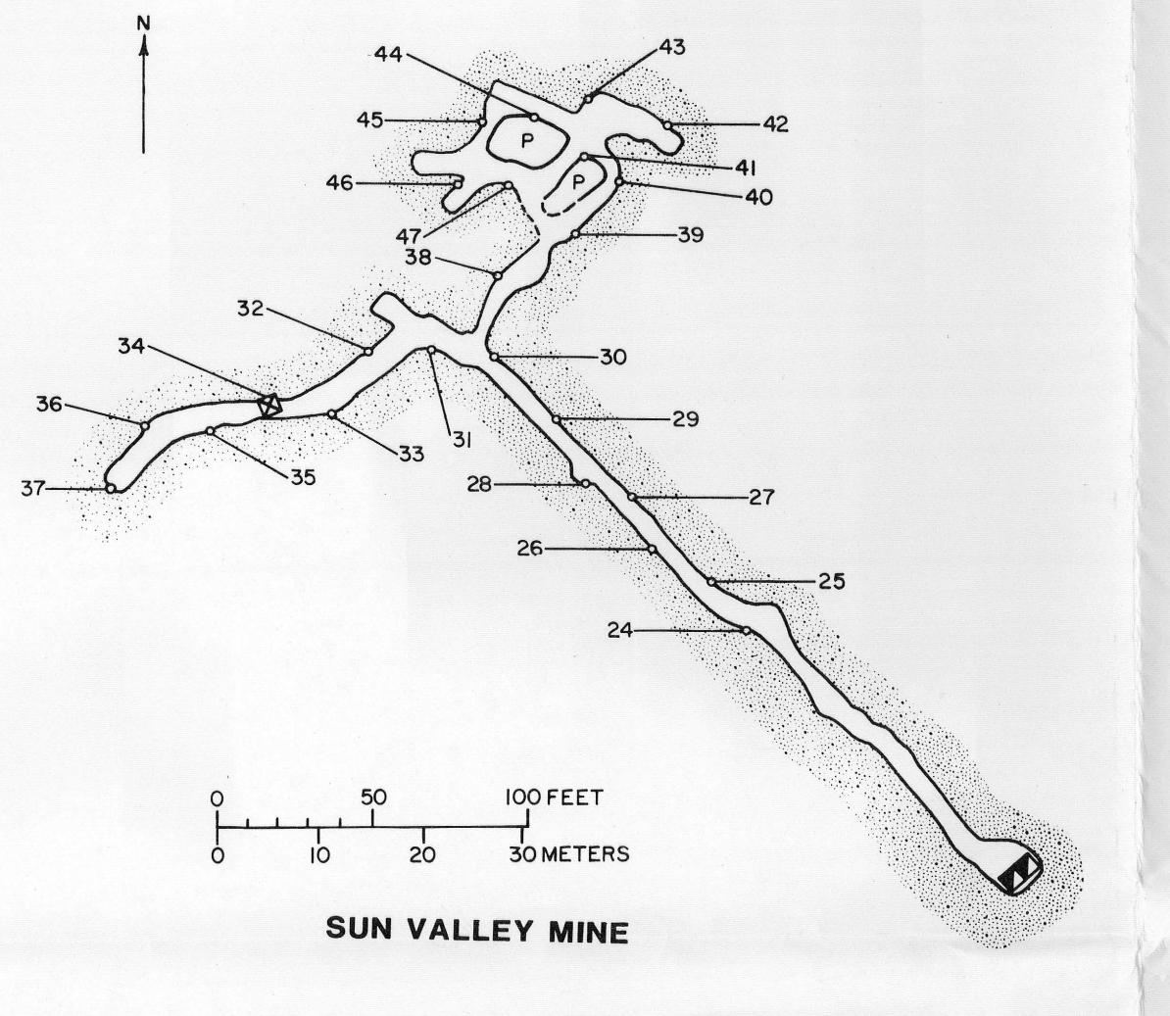
[1] Not detected.



