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INVESTIGATIONS OF DOMESTIC RADIOACTIVE RAW MATERIALS,
BERYLLIUM, AND OTHER TRACE ELEMENTS

PREPARED FOR U. S. ATOMIC ENERGY COMMISSION

MONTHLY REPORT -- OCTOBER 1951
TRACE ELEMENTS OFFICE
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INVESTIGATIONS OF DOMESTIC RADIOACTIVE RAW MATERIALS AND OTHER TRACE ELEMENTS

MONTHLY REPORT—October 1951

SUMMARY

Significant data reported in October for projects in the Trace Elements program are summarized below:

Reconnaissance investigations, domestic.—Field investigations of the Nigger Shaft area in northernmost Jefferson County, Colo. were begun to delineate the limits of the uranium-bearing deposit exposed in the prospect shaft. The deposit contains pitchblende (?), copper carbonates and sulfides, galena, pyrite, quartz, calcite, and barite (?). Four diamond-drill holes have been completed at the Leyden coal mine, Jefferson County, Colo. The percent equivalent uranium of radioactive strata, estimated from gamma-ray logs, ranges from 0.006 to 0.045 in the No. 1 hole and from 0.012 to 0.021 in the No. 2 hole. The total thicknesses of the radioactive strata in each hole are 7.4 feet and 7 feet, respectively. Estimations of equivalent uranium for the other two holes are not yet available.

New development work by the operator on the Lynn No. 3 claim of the Bulloch property, Kane County, Utah has exposed new inferred reserves of 100 tons containing 0.1 percent uranium. The operator plans to continue development work; he has already recovered 80 tons of ore assaying slightly less than 0.14 percent uranium from this claim.

Inferred reserves for the Yellow Canary claims, Daggett County, Utah were revised to 500 tons of tyuyumnite-bearing quartzite containing 0.04 percent uranium.

Colorado Plateau, exploration.—A total of 1,000 tons of ore was found by 54,349 feet of drilling in Colorado on Outlaw Mesa, Mesa County; on Long Park, Club Mesa, Horse Mesa, Atkinson Mesa, and Spring Creek Mesa, Montrose County; in the Spud Patch area, San Miguel County; and in the Yellow Cat area, Thompsons district, Grand County, Utah.

Colorado Plateau, geologic studies.—Drilling, begun in early October in the Yellow Cat district near Thompsons, Utah, will demonstrate the application and limitations of geobotanical work in ore finding. During October six out of nine holes, drilled on ground supporting selenium-indicator plants, cut mineralized material.

Pre-Morrison studies (Colorado Plateau).—The Conway claims just east of the Happy Jack mine, in the White Canyon area, San Juan County, Utah were mapped in detail (scale 1 inch equals 20 feet). On the claims, both copper and uranium minerals are concentrated along joint surfaces and along
bedding planes in the basal part of the Shinarump conglomerate and in the underlying Moenkopi formation. This occurrence seems to support the possibility mentioned in the September Monthly Report (p. 38) that some of the mineral deposits in the White Canyon area were localized by fractures.

Southeast phosphate.—Drilling was continued by the International Minerals and Chemical Corp. on its French tract, Polk County, Fla., and was begun by the Virginia-Carolina Chemical Corp. on its Homeland and Clear Springs tracts, Polk County. Both drilling programs are being done under contract with the Atomic Energy Commission. The leached zone on the French tract ranges in thickness from 1 to 13.5 feet, on the basis of the holes drilled to date.

Coal and lignite investigations and black-shale reconnaissance.—Detailed investigations were continued in New Mexico of a radioactive zone in coal and carbonaceous shale at the base of the La Ventana sandstone that caps La Ventana Mesa, Sandoval County. Examination and samples of outcrops of the La Ventana sandstone (Trace Elements Memorandum Rept. 309, plate II) revealed the presence of two small areas of possible ore a short distance east of the deposit (September Monthly Report, p. 43), on the west tip of the south butte and revealed a large area of radioactive coal and carbonaceous shale on the north butte.

A carnotite deposit was found in the Wasatch formation in the Powder River basin, NE¼ NE¼ sec. 23, T. 44 N., R. 76 W., Campbell County, Wyo. The carnotite-bearing material occurs in "rolls" or concretionary masses in a medium-grained porous soft brown sandstone about 25 feet thick.

A baked siltstone containing as much as 0.1 percent uranium by radio-metric analysis was found overlying a clinker bed at the top of the Great Pine Ridge escarpment in the Fort Union formation, NE¼ SE¼ sec. 11, T. 42 N., R. 78 W., Johnson County, Wyo. The baked siltstone and clinker zone, 30 feet thick, is derived from a coal and carbonaceous shale sequence which ranges from 20 to 40 feet in thickness.

Thorium and monazite investigations.—An estimated 200,000 tons of radioactive material that averages about 0.02 percent equivalent uranium is present on the Haputa Ranch extension; the radioactivity is probably due to thorium. The grade, however, is based on samples taken at the surface or in shallow prospect pits, and may not be reliable for the rock at depth.

Reports forwarded.—In October, four Trace Elements Investigations Reports and 10 Trace Elements Memorandum Reports were transmitted to the Atomic Energy Commission.

Other projects.—In October, work similar to that previously in progress was continued on the following projects, and no outstanding results pertaining to these projects were reported.

Reconnaissance investigations, Alaska
Northwest phosphate
Beryllium-bearing rocks
Laboratory investigations
RECONNAISSANCE INVESTIGATIONS, DOMESTIC

During October, field work was conducted in Colorado, Idaho, Minnesota, Montana, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming. Drilling data are given in table 1; a summary of reserves of radioactive material for current field projects is given in table 2.

Table 1.—Domestic reconnaissance drilling data, October 1951.

<table>
<thead>
<tr>
<th>Project</th>
<th>Number of holes</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This month</td>
<td>Total</td>
</tr>
<tr>
<td>Leyden coal mine</td>
<td>2</td>
<td>831</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1492</td>
</tr>
<tr>
<td>Lost Creek Schroekingerite</td>
<td>10</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td>2,227</td>
</tr>
<tr>
<td>White Signal district</td>
<td>1</td>
<td>230</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>230</td>
</tr>
<tr>
<td>Thomas Range</td>
<td>1</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>288</td>
</tr>
</tbody>
</table>

Property examinations

No private property examinations were made during October and no examinations are scheduled definitely for November; but if possible, an occurrence of uranium minerals at the Rhyolite Beacon Mining Company's property in the Cripple Creek district, Teller County, Colo. will be investigated. This occurrence was reported in the Mining and Scientific Press for September 17, 1904.

The examination of a uranium deposit presumed to be in the vicinity of the McFadden oil field, Albany County, Wyo. and scheduled for October, was not made because the person submitting the sample has not disclosed the location where the sample was obtained. The sample is of gypsiferous sandstone containing a black uranium mineral and 4.1 percent uranium.
Table 2.—Summary of reserves of radioactive material of current
Reconnaissance field projects, October 1951.

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Area</th>
<th>Material</th>
<th>Short tons</th>
<th>Uranium (inferred)</th>
<th>Uranium (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td>Boulder County</td>
<td>Caribou mine</td>
<td>--</td>
<td>10</td>
<td></td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Jefferson County</td>
<td>Leyden mine</td>
<td>Silicified carbonaceous silt.</td>
<td>9,200</td>
<td></td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Larimer County</td>
<td>Copper King mine</td>
<td>Pitchblende, pyrite, and sphalerite veins.</td>
<td>200</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>Utah</td>
<td>Daggett County</td>
<td>Yellow Canary claims</td>
<td>Tyuyamunite coating fracture surface</td>
<td>500</td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Kane County</td>
<td>Bulloch claims</td>
<td>Carnotite-bearing sandstone</td>
<td>100</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Sweetwater County</td>
<td>Red Desert</td>
<td>Schroeckingerite-bearing beds. 1/</td>
<td>11,7001/</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>do.</td>
<td>55,0001/</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Uraniferous Lignite beds.</td>
<td>255,000,0001/</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>do.</td>
<td>2,000,000,0001/</td>
<td>0.005</td>
<td></td>
</tr>
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</table>

1/ Does not include reserves for the 5000-foot extension of the deposit found during the 1951 field season.

Copper-uranium deposits in sandstones

No reconnaissance field work was done in the study of copper-uranium deposits in sandstones. A mineralogic and petrographic study of samples from the various deposits examined during the 1951 field season is in progress. Spectrographic and radiometric data from a small number of samples indicate that asphaltic bitumen pellets in the Shinarump con-
glomerate on the west side of the San Rafael Swell contain from 1 to 5 percent equivalent uranium and detectable quantities of copper, cobalt, nickel, molybdenum, chromium, lead, arsenic, vanadium, and zinc—the metals that normally are concentrated in organic materials.

**Relation of volcanism to uranium deposits**

Field study was made of several stratigraphic sections of the Salt Wash member of the Morrison formation in northeastern Arizona and northwestern New Mexico to determine the amount and distribution of benzidine reactive clays in the sandstones. Office and laboratory study was made of the relation of clay minerals and carbonaceous materials to uranium deposits.

**Central Mineral Belt, Colorado**

Reconnaissance has been completed in the Alma district, Park County and the St. Kevin district, Lake County. Nearly all of the dumps and accessible adits in the St. Kevin district have been examined radiometrically. The only new find of importance has been the discovery of several pieces of vein material, containing what is probably pitchblende, on the dump of a caved adit located in the southwest portion of the St. Kevin district. The pitchblende (?) occurs as a sooty, fracture-surface coating of pyritic siliceous vein material. This is one of the few occurrences noted in the district in which pyritic vein material has shown noteworthy radioactivity.

