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GEOLOGICAL SURVEY CIRCULAR 189

URANIUM OCCURRENCES ON MERRY WIDOW CLAIM WHITE SIGNAL DISTRICT GRANT COUNTY, N.MEX.

By Harry C. Granger and Herman L. Bauer, Jr.

UNITED STATES DEPARTMENT OF THE INTERIOR
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GEOLOGICAL SURVEY
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URANIUM OCCURRENCES ON THE MERRY WIDOW CLAIM

WHITE SIGNAL DISTRICT, GRANT COUNTY, NEW MEXICO

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ABSTRACT

The Merry Widow claim is near the center of sec. 22, T. 20 S., R. 15 W., New Mexico principal meridian, about 1 mile west of White Signal, Grant County, N. Mex. Secondary uranium minerals were not discovered in the White Signal district until the early 1920's, although several mines in the district had been worked previously for gold, silver, and copper. The writers mapped the Merry Widow claim in 1950, collected 133 samples, and logged the core from one diamond-drill hole on the Merry Widow claim.

The pre-Cambrian granite that forms much of the country rock in the vicinity of the Merry Widow claim is intruded by numerous dikes that represent extremes in composition--from basalt to pegmatite. The uranium deposits generally occur in basalt or diabase near one of the many strongly oxidized quartz-pyrite veins that are common in the district. Locally, as in the Merry Widow mine, the uranium minerals torbernite and autunite are in fractured granite or latite adjacent to a quartz-pyrite vein.

A diamond-drill hole located about 400 ft south of the Merry Widow shaft cut the vein at a depth of 520 to 550 ft. Even at this depth the persistent veins are completely oxidized; and although secondary uranium minerals and radioactive fracture surfaces were seen throughout the core, no primary uranium minerals were identified.

At 15 localities on the claim, the surface rocks display abnormal radioactivity. Diabase is at eight localities, granite at three, latite at two, and basalt at one; in the Merry Widow mine, diabase, latite, and granite are all uranium-bearing adjacent to the Merry Widow vein.

The close relationship between uranium mineral distribution and the oxidized parts of quartz-pyrite veins, suggests that the unoxidized parts of the veins may contain primary uranium minerals. The generally high phosphate content of the basic intrusive rocks in the district may account for the localization of phosphate-bearing uranium minerals near the intersections of quartz-pyrite veins with diabase and other subsilicic rocks. If further prospecting is done, it should be directed along these veins, especially near the intersections with diabase.

INTRODUCTION

Small scattered deposits of secondary uranium minerals occur on the Merry Widow claim and other properties in the White Signal district of New Mexico (fig. 1).

The Merry Widow claim is near the center of sec. 22, T. 20 S., R. 15 W., New Mexico principal meridian, near White Signal, Grant County, N. Mex. White Signal is 17 miles south of Silver City, on State Route 180; the Merry Widow claim is 0.7 mile by dirt road northwest from the highway and about 1/2 mile west of White Signal.

The Merry Widow claim, owned by Otto Forster, of Silver City, N. Mex., is under lease and option to A. G. Hill, of Dallas, Tex. It is part of a group of six adjoining claims controlled by Mr. Hill--namely, the Acme and Acme No. 1, Merry Widow and Merry Widow No. 1, Ace-in-the-Hole, and the Duece-in-the-Hole claims.

The claim is in rolling hills with generally low relief, at an elevation of about 6,000 ft. The climate is mild and dry for most of the year.

Gold, silver, and copper minerals were found in the White Signal district in the late 1800's (Keith, 1945) and during the subsequent mining activity, gold was discovered on the Merry Widow claim. In the early 1900's the richer ores near the surface were mined out and as a result, production in the district has been small for the last 40 yr. The Merry Widow mine was idle until the 1920's when Mr. A. A. Leach, then mining engineer for Phelps Dodge Co., recognized secondary uranium minerals on old dumps in the district. Offers of $50 per ton for 0.5 to 3 percent uranium ore revived mining activity. The uranium minerals, autunite, and torbernite, were roughly concentrated and imbedded in plaster plaques to be used in "activating" water for drinking, bathing, and watering plants. Two carloads of torbernite-bearing clay and sericite from the Merry Widow mine were used for the manufacture of radioactive face powder. Neither of these enterprises was successful.

In 1944 and 1945, the Union Mines Development Corp. made two examinations (Keith, 1944 and 1945) of the uranium deposits in the White Signal district.

The postwar interest in uranium again revived prospecting activity in the White Signal district and the U. S. Geological Survey examined the Merry Widow and other known uranium-bearing deposits. During February and March 1950, a geologic map on a scale of 100 ft to 1 in. was made on the Merry Widow claim (pl. 1); five prospecting trenches and the 40-and 60-ft levels in the Merry Widow mine (fig. 3) were mapped on a scale of 10 ft to 1 in.; and 133 samples were collected. Only the geologic map of trench 1 (pl. 2) has been included in this report inasmuch as the features exposed in trench 1 are typical of the other trenches. During May 1950, 650 ft of core from the Merry Widow claim (Granger and Bauer, 1950) was logged.

C. E. Bazley, engineer in charge of development work for A. G. Hill, was very helpful during the examination of the Merry Widow property. Members of the Geological Survey's office in Silver City, especially Mr. Elliot Gillerman, kindly supplied the writers with recent unpublished geologic information. The work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

GEOLOGY

The Merry Widow claim is in an area underlain by a large pre-Cambrian granite mass intruded by numerous dikes that range from basalt to pegmatite. As only a small area was mapped, relative ages were established for only a few of the intrusive rocks.

Pre-Cambrian rocks

Granite

The granite, which forms the country rock in the vicinity of the Merry Widow claim (pl. 1), is typically a leucocratic commonly biotite-poor medium-grained rock in which the feldspars are partly argillized. Quartz makes up about 30 percent of the rock, feldspar about 60 percent, and biotite and other mafic minerals less than 10 percent. The texture varies considerably; the grain size ranges from medium to coarse, and locally the granite is porphyritic. The exposures are low and rounded, and much of the surface is covered with the disintegration products of the granite. Iron-stained granite is more resistant than the unstained rock and forms the more prominent exposures.

Pegmatite and barren quartz veins

Several poorly exposed, highly irregular narrow dikes of quartz-feldspar pegmatite and veins of barren quartz that strike north were observed but were not mapped. The pegmatite and quartz veins may be pre-Cambrian, for in the northeast part of the area (pl. 1) a small pre-Cambrian(?) basalt dike less