RED WING MINE

Sample			Assay data (in percent)		
No.	Type	Length	U_3O_8	Cu	Remarks
72	Chip----	18 in. (46 cm)	0.185	0.35	Trashy zone of stream channel; carbonaceous wood fragments, Cu staining, localized high radioactivity.
73	Chip----	36 in. (91 cm)	.005	.033	Sandstone, coarse, crossbedded, sparse carbonaceous material; some Cu staining, trashy material on west wall.
74	Chip----	24 in. (61 cm)	.006	.013	Siltstone, fractured and blocky, no trashy material; coarse sandstone in back and upper part of face.
75	Chip----	24 in. (61 cm)	.030	n.a.[1]	Sandstone, gray, trashy toward bottom of sample.
76	Chip----	18 in. (46 cm)	.018	n.a.[1]	Siltstone lens, trashy.

[1] Not analyzed.

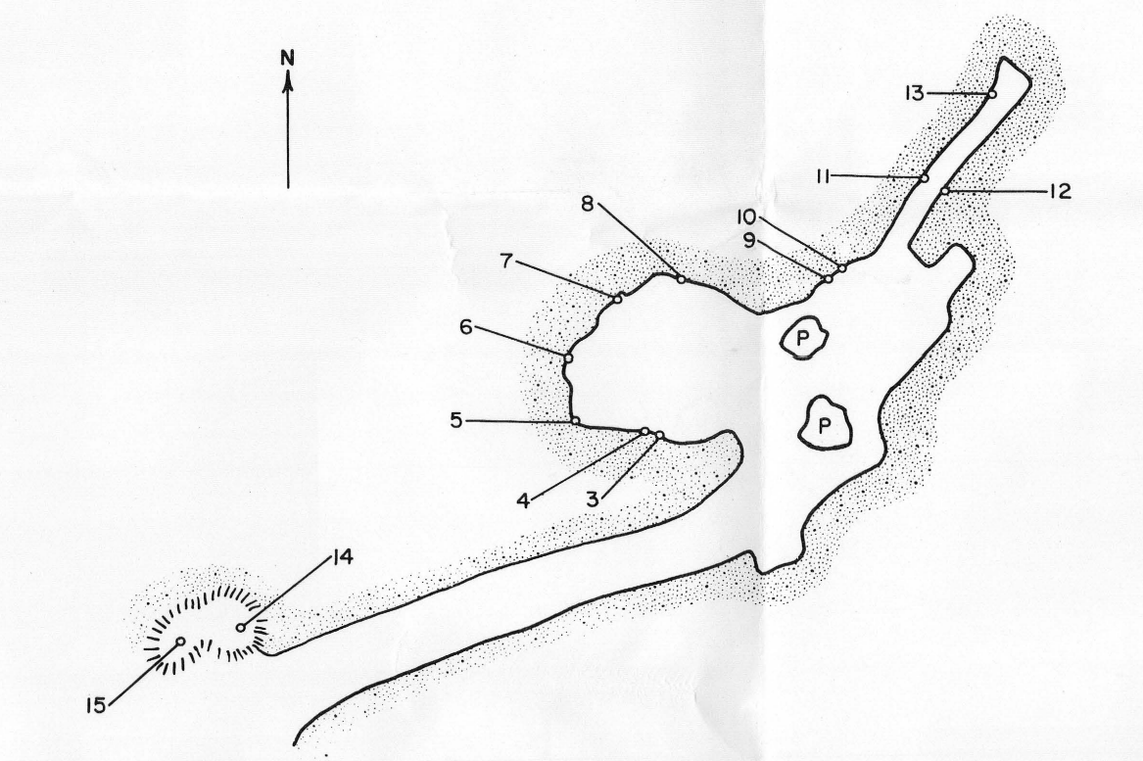


SUN VALLEY MINE

[<, less than]

