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FINAL REPORT
AIRBORNE RECONNAISSANCE PROJECT
DRIPPING SPRING QUARTZITE GILA CO. ARIZONA

R. J. SCHWARTZ & D. N. MAGLEBY

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UNITED STATES ATOMIC ENERGY COMMISSION
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FINAL REPORT
AIRBORNE RECONNAISSANCE PROJECT
DRIPPING SPRING QUARTZITE, GILA COUNTY, ARIZONA

By
Roland J. Schwartz and Dan N. Magleby

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September 7, 1955
Globe, Arizona

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GILA COUNTY, ARIZONA

ABSTRACT

A low-level airborne radiometric survey of the younger pre-Cambrian Dripping Spring quartzite, undertaken in the mountainous region lying roughly 100 miles east of Phoenix, was completed June 3, 1955. Twenty-seven radioactive anomalies were located. To date seven of these have produced uranium ore, four more will probably become producers, and six others may possibly become producers. Flying was concentrated in the Dripping Spring quartzite, but reconnaissance flights were made over other formations.

Private prospecting, both from the air and on the ground, increased considerably when the airborne project started. Eleven of the private discoveries have produced ore, and many others show considerable promise.

INTRODUCTION

An airborne radiometric survey was conducted by personnel of the Airborne Section, Technical Services Branch, Grand Junction Operations Office, in co-operation with the Phoenix Sub-office, Salt Lake Exploration Branch, Division of Raw Materials. This project was completed during the two winter seasons, March 5, to June 29, 1954, and November 8, 1954 to June 3, 1955.

This is the final report of the completed project with the preliminary report covering the first season's work [1] incorporated herein.

The project was set up to include the following nine priority areas, with varying intensities of coverage, in Gila, Pinal, and Pima Counties, Arizona (Figure 1):

Area No. 1 - Sierra Ancha Mountains between Cherry Creek and the Globe-Young Road.

Area No. 2 - Sierra Ancha Mountains between the Globe-Young Road and Tonto Creek.

Area No. 3 - Cherry Creek to Canyon Creek.

Area No. 4 - Salt River Canyon - Chrysotile - Cassadore Springs.

Area No. 5 - Mescal Mountains.

Area No. 6 - Dripping Spring Mountains.

Area No. 7 - McMillenville - Chrome Butte - Gilson.

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[1] Magleby, D. N. and Mead, W. E., Airborne Reconnaissance Project, Dripping Spring Quartzite, Arizona, U. S. Atomic Energy Commission RME-2023, 1955.

Area No. 8 - Kelvin to Santa Catalina Mountains along the San Pedro River.

Area No. 9 - Exposed Apache Group south-southeast of Roosevelt.

During the first winter season of flying, Areas Nos. 1, 2, and 5 were completed and Areas Nos. 3, 4, and 7 were partly completed. Twenty radioactive anomalies were found, eight of which appeared to have potential for uranium production.

During the second winter season, flying was completed in all nine priority areas except the upper Salt River Canyon in Area No. 4, where nearly ever-present turbulent air conditions restricted rim flying, and the small outcrops of Dripping Spring quartzite in the Santa Catalina Mountains and along the east side of the San Pedro River in Area No. 8. Seven new radioactive anomalies were found, two of which may become producing uranium mines. Four of the anomalies are on the Fort Apache Indian Reservation.

Prior to March, 1954, only two notable occurrences of uranium were known in the Dripping Spring quartzite; namely, the Red Bluff property in the southern Sierra Ancha Mountains and the Stockman-Shapp property about ten miles southeast of Young. During the last year, many miles of primitive access roads have been built, and considerable exploration and development work has been performed on numerous properties, some of which show considerable promise. To date the most productive section has been Area No. 1 in the Sierra Ancha Mountains.

Most of the outcrops of Dripping Spring quartzite covered by the survey are in the Tonto National Forest, Crook National Forest, San Carlos Indian Reservation, and Fort Apache Indian Reservation. Permission was obtained from the Tribal Councils to fly over the Reservations.

