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Geology of Eocene Rocks and Oil Yields of Green River Oil Shales on Part of Kinney Rim, Washakie Basin, Wyoming

UNITED STATES DEPARTMENT OF THE INTERIOR

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Geology of Eocene Rocks and Oil Yields of Green River Oil Shales on Part of Kinney Rim, Washakie Basin, Wyoming

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UNITED STATES DEPARTMENT OF THE INTERIOR
Rogers C. B. Morton, Secretary

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GEOLOGY OF EOCENE ROCKS AND OIL YIELDS OF GREEN RIVER OIL SHALES ON PART OF KINNEY RIM, WASHAKIE BASIN, WYOMING

by

Laurence G. Trudell,[1] Henry W. Roehler,[2] and John Ward Smith [3]

ABSTRACT

Geology and oil-yield data are presented for a 58-square-mile area encompassing the U.S. Department of the Interior oil-shale leasing program tracts in the western Washakie Basin, Sweetwater County, Wyo. Lithology and oil yields of samples from three Bureau of Mines coreholes are evaluated and correlated with Kinney Rim surface sections measured and sampled by the U.S. Geological Survey. Minable sections of oil shale averaging up to 25 gallons of oil per ton crop out on Kinney Rim in the Laney Member of the Green River Formation. Thick oil-shale sections in the Laney Member that average 15 gallons per ton represent 155 million barrels of oil in place per square mile. In the lower part of the Green River Formation the Tipton Shale Member contains a 20- to 40-foot section averaging 15 gallons per ton. Beds of high-volatile C bituminous coal up to 6 feet thick are present in intertongued parts of the lower Green River Formation and upper Wasatch Formation.

INTRODUCTION

Three adjacent oil shale-bearing tracts along Kinney Rim on the western edge of the Washakie Basin in Sweetwater County, Wyo., were nominated for inclusion in the U.S. Department of the Interior oil-shale leasing program. In 1972, two of these tracts were selected as the Wyoming sites to be offered. Publicly available information on the oil-shale resource in the selected tracts is extremely meager. However, both the Bureau of Mines and the U.S. Geological Survey have conducted studies applicable to this area. In 1968 to 1970, the Laramie Energy Research Center of the Bureau of Mines drilled three coreholes on public land in this area to sample and evaluate oil shales of the Green River Formation. The U.S. Geological Survey has measured and sampled the

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oil-shale outcrop along Kinney Rim and has included this information in its study of the geology and oil-shale resources of the Washakie Basin. This joint report is prepared to release the available data. It presents the geology of an area encompassing the tracts selected for lease offering and incorporates the areal geologic data obtained from U.S. Geological Survey field studies and the subsurface lithologic and oil-yield data obtained from the Bureau of Mines coreholes into an evaluation of the oil-shale resource in the selected area.

DESCRIPTION OF THE AREA

LOCATION AND ACCESSIBILITY

Figure 1 is a geologic map of the Washakie Basin showing the area of investigation on Kinney Rim. The report area covers 58 square miles in Tps 13 and 14 N, Rs 98, 99, and 100 W, Sweetwater County, Wyo. The area is accessible from Rock Springs by Wyoming Highway 430. Approximately 46 miles south of Rock Springs, an unimproved dirt road branches eastward from Wyoming 430. This dirt road trends eastward along the crest of a low ridge for several miles, passes over a platform bridge at the north edge of Trail Gasfield, and continues northeast to the Trail Dugway switchback up the southwest slope of Kinney Rim, 15 miles east of Wyoming Highway 430. The area can also be reached from Interstate Highway 80. Thirty-six miles east of Rock Springs a blacktop road leads south from I–80 about 7 miles to Bitter Creek Station on the Union Pacific Railroad. From Bitter Creek a dirt road (Sweetwater County Road 4–19) continues south approximately 25 miles to the Eversole Ranch. Two miles farther south a smaller road branches southwest and continues about 10 miles to Trail Dugway.

GEOGRAPHIC SETTING

Kinney Rim is an asymmetric ridge about 3 miles wide and 35 miles long with a southwest facing escarpment. The ridge trends N 30° W, rises nearly 800 feet, and comprises the most prominent feature of the landscape in the western part of the Washakie Basin (fig. 2). Elevations in the area of investigation range from 7,100 to 7,200 feet above sea level along the lower slopes of Kinney Rim to 7,900 to 8,300 feet along the crest of the rim.

No perennial streams are present within several miles of Kinney Rim, but washes carry water during spring runoff and following heavy thundershowers. In a few places along the lower east slopes, springs provide sufficient water to sustain small grassy meadows. Intermittent drainages on the northeast slopes of the rim coalesce basinward and about 5 miles east of the rim join Shell Creek, which trends southward. Intermittent drainages on the southwest slopes of the rim join Alkali Creek, which parallels Kinney Rim 1 mile to the southwest. Alkali and Shell Creeks both join Vermillion Creek, a tributary to the Green River.

Precipitation in the area is about 12 inches per year, mostly occurring as snow from October to April and as local afternoon thundershowers from May through July. Average winter temperatures generally vary from 20° to 60° during the day and 10° to 20° F night. Warmest summer daytime temperatures seldom exceed 95° F, and summer nighttime temperatures are usually between 35° and 50° F. Northwesterly winds occur almost daily on the rim and may exceed 50 miles per hour.

Vegetation on Kinney Rim consists of patches of sagebrush located in small depressions and along dry washes. Between the patches of sagebrush, thin soil cover and bedrock are visible through sparse desert grasses and occasional wildflowers, weeds, and cactus. Vegetation is generally more abundant on slopes that face northward. Cedar trees grow in places along the lower southwest slopes of the rim.

The sparse wildlife in the area includes antelope, deer, coyote, badger, bobcat, rabbits, rattlesnakes, horned toads, and a variety of rodents and birds. Antelope, deer, and sage grouse are hunted during fall seasons.

The area is primarily used as winter range for sheep, but some cattle and sheep are grazed there year around. A few unproductive oil and gas test wells have been drilled in the area. Mountain Fuel Supply Co. operates Trail Gasfield about 3 miles southwest of the area. Except for occasional sheepherders and geologists, Kinney Rim is uninhabited.