The Sweet Home mine, Alma district was traversed radiometrically; a portion of this mine was examined in July 1951. Radon gas was again noted and was present throughout the remaining portion of the mine. A sample of wall rock, taken where the radiometric reading was highest, was radiometric-
ally negative when tested outside the mine. Because of the presence of radon gas, the mine workings above the Sweet Home mine are scheduled to be examined during the next field season in an attempt to find the source of the gas.

In Chaffee County, the Comos Nos. 1 and 2 mining claims, owned by Mr. Ward Poyner of Buena Vista, Colo. were examined. The claims are located on a north-trending radioactive zone in pre-Cambrian granite and pegmatite several miles south-southeast of Trout Creek Pass. The radioactive zone is 30 to 40 feet wide and about 1500 feet long. About one-fifth of the outcrops were radioactive; samples will be analysed to determine the source of radioactivity. It is believed, however, that if commercial-grade uranium deposits are present, they are small and sporadic in occurrence.

Uraniferous granitic rocks

Granitic rocks were studied and sampled during October in the Little Belt Mountains, Cascade and Meagher Counties, and the Philipsburg area, Granite County, Mont.; Lava Creek district, Butte County, Idaho; Pine quadrangle, Baker County, Oreg.; and the upper Okanogan Valley, Okanogan County, Wash.

In the Little Belt Mountains, two types of rocks were studied in the field: nepheline syenite, which was examined at two localities, and biotite granite, which was examined at one. Neither type of rock was high in radioactivity; the nepheline syenite was estimated to have 0.002 percent equivalent uranium; whereas the granite was just equal to background. This comparison is quite different from that in most areas, where the granitic rocks are higher in radioactivity, as a general rule, than the nepheline syenites. It is not yet known whether the radioactivity observed is due chiefly to uranium or to thorium.
In the Philipsburg area, several varieties of granitic rocks were examined. This area was chosen because of (1) the wide variety of rocks involved; (2) the well known relationships of the different rock types; and (3) the presence of a so-called alkaline, fluorite-rich granite. These factors suggested the possibility of a higher-than-normal concentration of uranium. None of the rocks examined, however, gave radiometric readings indicating a content of more than 0.002 percent equivalent uranium. The equivalent uranium content of the alkaline granite was as high as any, but the range of variation is relatively low compared to that found in some areas.

In the Lava Creek area, a Tertiary, alkali-rich granite was examined radiometrically at a number of places and sampled at one. The granite has been hydrothermally altered in many places. The radiometry suggests a content of not more than 0.002 percent equivalent uranium, which is low.

In the Pine quadrangle, an albite granite has been formed by the replacement of a quartz diorite. The solutions involved were silica- and alkali-rich suggesting the possibility that radioactive material was brought in by the replacing solutions. Both the original and replaced rocks, however, were almost inert (less than 0.001 percent equivalent uranium).

In the upper Okanogan Valley, there are a number of bodies of intrusive rock of different sizes, differing considerably in age probably, and ranging in composition from malignite and nepheline syenite to granite and granodiorite. Many were examined, but the highest radioactivity detected was about 0.001 percent equivalent uranium, and most of the rocks were not significantly above background.
Colorado Front Range

Central City district, Gilpin County

The surface mapping planned for the 1951 field season in the Quartz Hill area, Central City district was completed during October; compilation of the maps is in progress.

No obvious relationship between the pitchblende deposits and structure in the pre-Cambrian rocks has been found. In several places, the geologic relationships indicate that at least some of the bostonite dikes were formed before some of the faults and before some of the silicification.

Lawson-Dumont district, Clear Creek County

Mapping (scale 1:1200, contour interval 20 feet) planned for the 1951 field season has been completed in the Jo Reynolds mine area. A radiometric examination was made of the accessible 1200 feet of the Elida Tunnel where one anomaly was detected within 300 feet of the portal. The sublevel of the Diamond Mountain mine, the first level of which had been found previously to be radioactive, was examined and sampled. A sample from the most radioactive part of the sublevel contained 0.35 percent uranium.

Mapping of the Upper Bellevue area (scale 1:1200, contour interval 20 feet) was continued during October.

Caribou mine, Boulder County

Surface mapping of the area around the Caribou mine is nearly complete. Radiometric reconnaissance along the No Name vein and along closely related structures (the Caribou vein and others), and underground mapping and sampling probably will be completed in November. Reserves for the Caribou
mine area are listed in table 2.

Prairie Divide district, Larimer County

Detailed surface mapping around the Copper King mine on the Black Hawk claim No. 1, sec. 8, T. 10 N., R. 72 W., and examination of the new workings were continued (see September Monthly Report, p. 14) to study in detail the structure, petrology, and reserves in the pitchblende deposit. The operating company has received a $12,500 D. M. A. development loan to sink the east shaft to the 150-foot level. On October 20, this shaft had been sunk 25 feet below the 60-foot level.

Twenty-three samples taken from the 60-foot level of the Copper King mine by the Survey in 1949 (see Trace Element Memorandum Report 128A) contained up to 0.50 percent uranium, although more than half of them contained less than 0.01 percent uranium. The samples also contained copper, which ranged from 0.50 to as high as 2.97 percent, and zinc, which ranged from 0.80 to as high as 5.96 percent.

Reserves for the Copper King mine are listed in table 2; revision of these reserves is pending completion of field and laboratory work.

Ralston Creek district, Jefferson County

Field investigations of the Nigger Shaft area in northernmost Jefferson County were begun in October to delineate the limits of the uranium-bearing deposit exposed in the prospect shaft. An area 800 feet by 1,000 feet was mapped at a scale of 1 inch equals 50 feet. The deposit is in a mineralized shear zone, probably not more than 1 foot thick, that trends N. 25° W. and dips 65° W. The visible minerals are pitchblende (?), copper carbonated and sulfides, galena, pyrite, quartz, calcite, and barite (?). The foliation of the Idaho
Springs formation, the principle country rock, trends about N. 60° W., and
dips southwest at an angle 75° to 90°. Gneiss of the Idaho Springs formation
has been intruded by granitic pegmatite in large masses, concordant with the
foliation, and by lit-par-lit injection. A prominent breccia zone was noted
in the area but its attitude and extent has not been determined.

Detailed study of the structure, variations in rock composition, and
breccia zones will be undertaken to aid in interpreting the deposit. Re-
stores of uraniferous rock in the Nigger Shaft area have not been esti-
mated.

Leyden coal mine, Jefferson County

Four diamond-drill holes (incorrectly reported as five in the Advance
Monthly Report) have been completed in the Leyden coal mine area (table 1).
The percentage of equivalent uranium of radioactive strata, estimated from
gamma-ray logs, ranges from 0.006 to 0.045 in the No. 1 hole, and from 0.012
to 0.021 in the No. 2 hole. The total thickness of the radioactive strata
in each hole is 7.4 feet and 7 feet, respectively. Estimates for the other
two holes are not yet available.

Inferred reserves at the Leyden coal mine are listed in table 2.

Silver Reef, Washington County, and Bulloch claims, Kane County, Utah

Detailed geologic mapping (scale 1 inch equals 40 feet) was nearly com-
pleted on the Rough Rider No. 2 claim and on the adjacent part of the Maud
claim in Silver Reef district. Many old workings were examined on these
properties; two occurrences of carnotite were noted on dumps on the Maud No.
1 claim and on the Rough Rider No. 2 claim. No radioactive rock was
noted inside any of the workings. Carnotite and volborthite (?) occur as pore fillings disseminated in fine-grained sandstone, and in a few places, as coatings on plant fossils. Reserves have not been calculated for the Silver Reef area.

In the Bullch area, two new adits, the No. 2 and No. 3 have been driven on the Lynn No. 3 claim by the Salina Mining and Smelting Co. (See Trace Elements Memorandum Report 213, fig. 2). Adit No. 2 exposed a shoot of carnotite-bearing sandstone just above the contact of the Summerville sandstone of Upper Jurassic age with the overlying Dakota sandstone of Upper Cretaceous age. Most of the ore shipped by Salina Mining and Smelting Co. has come from this ore shoot. Adit No. 3 exposed ore in a clay pod containing radioactive carbonaceous plant fossils.

A northerly extension of the mine road has exposed three feet of white sandstone of the Summerville formation containing finely disseminated autunite. The autunite also occurs as thick clusters of radiating crystals along fractures in the sandstone.

The conclusion "...geologic evidence suggests the presence of concealed deposits." in Trace Elements Memorandum Report 213 (p. 20) is substantiated by these new exposures. The conclusion "...that richer uranium deposits may be concealed behind the present weathered surface." can be neither confirmed nor denied by evidence from the development work to date.

Eighty tons of rock reported to contain from 0.11 to 0.13 percent uranium have been shipped from the Lynn No. 3 claim and new inferred reserves of 100 tons of rock containing about 6.1 percent uranium were estimated during October.
It has been recommended that the physical exploration proposed in Trace Elements Memorandum Report 213, to be done at government expense, no longer be considered, inasmuch as the operators have already accomplished the desired exploration, and are extending operations.

Thomas Range fluorite district, Juab County, Utah

Mapping on the southern part of Spor's Mountain (scale 1 inch equals 500 feet) has been completed except for local checking. (See Trace Elements Memorandum Rept. 167 for a description of the properties and geology involved). Drilling, begun in late September, was continued; a total of 288 feet has been drilled.

