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PRELIMINARY STUDY OF THE FAVORABILITY FOR URANIUM IN SELECTED AREAS IN THE BASIN AND RANGE PROVINCE, NEVADA

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October 1977

ISSUED BY THE U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION OFFICE
UNDER CONTRACT NO. EY-76-C-13-1664

EAST WALKER RIVER AREA

LOCATION

The East Walker River area is in southeastern Lyon County, Nevada. It is included on the Walker Lake 2° NTMS map. Parts of the area are also shown on the Yerington, Pine Grove Hills, Mt. Grant, and Aurora, Nevada 15' topographic quadrangle maps. The area investigated (Fig. 10) encompasses 120 sq mi and includes all or parts of T. 7 and 8 N., R. 27 and 28 E.; and T. 9 and 10 N., R. 26 and 27 E., Mount Diablo Base and Meridian.

PREVIOUS WORK

Uranium prospects have been explored by trenching and short underground workings. Drilling has been reported but no recent work was apparent. Gilbert and Reynolds (1973) made a detailed geologic study of the area. The geology and mineral deposits of Lyon County, Nevada, were described by Moore (1969). Staatz and Bauer (1953) described the uranium deposits in the Washington mining district. Ferguson and Muller (1949) mapped and described the structural geology. Aselrod (1956) described the paleoclimate and stratigraphy of Miocene-Pliocene formations in the area. Unpublished AEC maps by Sharp and Warner were used to compile a geologic map of the area (Pl. 18).

