Uranium mineralization in the Guindani Canyon area of the northern Whetstone Mountains, Cochise County, Arizona

by

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Arizona Geological Survey Contributed Report CR-08-B

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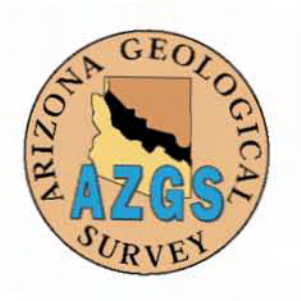

Arizona Geological Survey
Contributed Report CR-08-B

Proposed Mineral Withdrawal, Guindani Basin Area

Northern Whetstone Mts., Cochise County, AZ

Russell M. Corn (Registered Geologist)

The Coronado National Forest proposed a mineral withdrawal of approximately 2,600 acres covering all of the Guindani Basin drainage as shown on the attached copy of a topographic map. The proposed withdrawal includes virtually all of the Northern Whetstone Mining District, an area with numerous old small mines, prospects, known occurrences and past production of uranium, tungsten, fluorite and silica. It also includes the entire surface exposures of unusual alaskitic altered granite that contains disseminated fluorite and uranium minerals. Attached are copies of gamma logs and uranium assay logs fro three drill holes in the alaskite and a copy of a summary of Rocky Mountain Energy's drilling results for uranium in shear and fracture zones on claims north of the alaskite exposures.

The uranium exploration effort was carried out between 1973 and 1976 and the effort was terminated when the bottom dropped out of the uranium market. As indicated by the drill logs, the alaskitic altered granite is the source of soluble uranium that was precipitated in a supergene enriched zone in the alaskite and also mobilized laterally to be precipitated in fractured and sheared zones in granite and other reactive rocks. The soluble primary uranium mineral is believed to be brannerite (uranium – titanium oxide) and primary uranium values in the alaskite appear to be 20- to 30-ppm U_3O_8. Surface radioactivity over the leached alaskite is abnormally low except where seeps of ground water exhibit emanations of radon.

The proposed withdrawal stands out because of its excessive size. At 2,600 acres, it is far larger than the normal Forest Service withdrawal. It appears probable that the extensive withdrawal was proposed primarily because the area exhibits numerous mineral occurrences, past mineral production and has been of previous exploration interest. Although none of the known mineral occurrences are currently economically viable, these features are exactly the characteristics that indicate a favorable exploration potential and the possibility of undiscovered economic mineral deposits.

The indicated reason for the proposed withdrawal is "protection of the watershed above Kartchner Caverns State Park". The caverns are a wet cave system that depends upon near-surface ground water for moisture. Guindani Canyon is an ephemeral watercourse that only carries water during storms with the runoff dissipating and sinking into the valley fill alluvium. It is not know whether the Forest Service or Park personnel have any data on ground water in either the major mountain front fault zone west of the caverns or in the alluvium in the vicinity of the caverns. Surface runoff from Guindani Basin should be relatively free of uranium or other metal contaminants. However, ground water withdrawal that taps fractures at depths within the zone of uranium enrichment in

both the alaskite and granite will result in mobilization and migration of uranium and radon.

In my opinion, the Forest Service and State Park objective could be accomplished with a less extensive mineral withdrawal together with State Park control over the use of surface and ground water in the entire vicinity of Kartchner Caverns. Reportedly, the proposed withdrawal is being considered by upper levels in the Forest Service and will be transferred to the State Office of the Bureau of Land Management for their review and approval. The application requesting withdrawal from mineral entry was published in the Federal Register dated 30 October 2006. The proposed withdrawal was identified as Guindani Basin (AZA 33316). Should you or your Agency wish to comment on the proposed withdrawal, comments should be directed to Elaine Zielinski, State Director, Arizona State Office, Bureau of Land Management, One North Central Ave, Phoenix, AZ 85004.

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Uranium mineralization in the Whetstone Mountains

Introduction

Rain and snow contain dissolved oxygen because of equilibration with atmospheric oxygen. In contrast, groundwater deep in the Earth, especially at depths of hundreds to thousands of meters, contains little dissolved oxygen. As erosion gradually lowers the Earth's surface, oxygen-bearing groundwater gradually gains access to rock within the Earth that had not previously been exposed to oxidizing conditions. Uranium is generally stable under anoxic conditions, but is dissolved and transported by oxidizing waters. Gradual downward movement of uranium with a lowering groundwater table may produce a uranium enrichment zone at depth (supergene enrichment) overlain by rocks that have been depleted in uranium. Uranium may also be carried laterally for great distances away from sites where it was dissolved, and may be concentrated in secondary, supergene deposits.

Uranium Mineralization

Four types of uranium mineralization have been described from the northern Whetstone Mountains, including 1) in sulfide veins and localized in the margins of basic dikes, 2) in shear and fracture zones cutting granite and alaskite, 3) as a flat laying supergene enrichment zone in alaskite localized at the water table in the Guindani Basin area, and 4) exotic deposits of uranium transported outside of the Whetstone Mountains and redeposited elsewhere. All four of these depositional habits are the result of leaching of uranium from a source rock and migration through the groundwater system into reducing environments where the uranium was precipitated. The source of the uranium concentrated in any of theses deposits types is most likely the alaskite which prominently exposed in Guindani Basin (Creasy, 1967).

The alaskite in Guindani Basin is a medium to coarse-grained, muscovite-only, highly siliceous, porphyritic leucogranite of Precambrian age. It contains minor pyrite, disseminated fluorite, and quartz and fluorite veinlets. The primary uranium mineral in the alaskite is believed to be brannerite as evidenced by felty TiO_2 in voids centered within reddened radiation halos. Mineralization of economic interest occurring within and near the Guindani Basin alaskite is limited to the lithophile assemblage of fluorite, tungsten, uranium, and silica.

Geochemical testing by the U.S. Geological Survey (Drewes and Bultman, 1996) demonstrated elevated levels of these and other lithophile elements in the area, associated with anomalously low values for some other element groups such as chalcophiles and siderophiles, confirming the relationship of these lithophile elements and the alaskite. Past production of locatable minerals within and adjacent to the alaskite includes uranium, tungsten, fluorite and silica. Several mineral exploration programs conducted in

the area over the past 50 years have been directed toward the identification of uranium resources as described below.