Calculation of reserves of uraniferous fluorite in the Thomas Range district pend completion of the geologic and exploration work.

White Signal-Black Hawk districts, Grant County, N. Mex.

Preparations for geologic mapping were made in the Black Hawk district (about 20 miles west of Silver City), secs. 20, 21, 28, and 29, T. 18 S., R. 16 W., New Mexico principal meridian, to determine the distribution and geologic setting of possible radioactive material, indications of which were noted in 1950. (See Trace Elements Memorandum Rept. 118.) A total of 48 pits and shafts was tested radiometrically; the only radioactivity noted was from dump material around shafts in the Alhambra group of claims.

One hole has been drilled 230 feet deep on the Merry Widow claim but has not entered the supposed ore zone.
Boulder batholith, Montana

Geologic mapping (scale 1:12,000) was continued in T. 6 and 7 N., R. 4 and 5 W., near Boulder, Jefferson County, Mont. as part of a general program to find new deposits similar to those at the Free Enterprise mine and near Clancy. Two mines, eleven mine dumps, and three small areas containing silicified zones or "reefs" were examined radiometrically. A detailed study was begun of the Comstock mine in sec. 15, T. 6 N., R. 5 W., about 4 miles west-northwest of the Free Enterprise mine. The Comstock mine consists of three small drifts, an open cut, and a glory hole in an area of intense alteration and base-metal (copper and lead) deposition; slight radioactivity has been noted in the area.

Lost Creek schroeckingerite deposit, Sweetwater County, Wyoming

Possible schroeckingerite was noted in two of the ten auger-holes drilled during October in the Lost Creek area; abnormal radioactivity was noted in four other holes. All ten holes were located north of the Cyclone Rim fault zone to determine the possible lateral extent of the schroeckingerite deposit.

The 1951 exploration to date has indicated the presence of schroeckingerite in the Cyclone Rim fault zone as far as 5000 feet from the area of the previously known deposit, making the total length of the deposit 9000 feet. There are at least two schroeckingerite-bearing zones in this 5000-foot extension of the deposit. The width of the extension is assumed to be about 500 feet. Additional auger-drilling may determine accurately the width and the total number of schroeckingerite-bearing zones.

The limits of the deposit along the fault zone to the northwest and to
the southeast are not known. Drilling in the fault zone west of Lost Creek during this field season has not indicated the presence of schroeckingerite, but additional work will be necessary before the presence or absence is proved conclusively.

Reserves of schroeckingerite-bearing material and uraniferous lignite are given in table 2.

Yellow Canary claims, Daggett County, Utah

Field work on the Yellow Canary claims was completed during September. The deposit consists of thin coatings of tyuyamunite (reported as carnotite in the September Monthly Report) on fractures in the pre-Cambrian Red Creek quartzite, which overlies a sequence of pre-Cambrian quartzite, garnet schist, staurolite schist, quartz-muscovite-biotite schist, and amphibolite. The tyuyamunite is exposed in the quartzite in one open cut about 120 feet vertically above the contact of the quartzite with the underlying rocks. The owners report that "carnotite" is present in several small pits, which are now covered, 100 feet southeast of the open cut. Radiometric examination of the outcrops near the open cut indicated no abnormal radioactivity.

The uranium content of nine channel samples ranged from 0.001 to 0.050 percent, whereas, samples previously collected by the Survey ranged from 0.11 to 0.64 percent uranium. The inferred reserves of 500 tons of rock, (see September Monthly Report table 2, p. 12; TEPRR D-273, dated 9/5/51; and TEPRR, dated 5/28/51) containing 0.2 percent uranium should be revised, on the basis of new information, to 500 tons of rock containing 0.04 percent uranium.

Vanadium in the deposit occurs as volborthite and a black unidentified mineral; however, the amount of vanadium was unreported.
Radon in natural gas

Geological and reservoir data were obtained for about 200 wells in southern Moore and northernmost Potter Counties, Texas, from the Phillips Petroleum Company, the Natural Gas Pipeline Company of America, and the Canadian River Gas Company. Most of these wells were tested for radon content during the past summer's field season. The geological data was obtained mainly from graphic well logs and consists of notes on lithology and fossils, mineral and formation fluid occurrence, and the reservoir data (consisting mainly of gas flow determinations for individual gas-producing zones). This information will be used to assist in the gas flux calculations applicable to the radon measurements, and to establish a geological framework for evaluation of the final reduced radon measurements.

Compilation and reduction of the radon data obtained during last summer's field season was continued.

Airborne detection

At the conclusion of the cooperative investigation of gamma-ray scattering and absorption by the U. S. Air Force, the Oak Ridge National Laboratory, and the Geological Survey, the scintillation radiation detection equipment was removed from the Air Force C-47; the equipment was reinstalled in the Survey's DC-3 at Knoxville, Tenn., during the first week in October. Three 4-inch sodium iodide crystals for the scintillation radiation detection equipment were received at Oak Ridge during October, completing the contract with Harshaw Chemical Corporation for seven 4-inch crystals. The additional crystals will be mounted and installed in the next few months.
Examination of the records for the following airborne radioactivity surveys, made in conjunction with aeromagnetic surveys during October, has disclosed no radioactivity anomalies of interest.

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Flight miles</th>
<th>Terrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnesota</td>
<td>Lake</td>
<td>500</td>
<td>Sulfides in pre-Cambrian</td>
</tr>
<tr>
<td></td>
<td>Roseau, Marshall,</td>
<td>2,500</td>
<td>General pre-Cambrian</td>
</tr>
<tr>
<td></td>
<td>Pennington, Red Lake,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>Marquette, Iron</td>
<td>1,000</td>
<td>Pre-Cambrian</td>
</tr>
</tbody>
</table>

The airborne detection equipment for the proposed survey in Liberia has been assembled at Oak Ridge. J. M. Garner, a physicist at Oak Ridge National Laboratory, has been granted a 6-month leave of absence to act as observer for the Liberian survey; arrangements are underway for Garner's appointment and necessary clearance for foreign service.

Reports

Reports are being prepared on the following reconnaissance investigations:

1. Uraniferous lignites in North Dakota, South Dakota, Montana, and Wyoming.
2. Radiometric surveys of northeastern states.
3. Uranium occurrences on the Merry Widow claim, White Signal district, Grant County, N. Mex.
4. Uranophane at the Silver Cliff mine near Lusk, Niobrara County, Wyo.
6. The tin, copper, and uranium deposits at Majuba Hill, Pershing County, Nev.
7. Reconnaissance investigations for uranium in the Colorado Front Range.
(8) Uraniferous deposits in the Red Desert area, Sweetwater County, Wyo.

(9) Geology of the area adjacent to the Free Enterprise uranium-silver mine, Jefferson County, Mont.

(10) Carnotite deposits at the Yellow Canary claims, Daggett County, Utah.

(11) Radioactive deposits of the Haputa Ranch, Custer County, Colo.

(12) Reconnaissance survey of the Sheeprock Mountains, Tooele County, Utah.

(13) Rare-earth and fluorite deposits of the Bear Lodge Mountains, Crook County, Wyo.

(14) Radiometric reconnaissance of parts of the northwestern San Juan Mountains, Gunnison, Ouray, and San Juan Counties, Colo.

(15) Reconnaissance of sandstone-type copper-uranium deposits in parts of New Mexico, Colorado, Utah, Idaho, and Wyoming.

RECONNAISSANCE INVESTIGATIONS, ALASKA

Preparation of reports, recessed at the beginning of the 1951 field season, was continued during October. (See August Monthly Report, p. 14).

Field work for projects begun during the 1951 field season was recessed in the latter part of September. (See figure 2). No additional information is available on these projects. (See June, July, August, and September Monthly Reports.) Four preliminary reports, summarizing the 1951 field work, are in preparation. A memorandum report on the use of portable survey meters for airborne reconnaissance with light planes in Alaska will be transmitted in early November.
Reconnaissance investigations

1. Alma-St. Kevin districts, Colo.
2. Comus Nos. 1 and 2 claims, Colo.
3. Little Belt Mts., Mont.
4. Philipsburg area, Mont.
5. Lava Creek district, Idaho
7. Upper Okanogan Valley, Wash.
8. West Panhandle field, Tex.
9. Central City district, Colo.
10. Larson Dumont district, Colo.
11. Caribou mine, Colo.
12. Prairie Divide district, Colo.
13. Balston Creek district, Colo.
14. Leyden coal mine, Colo.
15. Thomas Range, Utah
17. Boulder Balcholith, Mont.
18. Lost Creek niobium-uraninite, Wyo.
19. Marysvale area, Utah
20. Yellow Canary claims, Utah
21. Colorado Plateau (see fig. 3)
23. White Canyon, Utah
24. Capitol Reef, Utah
25. Aspen Range-Dry Ridge
26. Willis quadrangle, Mont.
27. Southeast phosphate
28. Lignite, coal, and black shale
29. Silver Peak, Nev.
32. Teton County, Wyo.
33. Sierra Buttes, S. Dak.
34. Red Desert, Wyo.
35. Goose Creek district, Idaho
36. La Ventana Mesa, W. Mex.
38. "Nev. Mountains, Colo.
39. Southeast monazite
40. Airborne detection
41. Lake Co., Minn.
43. Rostau, Marshall, Pennington, Red Lake, and Polk Counties, Minnesota

Figure 1.--LOCATION OF TRACE ELEMENTS FIELD PROJECTS IN THE UNITED STATES
COLORADO PLATEAU, EXPLORATION

Field work in progress

East Gateway district, Mesa County, Colorado

Outlaw Mesa.--Drilling continued on Outlaw Mesa during October with seven rigs in operation throughout the month. Of the 43 holes completed during October, one (No. 1262) is in ore, and five (Nos. 1259, 1266, 1273, 1275, and 1277) are in mineralized material that is below the cut-offs for ore (fig. 4). This drilling discovered one new deposit and extended the known limits of four others. Drilling during October was planned to continue the search for deposits in favorable ground and to delimit known deposits. This plan of drilling will continue during November.

