Maybell - Baggs Area

Maybell area, Moffat County, Colorado
Baggs area, Carbon County, Wyo.
Both areas include Miocene Browns Park Formation -

Maybell area more attractive

Browns Park - Oligocene surface that forms a sedimentary syncline. unconformably covers a folded, faulted, eroded

fine to med. grained, well bedded, partly x-bedded, calcareous, tuffaceous, arkosic sandstone

Max. thickness - Maybell - 300-1200'
Baggs - max 600'

Oxidation zone - surface to 125' - autunite - uranophane

Unoxidized zone - characterized by dark gray pyritic ss with uraninite and coffinite

Secondary minerals - selenium and molybdenum occur in Baggs area.

Ore deposits - range in size from few tons to 250,000 tons. - occur from surface to 300'

The Lay Syncline trends east-west and is thought to exercise a major structural control.

Ore is usually difficult to distinguish megascopically from barren ss.

Ore of economic grade is associated with large tonnages of low-grade (.04 to .09% U_3O_8) which must be mined concurrently.

Grade variable both horizontally & vertically and requires very close control in mining.

Average grade is .20% U_3O_8, exclusive of low-grade.

Trace Elements Mill of UCN - 300 tons/day

MAYBELL-BAGGS AREA

Introduction

The Maybell-Baggs area includes two very similar areas of uranium deposits in Miocene Browns Park sandstone. The more important deposits are near Maybell in northwestern Colorado, and the others are near Baggs in south central Wyoming. In both areas large tonnages of low grade material are associated with the commercial grade ore.

The deposits were discovered near Baggs in October, 1953, by a U. S. Geological Survey carborne reconnaissance radioactivity survey, made in behalf of the Atomic Energy Commission. The deposits near Maybell, Colorado were discovered by Russell Cutter and George Morehouse in November, 1953, during a privately conducted airborne radioactivity survey.

The Browns Park formation is composed of fine to medium grained, well bedded and partly cross-bedded, tuffaceous, calcareous, arkosic sandstone. A basal conglomerate about 75 feet (23 m) thick is present under the uranium areas. The depth of oxidation varies from a few feet to about 125 feet (46 m) and is sharply marked by a color change from chalky white, light gray or buff weathered sandstone to medium or dark gray pyritic sandstone below. The formation has a maximum thickness of 1,200 feet (365 m) at Maybell and more than 500 feet (150 m) at Baggs.

The Browns Park sediments were derived from erosion of uplifted mountains to the east and west and deposited in the low lands of the intervening Sand Draw basin, covering an Oligocene erosional surface. The outcrops at both Baggs and Maybell are erosional remnants filling basins in the pre-Browns Park surface, with gentle basinward dips. The older rocks at both places were folded and faulted prior to Miocene time, whereas the overlying Browns Park sandstones are essentially undisturbed except for some normal faulting.

Ore Deposits

The ore deposits are roughly tabular, parallel to the bedding, and consist of groups of lenticular, discontinous ore bodies distributed within a limited stratigraphic interval. They range in size from a few tons to more than 250,000 tons. Known reserves exceed 1,000,000 tons, mostly in the Maybell area. Ore thickness varies from one foot to more than twenty-five feet (8 m). Large tonnages of low grade material (less than 0.10% U_3O_8) commonly are intimately associated with the commercial ore; locally the low grade material is as much as 50 feet (15 m) thick. Ore deposits have been found from the surface down to about 350' (110 m) maximum depth. Deposits seem to be distributed along the deeper parts of the basins, and to be localized along certain normal faults.

The host rock is fine to medium grained sandstone, generally uniform in appearance. No carbonaceous vegetal material has been found, but asphaltite and "dead oil" occur locally in some mines. The ore minerals are dominantly uraninite and coffinite in the primary zone, with autunite and uranophane in the oxidized zone. Many other secondary minerals are present, and selenium and molybdenum minerals occur in the Baggs deposits. Vanadium is sparsely