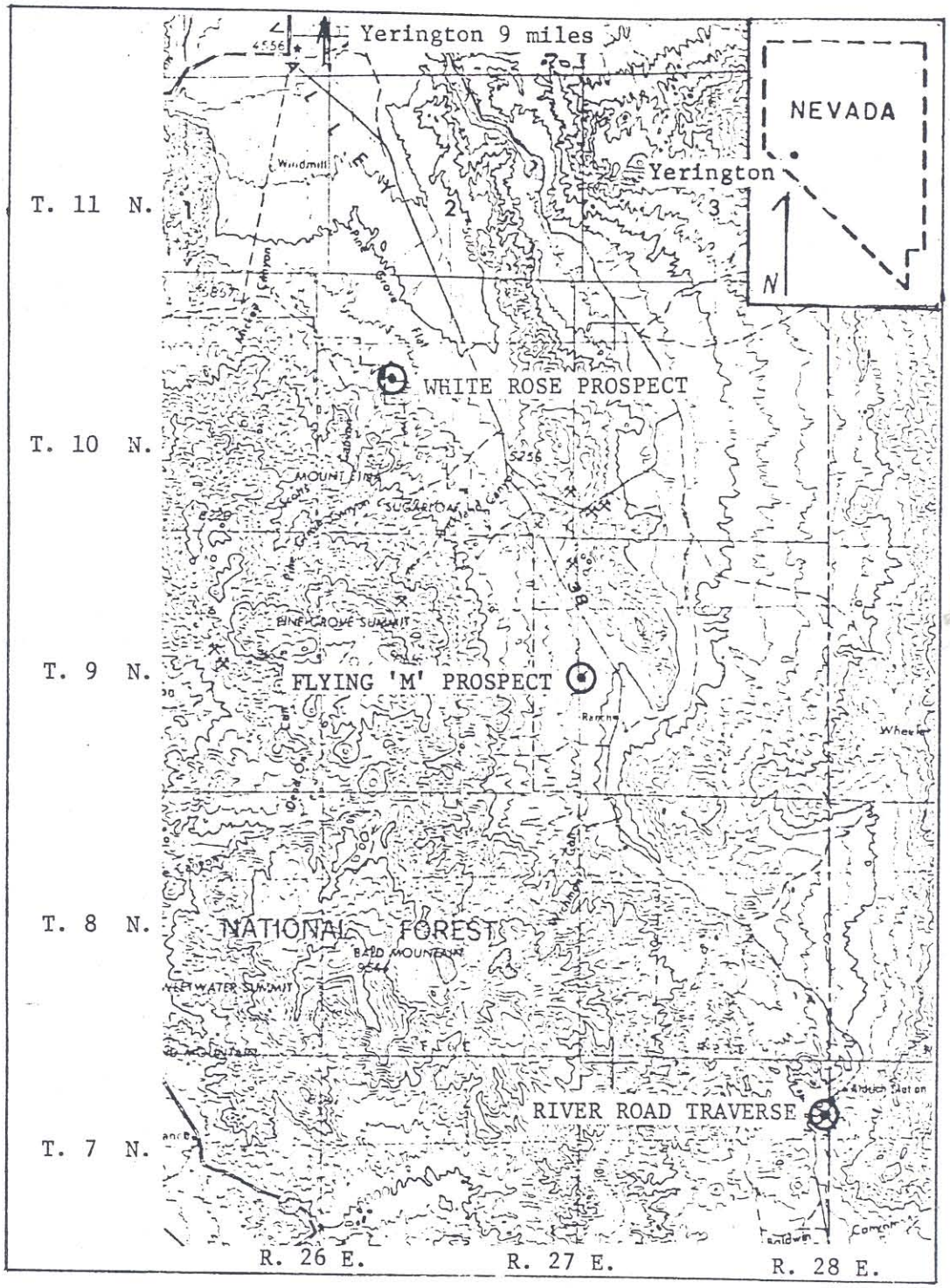
GEOLOGY

Stratigraphy

Basement rocks in the study area are metavolcanic and sedimentary rocks of Triassic and Jurassic ages intruded by granitic rocks of Cretaceous age which are interpreted to be an eastern continuation of the Sierra Nevada batholith (Pl. 18). The basement rocks are unconformably overlain by a sequence of volcanic, fluvial, and lacustrine rocks, the oldest of which are andesitic and rhyolitic volcanic rocks. According to Gilbert and Reynolds (1973): "From approximately 22 to 18 m.y. ago, the area was a highland from which ignimbrite flows of Oligocene age were generally eroded. Subsequent eruptions of andesitic rocks blanketed the area with flows and breccia. Between about 12.5 and 9 to 8 m.y. ago, the area became an integrated basin of sedimentation in which some 2,500 m of strata accumulated.... By approximately 7.5 m.y. ago, the region had been disintegrated by normal faulting into existing structural blocks.... Broad upwarping and block faulting during the Quaternary Period produced the present topography."

Aselrod (1956, p. 23) divided the sedimentary rocks of late Miocene to Pliocene age into three formations. They are, in ascending order:

1. Aldrich Station Formation, a fluviolacustrine deposit of siliceous shale, diatomaceous shale, siltstone, sandstone, and volcanic pebble beds up to 4,050 ft thick;
2. Coal Valley Formation, a fluviolacustrine deposit of mudstone, sandstone, conglomerate, and sedimentary breccia up to 3,325 ft thick: and
3. Morgan Ranch Formation, a deposit of fanglomerate, sandstone, breccia, and some pumice up to 700 ft thick.



Scale 1:250,000

5 0 5 10

Statute miles

Figure 10. Known uranium prospects, East Walker River study area (from Walker Lake NTMS topographic map).

In the south and southwestern portion of the study area, basaltic flow rocks, some of Pliocene or Holocene age, overlie the older formations.

Structure

The Wassuk Range on the northeast side of the study area and the Pine Grove Hills on the southwest side are fault-block mountains tilted to the west. The East Walker River follows a broad structural trough in which sedimentary rocks of Tertiary age are downwarped and preserved (Moore, 1969, p. 21). Numerous northwest-trending normal faults and a few northeast-trending faults add to the structural complexity of the area.

URANIUM FAVORABILITY

Uranium Deposits

The White Rose prospect, the Flying "M" prospect, and the River Road prospect (Fig. 10) are in fluviolacustrine rocks of Miocene to Pliocene age; their positions within the stratigraphic sequence were not determined. Uranium deposits associated with granitic rocks in the project area have been described by Staatz and Bauer (1953), and the descriptions are not repeated here.

White Rose Prospect. The White Rose prospect is in NW¼ sec. 16, T. 10 N., R. 26 E. (Pl. 18). The locality is included on the Pine Grove Hills, Nevada 15' topographic quadrangle map. Garside (1973) described the deposit as follows:

> "Carnotite, gypsum, and sulfur (?) are reported as coatings along fractures and joints in diatomaceous beds of Miocene or Pliocene age."

The prospect is a partially filled pit at the base of a talus slope. No diatomaceous beds are exposed and no anomalously radioactive areas were discovered. No samples were taken.

The uranium deposit, if now buried beneath the fill in the pit, must be of very limited extent.