Supergene uranium mineralization in the Whetstone Mountains

Supergene uranium mineralization within the alaskite was the target for a drilling program in Guindani Canyon by Kerr-McGee Corporation in 1978. The one vertical and two angle holes drilled by Kerr-McGee encountered prominent supergene uranium mineralization that generally occurred as sooty black material in seams and on fracture surfaces. A perched, near-surface supergene zone in one angle drill hole exhibited oxide uranium minerals (autunite and torbernite) and averaged near 0.01% U_3O_8 (100 ppm) over a 27.5 foot interval. The supergene zone encountered in the other drill holes was a 30- to 50-foot interval averaging 50- to 70-ppm U_3O_8. Included in this zone were thin, 3- to 5-foot intervals with values in excess of 0.02% U_3O_8. In contrast, the indicated primary uranium values at depth beneath the supergene zone were 20- to 30-ppm U_3O_8 and the thoroughly leached alaskite near the surface contained only 3- to 5-ppm U_3O_8.

Uranium exploration in the mid-1950's concentrated on a series of veins, dikes and shear zones in the Cottonwood Canyon area north of Guindani Basin. The mineralized veins are localized in sections 9 and 10, T. 18 S., R. 19 E., and are hosted in a two-mica phase of the granite. The veins include sulfide minerals such as galena, sphalerite, and chalcopyrite with their oxidation products as well as local occurrences of uranium mineralization. Uranium is also localized in shear zones within the Cottonwood Canyon area which was the target of the Rocky Mountain Energy uranium exploration drilling in 1978.

During the early 1950's, approximately 600 tons of uranium ore grading 0.11% U_3O_8 were shipped from the Bluestone or Lucky Star No. 1 Mine on the north flank of Guindani Canyon (SE1/4, NE1/4, Sec. 25, T. 18 S., R. 19 E.), within the east-central part of the Guindani Canyon alaskite. Secondary uranium minerals at the Lucky Star, including uraninite, occur along the contact of the alaskite with an andesite dike striking N 8° W, dipping 35° W. Normally, andesitic rocks are deficient in uranium in comparison to granite. However, during the weathering process, mafic rocks such as andesite create a reducing environment which will precipitate uranium from groundwater.

A possible fourth type of deposit was reportedly searched for at the northern end of the Whetstone Mountains, 3.2- to 8.1-kilometers (2- to 5-miles) north of the alaskite, and in the margins of the San Pedro Basin, 1.5 kilometers (1 mile) or so east of Kartchner Caverns, along the projected subsurface outflow zone from Guindani Basin (e.g., Shipman and Ferguson, 2003). This potential style of uranium mineralization is only inferred by indirect field evidence and anecdotal accounts by local ranchers, Cochise County mining claim records, and personal recollections. Reportedly during the late 1940's and early 1950's a number of deep pits were dug by Sohio (now Exxon) and/or other oil companies on the broad, alluvial covered pediment between the northern end of the Whetstone Mts, and Interstate 10. They were reportedly testing for possible uranium mineralization in what was described as black dirt noted at the bottom of many of the pits

(Sebring, 1997, reference uncertain) who described a number of widely spaced, deep pits in the area, now mostly sloughed in. Possibly, the black dirt is black shale related to the partially lacustrine, Oligocene to lower Miocene Pantano Formation, although no black shale has been recognized in nearby areas (Spencer et al., 2001; Skotnicki, 2001), or to the Fort Crittenden Formation or Bisbee Group. Such black shale could represent a strong reducing environment capable of precipitating uranium from groundwater after it had been leached out of the alaskite in the northern Whetstones. Uranium occurrences in this type of environment have been identified elsewhere.

Also, in 1978 St. Joe American tested the valley sediments directly east of Guindani Basin for a somewhat similar target based on assumed leaching of uranium from Guindani Basin and precipitation in adjacent sediments. The results of their work are unknown but can be assumed to be negative.