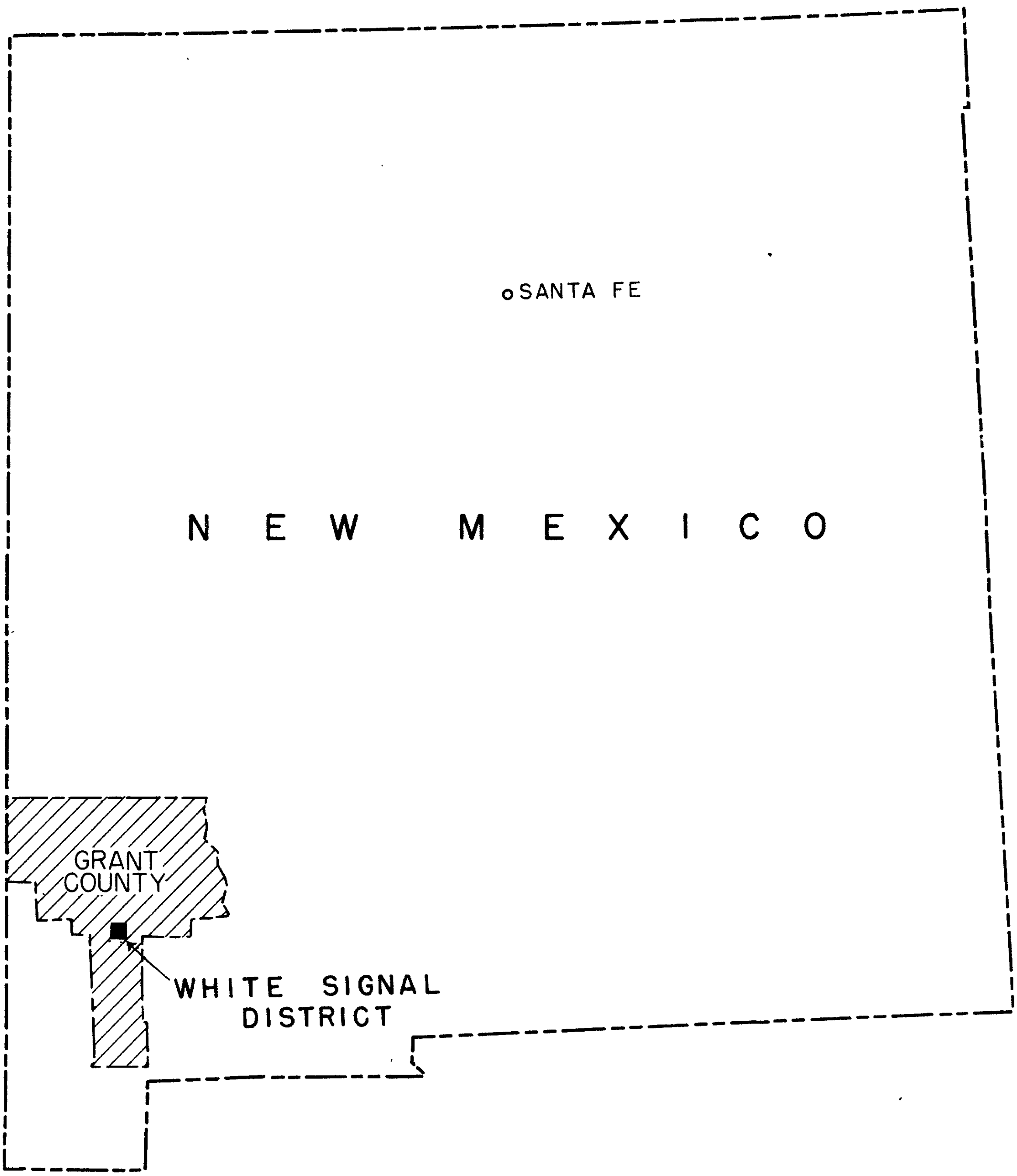

Figure 1.--Map showing the location of the White Signal district, Grant County, N. Mex.

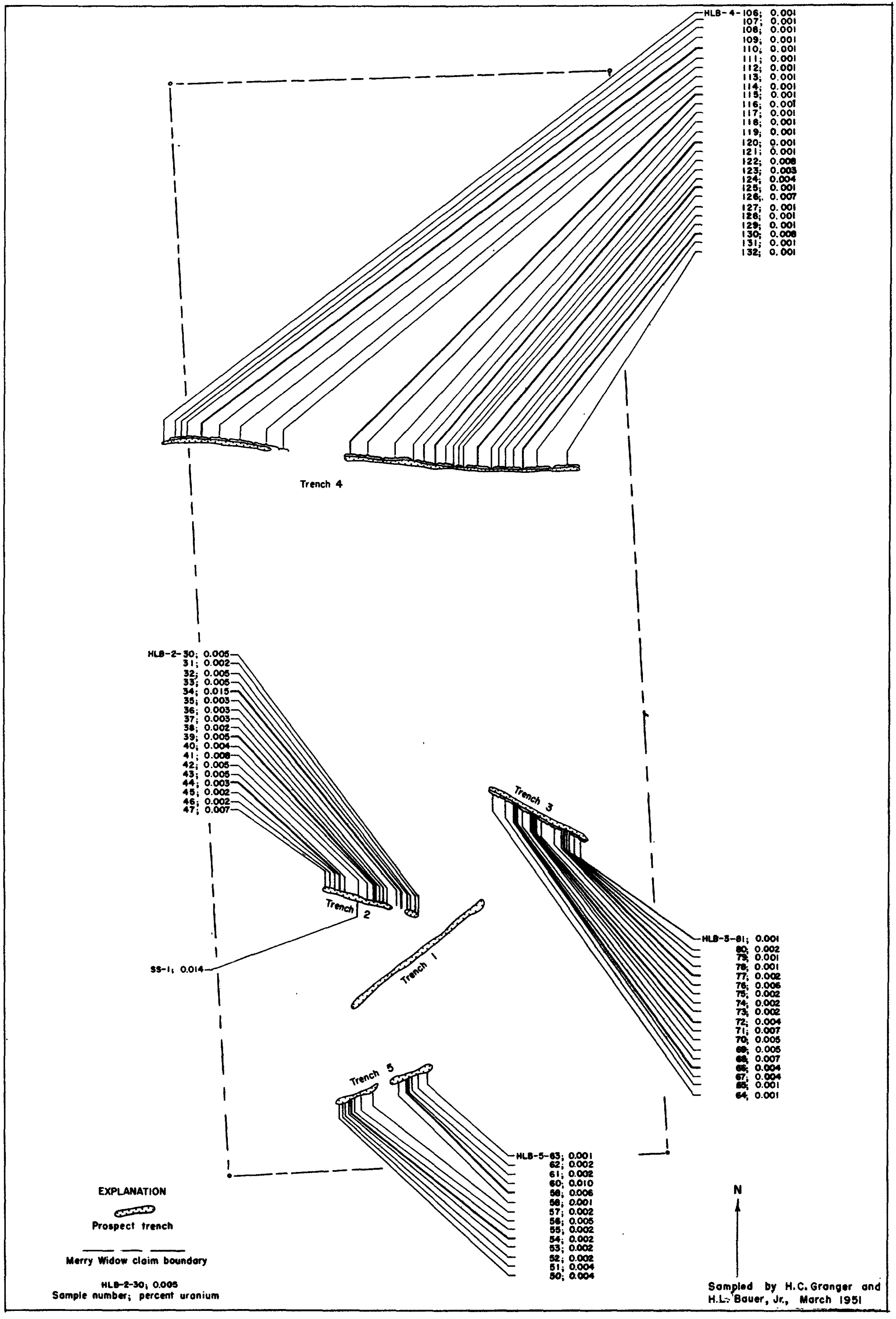

Figure 2.--Assay plan, trenches 2, 3, 4, and 5, Merry Widow claim, White Signal district, Grant County, N. Mex.

than 4 ft long and 6 in. wide has longitudinally intruded the core of a barren quartz vein.

Diabase and basalt

Two prominent diabase dikes (pl. 1) and several narrow basalt dikes of pre-Cambrian(?) age (Keith, 1945) are exposed on the Merry Widow claim. The dikes strike north and dip to the east.

The diabase dikes are as much as 35 ft thick. The texture ranges from coarse diabasic in the center to a fine-grained chilled-border facies along the margin. The plagioclase is partly argillized, especially near veins, and green mafic minerals give the rock a characteristic dull-greenish-gray color. The basalt dikes, on the other hand, are commonly less than 3 ft thick and have a fine-grained texture similar to the margins of the diabase dikes. A thick blanket of dark soil covers the diabase and basalt dikes except where hardened by iron oxides adjacent to a vein. Analyses (table 1), show that these rocks have an abnormally high phosphate content. (Daly, 1933, pp. 17, 18.)

The similar trends, textures, phosphate content, alteration by iron oxides, and general appearance of the diabase and basalt dikes lead to the conclusion that they are of the same age.

Younger rocks

Latite(?)

Several gray aphanitic dikes designated as latite(?) on plate 1, but which have been almost completely altered to clay minerals, cut both the diabase and the granite on the Merry Widow claim. The dikes are concealed at the surface because the latite(?) weathers rapidly and can be seen only in mine workings and prospect trenches. On the south half of the claim the average strike of the latite(?) dikes is east, whereas they strike northeast on the north half of the claim; possibly the two dike systems are different in age.

Quartz monzonite porphyry

Quartz monzonite porphyry (pl. 1),which consists of green-gray groundmass, with scattered quartz phenocrysts as much as 8 mm in diameter, forms prominent northeast-trending dikes in the granite on the north half of the Merry Widow claim. Locally, the quartz monzonite porphyry is more resistant to weathering than the granite and stands as much as 2 to 3 ft above the surrounding surface. The dikes are believed to dip nearly vertically, although the contacts generally are concealed by granitic soil.

Diorite(?)

Three small exposures of a dark, fine-grained rock, tentatively identified as diorite(?) (pl. 1), were observed on the claim. The exposures of the diorite were irregular and discontinuous, and the relationships of the diorite(?) to the other rocks was not determine.