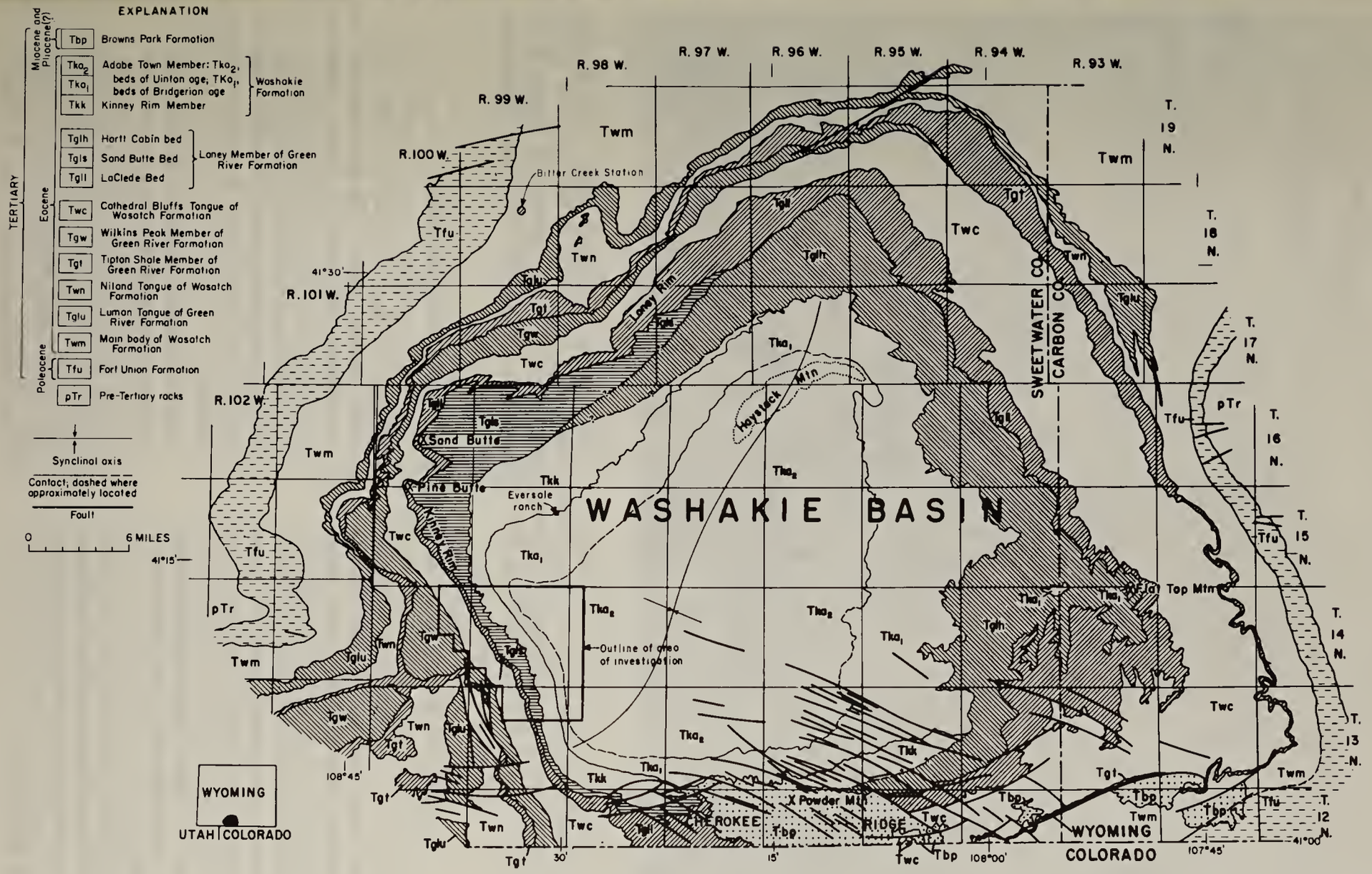

Figure 1.—Geologic map of Washakie Basin showing area of investigation.

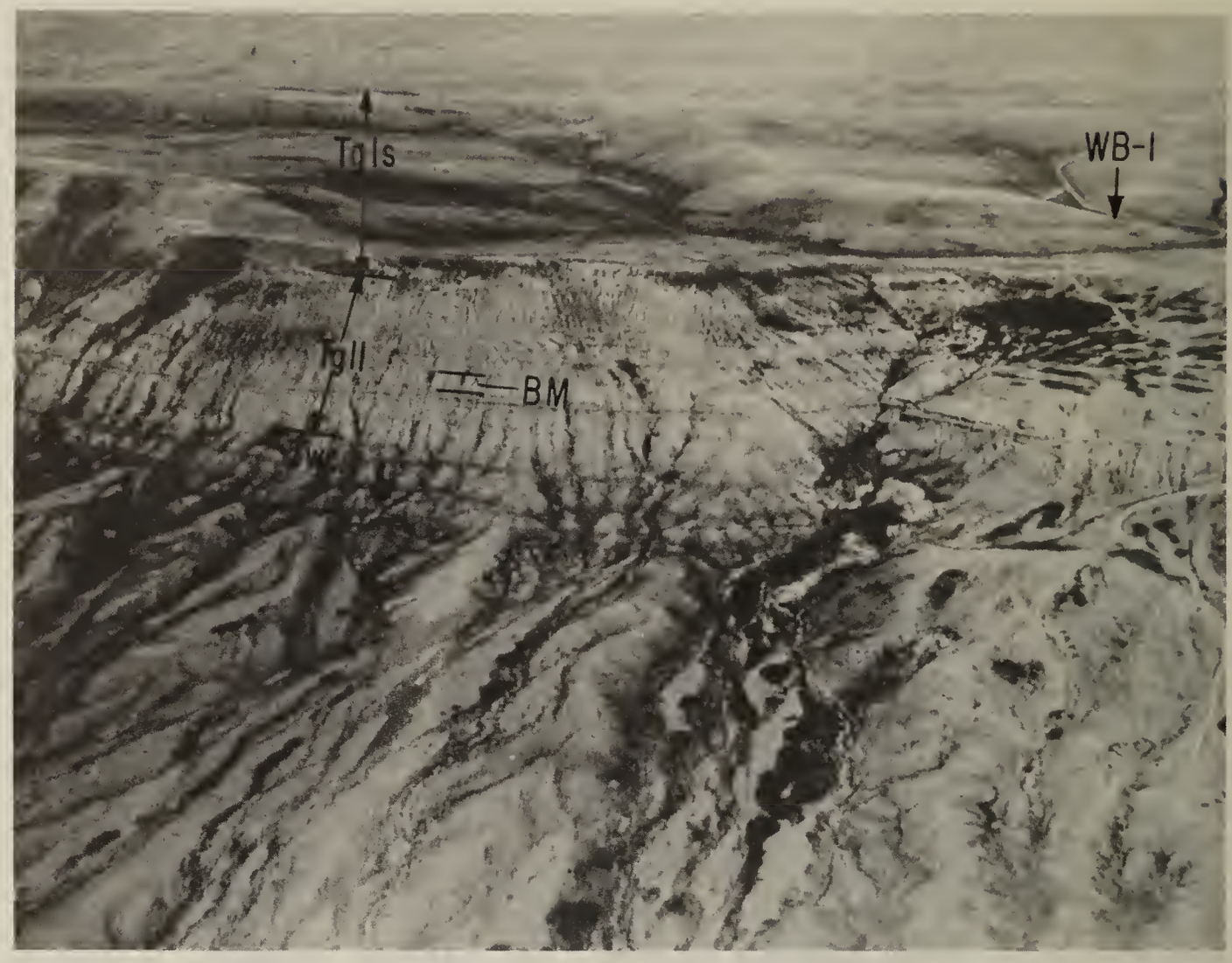

Figure 2.—Oblique aerial photograph of Kinney Rim. Trail Dugway switchback, near center of right margin of photograph, is located on line between secs 18 and 19, T 14 N, R 99 W (fig. 4). WB–1, location of Washakie Basin corehole 1; Tgls, Sand Butte Bed of Laney Member of Green River Fm.; Tgll, LaClede Bed of Laney Member; BM, buff marker; Twc, Cathedral Bluffs Tongue of Wasatch Fm.

SOURCES OF DATA AND DRILLING HISTORY

Areal geology and stratigraphy described in this report are based on field work done by H. W. Roehler in 1968 and 1969. The work includes lithologic description and sampling of the Laney Member of the Green River Formation in five measured sections spaced at 6- to 8-mile intervals along the length of Kinney Rim. One of these, the Trail Dugway section, is within the area of this report. Surface samples from these sections were assayed for oil yield by the Bureau of Mines.

Subsurface lithology and oil-yield data were obtained from three Bureau of Mines coreholes. The name, location, surface elevation, sampled intervals, and percent core recovery for each corehole are as follows:

Washakie Basin corehole 1(WB–1): NW1/4SW1/4 (2,277 ft N of S line and 404 ft E of W line) sec 17, T 14 N, R 99 W. Elevation 7,703 feet. Sampled intervals—drill cuttings 0 to 100 and 683.1 to 2,172.5 feet, cores 102.7 to 683.1 and 2,172.5 to 2,857.3 feet. Recovery 97.8 percent.

Washakie Basin corehole 1A (WB–1A): SW1/4SW1/4 (281 ft N of S line and 567 ft E of W line) sec 24, T 14 N, R 100 W. Elevation 7,078 feet. Sampled intervals—drill cuttings 0 to 195 feet, cores 209.8 to 1,493.0 feet. Recovery 99.1 percent.

Washakie Basin corehole 2(WB–2):

SW1/4SW1/4 (91 ft N of S line and 395 ft E of W line) sec 6, T 14 N, R 98 W. Elevation 7,000 feet. Sampled intervals—drill cuttings 0 to 2,395 feet, cores 2,395.5 to 3,236 feet. Recovery 97.3 percent.

Corehole WB–1 was drilled in the winter of 1968–69. The plan was to core and log the Laney Member of the Green River Formation, rotary drill the Cathedral Bluffs Tongue of the Wasatch Formation, and then core and log the lower part of the green River Formation to the main body of the Wasatch at an expected depth of 3,900 feet. The first two phases were successfully completed, but after coring the lower section to 2,857 feet, the drill string stuck fast in the Cathedral Bluffs Tongue at about 2,200 feet. The hole was lost. The Luman Tongue of the Green River Formation remained unsampled, and the hole could not be logged below the Laney Member. To correct these deficiencies, WB–1A was drilled in summer of 1969 on a site near the base of the Cathedral Bluffs Tongue, about 2½ miles southwest of WB–1. Corehole WB–1A was successfully cored to 1,493 feet and reached the main body of the Wasatch Formation. Logging tools would not pass a fault zone at 752 feet, but satisfactory logs were obtained through the Wilkins Peak and Tipton Members of the Green River Formation. Corehole WB–2 was drilled in the fall of 1970 to test the oil shale in the Laney Member of the Green River Formation about 5 miles basinward from WB–1. The corehole was successfully completed and logged to the Cathedral Bluffs Tongue of the Wasatch Formation.