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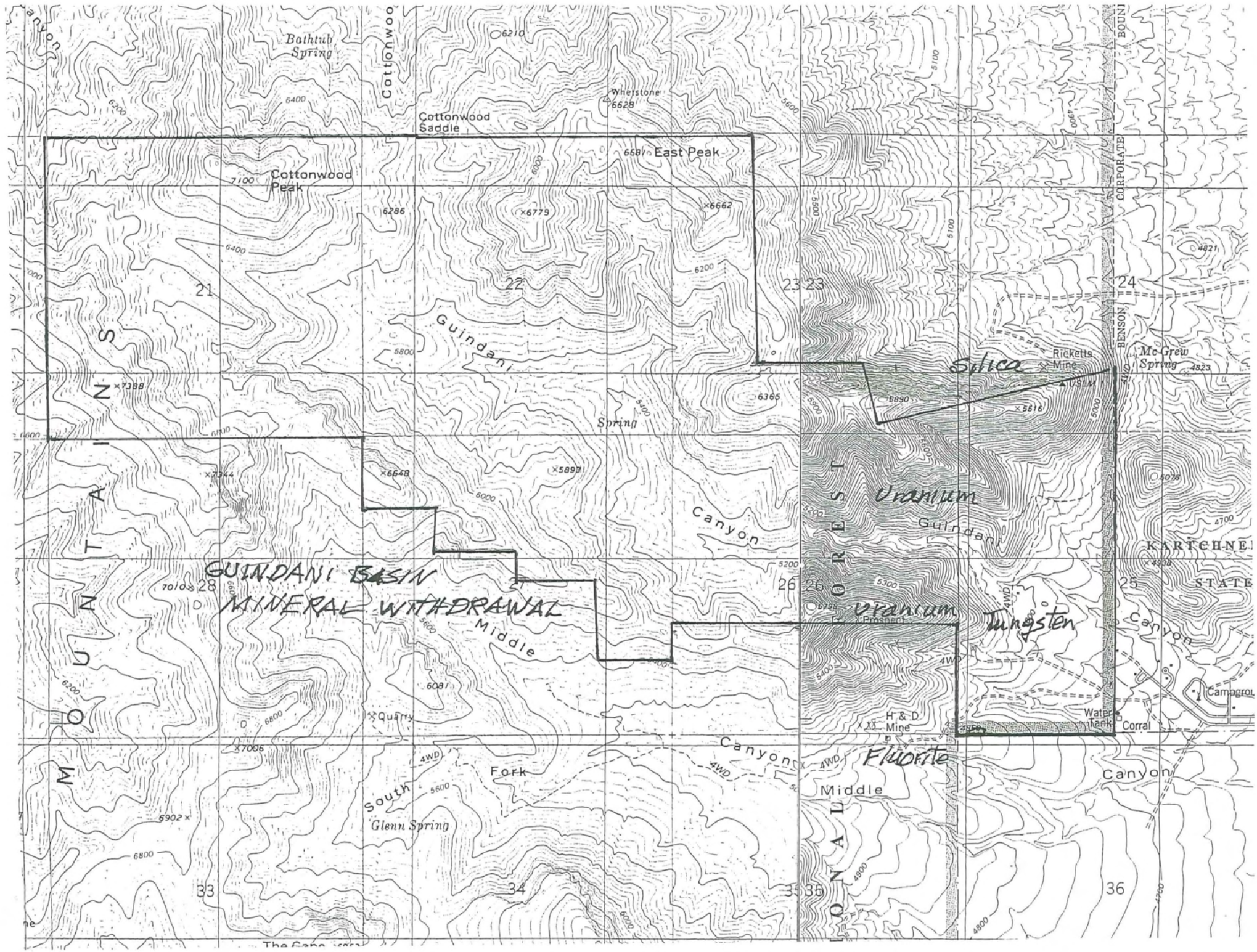
GUINDANI BASIN
MINERAL WITHDRAWAL
Bathtub Spring
Cottonwood Saddle
Whetstone 6628
East Peak
Cottonwood Peak
Guindani Canyon
Spring
Middle Canyon
South Fork
Glenn Spring
Quarry
Ricketts Mine
McGrew Spring
Silica
Uranium
Uranium
Tungsten
Fluorite
H & D Mine
Prospect
Water Tank
Corral
Campgrou
KARTCHNE
STATE
CORPORATE BOUNDARY
BENSON
MOUNTAIN
CONNAUGHT FOREST
21
22
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Whetstone Mountain Project Summary

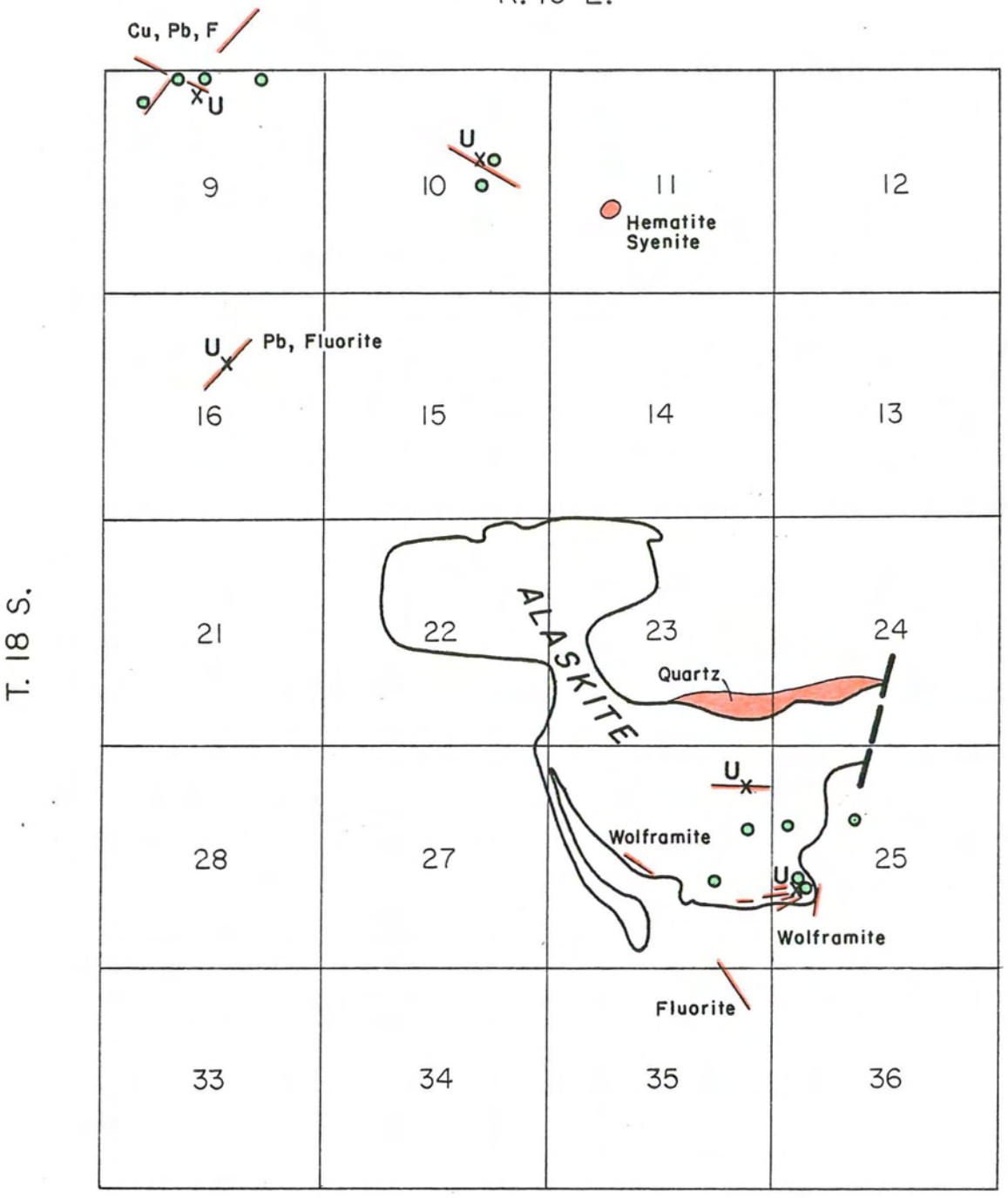
Location: The Whetstone Mountain Project is situated in northwestern Cochise County, Arizona, 40 miles southeast of Tucson.