Rhyolite

Aphanitic green rhyolite, believed to be the youngest intrusive rocks on the Merry Widow claim, crop out along a zone that trends eastward (pl. 1). Rhyolite dikes in this zone strike northwest, whereas the rhyolite dikes elsewhere in the White Signal district strike northeast. Possibly, these dikes are echelon apophyses of a larger dike, not yet exposed at the surface, that trends eastward.

Structure

The rocks on the Merry Widow claim have been complexly faulted and fractured. Displacement, however, can be seen only where the larger faults cut diabase dikes which are offset as much as 60 ft.

The faults are commonly filled with vein materials or dike rocks and are characterized at the surface by limonite, silica, and an altered zone. Many minor faults and joints are so well healed by quartz and minor amounts of limonite that they are barely discernable.

Locally, such as the eastern end of trench 4 (fig.2), the veins show a consistent trend but no general alignment is seen when a broader area is considered except in the southern half of the claim, where several veins trend east along faults with steep dips that offset the diabase dikes as much as 60 ft.

Although Keith (1945) reported a strong sheeting pattern in the White Signal district, measurements of numerous joints on the Merry Widow claim showed no consistent trend. Locally, a series of joints may strike and dip uniformly but another conflicting set may appear a few feet away. The more persistent joint sets commonly have the same attitude as nearby faults or dike contacts suggesting that they may be minor fractures in a shear zone.

All the pre-Cambrian and many of the younger rocks have been broken by closely spaced irregular joints. Some of these fractures are filled with this quartz-pyrite or specularite veinlets.

Mineral deposits

Veins

Three distinct types of veins occur on the Merry Widow claim: barren quartz, quartz-specularite, and quartz-pyrite. The barren quartz veins are filled with milky "bull" quartz. They are traceable only by float, as the quartz is highly fractured and does not crop out. Although no feldspar was seen, the barren quartz veins may grade imperceptibly into the pegmatitic rocks on the Merry Widow claim.

The quartz-specularite veins are less prominent on the Merry Widow claim than in other parts of the district, but the presence of float confirms their presence here. The vein filling is specularite with quartz and the adjacent wall rocks commonly are silicified. No ore minerals were seen to be associated with the quartz-specularite veins.

Table 1.--Results of sampling, Merry Widow claim, White Signal district, Grant County, N. Mex.
[See fig. 2 and pls. 1 and 2 for location of samples]

Sample no.	Material	Type	Length (feet)	eU[1] (percent)	U (percent)	P_2O_5 (percent)
HLB-1- 1	Granite------------	Channel---	2.7	0.004	0.002	0.13
HLB-1- 2	------ do ---------	-- do ----	2.9	.004	.001	.13
HLB-1- 3	Quartz-pyrite vein, 1 in.	Grab------	---	.007	.006	.54
HLB-1- 4	Diabase -----------	Channel---	2.0	.002	.001	2.69
HLB-1- 5	------ do ---------	-- do ----	2.5	.002	.001	2.69
HLB-1- 6	------ do ---------	-- do ----	2.5	.002	.001	2.60
HLB-1- 7	Latite ------------	-- do ----	.5	.003	.001	.83
HLB-1- 8	Granite, altered---	-- do ----	2.5	.004	.001	.10
HLB-1- 9	------ do ---------	-- do ----	2.5	.004	.001	.20
HLB-1-10	Granite, altered---	-- do ----	1.5	.006	.003	.09
HLB-1-11	Latite and quartz-pyrite vein.	-- do ----	.3	.023	.019	.53
HLB-1-12	Granite ------------	-- do ----	1.5	.008	.004	.10
HLB-1-13	Granite,altered-----	-- do -----	1.5	.005	.003	.10
HLB-1-14	------ do ----------	-- do -----	2.0	.009	.005	.14
HLB-1-15	Granite, iron-stained.	-- do -----	2.0	.005	.003	.06
HLB-1-16	Quartz-pyrite vein, 3 in.	Grab-------	---	.005	.003	.17
HLB-1-17	Granite, iron-stained.	Channel----	2.0	.004	.002	.10
HLB-1-18	Granite ------------	-- do -----	2.0	.007	.002	.07
HLB-1-19	Granite, iron-stained.	-- do ----	2.5	.003	.002	.07
HLB-1-20	Quartz-pyrite vein, 20 in.	-- do -----	2.0	.009	.007	.23
HLB-1-21	Granite, altered----	-- do ----	2.0	.004	.003	.09
HLB-1-22	------ do ----------	-- do ----	2.5	.004	.003	.13
HLB-1-23	------ do ----------	-- do ----	2.0	.009	.009	.14
HLB-1-24	Diabase autunite----	-- do ----	1.7	.100	.11	1.18
HLB-1-25	------ do ----------	-- do ----	2.7	.029	.025	2.18
HLB-1-26	Diabase ------------	-- do ----	3.0	.005	.004	1.79
HLB-1-27	------ do ----------	-- do ----	2.0	.010	.009	1.65
HLB-1-28	Granite ------------	-- do ----	3.0	.005	.004	.18
HLB-1-29	------ do ----------	-- do ----	3.0	.006	.002	.12
HLB-2-30	Granite, silicified.	-- do ----	3.0	.011	.005	.08
HLB-2-31	------ do ----------	-- do ----	4.1	.003	.002	.06
HLB-2-32	Granite, altered----	-- do ----	3.0	.008	.005	.14
HLB-2-33	Diabase, altered----	-- do ----	3.1	.006	.003	.56
HLB-2-34	Diabase, iron-stained.	Channel---	2.5	.013	.015	1.42
HLB-2-35	------ do ----------	-- do -----	3.0	.004	.003	1.70
HLB-2-36	Diabase, altered----	-- do ----	3.0	.006	.003	1.62
HLB-2-37	Granite, iron-stained.	-- do ----	3.0	.005	.003	.35
HLB-2-38	Granite, altered----	-- do ----	2.5	.005	.002	.04
HLB-2-39	Quartz-pyrite vein.	-- do ----	2.5	.006	.005	.15
HLB-2-40	Granite ------------	-- do ----	3.3	.006	.004	.11
HLB-2-41	Granite, torbernite.	-- do ----	2.0	.011	.008	.04
HLB-2-42	Quartz-pyrite vein.	-- do -----	3.0	.008	.005	.10
HLB-2-43	Granite ------------	-- do -----	3.0	.005	.003	.07
HLB-2-44	------ do ----------	-- do -----	3.8	.005	.003	.11
HLB-2-45	------ do ----------	-- do ----	2.6	.004	.002	.09
HLB-2-46	Granite ------------	-- do ----	3.0	.004	.002	.06
HLB-2-47	Granite, iron-stained.	-- do ----	6.5	.006	.007	.15
HLB-6-48	Diabase, iron-stained.	-- do -----	3.0	.016	.010	.97
HLB-7-49	Diabase, fault gouge.	-- do -----	3.0	.020	.010	.46
HLB-5-50	Diabase-------------	-- do -----	3.0	.005	.004	1.72
HLB-5-51	------ do ----------	-- do -----	2.0	.006	.004	.95
HLB-5-52	Granite, altered----	-- do -----	3.0	.005	.002	.08
HLB-5-53	------ do ----------	-- do -----	3.0	. 02	.002	.08
HLB-5-54	Quartz-pyrite vein.	-- do -----	1.3	.002	.002	.07
HLB-5-55	Granite, altered----	-- do -----	2.0	.005	.002	.07
HLB-5-56	------ do ----------	-- do -----	1.7	.008	.003	.06
HLB-5-57	------ do ----------	-- do -----	2.0	.005	.002	.04

[1]Equivalent uranium.

Table 1.--Results of sampling, Merry Widow Claim, White Signal district, Grant County, N. Mex.--Con.