Sample			Assay data		
No.	Type	Length	[1]U_3O_8	[2]Re	Remarks
24	Chip----	24 in. (61 cm)	0.011	[3]n.a.	Pebble conglomerate.
25	Chip----	48 in. (122 cm)	.014	2	Pebble conglomerate, lower Shinarump.
26	Chip----	39 in. (99 cm)	.028	26	Pebble conglomerate with sandstone and siltstone boulders, stream channel, Shinarump.
27	Chip----	36 in. (91 cm)	.144	20	Stream channel, poorly sorted, sand- to boulder-size material, Shinarump.
28	Chip----	16 in. (41 cm)	.054	6	Stream channel, pebbles as large as 1-in. diameter, abundant shale, Shinarump.
29	Chip----	25 in. (64 cm)	.024	<2	Pebble to cobble conglomerate, poorly sorted, Shinarump.
30	Chip----	36 in. (91 cm)	.023	[3]n.a.	Pebble conglomerate, Shinarump stream channel.
31	Chip----	38 in. (97 cm)	.014	<2	Stream channel, mostly rounded pebbles, some larger siltstone fragments.
32	Chip----	42 in. (107 cm)	.125	[3]n.a.	Polymictic conglomerate, poorly sorted, shale and siltstone boulders, Shinarump.
33	Chip----	26 in. (66 cm)	.021	[3]n.a.	Coarse sandstone with 1-in. band of pebble conglomerate, lower Shinarump.
34	Grab----	Random-------	.016	[3]n.a.	Muck pile from raise, mostly Shinarump conglomerate, poorly sorted, siltstone and sandstone boulders.
35	Chip----	16 in. (41 cm)	.028	<2	Pebble conglomerate in stream channel, yellow staining, lower Shinarump.
36	Chip----	8 in. (20 cm)	.002	[3]n.a.	Dark-brown mudstone and siltstone, no visible mineralization, local bleaching, upper Moenkopi(?).
37	Chip----	27 in. (69 cm)	.014	[3]n.a.	Sandstone and siltstone, most likely out of Shinarump channel, upper Moenkopi.
38	Chip----	30 in. (76 cm)	.004	[3]n.a.	Stream channel, small pebble conglomerate, sandy matrix, Shinarump.
39	Chip----	60 in. (152 cm)	.032	<2	Poorly sorted conglomerate, polymictic, sandstone and siltstone clasts, Shinarump.
40	Chip----	36 in. (91 cm)	.023	[3]n.a.	Pebble conglomerate, light gray, coarsely sorted, sandstone underneath.
41	Chip----	51 in. (130 cm)	.216	<2	Interbedded siltstone, sandstone, conglomerate, mudstone; sample taken in siltstone, mudstone, and sandstone.
42	Chip----	24 in. (61 cm)	.059	<2	Coarse sandstone, gray, with rounded quartzite pebbles, green siltstone; Shinarump-Moenkopi contact(?).
43	Chip----	24 in. (61 cm)	.007	[3]n.a	Stream channel, interbedded sandstone and pebble conglomerate, yellow staining, Shinarump.
44	Chip----	46 in. (117 cm)	.069	[3]n.a.	Well-rounded quartz pebbles in black matrix; contains large fragments of siltstone and mudstone.
45	Chip----	42 in. (107 cm)	.013	<2	Rounded pebble conglomerate, sandstone matrix, yellow staining, Shinarump.
46	Chip----	60 in. (152 cm)	.082	[3]n.a.	Graded conglomerate, shale clasts, large sandstone and siltstone boulders in back; stream channel.
47	Chip----	36 in. (91 cm)	.046	18	Rounded pebble conglomerate, some siltstone boulders, stream channel, Shinarump.

[1] In percent.
[2] In parts per million.
[3] Not analyzed.



EL PEQUITO MINE

Sample			Assay data[1]		
No.	Type	Length	U_3O_8	Cu	Remarks
3	Chip----	52 in. (132 cm)	0.110	1.9	Interbedded siltstone and shale, stream channel, Cu staining.
4	Chip----	24 in. (61 cm)	.128	n.a.[2]	Trashy stream channel, mixed siltstone, sandstone, carbonaceous wood fragments.
5	Chip----	30 in. (76 cm)	.091	n.a.[2]	Trashy stream channel, sandstone, Cu staining, some organic matter.
6	Chip----	36 in. (91 cm)	.149	n.a.[2]	Sandstone layered with organic matter, traces of gypsum, Cu staining, back is small pebble conglomerate.
7	Chip----	36 in. (91 cm)	.009	n.a.[2]	Alternating sandstone and conglomerate bands, poorly sorted, little carbonaceous wood fragments, no siltstone.
8	Chip----	54 in. (137 cm)	.071	1.75	Mixed sandstone and conglomerate, stream channel; Cu staining.
9	Chip----	18 in. (46 cm)	n.d.[3]	.325	Interbedded siltstone, sandstone, and shale; carbonaceous wood particles.
10	Chip----	40 in. (102 cm)	.024	.024	Massive interbedded sandstone and conglomerate with carbonaceous wood fragments.
11	Chip----	23 in. (58 cm)	.057	.124	Interbedded shale and siltstone with minor sandstone and conglomerate; carbonaceous wood fragments.
12	Chip----	48 in. (122 cm)	.008	91 ppm	Interbedded sandstone and conglomerate with minor siltstone and carbonaceous wood fragments.
13	Chip----	48 in. (122 cm)	.082	.130	Trashy stream channel, siltstone, sandstone, conglomerate, carbonaceous wood fragments.
14	Grab----	Random---------	.013	.282	Dump material, fragments as large as 6 in. in diameter, mostly siltstone.
15	Grab----	Random---------	.028	.75	Dump material, mostly sandstone and conglomerate.