PHYSIOGRAPHY

The region covered by this project lies in the mountainous province known as the Southern Arizona Rockies or Mexican Highland which is a rough transition zone between the Colorado Plateau on the northeast and the Sonoran Desert Division of the Great Basin on the southwest. In general the topography is one of rugged mountains and steeply incised canyons. Cliffs, rims, hogbacks, and canyons make travel extremely difficult except along old established routes. The rough terrain largely limited low-level flying to days of calm, nonturbulent weather conditions.

The Sierra Ancha Mountains, Areas Nos. 1 and 2, are rugged and almost completely incised except for local flat areas underlain by resistant rocks, generally quartzite. Elevations range from 2,120 feet at Roosevelt Reservoir to 7,694 feet at Aztec Peak. Area No. 3, except for the precipitous canyons of Canyon Creek and its tributaries, and Area No. 4, except for the steeply walled Salt River Canyon, have more moderate terrain. The mountains have steep slopes and ledges but display few of the sheer cliffs so common in the Sierra Ancha Mountains. Except in the Gila River Canyon, the relief in Areas Nos. 5 and 7 is moderate. The mountains are of tilted fault blocks which have relatively gentle slopes on the southwesterly flanks and steep slopes, ledges, and low cliffs on the northeasterly flanks. Area No. 6 covers the rugged and steeply sloping Dripping Spring Mountains which are incised by many steep and narrow canyons. The northern part of Area No. 8 and the undesignated area flown west of Winkelman have rounded hills of older Precambrian granite and ridges and hogbacks

of steeply-dipping, folded, and faulted Apache and younger rocks. The terrain of Area No. 9 is extremely rugged and consists of folded, faulted, and tilted blocks of Precambrian and Paleozoic sediments and Tertiary volcanics. Canyons are steep and tortuous.

The only graded all-weather road through the Sierra Ancha area is the Globe-Young Road. Fair pioneer good-weather roads extend about halfway down the highlands between Cherry and Canyon Creeks and along the east side of Canyon Creek. Connecting roads between these and between the Globe-Young Road and Tonto Basin may be travelled only in fair weather and even then only by four-wheel drive vehicles. Very few roads enter, and only a few trails cross Areas Nos. 6 and 9 and the southern portion of Area No. 4. Networks of graded and ungraded roads serve the rest of the areas adequately, although some isolated spots can be reached only by foot or horseback.

In much of the region, travel off the roads and trails is made difficult by thickly growing, thorny brush. Timber which is present above elevations of about 5,000 feet can be used where needed in mining operations.

GEOLOGY

This mountainous region consists of older Precambrian schist, diorite, and granite overlain by the younger Precambrian Apache group, Cambrian Troy quartzite, post-Silurian Paleozoic limestones, and Tertiary volcanics. Erosion has denuded the Sierra Ancha areas almost completely of post-Cambrian rocks. Formations of the Apache group are extensively intruded by diabase, generally considered as a unit but known to consist of several separate intrusions which may range in age from late Cambrian to Tertiary.

A generalized columnar section for the Sierra Ancha area is as follows:

Age	Formation	Thickness (Feet)
Tertiary and Quaternary	Gravel and sand	
Cambrian	Troy quartzite (unconformity)	500-1000
Younger Precambrian	Vesicular basalt	0-75
	Mescal limestone	225-400
(Apache group)	Dripping Spring quartzite	450-700
	Barnes conglomerate	3-50
	Pioneer shale	150-250
	Scanlan conglomerate (unconformity)	0-75
Older Precambrian	Granite and schist	

The Dripping Spring quartzite, with which this radiometric survey was primarily concerned, may be conveniently separated into two divisions, now commonly known as the upper and lower members. In neither of the two members is there a marker bed widespread enough to serve as a reliable reference horizon. Distinctive beds which can be used locally as marker beds either lens out or undergo facies changes over short distances.

