U.S. ATOMIC ENERGY COMMISSION

GRAND JUNCTION OPERATIONS OFFICE

EXPLORATION DIVISION

TECHNICAL MEMORANDUM

TM-184

URANIUM OCCURRENCES ON THE GOODNER LEASE
SANDOVAL COUNTY, NEW MEXICO

By

L. R. Kittleman, Jr.

and

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July 15, 1957

(Grand Junction, Colorado)

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ABSTRACT

The Goodner Lease, located on the Ojo del Espiritu Santo Grant, Sandoval County, New Mexico, contains the only known occurrences of visible uranium minerals in the Morrison Formation of the Nacimiento Mountains. Weak mineralization occurs at sandstone-claystone contacts and in thin zones within sandstone beds in the Brushy Basin and Westwater Canyon Members. An unusual color change in the sandstones occurs in the area and is believed to be related to the uranium mineralization.

INTRODUCTION

Location and Ownership

The Goodner Lease consists of sections 11, 24, 25 and the NW¼ 31, T.17N., R.1W. (projected), Sandoval County, New Mexico. The land is part of the Ojo del Espiritu Santo Grant, a Spanish land grant which is now controlled by the federal government. The grant is administered by the U.S. Department of the Interior, Bureau of Land Management and Bureau of Indian Affairs. Mineral rights on the tract described are leased by Mr. Cass Goodner of San Ysidro, New Mexico. The lease is immediately east of New Mexico Highway 44, about 17 miles by the Highway northwest of the village of San Ysidro (fig. 1). Sections 24, 25, and 31 are accessible via the dirt road that joins the Highway about 16 miles from San Ysidro; and section 11 is reached by the dirt road that intersects the highway about 17 miles from San Ysidro. The geography and topography of the area are shown on the U.S. Geological Survey San Ysidro Quadrangle 15 minute topographic map.

Purpose and Scope

Visible uranium minerals were first noted in the area in 1952 by Mirsky (1953). Seven areas of anomalous radioactivity were found by the Atomic Energy Commission during an aerial radiometric survey of the area in 1955. These areas were investigated by Brassfield and Kittleman (1955) who found additional anomalies. The strongest anomalies were covered by the existing Goodner lease. The numerous