[1] Values in percent unless otherwise noted.
[2] Not analyzed.
[3] Not determined.

Table 1.--Mineral deposits of the Vermilion Cliffs-Paria Canyon Instant Study Area and adjacent wilderness study areas

[Prospects or mines labeled "inactive" have had no exploration or development work since 1975]

Sample No.	Name	Location	Resource	Type deposit	Development category	Brief description	Reference
[1]1-2	None-----	NW1/4 sec. 18, T. 40 N., R. 8 E. (Arizona).	Hg-------	Sedimentary----	Prospect, inactive.	Originally thought to have Hg in siltstone and mudstone of Chinle Formation; no evidence of Hg from sampling.	Phoenix, 1963.
[1]3-16	El Pequito mine.	NW1/4 sec. 14, T. 40 N., R. 7 E. (Arizona).	U--------	Stream channel.	Mine, inactive.	Trashy stream channel in lower Shinarump Member; mixed siltstone, sandstone, carbonaceous wood; some Cu staining.	Do.
[1]17-18	Sam Prospect.	SE1/4 sec. 2, T. 39 N., R. 6 E. (Arizona).	U--------	Sedimentary----	Mine, inactive.	Moderate to slight U concentrations in interfingered siltstone and mudstone in Chinle Formation.	Do.
19-23	Jasper mine.	SW1/4 sec. 27, T. 39 N., R. 6 E. (Arizona).	U, Cu----	Stream channel.	Mine, inactive.	Low U concentrations in conglomerate and alternating conglomerate and siltstone in lower Shinarump.	Do.
24-47	Sun Valley mine.	SW1/4 sec. 6, T. 38 N., R. 6 E. (Arizona).	U--------	Stream channel.	Mine, inactive.	Uranium mineralization in a stream channel in thin base of Shinarump Member; stream channel is horseshoe shaped in mine vicinity, and higher concentrations of U occur as there is greater ground cover; U in uraninite and carnotite with association of Re.	McGregor, D.R., 1977, unpub. data.
[1]48-54	None-----	T. 40 N., R. 4 E., R. 5 E.; T. 39 N., R. 4 E., R. 5 E. (Arizona).	None-----	None-----------	Outcrop----	Random Navajo Sandstone outcrop samples from Paria Plateau; fine-grained sandstone, crossbedded, no visible mineralization.	None.
[1]55	None-----	SW1/4 sec. 36, T. 42 N., R. 3 E. (Arizona).	Gypsum---	Evaporite------	Outcrop----	Moenkopi Formation, thinly bedded siltstone with gypsum-filled fractures, occurring as thin layers as thick as a few inches.	None.
[1]56-58	None-----	SW1/4 sec. 14, T. 43 S., R. 2 W. (Utah).	Cu-------	Secondary staining.	Mine, inactive.	Alternating beds of siltstone and sandstone with minor Cu staining at caved adit; host rock is light gray to buff.	None.