The lower member is medium to very fine grained, massively bedded, and sometimes obscurely cross-laminated and is about 300 feet thick. Gradational into the underlying Barnes conglomerate, it ranges upward from light red and reddish orange, highly arkosic quartzite, to very pale orange and grayish pink, relatively pure quartzite. It consistently forms sheer cliffs. Alternating light and darker banding of buff, yellow, pink, dull red, maroon, and/or brown on the weathered surfaces commonly gives the lower member a deceptive appearance of thin-bedding. Although locallly mudstone lenses are slightly radioactive, no uranium deposits are known in this member.

The upper member is distinctively marked by a platy-weathering type of thin bedding. About 300 feet thick, it is predominantly very fine grained and contains considerable clay and silt. In general it can be clearly divided into three units of almost equal thicknesses. The lowest unit consists of light grayish red and orange, siliceous siltstone and quartzite in alternating thick and thin beds. It is gradational into the middle unit which consists of light to dark gray, thinly laminated, often clayey, siliceous siltstone. On weathering the thin laminae usually break off in thin plates and the surfaces are commonly stained and coated with red to black iron and manganese oxides. Disseminated sulfides are common in the middle unit and transitional part of the lowest unit. The characteristic dark gray color of some of the strata is due to locally varying combinations of contained disseminated sulfides, carbon, manganese oxides, and/or dark ferro-magnesian minerals in the silt. The overlying unit grades from light colored, very fine grained, thin-bedded quartzite near the bottom to fine to medium grained, more thick-bedded quartzite near the top. Locally the uppermost 10 to 30 feet is platy and resembles the middle unit.

The upper member usually weathers to form ledges and steep slopes, but locally forms cliffs and produces odd-shaped spires and towers. Weathered surfaces are commonly a darker color than those of the lower member. A slight indentation is usually present at the base of the upper member. Locally, caves and overhanging walls above this indentation are the sites of ruins of ancient Indian cliff dwellings.

All uranium deposits now known in the Dripping Spring quartzite are confined to the middle and lower units of the upper member, with those in the lowest unit occurring in the upper or gradational zone.

In the area from Lookout (Greenback) Mountain to Buzzard Roost Mesa, uranium occurs in the upper member within a few feet of its contact with the lower member. However, a thinning of the upper member and paleo-channels in the lower member may indicate that the lowest unit of the upper member may be missing. The two principal rock types within the upper member that are favorable to uranium mineralization are: (1) Gray, thin-bedded, arkosic and argillaceous siltstone, and (2) metamorphosed equivalents of similar siltstone. The degree of metamorphism varies from coarse grained meta-syenite to fine grained, slightly feldspathized siltstone megascopically indistinguishable from normal silt stone.

Uranium minerals identified in the region include uraninite, coffinite, meta-torbernite, bassetite, uranophane, uranocircite, autunite, uraniferous hyalite, and, confined to the Tonto Basin lake beds, carnotite. Sulfides frequently associated with the uranium in the unoxidized zones are pyrite, marcasite, pyrrhotite, chalcopyrite, less commonly galena and molybdenite, and very rarely sphalerite.

Everywhere tested the upper member of the Dripping Spring quartzite was readily distinguished from similar appearing rocks by a high, rather uniform background radioactivity. Work done, but as yet unpublished, by Harry C. Granger and R. B. Raup, Jr., U. S. Geological Survey, indicates that this abnormal radioactivity may be due to potassium. The siltstone member of the Mescal limestone has a similarly high background radioactivity. However, even though select samples have assayed 0.07 to 0.09 percent eU_3O_8, to date no prospect examined in the Mescal limestone has shown promise of commercial production. A comparison of average radiometric backgrounds

of various formations is as follows:

Formation	Microamperes
Troy quartzite	125 - 200
Diabase	100
Mescal limestone	
Limestone members	125 - 150
Siltstone member	375 - 475
Dripping Spring quartzite	
Upper member	375 - 475
Lower member	250 - 350
Pioneer shale (highest in dark red phases)	250 - 350
Granite (pink or light colored) (high background produced by mass effect)	375 - 500
Background over water	75

Geologic and Radiometric Observations of Each Area Flown

Area No. 1 - Sierra Ancha Mountains between Cherry Creek and Globe-Young Road. Tonto National Forest.