Unnamed Prospect (Flying "M" Prospect). An unnamed prospect, herein called the Flying "M" prospect because of its proximity to the Flying "M" Ranch is in NW¼ sec. 19, T. 9 N., R. 27 E. (Pl. 18). The locality is included on the Pine Grove Hills, Nevada 15' topographic quadrangle map. The prospect has been explored by three short adits, several surface trenches, and two drill holes. It is in a 65-ft-thick section (Fig. 11) of massive diatomite interbedded with fine- to coarse-grained, poorly to well-

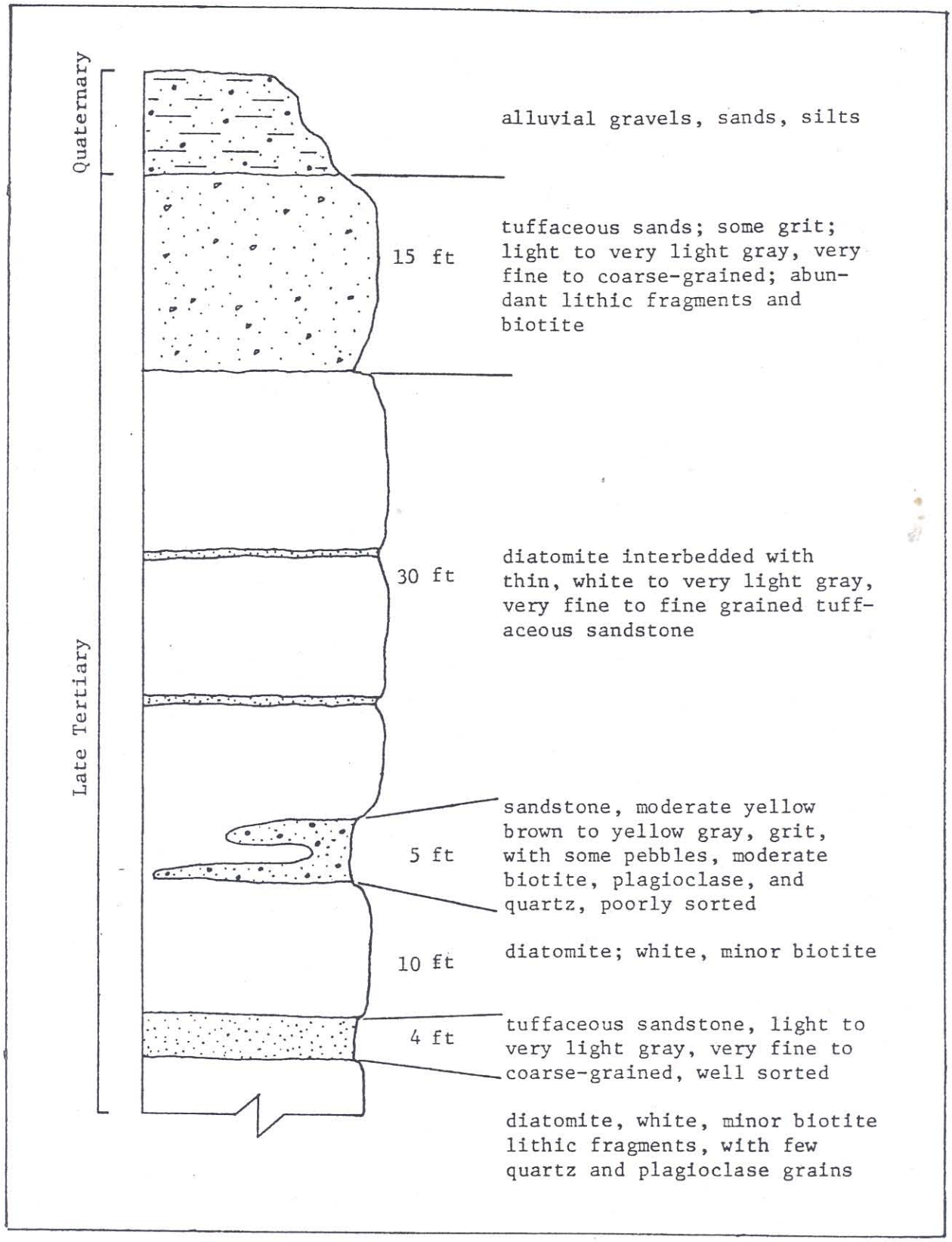


Figure 11. Stratigraphic section, Flying "M" prospect, East Walker River area.

sorted, tuffaceous sandstones that crops out along strike for 850 ft. Yellow secondary uranium minerals occur as thick coatings on northeast-trending fracture surfaces in zones ranging from 8 to 12 ft in width. Some iron-oxide staining is also present. The U_3O_8 content of these anomalous fracture zones ranges from 42 to 1886 ppm (Table 5). A sample of the unmineralized diatomite unit taken near the prospect contained 6 ppm U_3O_8. Uranium mineralization and sample locations are shown in Figures 12 and 13. Anomalous radioactivity was not detected in a helicopter scintillometer survey of the prospect. Uranium mineralization, although obvious, is minor compared to the volume of exposed diatomite.