[1]59-60	None-----	NW1/4 sec. 14, T. 43 S., R. 2 W. (Utah).	None-----	None-----------	Mine, inactive.	Alternating yellow sandstone beds and dark-brown siltstone; no visible mineralization.	None.
[1]61	None-----	SW1/4 sec. 11, T. 43 S., R. 2 W. (Utah).	None-----	None-----------	Prospect, inactive.	Iron-stained fractures in Chinle Formation; buff sandstone and siltstone.	None.
[1]62-63	None-----	Secs. 22, and 30, T. 43 S., R. 1 W. (Utah).	None-----	None-----------	Outcrop----	Random chip sample of Navajo Sandstone, crossbedded, buff, well sorted, fine grained.	None.
[1]64	None-----	NE1/4 sec. 15, T. 43 S., R. 1 W. (Utah).	None-----	None-----------	Outcrop----	White Navajo Sandstone, fine grained, crossbedded.	None.
[1]65	None-----	SE1/4 sec. 8, T. 43 S., R. 1 W. (Utah).	None-----	None-----------	Outcrop----	Carmel Formation; siltstone, bleached in places.	None.
[1]66	None-----	SE1/4 sec. 14, (unsurveyed) T. 41 N., R. 6 E. (Arizona).	None-----	None-----------	Outcrop----	Chinle Formation; siltstone, purple and light gray.	None.
[1]67	None-----	SW1/4 sec. 20, T. 41 N., R. 7 E. (Arizona).	None-----	None-----------	Prospect, inactive.	Sandstone talus slope, most likely Navajo Sandstone.	None.
[1]68	None-----	SW1/4 sec. 34, T. 41 N., R. 7 E. (Arizona).	Cu, U----	Stream channel.	Mine, inactive.	Copper showing in sandstone member of Chinle Formation; very low Cu content.	None.
[1]69	Lehneer	NW1/4 sec. 34, T. 41 N., R. 7 E. (Arizona).	U, Ag----	Sedimentary----	Prospect, inactive.	Gray siltstone of Chinle Formation that contained very low concentrations of U and Ag.	Phoenix, 1963.
[1]70-71	Lehneer	SW1/4 sec. 34, T. 41 N., R. 7 E. (Arizona).	U--------	Stream channel.	Prospect, inactive.	Light siltstone lens in massive sandstone containing carbonaceous wood fragments; lens about 12 ft long and 6-8 in. thick.	Do.
72-76	Redwing	NE1/4 sec. 3, T. 40 N., R. 7 E. (Arizona).	U, Cu----	Stream channel.	Mine, inactive.	Trashy stream channel, carbonaceous wood fragments; Cu staining; some massive sandstone with siltstone; Moenkopi crops out irregularly.	Do.
[1]77-78	None	SW1/4 sec. 2, T. 40 N., R. 7 E. (Arizona).	U--------	Stream channel.	Mine, inactive.	Maroon and gray mottled mudstone; back is bottom of stream channel; some thinly layered siltstone over sandstone; some carbonaceous wood fragments.	Do.

