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Uranium Occurrences In the Datil Mountain Area, Catron and Socorro Counties, New Mexico

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ABSTRACT

There are many small deposits of primary and secondary uranium minerals along the southern border of the Colorado Plateau in the Datil Mountain area, 20 miles north of Datil, New Mexico. The mineralization was controlled by structural and lithologic characteristics of the contact zone between the Chamiso member of the Lower Tertiary age.

Most of the deposits are small, but at least one, the Red Basin deposit, contains an estimated 10,000 tons of indicated and inferred ore of 0.15% + U_3O_8 grade. Potential for the immediate area may be two or three times this figure. Uranium mineralization has been widespread in the Datil area, and drilling has a reasonable potential of yielding larger and more important discoveries in the future.

INTRODUCTION

Uranium was discovered in the Mesaverde formation in the Datil Mountain area during the fall of 1953. The initial discoveries were made in the vicinities of the McPhaul and Webster ranches, located in the northern foot hills of the Datil Mountains, Catron County, New Mexico (fig. 1).

Uranium mineralization occurred at or near the contact between the Baca formation of Tertiary age and the Mesaverde formation of Upper Cretaceous age. Extensive private prospecting and exploration has extended this area of scattered uranium occurrences for nearly 20 miles along the contact zone. Although most of the occurrences discovered to date have failed to yield commercial tonnages of ore, more than 100 tons of ore were strip-mined in the spring of 1954 from the most promising property, the Red Basin deposit. Twenty-three tons of this ore, averaging 0.196% U_3O_6, were shipped to the Anaconda Company mill at Bluewater, New Mexico by Elayer and Company of Silver City, New Mexico. A subsequent land survey showed the Red Basin deposit to be on ground owned by the Santa Fe Railway Company, and private activity on the property was suspended pending a leasing agreement with the Company. In March, 1957, 38 tons of ore was shipped from the McPhaul ranch.

Atomic Energy Commission work in the Datil area has included general reconnaissance, property inspections, radiometric logging of private drill holes, and preliminary geologic studies of the Red Basin deposit.

Location and Accessibility

Uranium deposits in the Datil area have been found at the base of the north slope of the Datil Mountains, about 20 miles north of the town of Datil in west-central New Mexico (fig. 1). The area lies along the southern boundary of the Colorado Plateau and is included in T. 2 N., R. 9, 10, and 11 W. The area is easily accessible by unpaved ranch roads from U.S. Highway 60.

Topography

The Datil Mountains consist of a north-facing cuesta that rises 1500 feet above a dissected plateau. Elevations along the crest of the range exceed 8500 feet. At the base of the cuesta, northeast-trending arroyos, separated by low ridges, cross the Baca-Medaverde contact zone. Relief in this area is approximately 150 feet. To the north, narrow canyons, several hundreds of feet deep, are cut into a plateau of nearly flat-lying sedimentary rocks.

GENERAL GEOLOGY

The area investigated is underlain by yellow-green sandstones and gray shales of Upper Cretaceous age that dip gently to the southwest beneath the several thousand feet of Tertiary "red beds" and rhyolite volcanics that compose the Datil Mountains. Uranium deposition has been controlled by minor flexures, lithologic changes, and the presence of carbonaceous material at or near to the Baca-Mesaverde contact.

Stratigraphy

Age	Formation	Description
Miocene(?)	Datil volcanics	A series of gray tuffs, rhyolite, sandstone, and conglomerate; 1500+ feet.
Lower Tertiary(?)	Baca	Predominately red sandstone, siltstone and shale with some conglomerate at the top; 700 to 1500 feet.
Cretaceous	Chamiso member of the Mesaverde formation	Yellow-brown sandstone and gray shale, massive sandstone near top, local thin or carbonaceous shale and coal layers; 1800 feet.