Only a few more holes will be drilled on Outlaw Mesa. If conditions are favorable, drilling on the mesa will be finished in early November.

Uravan district, Montrose County, Colorado

Horse Mesa.--Drilling continued in the Horse Mesa area during October with two rigs in operation. One wagon-drill rig was in operation from October 3 through the rest of the month, drilling and setting casing in the overburden as a preparation for the diamond-drill rigs. Of the five holes completed during the month, two (Nos. 59 and 60) are in mineralized material that is below the cut-offs for ore (fig. 5). Each of these two holes is a new discovery. All of the holes were drilled on wide-spaced intervals for geologic information.

During November, drilling will continue on a wide spacing to obtain more geologic information along the canyon bottoms in the western part
Table 3.—Summary of exploration, Colorado Plateau project, October 1951

<table>
<thead>
<tr>
<th>Project or activity</th>
<th>Drilling, radiometric scanning, and sampling</th>
<th>Indicated and inferred reserves found by drilling (short tons)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Holes</td>
<td>Feet or samples (s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last month</td>
<td>This month</td>
<td>Total</td>
</tr>
<tr>
<td>Exploration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling concluded, reports finished, combined totals</td>
<td></td>
<td></td>
<td>111,815</td>
</tr>
<tr>
<td>Drilling recessed or concluded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrizo Mesa, Apache Co., Ariz.</td>
<td>24</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Blue Mesa, Mesa Co., Colo.</td>
<td>24</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Noon Mesa, Mesa Co., Colo.</td>
<td>46</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jo Dandy area, Montrose Co., Colo.</td>
<td>247</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal</td>
<td>25</td>
<td>0</td>
<td>922</td>
</tr>
<tr>
<td>Drilling continuing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outlaw Mesa, Mesa Co., Colo.</td>
<td>43</td>
<td>43</td>
<td>1,298</td>
</tr>
<tr>
<td>Horse Mesa, Montrose Co., Colo.</td>
<td>5</td>
<td>60</td>
<td>1,189</td>
</tr>
<tr>
<td>Atkinson Mesa, Montrose Co., Colo.</td>
<td>15</td>
<td>4,672</td>
<td>3,595</td>
</tr>
<tr>
<td>Spring Creek Mesa, Montrose Co., Colo.</td>
<td>20</td>
<td>4,629</td>
<td>7,043</td>
</tr>
<tr>
<td>Club Mesa, Montrose Co., Colo.</td>
<td>60</td>
<td>2,976</td>
<td>7,041</td>
</tr>
<tr>
<td>Long Park, Montrose Co., Colo.</td>
<td>7</td>
<td>473</td>
<td>814</td>
</tr>
<tr>
<td>Spud Patch area, San Miguel Co., Colo.</td>
<td>309</td>
<td>2,631</td>
<td>8,178</td>
</tr>
<tr>
<td>Yellow Cat area, Grand Co., Utah</td>
<td>86</td>
<td>84</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal</td>
<td>273</td>
<td>2,873</td>
<td>38,779</td>
</tr>
<tr>
<td>Total drilling</td>
<td>178</td>
<td>273</td>
<td>6,033</td>
</tr>
<tr>
<td>Gamma-ray hole scanning</td>
<td>129</td>
<td>5,003</td>
<td>28,174</td>
</tr>
<tr>
<td>Radiometric core scanning</td>
<td>75</td>
<td>5,181</td>
<td>1,934</td>
</tr>
</tbody>
</table>
Figure 2—Map of part of the Colorado Plateau, showing the areas of drilling.

- Drilling concluded, reports finished
- Drilling recessed or concluded
- Drilling during current month
- Drilling planned
- Significant uranium-vanadium mine or group of mines
of the area. The maximum contract footage will probably be attained in the early part of November. When the drilling on Outlaw Mesa is completed, probably in early November, the remaining footage on the Outlaw Mesa contract is planned to be drilled in the Horse Mesa area.

Atkinson Mesa.—Drilling continued on Atkinson Mesa during October with an average of ten diamond-drill rigs and one churn drill in operation. The five holes completed during the month are in barren material (fig. 6). Although the new drilling techniques started in September seem to have solved the difficulties of drilling, water delays, absent drillers, and lack of equipment continue to keep the rate of drilling below schedule. Drilling during November will continue to be wide-spaced to acquire geologic formation.

Dolores Bench.—Bids were opened in Denver on October 10 for 30,000 to 45,000 feet of diamond drilling on the Dolores Bench (fig. 3). The low bidder was Minerals Engineering Co. of Grand Junction, Colo. It is expected that the contract will be approved in Washington in November and that field operations will start in December.

Spring Creek Mesa.—Ten drill rigs continue to operate on Spring Creek Mesa during October. Of the eleven holes completed, three (Nos. 13, 15, and 20) are in mineralized material that is below the cut-offs for ore (fig. 7). Each of these three holes is in a new discovery. All drilling is wide-spaced for obtaining geologic information. The rate of drilling during October was a considerable improvement over earlier months due to greater efficiency and fewer breakdowns.

San Miguel Bench.—Bids were opened in Denver on October 10 for 30,000 to 45,000 feet of diamond drilling on the San Miguel Bench (fig. 3). The low bidder was Mott Core Drilling Co. of Huntington, West Virginia. The contract was approved in Washington in October and field operations will probably start in late November.
Club Mesa.--Drilling continued on Club Mesa during October with six rigs in operation, four of them on a double-shift basis. Of the 25 holes completed, six (Nos. 591, 593, 594, 595A, 601, and 605) are in mineralized rock that is below the cut-offs for ore (fig. 8). The drilling resulted in the discovery of one deposit and extended the known limits of deposits discovered earlier.

The drilling during October was planned to define more completely some known deposits and to appraise the inferred favorable belt beneath the Burro Canyon formation in the center of the Mesa. This plan of drilling will continue during November. Two drills were moved from Long Park, one on the 4th and the other on the 16th of the month.

Long Park.--Drilling continued in the vicinity of Long Park during October with six rigs in operation until the 4th when one rig was moved to Club Mesa followed by another on the 16th, leaving four rigs in operation for the remainder of the month. Of the 13 holes completed during October, seven (Nos. 471, 472, 473, 474, 475, 476, and 477) are in mineralized material that is below the cut-offs for ore (fig. 9). As a result of this drilling, seven new deposits were discovered. Wide-spaced drilling in north and central Long Park was continued for geologic information. This wide-spaced drilling will continue during November along with some moderate-spaced drilling to test for extensions of known ore deposits.

Slick Rock district, San Miguel County, Colorado

Spud Patch area.--During October, eight rigs operated in the Spud Patch area. Of the 87 holes completed during the month, three (Nos. 285, 297, and 299) are in ore and 18 (Nos. 227, 229, 243, 246, 248, 253, 254, 260, 267, 272, 274, 277, 289, 291, 298, 303, 304, and 310) are in mineralized material that is below the cut-offs for ore (fig. 10). Twelve deposits were dis-
covered as a result of this drilling. Most of the drilling was planned to test favorable ground for ore deposits with moderately spaced drilling. Some drilling was planned to further define deposits discovered by previous drilling and some wide-spaced drilling was planned to obtain geologic information in untested ground. The drilling during November is planned to test favorable ground for ore deposits with moderately spaced drilling. Drilling in the Spud Patch area will probably be recessed at the end of November when the maximum footage will be reached on the present contract. A brief report summarizing the results of the drilling is in preparation.

Thompsons district, Grand County, Utah

Yellow Cat area.—Diamond-drilling and non-core, dry-hole experimental drilling started in the Yellow Cat area on October 9, with four diamond-drill rigs and one wagon drill. Two additional diamond-drill rigs were moved into the area on the 16th of the month. Of the 46 diamond-drill holes completed during the month, six (Nos. 2, 3, 9, 15, 31, and 31A) are in ore and eight (Nos. 11, 12, 20, 26, 28, 29, 30, and 34) are in mineralized material that is below the cut-offs for ore (fig. 11). Of the 38 wagon-drill holes completed during the month, three (Nos. W-12, W-29, and W-38) are in ore and seven (Nos. W-3, W-4, W-28, W-32, W-33, W-34, and W-37) are in mineralized material that is below the cut-offs for ore (fig. 11). Eleven deposits were discovered as a result of the drilling during October. Most of the holes were drilled on a wide-spaced pattern for geologic information with a few offset holes to test favorable ground. Fifteen holes were drilled to test geobotanical data and nine of these cut mineralized sandstone. Drilling during November will follow the same plan.
Radiometric logging of drill holes

During October four gamma-ray logging units were used on the Colorado Plateau. Drilling projects at eight areas were serviced, the distribution of drilling activities necessitates an excessive amount of travel on the part of the gamma-ray logging units and the operators. One gamma-ray logging unit is being used on a full time basis for the logging of drill holes in Florida.