River Road Prospect. The River Road prospect (Garside, 1973, p. 75) is in NW¼ sec. 12, T. 7 N., R. 27 E. (Pl. 18). The locality is included on the Aurora, Nevada-California 15' topographic quadrangle map. The prospect could not be found during the present study.

Twitchell (1955) reported that the prospect was discovered in 1954. Garside described the prospect as follows:

> "Tertiary sedimentary rocks (tuffs, sandstones, shales, etc.) overlie a coarsely crystalline quartz monzonite. Radioactivity is probably localized in the tuffs, but little information is available."

Favorability Criteria Present

Source Rocks. The granitic and volcanic rocks of the area are possible sources for uranium. Granitic and volcanic rocks flown over during the helicopter scintillometer survey (Pls. 7, 8, 9, 10) generated radioactivity anomalies with values two to three times background. Uranium mineralization in granitic rocks in the Washington mining district, T. 8 N., R. 27 E., and at the Flyboy claims (Garside, 1973, p. 76) in NW¼ sec. 16, T. 11 N., R. 26 E. indicates the former presence of a magma that contained above-normal amounts of uranium. Select samples from the Yerington Mine, an open-pit porphyry copper mine operated by the Anaconda Company in sec. 16, T. 13 N., R. 25 E., contained 0.05 percent U_3O_8 (Garside, 1973, p. 76). The granitic rocks of the area are, therefore, possible source rocks.

The uranium content of the rhyolitic, dacitic, and andesitic flows and tuffs is less well known, but they too may serve as source rocks. An airborne anomaly two times background was noted over an exposure of andesitic volcanic rocks in the south-central part of T. 11 N., R. 25 E., immediately south of the east end of Wilson Canyon (Pl. 18).

TABLE 5. ANALYSES OF ROCK-CHIP SAMPLES FROM THE FLYING "M" PROSPECT, EAST WALKER RIVER AREA.

Sample no. (Figs. 12, 13)	Chemical U_3O_8 (ppm)	Surface radiometric values (cps)	Sample interval (ft)
19550	8	142	3
19551	17	285	3
19552	42	600	3
19553	6	130	3
19554	6	130	3
19555	11	340	3
19556	1886	1700	3
19557	106	400	3
19558	47	740	3
19559	71	340	3
19560	5	115	3
19561	31	215	3

