Building 80 - Federal Center
Denver 25, Colorado

June 7, 1960

Memorandum

To: George E. Saltridge, Chief
Division of Field Operations, GME

From: Hugh M. Connors, Acting Field Officer
GME, Region XII

Subject: Docket No. 6084 (Uranium)
Southwestern Exploration Inc.
(Dry Lake Claim etal.)
Natrona County, Wyoming

Enclosed are the original and two copies of a joint engineering and geologic report dated June 3, 1960, by J. W. Mualem, U. S. Geological Survey, and Hugh M. Connors, Bureau of Mines, covering the examination of the subject property.

The field examiners conclude that the chances of finding uranium ore bodies of significant size and grade down-dip from the open pit in the Fox Hills sandstone on the applicant's property are not good. We recommend that the application be denied.

Original signed by

Hugh M. Connors

Attachments

HMC/lm
cc: D. D. Baker AEC (2))
Chief Production & Evaluation Division)
Grand Junction Operations Office) W/cpy of report
Hasler
DMR/DFC
Docket OME 6084
Chron

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UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

OFFICE OF MINERALS EXPLORATION
REGION III

OME 6084

GeoResources Exploration, Inc.

Dry Lake claims, et al.

Natrona County, Wyoming

Uranium

Joint Engineering and Geologic Report

by

J. W. Hasler, Geologist
Geological Survey

H. M. Connors, Mining Engineer
Bureau of Mines

June 3, 1960

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CONTENTS

	Page
Introduction and summary	1
Location, accessibility, and physical features	2
History and production	3
Ownership and extent	3
Present status	4
Exploration and development	4
Geology and ore deposits	5
Proposed exploration	8
Conclusions and recommendations	10

ILLUSTRATIONS

Figure	Follows page
1. Index map of Wyoming showing location of the Dry Lake, claims, et al	1
2. Map showing recommended exploration, section 33, T. 35 N., R. 79 W., Natrona Co., Wyoming	10

OME 6084

GEO RESOURCES EXPLORATION, INC.
DRY LAKE CLAIMS ET AL.
NATRONA COUNTY, WYOMING

INTRODUCTION AND SUMMARY

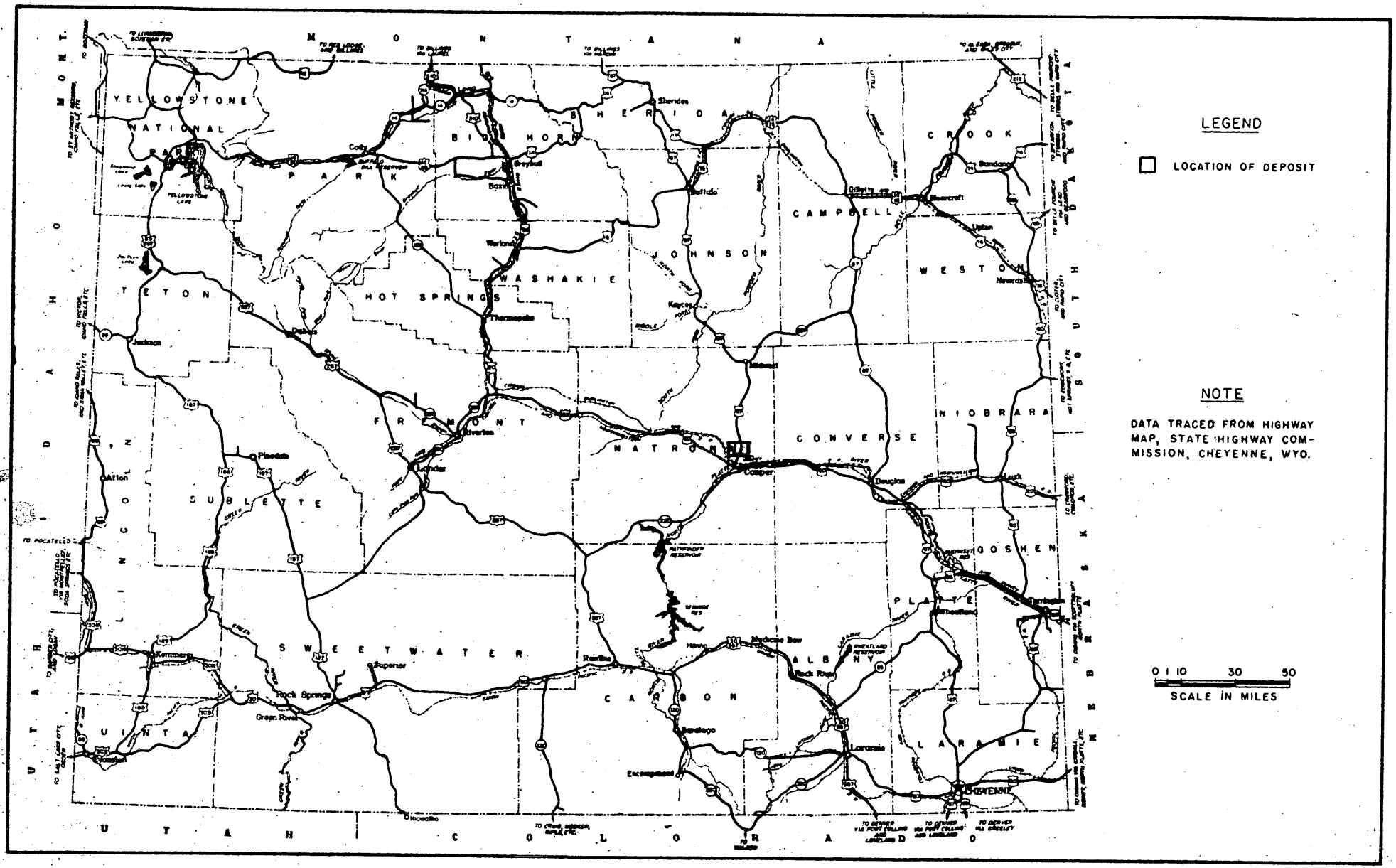
GeoResources Exploration, Inc., 1801 Taber Street, Denver 15, Colorado, applied April 16, 1960, to the Office of Minerals Exploration for Government assistance to explore for uranium on the Dry Lake et al. claims in Natrona County, Wyoming.