[1] Sample analysis in table 2.

Table 2.--Information and analyses of samples not shown in mine illustrations, Vermilion Cliffs-Paria Canyon Instant Study Area and adjacent wilderness study areas

[n.a., not analyzed; n.d., not detected; <, less than]

Sample			Assay data					
No.	Type	Length	[1]U_3O_8	[1]Cu	[1]V	[2]Hg	[2]Re	Remarks
1	Grab---	Random---------	0.031	n.a.	0.010	<2	n.a.	Petrified Forest Member of Chinle Formation; highly weathered siltstone and interbedded mudstone.
2	Chip---	6 ft (1.8 m)---	.011	n.a.	.099	<2	n.a.	Do.
16	Chip---	54 in. (137 cm)	.041	0.099	.003	<2	<2	Conglomerate (Shinarump Member) mixed with sandstone; some iron staining; small amounts of gypsum.
17	Chip---	30 in. (76 cm)	.337	n.a.	.014	5.6	<2	Mudstone and siltstone conglomerate, interbedded; alternating maroon and buff.
18	Chip---	60 in. (152 cm)	.026	n.a.	.007	<2	n.a.	Siltstone and mudstone complexly interbedded, maroon, with minor buff mudstone and siltstone.
48	Chip---	28 in. (71 cm)	.001	n.a	<.003.	n.a.	<2	Navajo Sandstone outcrop; buff to rust color; concretions.
49	Chip---	Random---------	.002	n.a.	<.003	n.a.	<2	Navajo Sandstone outcrop, red; weathered, crossbedding.
50	Chip---	20 in. (51 cm)	n.d.	n.a.	<.003	n.a.	n.a.	Navajo Sandstone, white, weathered into knobs.
51	Chip---	24 in. (61 cm)	.004	n.a.	<.003	n.a.	n.a.	Navajo Sandstone, light buff to white; contains small iron-stained blebs.
52	Chip---	Random---------	.003	n.a.	<.003	n.a.	n.a.	Navajo Sandstone, red.
53	Chip---	24 in. (61 cm)	.002	n.a.	<.003	n.a.	n.a.	Navajo Sandstone, red, crossbedded.
54	Chip---	18 in. (46 cm)	n.d.	n.a.	<.003	n.a.	n.a.	Do.
55	Chip---	24 in. (61 cm)	.008	n.a.	.004	n.a.	<2	Moenkopi Formation(?), thinly bedded siltstone with gypsum filling fractures; bedding planes about 0.5 in. thick.
56	Grab---	Random---------	n.d.	.35	<.003	n.a.	n.a.	Sandstone, white to light gray, Cu staining.
57	Chip---	18 in. (46 cm)	.015	n.a.	.004	n.a.	n.a.	Shear zone in siltstone, abundant slickensides, highly fractured, no visible mineralization.
58	Chip---	18 in. (46 cm)	.003	n.a.	.003	n.a.	<2	Fracture zone in alternating siltstone and sandstone beds, slickensides.
59	Chip---	24 in. (61 cm)	.006	n.a.	<.006	n.a.	n.a.	Siltstone beds, alternating light yellow to buff and dark brown; no visible mineralization.
60	Grab---	Random---------	.006	n.a.	<.003	n.a.	n.a.	Dump sample from sample 59 locality.
61	Chip---	24 in. (61 cm)	.005	n.a.	.004	n.a.	n.a.	Chinle Formation, siltstone, limonite staining on fractures, some weathered-out gypsum; beds dip 40° E.
62	Chip---	24 in. (61 cm)	n.d.	n.a.	<.003	n.a.	n.a.	Navajo Sandstone, white, with iron-stained blebs.
63	Chip---	Random--------	.004	n.a.	<.003	n.a.	n.a.	Navajo Sandstone, white.
64	Chip---	Random--------	.002	n.a.	<.003	n.a.	<2	Navajo Sandstone, beige to pink.
65	Chip---	Random--------	n.d	n.a.	<.003	n.a.	<2	Carmel Formation, interbedded siltstone and sandstone, zebra coloring pattern.
66	Chip---	Random--------	.020	n.a.	.009	<2	n.a.	Outcrop of Chinle siltstone, maroon and gray.
67	Grab---	Random--------	.015	n.a.	.007	<2	n.a.	Sandstone blocks and sand from upper cliffs, formation unknown.
68	Chip---	17 in. (43 cm)	.008	n.a.	.011	<2	n.a.	Dark band in sandstone; small amounts of Cu staining in dump; limonite.
69	Grab---	Random--------	.006	[2]36	n.a.	<2	n.a.	Chinle outcrop; siltstone.
70	Chip---	6 in. (15 cm)	.006	.092	n.a.	n.a	n.a.	Siltstone-mudstone lens in massive sandstone, chocolate colored, minor Cu staining.
71	Chip---	5 in. (12 cm)	.689	.45	n.a	n.a.	n.a.	Organic material in siltstone lens.
77	Chip---	36 in. (91 cm)	.002	n.a.	n.a.	n.a.	n.a.	Mudstone, maroon and gray spotted, back is bottom of stream channel composed of mudstone matrix with sandstone boulders.
78	Chip---	18 in. (45 cm)	.033	n.a.	n.a.	n.a.	n.a.	Siltstone, thinly layered, overlying massive sandstone; some organic matter.

[1] In percent, except as noted.
[2] In parts per million.

MINE AND PROSPECT MAP OF THE VERMILION CLIFFS-PARIA CANYON INSTANT STUDY AREA AND ADJACENT WILDERNESS STUDY AREAS, COCONINO COUNTY, ARIZONA, AND KANE COUNTY, UTAH

By

Michael E. Lane, U.S. Bureau of Mines

1983

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1983

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