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Uranium Occurrences on the Blue Jay Claim, White Signal District, Grant County, New Mexico

Trace Elements Memorandum Report 117

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

URANIUM OCCURRENCES ON THE BLUE JAY CLAIM, WHITE SIGNAL DISTRICT, GRANT COUNTY, NEW MEXICO

By

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

June 1951

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URANIUM OCCURRENCES ON THE BLUE JAY CLAIM, WHITE SIGNAL DISTRICT, GRANT COUNTY, NEW MEXICO

By

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

ABSTRACT

A discovery of secondary uranium minerals on the Blue Jay claim was reported in 1949 and the occurrence was examined by the authors in March 1950. The Blue Jay claim is about three-fourths of a mile south of White Signal, Grant County, N. Mex. in secs. 23 and 26, T. 20 S., R. 15 W., New Mexico principal meridian.

The Blue Jay claim is underlain by a pre-Cambrian granite mass that was intruded by numerous dikes ranging from rhyolite to basalt in composition. Abnormal radioactivity and secondary uranium minerals occur in altered rocks near oxidized quartz-pyrite veins. Forty-four samples ranged in grade from 0.001 to 0.11 percent uranium. The intermediate and basic rocks seem to have been the more favorable host rocks for the deposition of secondary uranium minerals, possibly because of their higher phosphate content.

It is believed that primary uranium minerals may occur in the quartz-pyrite veins below the zone of oxidation and if prospecting is done it should be directed along these veins, especially near the intersections of such veins with basic dikes.

INTRODUCTION

Secondary uranium minerals associated with pyrite and a little gold and occurring as fracture fillings have been known in the White Signal mining district, Grant County, N. Mex., since about 1920. The Blue Jay claim, one of the uranium prospects in this district, was located in 1949. The uranium deposits are about 400 feet west of a dirt road that joins New Mexico Highway 180 at White Signal, about three-quarters of a mile to the north (fig. 1). The quarter-section corner of the boundary between secs. 23 and 26, T. 20 S., R. 15 W., New Mexico principal meridian, lies within the claim boundaries. The claim is owned by Otto and Fred Prevost, of White Signal and Silver City, respectively, and is leased to E. B. Killion, of Silver City, N. Mex.

An examination of the radioactive deposits on the Blue Jay claim was made in March 1950 by the authors as part of a study of uranium deposits in the White Signal district. The area containing the radioactive deposits was mapped (fig. 2) by plane table on a scale of 1 inch equals 30 feet. Forty-four samples representative of several different types of rocks and uranium occurrences were taken. Both radioactive and barren rocks were sampled and assayed for P_2O_5 as well as uranium as it was believed that the phosphate content of the country rock might have determined the localization of phosphate-bearing uranium minerals.