Sample no.	Material	Type	Length (feet)	eU[1] (percent)	U (percent)	P_2O_5 (percent)
HLB- 5- 58	Granite ------------	-- do ----	2.0	0.004	0.001	0.08
HLB- 5- 59	------ do ----------	-- do ----	1.6	.008	.006	.08
HLB- 5- 60	Quartz-pyrite vein.	-- do ----	1.0	.014	.010	.13
HLB- 5- 61	Granite ------------	-- do ----	2.0	.007	.002	.06
HLB- 5- 62	Granite, altered----	-- do ----	2.0	.005	.002	.04
HLB- 5- 63	Granite ------------	-- do ----	1.5	.005	.001	.07
HLB- 3- 64	------ do ----------	Chip------	2.0	.004	.001	.13
HLB- 3- 65	Granite, altered----	-- do ----	1.5	.005	.001	.07
HLB- 3- 66	------ do ----------	Channel----	2.5	.005	.004	.22
HLB- 3- 67	Latite -------------	-- do -----	.5	.005	.004	.23
HLB- 3- 68	Diabase, iron-stained.	Channel---	2.5	.009	.007	1.48
HLB- 3- 69	Diabase ------------	Chip ------	30.0	.006	.005	2.54
HLB- 3- 70	------ do ----------	Channel----	2.5	.008	.005	2.31
HLB- 3- 71	Granite, altered-----	-- do -----	2.5	.010	.007	.40
HLB- 3- 72	Quartz-pyrite vein, 1/2 in.	Grab ------	---	.008	.004	.32
HLB- 3- 73	Granite, altered-----	Channel----	2.5	.004	.002	.06
HLB- 3- 74	------ do ----------	Chip ------	17.0	.005	.002	.06
HLB- 3- 75	------ do ----------	-- do -----	7.0	.005	.002	.07
HLB- 3- 76	Latite -------------	Channel----	1.5	.006	.006	.15
HLB- 3- 77	Granite ------------	-- do -----	3.0	.004	.002	.13
HLB- 3- 78	Quartz-pyrite vein, 24 in.	-- do -----	2.0	.003	.001	.15
HLB- 3- 79	Granite ------------	-- do -----	2.5	.004	.001	.08
HLB- 3- 80	Granite, altered-----	Chip ------	13.0	.005	.002	.11
HLB- 3- 81	Granite ------------	-- do -----	14.0	.003	.001	.08
HLB- 8- 82	Latite -------------	Channel----	1.5	.017	.020	.41
HLB- 8- 83	Diabase ------------	-- do -----	1.7	.012	.015	.59
HLB- 9- 84	------ do ----------	-- do -----	2.5	.076	.067	.42
HLB-10- 85	Diabase, iron-stained.	Chip ------	2.9	.010	.006	2.09
HLB-10- 86	------ do ----------	Grab ------	---	.021	.020	1.60
HLB-10- 87	Fault gouge ---------	Channel----	2.5	.010	.006	.26
HLB-10- 88	Diabase, altered-----	-- do -----	2.5	.017	.020	.66
HLB-10- 89	Rhyolite fault breccia.	-- do -----	3.0	.005	.003	.08
HLB-10- 90	Quartz monzonite-----	Grab ------	---	.003	.001	.47
HLB-10- 91	Granite ------------	-- do -----	---	.005	.001	.05
HLB-10- 92	Basalt -------------	-- do -----	---	.092	.10	1.56
HLB-10- 93	Quartz monzonite-----	-- do -----	---	.002	.001	.45
HLB-10- 94	Granite ------------	-- do -----	---	.005	.001	.02
HLB-10- 95	Basalt -------------	-- do -----	---	.007	.003	1.14
HLB-10- 96	Rhyolite -----------	-- do -----	---	.004	.001	.06
HLB-11- 97	Granite ------------	Channel----	3.0	.005	.001	.08
HLB-11- 98	------ do ----------	Grab ------	---	.004	.001	.05
HLB-11- 99	Quartz-pyrite vein.	Channel----	2.5	.004	.004	.58
HLB-11-100	Diabase ------------	-- do -----	2.5	.005	.001	2.51
HLB-12-101	Diabase, torbernite.	-- do -----	2.0	.87	.092	1.69
HLB-12-102	Diabase ------------	-- do -----	2.0	.039	.034	2.11
HLB-12-103	Diabase, torbernite.	-- do -----	2.0	.098	.077	1.77
HLB-12-104	Diabase ------------	Channel----	2.0	.018	.014	2.11
HLB-12-105	Granite, torbernite.	Grab ------	---	.10	.070	.44
HLB- 4-106	Granite, altered----	Chip ------	17.0	.004	.001	.14
HLB- 4-107	Diabase, altered----	Channel----	3.0	.003	.001	.39
HLB- 4-108	Granite and diabase.	-- do -----	1.0	.002	.001	.27
HLB- 4-109	Granite, altered----	Chip ------	4.5	.004	.001	.10
HLB- 4-110	Diabase, altered-----	-- do -----	26.0	.002	.001	.43
HLB- 4-111	Granite ------------	-- do -----	29.0	.005	.001	.08
HLB- 4-112	Diabase ------------	-- do -----	31.0	.002	.001	2.58
HLB- 4-113	Granite ------------	-- do -----	77.0	.006	.001	.04
HLB- 4-114	Quartz-monzonite-----	-- do -----	9.0	.003	.001	.43
HLB- 4-115	Granite ------------	-- do -----	26.0	.004	.001	.13
HLB- 4-116	Diabase ------------	-- do -----	26.0	.002	.001	2.02
HLB- 4-117	Granite ------------	-- do -----	33.0	.006	.001	.03
HLB- 4-118	Quartz-pyrite vein.	Channel----	6.0	.003	.001	.10
HLB- 4-119	Granite ------------	Chip ------	18.0	.000	.001	.03

[1]Equivalent uranium.

Table 1.--Results of sampling, Merry Widow Claim,White Signal district,Grant County, N. Mex.--Con.

Sample no.	Material	Type	Length (feet)	eU[1] (percent)	U (percent)	P_2O_5 (percent)
HLB- 4-120	Quartz-pyrite vein and gouge.	Channel----	0.5	0.005	0.002	0.19
HLB- 4-121	Granite -------------	Chip ------	18.0	.005	.001	.06
HLB- 4-122	Latite -------------	Channel----	2.0	.010	.008	.28
HLB- 4-123	Granite ------------	Chip ------	9.0	.005	.003	.03
HLB- 4-124	Latite -------------	Channel----	4.0	.005	.004	.30
HLB- 4-125	Granite ------------	Chip ------	37.0	.004	.001	.07
HLB- 4-126	Latite -------------	Channel----	6.0	.007	.007	.31
HLB- 4-127	Granite ------------	Chip ------	17.0	.001	.001	.08
HLB- 4-128	Latite -------------	Channel----	5.0	.001	.001	.32
HLB- 4-129	Granite ------------	Chip ------	24.0	.001	.001	.05
HLB- 4-130	Latite -------------	Channel----	4.0	.008	.008	.36
HLB- 4-131	Granite and quartz-pyrite veins.	Chip ------	40.0	.005	.001	.07
HLB- 4-132	------ do ----------	-- do -----	40.0	.004	.001	.04
HLB-ss- 1	Granite, torbernite.	Selected---	---	.021	.014	.07

[1]Equivalent uranium.

The quartz-pyrite veins are strongly oxidized near the surface and the pyrite is altered to a massive vitreous or a vesicular limonite. Quartz is not continuous but occurs as discrete lenses and blebs, the centers of which rarely contain unoxidized pyrite. Granite wall rock bordering the veins is generally either silicified or intensely altered to clay minerals and minor sericite, and is stained by hydrous iron oxides. Diabase cut by the veins is usually impregnated with silica and hydrous iron oxides and locally is relatively resistant to weathering.

Ore minerals on the Merry Widow claim are found only in the quartz-pyrite type veins. In the parts of the veins near the surface all the minerals are secondary but increasing amounts of metallic sulfides are found as depth increases in the Merry Widow mine and in the diamond-drill core.

Ore deposits

The ore minerals on the Merry Widow claim are associated with silica and with hydrous iron oxides produced by the oxidation of pyrite and perhaps also of chalcopyrite. The oxidized parts of the quartz-pyrite vein contain a simple suite of minerals. The mineralogy of unoxidized parts of the veins is poorly known, except for the dominance of quartz and pyrite.

Bismite, bismuth trioxide, has been reported (Keith, 1945) from the Merry Widow mine. The bismite is said to be closely associated with the better gold occurrences and its presence is sometimes used as a guide to gold prospecting.

Some green minerals exposed on the walls in the Merry Widow mine are believed to be copper sulfates. They are similar in appearence to torbernite and may easily be confused with that mineral.