Compilation of calibration data by which gamma-ray logs can be interpreted in terms of equivalent uranium is progressing very slowly. Uncorrected calibration curves for all grades and thicknesses of ore have been determined and experiments are being set up to determine the effects of hole diameter and other variable factors. The results of the experiments will be used to determine correction factors to be applied to the calibration curves.

A portable hand-operated cable reel to be used as part of the equipment necessary for the qualitative logging of drill holes has been designed and built at Grand Junction. This reel holds approximately 1,000 feet of RG-59/U cable, can easily be carried in the field by one person, and is equipped with slip-ring contacts. When proper impedance matching circuits are installed at the ends of the cable a variety of probes and rate meters can be used for the logging of drill holes. This equipment is being tested in the field. After comments have been received from several users, the design will be improved if necessary and additional units will be made.

During November the activities of the unit will be almost wholly restricted to routine services. Experimental work will be performed whenever personnel are available.

Trace Elements Memorandum Report 311, summarizing the progress in the development of gamma-ray logs on the Colorado Plateau was transmitted to the
Resistivity studies

Vertical resistivity measurements were completed in the western and southwestern parts of the Spud Patch area, San Miguel County, to determine if wide-spaced measurements would serve to locate favorable ground in much the same manner as wide- or moderate-spaced drilling. Depth profiling was done at proposed drill holes and at stations approximately 500 feet apart along north-south traverses across the area at intervals of 500 feet. The measurements were made at depth intervals of ten feet to a total depth of 180 feet in the western part of the area. At the higher elevations in the southwestern part of the area, measurements were made to depths of 250 and 300 feet.

Three general types of resistivity-depth curves were obtained. The resistivity-depth curves obtained at some stations show a gradual increase in resistivity with depth that indicates an increase in the amount of sandstone in the total section measured at intervals of increasing depth. In such areas the ore-bearing sandstone probably will be of sufficient thickness to be classed as favorable. Another type of curve is similar to type described above, but shows discontinuity at shallow depth, which indicates that the ore-bearing sandstone is probably too thin to be classed as favorable. The third type of curve shows a decrease in resistivity with depth that may be caused by the presence of thick mudstone lenses or splits in the ore-bearing sandstone. In general, areas where this third type of curve was obtained may be considered as unfavorable or semi-favorable ground.

The results of drilling show that 12 of 16 holes that are in favorable ground are in areas where the resistivity-depth curves indicate a favorable
thickness of sandstone to be present; favorable ground was found in approximately half of the number of holes drilled in areas interpreted from the curves as underlain by thick sandstone; favorable ground was found in 4 of 14 holes drilled in areas where the curves indicate semi-favorable or unfavorable ground.

Correlation studies of the data show that the degree of favorability may not be interpreted accurately in parts of the area. At stations underlain by a thick section of sandstone the curves do not indicate the presence of unfavorable colored sandstone lenses or thin mudstone "splits" that are important factors in determining favorability. Near the Bell Canyon reservoirs in the Spud Patch area, a thick section of interbedded thin mudstone and hard sandstone strata overlies the ore-bearing sandstone. Measurements made over this type of section may give curves indicating thick sandstone at stations where the ore-bearing sandstone is too thin to be classed as favorable. The resistivity-depth curves do not indicate accurately subsurface conditions at holes in the northern part of the area where the ore-bearing sandstone lies near the surface. The variation in resistivity caused by changes in moisture conditions in the upper part of the sandstone cause discontinuities that are not related to changes in subsurface geological conditions.

The results of this work imply that resistivity measurements may be used to outline in a general manner those areas in which most of the favorable ground occurs. The measurements will probably delineate more accurately areas underlain by sections consisting of thick mudstone and thin ore-bearing sandstone.

Field work recessed or completed

Areas in which exploration of the carnotite deposits of the Colorado Plateau was recessed or completed prior to October 1951, and for which final
reports are not completed, are listed in table 3 on page 26.

Radiometric scanning of core

The data on radiometric scanning of core are given in table 3 on page 26. Since March 19, a cut-off of 0.035 percent equivalent \(U_3O_8\) has been used as a lower limit for the selection of samples for uranium assay. Since August 8, a cut-off of 0.020 percent equivalent \(U_3O_8\) has also been used as a lower limit for the reporting of equivalent \(U_3O_8\) values, but these samples (between 0.020 and 0.035) are not submitted for chemical assay. Only core from holes that could not be probed by a gamma-ray field counter has been scanned completely.

Claim inventory and appraisal

Searching of public records for the recording and status of claims continued in October, and revealed 81 newly recorded claims, 4 amended claim locations, and 30 instruments--leases, deeds, and affidavits of labor.

About 80 claims were found in the field and their locations plotted on quadrangle maps. Compilation of claim data for 12 topographic base claim maps was continued.

Information to claim owners and lessees

The number of requests received from claim owners and lessees, or the Commission, for information on U. S. Geological Survey drilling on private ground or Commission-controlled ground, and the number of replies transmitted are summarized in the following table:

<table>
<thead>
<tr>
<th></th>
<th>September 1951</th>
<th>October 1951</th>
<th>Total to date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of requests</td>
<td>3</td>
<td>1</td>
<td>69</td>
</tr>
<tr>
<td>Number of replies</td>
<td>6</td>
<td>1</td>
<td>67</td>
</tr>
</tbody>
</table>
Field work in progress

Stratigraphic studies

Stratigraphic studies of the ore-bearing Morrison formation were continued through October. Sections were studied in northeastern Arizona, northwestern New Mexico, and central Utah. Pebble studies, sedimentary structure studies, and lithofacies studies of the Morrison and adjacent formations were made in northeastern Arizona, northwestern New Mexico, and southwestern Colorado. Rock samples for laboratory analysis were collected in northeastern Arizona and northwestern New Mexico.

The field work is aimed at completing the regional study of the Morrison formation in mid-November. A final report on the Morrison formation will be prepared during the winter and spring months.

Geochemical prospecting

Plants growing over shallow uranium deposits in the Colorado Plateau absorb detectable quantities of the ore metals and associated elements, as shown by studies during the past two years in various places on the Plateau. Drilling began in early October in the Yellow Cat area near Thompsons, Utah, and will demonstrate the application and limitations of geobotanical work in ore finding.

In October a report, TEMR 273, "Preliminary report on geobotanical exploration in the Yellow Cat district, Grand County, Utah," was transmitted in advance of the drilling in that area. Ground thought favorable for ore finding is shown on the maps of this report by the distribution of selenium-bearing plants. During October six out of nine holes drilled on ground sup-
porting selenium-indicator plants cut mineralized material. The geologist in charge of the geochemical prospecting is watching the progress of drilling carefully.

Other work during October consisted of compiling data, collected in the course of these plant studies, on the chemistry of the ore-bearing sandstone in the area. A report, "Geobotanical reconnaissance near Grants, New Mexico," is in preparation that will recommend analyzing samples of trees growing on the Todilto limestone of the Grants area for uranium, as a guide in ore finding.

Geochemical prospecting work on the Colorado Plateau will be suspended for the next two months, while the geologist in charge is on a tour of duty in Washington.

Resource appraisal

Northeastern Arizona.--The appraisal of the total uranium resources and geologic studies of carnotite deposits in the Salt Wash member of the Morrison formation in the Carrizo Mountains area, Apache County, Ariz., continued during October. Deposits on Kinusta and Toh Acon Mesas were examined. A preliminary resource appraisal report will be prepared after field work is recessed this fall.

Two weeks during October were spent in conferences concerning uranium deposits in New Mexico and general stratigraphic relations in New Mexico and eastern Arizona.

Field work recessed

Regional mapping

Southwestern Colorado.--Regional mapping compilation and the preparation of reports for publication in the Quadrangle Map Series continued during October.
The approximate status of various phases of this work on the eighteen 7½-minute quadrangles in southwestern Colorado is shown below:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Percent completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compilation on topographic base maps from air photos</td>
<td>78</td>
</tr>
<tr>
<td>Preparation of structure contour maps</td>
<td>73</td>
</tr>
<tr>
<td>Preparation of structural sections</td>
<td>75</td>
</tr>
<tr>
<td>Writing of texts to accompany geologic quadrangle maps</td>
<td>5</td>
</tr>
<tr>
<td>Editorial review and criticism</td>
<td>0</td>
</tr>
</tbody>
</table>

Northeastern Arizona.—Geologic mapping in the Carrizo Mountains area, Apache County, Ariz., was recessed at the end of August. An area of about 75 square miles comprising the igneous-sedimentary laccolithic complex of the mountains remains to be mapped.

The status of the various phases of the work on the four 15-minute quadrangles is summarized below:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Percent completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geologic mapping</td>
<td>92</td>
</tr>
<tr>
<td>Preliminary map compilation</td>
<td>57</td>
</tr>
<tr>
<td>Checking and editing compilation</td>
<td>43</td>
</tr>
</tbody>
</table>

Slick Rock area.—Field and office work on the resource appraisal of the Slick Rock area, San Miguel County, Colo., has been completed. The report on this work is in preparation. Calculations show that indicated and inferred reserves total about 105,000 tons of ore, averaging 0.3 percent U₃O₈ and 2.1 percent V₂O₅. Estimates of potential reserves of the same average grade total approximately 500,000 tons. It is predicted that about 50,000 tons of ore will be produced from this area in 1951 and 1952, and that the production after 1952 will decrease slowly unless considerable deep exploratory drilling is done and followed up by mining.
Ground-water studies

The ground-water studies originally planned were completed in mid-September. The report prepared on this work is being reviewed and revised. The report gives the available evidence regarding present ground-water conditions, including the composition of the waters and the permeability and porosity relations in the ore-bearing sandstone, and also discusses the geologic features that would have influenced ground-water conditions in the past. It is suggested that the more favorable time of the accumulation and concentration of the ore-bearing solutions was during the period after the deposition of the Salt Wash, and before regional deformation in early Tertiary time.