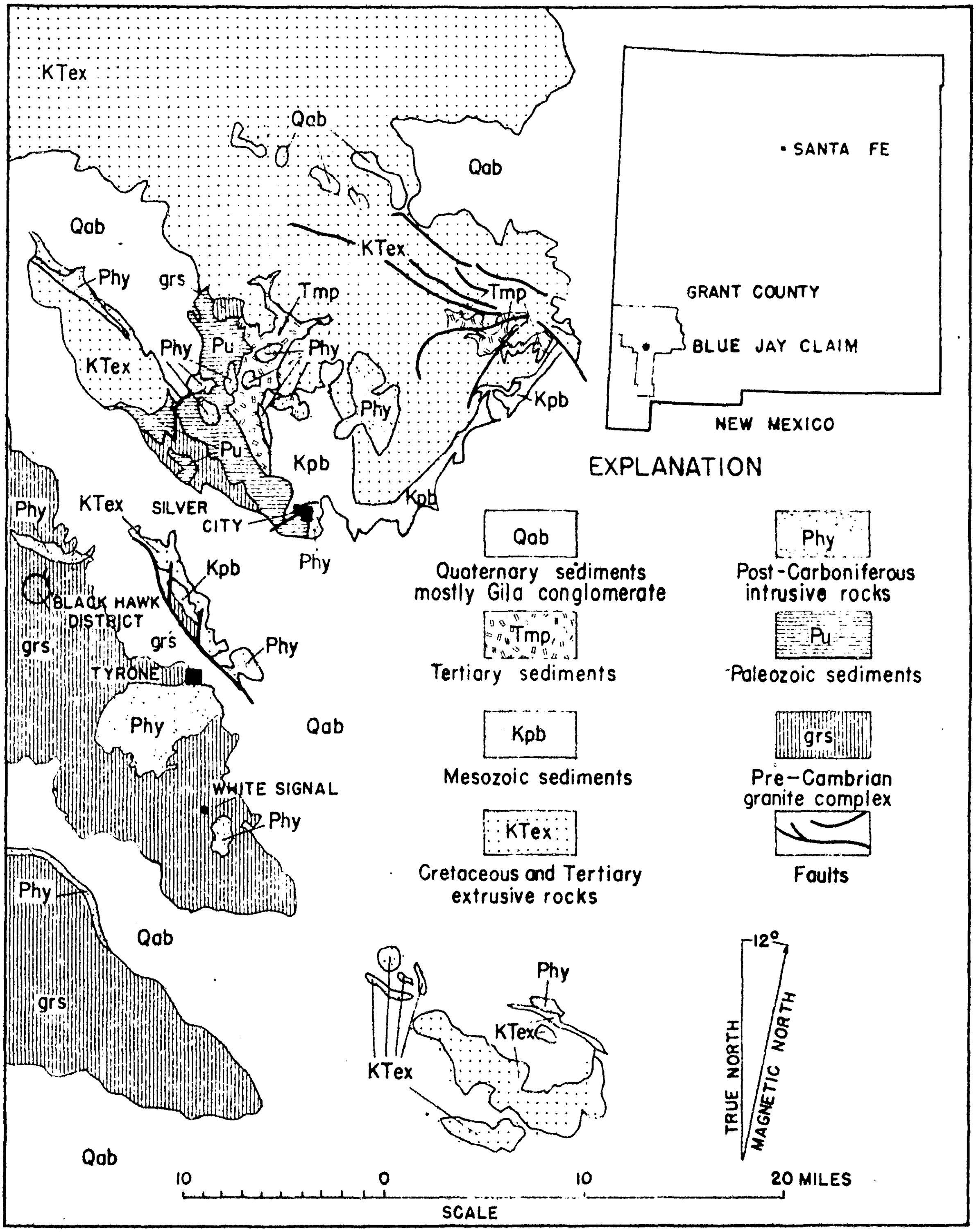

FIGURE 1.—MAP SHOWING THE LOCATION AND GENERAL GEOLOGY OF THE BLUE JAY CLAIM, GRANT COUNTY, NEW MEXICO.

The White Signal district had previously been examined by the Union Mines Development Corp. _/ but the examination did not include the Blue

_/ Keith, S. B., Preliminary field reconnaissance of reported S-37 occurrences in southwestern New Mexico: Union Mines Development Corporation, Report No. 29-3, 1944.

_/ __________, Report on detailed examination of S-37 occurrences in the White Signal and associated districts, New Mexico: Union Mines Development Corporation, Report No. 29-4, 1945.

Jay claim.

Prior to our examination, Mr. Killion had removed the overburden from four localities on the claim by bulldozer. These localities were selected by him on the basis of abnormal radioactivity detected with a portable Geiger counter. No ore has been produced from the claim.

GEOLOGY

Rocks

The Blue Jay claim and much of the White Signal district is underlain by a large mass of pre-Cambrian granite intruded by dikes of various compositions. The relative ages of several of the intrusive rocks were not established during the examination because of the small area being studied. The sequence, therefore, is postulated.

Granite

The granite that forms the country rock in the vicinity of the Blue Jay claim is typically a leucocratic, biotite-poor, medium-grained rock with the feldspars partly argillized. The grain size ranges from medium to coarse and porphyritic rocks are locally present. The granite is weathered to low, rounded exposures, and over most of the area the surface is covered with the disintegration products of the granite.

Diabase

A diabase dike (fig. 2), faulted and intruded by other rocks, trends northwestward across the Blue Jay claim. It is believed to be pre-Cambrian in age and is probably the oldest rock that intrudes the granite. The diabase has been extensively faulted and disrupted by rhyolite intrusions. The diabasic texture is commonly obscure, as the laths are nearly as dark as the groundmass except where they have been bleached by alteration.