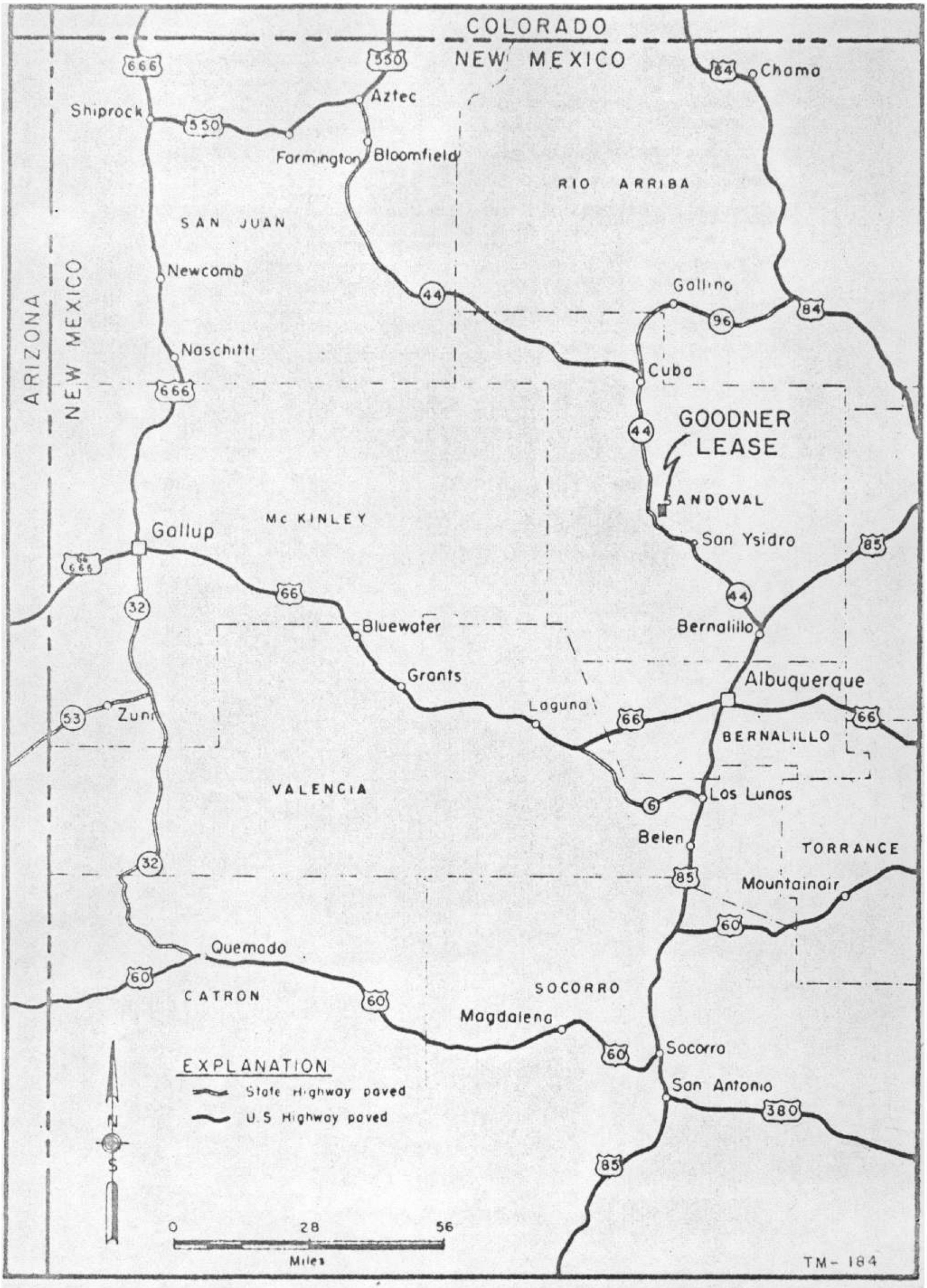

Figure I. Index map of a portion of New Mexico, showing the location of the Goodner lease.

radioactive occurrences prompted geologic investigation by the Atomic Energy Commission and drilling and prospecting by the lease holder. The purpose of this memorandum is to present a compilation of geologic data pertaining to the area.

Geologic investigations for the Atomic Energy Commission have been done by the writers, assisted by J. O. Brassfield, W. F. McConnell, and R. K. Nestler. The investigations began in May 1955 and continued intermittently until January 1957.

HISTORY OF DEVELOPMENT

The lease on three and a quarter sections of the Grant was obtained by Mr. Goodner from the Bureau of Land Management in July 1953. At various times, drilling rights have been granted to E. H. Collins of Amarillo, Texas, Compania Minera la India of Managua, Nicaragua and Gibralter Minerals Company of Grand Junction, Colorado. About 13,000 feet in 90 holes were drilled. With the exception of six holes on section 11, all of the drilling was on sections 24 and 25. A small amount of bulldozing was also done by E. H. Collins. The exploration drilling disclosed no commercially valuable mineralization, although chemical assays on drill cuttings and gamma ray logs of drill holes show isolated occurrences of uranium which exceed .10 per cent U_3O_8 or eU_3O_8.

The lease was assigned to E. H. Collins in May 1957. After acquiring the property, Collins shipped about 30 tons of ore averaging .12 per cent U_3O_8 to the Kerr-McGee mill at Shiprock, New Mexico. The ore came from a small pit in the NW 1/4, SW 1/4, NW 1/4, section 25, which was not developed at the time of the AEC investigations.

GENERAL GEOLOGY

The Goodner lease is on the west flank of the Nacimiento Mountains on outcrops of the Morrison Formation along a monocline west of the north-trending Nacimiento thrust fault (Wood and Northrop, 1946). The Morrison Formation is underlain by rocks tentatively assigned to the Summerville Formation, and is overlain by the Upper Cretaceous Mancos Shale. The Dakota Sandstone, which normally overlies the Morrison Formation in northwestern New Mexico is locally absent. The Nacimiento thrust fault, the east side of which is overthrust, is about two miles east of the Goodner lease. In the vicinity of the fault, Precambrian granite is in contact with sedimentary rocks of

Mississippian (Fitzsimmons et. al., 1956), Pennsylvanian, Permian, and Triassic age along the fault plane. The fault line scarp of the Nacimiento thrust constitutes the steep western escarpment of the Nacimiento Mountains. In the monocline west of the fault, the sedimentary rocks dip westward. The dip is steep near the fault, but decreases rapidly to the west. The Morrison Formation in the vicinity of the lease dips usually is less than 20 degrees. Minor dip faults and flexures are present along the Nacimiento monocline. The axis of the northwest-plunging Warm Springs anticline is less than one mile south of the south line of section 25, and a small, southwest-trending normal dip fault passes through section 13, between the two portions of the lease.