GEOLOGY

Figure 1 shows the geologic setting of the area of investigation in relation to the overall geology of the Washakie Basin. The Washakie Basin is a structural and topographic basin located between the Sierra Madre to the east, the Rock Springs uplift to the west, the Wamsutter arch to the north, and Cherokee Ridge to the south. The basin and mountain structural framework of the area dates from the Laramide Revolution, nearly 75 million years ago. The rock formations exposed on and near Kinney Rim were deposited during the Eocene Epoch, about 48 million years ago, and were tilted to their present attitude by the last upwarp of the Rock Springs uplift during the Oligocene Epoch, about 34 million years ago. Except for minor faulting, regional uplift, and erosion, the area has changed little since Oligocene time.

The Kinney Rim escarpment is capped by brown—and tan-weathering tuffaceous sandstone and siltstone (fig. 2). Steep, often cliff-forming, southwest slopes of the rim are fromed by outcrops of mainly dark brown-weathering oil shale. The northeast slopes of the rim are formed of mainly drab gray- or tan-weathering mudstone and sandstone exposed in a series of minor ridges and valleys decreasing in elevation toward the interior of the basin.

STRATIGRAPHY

The Eocene section in the area of investigation is nearly 8,000 feet thick and is divided into the Wasatch, Green River, and Washakie Formations. Each of the formations is further subdivided into tongues, members, and beds (table 1). Historically, rocks of lacustrine (lake) origin have been assigned to the Green River Formation, and rocks of fluvial (stream and floodplain) origin have been assigned to the Wasatch and Washakie Formations (*2–3*).[4] The Green River Formation intertongues extensively with the Wasatch and Washakie Formations, and all three units are characterized by rapid facies changes, rapid thickness changes, and transitional contacts. Oil shales in the area of investigation are all lacustrine deposits normally assigned to the Green River Formation. However, some beds of lean oil shale occur in the transitional and mixed facies of the Niland Tongue of the Wasatch Formation.

The Wasatch Formation is divided into three parts—a basal member (the main body) and two overlying tongues (Niland and Cathedral Bluffs)—separated from each other by tongues and members of the Green River Formation (table 1). The Green River Formation is divided into the Luman Tongue, Tipton Shale Member, Wilkins Peak Member, and Laney Member. The stratigraphic divisions of the Green River Formation either have distinctive lithologic characteristics or are separated by tongues of the Wasatch Formation. The Washakie Formation is divided into the Kinney Rim and Adobe Town Members by an unconformity and by minor lithologic differences.

Figure 3 identifies stratigraphic units on a resistivity and spontaneous potential log from the Cabot Carbon Co. Cathedral Reservoir 1

[4] Italicized numbers in parentheses refer to items in the list of references preceding the appendixes.

Table 1.—*Eocene rock units in the Kinney Rim area*

Formation	Unit	Thickness, ft	Lithology
Washakie Formation	Adobe Town Member	2,300	Varicolored mudstone, gray and green sandstone, and abundant tuff.
	Unconformity		
	Kinney Rim Member	700–1,000	Gray, green and some red mudstone, gray and green sandstone, and some tuff.
	Intertongued contact		
Green River Formation	Laney Member: Sand Butte Bed	700–800	Tan tuffaceous sandstone and siltstone.
	Laney Member: Unconformity		
	Laney Member: LaClede Bed	350–500	Brown oil shale and thin interbedded tan tuffaceous siltstone; thin beds of algal limestone and pisolitic limestone.
	Intertongued contact		
Wasatch Formation	Cathedral Bluffs Tongue	1,200–2,000	Variegated mudstone; sparse gray and tan sandstone, siltstone, limestone and conglomerate.
	Intertongued contact		
Green River Formation	Wilkins Peak Member	500–600	Brown dolomitic oil shale (lower part); gray and green dolomitic mudstone (upper part); sparse thin algal limestone and dolomite.
	Tipton Shale Member	150–250	Brown oil shale; thin beds of ostracods and mollusks.
	Intertongued contact		
Wasatch Formation	Niland Tongue	200–400	Interbedded gray sandstone, brown and gray shale, gray siltstone, gray and brown carbonaceous shale, gray mudstone and gray limestone; abundant mollusks.
	Intertongued contact		
Green River Formation	Luman Tongue	275–500	Brown oil shale; thin beds of gray sandstone, gray shale, gray-green mudstone and sparse coal; abundant mollusks.
	Intertongued contact		
Wasatch Formation	Main body	1,800–2,600	Variegated mudstone and sandstone; thin beds of carbonaceous shale, conglomerate, gray limestone, gray siltstone and gray shale.

well in CNW1/4 sec 21, T 14 N, R 99 W. The log is presented as a type log of an essentially complete Green River section in the Kinney Rim area.

SURFACE GEOLOGY

Figure 4 is a geologic map showing the outcrop pattern of stratigraphic units in the area of investigation. Strata below the Wilkins Peak Member of the Green River Formation are not exposed in the area but crop out a few miles to the west. The Wilkins Peak Member forms low drab chalky-gray slopes west of Alkali Creek. The Wilkins Peak is a heterogeneous mixture of interbedded gray and green dolomitic mudstone, brown dolomitic oil shale, and minor thin beds of algal limestone and gray-brown silty dolomite. Saline minerals—such as shortite ($Na_2CO_3 \cdot 2CaCO_3$), trona ($Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$) and halite (NaCl), which are common in the Wilkins Peak Member in the Green River Basin—are not known in the Washakie Basin and were not found in the Bureau of Mines cores. Northeast of the Wilkins Peak outcrop, mudstones and sandstones of the Cathedral Bluffs Tongue of the Wasatch Formation crop out along Alkali Creek and on low round slopes in front of Kinney Rim. The steep southwest face of Kinney Rim is formed by outcrops of resistant bench-forming oil shale separated by less resistant beds of tuffaceous siltstone that together make up the LaClede Bed of the Laney Member of the Green River Formation (fig. 2). Sandstones and siltstones of the Sand Butte Bed form the crest of the rim. Varicolored gray and green fluvial mudstones and siltstones of the Washakie Formation crop out on the lower dip slope and basin interior northeast of Kinney Rim.

Figure 5 shows stratigraphic relationships and correlations in the Laney Member along Kinney Rim from Sand Butte to Shell Creek. Roehler (*4*) originally designated six prominent oil-shale benches in the LaClede Bed. In this