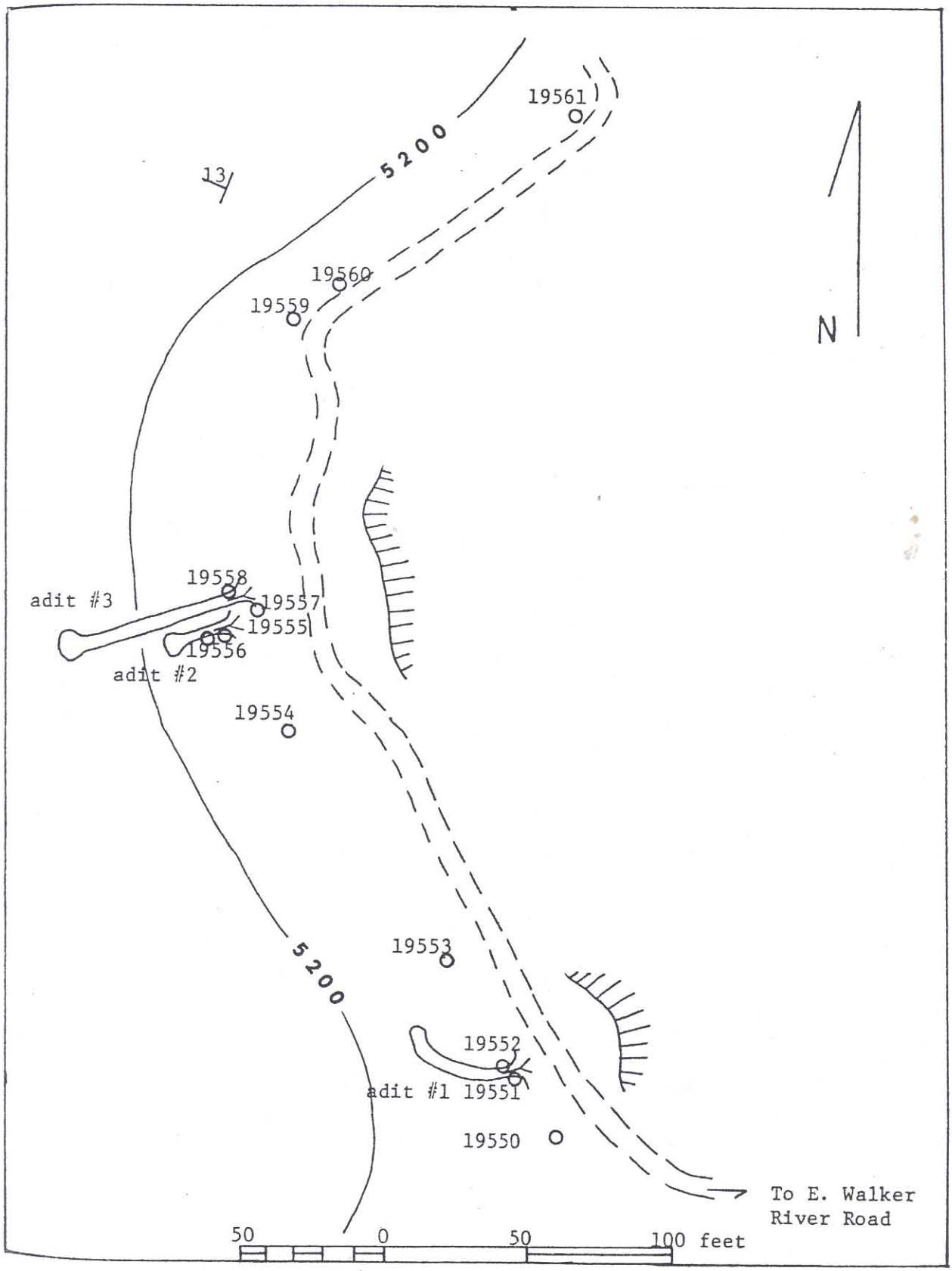


Figure 12. Sample sites, Flying "M" prospect, East Walker River area.

The radioactivity profiles recorded during helicopter flights in the Walker River area indicate substantial variation in the distribution of radioactive elements in the formations. If this variation is caused by changes in the uranium content, additional ground work may help locate other source-rock areas.

Host Rocks. The fluviolacustrine sequence of rocks provided a variety of environments for possible supergene uranium deposits. Two of the deposits in the East Walker River area are associated with diatomaceous sediments, a common setting in Nevada for uranium deposits. Additional diatomite deposits probably exist in the project area but, because of the low grade and limited extent of uranium mineralization in this environment, may not be worthy exploration targets.

More worthy sites for uranium deposition are carbonaceous basal sands and channel fillings. A massive 50-ft-thick channel sandstone with anomalous radioactivity was found in NE¼ sec. 12, T. 7 N., R. 28 E., in the vicinity of the reported River Road prospect. A radiometric and rock sampling traverse (Fig. 14; Table 6) was made along this unit. The U_3O_8 content ranged from 7 ppm to 18 ppm. The unit is a massive white to buff-colored, fine- to coarse-grained, moderately sorted and indurated quartzofeldspathic arenite that crops out for 750 ft in a canyon northeast of Aldrich Grade. Irregular lenses of tuff and fine-grained tuffaceous sandstone are common, and boulder-size clay galls containing trace amounts of carbonaceous debris occur locally. Some fracture and joint surfaces are coated with iron-oxide staining. This sandstone unit also crops out on the south slope of a hill 0.7 mi north of the first outcrop. It is exposed to 1,100 ft along strike with a maximum width of 40 ft. At this location, the unit contains massive irregular clay lenses exceeding 50 ft in length and 9 ft in width. The upper part of the clay lenses contains secondary uranium minerals in carbonaceous debris, and gypsum is found as fracture fillings. A series of samples taken at this exposure (Fig. 15; Table 6) contained an average of 17 ppm U_3O_8.

Other rock units of similar nature must exist in the area because of the many periods of erosion and deposition during Tertiary time. Their position in the stratigraphic sequence and the proximity of source rocks may control the extent of supergene uranium mineralization.

Hydrogeochemical Studies

A hydrogeochemical and stream-sediment survey (Lawrence Livermore Laboratory, 1976) discovered anomalous quantities of uranium in both the East Walker River and the West Walker River drainage basins. Many stream-sediment samples in the East Walker River contained >10 ppm uranium, and a few samples contained >20 ppm uranium.

CONCLUSIONS

The East Walker River area is considered favorable for uranium because:

1. Anomalous radioactivity was found in granitic and volcanic rocks, and a hydrogeochemical survey indicates anomalous quantities of uranium over an area of several thousand square miles.

2. Primary uranium minerals occur in quartz veins associated with granitic intrusive rocks.

3. Excellent host rocks, carbonaceous basal sands, and channel fillings were found.