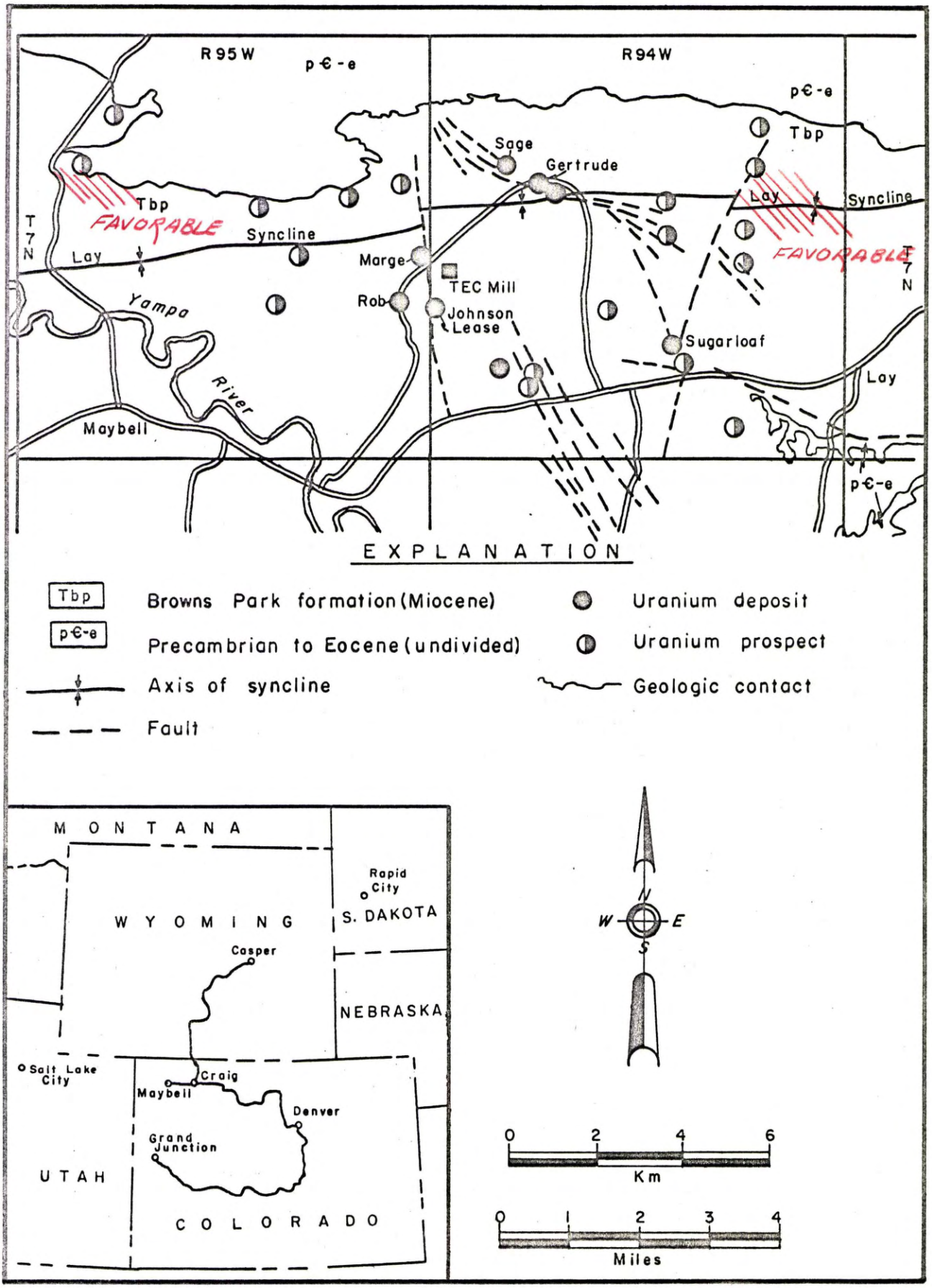
represented. Ore minerals are restricted to the Browns Park formation, with only rare exceptions.

The origin and mode of emplacement of the uranium is not known. It has been postulated that the uranium may have been leached from tuffaceous material in the Browns Park formation, or higher beds, transported by ground water, and deposited in a reducing environment which may have been produced by hydrogen sulfide from natural gas.