The Morrison Formation in the vicinity of the lease is about 625 to 650 feet thick. A measured surface stratigraphic section with accompanying lithologic descriptions is shown in figure 2. The formation in this section is 652 feet thick. The Morrison is subdivided into the Recapture, Westwater Canyon, and Brushy Basin Members. These correlations are based on measured sections, lithologic logs of uranium exploration test holes and lithologic and electric logs of oil and gas tests between the Goodner lease and the area northeast of Laguna, New Mexico (fig. 1) where the three members are exposed.

The Bluff Sandstone which underlays the Morrison Formation in the Laguna area cannot be recognized in the subsurface southwest of the Goodner lease. Hence, the rocks present between the Morrison Formation and the Todilto Formation at the Goodner lease are correlated with the Summerville Formation which overlies the Todilto in the Laguna area.

The sandstone units, particularly those in the upper part of the section are lenticular and lithologically variable, and do not retain constant characteristics for as much as one mile. For the purposes of this memorandum, they are designated "A" through "J" (fig. 2). Units "A" through "G" are included in the Brushy Basin Member and units "H," "I" and "J" comprise the Westwater Canyon Member. Units "A," "B" and "C" are correlated with the Jackpile sandstone which outcrops in the drainage of the Rio Puerco to the southwest.

URANIUM GEOLOGY

Surface

Known radioactivity anomalies in the vicinity of the Goodner lease occur in the sandstone units "C," "F," "G"