Secondary uranium minerals occur at several localities on and near the Merry Widow claim. In the field, the flaky yellow fluorescent uranium minerals were called autunite, and the flaky or tabular green weakly or nonfluorescent uranium minerals were called torbernite. No distinction was made between torbernite and metatorbernite. These minerals usually occur in or near the intersection of diabase or basalt dikes with quartz-pyrite veins. Both minerals coat fracture surfaces and project into small cavities in the fractured rocks. The fractures and cavities are also commonly iron-stained. Locally, as in trench 2 (locality R-7) and shaft 2, the torbernite crystals are disseminated in the granite and coat altered grains of feldspar. Although autunite is locally predominant in the near-surface parts of the deposits, torbernite is generally predominant a few feet below the surface.

Most of the uranium minerals are localized in or near diabase dikes where they are cut by quartz-pyrite veins. The autunite and torbernite occur in the vein filling and in the adjacent altered and fractured wall rocks. Locally the uranium minerals occur in the veins away from adjacent diabasic rocks, as in the Merry Widow mine, or in fractured granite, as in trench 2.

At fifteen localities, on or adjoining the Merry Widow claim, samples were obtained that contain more than 0.01 percent uranium or the field radioactivity indicated an equivalent uranium content of 0.01 percent. This figure was arbitrarily chosen as the minimum grade constituting an abnormal concentration of uranium.

Description of localities

Locality R-1

A small exposure of radioactive basalt less than 3 ft long and 2 ft wide lies within a narrow diabase dike in the north-central part of the area (pl. 1). Torbernite crystals are found as coatings on fractures a few inches beneath the weathered surfaces. Hydrous iron oxides and perhaps some silica impregnate the radioactive rock and make it more resistant to weathering than the unaltered diabase farther along the strike. The offsetting of the dike near the small exposure and the heavy iron-staining suggest that the dike may be faulted, instead of changing strike as shown on plate 1. One grab sample containing 0.10 percent uranium was cut from the rock.

Locality R-2

A southeast-trending fault has placed a diabase dike in contact with a rhyolite dike in the northwest part of the area shown on plate 1. The altered diabase along the fault is abnormally radioactive and a fracture surface on one small specimen was spotted with a few autunite crystals. The fault gouge between the diabase and rhyolite is very weakly radioactive and the rhyolite is virtually nonradioactive. A 30-in. channel sample in the highly altered diabase, perpendicular to the strike of the fault, contained 0.020 percent uranium, whereas a 30-in. channel sample in the iron-stained fault gouge contained only 0.006 percent uranium.

Locality R-3

Resistant iron-stained diabase, at two exposures near the fault described above under locality R-2, is abnormally radioactive. The exposures are less than 3 ft in diameter and are about 25 ft apart. Although a grab sample from the west exposure contained only 0.006 percent uranium, a similar sample from the east exposure contained 0.020 percent uranium. The iron-stained fracture surfaces were the most radioactive parts of the specimens. No uranium minerals were noted in the samples.

Locality R-4

An east-trending latite(?) dike in the east-central part of the area (pl. 1) locally contains 0.015 to 0.020 percent uranium. The dike averages about 2 ft in thickness; the radioactive zone is less than 30 ft long. Sample HLB-8-83 was taken between the main dike and a short radioactive branch dike (too small to be shown on the map) in rock that has a diabasic texture. This rock may be diabase, which was faulted into this position prior to the intrusion of the latite(?) dike. The size of the body with the diabasic texture could not be determined although it is probably small.

Locality R-5

Near the west-central part of the area (pl. 1) there is a triangular block of diabase, less than 30 ft long and about 3 ft across whose longer sides are bordered by faults and whose shortest side apparently is in normal contact with granite. The source of this block of diabase is not known, as the nearest exposed diabase is more than 300 ft away. The entire block is radioactive and one 30-in. channel sample assayed 0.067 percent uranium. Fracture surfaces are locally coated with fluorescent hyalite, but no uranium minerals were identified.

Locality R-6

Iron-stained fracture surfaces along the south wall of a prospect pit near trench 2 are abnormally radioactive. The fractures are in granite along a vein that dips about 70° S. and is believed to be an extension of the Merry Widow vein. No samples were taken, but the radioactivity, about 15 divisions on the first scale of a Geiger counter, indicates that selected samples probably would contain about 0.01 percent equivalent uranium.

Locality R-7

Torbernite locally coats fracture surfaces in granite along the south wall of trench 2. This is one of the few occurrences of torbernite in granite. The fractures are relatively free from iron oxide stains, and the torbernite crystals lie with their flat sides parallel to the surfaces. These fractures are within a few feet of the Merry Widow vein, which is exposed in trench 2. In further contrast with the usual torbernite occurrence is the low phosphate content, 0.07 percent, of the granite. Generally the rocks containing torbernite contain more than 0.30 percent P_2O_5 (table 1). A sample of selected specimens contained 0.014 percent uranium.

Locality R-8

Two shallow pits between trenches 1 and 2 expose a radioactive vein in diabase. The vein occupies a northeast-trending fault that offsets a diabase dike a distance of several feet. Where the fault intersects the diabase it changes strike and contains 2 to 3 ft of iron-stained gouge. The gouge, and the bordering diabase, which is heavily iron-stained and weakly silicified, are abnormally radioactive. Channel samples cut across the vein material in each pit, contained 0.01 percent uranium, but no uranium minerals were identified.

Locality R-9

A highly radioactive fracture zone that contains autunite is exposed along the east margin of a diabase dike at the west end of trench 1. This zone lies between two northeasterly trending veins that occupy faults, and it is possible that the fracturing resulted from movement along these faults. The uranium content apparently is greatest in the altered diabase adjacent to the contact with granite; it decreases abruptly away from the altered diabase into granite and more gradually into diabase. A 20-in. sample from the contact of the altered diabase contained 0.11 percent uranium. A 33-in. sample cut in the diabase about 20 to 53 in. from the contact contained only 0.025 percent uranium.

Locality R-10

A 30-in. channel sample of diabase in the middle of a dike exposed in trench 2 contained 0.015 percent uranium. The diabase is locally iron-stained and fractured by an obscure fault that nearly parallels the trench. Abnormal radioactivity is traceable for only a few feet; no uranium minerals were identified.

Locality R-11

A quartz-pyrite vein, half an inch thick, follows the south contact of a 4-in. latite dike with granite in the north wall of trench 1. The vein material and an inch or two of adjacent wall rock are abnormally radioactive but no uranium minerals were identified. A grab sample cut in both the vein and the dike contained 0.019 percent uranium. The vein is apparently uranium bearing only locally as it is much less radioactive where exposed on the south wall of trench 1.

Locality R-12

The Merry Widow mine consists of a 150-ft shaft inclined from 65° to 72° to the southeast, and about 450 ft of workings on four levels, at 40-, 60-, 90-, and 130-ft depths. In 1950, the mine was inaccessible below the 60-ft level, but both the 40- and 60-ft levels were mapped on a scale of 10 ft to 1 in. (fig. 3). The mine workings follow a fault which offsets the diabase dikes about 60 ft on the surface. The fault is intruded by a latite(?) dike that ranges from a fraction of an inch to 5 ft in width. It strikes N. 45° - 85° E. and dips 60° - 72° SE. Later movements along the latite dike locally have brecciated the dike and nearby wall rocks and provided fractures in which quartz-pyrite veins were deposited.

The appearance of the latite(?) dike varies greatly throughout the mine. Where nearly fresh it is a fine-grained dark-gray rock. Locally it is highly fractured, iron-stained, and argillized or sericitized. The intensely argillized and sericitized rock commonly has the appearance of fault gouge, and fault gouge may have been mistakenly mapped by the authors as altered latite in parts of the Merry Widow mine. Near the west face of the 40-ft level the dike is nearly white and is altered to clay and sericite. This is probably the material that was mined for the manufacture of radioactive face powder.

Torbernite occurs throughout the mine on fracture surfaces in altered granite, diabase, and latite. Near the winze on the 40-ft level the latite dike has been argillized and bleached. Many random curved slickenside surfaces, which possibly result from movement caused by an increase in volume during the argillization of the rock, are coated with a film of torbernite, much of which appears to be elongated in the direction of the movements.

The Merry Widow mine was not sampled by the writers, as 182 samples were collected and assayed during Keith's examination in 1944 (Keith, 1945). The uranium content of these samples was as much as 2.06 percent (table 2). Results of the sampling indicated that, aside from small localized concentrations of uranium minerals, the higher-grade uranium-bearing rock is within 30 ft of the shaft on the 40- and 60-ft levels.