Ref: McFadden Peak quadrangle.
Rockinstraw Mountain quadrangle.

Flying of this area was completed during the first part of the project. The two previously known occurrences of uranium in the region, the Red Bluff property on Warm Spring Creek and the Stockman-Shepp property on Wilson Creek, are at nearly the southern and northern extremities of the area. The relatively flat-lying strata have been profusely faulted, sometimes with considerable displacements, and intruded by diabase. In places along the west side of Cherry Creek, beds are steeply tilted and even overturned, probably due to drag folding. Twelve distinct anomalies and several locations of high background were found in the area. Pendleton Mesa registers abnormally high background which appears to be associated with the siltstone member of the Mescal limestone.

Many occurrences of uranium were found by private individuals during and following the airborne survey, including some near Ash and Horse Tank Creeks, from which anomalous radioactivity could not be detected from the air. Deep, narrow canyons which were impossible to check from the air but which now show promise include Devil's Chasm, Pueblo, Cold Spring, and Parker Canyons. In Horse Camp and China Spring Canyons promising areas went undetected from the air because tall timber prevented low-level flying. Because of the masking of radioactivity by soil, brush, and timber on north-facing slopes, some promising properties were not detected during the airborne survey.

Area No. 2 - Sierra Ancha Mountains between the Globe-Young Road and Tonto Creek.

Ref: Diamond Butte quadrangle,
Roosevelt quadrangle.

Flying of the large exposure of Dripping Spring quartzite was also completed in this area during the first part of the project. Only three weak anomalies were located. Faulting is not as pronounced as in Area No. 1, but considerable diabase is present. Locally much of the upper member of the Dripping Spring quartzite has been removed by erosion. The upper member is present in areas near Dutchman Butte, Lookout (Greenback), Lauffer (Buck), Copper and Chalk Mountains, and in the upper drainages of Rock, Gun, Spring, and Salome (Sally May) Creeks. Tall timber covering much of the upland area hindered low-level flying. The granite in Salome Creek registers a very high background. In the Salome area a thick diabase sill separated the Barnes conglomerate from very silicified Pioneer shale. Although basalt normally registers a low background as compared with other rocks, a Tertiary basalt capping Buzzard Roost Mesa has a very high radiometric background.

During and following the airborne survey, several promising occurrences of uranium were found by private prospectors. Largely because of inaccessibility, insufficient work has been done on these properties to prove their potential.

Area No. 3 - Cherry Creek to Canyon Creek. Tonto National Forest and Fort Apache Indian Reservation.

Ref: McFadden Peak quadrangle.
Blue House Mountain quadrangle.

The southern portion of the area from Mustang Ridge north to Rock House Creek was flown during the first season in 1954. The structure in Canyon Creek is similar to that in Cherry Creek, but very little diabase is present. Exposures from Mustang Ridge north to Keystone Ridge represent the uppermost strata of Dripping Spring quartzite. Willow Creek displays one of the most complete sections of Dripping Spring quartzite found in the region. Three weak anomalies and several areas of high background were found.

Flying in the northern portion of the area was completed in the 1954-1955 season. Five anomalies and several areas of high background were found. Four of the anomalies are on the Fort Apache Indian Reservation and the fifth is on Gentry Creek about one-half mile west of the reservation boundary. Recently two private companies have leased portions of the Fort Apache Indian Reservation and have started extensive exploration programs.

Ten percent coverage was given to a portion of the adjacent Supai formation with negative results.

Area No. 4 - Salt River Canyon - Chrysotile - Cassadore Spring. Fort Apache and San Carlos Indian Reservations and Crook National Forest.
Ref: Blue House Mountain quadrangle.

Outcrops of Dripping Spring quartzite in the San Carlos Indian Reservation and along Ash Creek and a general reconnaissance of the Salt River Canyon were flown during the spring of 1954. Two weak

anomalies and several areas of high background were located near Seneca in what appears to be the siltstone member of the Mescal limestone. Other areas of high background were noted near Ash Creek.

During the later 1954-1955 season, flying was completed in the area except for the east end of Salt River Canyon where almost ever-present turbulent air conditions prevented rim flying. No new anomalies were found.