Land Position: RMEC controls a total of 5700 acres of National Forest land with 285 lode mining claims.

Exploration to Date: Project evaluation has undergone several stages of exploration. Initially an airborne radiometric and magnetometer survey was employed to identify anomalous zones. Preliminary mapping of the property was accomplished on a scale of 1" = 500 ft. with more detailed mapping in three selected areas. Radon emanation surveys were utilized to evaluate the major shear zones. Additionally, a spectrometer survey covering the area was conducted on a 300 ft. grid. Several drilling programs totalling 19,148 ft. in 55 holes have tested favorable targets.

Classification of Occurrence: Uranium mineralization has been emplaced within fracture surfaces and voids along major zones cutting a Precambrian two mica granite porphyry. Wall rock alteration has accompanied the introduction of the hydrothermal uranium bearing fluids.

Results: Subsurface investigations have resulted in locating two encouraging mineralized areas. Several targets have yet to be tested. 58% of the drill holes encountered 0.01% U_3O_8 or better. 30 of the 55 holes drilled were to satisfy the claim validation requirements. The best mineralized drill hole intercepts included 11' of 0.23% eU_3O_8 at 50 ft.; 36' of 0.05% eU_3O_8 at 52 ft.; 8' of 0.10% eU_3O_8 at 418 ft. down hole: 7' of 0.27% eU_3O_8 at 302 ft. Drill hole density is not sufficient to establish continuity of the mineralized trends. Structurally prepared zones are present where potential high grade reserves of greater than 5 million pounds could be deposited down dip.