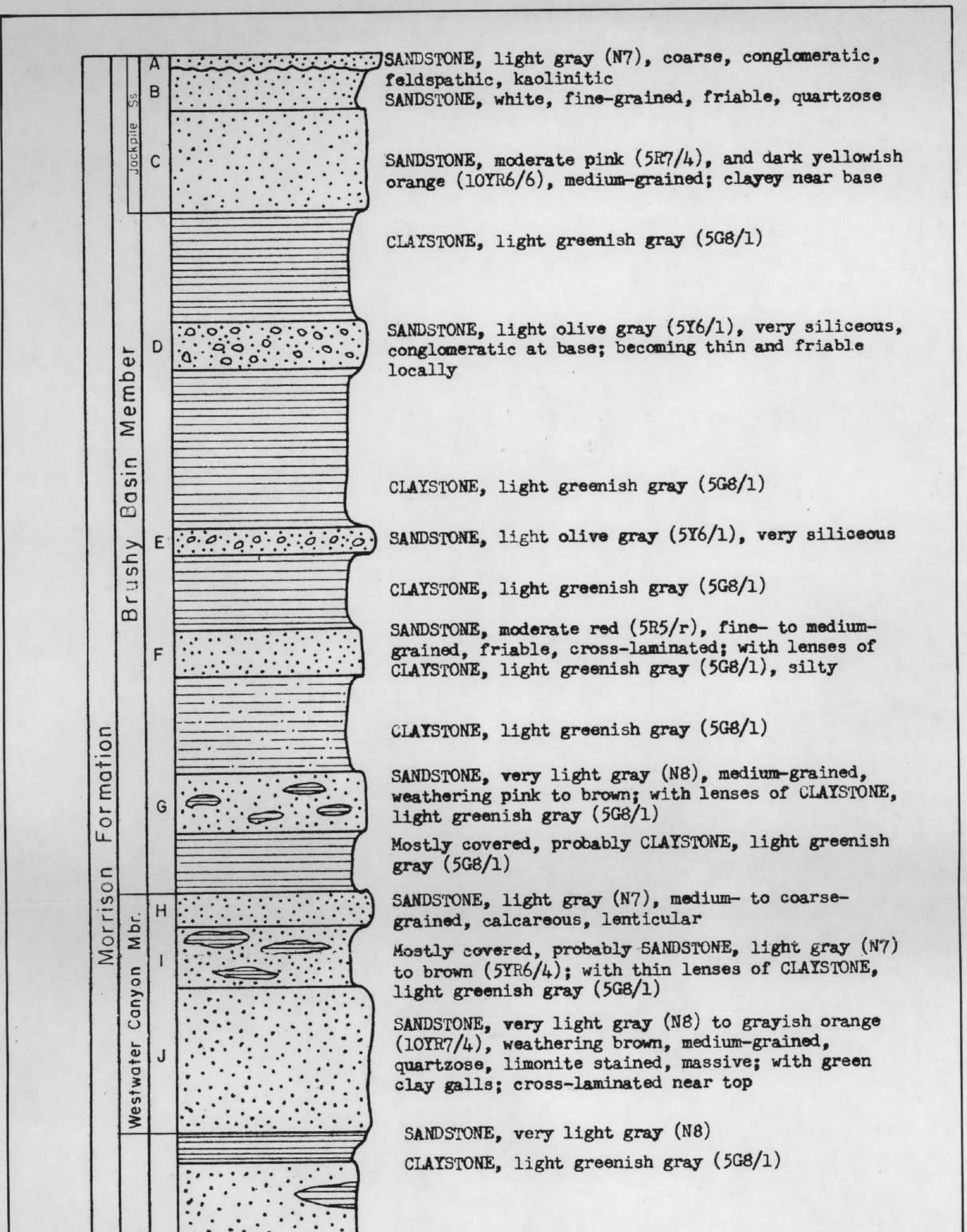

Figure 2. Measured stratigraphic section of the Morrison formation, Cachana Arroyo E 1/2 Sec. 25, T. 17 N., R. 1 W.

and "H" (fig. 2). The pit from which the ore was shipped occurs in unit "F". The sandstone may be pale yellowish-orange (10YR 8/6), moderate red (5R 4/6), very light gray (N8), or white (N9) (Goddard, 1948). The grain size usually is medium or fine. The pale yellowish-orange color is imparted by limonite. The units "D" and "E" usually are indurated by silica to such an extent that the term "sedimentary quartzite" may be applied to them. In places the extreme induration is absent, and the units are very friable.

Anomalous radioactivity is associated with contacts at which sandstone overlies green claystone. At such occurrences, the lower few inches of sandstone and the upper few inches of claystone are anomalously radioactive. Anomalies not associated with lithologic contacts also are common. In these, radioactivity occurs in thin zones within homogeneous sandstones. Usually no uranium minerals are visible, but minor yellow and green secondary uranium minerals have been observed. Anomalies occur erratically, but persistently, throughout the area, along the sandstone outcrops. Probably the "E" sandstone is the most extensively mineralized. The strength of the anomalies ranges from 10 to 20 times the background level, which in this area is about 0.02 milliroentgens per hour (LaRoe FV-5 Scintillation Detector). Mr. Goodner has reported assays of selected samples as high as 0.72 per cent U_3O_8, but Commission assays have not exceeded 0.16 per cent U_3O_8. In all samples tested, eU_3O_8 exceeds U_3O_8 by a few hundredths of one per cent. The eU_3O_8/U_3O_8 ratio appears not to be constant.

Visible uranium minerals occur at scattered localities, and are usually found as coatings in joint planes. Autunite and schroekingerite have been identified tentatively in the field by their reactions to hydrochloric acid and to ultraviolet light. A yellow secondary mineral, possibly tyuyamunite, is found in a sandstone exposed in the banks of an arroyo in section 11. At this locality, the uranium mineral occurs as a halo surrounding a small, irregularly-shaped area that contains numerous sand grains coated with a substance that may be asphaltite (fig. 3). The occurrence is in a very light gray (N8), medium-grained sandstone a few feet down dip from a limonite-stained phase of the same stratum. The limonite staining terminates at a distinct, irregular boundary of the type that has been called a "solution front" by some workers.

No constant relationship between radioactivity and primary sedimentary features has been observed; however, the Morrison Formation displays a prominent, unique secondary feature in the area studied. The writers believe that the feature has some direct correlation with the mineralization