PRE-MORRISON STUDIES (COLORADO PLATEAU)

Field work in progress

Regional mapping and detailed studies of the pre-Morrison ore-bearing formations (mainly Triassic) are being conducted by the Pre-Morrison project to determine the distribution and character of the ore-bearing strata, and to study geologic relations that may be useful in guiding exploration and appraising the total resources. The progress and results of the work during October are reported below.

White Canyon, San Juan County, Utah

Field work in the White Canyon area was recessed on October 11 and will be resumed next spring. Of the 400 square miles in the area, about 100 square miles was mapped on air photos and 75 square miles on plane table sheets during the 1951 field season. Mapping extended from the head of White Canyon
to just below the Happy Jack mine. Work in the office during the last half of the month consisted of map compilation and report writing.

An increasing amount of evidence favoring fracture control for the localization of the ore deposits was found in the White Canyon area during the last part of the field season. The Conway claims just east of the Happy Jack mine were mapped in detail (scale 1 inch equals 20 feet). On these claims, both copper and uranium minerals are concentrated along joint surfaces and along bedding planes in the basal part of the Shinarump conglomerate and in the underlying Moenkopi formation.

Field work recessed

Monument Valley, Apache and Navajo Counties, Arizona

Field work in the Monument Valley area was recessed in September and will be resumed next spring. Work in October consisted of final compilation of the field maps and preparation of reports. A preliminary report, Trace Elements Memorandum Report 318, was transmitted to the Atomic Energy Commission on October 15; a more detailed report is in preparation.

Capitol Reef, Wayne County, Utah

Field work in the Capitol Reef area was recessed at the end of September. Office work during October consisted of the preparation of a preliminary report and the final compilation of field maps. Work on a detailed report was also started. Field work will be resumed next spring.
NORTHWEST PHOSPHATE

Geologic mapping

Geologic mapping (scale 1:12,000) in the Aspen Range-Dry Ridge area, Bear Lake County, Idaho (fig. 1) during October consisted of completing the mapping of small areas (table 4) and field review of critical areas already mapped.

Table 4.—Mapping and sampling data, Northwest phosphate project.

<table>
<thead>
<tr>
<th>Location</th>
<th>Area mapped (square miles)</th>
<th>Localities sampled</th>
<th>Samples taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole project</td>
<td>24 510</td>
<td>1 50</td>
<td>1/ 1133+</td>
</tr>
<tr>
<td>Idaho, Utah, and Wyoming</td>
<td>2 193</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Bear River region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lyon quadrangle</td>
<td>0 290</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Willis quadrangle</td>
<td>1/ 20</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Other areas</td>
<td>0 7</td>
<td>0 16</td>
<td>0 208</td>
</tr>
</tbody>
</table>

1/ Not reported

Geologic mapping of the NW 1/4 of the Willis quadrangle was continued in the north part of the quadrangle near a tungsten-bearing area.

Stratigraphic and paleontologic studies

One section of the Phosphoria formation was sampled and described near Talbot Creek, Teton County, Idaho. Previously sampled sections of the Phosphoria were measured and described in the Montpelier region, Bear Lake County to evaluate the consistency of results obtained by different geologists working on the same stratigraphy.

No sampling or description was done in Montana.

A sixth report containing analyses of stratigraphic samples of the Phosphoria formation is in preparation for release in open file.
SOUTHEAST PHOSPHATE

In October, investigation of the Florida phosphate deposits (fig. 1) consisted principally of: (1) recording data from drilling programs on the French tract (Polk County) of the International Minerals and Chemical Corp., the Homeland and Clear Springs tracts (Polk County) of the Virginia-Carolina Chemical Corp., and on property of the Royster Guano Co. (Polk County); (2) sampling and gamma-ray logging of current company prospect holes; (3) stratigraphic studies; (4) preparing isopach maps of the matrix, overburden, and leached zone, and contour maps of the basement rock surface; and (5) preparing reports. Tabular data pertaining to the sampling, drilling, and gamma-ray logging activities are given in table 5. Tracts of land on which records have been furnished by each company are listed in the illustrations (fig. 12, sheet B). Progress in compiling company data and preparing isopach and contour maps is given (fig. 12, sheets, C, D, E, F, and G).

Table 5.—Sampling and drilling data, Southeast phosphate project.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Samples taken</th>
<th>Drilling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of holes</td>
</tr>
<tr>
<td></td>
<td>This month</td>
<td>Total</td>
</tr>
<tr>
<td>Whole project</td>
<td>1956</td>
<td>93,362</td>
</tr>
<tr>
<td>TVA drilling</td>
<td>67</td>
<td>1,748</td>
</tr>
<tr>
<td>AEC drilling</td>
<td>0</td>
<td>5,146</td>
</tr>
<tr>
<td>IMCC 3/</td>
<td>187</td>
<td>187</td>
</tr>
<tr>
<td>VC 4/</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Mine sampling</td>
<td>9</td>
<td>3,753</td>
</tr>
<tr>
<td>Company drilling</td>
<td>1623</td>
<td>63,875</td>
</tr>
<tr>
<td>Royster tract</td>
<td>51</td>
<td>148</td>
</tr>
<tr>
<td>Gamma-ray logging</td>
<td>0</td>
<td>0,106</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>19</td>
<td>18,523</td>
</tr>
</tbody>
</table>

1/ Excludes gamma-ray logging.
2/ Fiscal year 1951
3/ International Minerals and Chemical Corp.
4/ Virginia-Carolina Chemical Corp.
5/ Drilling by U.S.G.S.

The International Minerals and Chemical Corp. continued drilling on its
French tract, Polk County under contract with the Atomic Energy Commission. From the drilling to date, it has been found that the leached zone ranges in thickness in this tract from 1.0 to 13.5 feet and averages 5.6 feet thick. Analyses are available for only the first hole; the unscreened sample contained 0.009 percent uranium, whereas the minus 200 mesh fraction, roughly 25 percent of the sample by weight, contained 0.022 percent uranium. Chemical analyses for $\text{Al}_2\text{O}_3$ and $\text{P}_2\text{O}_5$ will be made and reported by the company.

The Virginia-Carolina Chemical Corp. began drilling on its Homeland and Clear Springs tracts, Polk County, in early October (table 5) under contract with the Atomic Energy Commission. This drilling program will be completed early in November.

Drilling was continued in September by Wayne Thomas, independent consultant, on land owned by the Royster Guano Co. in secs. 11, 14, and 23, T. 30 S., R. 25 E., Polk County. About 400 drill holes are planned; 23 were sampled and logged by the Survey in October, making total of 92 holes. The thickness of the leached zone ranges from one foot in the southwestern corner of the property (sec. 23, T. 30 S., R. 25 E.) to 60 feet in the northeastern (sec. 11, T. 30 S., R. 25 E.). The minus 150 mesh fraction of a sample of leached zone material from one hole, in which the zone was 38.5 feet thick, was 22 percent by weight and contained 0.032 percent uranium. Using a weight factor of 90 pounds of leached zone material per cubic foot, there are 14,800 tons per acre of minus 150 mesh material in the vicinity of the hole, or about 4.8 long tons of uranium per acre.

Further study of the content of leached zone material in overburden dumps in the land-pebble phosphate district is pending the analysis of samples.

Reports are being prepared on a statistical study of drilling at the Bonny Lake mine, Polk County, and on the use of local mining terminology.
Nine holes were drilled by the Survey with a mobile auger drill near the edges of the district and outside the district to determine changes in lithology and thickness of the phosphate-bearing strata, if any, and related strata.

LIGNITE AND COAL INVESTIGATIONS AND BLACK SHALE RECONNAISSANCE

The objectives of the present investigations of lignite, coal, and black shale in the Rocky Mountains region are (1) to search for new uraniferous deposits; (2) to map, sample and appraise, in a preliminary manner, the more promising of the known uraniferous deposits; and (3) to study the possible sources of uranium found in lignite, coal, and black shale to guide future investigations. Reconnaissance search for new deposits was undertaken in Esmeralda County, Nev., and Campbell, Fremont, Johnson, and Teton Counties, Wyo. Mapping and sampling was underway during October (1) in the Red Desert, Sweetwater County, Wyo.; (2) in the Goose Creek district, Cassia County, Idaho; (3) on the La Ventana Mesa, Sandoval County, N. Mex.; and (4) on Slim Buttes, Harding County, South Dakota.

Silver Peak Range, Esmeralda County, Nevada

A possibly significant occurrence of carnotite was discovered during October at the north end of the Silver Peak Range while testing the radioactivity of tuffs that might constitute a source of uranium in lignite. The carnotite occurs as veins in a rhyolite tuff that contains as high as 1.6 percent equivalent uranium; as dark chalcedonic stringers along joints and fractures in the tuff that contain about 0.31 percent equivalent uranium; and disseminated throughout portions of the radioactive tuff that contains about 0.16 percent equivalent uranium. Four representative samples of the main mass of the
radioactive tuff body, which is about 300 feet or more in length, and 200 feet wide, contain 0.01 to 0.03 percent equivalent uranium. The uranium in these samples has not been reported.