In the northwesternmost bulldozer cut a rock mapped as diabase (fig. 2) is intensely altered, friable, and locally bleached or iron-stained. Although the phosphate content and type of alteration affecting this rock are more nearly similar to the latite described below, the obscure diabasic texture prompted the writers to classify it with the other diabase.

The diabase surrounding a 10-foot pit near the western margin of the area (fig. 2) is bleached nearly white and cut by paper-thin veinlets containing specularite and siderite.

Basalt

A dark gray, fine-grained dike about 7 feet wide that trends northwestward, nearly parallel to the diabase (fig. 2), is believed to be basalt. At its southern end it is off-set by faults. The dike may be of nearly the same age and composition as the diabase.

Latite

Two bodies of altered intrusive rock (fig. 2) are tentatively identified as latite by comparison of habit and general appearance with unaltered latite outside the mapped area. The bodies have an easterly trend and are separated by rhyolite dikes. They may have been part of a more extensive dike or plug before faulting and an intrusion of rhyolite disrupted its continuity.

The latite is very friable and ranges in color from nearly white, through gray, to light purple. The original texture has been almost completely destroyed and the minerals are so altered as to be unidentifiable in the field.

Aphanitic dikes

A thoroughly fractured, friable, gray, aphanitic dike about 3.5 feet wide is exposed in the northernmost bulldozer trench (fig. 2) and strikes about N. 80° E. with a nearly vertical dip. A 1- to 6-inch dike of similar material is exposed in a shallow pit about 40 feet west of this trench. The minerals and texture of the original rock have been destroyed by intense alteration. The similarity of color, alteration, and trend between the latite and the aphanitic dikes suggest that they may be related. Fracture surfaces in the larger dike are coated with a yellow radioactive mineral. This dike is concealed by overburden on both sides of the northernmost trench and was mapped for the most part on the basis of abnormal radioactivity at the surface.

Rhyolite

A large, white to gray rhyolite dike trends eastward across the area mapped (fig. 2). It dips about 70° S. Near the east edge of the area (fig. 2), the dike contains four small granite inclusions. Contacts between rhyolite and granite, where exposed, are undulating and gradational, as if the rhyolite had partly assimilated the granite along margins of the dike.

Small limonite-stained cavities in the rhyolite are believed to represent oxidized, disseminated pyrite. Locally, the dike was thoroughly shattered and cut by a network of thin fractures which are now stained with limonite but was rarely cut by prominent faults. The rhyolite intruded the latite; therefore, it is probably the youngest intrusive rock on the Blue Jay claim.

Veins

Faults on the Blue Jay claim are occupied by dikes or veins for the most part. Where the faults are unmineralized, they are obscure and display no brecciation or fracturing. Two types of veins occupy the faults; specularite veins and quartz-pyrite veins. A persistent specularite vein $\frac{1}{2}$ to 2 inches wide trends about N. 70° E. and dips steeply northward throughout a length of about 260 feet (fig. 2). Other minor specularite veins seemingly are short and very narrow.

Most of the veins are filled with limonite and quartz, and are bordered by argillized, and less commonly, sericitized wall rock. These are believed to be the oxidized parts of quartz-pyrite veins.

Joints

Jointing in the granite is common but apparently there is no predominant trend. Locally, several joints may be parallel, but another set only a few feet away may have an entirely different orientation. Persistent joints in the dikes are generally parallel to the contacts.

URANIUM DEPOSITS

The uranium deposits on the Blue Jay claim, generally occur in intermediate or basic rocks very near the oxidized parts of quartz-pyrite veins. Two secondary uranium minerals occur in the deposits. One, a tabular, green usually non-fluorescent mineral, is probably torbernite; the other, a yellow, powdery mineral with weak yellow fluorescence was not identified. Torbernite coats fracture surfaces in the rocks at sample localities HLB-15-137, -159, -163, -170, and -176 (fig. 2). At sample locality HLB-15-177 in granite the torbernite coats fracture surfaces and also occupies the contacts between quartz grains and argillized surfaces of feldspars.