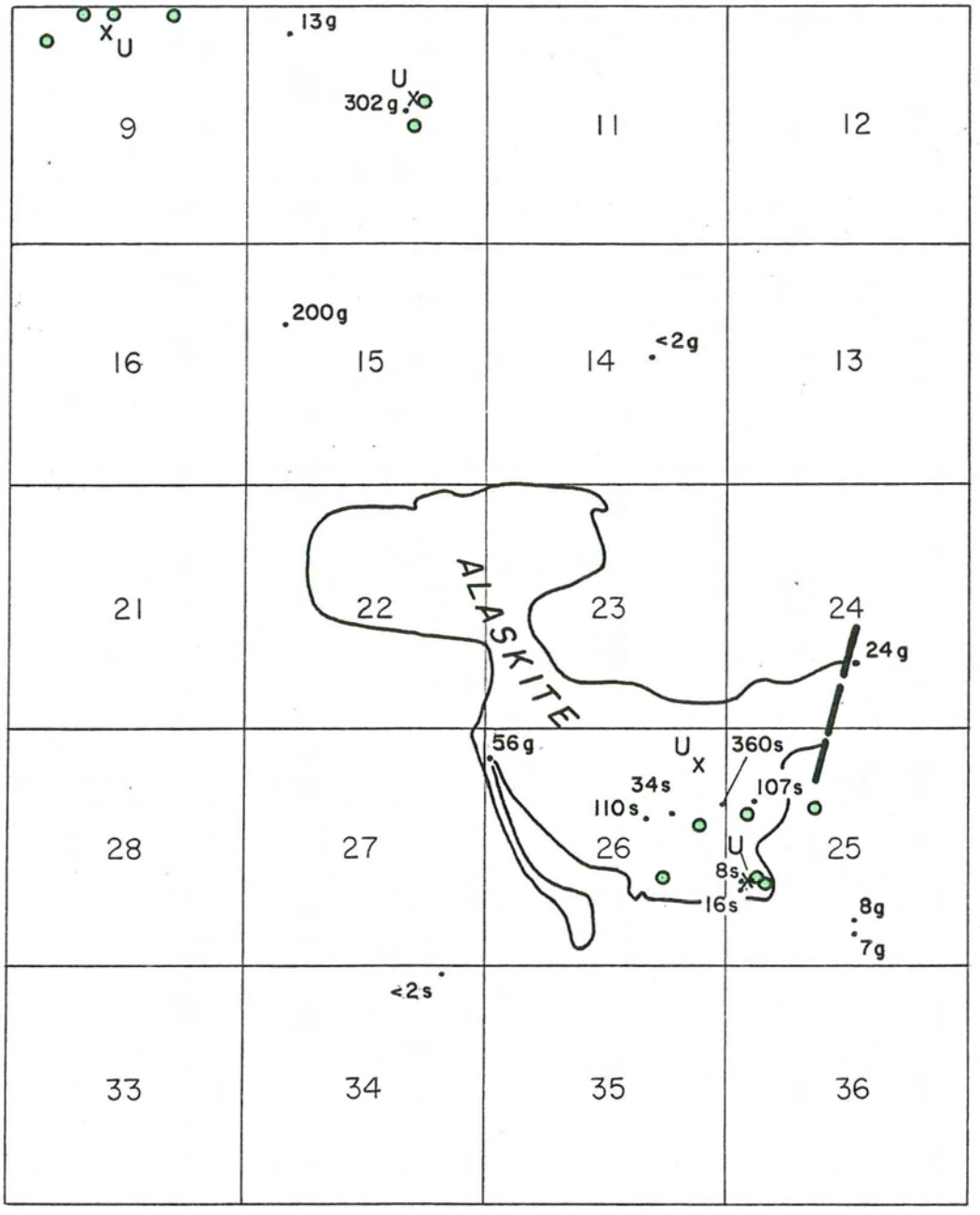


GENERALIZED MINERAL AND METAL DISTRIBUTION
WHETSTONE DISTRICT
COCHISE COUNTY, ARIZONA
1 INCH = 4,000 FEET

U_X Uranium Prospect
o Drill Hole
— Vein or Zone of Mineralization

R. 19 E.

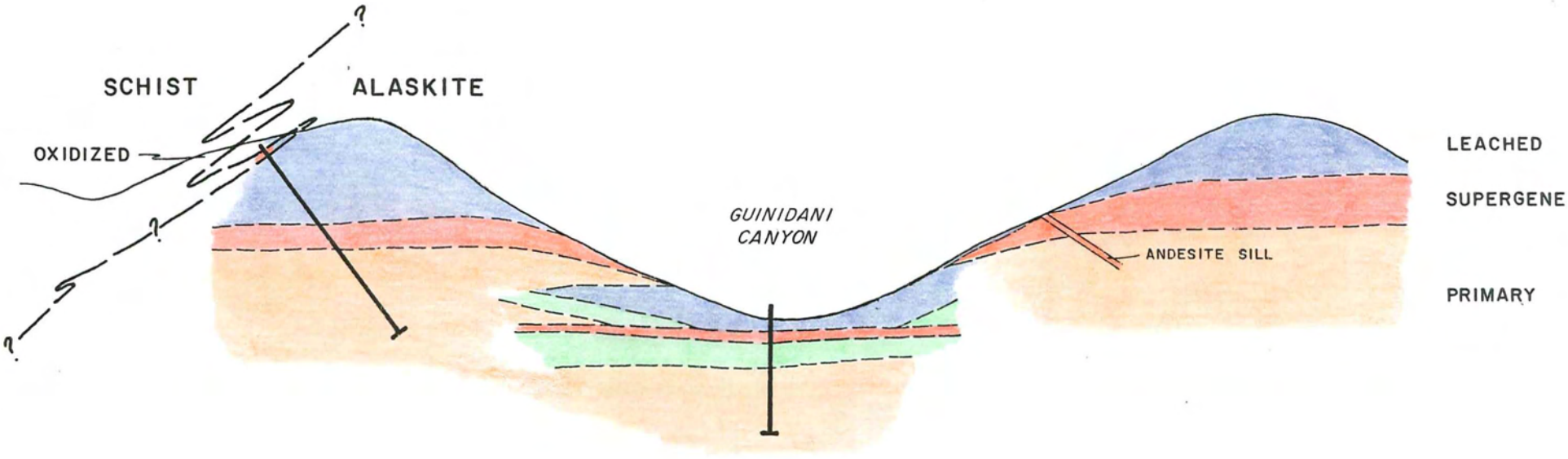
T. 18 S.



GENERALIZED PATTERN OF URANIUM IN WATER
WHETSTONE DISTRICT
COCHISE COUNTY, ARIZONA

1 INCH = 4,000 FEET

Water Sample Site
g. Ground water
s. Surface water
54 PPB U
U_X Uranium Prospect
o Drill Hole



GENERALIZED SECTION (LOOKING NORTHWEST)

SHOWING THE ZONES OF SUPERGENE ENRICHED URANIUM MINERALIZATION

WHETSTONE ALASKITE
COCHISE COUNTY, ARIZONA

1 INCH = 500 FEET

lbs. U_3O_8 /ton

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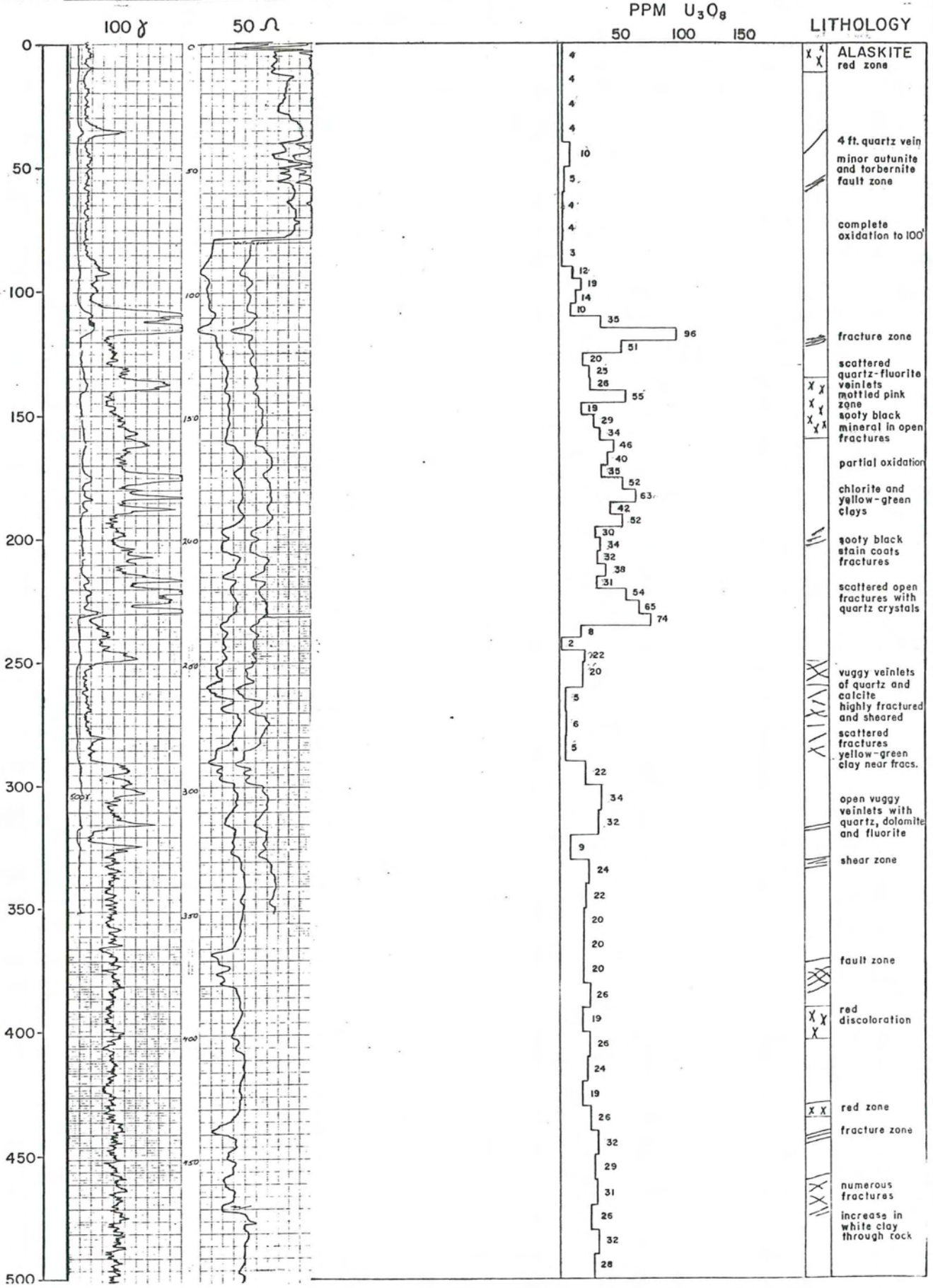
.02 - .04	>.10