Private prospecting on the ground located several promising uranium occurrences in the area.

Area No. 5 - Mescal Mountains.
San Carlos Indian Reservation (in part).

Ref: Ray quadrangle.

Flying of this area was completed early in 1954. Two uranium prospects were being worked at that time, but detailed airborne survey failed to detect any extensions of these privately discovered occurrences. Block faulting and tilting have imparted a 20 to 30 degree southwesterly dip to formations. The considerable faulting and intrusion by diabase make the Dripping Spring quartzite outcrops difficult to follow from the air.

Several private discoveries of uranium were found before and after the airborne survey, but to date few, if any, of these appear promising.

Area No. 6 - Dripping Spring Mountains.
Ref: Ray quadrangle.

A brief reconnaissance was flown early in the spring of 1954, and the flying was completed later in the 1954-1955 season. The Dripping Spring quartzite in this area is folded, faulted, and intruded by diabase. No anomalies were found, but high background radioactivity one-half to

one and one-half miles east of Tam O'Shanter Peak indicates a possible favorable area for ground prospecting. Claims covering this area have been filed, but to date inaccessibility due to the rugged terrain and deep canyons has prevented effective exploration and development.

Area No. 7 - McMillenville - Chrome Butte - Gilson.
San Carlos Indian Reservation (in part).

The outcrops of Dripping Spring quartzite in the San Carlos Indian Reservation were flown early in 1954, and the flying of the balance of the area was completed in the later season. Results were negative even though the radioactive background was considered favorable for possible anomalies. To date, such private discoveries of uranium as have been made in this area appear to be weak and unpromising.

Area No. 8 - Kelvin to the Santa Catalina Mountains along the San Pedro River.

Ref: Ray quadrangle,
Crozier Peak quadrangle,

The steeply dipping outcrops of the Apache group south of Kelvin and west of Winkelman were flown in the late 1954-1955 season. Formations are highly folded and faulted, and the characteristic thin-bedded upper member of the Dripping Spring quartzite is largely missing in this area. One weak anomaly was detected in a fault zone in the Dripping Spring quartzite west of Winkelman. Private prospecting, not very active until after the posting of the anomaly maps, is just starting to make a few finds of uranium occurrences, but as yet none of these appear to offer much promise.

Outcrops southeast of Winkelman along the east side of the San Pedro River and in the Santa Catalina Mountains were not flown.

Area No. 9 - Exposed Apache group south-southeast of Roosevelt. Crook National Forest (in part).

Ref: Roosevelt quadrangle.
Haunted Canyon quadrangle.
Picketpost Mountain quadrangle.

Scattered outcrops of the Apache group from Roosevelt southeast to Castle Dome, south to Superior, and west to, and including in part, the Superstition Wilderness were flown during the 1954-1955 season. This was one of the most difficult areas to fly because of the rugged, chopped-up terrain in this intensely faulted region. One weak anomaly was found in a shear zone in the Dripping Spring quartzite northwest of Superior. Areas of high background radioactivity that appear to warrant ground prospecting were detected near Apache, Burro, and Red Rock Springs, Haunted Canyon quadrangle.

Private prospecting has located a few occurrences of uranium, but samples taken so far do not indicate much promise for the area.

Undesignated Areas:

1. Tertiary lake sediments in Tonto Basin which include the sediments bordering Roosevelt Reservoir and Tonto Creek north to Gun Creek were given 50 percent coverage. Highest background readings were associated with sediments having a high lime content. Previously discovered carnotite in the lake beds on the east side of the basin could not be detected from the air.

2. Igneous rock outcrops west of the Tortilla Mountains and east of Florence for a north-south distance of about ten miles were given 50 percent coverage. Ground detected radioactivity associated with copper in shear zones in granite could not be pinpointed from the air. Acid or light colored igneous outcrops and areas

of limonitic staining registered the highest background radioactivity. Flight lines were adjusted to include prospect pits and old mine workings. No anomalies were found.