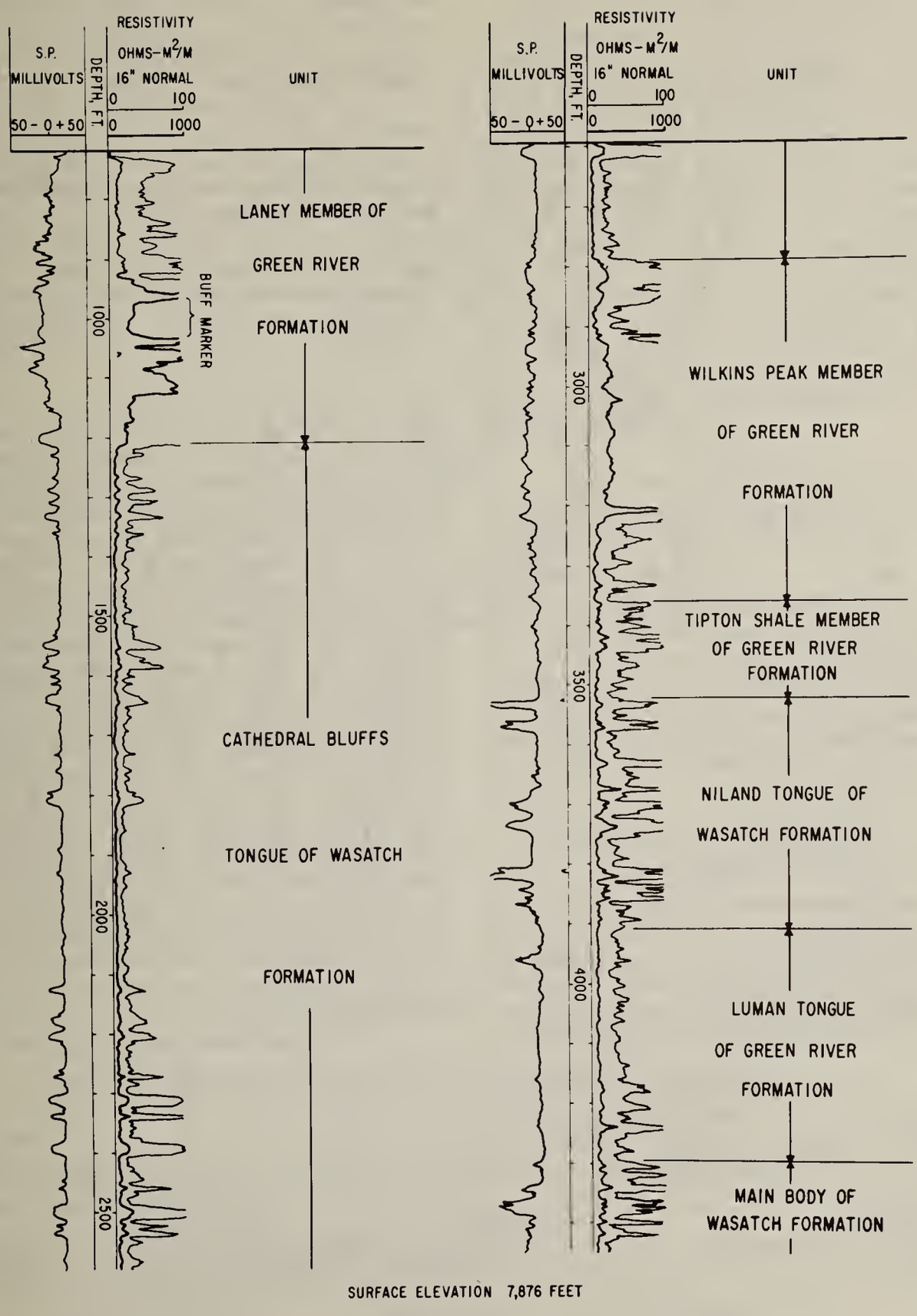

Figure 3.—Type resistivity-spontaneous potential log from Cabot Carbon Co. Cathedral Reservoir 1 well, sec 21, T 14 N, R 99 W.

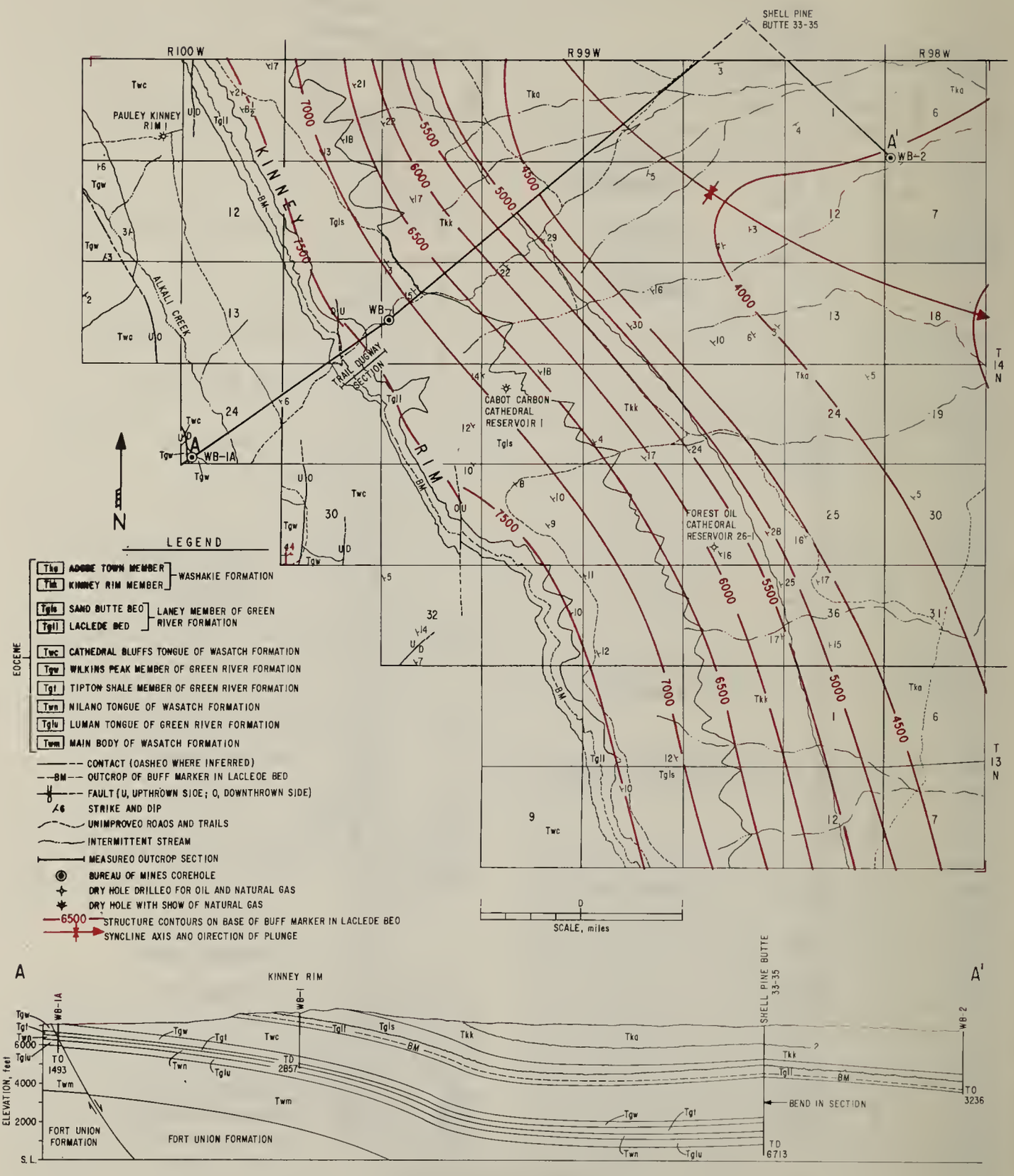

Figure 4.—Geologic map and section of part of Kinney Rim.

report these benches have been slightly modified and partly subdivided to facilitate evaluation of the oil shales. The oil-shale units are designated benches 1–9, from the bottom up (fig. 5). The thickest (up to 60 feet) are most distinctive siltstone unit in the LaClede Bed is informally known as the buff marker (*4*), and the section of silver- and gray-weathering oil shales between the buff marker and the Cathedral Bluffs Tongue of the Wasatch Formation has been called the silver bench (*5*). The algal marker, Gyraulus marker (containing abundant tiny planispiral snails), and the green shale marker are key beds used by Roehler in surface correlations.

STRUCTURE

Figure 4 shows the strike and dip of outcrops across the area of investigation and structure contours on the base of the buff marker bed in the Laney Member of the Green River Formation. The buff marker is easily recognized on resistivity logs from all wells in the area east of Kinney Rim (fig. 3). Rock strata in the area generally dip 4 to 30° northeastward. A few lesser dips are present along the limbs of the east plunging Salt Wells anticline in the northwest part of the area and along the limbs of an unnamed southeast plunging syncline in the northeast part of the area (fig. 4). The rapid increase in dips, from about 10° along the crest of Kinney Rim to nearly 30° 2 to 3 miles northeastward, reflects a monoclinal fold that parallels Kinney Rim. The fold is readily visible in surface rocks on the east slopes of the rim.

Several high angle normal and reverse faults have been mapped in the western part of the area as shown on figure 4. Maximum displacement along these faults ranges from a few feet to nearly 150 feet. Jointing appears minor, and no regional joint patterns are discernible.

CORE LITHOLOGY

Figures 6–7 show lithologic columns, oil-yield histograms, and resistivity log curves for the three Bureau of Mines Washakie Basin coreholes. Depths of stratigraphic units in the coreholes are listed in table 2. The lithologic description of cores from the Laney Member in WB–1 is presented in table A–1 in appendix A, and the description of the lower Green River Formation and associated Wasatch units in WB–1A is given in table A–2 in appendix A. Other core descriptions used in preparing figures 6–7 have been placed on open file. Explanation of the descriptive pattern and definitions of lithologic terms used in the descriptions are given at the beginning of appendix A. Core lithologies for the units sampled are summarized in the following text.

Main Body of Wasatch Formation

The main body of the Wasatch Formation was sampled in the lower 324 feet of WB–1A. It consists predominantly of medium to light gray-green and olive-gray fluvial mudstone, siltstone, and sandstone. Some parts are variegated or mottled with maroon, purplish gray, or rusty to yellowish brown. The upper 65 feet contains a few paludal limestones, carbonaceous shales, and coal beds. Only the upper 90 feet of the main body of the Wasatch Formation is shown on figure 6.