KERR-McGEE CORPORATION
SUMMARY DRILL HOLE LOG
SCALE 1" = 50'

PROJECT WHETSTONE
LOCATION Sec 25 T18S R19E
COCHISE CO. ARIZONA

DRILL HOLE NO. W-1
BEARING
TOTAL DEPTH 840 ft.

PAGE 1 OF 2
DIP 60°
BY

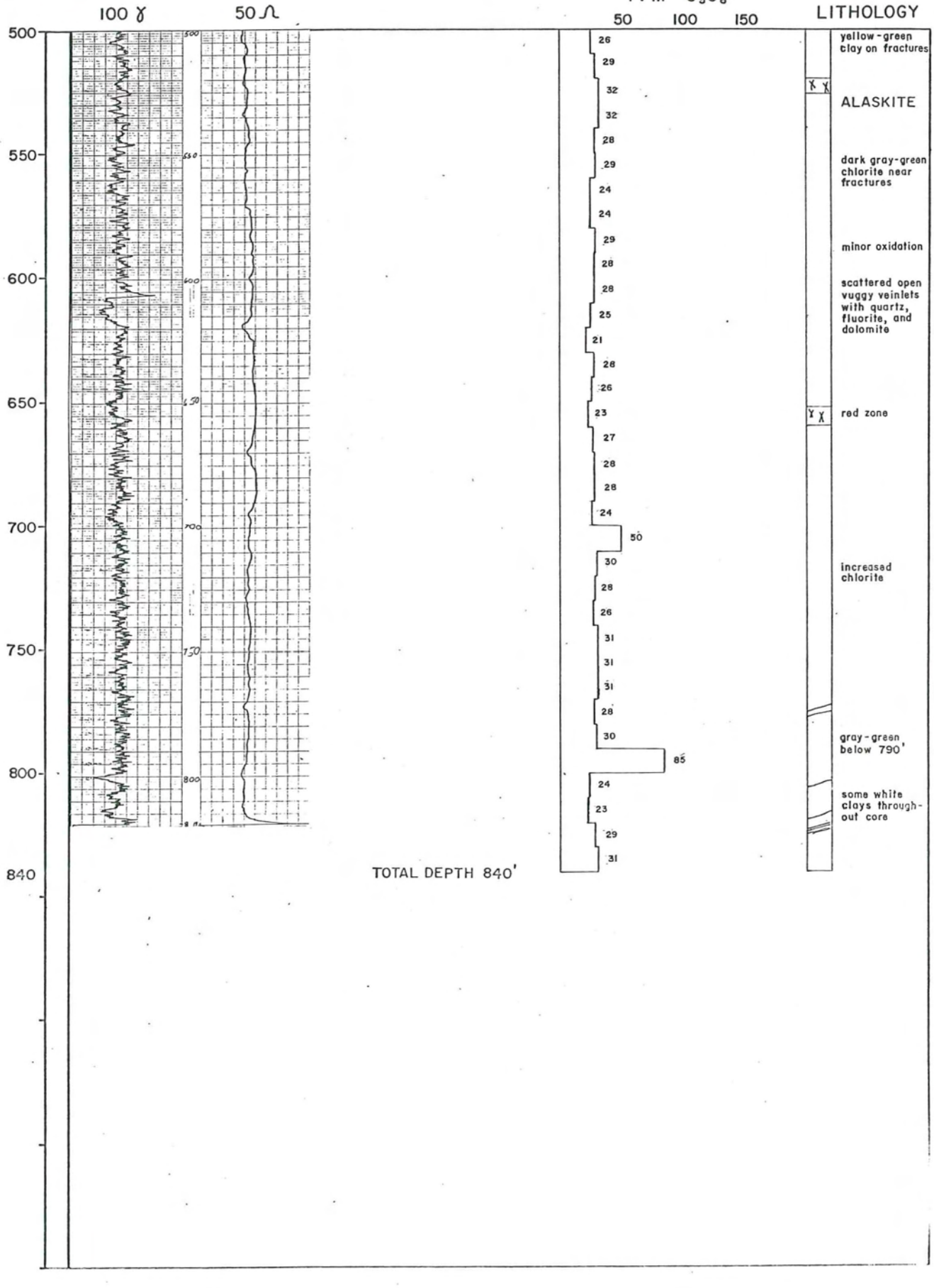


KERR-McGEE CORPORATION
SUMMARY DRILL HOLE LOG
SCALE 1" = 50'

PROJECT WHETSTONE
LOCATION Sec 25 T18S R19E
COCHISE CO. ARIZONA

DRILL HOLE NO. W-1
BEARING
TOTAL DEPTH 840 ft.

DIP 60°
BY



KERR-McGEE CORPORATION
SUMMARY DRILL HOLE LOG
SCALE 1" = 50'

PROJECT WHETSTONE
LOCATION Sec 26 T18S R19E
COCHISE CO. ARIZONA

DRILL HOLE NO. W-2
BEARING
TOTAL DEPTH 500 ft.