Powder River Basin, Campbell County, Wyoming

A carnotite deposit was found in the Wasatch formation of Eocene age in the NE\(^4\) NE\(^{1/4}\) sec. 23, T. 44 N., R. 76 W., in the Powder River Basin, a short distance north of an anomaly reported to be at Pumpkin Buttes, Johnson County in the December 1950 Monthly Report. The carnotite-bearing material occurs in "rolls" or concretionary masses in a medium-grained porous soft brown sandstone about 25 feet thick. About 500 feet of abnormally radioactive Wasatch variegated claystones, coal, carbonaceous shales, and lenticular sandstones overlie the carnotite deposit. A one-foot thick coal bed in this series, 230 feet above the carnotite deposit contains about 0.005 percent equivalent uranium. A greenish siltstone, 586 feet thick, at a slightly higher horizon than the carnotite deposit and located about 1800 feet east-northeast of it, contains 0.022 percent equivalent uranium.

The Wasatch formation is overlain by 250 feet of soft coarse-grained porous yellowish sandstone, containing thin lenses of soft green and pinkish-white tuff and claystone. North Pumpkin Butte and the other buttes to the south are capped by about 50 feet are more of siliceous cliff-forming tuffaceous sandstone with conglomeratic layers near the top. The age of the post-Wasatch deposits is not known but the sandstones do not resemble the Oligocene or Miocene strata on the Bighorn Mountains to the west. A similar type of sandstone, 50 to 75 feet thick, is reported to be at the base of the White River formation of Oligocene age, 80 miles to the southeast. Radiometric examination of these post-Wasatch deposits showed that the soft sandstone, the tuff and
claystone beds, and the tuffaceous caprock at the tip of the North Pumpkin Butte were abnormally radioactive and that the tuffaceous caprock was most radioactive. The carnotite may have been derived by leaching of the uranium from the thick radioactive tuffaceous sandstone overlying the Wasatch formation.

The post-Wasatch sandstone is present in broad outcrops on all four Pumpkin Buttes, along linear distance of approximately 9 miles north-south. These buttes rise from 500 to 1000 feet above the general land surface and are carved in essentially undeformed strata, so it can be presumed that the post-Wasatch sandstone is a remnant of a much more extensive deposit that covered a considerable part of the Wasatch strata in the central Powder River Basin. If the tuffaceous sandstone is the source rock and if the uranium in it is widely distributed as it appears to be, then many deposits of carnotite, uraniferous coal, shale, and sandstone may be present in this region. Not all may necessarily be in the immediate vicinity of the Pumpkin Buttes.

These deposits will be fully investigated later.

Johnson County, Wyoming

A baked siltstone containing as much as 0.1 percent equivalent uranium was found overlying a clinker bed at the top of the Great Pine Ridge escarpment in the Fort Union formation, NE\(^2\) SE\(^2\) sec. 11, T. 42 N., R. 78 W. The baked siltstone and clinker zone, 30 feet thick, was derived from a coal and carbonaceous shale sequence which ranges from 20 to 40 feet in thickness, and is exposed in places for many miles along the escarpment. The radioactivity of the coal, although slight, is normally higher near the top of each coal bed. This suggests that the uranium was carried down from overlying rocks, and it is quite possible that the post-Wasatch uraniferous sandstone, represented by the remnants on Pumpkin
Buttes, 15 miles to the northeast, once extended over this area and furnished the uranium now present in the coal, clinker and siltstone.

Fremont County, Wyoming

A Pliocene (?) brecciated, spongy, siliceous, limestone that resembles a spring deposit was examined in a valley, filled with Tertiary sediments, that is cut in pre-Cambrian granite on the Granite Mountain, NW\textsuperscript{\frac{1}{4}} sec. 25, T. 30 N., R. 90 W. A grab sample of limestone, selected where the highest radioactivity was apparent, contained 0.16 percent equivalent uranium.

Teton County, Wyoming

Radioactive loess-like Pleistocene white ash deposits, which overlie Pleistocene terrace gravels and folded Pliocene (?) rocks, are present throughout much of the Jackson Hole region, Teton County. The radioactivity in these deposits decreases toward the south so that near the junction of the Snake and Hoback Rivers the radioactivity is appreciably lower. Similar radioactive ash deposits have also been noted in the Wind River Basin, Fremont County, about 5 miles northwest of the Bull Lake Creek bridge on U. S. Highway 287, where the ash overlies terrace gravels; in the Boysen area, SE\textsuperscript{\frac{1}{4}} sec. 5, T. 3 N., R. 4 E., 35 miles east of the Bull Lake locality; and in a bulldozer trench on the east side of the Conant Creek anticline, NE\textsuperscript{\frac{1}{4}} sec. 7, T. 32 N., R. 93 W., Fremont County, 65 miles southeast of Bull Lake locality.

Slim Buttes, Harding County, South Dakota

Core drilling in South Dakota is nearing completion. One hole, 328 feet deep was completed on top of Slim Buttes (Trace Elements Morandum Report 175,
fig. 6) in the Custer National Forest about 5 miles south of Reva Gap, Harding County; 15 feet of lignite core was submitted for uranium analysis and laboratory study. On October 22, 1951 the drilling totaled 2,324 feet in 18 completed holes and 1 incomplete hole. A total of 217 samples of 159 feet of lignite core has been submitted to the Survey's Trace Elements laboratory in Washington for uranium analysis. Uranium analyses on 89 samples, representing 67 feet of lignite core from the first 6 holes, indicate a maximum of 0.044 percent uranium in the lignite and 0.138 in the ash. These analyses and studies of the core strongly suggest that the amount of uranium is related intimately to the permeability of the rocks overlying the lignites and to the position of the lignites below the pre-Oligocene unconformity.

The Survey plans no further work in the area after the completion of two 300-foot holes in the Bar-H area at the north of Slim Buttes sometime late in November.

Red Desert, Sweetwater County, Wyoming

Detailed sampling and mapping of the radioactive Red Desert lignites, underlying an area of about eight townships south of the Cyclone Rim fault in Sweetwater County, Wyo. have been completed. Sixty-five auger-drill holes for a total footage of 2,211 feet have been drilled in the area. A total of 650 samples have been submitted to the Washington laboratory for uranium analysis.

The lignite beds, many of which are 10 to 25 feet thick, extend over large areas where the overburden, consisting of soft friable sandstone and fissile shale, averages less than 60 feet thick. The radioactivity of the lignites seems to be closely related to their topographic position and to
tongues and lenses of shale of the Green River formation of Eocene age that interfinger with the lignite-bearing member of the Wasatch formation. Significantly higher radioactivity is present in those lignites that are 20 feet or more below an old erosion surface that truncates beds along the eastern and topographically highest part of the area—the Continental Divide. Above this old erosion surface, or unconformity, is a series of abnormally radioactive arkosic grits, claystone, and sandstone, the age of which is not known definitely. Because the strata of this series overlap, with marked regional regularity, tilted beds of the Arikaree formation of probable middle Miocene age, they are assumed to be upper Miocene or Pliocene in age or possibly both. Investigations during the remainder of the season will be focused on determining whether there is a meaningful relationship between this widespread post-Arikaree unconformity and the overlying arkosic grits to the concentrations of uranium in the lignite below the unconformity.

Work in the Red Desert probably will be terminated about November 15. Inasmuch as this is one of the most promising areas, another field season's work will be recommended.

Goose Creek district, Cassia County, Idaho

Work in the Goose Creek district was begun on October 20. Three grab samples of carbonaceous shale from zones directly underlying 800 feet or more of radioactive volcanic ash and tuffaceous sandstone contained 0.042, 0.032, and 0.034 percent uranium, and 0.017, 0.017, and 0.020 percent equivalent uranium, respectively. The volcanic ash overlying the upper lignite and carbonaceous shale zone contains 0.004 percent uranium and 0.008 percent equivalent uranium. The lower of the two widespread carbonaceous zones in the area is
relatively inactive but the upper one directly underlies the volcanic sequence and has two or more carbonaceous shale and lignite beds that are known to be radioactive for a distance of at least seven miles along the outcrop.

Field work in the Goose Creek district will be terminated about November 15. Due to the relative inaccessibility and ruggedness of the area only a general approximation of the extent and quality of the uranium-bearing carbonaceous shales and lignites will be obtained this field season. If the analyses of the samples show notably high concentrations of uranium detailed mapping will be undertaken next year.

La Ventana Mesa, Sandoval County, New Mexico

Detailed investigations were continued of a radioactive zone in coal and carbonaceous shale at the base of the La Ventana sandstone that caps La Ventana Mesa. Examination and samples of outcrops of the La Ventana sandstones (Trace Elements Memorandum Report 309, plate II) revealed the presence of two small areas of possible ore a short distance east of the deposit (September Monthly Report, p. 43) on the west tip of the south butte. Both areas appear to be of slightly lower grade than the deposit on the west tip of the south butte.

Examination and samples of outcrops on the north butte revealed a large area of radioactive coal and carbonaceous shale. The radioactivity at the southwestern corner of the butte is equal to, and in some places greater than, the radioactivity of the ore deposit on the west tip of the south butte. The coal on the north butte is thicker (up to 3 feet thick) than it is on the south butte. These indications—equal or greater radioactivity, larger area, and thicker radioactive coal—make the western end of the north butte the
most favorable area for further investigation. A detailed geologic map of La Ventana Mesa is in preparation.