A thickness of 500 to 700 feet of nearly flat-lying Datil volcanics form the resistant cap of the Datil Mountains. The volcanics rest conformably on more than 1000 feet of Baca "red beds" that outcrop on the middle and lower north slopes of the mountains. The Baca formation consists chiefly of friable red sandstone and siltstone. Near the base, the presence of coarser, light-colored sandstone and gray shales indicates that the basal sediments of the Baca formation in this area consist primarily of reworked Mesaverde detritus (Bachman, et al).

An erosional unconformity separates the Baca formation from the underlying Chamiso member of the Mesaverde formation. The contact zone is marked by widespread iron staining and the presence of carbonaceous material in the sandstone and shale in the top of the Chamiso member. North of the exposed contact, the Chamiso mesas are capped by massive, buff-colored sandstone that is as much as 100 feet in thickness. Beneath this caprock are thin-bedded to massive, lenticular sandstones alternating with gray to black shales, frequently carbonaceous. Locally, thin coal seams are present. A section of the Chamiso member, measured just northeast of the area under consideration, showed it to be at least 1809 feet in thickness.

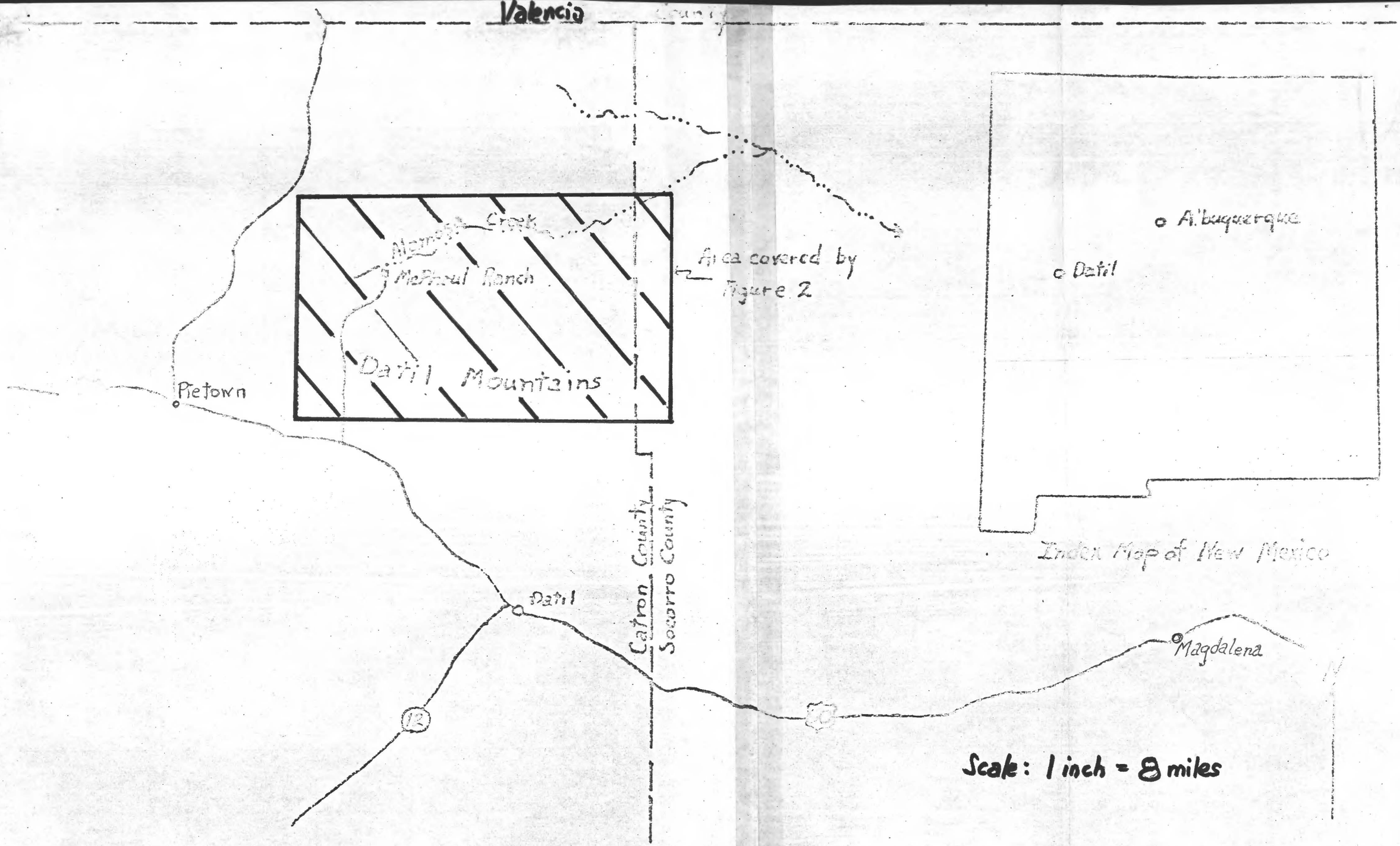
Igneous Rocks

A Late Tertiary basalt dike forms a prominent northwest-trending ridge several miles southwest of the mineralized area. This dike, which is as much as 20 feet in width and is nearly vertical, has been intruded along a normal fault. It is one of several major, parallel dikes in this region, and can be traced for nearly 15 miles northwest from its southern terminus near the crest of the Datil Mountains.

Structure

The geologic structure of the area is relatively simple. The Chamiso member of the Mesaverde, the Baca, and the Datil formations all display a regional dip of about 3^{o} to the southwest.

There has been no major folding of the beds, although minor synclinal flexures have apparently helped to localize uranium minerals in the Chamiso member near the McPhaul ranch house (Bachman, et al). Faulting is not common, but several normal faults of slight displacement are found near uranium occurrences, and one longer fault has channeled the intrusion of the basalt dike.



Location Map of Datil Mountains Area, Catron and Socorro Counties, New Mexico

Figure 1