Luman Tongue of Green River Formation

The Luman Tongue is 293 feet thick in WB–1A. The lower 124 feet consists of a mixed fluvial, paludal, and lacustrine facies composed of mostly gray and brownish-gray sandstone, mudstone, and shale with a few coal beds ranging up to nearly 6 feet thick. Mollusks are fairly abundant in this zone. The upper 169

Table 2.—*Stratigraphic units sampled in Bureau of Mines Washakie Basin coreholes*

Formation	Unit	Interval depth, ft		
		WB–1	WB–1A	WB–2
Green River	Laney Member Sand Butte Bed LaClede Bed	0 – 200.6 200.6– 649.9	----------	[1] 2,395.5–2,650.2 2,650.2–3,211.0
Wasatch	Cathedral Bluffs Tongue	649.3–2,239.3	----------	3,211.0–3,236.0(TD)
Green River	Wilkins Peak Member Silty zone Oil-shale zone	2,239.3–2,451.0 2,451.0–2,588.8	0 – 366.6 366.6– 492.6	----------
	Tipton Shale Member	2,588.8–2,809.4	492.6– 676.8	----------
Wasatch	Niland Tongue	2,809.4–2,857.3(TD)	676.8– 876.0	----------
Green River	Luman Tongue	----------	876.0–1,169.0	----------
Wasatch	Main body	----------	1,169.0–1,493.0(TD)	----------

[1] Top of core.

feet of the Luman Tongue consist almost entirely of medium to dark brownish-gray fissile shale (low-grade oil shale) containing abundant ostracods, clams and snails, and occasional fish fragments. Quartz, illite, calcite, pyrite, montmorillonite, kaolin, and feldspar are the principal shale minerals identified by X-ray diffraction. Fossiliferous limestones and mollusk coquinas, mostly less than 6 inches thick, are abundant.

On the oil-yield histogram of WB–1A (fig. 6) beds of coal and coaly shale in the lower part of the Luman Tongue and the upper part of the main body of the Wasatch Formation stand out as isolated high oil yields ranging up to 40 gallons of oil per ton. The coal is typically black, brittle, vitreous to subvitreous, and massive. Proximate analysis of a coal bed at 1,163.0 to 1,165.4 feet in WB–1A indicates that it should be classed as high-volatile C bituminous coal. Results of analyses on this bed performed by the Natural Resources Research Institute at the University of Wyoming are as follows:

Moisture, as received	wt-pct	2.2
Volatile matter	wt-pct	44.0
Fixed carbon	wt-pct	46.2
Ash	wt-pct	7.6
Total	wt-pct	100.0
Sulfur, total	wt-pct	8.9
Heating value	Btu/lb	12,330

Calculated to a moist, mineral matter-free basis by the Parr formulas for ranking (*1*), the heating value of the coal is 13,680 Btu per pound. Such a heating value would cause this agglomerating coal to be classed as high-volatile B bituminous (*1*). However, because this coal was analyzed after a prolonged air-drying period, its natural moisture content is probably higher than that obtained in proximate analysis. An estimate of 10.0 weight-percent for its natural moisture was obtained from the oil-yield assay run soon after coring. After correcting the moisture content to this value, the heating value for the moist, mineral matter-free coal becomes 12,480 Btu per pound, indicating that the coal should be classed as high-volatile C bituminous.

Niland Tongue of Wasatch Formation

In WB–1A the Luman Tongue is separated from the Tipton Shale Member of the Green River Formation by 199 feet of transitional and mixed fluvial, paludal, and lacustrine deposits of the Niland Tongue of the Wasatch Formation. The Niland Tongue consists of gray and brownish-gray, commonly carbonaceous and fossiliferous mudstone, siltstone, and sandstone interbedded with low-grade oil shale, carbonaceous shale, and coal. Part of the Niland may be missing in WB–1A because of normal displacement by a fault at 752 feet.

Coal beds in the Niland Tongue are similar to those in the lower part of the Luman Tongue of the Green River Formation. Proximate analysis, total sulfur content, and heating value of a coal from 775.9 to 778.0 in WB–1A are as follows:

Moisture, as received	wt-pct	3.0
Volatile matter	wt-pct	36.8
Fixed carbon	wt-pct	43.8
Ash	wt-pct	16.4
Total	wt-pct	100.0
Sulfur, total	wt-pct	7.8
Heating value	Btu/lb	10,410

This coal was nonagglomerating. Its moist, mineral matter-free heating value from the Parr formula (*1*) was 12,850 Btu per pound, indicating a high-volatile C bituminous classification (*1*). The water content of the sample was probably low from long drying. As with the coal sample from the Luman Tongue, the moisture content was corrected to the 12.0 weight-percent water determined on oil-yield assay. This lowered the moist, mineral matter-free heating value of the coal to 11,690 Btu per pound. Although this coal is nonagglomerating, its heating value is too high for the subbituminous classes; high-volatile C bituminous coal is its classification (*1*).

Tipton Shale Member of Green River Formation

The Tipton Shale Member is 184 feet thick in WB–1A and 221 feet thick in WB–1. Oil-yield correlation between the two coreholes is excellent and thus makes possible precise determination of thickness changes (fig. 6). The lower half of the Tipton consists of medium to dark brownish-gray fossiliferous low-grade oil shale very similar to the shale of the Luman Tongue. Clam and snail shell fragments are abundantly scattered through the shale and concentrated in coquina layers. Ostracods are also abundant. The chief shale minerals are quartz, illite, calcite, pyrite, feldspar, kaolin, and montmorillonite. In the upper half of the Tipton, mollusks and ostracods become sparse, zones of olive to greenish-gray oil shale alternate with brownish-gray oil shale, and dolomite occurs as occasional massive bands or algal layers. Quartz, illite, dolomite, feldspar, montmoril-

[5] Ferroan is an informal term used by the Bureau of Mines for carbonate minerals of the siderite-magnesite isomorphous series. Ferroan is represented by the generalized formula $(Fe_xMg_{1-x})CO_3$, where x ranges from 1 to 0.

lonite, pyrite, and ferroan[5] are the principal minerals in the upper part of the Tipton.

Wilkins Peak Member of Green River Formation

The lower part of the Wilkins Peak Member consists of medium to dark olive-gray and brownish-gray oil shale with a few zones of light olive-gray to gray-green mudstone and claystone. Dolomite layers and nodules are moderately abundant. Ostracods and mollusks are very sparse. Quartz, illite, feldspar, dolomite, and ferroan are the main oil-shale minerals. The oil-shale zone of the Wilkins Peak Member is 138 feet thick in WB–1 and 126 feet thick in WB–1A. The top of this zone was used as the correlation datum on figure 6. Above the oil-shale zone the Wilkins Peak is composed of olive-gray to gray-buff claystone, mudstone, siltstone, and sandstone with only a few thin beds of brownish-gray oil shale. Sparse plant debris and a few algal beds were the only fossils found in this section. No saline minerals were observed or detected by X-ray diffraction in the Wilkins Peak Member nor in other parts of the cores.

Cathedral Bluffs Tongue of Wasatch Formation

In WB–1 the Wilkins Peak Member is separated from the Laney Member of the Green River Formation by 1,589 feet of fluvial rocks of the Cathedral Bluffs Tongue of the Wasatch Formation (cross section, fig. 4). In the cored sections at the top and bottom, the Cathedral Bluffs consists mostly of light to medium olive-gray, gray-green, and gray-buff mudstone, siltstone, and fine sandstone. Some purplish-gray and reddish-brown mottling was present in the lower 4 feet of the upper cored section in WB–1 and at the very bottom of WB–2 (fig. 7).

Laney Member of Green River Formation

The Laney Member is divided into a lower oil-shale unit, the LaClede Bed, and an upper sandy unit, the Sand Butte Bed (fig. 7). The LaClede Bed consists of thick units of brownish-gray to black oil shale separately by 3- to 75-foot barren zones of buff to slightly brownish and greenish-gray mudstone, siltstone, sandstone, and marlstone. The numerical designation of these oil-shale units (or benches) was explained in the section on surface geology. Gray to brown tuff layers, from a fraction of an inch to several inches thick, are scattered throughout the oil shale of the LaClede Bed, and buff to brown algal or oolitic dolomite layers are fairly abundant in the lower part. Zones of octracods, snails, and fish occur as shown on figure 7. A 6- to 10-inch zone of limestone nodules near the base of bench 7 is a distinctive marker in the cores. Closely spaced small dense brownish-gray nodules in wavy bedded oil shale give the zone a knotty appearance. This knotty bed was recently found in a core near Sand Butte, 13 miles north of WB–1. The principal minerals in the oil shale of the LaClede Bed are quartz, analcite, dolomite, calcite, illite, feldspar, and pyrite. Dolomite decreases and calcite increases above bench 6. Aragonite was found in a few samples.