The application was referred to the field, and a field examination was made on May 13, 1960, by J. W. Hasler, USGS, and Hugh M. Connors, USBM, in company with Dr. Rollin C. Vickers, President of the applicant company.

The Dry Lake claims, et al., are located about 9 miles north of Casper, Wyoming, in the extreme southwest part of the Powder River Basin. Some 87 tons of ore-grade material has been shipped from the property, and exploration drilling has since shown that an area east of the mined area contains some mineralized material.

The applicant proposes drilling at depth to test for possible enriched uranium ore bodies. The examining team thinks that the chances of finding significant bodies of ore-grade material are not good and therefore recommend denial of the application.

The uranium deposit on the Dry Lake claims, et al., is in the Fox Hills sandstone of upper Cretaceous age, and is the only significant occurrence of uranium in that formation in the Powder River Basin. Should



ME 6084 Geo Resources, Inc., Dry Lake Area, Natr[illegible] County, Wyoming

any additional work be done on the property, it should be done because the Fox Hills sandstone is a relatively unknown and new uranium-bearing formation. The major uranium deposits in the Powder River Basin are found in the Wasatch formation of Tertiary age.

LOCATION, ACCESSIBILITY, AND PHYSICAL FEATURES

The Dry Lake claims, numbers 1 through 4, and the Zero claims, numbers 1 through 4, leased by GeoResources Exploration, Incorporated, are all located in the southeast 1/4, sec. 33, T. 35 N., R. 79 W., Natrona County, Wyoming (fig. 1).

The property is easily accessible by travelling north from Casper, Wyoming, on U. S. Highway 87 for a distance of 9 miles, then turn right for one-quarter of a mile, near the old highway.

The applicant's property is in the extreme southwest portion of the Powder River Basin. The surface of the country is hilly, but not mountainous. Near the mountains the country is essentially a plain that has been deeply dissected by streams, leaving the mesas sloping gently toward the north away from the mountains. Farther away from the mountains the country is gently rolling, with a few flat topped hills, but there are a few small areas of rough country where the mantle of Tertiary and Quaternary material is removed, revealing the presence of the lower and more indurated rocks. There is little vegetation in the immediate area except for grasses and sage.

HISTORY AND PRODUCTION

Uranium ore was first discovered in the Dry Lake area in 1954 and since that time some 87 tons of material containing 0.32 percent U_3O_8 has been mined from a small open pit on the Dry Lake No. 2 claim. Very little exploration has been done on the applicant's claims except for some drilling mostly east of the open pit. This drilling was completed during March 1960. Some 33 holes were drilled and uranium-bearing material was penetrated in the Fox Hills sandstone formation that averaged 3 feet thick and assayed about 0.16 percent eU_3O_8.

OWNERSHIP AND EXTENT

The area consists of eight contiguous and slightly overlapping unpatented mining claims. The Dry Lake claims 1 through 4, and the Zero claims 1 through 4 are recorded in the records of the Natrona County recorder's office as follows:

Claim	Book	Page
Dry Lake No. 1	29 (LN)	528
Dry Lake No. 2	29 (LN)	525
Dry Lake No. 3	29 (LN)	527
Dry Lake No. 4	29 (LN)	526

The Dry Lake claims are all located in the SE¼, sec. 33, T. 35 N., R. 79 W., Natrona County, Wyoming.