URANIUM OCCURRENCES

Features of the Deposits

Extensive private prospecting, bulldozing and drilling have outlined an area of scattered occurrences of primary and secondary uranium minerals that has a linear extent of nearly 20 miles in the Datil Mountain area. Most of this uranium mineralization has occurred in the Baca-Chamiso contact zone, but small deposits have been discovered more than 100 feet stratigraphically above and below the contact.

Nearly all the deposits are small; they consist of uranium-bearing carbonaceous material, and uranium minerals deposited along sandstone-shale contacts and in iron-stained sandstone. The deposition of the uranium has apparently been controlled in part by the presence of carbonaceous material and clay galls, by minor structural warping and by variations in permeability in the host rocks. Visible uranium minerals, chiefly tyuyamunite and carnotite, are commonly associated either with detrital carbon in sandstone, with carbonaceous shale, or with thin coal seams. Clay fragments are ferruginous compounds, chiefly limonite, are almost always present in the mineralized zones. The greatest concentrations of uranium minerals are in dark gray to black bands or zones in sandstone, found both at the base of the Baca formation and at sandstone-shale contacts in the Chamiso member of the Mesaverde formation. The dark color of the bands in the sandstone is due to the presence of iron oxide, manganese dioxide, and possibly vanadium minerals. Assay data on selected samples of this dark sandstone show values of as much as 1.28% U_3O_8 and 1.00% V_2O_5, with an average of 0.15% U_3O_8 and 0.20% V_2O_5. In general, the chemically determined U_3O_8 content is slightly greater than that indicated by radiometric results. Anomalous radioactivity also can be detected over outcrops of limonite-stained Chamiso sandstone. No visible uranium minerals have been observed in these latter orange-brown sandstones, and analyses have shown that the radiometric assays range from two to ten times greater than the low chemical U_3O_8 content.

Although uranium minerals are widespread throughout the Baca-Chamiso contact zone, concentration of uranium minerals has been spotty and confined to thin zones. Local concentrations of ore grade uranium-bearing material are numerous, but in most of the known deposits only small tonnages of commercial grade ore are present.