3. About four hours of reconnaissance flying was done in the Verde River Valley between Verde Hot Springs and the Salt River. No anomalies were found.

Summary of Airborne Anomalies, Dripping Spring Quartzite, Arizona:

(SEE ATTACHED SHEETS)

Summary of Airborne Anomalies, Dripping Spring Quartzite, Arizona

Anomaly Property Name	Location Sec.	T.	R.	Date Discovered	Initial Assays eU_3O_8	Initial Assays cU_3O_8	Remarks
B6-1 Juniper & Deer Foot	14	5N	13E	3/18/54		0.04	Probably of no economic value
B6-2 Lamanite	19	5N	15E	3/31/54	0.33 0.05	0.04 0.08 1.00	Possible potential
B6-3 Laminite	19	5N	15E	3/31/54	0.05	0.06	Possible potential no work done
B B6-4 Donna Lee	13	5N	14E	4/2/54	0.17	0.17	Produced ore
B6-5 Black Brush	4	6N	14E	4/5/54	0.06 0.38	0.43 0.35	Produced ore, visible primary uranium
B6-6 Grindstone (?)	12	6N	14E	4/6/54	no samples		Doubtful potential
B6-7 Little Joe	19	6N	14E	4/12/54		0.17	Produced ore
B6-8							
B6-9 Workman	19	6N	14E	4/12/54	0.30 0.05	0.23 0.04	Produced ore, visible primary uranium
B6-10							
B6-11 Hope	19	6N	14E	4/12/54	0.53 0.05 0.05	0.47 0.04 0.04	Produced ore, visible primary uranium
B6-12 Walnut Creek	14	8N	14E	4/20/54	0.03	0.01	Doubtful potential
B6-13 Blevins Canyon	1	6N	12E	5/5/54	0.01	0.01	Doubtful potential may improve
B6-14	35	8N	11E	5/11/54	0.01		Probably of no economic value
B6-15 Pranty	6	7N	12E	5/15/54	0.02		Probably of no economic value

Anomaly Property Name	Location Sec.	T.	R.	Date Discovered	Initial Assays eU_3O_8	cU_3O_8	Remarks
B6-16							
B6-17					0.01		Mescal siltstone,
San Carlos Res.	15	5N	17E	5/24/54	0.01		no economic value
B6-18							
Ft. Apache Res.	21	6N	15E	5/25/54	0.04		Doubtful potential may improve
B6-19							
Ft. Apache Res.	1	6N	15E	6/21/54	no samples		Probably of no economic value
B6-20							
Ft. Apache Res.	33	6N	16E	6/25/54	no samples		Doubtful potential
B6-21							
Ft. Apache Res.	21	8N	15E	12/8/54	0.03		Possible potential
B6-22							
Ft. Apache Res.	28	8N	15E	12/8/54	no samples		Probably of no economic value
B6-23							
Ft. Apache Res.	29	8N	15E	12/15/54	no samples		Doubtful potential
B6-24					0.26		Possible potential
Roxy	27	9N	15E	1/10/55	0.24		
B6-25	4	8N	15E	1/31/55	0.13		Possible potential
Ft. Apache Res.	Navajo County						
B6-26	13	1S	11E	1/4/55	0.06		Doubtful potential
Western Uranium	Pinal County						
B6-27	25	5S	13E	4/11/55	no samples		Probably of no economic value
	Pinal County						

Note: All anomalies are in Gila County and are in the upper member, Dripping Spring quartzite, except where noted.

AIRBORNE PROCEDURE

A Piper PA-18 airplane, piloted and maintained by T. E. Kocher and equipped with a Mark VI Scintillometer, was used in this survey. The Scintillometer was checked periodically with a calibration pot to assure standardized readings. Falcon Field, east of Mesa, Arizona, where gas, hanger space, and ship facilities were available, was used as a base of operations. Communications were made by radio with the Phoenix CAA Communications Station to obtain aviation weather and to file "round-robin" flight plans. Unimproved air strips, one at Cutter near Globe, a second at Punkin Center north of Roosevelt, and a third adjacent to the Globe-Young Road about three miles southwest of the Red Bluff property were used to meet ground personnel.