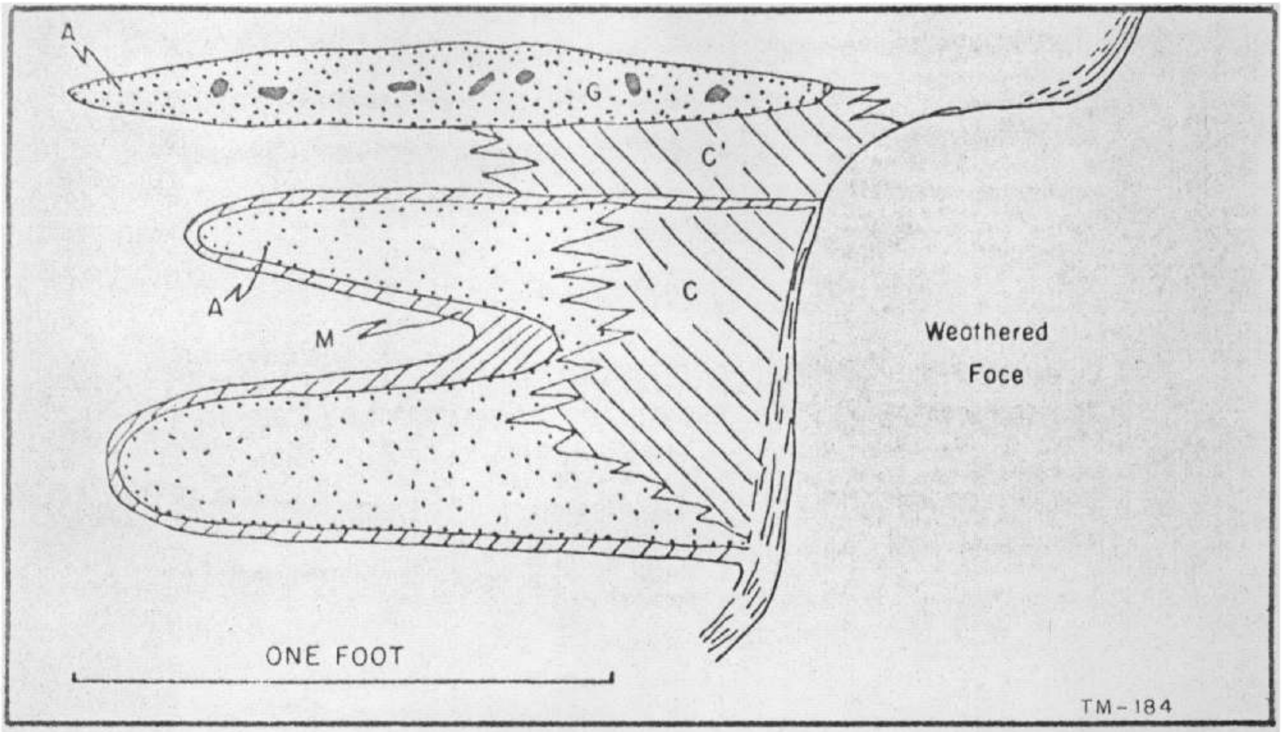

Figure 3. Diagrammatic sketch showing newly exposed face of Morrison sandstone showing uranium mineralization. Host is light-gray (N8), medium-grained, friable sandstone. A, sand grains coated with asphaltite; G, green clay galls; C, zone of interstitial green clay; M, interstitial yellow, secondary uranium minerals. Exposure is in a sandstone stratum that crops out along the bank of an arroyo, section 11.