Paragenesis

Preliminary evidence indicates that the uranium has been precipitated from circulating ground waters. The U.S. Geological Survey has sampled and analyzed water from a number of wells in the Datil Mountain area (Bachman, et al). Water from wells located near the known uranium deposits had an anomalous uranium content, with high of 0.036 p.p.b. compared with an average of 0.002 p.p.b. The chemical-radiometric disequilibrium displayed by both the limonite-stained sandstone, and to a lesser extent, the ore-bearing, dark-gray sandstone suggests that considerable leaching and redistribution of uranium has taken place. The presence of high uranium content in the ground waters near the deposits indicated that this process is still active.

It is possible that the source of the uranium is the overlying Datil rhyolitic volcanics, which display a higher than normal background radioactivity. Minor amounts of uranium could have been leached by ground waters from these volcanics and carried downward into the permeable red sandstones and siltstones of the Baca formation. A water analysis by the U.S. Geological Survey has detected 0.023 p.p.b. uranium in water from a well at the Double Circle Ranch south of the Datil Mountains. This well, drilled through the lower portion of the Datil volcanics, takes water from the underlying Baca formation. Its high uranium content suggests that leaching of the Datil volcanics is at present mineralizing the ground waters. The lack of precipitants in the Baca formation would delay deposition of uranium from downward percolating ground waters until the solutions came in contact with Upper Cretaceous sandstones and shale. Minor structural flexures in the Chamiso beds may have served to channel the ground waters to favorable zones where the presence of carbonaceous matter, clay galls, and a decrease in permeability resulted in the precipitation of uranium minerals.

McPhaul Ranch Area

North of the McPhaul ranch house in secs. 11 and 12, T. 2 N., R. 11 W., secondary uranium minerals occur in carbonaceous sandstone lenses within the massive sandstone caprock of the Chamiso member (fig. 2). Extensive private drilling and bulldozing have exposed a number of these deposits. All contained only spotty con of ore grade material. An initial shipment of 38 tons was made in March 1957.

Northeast of the McPhaul ranch house in sec. 14, a 50-foot adit has exposed a 1 to 6-inch thick layer of uranium-bearing dark gray sandstone at the contact of the massive sandstone caprock with the underlying gray shale.