Rim-type coverage was employed on steep slopes and rim-forming structures, making passes at the outcrop in contour intervals of 50 to 75 feet. In 50 percent coverage the flight lines were at about 100-foot contour intervals. Grid-type coverage was employed only in portions of the less rugged areas. With this type of flying, the flight lines were spaced from 100 to 200 feet apart at altitudes ranging from 25 to 200 feet, depending upon timber and topography. Grid flying was best accomplished by flying parallel to the drainage. Criss-cross flight lines were made in areas of known and detected anomalous radioactivity in attempts to find extensions or to pinpoint the source. Special thoroughness was given to all visible and known faults and to areas of limonitic staining.

The Gripping Spring quartzite was given 100 percent coverage and the other formations of the Precambrian Apache group were given

50 percent coverage. Only 10 - 15 percent coverage was given the Cambrian Troy quartzite in Areas Nos. 1 and 2. During days of wind and turbulence in the mountainous terrain, some 50 percent grid coverage was given the Tertiary lake sediments in Tonto Basin and the igneous outcrops in the flat terrain west of the Tortilla Mountains and east of Florence.

Despite the tight network coverage, some anomalous radioactivity went undetected from the air and was later located by intense and careful ground prospecting. Assurance of 100 percent "finds" of anomalous radioactivity was difficult because of rugged topography, high timber, soil cover, and the everywhere high radiometric background of the upper member of the Dripping Spring quartzite, which background tends to mask anomalous radioactivity from airborne detection. Most of the uranium occurrences undetected by airborne methods are on north-facing slopes.

Topographic maps were used to plot progress and locations of radioactive highs. Geologic information was taken from the Arizona State Geologic Map.

A summary of the flying time was:

	1954	1954-1955
Rim and grid	131:18 hours	144:05 hours
Reconnaissance	34:12 hours	84:30 hours
Cross-country	86:48 hours	114:20 hours

This time was used in flying about 350 miles of rim and 25 square miles of grid in the 1954 season and 455 miles of rim and 300 square miles of grid in the 1954-1955 season. Part of the reconnaissance is radiometric and part of the cross-country can be considered visual reconnaissance. The 1954-1955 season was characterized by more than the normal amount of wind, turbulence, and unstable air which hampered

low-level flying, especially in the mountainous terrain.

GROUND INVESTIGATIONS PROCEDURES

During the 1954 season, a Model 111 Precision Scintillator was used in ground checking the anomalies. A four-wheel drive vehicle afforded transportation except in Cherry Creek and the interior of Areas Nos. 2 and 3 where hiking or pack mule was necessary. Air to ground communication would have been helpful in directing ground crews to the radioactive anomalies.

During the 1954-1955 season, ground checks were not made on anomalies prior to posting, consequently anomalies discovered during this season, especially the weaker ones, received only cursory examinations.

SUMMARY AND CONCLUSIONS

This airborne radiometric survey not only located twenty-seven radioactive anomalies and many areas of high background, but also aroused considerable interest in the Dripping Spring quartzite and incited intense private activity in the region throughout 1954 and early 1955. Private prospecting has abated considerably since early 1955, but it still continues in the more inaccessible areas. Several of the uranium occurrences found by both airborne survey and private prospecting have produced commercial ore and many others show considerable promise. However, to date insufficient exploration, development, and mining have been done to ascertain the extent or grade of the many uranium deposits now known in the Dripping Spring quartzite. Very little work has been done on a number of promising prospects because of inaccessibility and the need for costly access roads. The recent opening of a uranium ore buying station at Cutter, near Globe, stimulated renewed activity in the nature of access road building and extensive exploration and development.