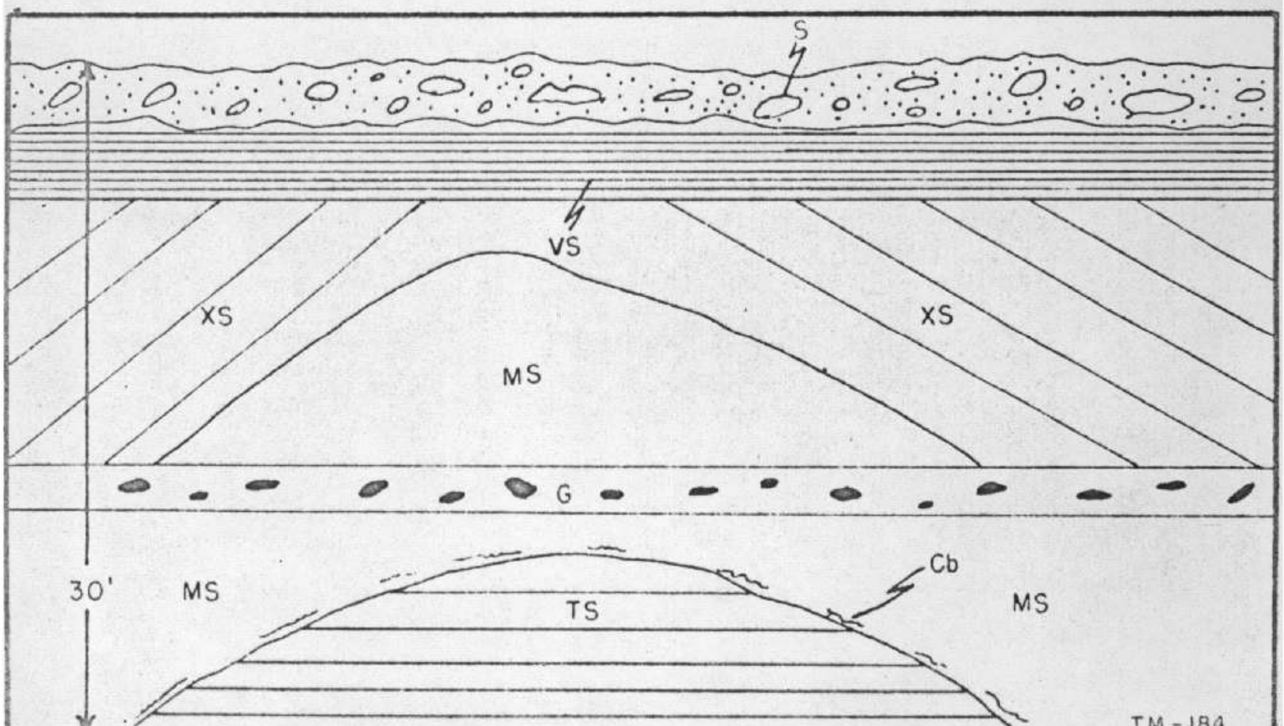

Figure 4. Diagrammatic sketch showing natural cross-section exposed in bulldozer pit, section 11. S, soil; VS, very thin-bedded sandstone; XS, crossbedded sandstone; G, green clay galls; MS, massive sandstone; Cb, carbonaceous trash; TS, thin-bedded sandstone. All sandstone medium gray (N5), fine-grained, friable.

in the area studied, although the exact relationships are obscure. The normal color of the Morrison sandstones regionally is pale yellowish-orange (10YR 8/6). In the area studied, the color becomes moderate red (5R 4/6) in places. The color change affects the entire thickness of the sandstone unit, and takes place within five feet laterally. The phenomenon usually is observed in unit "F" (fig. 2), but may occur in other sandstones. The feature may be seen where Highway 44 crosses a ridge of Morrison rocks near the southwest corner of section 25. Northward, the color fluctuates between the two extremes several times, and, in section 11, where radioactivity is strongest, becomes very light gray (N8) to white (N9). Cursory field examination suggests that the white color may be correlated with higher calcium carbonate content. No radioactivity has been observed in the red phase of the sandstone.

<u>Subsurface</u>

Forty-three of the holes drilled by E. H. Collins on sections 24 and 25 were logged by the Atomic Energy Commission truck-mounted gamma-ray logging unit No. 1251. Figure 5 is a drill hole location map of sections 24 and 25.

The gamma-ray logs indicate that nearly all sandstones in the upper part of the Morrison Formation penetrated by the drill holes are locally weakly mineralized. The distribution of the mineralization is erratic, but the mineralized sandstones may be traced discontinuously in the subsurface across the area (fig. 6). The gamma-ray intensity curves on the logs indicate that the radioactive source is disseminated throughout nearly the entire thickness of the host sandstones. Thicknesses of radioactive zone measured on the logs through the point that represents 50 per cent of the maximum deflection from the base line correlate closely with the thicknesses of the sandstones measured on the surface.

The strongest anomaly was observed in hole number 14, probably in the "H" sandstone (fig. 2). An intensity of 1400 counts per second, or approximately 0.05 per cent eU_3O_8 was recorded. The majority of the other anomalies range from 500 to 900 counts per second. A radioactive zone estimated at 0.15 per cent eU_3O_8 was indicated at a depth of 44-48 feet on a log of a hole in section 11. The anomaly probably is in the "C" sandstone (fig. 2) or its equivalent. E. H. Collins commenced a bulldozer pit at the hole, but abandoned the project after reaching a depth of about 30 feet. Radioactivity at the bottom of the pit is about 0.20 milliroentgens per hour, or about ten times the background level. The walls of the pit display an unusual sequence of thin bedded, cross-bedded, and massive sandstone associated with clay galls and carbonaceous material (fig. 4).