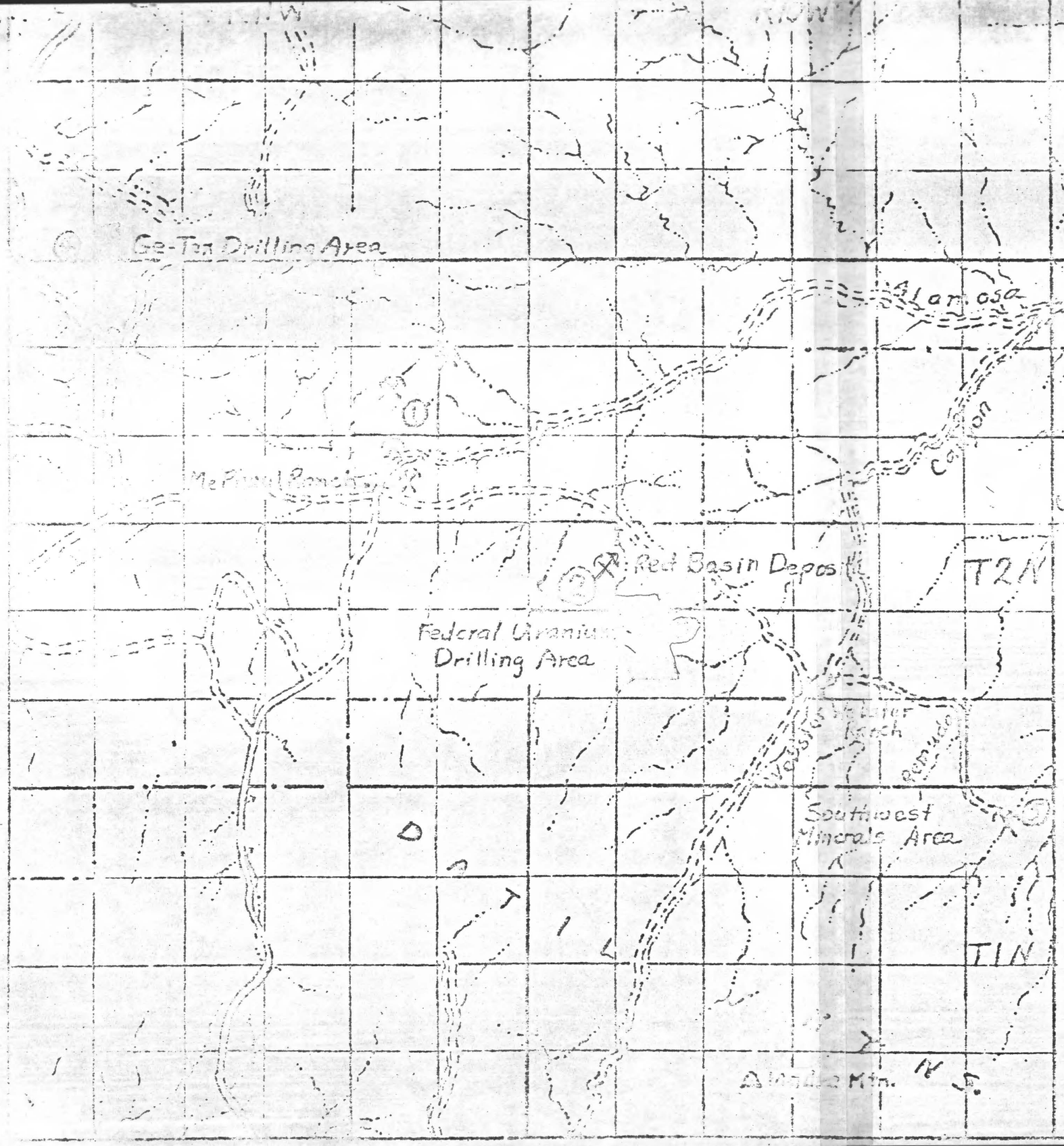


Figure 2.
Uranium Occurrences in the
Datil Mountain Area

1. McPhaul Ranch Area
2. Red Basin Area
3. Federal Uranium Area
4. Ge-Tex Drilling Area
5. Southwest Minerals Area
6. Rayborn Area

Scale: 1 inch = 2 miles

Red Basin

The Red Basin deposit, in sec. 19 T. 2 N., R. 10 W., contains the most promising ore body discovered in the Datil Mountain area. The mineralization occurred in a basal sandstone of the Baca formation that fills a channel-like depression cut into the top of the Chamiso member of the Mesaverde formation. This cross-bedded, basal sandstone is light gray in color, fine to medium-grained, and is composed chiefly of quartz grains. In the vicinity of the Red Basin claims this basal "channel" sandstone is a southeast-trending, lenticular mass of undetermined length, 1400 feet wide and as much as 80 feet in thickness. Small scattered lenses of mineralized, dark gray sandstone are found at several points at the base of this "channel" sandstone, but only near the western border of the "channel" in the mineralized zone thick and continuous enough to constitute an ore body.

The mineralized zone is characterized by an abundance of clay galls, carbonaceous material, and iron and manganese staining. A 6 to 18-inch thick layer of ore has been exposed for 70 feet in the Red Basin pit. More than 100 tons of ore have been stockpiled and 23 tons of ore, averaging 0.196% U_3O_8 and 0.30% V_2O_5, has been shipped to the Anaconda Company mill at Bluewater, New Mexico. Extensive private drilling has shown the uranium-bearing zone to extend for more than 600 feet southwest from the outcrop, and the limits of the ore body still have not been defined. Preliminary AEC ore estimates, based on the results of private exploration, include 1500 tons of indicated and 8500 tons of inferred 0.15% U_3O_8 ore. No work has been done on the property since the spring of 1955, and no further private exploration can be done until leasing arrangements are completed with the Santa Fe Railway Co.