THORIUM AND MONAZITE INVESTIGATIONS

Thorium investigations

Field investigations were continued of the study of thorium resources of the United States; these investigations are part of a program to search for new thorium deposits.

Wet Mountains—Haputa Ranch, Custer County, Colorado

Inferred reserves of about 200,000 tons of radioactive material that averages about 0.02 percent equivalent uranium are estimated to be on the Haputa Ranch extension, Custer County, Colo. The radioactivity is probably due largely to thorium, but, as the grade is based on analyses of samples collected at the surface or in shallow prospect pits, it may not be accurate for the rock at depth. Analyses of fresh rock must be obtained before the grade can be estimated more accurately.

Approximately 85,000 tons of probably thorium-bearing material (grade unknown) has been found on the Tuttle ranch and the Greenwood property in the Wet Mountains, Custer County, Colo.

Mountain Pass, San Bernardino County, California

Detailed geologic mapping was begun of a calcite-barite-bastnasite (a flucarbonate of thorium and rare earths) deposit on the Sulphide Queen claims in the Mountain Pass district and in the area between the Sulphide Queen claims and the Birthday claims (see Trace Elements Memorandum Report 35,
June 1950). Mapping will be continued during November and will be completed about the middle of December.

Discontinuous lens-like deposits of monazite and xenotime in a pre-Cambrian gneiss were examined on the Andalusite claim in the Virgin Mountains, Mohave County, Ariz. These deposits probably are not of commercial value for either thorium or rare-earths.

Southeastern monazite

The search for and reconnaissance appraisal of economically minable monazite placer deposits in the western Piedmont of the southeastern States was continued during October in North Carolina and South Carolina.

Mapping on aerial photographs (scale 1:20,000) and sampling were continued in drainage basins of creeks in Cleveland, Lincoln, McDowell, and Rutherford Counties, N. C., and in Cherokee County, S. C.; a total of 131 square miles mapped to date. The samples taken from the drainage basins were panned concentrates from known volumes of the fluvial sediments, and serve to establish the tenor and inferred reserves of the deposits as a guide for future exploration. Detailed examination of the samples is being made in the Survey's Trace Elements laboratory in Washington.

Reconnaissance examination and sampling of the placer deposits was recessed on November 1 for the winter. Selected placer sites, which will be drilled by the Special Minerals Investigating Unit, U. S. Bureau of Mines, will be mapped by the plane-table method (scale 1:6,000) during the winter.

BERYLLIUM-BEARING ROCKS

All field work related to the investigation of beryllium-bearing rocks and supported by the Atomic Energy Commission was discontinued on June 30, 1950.
Preparation of reports was continued on the sub-projects listed on pages 35 and 36 of the June 1951 Monthly Report.

LABORATORY INVESTIGATIONS

Tabular data pertaining to routine analytical work completed during October are listed in table 6. A total of 61 samples was received by the Geological Survey from the public, including 20 public samples forwarded by the Atomic Energy Commission.

Table 6. Analytical work and sample inventory.

<table>
<thead>
<tr>
<th>Project or material</th>
<th>Chemical determinations</th>
<th>Spectrographic determinations</th>
<th>Radiometric determinations</th>
<th>Samples received</th>
<th>Samples on hand</th>
<th>Samples at end of month</th>
</tr>
</thead>
<tbody>
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<td>Washington Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida phosphates</td>
<td>354</td>
<td>6</td>
<td>2</td>
<td>1419</td>
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<tr>
<td>Northwest phosphates</td>
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<td>6</td>
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<td>Lignites</td>
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<tr>
<td>Monazites</td>
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<td>0</td>
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<td>0</td>
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<tr>
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<td>4010</td>
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<tr>
<td>Denver Laboratory</td>
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<td></td>
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</tr>
<tr>
<td>Colorado Plateau</td>
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<tr>
<td>Carnotites</td>
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<td>255</td>
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<td>Oil-well drillings</td>
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<td>Florida phosphates</td>
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<td>Northwest phosphates</td>
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<td>0</td>
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</tr>
<tr>
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<td>872</td>
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<tr>
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<td>864</td>
<td>2554</td>
<td>1744</td>
<td>682</td>
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<tr>
<td>Grand total</td>
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<td>1391</td>
<td>10490</td>
<td>3189</td>
<td>2085</td>
<td>3715</td>
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</table>

Research

Detailed reports of progress in laboratory research projects are given in quarterly, semiannual, and annual reports. A report for the first half of calendar year 1951 was transmitted to the Atomic Energy Commission on October 9, 1951.
Chemical

Chemical research projects in progress are: (1) Determination of micro amounts of lead in minerals, rocks and ores as an aid in determining geologic age (no work was done during the month). (2) Study of immersion liquids of high refractive index and liquids of high specific gravity, (this is also a mineralologic study). This project will be continued on a part-time basis but will only be listed for those months during which work was done. (3) Continuing studies of methods for the determination of many different elements and compounds in radioactive rocks, minerals, and ores. (4) Statistical interpretation of chemical and radiometric analyses.

The project for the determination of a short procedure for estimation of oil content of shale and phosphate rock has been completed and a report is in preparation.

Mineralogic

Mineralogic research studies in progress are: (1) the Carnotite project, including lead and uranium isotope studies, studies of the minerals of the carnitite deposits, and study of the clays associated with the ore deposits; (2) the Phosphate project, including a study of the mineralogy and petrology of the Florida and northwest phosphate deposits and synthesis of apatite (no work was done during the month on this phase of the project); (3) properties of uranium minerals; (4) Colorado Front Range project, including the mineralogy and petrology of the veins and dikes in the Central City district, Gilpin County, the mineralogy and petrology of the fluorite deposits at, and the cerite deposits near, Jamestown, Boulder County, and the mineralogy and petrology of the Copper King mine, Larimer County; and (5) mineralogy and
petrology of lignites and shales.

Spectrographic

Spectrographic research projects in progress are: (1) detection of thorium in amounts as small as 0.001 percent; (2) detection of lead in amounts of less than one part per million to aid in geologic-age studies; and (3) continuing studies in methods of analysis.

Radiometric

Radiometric research projects in progress are: (1) establishment of a control chart for the performance of the Tracerlab automatic scaler (no work was done during the month); (2) continuing studies to improve the counting methods; and (3) development of a rapid radiochemical method for the determination of uranium and thorium in monazite.

REPORTS: FORWARDED

Technical and other reports and memoranda prepared by the Trace Elements Office for transmittal to the Atomic Energy Commission include: (1) Trace Elements Investigations reports on specific areas, types of material, or laboratory and field techniques; (2) Trace Elements Memorandum reports on results of property examinations or preliminary appraisals of results of field projects, and on miscellaneous subjects; and (3) financial and administrative reports.

The reports listed below were transmitted to the Atomic Energy Commission in October on the dates given after the report titles.
Trace Elements Investigations Reports

119--"Geologic guides to prospecting for carnotite deposits on the Colorado Plateau," by Doris Blackman (Weir); October 2, 1951.


167--"Summary of the research work of the Trace Elements Section, Geochemistry and Petrology Branch, for the period January 1-June 30, 1951," by J. C. Rabbitt; October 9, 1951.


Trace Elements Memorandum Reports


270--"Preliminary report on correlation between gamma-ray logs and permeability logs of the ore-bearing sandstone in the Morrison formation, Calamity Mesa, Mesa County, Colorado," by D. A. Phoenix; October 15, 1951.

271--"Large scale guides to carnotite deposits in the Uravan and Gateway districts, Montrose and Mesa Counties, Colorado," by E. J. McKay; October 2, 1951.

273--"Preliminary report on geobotanical exploration in the Yellow Cat district, Grand County, Utah," by Helen L. Cannon; October 22, 1951.

275--"Preliminary report on diamond-drill exploration of the Legin group area, San Miguel County, Colorado," by Henry Bell; October 31, 1951.


311--"Progress in development of gamma-ray logging instruments and techniques," by K. G. Bell; October 17, 1951.

316--"Noninterference of arsenate ion in the volumetric determination of uranium using the Jones reductor," by J. J. Rowe; October 26, 1951.

317--"The identification and lead-uranium ratio ages of massive uraninite from the Shinarump conglomerate, Utah," by L. R. Stieff and T. W. Stern; October 9, 1951.

FINANCIAL AND PERSONNEL STATEMENT

The monthly statement of project costs is being discontinued temporarily because the project costs are not received from the Accounting Section in time to include them; they will be reported separately in the future until some arrangement can be made for their inclusion.

The number of persons employed by each project are listed in table 8.

<table>
<thead>
<tr>
<th>Project</th>
<th>Last month</th>
<th>This month</th>
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<tbody>
<tr>
<td>Reconnaissance, domestic</td>
<td>59</td>
<td>51</td>
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<tr>
<td>Airborne detection</td>
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<td>Reconnaissance, Alaska</td>
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<td>Colorado Plateau, exploration</td>
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<td>92</td>
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<tr>
<td>Colorado Plateau, geologic studies</td>
<td>16</td>
<td>16</td>
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<td>Colorado Plateau, Pre-Morrison studies</td>
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<td>11</td>
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<tr>
<td>Northwest phosphate</td>
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<td>9</td>
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<tr>
<td>Southwest phosphate</td>
<td>14</td>
<td>15</td>
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<tr>
<td>Lignite and coal investigations and black-shale reconnaissance</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Thorium and monazite</td>
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<td>3</td>
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