Some specific conclusions are:

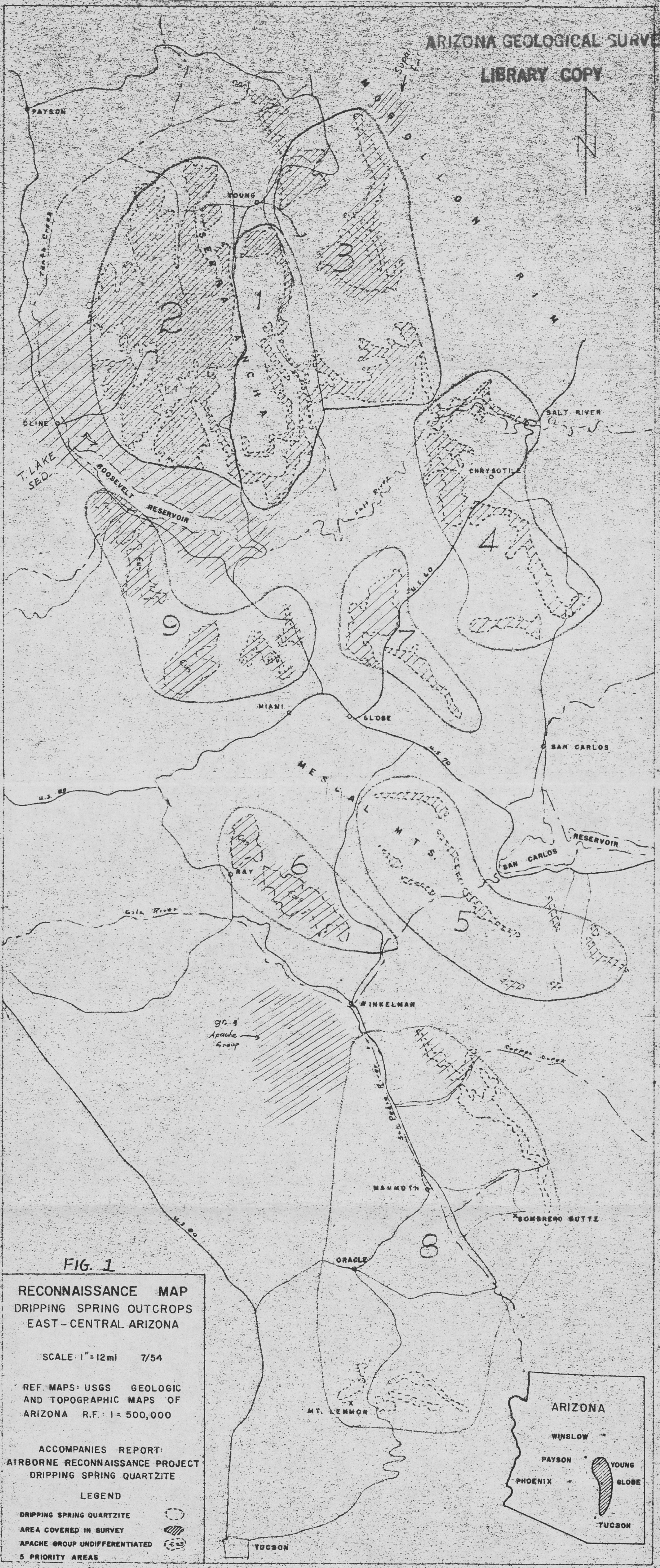
1. The upper member of the Dripping Spring quartzite has a constant abnormally high background radioactivity, about equal to that of granite, which is probably due to potassium.

2. All known commercial uranium deposits in the Dripping Spring quartzite are restricted to the middle unit and upper gradational zone of the lower unit of the upper member.

3. The host rocks for the uranium deposits consist primarily of two rock types: gray, thin-bedded, argillaceous, and arkosic siltstone, and metamorphosed equivalents of the same or similar siltstone.

4. Diabase is not everywhere exposed in areas of anomalous radioactivity, but in some areas it appears to have a direct relationship, either genetic or structural, to the uranium mineralization. Certainly, outcrops of the favorable beds of Dripping Spring quartzite near even slightly discordant diabase seem to be the most likely locations for prospecting and exploration.

5. Fractures are of obvious importance in the control of secondary ore and in some cases of primary ore, but in other cases of primary ores their importance, if any, is completely obscured. All other factors being favorable, it appears to be propitious to explore along fractures trending roughly north 20° east or north 70° west, wherever possible.



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