CONCLUSIONS

The Goodner lease and vicinity contains the only known visible uranium in the Morrison Formation of the Nacimiento Mountains. As many as five different sandstone lenses in the Brushy Basin and Westwater Canyon Members contain mineralization. An unusual type of color change in the Morrison sandstones occurs in the area. This is believed to have some direct relationship to the mineralization, and could be a prospecting guide for additional occurrences in the region.

The potential of the area is regarded as low. One small pod of ore has been discovered and similar ore bodies may exist in the area, but it is doubtful if they will be economic to mine.

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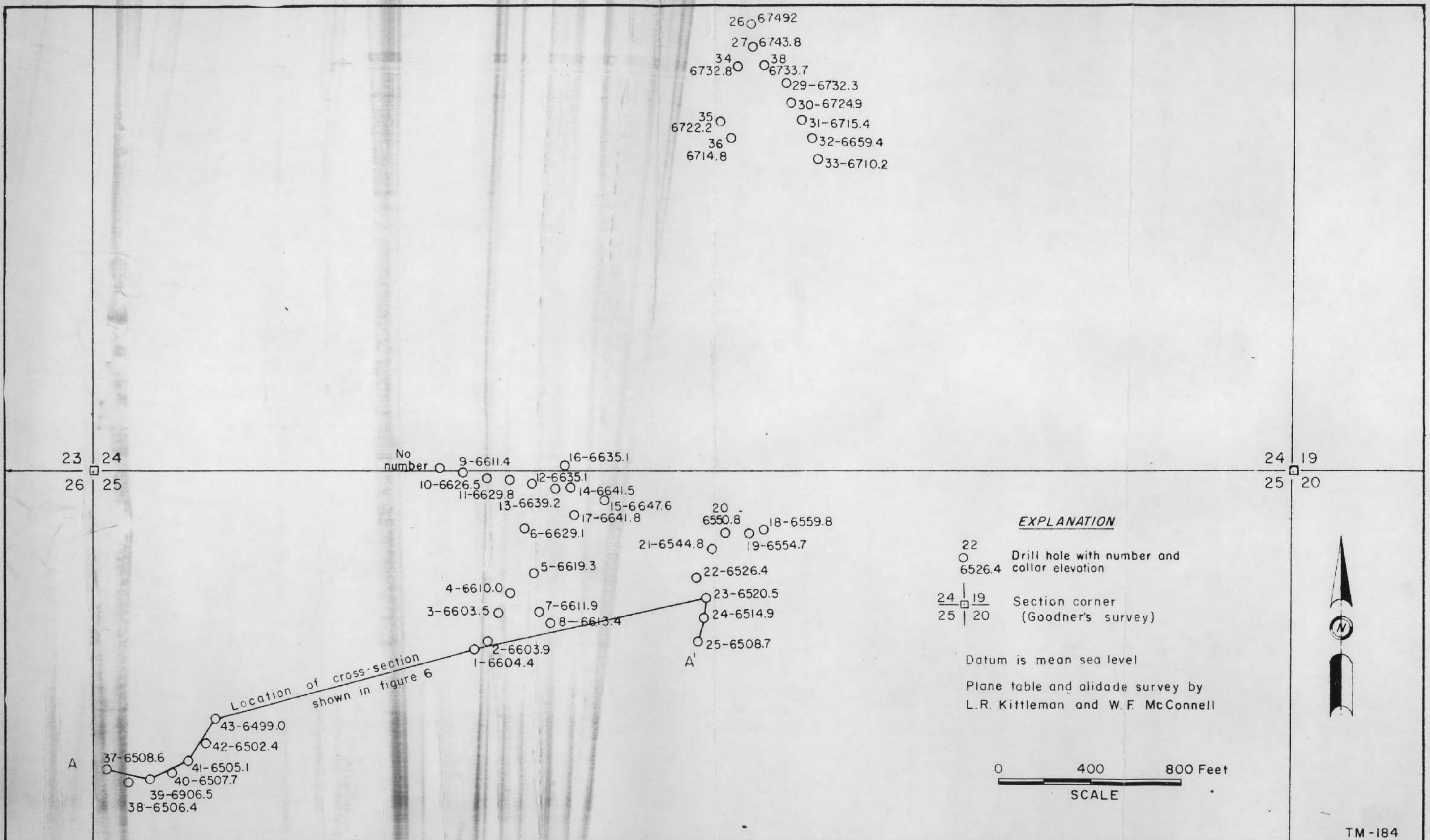

Figure 5. Drill hole location map, Sections 24 and 25