Claim	Book	Page
Zero No. 1	60 (LN)	238
Zero No. 2	60 (LN)	239
Zero No. 3	60 (LN)	240
Zero No. 4	60 (LN)	241

The Zero claims are located in the SE¼ sec. 33, and the SW¼ sec. 34, T. 35 N., R. 79 W., Natrona County, Wyoming.

The claims listed above are held under a lease agreement as shown in Exhibit A accompanying the application.

PRESENT STATUS

The property is idle at the present time, as no further exploration work, or production is being made.

Exploration and development

A small open pit has been mined from which 87 tons of ore that assayed 0.32 percent U_3O_8 was produced. Some 40 diamond drill holes averaging approximately 80 feet in depth have been drilled to test the area around the open pit and especially the area east of the pit, for an estimated total footage of 3,200 feet.

GEOLOGY AND ORE DEPOSITS

The Powder River Basin which covers about 12,000 square miles of northeastern Wyoming is a broad structural and topographic basin terminated on the south by the Laramie Mountains and the Hartwell uplift, on the east by the Black Hills and related structures, and on the west by the Big Horn Mountains. The surface of the central part of the basin is characterized by moderately dissected rolling hills ranging from 4,500 to about 5,400 feet in elevation. The Pumpkin Buttes which are a prominent landmark rise to an elevation of 6,000 feet, or about 1,000 feet above the surrounding countryside.

Uranium deposits are found largely in the Wasatch formation of Tertiary age in the Powder River Basin. Uranium and vanadium are the dominant elements. The deposits are, almost without exception, associated with areas of red coloration. They are generally located east of the synclinal axis and are found in the middle or predominantly lenticular sandstone unit of the Wasatch formation. They all occur within 150 feet or less below the surface of the ground and have not been found more than a few feet below the water table. The deposits may be broadly classified into three general types on the basis of size and grade, mineralogy, and red bed association.

Some of the following observations have been made with respect to the origin of the deposits:[1/]

1/ Mrak, Vernon A., 1958, "Uranium Deposits in the Tertiary sediments of the Powder River Basin, Wyoming," Wyoming Geological Association Guidebook, pp. 233-238, 1958.

(1) Most of the major uranium deposits are found in the buff to white sandstones down-dip from the predominantly red sandstone zone.

(2) The narrow zone of red coloration generally follows the trend of greatest structural disturbance in the Wasatch rocks, and it also follows the area of greatest porosity and permeability.

(3) Uranium deposits occur intermittently along a narrow trend for a distance of 6 miles through the Dry Fork area. Where uranium is found it usually occurs at two or more stratigraphic horizons.

(4) The sediments below the water table are various shades of gray and rarely if ever show any evidence of red coloration.

(5) In more than 130,000 feet of drilling in the Powder River Basin, no uranium deposits were found to extend more than a few feet below the present water table.

(6) An over-all average of uranium samples taken from the mineralized area shows the uranium to be approximately in radioactive equilibrium. However, single samples will sometimes show extreme disequilibrium which suggests that uranium is presently moving.

Groundwater samples were obtained from holes drilled on a grid pattern across the mineralized trend between the red and the buff sandstones in the Dry Fork area. A preliminary study of the groundwater samples indicates that the average uranium content of the groundwater from the red sandstone is 60.4 ppb, whereas the groundwater from the buff sandstone is 35.3 ppb. The groundwater is moving down dip from the red sandstone and loses 41.5 percent or 25.1 ppb of the contained uranium when it passes through the zone of mineralization. This uranium loss is

equivalent to 25.1 pounds of uranium per one billion pounds of groundwater. If we take a cross sectional area, normal to the dip and assume it lies at the top of the permanent water table in the transitional zone between the oxidized and non-oxidized sediments and allow groundwater to move down dip at the rate of .001 feet per minute, we find that 32.8 million pounds of water would pass through an area 10 feet by 100 feet each year. If conditions would remain relatively constant for a period of 25,000 years it is noted that 820 million pounds of groundwater would pass through the 1,000 square feet area and 20,582 pounds of uranium would be released to the zone of mineralization. This figure is equal to 4,116 tons of 0.25 percent uranium ore.

The uranium on the applicant's property is found in the Fox Hills sandstone of upper Cretaceous age, and is the only known occurrence of uranium in the Fox Hills sandstone in the Powder River Basin.