Exploration

Exploration has been almost entirely by rotary non-core wet or dry drilling, in holes of 4- to 6-inch (10 to 15 cm) diameter to depths of 100 to 150 feet (30 to 45 m), with some deeper holes intersecting the ore down the dip. Exploration drilling is done on 300- to 600-foot (90 to 180 m) centers. Drilling is done on 50- and 100-foot (15 and 30 m) centers to delineate ore deposits after discovery. Radiometric gamma-ray logging is used extensively to evaluate drilling results, in combination with chemical assays. Most exploration programs include a few deep holes to the base of the formation for stratigraphic correlation. Drilling costs average from $0.25 to $0.50 per foot and $0.50 to $1.00 per ton of ore developed.

Mining is predominantly in open pits, because stripping is easy and cheap. Pits have been excavated to depths of 90 feet (27 m) and may be opened to depths of 200 feet (60 m) or more in the future, depending upon economic factors. Open pits permit better ore recovery, selective mining, flexible mining rates, and lower cost. Heavy earth moving equipment, such as 20 cubic yard (15 m^3) scrapers and push-cats, or 2 1/2 cubic yard (1.9 m^3) shovels, are used for stripping. Mining is done with small shovels, or front-end loaders and trucks are commonly used. One underground mine (Teton No. 3) is being worked through circular shafts, because of the depth to ore and its discontinuous, elongate shape.



Geologic map of Maybell—Lay area, Moffat County, Colorado

Stratigraphic Column for Northwest Colorado,
Sand Wash Basin

Era	Period	Epoch	Formation	Character
		Miocene	Browns Park fm.	Sandstone, light-colored, soft, or hard calcareous, with thinner beds of siltstone, claystone, shale, and volcanic ash. Basal conglomerate common.
			Bishop cgl. (?)	Conglomerate.
			(Unconformity)	
Cenozoic	Tertiary	Eocene	Bridger fm.	Shale, gray and greenish gray; sandstone, buff and blue-green; marl, light-gray and white; limestone; chert; conglomerate.
			Wasatch fm. / Green River fm.: Laney member; Cathedral Bluffs tongue; Tipton tongue; Hiawatha member	Wasatch fm.: variegated shale or claystone and conglomeratic sandy mudstone; sandstone, gray and yellowish brown; conglomeratic arkosic sandstone; conglomerate; carbonaceous shale and coal. Green River fm.: fissile shale, gray; clay shale, gray; oil shale; carbonaceous shale; limestone; marlstone; sandstone, gray and buff.
			(Unconformity)	
		Paleocene	Fort Union fm.	Interbedded conglomerate, conglomeratic sandstone, and sandstone, yellowish-gray to yellowish brown; siltstone and sandy shale, gray; clay shale, gray; carbonaceous shale, brown; coal. Basal conglomerate in part of area.
Mesozoic	Cretaceous	Upper Cretaceous	Lance fm.	Sandstone, massive, light-gray and yellowish brown; thin soft beds of shaly sandstone, siltstone, gray shale, carbonaceous shale, and coal
			Lewis sh.	Marine shale, dark gray, calcareous; thin beds of calcareous sandstone.
			Mesaverde group: Williams Fork fm.	Sandstone, massive, brown, gray, and white; soft beds of gray shale, carbonaceous shale, and economic coal deposits.
			Mesaverde group: Iles fm.	Sandstone, massive, brown, gray and white; gray shale, carbonaceous shale and thin coal beds.
			Mancos sh.	Marine shale, dark gray; thick sandstone lenses near top and base.

TRACE ELEMENTS CORPORATION MINES, MAYBELL DISTRICT

(Johnson, Marge, Sage, & Gertrude groups)

Owner: Trace Elements Corporation, a unit of Union Carbide Corporation

Operator: Trace Elements Corporation

Location: Sections, 7, 8, 9, 10, 16, 17, 18, 19, 20, & 30, T. 7 N., R. 94 W. & Sections 13 and 24, T. 7 N., R. 95 W., Moffat County, Colorado

Type of Entry: Open pit Mining Method: Open pit

Principal Equipment: Bottom scrapers, bulldozers, and rippers for stripping; shovels or endloaders and trucks for mining.