Figure 7 shows the unconformity separating the LaClede Bed from the overlying Sand Butte Bed. The nearly perfect oil-yield correlations on figure 7 show that the unconformity rises stratigraphically about 75 feet between WB–1 and WB–2 and the stratigraphically equivalent section of the LaClede Bed thickens nearly 9 percent in the same direction. These two factors combine to make the LaClede Bed 112 feet thicker in WB–2 than in WB–1 (561 feet compared with 449 feet). The thickening is accompanied by a moderate increase in oil-shale richness as explained in the section on oil yields.

A 98-foot section of the Sand Butte Bed was cored in WB–1, and a 254-foot section was cored in WB–2. The Sand Butte Bed consists of light gray and gray-buff to brownish and olive-gray sandstone, siltstone, and mudstone with occasional interbedded zones of medium to dark brownish-gray oil shale and marlstone. Zones of carbonaceous plant debris occur in some clastic sections, and ostracods and algal or oolitic layers occur in oil-shale zones.

OIL YIELDS

OIL-YIELD DATA

Oil yields of samples from the three Bureau of Mines Washakie Basin coreholes are tabulated in appendix B and are shown as histograms on figures 6-7. Figures 5 and 7 also show oil yields of surface samples. These oil yields, expressed in gallons of shale oil per ton of rock, were determined by the Fischer retort method (*10*) used extensively to evaluate oil shales. Core samples were prepared from mechanically split half-core portions representing each sample interval. Sample intervals were chosen to emphasize variations in richness and were normally from 1 to 2 feet long. Some thick sections of

obviously barren rock were not assayed. Surface samples were collected to represent lithologic units described in measured outcrop sections. Samples taken from the bottom of several small pits dug at random places across the width of each bed were carefully combined and mixed to obtain a sample representative of the entire bed. Core and outcrop samples were crushed to pass an 8-mesh-per-inch screen and were air dried before assay. Drill-cutting samples from uncored parts of the coreholes were air dried before assay and did not require crushing. Barren or very lean drill-cutting samples were eliminated from assay by a simple qualitative oil-yield test (*9*).

Samples containing coal are noted in appendix B. Beds of coal and coaly shale are present in the Niland Tongue and main body of the Wasatch Formation and the Luman Tongue of the Green River Formation. Coal samples yielded as much as 40 gallons of heavy oil per ton. Specific gravity of Fischer assay oil from coal ranged from 0.96 to 1.00, whereas shale-oil gravities are normally between 0.87 and 0.93 (*7*).

The oil-yield tables in appendix B include a column labeled "Length times gallons per cubic foot." These values permit the calculation of average oil yield for any desired interval on a volume basis (gallons per cubic foot) instead of a weight basis (gallons per ton). This computation procedure, described in detail in Report of Investigations 5614 (*11*), compensates for the large differences in oil-shale density associated with variation in organic content (*6-7*). To find an average oil yield (in gallons per cubic foot) sum the values for the interval (length times gallons per cubic foot) and divide by the length represented (total length minus missing footage). A table for converting gallons per cubic foot to gallons per ton has been published in Reports of Investigations 5614 (*11*) and 6420 (*12*). This table, derived for Mahogany zone oil shale in Colorado, has been shown to be valid for Wyoming oil shales (*8*).

OIL YIELDS OF SELECTED SECTIONS

Average oil yields of selected sections were computed to evaluate the shale-oil potential of oil-shale units sampled in the Bureau's Washakie Basin coreholes. Table 3 summarizes oil-yield data for sections calculated to represent maximum continuous thicknesses averaging approximately 30, 25, 20, 15, and 10 gallons of oil per ton, or for the total continuous oil-shale section in each unit. Oil shales of the LaClede bed of the Laney Member show the maximum potential in every category. The thick barren buff marker divides the LaClede Bed into upper and lower sections (fig. 7). Minable thicknesses of oil shale averaging up to 25 gallons per ton are present both above and below the buff marker. The selected sections thicken from WB–1 to WB–2. Table 3 shows the in-place oil potential of each selected section expressed in millions of 42-gallon barrels per square mile.

Table 3.—*Maximum continuous thicknesses of oil shale of selected average oil yields*

Unit	Interval depth, ft	Thickness, ft	Average oil yield, gal/ton	Oil in place, million bbl/sq mi	Interval depth, ft	Thickness, ft	Average oil yield, gal/ton	Oil in place, million bbl/sq mi
	Washakie Basin Corehole 1				Washakie Basin Corehole 2			
LaClede Bed of Laney Member—above buff marker.	321.0– 326.8	5.8	30.22	7.76	2,878.8–2,885.6	6.8	30.61	9.18
	355.3– 368.4	13.1	25.09	15.05	2,877.4–2,895.8	18.4	25.04	21.12
	341.8– 381.4	39.6	19.95	37.53	2,854.0–2,906.1	52.1	20.01	49.50
	296.0– 432.9	136.9	15.03	101.30	2,780.5–2,958.2	177.7	14.98	131.10
	200.6– 432.9	232.3	11.69	137.20	2,650.2–2,959.2	309.0	12.88	199.20
LaClede Bed of Laney Member—below buff marker.	515.8– 523.0	7.2	29.98	9.57	3,059.0–3,067.0	8.0	30.11	10.67
	514.1– 531.7	17.6	25.03	20.20	3,057.0–3,076.2	19.2	25.14	22.11
	496.6– 542.6	46.0	19.95	43.60	3,033.2–3,079.4	46.2	19.98	43.85
	493.4– 565.4	72.0	15.06	53.39	3,027.4–3,133.0	105.6	15.25	79.19
	493.4– 593.0	99.6	13.96	69.04				
	Washakie Basin Corehole 1				Washakie Basin Corehole 1A			
Wilkins Peak and Tipton Members.	2,453.6–2,462.0	8.4	24.76	9.55	368.3– 372.7	4.4	25.52	5.13
	2,452.3–2,466.5	14.2	19.99	13.48	366.6– 374.0	7.4	20.00	7.02
	2,644.0–2,683.8	39.8	14.94	29.31	535.6– 555.1	19.5	15.04	14.45
	2,451.0–2,770.4	319.4	10.00	163.60	492.6– 612.0	119.4	10.00	61.13
					366.6– 674.0	307.4	8.06	129.00
Luman Tongue	(1)	----	----	----	893.0– 905.0	12.0	11.43	6.95
					889.6–1,042.0	152.4	6.49	52.21

[1] Not sampled.

Together, the 15-gallon-per-ton sections above and below the buff marker represent 155 million barrels of shale oil per square mile in WB–1 and 210 million barrels of shale oil per square mile in WB–2.

Table 4 lists average oil-yield data for each of the oil-shale benches in the LaClede Bed. The excellent oil-yield correlation of these units between coreholes and with the outcrop on Kinney Rim is illustrated on figure 7. Trudell, Beard, and Smith (*13*) demonstrated that such oil-yield correlations reliably define time lines and stated that rocks within time-stratigraphic units can be expected to vary gradually with geographic position. The changes in oil-shale richness and thickness between WB–1 and WB–2 are clearly defined in table 4. For the four benches with average oil yields greater than 15 gallons per ton (benches 3-6), the average increases in grade and thickness from WB–1 to WB–2 are 6 and 11 percent, respectively. Oil in place in the four benches increases from 132 to 154 million barrels per square mile.

The lower part of table 3 summarizes oil-yield data for the lower Green River Formation sampled in WB–1 and WB–1A (fig. 6). The selected sections in the Wilkins Peak and Tipton Members are thicker in WB–1 at every grade level. The maximum 15-gallon-per-ton section, which occurs in the Tipton Member, is 39.8 feet thick in WB–1 and 19.5 feet thick in WB–1A. The only significant 25- and 20-gallon sections in the lower Green River Formation are at the top of the Wilkins Peak oil-shale zone. In WB–1, the Wilkins Peak 25-gallon section is 8.4 feet thick, and the 20-gallon section is 14.2 feet thick. Only WB–1A sampled the Luman Tongue of the Green River Formation. The Luman Tongue has 152 feet of continuous oil shale averaging 6.5 gallons of oil per ton. A 12-foot section near the top of the Luman yields 11.4 gallons per ton.