The yellow secondary uranium mineral occurs in the larger aphanitic dike where it coats innumerable fracture surfaces with a dull amorphous powder. The prevalence of this mineral in the dike makes this rock the richest sampled (table 1).

No uranium minerals were seen in several of the samples containing an abnormal amount of uranium. Generally, the rock and the vein material are also highly iron-stained, suggesting that the uranium may be associated with hydrous iron-oxides by adsorption or molecular replacement. On the other hand, the uranium minerals may be so finely disseminated or so concealed by iron-staining that they were not seen.

Nearly all the samples that contained more than 0.01 percent uranium were taken in altered mafic rock near a quartz-pyrite vein. The samples that are exceptions to this generalization, were taken from material within quartz-pyrite veins or along fractures in granite. The veins are highly iron-stained and locally contain quartz in small amounts. The intense iron-staining is believed to be indicative of oxidized pyrite in the near-surface parts of the veins, and affects the argillized and sericitized wall rock in granite as much as 3 feet from the vein.

Grade and size

Radioactivity on the Blue Jay claim was recorded with a Beckman Mx-5 beta-gamma counter. The radioactivity of each type of rock was tested by recording the minimum and maximum fluctuations of the rate-meter needle for approximately 30 seconds with the probe held 4-5 inches from the surface. The average reading for most of the relatively unaltered rocks is about 1 to 7 divisions on the 0.2 scale. This corresponds to about 0.001 to 0.003 percent uranium in samples taken nearby.

Forty-four samples were collected during the examination. Channel samples were cut in most areas of abnormal radioactivity and grab samples were cut at several points in relatively unaltered rock showing minimum radioactivity. Minimum and maximum rate-meter readings were recorded for many of the samples (table 1) with the probe held about 1 inch from the rock.

Normally, on the Blue Jay claim, both granite and rhyolite contain 0.001 to 0.002 percent uranium. Within a few inches of fractures and veins the granite may contain as much as 0.076 percent. Basalt and diabase contain about 0.001 to 0.005 percent uranium except within or near fractures and veins where there may be as much as 0.085 percent. The latite, all intensely altered, contains from 0.006 to 0.064 percent uranium. The aphanitic dikes are altered universally and contain as much as 0.11 percent uranium.

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Table 1.--Results of sampling, Blue Jay claim, White Signal district, Grant County, New Mexico

Sample number HLB-15-	Material	Equivalent uranium (percent)	Field meter reading Min.	Field meter reading Max.	Uranium (percent)	P_2O_5 (percent)
137	Basalt, showing torbernite	0.018	9	17	0.017	2.58
138	Granite, altered	0.014	12	20	0.009	0.37
139	do.	0.011	11	18	0.006	0.54
140	do.	0.004	2	6	0.003	0.41
141	Basalt	0.004	4	8	0.003	2.58
142	Granite, altered	0.008	4	9	0.006	0.43
143	Granite and vein material	0.020	13	16	0.013	0.35
144	Granite, altered	0.008	5	9	0.009	0.54
145	Granite and vein material	0.050			0.035	0.39
146	Aphanite dike, altered	0.17	15_/	17_/	0.11	0.49
147	Granite, altered	0.017			0.010	0.35
148	Granite and vein material	0.020			0.010	0.43
149	Aphanite dike, altered	0.060	6_/	8_/	0.041	0.85
150	Rhyolite	0.003			0.001	0.48
151	Granite	0.004			0.001	0.36
152	Diabase	0.007			0.005	2.86
153	Granite	0.001			0.001	0.43
154	Diabase	0.003			0.001	2.95
155	do.	0.003			0.001	2.65
156	Diabase, leached	0.003			0.002	2.93
157	Rhyolite	0.002			0.001	0.50
158	Granite, altered	0.004			0.001	0.30
159	Diabase, showing torbernite	0.037	5_/	7_/	0.041	1.00
160	Diabase, altered	0.010		2_/	0.008	0.49
161	do.	0.028	3_/	6_/	0.020	0.56
162	do.	0.024	2_/	4_/	0.028	0.69
163	Diabase, showing torbernite	0.035	3_/	5_/	0.042	0.80
164	Diabase, altered	0.039	3_/	5_/	0.037	0.62
165	do.	0.036	2_/	5_/	0.031	0.91
166	do.	0.010	10	14	0.005	0.53
167	do.	0.036	3_/	5_/	0.035	0.60
168	Latite, altered	0.010			0.006	0.70
169	do.	0.019	2_/	5_/	0.018	0.95
170	Latite, showing torbernite	0.051	3_/	8_/	0.064	0.90
171	Latite, altered	0.040	4_/	7_/	0.031	1.03
172	do.	0.017	2_/	5_/	0.009	0.53
173	Rhyolite, altered	0.012	10	15	0.006	0.36
174	Latite, altered	0.018	10	20	0.016	0.79
175	do.	0.016			0.009	0.76
176	Basalt, showing torbernite	0.079	5_/	20_/	0.085	1.65
177	Granite, showing torbernite	0.079	5_/	20_/	0.076	1.29
178	Granite, altered	0.023	3_/	5_/	0.020	0.37
179	Granite	0.004	2	7	0.002	0.65
180	Granite	0.004	0	5	0.001	0.60