Locality R-13

Shaft 2 is about 15 ft deep and is in diabase. The diabase forms a triangular-shaped block about 25 by 35 by 18 ft that is bordered by two quartz-pyrite veins. The shaft follows the contact of granite and diabase between these veins. Rock within a few inches of the contact is the most radioactive, containing a little less than 0.01 percent uranium. Torbernite crystals coat irregular fractures in both the granite and diabase and extend several feet from the contact into the diabase. Five samples range in grade from 0.014 to 0.092 percent uranium; the lower grades represent material farther from the contact. Locality R-13, together with R-8 and R-9, probably represents a more or less continuous deposit that follows the contact between granite and the diabase dike.

Locality R-14

A quartz-pyrite vein about 2 in. wide that strikes north in trench 5 is weakly radioactive. The granite wall rock is highly argillized for about 5 in. on either side of the vein and locally is intensely iron-stained. One 12-in. channel sample across the vein and altered rock contained 0.01 percent uranium. Adjoining samples cut in the less altered bordering granite contained 0.006 to 0.002 percent uranium, respectively.

Locality R-15

A narrow vein and associated fractures that form a zone about 4 in. wide in diabase near the south margin of the area shown on plate 1 are abnormally radioactive. Although no samples were taken, it is believed that the radioactivity detected with a Geiger counter, 7 to 15 divisions on the 0.2 scale, indicates an equivalent uranium content of nearly 0.01 percent. The extent of the radioactivity along the strike of the vein could not be traced because of the overburden.

SAMPLING AND GRADE

The five prospect trenches on the Merry Widow claim were sampled in detail (fig. 2) so that variations in uranium and phosphate content among the different types of rocks and veins might be studied. Abnormally radioactive rocks and relatively unaltered rock outside the trenches were also sampled. The uranium content of 133 samples ranged from 0.001 to 0.11 percent. Of these, 19 samples from 12 different localities contained more than 0.01 percent uranium.

Results of the sampling suggest that the average uranium content of all the rocks on the Merry Widow claim, where relatively unaffected by alteration other than weathering, is 0.003 percent or less. The phosphate content, on the other hand, differs greatly in the various types of rock. Diabase and basalt show a higher phosphate content than the other rocks and show a wider range among individual samples. Commonly the more highly altered samples contain the least phosphate. Granite is generally very poor in phosphate but samples taken in granite near diabase dikes show an abnormally high phosphate content. The average P_2O_5 content for several rocks on the Merry Widow claim is: Diabase, 1.60 percent (32 assays); basalt, 1.35 percent (2 assays); quartz monzonite, 0.45 percent (3 assays); latite, 0.37 percent (10 assays); granite, 0.10 percent (69 assays); rhyolite, 0.06 percent (2 assays).

Of 19 samples that contained more than 0.01 percent uranium, only two contained less than 0.30 percent P_2O_5. These two samples represent the only samples that were taken more than 2 ft from diabase, basalt, or latite.

RESULTS OF DIAMOND DRILLING

In May 1950 the lessee of the Merry Widow claim core drilled the Merry Widow vein. The diamond drill hole, which is located about 400 ft south of the Merry

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, N. Mex. Length of sample: S. and N. indicate sample taken from south or north wall of shaft

[Adapted from Keith, 1945. Only samples from 40- and 60-ft levels are tabulated. Keith did not recognize latite in the mine. Part of diabase and much of the gouge mentioned in the table are probably altered latite. FeO indicates iron oxide]

Sample no.	Distance from shaft (feet)	Length of sample (feet)	Description (Keith)	Percent uranium as tested at Rifle, Colo.
			40-ft level	
6557	0 W.	2.1 S.	Back - diabase with altered granite, torbernite.	0.67
6558	0 W.	2.0 N.	Back - gouge and FeO -----------------	.04
6559	5 W.	2.1 S.	Back - special of 5-in. contact zone - torbernite.	.41
6560	5 W.	2.8	Back - gouge, diabase, granite, FeO, breccia, torbernite.	.34
6561	5 W.	4.0	Back - diabase, FeO, bismite, hyalite.	.03
6562	5 W.	2.0 N.	Back - diabase, bismite, hyalite-----	.08
6563	10 W.	3.5 S.	Back - blocky diabase ---------------	.03
6564	10 W.	3.0	Back - gouge, altered granite, FeO, torbernite.	.43
6565	10 W.	3.8 N.	Back - altered diabase, bismite, torbernite.	.16
6566	15 W.	4.2	High back - altered granite, FeO, gouge.	.03
6567	20 W.	3.7 S.	Back - altered diabase, FeO ---------	.06
6568	20 W.	5.0 N.	High back - gouge, FeO, altered granite, torbernite.	.44
6569	25 W.	2.7	High back - gouge, altered diabase, FeO.	.07
6570	30 W.	3.5	High back - gouge, altered diabase, FeO, torbernite.	.11
6571	35 W.	2.9	High back - altered diabase, gouge, FeO.	.07
6572	40 W.	3.3	High back, gouge, diabase, FeO-------	.06
6573	45 W.	1.9 S.	Back - altered diabase, disseminated torbernite.	.08
6574	45 W.	2.0 N.	Back - strong FeO, gouge, altered diabase.	.08
7500	50 W.	0.8 S.	Back - altered granite --------------	.03
7501	50 W.	1.5	Back - gouge, altered diabase--------	.14
7502	50 W.	1.7 N.	Back - diabase, FeO -----------------	.03
7503	55 W.	1.5 S.	Back - altered granite, FeO ---------	.05
7504	55 W.	1.0 N.	Back - gouge, FeO, altered diabase---	.03
7505	60 W.	1.7 S.	Back - altered granite, FeO ----------	.02
7506	60 W.	.8 N.	Back - gouge, FeO --------------------	.04
7507	60 W.	2.2	N. Wall - perpendicular to diabase-granite contact, torbernite.	.48
7508	5 E.	2.0 S.	Back - altered granite, FeO, torbernite.	.46
7509	5 E.	2.1 N.	Back - gouge, FeO -------------------	.30
7510	10 E.	1.2 S	Back - altered granite --------------	.03
7511	10 E.	1.3	Back - altered granite, disseminated torbernite.	.33
7512	10 E.	.9	Back - gouge, altered diabase, strong torbernite.	1.88
7513	10 E.	2.2 N.	Back - altered diabase, gouge, torbernite.	.66
7514	15 E.	.7 S.	Back - gouge, altered diabase -------	.04
7515	15 E.	2.2	Back - altered granite, FeO, torbernite.	.32
7516	15 E.	1.0	Back - diabase ----------------------	.21
7517	15 E.	.4	Back - altered diabase, gouge, strong torbernite.	1.74
7518	15 E.	1.4 N.	Back - altered diabase, FeO ---------	.06
7519	20 E.	.2 S.	Back - gouge ------------------------	.00
7520	20 E.	2.4	Back - altered granite, FeO ----------	.04
7521	20 E.	1.5	Back - altered granite, FeO, disseminated torbernite.	.35
7522	20 E.	2.2	Back - altered diabase ---------------	.05
7523	20 E.	2.3 N.	Back - altered diabase, FeO ----------	.03
7529	25 E.	2.2	Back - altered granite, FeO stringers.	Tr.

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, N. Mex. Length of sample: S. and N. indicate sample taken from south or north wall of shaft--Con.