Federal Uranium Drilling Area

In the summer 1956, Federal Uranium Company completed 10,350 feet of drilling in sec. 20 and 29, T. 2 N., R. 10 W., about one mile southeast of the Red Basin deposit. Uranium was detected both at the base of the southern extension of the Red Basin "channel" sandstone in the underlying Chamiso sandstone. Weak uranium content near the Baca-Chamiso contact was found for nearly 2 miles southeast from the Red Basin deposit.

As in the McPhaul and Red Basin area, the mineralization was controlled by minor structural flexures in the Chamiso member. From 1 to 3 feet of ore ranging from 0.10 to 0.50% U_3O_8 was detected in two areas in scattered drill holes that penetrated iron-stained and coaly, Chamiso sandstone at an average depth of 160 feet. Insufficient drilling has been done to determine if the Federal Uranium property is a potential producer, but preliminary evidence indicated that the ore bodies are small and at too great a depth to support mining operations at the present time.

Ge-Tex Drilling Area

Anomalous radioactivity and minor amounts of secondary uranium minerals have been detected by drilling the Ge-Tex Mineral Company in sec. 32, T. 3 N., R. 11 W. northwest of the McPhaul Ranch. The uranium is in carbonaceous material and along iron-stained sandstone-shale contacts within the Chamiso member. Mineralization occurred in two thin zones at 70 and 90 feet below the surface, and more than 100 feet beneath the Baca-Chamiso contact. The property has no commerical possibilities at present.

Southwest Minerals Property

A stream-deposited, pebbly conglomerate is exposed at the base of the Baca formation on the Southwest Minerals property in sec. 1(?), T. 1 N., R. 10 W. Very minor amounts of tyuyamunite have been found in the pebble conglomerate, and anomalous radioactivity is present in thin, black lenses of iron-stained sandstone within the overlying, red Baca sandstone. No ore grain material is exposed and none has been discovered by bulldozing and shallow drilling. The property has no commericial possibilities at present.

Rayborn Property

The Rayborn property is located on the north slope of the basalt capped Blue Mesa in sec. 6, T. 2 N., R. 8 W., Socorro County (fig. 2). Although extensive normal faulting in this area has tilted the Chamiso and Baca units 20^{o} to the south, the uranium occurrences are similar to those in the less deformed beds to the west. Anomalous radioactivity and minor amounts of tyuyamunite were discovered in limonite-stained, carbonaceous sandstone in the top of the Chamiso member. Although only limited exploration, by bulldozing and drilling, has been done, this property appears to be of doubtful commerical interest.

CONCLUSIONS AND RECOMMENDATIONS

There is widespread distribution of small deposits of secondary uranium minerals in the Datil Mountain area. The mineralization was controlled by minor structural features, carbonaceous material and changes in permeability in the host rocks at the Baca-Chamiso contact zone. Preliminary studies indicate that the mineralizing solutions were circulating ground waters that possibly derived their uranium by leaching, from the overlying Datil volcanics.

At most of the known occurrences, the favorable zones are thin and uranium mineralization has been irregular. Considerable tonnage of ore has been discovered in the Red Basin deposits, however, and this mineralized zone has been traced by Federal Uranium Company's drilling for about two miles along the contact zone.

It seems probably that similar but larger deposits will be found in the Datil Mountain area.

The upper Cretaceous-Tertiary contact can be traced eastward from the McPhaul Ranch area for more than 30 miles along the northern foothills of the Datil and Gallinas Mountains. The contact zone should be investigated by a careful ground reconnaissance with particular attention being paid to the lithologic and structural characteristics of the uppermost Cretaceous beds. In this way, favorable areas may be outlined for more detailed study or exploration.

Future AEC work should include following the results of exploration work now being done by several private companies active in the Datil Mountain area, to permit a more complete, final evaluation of the uranium potential of the area.

REFERENCES

Bachman, G. O., Baltz, E. H., Jr., and Griggs, Roy L., 1954; Geology of the Upper Alamosa Creek Valley, Catron County, New Mexico: U.S.G.S. unpublished report.

Winchester, Dean E., 1922; Geology of Alamosa Creek Valley, Socorro County, New Mexico: U.S.G.S. Bull. 716.