_/ Divisions on 2.0 scale of Beckman Mx-5 beta-gamma rate meter. Others on the 0.2 scale.

Exposed areas of uranium-bearing rock are generally small on the Blue Jay claim. The 3.5-foot aphanitic dike is about 90 feet long as determined on the basis of abnormal radioactivity in the soil along the indicated strike. The uranium content of the diabase in the northwesternmost bulldozer cut (fig. 2) is abnormally high, but the highest concentration in the diabase is in an area about 25 feet square where it is intersected by an iron-stained vein or fracture.

Although the latite apparently has a generally high uranium content, the best concentration is along an iron-stained fractured zone in the southwesternmost bulldozer cut (fig. 2), at sample localities HLB-15-169, -170, and -171. This zone is about 10 feet across and of unknown lateral extent. Other abnormally radioactive rocks lie along veins but are generally less than 6 feet wide and 10 feet long.

Origin

Although only secondary uranium minerals have been found in the White Signal district, the following observations made during this examination suggest that some of the quartz-pyrite veins may contain primary uranium minerals below the zone of oxidation. Relatively unaltered rocks on the Blue Jay claim have a lower uranium content than the altered rocks near quartz-pyrite veins. For example, although the average uranium content of granite is less than 0.003 percent, samples HLB-15-142, -143, and

-144 (fig. 2) contain a minimum of 0.006 percent. Furthermore, sample HLB-15-143, which was cut across the intensely altered vein material, contains more uranium than the samples cut in the altered wall rocks on either side.

The increased uranium content in veins and altered rocks near veins suggests that the unoxidized parts of the veins may contain primary uranium minerals and that the distribution of secondary uranium minerals in altered rocks has resulted from alteration of primary uranium minerals in the veins and re-distribution by circulating meteoric waters.

Apparently the intermediate and basic rocks have been more favorable hosts for the deposition of secondary uranium minerals than have the acid rocks. The reason for this is not clear but may be due in part to the phosphate content. The average P_2O_5 content of each type of rock (table 1) is: basalt, 2.27 percent; diabase, 1.34 percent; latite, 0.81 percent; aphanitic dikes, 0.67 percent; granite, 0.49 percent; rhyolite, 0.45 percent. This suggests that a content of somewhat more than 0.50 percent P_2O_5 may make a rock more favorable for the precipitation of secondary, phosphate-bearing uranium minerals.

Although it is not known if the yellow uranium mineral in the aphanitic dike is a phosphate, it would certainly seem that the phosphate content of the rock is sufficient to precipitate uranium from solution. The intense fracturing of the dike also has helped to prepare it as a favorable host rock.

SUGGESTIONS FOR PROSPECTING

Uranium minerals on the Blue Jay claim, as is true elsewhere in the White Signal district, are found chiefly in or near the intersections of quartz-pyrite veins with intermediate or basic dikes. In a few places the faults are parallel to the dike contacts. If prospecting is done, it should be guided by these criteria but perhaps should not be limited entirely to the basic rocks; quartz-pyrite veins cutting granite at some distance from basic dikes may be locally uraniferous, especially below the zone of oxidation.