Sample no.	Distance from shaft (feet)	Length of sample (feet	Description (Keith)	Percent uranium as tested at Rifle, Colo.
		40-ft level--Continued		
7530	30 E.	3.3 N.	Back - altered granite, gouge, FeO stringers.	0.01
7524	25 E.	3.4 S.	Back - granite, FeO stringers --------	.04
7525	25 E.	.9 N.	Back - altered diabase ---------------	.03
7526	37 E.	3.5 S.	E. wall - altered granite, FeO stringers.	.01
7527	37 E.	3.3	E. wall - altered granite, FeO stringers.	.01
7528	37 E.	3.1 N.	E. wall - altered granite, FeO, gouge vein.	.01
7531	25 E	1.2	N. wall - altered granite, torbernite.	.26
7532	25 E.	.7	N. wall - altered diabase, torbernite.	.35
		60-ft level		
6250	0 W.	1.3 S.	Back - altered diabase, torbernite.	.14
6251	0 W.	2.7	Back - gouge, FeO --------------------	.03
6252	0 W.	1.4 N.	Back - gouge, FeO, weak torbernite----	.05
6253	5 W.	1.7 S.	Back - brecciated diabase, gouge, torbernite.	.43
6254	5 W.	1.8 N.	Back - gouge, FeO, torbernite -------	.51
6255	10 W.	1.5 S.	Back - gouge, FeO, torbernite --------	.86
6257	10 W.	2.5 N.	Back - FeO, gouge, bismite, torbernite.	.57
6258	20 W.	5.0 S.	Back - south cross-cut - altered granite, FeO.	.02
6259	20 W.	2.8	Back - gouge, FeO -------------------	.05
6260	20 W.	3.5	Back - FeO, gouge, torbernite --------	.32
6261	20 W.	4.8	E. wall of north cross-cut - diabase, pyrite, FeO, bismite stringers.	.05
6262	20 W.	4.8 N.	E. wall of north cross-cut - diabase, pyrite, FeO, bismite stringers	.06
6263	25 W.	.3 S.	Back - granite, FeO -----------------	.04
6264	25 W.	1.1	Back - gouge, torbernite, hyalite-----	.12
6265	25 W.	.5	Back - FeO, gouge, torbernite, hyalite.	.12
6266	25 W.	.5 N.	Back - diabase, torbernite -----------	.49
6267	30 W.	1.7 S.	Back - granite, FeO ------------------	.03
6268	30 W.	1.3	Back - gouge, FeO -------------------	.04
6269	30 W.	.5 N.	Back - diabase ---------------------	.07
6270	35 W.	2.7	E. side raise - 12 ft above rail - gouge, FeO, torbernite.	.12
6271	40 W.	1.7	W. side raise - 12.6 ft above rail - gouge, FeO.	.07
6272	45 W.	.8 S.	Back - gouge, torbernite ------------	.27
6273	45 W.	1.1	Back - diabase ----------------------	.13
6274	45 W.	2.6 N.	Back - altered granite ---------------	.02
6275	50 W.	.9 S.	Back - altered granite, FeO ----------	.03
6276	50 W.	1.6	Back - gouge, FeO, brecciated diabase.	.02
6277	50 W.	2.6 N.	Back - altered granite ---------------	Tr.
6278	55 W.	2.2 S.	Back - gouge, FeO -------------------	.02
6279	55 W.	1.7 N.	Back - granite ----------------------	.00

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, N. Mex. Length of sample: S. and N. indicate sample taken from south or north wall of shaft--Con.

Sample no.	Distance from shaft (feet)	Length of sample (feet)	Description (Keith)	Percent uranium as tested at Rifle, Colo.
			60-ft level--Continued	
6280	60 W.	3.3 N.	Back - gouge, FeO	0.02
6281	65 W.	2.5 S.	Back - brecciated granite, FeO, gouge.	.03
6282	65 W.	1.8 N.	Back - gouge, altered granite	.02
6283	70 W.	1.7	High back - gouge, FeO	.04
6284	75 W.	1.3	High back - gouge, diabase, granite.	.03
6285	80 W.	1.7 S.	Back - granite, FeO	Tr.
6286	80 W.	1.7 N.	Back - altered diabase, gouge, FeO.	.05
6287	85 W.	2.2 S.	Back - granite	.02
6288	85 W.	1.6 N.	Back - altered diabase, gouge, torbernite.	.20
6289	90 W.	3.1 S.	Back - granite, hyalite	.03
6290	90 W.	.7 N.	Back - gouge, altered diabase, FeO, torbernite.	.23
6291	95 W.	2.2 S.	Back - granite	Tr.
6292	95 W.	1.1 N.	Back - altered diabase, gouge	.10
6293	100 W.	1.0 S.	Back - granite, FeO	.01
6294	100 W.	1.0	Back - altered diabase	.09
6295	100 W.	1.2 N.	1 Back - FeO, gouge	.05
6296	105 W.	2.5 S.	Back - granite, FeO	.03
6297	105 W.	1.8 N.	Back - granite, FeO	.03
6298	110 W.	.9 S.	Back - granite, FeO	.02
6299	110 W.	.7	Back - altered diabase, gouge	.02
6300	110 W.	2.6	Back - granite, FeO	.02
6301	110 W.	.6 N.	Back - altered diabase, gouge	.21
6302	115 W.	.9	Back - altered granite, FeO	.02
6303	115 W.	.4	Back - altered diabase, torbernite.	.33
6304	115 W.	2.5	Back - altered granite, FeO	.02
6305	115 W.	.5	Back - gouge, altered diabase, FeO	.32
6306	120 W.	.6 S.	Back - altered diabase, gouge, torbernite.	.30
6307	120 W.	2.7	Back - granite, FeO	.01
6308	125 W.	.7	Back - altered diabase, gouge	.15
6309	125 W.	1.1	Back - granite, FeO, gouge	.01
6310	130 W.	.8	Back - diabase, gouge, torbernite	.11
6311	130 W.	1.9	Back - granite, FeO	.01
6312	135 W.	.6	Back - gouge, diabase, FeO, torbernite.	.12
6313	135 W.	2.0	Back - granite, FeO	.01
6314	140 W.	.6	Back - gouge, FeO	.02
6315	140 W.	1.0	Back - FeO	.01
6316	140 W.	2.3	Back - granite, FeO	.00
6317	10 E.	1.6 N.	Back - diabase	.08
6318	10 E.	2.0	Back - gouge, altered diabase, FeO	.04
6319	10 E.	1.5 S.	Back - diabase	.05
6320	15 E	1.8 N.	W. side raise, 10.5 ft above rail - gouge, altered diabase, torbernite.	.34
6321	15 E.	1.2 S.	W. side raise, 10.5 ft above rail - diabase.	.10
6322	15 E.	3.7 N.	W. wall of cross-cut - diabase, pyrite, bismite.	.03
6323	15 E.	4.3	W. wall of cross-cut - diabase, pyrite, bismite.	.03
6324	15 E.	1.7 S.	W. wall of cross-cut - diabase, pyrite, bismite.	.03

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, N. Mex. Length of sample: S. and N. indicate sample taken from south or north wall of shaft--Con.

Sample no.	Distance from shaft (feet)	Length of sample (feet)	Description (Keith)	Percent uranium as tested at Rifle, Colo.
			60-ft level--Continued	
6550	20 E.	4.7 S.	E. wall cross-cut - gouge, brecciated diabase, torbernite.	0.26
6551	20 E.	3.2	E. wall cross-cut - granite, FeO------	.01
6552	20 E.	2.1 N.	E. wall cross-cut - granite, FeO, diabase.	.02
6554	30 E.	1.7	N. wall of raise - granite, diabase, torbernite.	.21
6553	25 E.	4.2	Back - diabase, pyrite, FeO ----------	.03
6555	35 E.	1.7	N. wall of raise - torbernite, granite, diabase.	.43
6556	40 E.	2.0	N. wall of drift - torbernite, granite, diabase.	.13

Note: According to Keith, the average gold and silver content of samples taken in the Merry Widow mine are 0.01 and 0.30 oz per ton, respectively. Locally, however, the vein may contain as much as 1.5 oz of gold and 1.4 oz of silver.

Widow shaft (Granger and Bauer, 1950), was cored with an Ax bit on a bearing of N. 6° E., and at an angle of minus 72°. The core cut the vein zone between 520 and 550 ft and was continued to a depth of 650 ft. Over-all core recovery was nearly 80 percent.

For the most part, the core is medium-grained granite composed of quartz (30 percent), potash feldspar (60 percent), and biotite and other mafic minerals (10 percent). The feldspars have been partly argillized and are soft and greenish; near the veins they have been moderately sericitized. The granite from 550 to 650 ft is unaltered. Between depths of 72 and 97 ft, a diabase dike was cored. The margins are fine-grained and the inner part is medium to coarse-grained. The diabase is greatly fractured, and the plagioclase has been argillized. Green mafic minerals give the rock a characteristic dull greenish-gray color.