Geologic formation: Browns Park (Miocene) Discovery: Private airborne radioactivity survey & field exploration

Mineralogy: Autunite and uranophane in sandstone in oxidized zone; uraninite and coffinite with pyrite in sandstone in primary zone.

Features of the deposits: Thin to moderately thick lenticular ore bodies in gently dipping sediments; moderate grade with abundant additional low grade ores; outstanding mine control system.

Geology

The ore deposits are found entirely within the Browns Park formation of Miocene age and range from the surface to about 300 feet (91 m) deep. Total thickness of the formation ranges from 300 to 1,200 feet (91 to 365 m) in the area of the deposits. The host rock is a fine to medium grained, chalky white to light gray or buff, tuffaceous, calcareous, arkosic sandstone. Oxidation by weathering has penetrated from 40 to 125 feet (21 to 38 m) deep and the contact between primary and oxidized sandstone is sharply marked by a color contact from the light colored sandstone above to gray or dark gray pyritic sandstone below. The sediments were deposited upon an Oligocene erosional surface and form a sedimentary syncline, the axis of which passes through the deposits. This Lay syncline trends east-west and is thought to exercise a major structural control. Normal (?) faults of small displacement are invariably present with the ore bodies.

Ore is generally conformable to the bedding and ore deposits consist of many smaller ore bodies distributed within a thicker stratigraphic interval. Ore thickness ranges from 3 to 25 feet (1 to 8 m). Ore is usually difficult to distinguish megascopically from barren sandstone. The ore of economic grade is associated with large tonnages of low grade ore (0.04 to 0.09% U_3O_8) which must be mined concurrently. Grade is highly variable both horizontally and vertically within the ore bodies so that close control is required in mining. Average grade in the district is about 0.20% U_3O_8, exclusive of the low grade ore. The largest ore deposit is 1,500 feet (460 m) long and 500 feet (150 m) wide, containing about 250,000 tons.

Exploration

The Trace Elements Corporation deposits were the first discovered in the Maybell area, by a privately conducted airborne radioactivity survey in March 1954, followed by ground prospecting. The ore bodies were located on the ground by rotary non-core grid drilling on 300- and 600-foot (91 and 182 m) centers, and then delineated by drilling on 50- to 100-foot centers (15 to 30 m). Chemical assays of drill cuttings and cores, and gamma probing were used to evaluate results of drilling and compute ore reserves. Beta-gamma assaying of drill cuttings has been used extensively in the past year, and results have proved reliable.

Mining

Mining is entirely through open pits, which are more advantageous than underground methods because of the ease and cheapness of stripping, improved ore recovery, flexibility in mining rates and grade selection, and safety factors. Development of pits is planned on the basis of grid exploration drilling. Road equipment (rippers, bottom scrapers etc.) is used for stripping although shovels and trucks may be used where selective mining of ore is required during the stripping operation.

Ore is drilled on 25-foot (8 m) centers after stripping. Sampling of these drill cuttings by gamma scaler, chemical analysis, or beta-gamma analysis is used for final mining plans. These data are compiled into "bench" maps for maintaining mine control. The bench map shows the area to be mined, and the grade expected in a ten-foot interval to be mined as a bench.

Mining is generally done by 1/2 to 1 yard (0.4 to 0.8 m^3) shovels mining in 10-foot (3 m) high benches. A pit "leadman" uses the bench map and a Geiger counter to direct the shovel to the grade of ore desired, and dispatch ore trucks to the proper stockpile. Usually several grades of ore must be mined concurrently. As an added control, a beta-gamma scaler installed in a trailer at the pit exit analyzes grab samples from the ore trucks between the time when they leave the pit and arrive at the stockpile. These analyses require about two minutes, and the scaler operator redirects the ore truck by radio communication if it has been sent to the wrong stockpile by the pit "leadman."

Four categories of material are mined from the pit. These include economic or mill grade (about 0.13% U_3O_8 minimum), low grade or upgrader grade (about 0.05 to 0.12%), mineralized (about 0.02 to 0.04%), and waste. Trace Elements Corporation operates a mill on the property.

Production rate of the mines is about 750 to 1,000 tons (680 to 910 tonnes) per day of all grades. Mill capacity is rated at 300 tons per day, combined mill grade ore and upgrader product.