PAGE 1 OF 1
DIP Vertical
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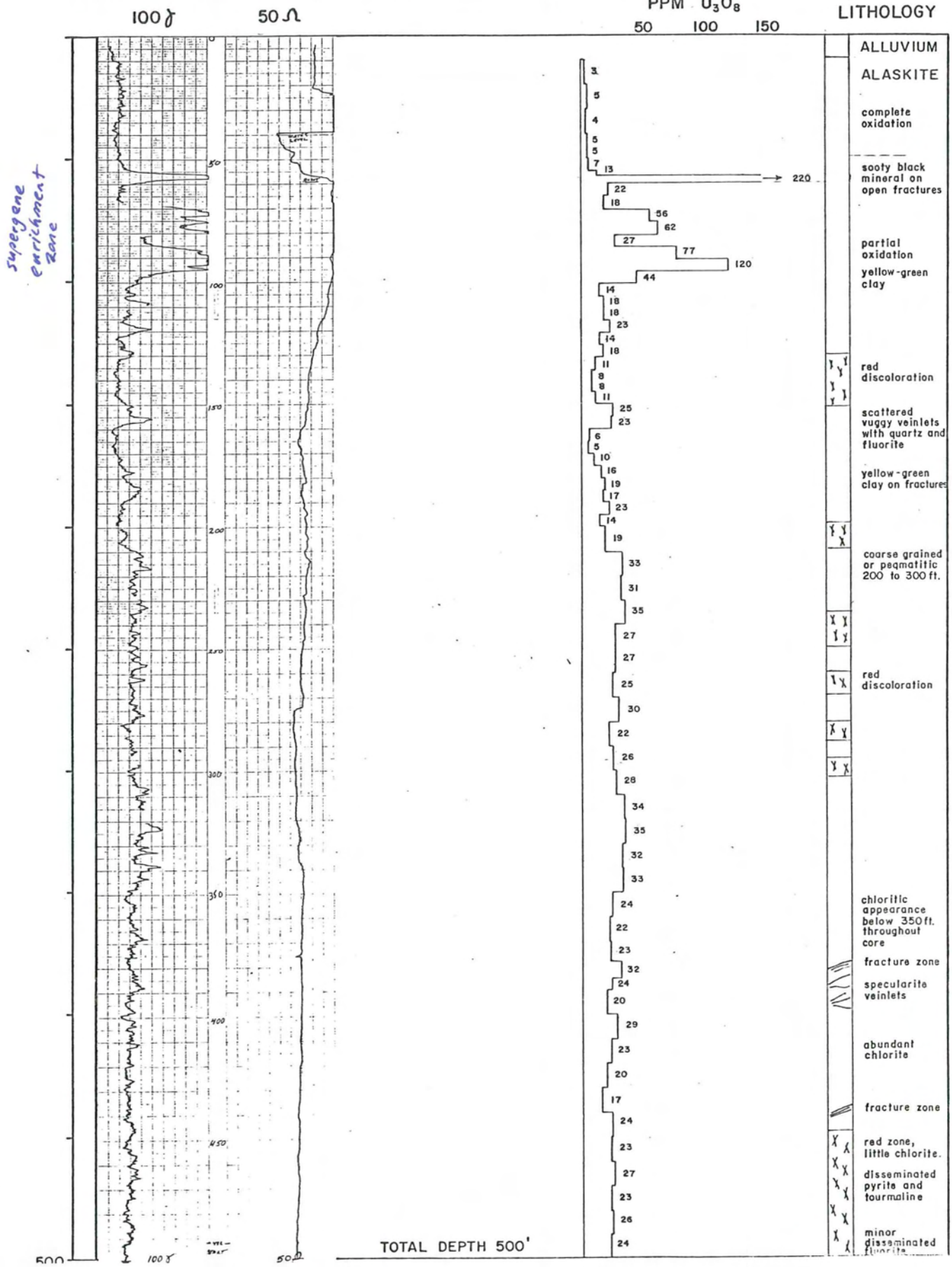
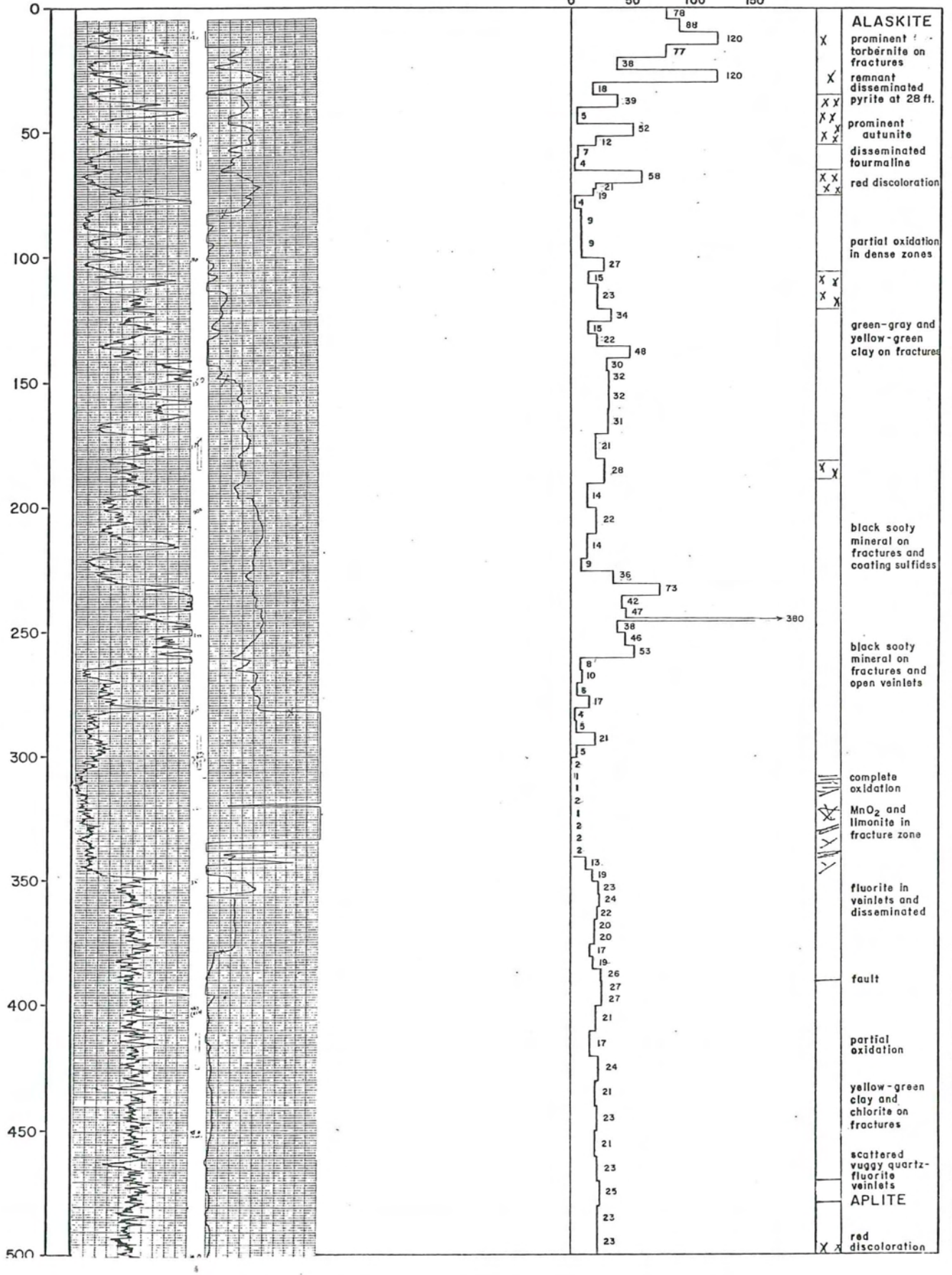