The Fox Hills sandstone crops out as a narrow band of generally steeply-dipping strata paralleling the western margin of the Black Hills. The formation continues northward and southward to outline most of the eastern border of the Powder River Basin. It is predominantly a sandstone but commonly contains beds of gray shaly claystone and siltstone of variable thickness which become more abundant near the base and locally may comprise a large part of the formation. The thickness of the formation is reported to range from 120 to 200 feet; but the lack of good exposures in the area and the gradational contact with, and similar to the overlying Lance formation makes accurate measurement difficult. The sandstones of the formation are generally gray to light-brown,

fine- to medium-grained, soft, thin-bedded, and cross laminated. The rock has a slabby appearance on weathered surfaces and locally contains numerous calcareous and ferruginous concretions.

The Fox Hills sandstone in the immediate area consists mainly of fine- to medium-grained sandstone units as much as 60 feet in thickness. Uranium has been found in the thicker sandstone lenses in or immediately adjacent to areas where the sandstone is interbedded with mudstone or lignitic siltstone.

PROPOSED EXPLORATION

The applicant proposes to drill some 40 diamond drill holes to test for continuity of the zone of mineralized material extending eastward from the pit on the Dry Lake No. 2 claim. Total cost of the proposed project is estimated to be $9,416.00.

Exploration to date has shown that the Fox Hills sandstone has been mineralized for some distance east of the pit that contained 87 tons of ore-grade material. Drilling indicated, according to the applicant, that there is a possibility of an enriched zone farther down dip in the nearly flat-lying Fox Hills sandstone. The applicant indicated that the gamma ray analyses shows the uranium to be out of equilibrium due mainly to leaching near the outcrop. The applicant further proposes that the red-gray sandstone relationship to uranium is the same in the Fox Hills sandstone as that in the Wasatch formation, and therefore basic warranty of further exploration by the applicant is given in the five reasons as follows:

1. The uranium occurrences at the Dry Lake claims are about the only significant deposits that have been found in the Fox Hills sandstone in the Powder River Basin. Further exploration of the Dry Lake claims has the potential not only of developing an ore body, but also of suggesting that other areas of Fox Hills sandstone may contain significant uranium deposits. Uranium-bearing solutions have migrated downward in the Fox Hills sandstone as evidenced by the known deposits at Dry Lake and the presence of many small radioactive anomalies in the surface exposures of the Fox Hills sandstone in a large area to the north.

2. The fact that large quantities of uranium have been leached from the near-surface rocks suggests that significant deposits may be present down dip where conditions would favor deposition.

3. The lithology of the Fox Hills sandstone is favorable for uranium deposition. The Fox Hills sandstone contains permeable sandstone units containing abundant carbonaceous material and interbedded with mudstone and siltstone.

4. The sandstone facies containing the known deposits is believed to change to a relatively impermeable mudstone facies down dip, a condition that would favor uranium deposition.

5. The limits of uranium deposition down dip from the surface anomalies have not been determined.

The Dry Lake area uranium occurence is the only significant one that has been found in the Fox Hills sandstone in the Powder River Basin. Perhaps, on this basis, some preliminary exploration work may be warranted to test the Fox Hills sandstone down dip for possible ore-grade material.

Samples assayed (gamma ray) from the limited drilling show that only three samples out of eight are out of equilibrium, indicating that not all the uranium has been leached from the sandstone, even though there was no visible uranium in the sandstone at the surface, and in only a few of the holes drilled, did the cuttings show any uranium bloom due to oxidation. The zone drilled as shown by the 33 holes, showed only 3 feet of 0.16 percent eU_3O_8. The applicant must be able to mine at least 0.20 percent U_3O_8 for the material to be considered ore.

The Fox Hills sandstone appears favorable for uranium deposition in that it is a relatively permeable sandstone and contains considerable carbonaceous material and interbedded mudstone and siltstone.

CONCLUSIONS AND RECOMMENDATIONS

The results of a field examination and considerable study indicate that the chances of finding uranium ore bodies of significant size and grade down-dip from the open pit in the Fox Hills sandstone on the applicant's property are not good, and it is therefore recommended that the application be denied. The Dry Lake area occurrence of uranium in the Fox Hills sandstone is the only significant occurrence of uranium in that formation in the Powder River Basin. Any approval of this request for Government assistance would be only on the basis that, here would be exploration in a new-found relatively unknown formation, insofar as uranium is concerned. Any drilling to be done east of the pit should be in a series of four fences of holes 400 feet apart with holes along the fences 100 feet apart (fig. 2). This will test any down dip extension of the mineralized zone as far to the east as is the applicant's property will permit and still gain any depth on the formation.

DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

OFFICE OF MINERALS EXPLORATION
DOCKET 6084 JUNE 1960

Adapted from applicant's map by JWH. 6/2/60.

FIGURE 2.

MAP SHOWING RECOMMENDED EXPLORATION, SECTION 33, T. 35 N., R. 79 W., NATRONA COUNTY, WYOMING.