OIL-YIELD REPRESENTATION BY SURFACE SAMPLES

Thicknesses and average oil yields of oil-shale benches sampled on the Trail Dugway surface section are listed on the right side of table 4. These oil-yield averages were calculated from assays of surface samples representing individual beds ranging in thickness from a few inches to 33 feet. Because weathering drastically reduces oil yields, the averages for the benches on Trail Dugway are 17 to 69 percent lower than the average yields in WB–1. However, the correlation between the average surface and core oil yields is 96 percent. Although more comparisons are needed to derive a reliable correction formula, this strong correlation indicates that carefully taken surface samples could provide usable oil-yield estimates.

OVERBURDEN

Any endeavor to produce oil from oil shale by mining or in situ methods must take into account the overburden thickness on the zone to be processed. Selection of an oil-shale production zone depends on many technical and economic factors beyond the scope of this report. To provide some basis for judging overburden thicknesses, figure 8 shows overburden

Table 4.—*Average oil yields of oil-shale benches in the LaClede Bed of the Laney Member*

Bench (fig. 7)	Washakie Basin corehole 1				Washakie Basin corehole 2			Trail Dugway Section [1]		
	Interval depth, ft	Thickness, ft	Average oil yield, gal/ton	Oil in place, million bbl/ sq mi	Interval depth, ft	Thickness ft	Average oil yield, gal/ton	Oil in place, million bbl/ sq mi	Thickness, ft	Average oil yield, gal/ton
ABOVE BUFF MARKER										
9	([2])	----	----	----	([3])	----	----	----	([2])	----
8	([3])	----	----	----	2,676.0–2,741.9	65.9	11.28	37.68	([3])	----
7	221.1–322.8	101.7	7.28	38.79	2,741.9–2,838.5	96.6	9.32	46.38	102.2	4.43
6	322.8–386.8	64.0	17.75	54.81	2,838.5–2,911.1	72.6	18.57	64.59	58.7	13.00
5	395.4–432.9	37.5	17.56	31.82	2,918.5–2,958.2	39.7	19.66	37.15	37.1	14.56
BELOW BUFF MARKER										
4	495.2–509.2	14.0	22.81	14.86	3,032.0–3,048.1	16.1	22.38	16.83	15.4	17.03
3	512.6–547.4	34.8	18.45	30.83	3,051.3–3,089.1	37.8	19.46	35.07	34.6	13.50
2	552.9–593.0	40.1	10.59	21.65	3,092.9–3,133.0	40.1	12.42	25.03	40.9	4.73
1	628.0–649.1	21.1	7.34	8.11	3,186.4–3,207.3	20.9	8.65	9.36	26.7	2.29

[1] Surface samples from measured section.
[2] Not present.
[3] Not complete.

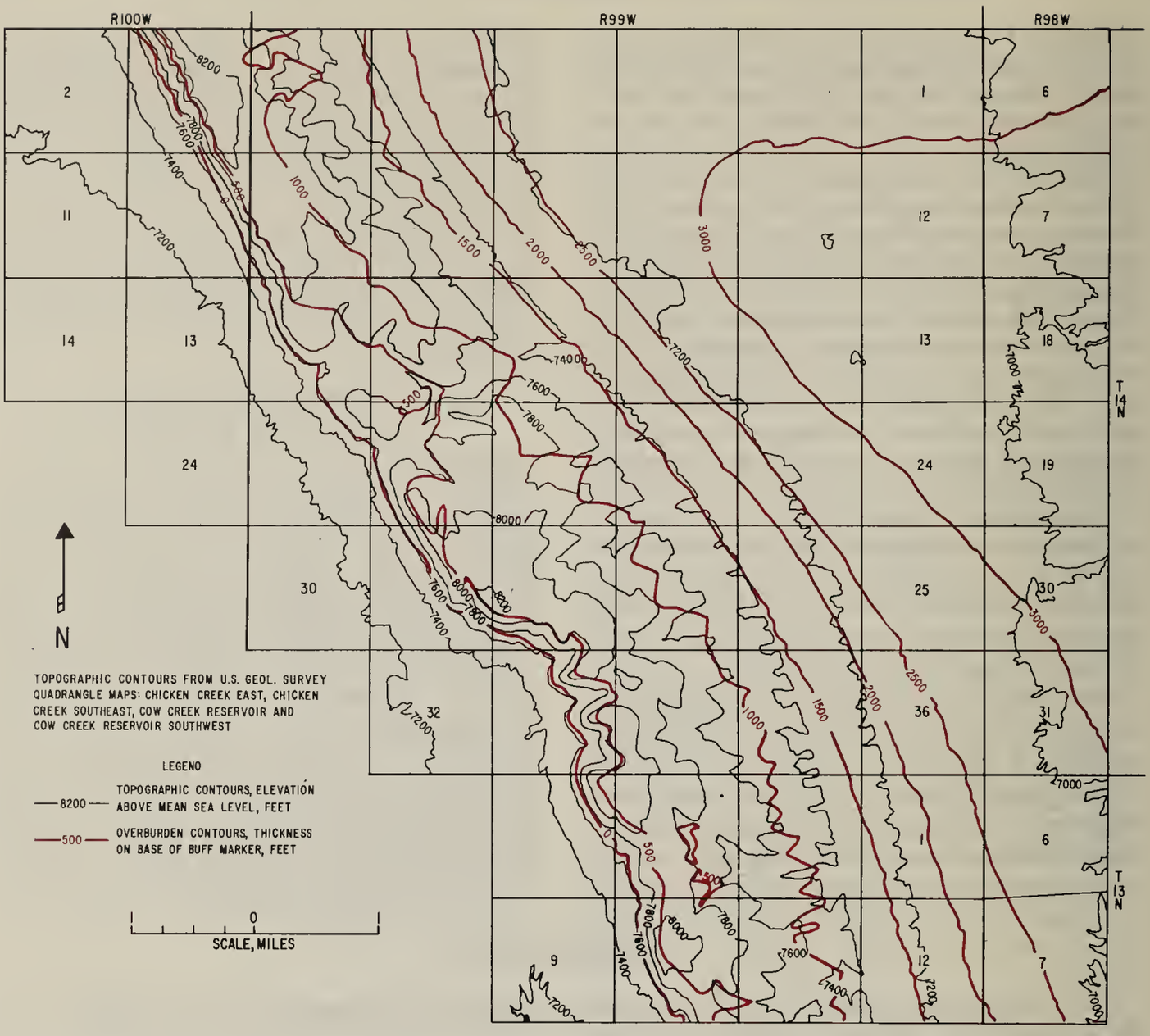

Figure 8.—Topographic map showing overburden on base of buff marker in Laney Member of Green River Formation.

contours using the base of the buff marker (or top of bench 4) as the datum and relates the overburden to the topography of the area. The buff marker is within the section of greatest oil-yield potential, the LaClede Bed of the Laney Member (fig. 7). Thickness of overburden on other stratigraphic horizons can be estimated by subtracting from or adding to the contour values the distance of the horizon above or below the datum. Overburden on the base of the buff marker increases rapidly northeast from the outcrop on the front of Kinney Rim to more than 500 feet under the crest of Kinney Rim. It reaches 2,700 feet at the base of the monocline 3 miles northeast of the rim and continues to increase to 3,032 feet in WB–2 and more than 3,400 feet in the syncline in sec 18, T 14 N, R 98 W. Overburden on the Tipton Shale Member is about 500 feet thick at WB–1A in the western part of the area. It increases to over 1,000 feet in front of Kinney Rim and is 2,500 to 3,000 feet thick under the crest of the rim (cross section, fig. 4).

SUMMARY

Eocene rocks in the western part of the Washakie Basin include thick sections of oil shale in the Laney, Wilkins Peak, and Tipton Shale Members, and the Luman Tongue of the Green River Formation. Oil shales of the LaClede Bed of the Laney Member show the

maximum oil-yield potential. In Washakie Basin corehole 1, near the outcrop on Kinney Rim, the LaClede Bed contains two oil-shale sections (72 and 137 feet thick) averaging 15 gallons of oil per ton of rock. Together, these two sections represent 155 million barrels of oil per square mile. Minable thicknesses averaging up to 25 gallons per ton are present. Oil-shale units in the LaClede Bed substantially increase in thickness and richness toward the basin center, from Washakie Basin corehole 1 to corehole 2. The thickness of overburden on the oil shale rapidly increases to more than 2,500 feet in the same direction. The Wilkins Peak Member contains about 130 feet of oil shale with an average yield of less than 15 gallons of oil per ton. Near the top of this zone, sections less than 15 feet thick average 20 to 25 gallons per ton. In the western part of the area of investigation, the Tipton Shale Member has 119 feet of oil shale averaging 10 gallons of oil per ton and 19.5 feet averaging 15 gallons per ton—both under about 500 feet of overburden. The Tipton becomes considerably richer to the northeast toward Kinney Rim as overburden thickness increases rapidly to more than 1,000 feet. The Luman Tongue of the Green River Formation includes about 150 feet of low-grade oil shale in Washakie Basin corehole 1A. Few samples from the Luman yielded as much as 10 to 15 gallons of oil per ton, and the entire oil-shale section averages only 6.5 gallons. Beds of bituminous coal up to 6 feet thick were sampled in the lower part of the Luman Tongue of the Green River Formation and in the Niland Tongue and main body of the Wasatch Formation. The coals are unusually high in volatile matter and sulfur. Saline minerals, such as shortite, trona, and halite, were diligently sought in the Bureau of Mines cores, but no evidence of their presence was found.