KERR-McGEE CORPORATION
SUMMARY DRILL HOLE LOG
SCALE 1" = 50'

PROJECT WHETSTONE
LOCATION Sec 26 T18S R19E
COCHISE CO. ARIZONA

DRILL HOLE NO. W-3
BEARING
TOTAL DEPTH 840 ft.

DIP 60°
BY

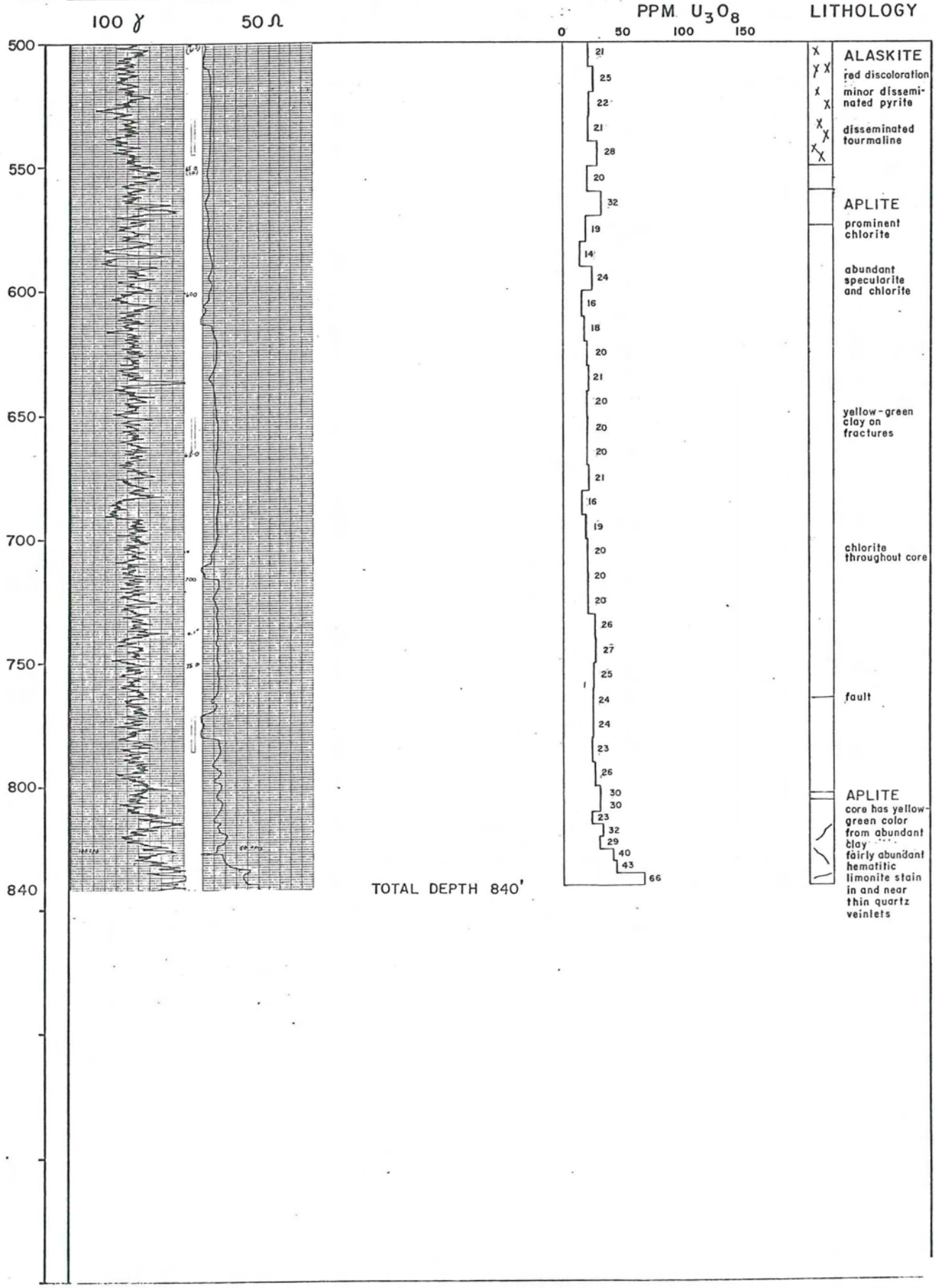


KERR-McGEE CORPORATION
SUMMARY DRILL HOLE LOG
SCALE 1" = 50'

PROJECT WHETSTONE
LOCATION Sec 26 T18S R19E
COCHISE CO. ARIZONA

DRILL HOLE NO. W-3
BEARING
TOTAL DEPTH 840 ft.

PAGE 2 OF 2
DIP 60°
BY



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