Several quartz-pyrite veins were cut in the core, most of which are less than 1/2 in. thick but a few are 1/2 to 2 in. thick. The veins are abundant but have no consistent orientation. They are completely oxidized to a depth of 80 ft and partly oxidized from 80 to 150 ft. Below 150 ft the pyrite is oxidized only in the wide vein zones. In the Merry Widow vein zone between 520 and 550 ft the pyrite in the veins is oxidized to limonite, and the granite wall rock is intensely altered and iron-stained. A 2-in. vein of massive limonite at 528 ft and two 1-in. quartz veins at 540 ft. are the largest individual veins in this zone. The latite(?) dike that locally parallels the vein in the Merry Widow mine was not identifiable in the core, but the recovery was very poor throughout this zone. Along the border of numerous specularite-bearing veinlets, between 380 and 650 ft, the wall rock is only slightly iron-stained.

Abnormally radioactive zones in the core are limited commonly to narrow fractures less than one-eighth inch thick. Crystals of torbernite were noted in some of the fractures at depths of 127, 151, 154, 156, 161, and 184 ft. Other radioactive fracture surfaces, showing no torbernite at 80, 170, 214, 229, 246, 278, 324, 510, 540, and 542 ft, were usually coated with fine-grained green and white claylike minerals, possibly a mixture of talc and serpentine or sericite.

The Merry Widow vein zone was cored from 520 to 550 ft. The granite is altered and iron-stained throughout, and the core recovery was poor. At 540 ft weak radioactivity occurs in two 1-in. thick quartz veins. Two feet below these veins amorphous dark-green and black minerals, that contain about 0.2 percent equivalent uranium, fill a small fracture. Similar black radioactive material was noted at 278 ft and 510 ft, but no uranium minerals were identified.

ORIGIN

Although only secondary uranium minerals have been found in the White Signal district, observations made during this examination suggest that some of the quartz-pyrite veins may contain primary uranium minerals below the zone of oxidation.

The relatively unaltered rocks on the Merry Widow claim commonly have a lower uranium content than the quartz-pyrite veins. The large quartz-pyrite vein near the west end of trench 1 (pl. 2) contains 0.007 percent uranium, whereas the wall rocks on either side contain 0.003 and 0.002 percent. A narrow quartz-pyrite vein along the contact between granite and diabase in the east end of trench 1 contains 0.006 percent uranium, whereas the adjacent granite and diabase contain only 0.001 percent. Similar examples in the other trenches suggest that the quartz-pyrite veins have played an important part at least in the distribution of secondary uranium minerals.

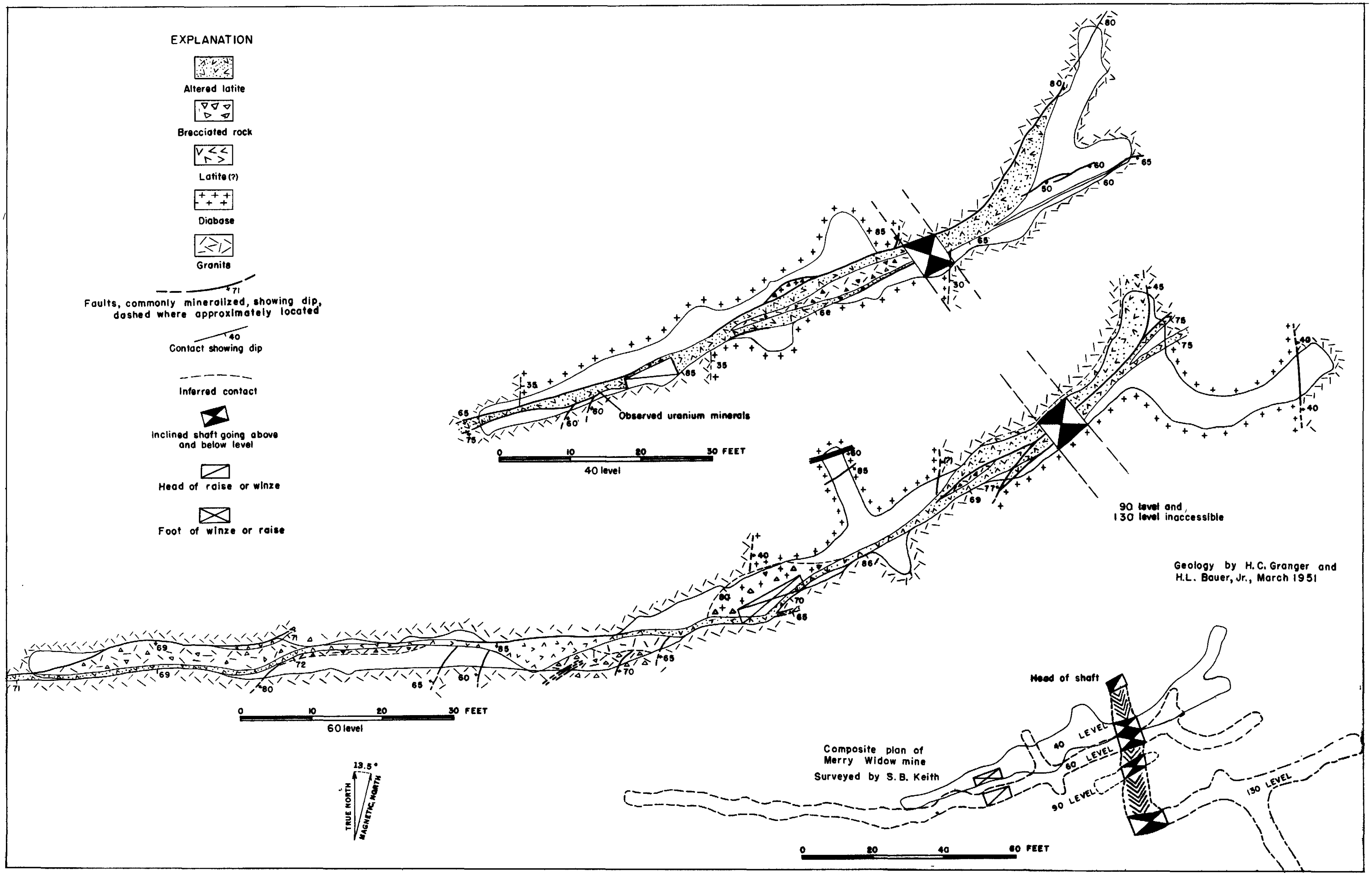

Figure 3.--Geologic map, 40-and 60-ft levels, Merry Widow mine, White Signal district, Grant County, N. Mex.

During exploration of the Merry Widow vein by diamond drilling it was found that the vein material in larger veins had been thoroughly oxidized by ground waters to a depth of at least 550 ft. Pitchblende or other primary uranium minerals would probably be unstable in the highly acid waters produced from the oxidation of pyrite; consequently the lack of recognizable primary uranium minerals in the drill core merely suggests that if these minerals were once present they have since been removed. It is believed that the unoxidized parts of some of the veins may contain primary uranium minerals and that the distribution of secondary uranium minerals in altered rock has resulted from precipitation of uranium from solution in meteoric waters along fractures in the more favorable host rocks.

There is a possible relationship between the latite(?) dikes and the uranium deposits. Locally, in the Merry Widow mine, the uranium minerals occur in fractures in the latite(?) away from the diabase dikes. At localities R-4 and R-11 the uranium is closely associated with the latite(?). Field relationships suggest that the vein minerals were deposited after the intrusion of the latite(?) and before the intrusion of the rhyolite. Perhaps the mineral-bearing solutions followed closely after the intrusion of the latite(?), and as the writers believe, were derived from magma that consolidated to form latite(?).

Apparently the intermediate and basic rocks, latite, basalt, and diabase, have been more favorable hosts for the deposition of secondary uranium minerals than has the granite. The reason for this is not entirely clear but may be due in part to the phosphate content. Certainly, it would seem that a high phosphate content in the host rock would be more conducive to precipitation of phosphate-bearing uranium minerals than would a low phosphate content. Of 19 samples that contained over 0.01 percent uranium, all but 2 contained more than 0.30 percent P_2O_5. The average P_2O_5 content of these samples was 1.07 percent.

SUGGESTIONS FOR PROSPECTING

Uranium minerals on the Merry Widow claim and elsewhere in the White Signal district are found most commonly in or near the intersections of quartz-pyrite veins with intermediate or basic dikes. In a few places the faults and veins are parallel to the dike contacts. Prospecting should be guided by these associations but perhaps should not be limited entirely to the intermediate and basic rocks. It is believed that quartz-pyrite veins cutting granite at some distance from basic dikes may be locally uraniferous. This is especially true concerning primary minerals in parts of the veins that are unaffected by oxidation.

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