REFERENCES

1. American Society for Testing and Materials. Specifications for Classification of Coals by Rank. ASTM Designation D388–66 in 1970 Annual Book of ASTM Standards. Part 19—Gaseous Fuels; Coal and Coke. Philadelphia, Pa., 1970, pp. 65–70.
2. Bradley, W. H. Geology of Green River Formation and Associated Eocene Rocks in Southwestern Wyoming and Adjacent Parts of Colorado and Utah. U.S. Geol. Survey Prof. Paper 496–A, 1964, 86 pp.
3. Roehler, H. W. Early Tertiary Depositional Environments in the Rock Springs Uplift Area. Wyoming Geol. Assoc. Guidebook, 19th Field Conf., 1965, pp. 140–150.
4. _____. Stratigraphy and Oil-Shale Deposits of Eocene Rocks in the Washakie Basin, Wyoming. Wyoming Geol. Assoc. Guidebook, 21st Field Conf., 1969, pp. 197–206.
5. _____. Stratigraphic Divisions and Geologic History of the Laney Member of the Green River Formation in the Washakie Basin in Southwest Wyoming. U.S. Geol. Survey Bull. 1372–E, 1973, 26 pp.
6. Smith, J. W. Specific Gravity-Oil Yield Relationship of Two Colorado Oil-Shale Cores. Ind. and Eng. Chem., v. 48, March 1956, pp. 441–444.
7. _____. Theoretical Relationship Between Density and Oil Yield for Oil Shales. BuMines RI 7248, 1969, 20 pp.
8. Smith, J. W., L. G. Trudell, and K. E. Stanfield. Characteristics of Green River Formation Oil Shales at Bureau of Mines Wyoming Corehole No. 1. BuMines RI 7172, 1968, 92 pp.
9. Stanfield, K. E. Estimating Oil Yield of Lean Oil Shale. Anal. Chem., v. 25, October 1953, pp. 1552–1553.
10. Stanfield, K. E., and I. C. Frost. Method of Assaying Oil Shale by a Modified Fischer Retort. BuMines RI 4477, 1949, 13 pp.
11. Stanfield, K. E., J. W. Smith, H. N. Smith, and W. A. Robb. Oil Yields of Sections of Green River Oil Shale in Colorado, 1954–57. BuMines, RI 5614, 1960, 186 pp.
12. Stanfield, K. E., J. W. Smith, and L. G. Trudell. Oil Yields of Sections of Green River Oil Shale in Utah, 1952–62. BuMines RI 6420, 1964, 217 pp.
13. Trudell, L. G., T. N. Beard, and J. W. Smith. Green River Formation Lithology and Oil Shale Correlations in the Piceance Creek Basin, Colorado. BuMines RI 7357, 1970, 226 pp.

APPENDIX A.—LITHOLOGIC DESCRIPTIONS

The lithologic description presented in table A–1 of appendix A represents the Laney Member of the Green River Formation sampled in Bureau of Mines Washakie Basin corehole 1, and the description in table A–2 represents the lower Green River Formation and associated units of the Wasatch Formation in Washakie Basin corehole 1A. Descriptions of the lower part of Washakie Basin corehole 1 and all of corehole 2 have been placed on open file. These descriptions were made from handlens examination of split core surfaces. Each interval description is presented in the following pattern:

Depth of interval followed by—

A. Rock classification.
B. Color.
C. Action with acid.
D. Significant luster.
E. Stratification.
F. Physical properties.
G. Accessory features.
H. Minerals identified by X-ray diffraction.

To illustrate the application of this pattern, the description for the interval 200.6 to 202.7 feet in Washakie Basin corehole 1 is divided into these segments:

(A) Oil shale (mudstone): (B) Medium brownish gray (2.5Y 5/2–4/2), (C) Calcareous. (D) (No entry.) (E) Faint very fine smooth laminae. (F) Very regular thick parting. (G) Common *very* fine tan dolomite streaks and rare fine lenses. Rare very fine pyrite streaks. A very thin band of gray shaly mudstone at 200.8. (H) Sample of oil shale from 202.2 feet: X-ray—calcite, quartz, illite, pyrite, dolomite.

Explanations and definitions of terms used in the descriptions are presented under the following rock property headings.

A. Rock classification.

Sandstone: Composed predominantly of clastio grains between 1/16 mm and 2.0 mm in diameter (textures were determined by comparison with standard samples in a sand gage folder distributed by Geologic Specialty Co., P.O. Box 8337, Britton Station, Oklahoma City, Okla.). Coarse–1/2–2.0 mm, medium—1/4–1/2 mm, fine—1/16–1/4 mm.

Siltstone: Composed predominantly of clastic grains discernible under X 10 magnification but smaller than 1/16 mm in diameter.

Mudstone: Composed predominantly of poorly sorted microgranular to fine sand size clastic grains.

Claystone: Composed predominantly of microgranular clastic material.

Shale: Claystone displaying tendency to part into thin sheets along bedding planes.

Marlstone: Microgranular to silty-textured rock composed predominantly of chemically precipitated carbonates with moderate amounts of authigenic quartz, feldspar, clay, or other noncarbonate minerals.

Oil Shale: Organic marlstone, shale, or mudstone which, by visual examination, is estimated to yield more than 3 gallons of oil per ton by retorting, excluding petroleum or bitumen-impregnated rocks and coal.

Limestone: Composed predominatly of calcite or calcite and dolomite.

Tuff: Composed predominatly of volcanic ash.

B. Color.

Rock colors are indicated by descriptive terms and by symbol notations (in parentheses) according to the Munsell system of color notation (Munsell Book of Colors, Pocket Edition, v. 1, Munsell Color Co., Inc., Baltimore, Md., 1929–42).

C. Action with acid.

Cores were frequently tested with approximately 1.0 normal HCl giving the following results: Calcareous—rapid effervescence producing a white froth; dolomitic—slow evolution of fine bubbles.

D. Luster.

Chalky: Very dull, powdery.
Earthy: Dull, lusterless; like clay.
Satiny: Very slight sheen.
Resinous: Moderate sheen.
Waxy: Very lustrous; like polished leather.
Vitreous: Bright luster, glassy.

E. Stratification.

Massive: No visible stratification.
Bedded: Textural stratification without distinguishable layers.
Variegated: Irregular subtle color variations.
Mottled: Irregular color blotches or spots.
Streaked: Stratification marked by thin to fine flat discontinuous elements.
Laminated: Composed of alternating layers mostly thinner than 1/2 inch.
Banded: Composed of alternating layers mostly thicker than 1/2 inch.
Loop Structure: Pinching out of several laminae.
Displacement: Vertical or diagonal offset of laminae, streaks, etc.

F. Physical properties.

Parting: Tendency of rock to break parallel to stratification.
Shaly parting: Commonly breaks into fairly uniform plates 0.1 to 0.5 inch thick.
Papery parting: Commonly breaks into plates thinner than 0.1 inch.
"Curly" parting: Breaks into irregular undulating plates.
Fracture: Characteristics of vertical surfaces produced by splitting core.
Conchoidal fracture: Smoothly curved.
Hackly fracture: Jagged with sharp blades or irregular projections roughly parallel to stratification.
Unctuous: Smooth soapy feel indicating abundance of clay minerals.

G. Accessory features.

1. Forms.

Band: Fairly regular and conformable layer thicker than 1/2 inch.
Lamina: Fairly regular and conformable layer thinner than 1/2 inch.
Stringer: Irregular layer or vein.
Streak: Thin to fine flat discontinuous mass.
Lens: Roughly biconvex or oval mass.
Nodule: Large or small round mass.
Bleb: Very small irregular or round mass.
Patch: Very irregular mass.
Disseminated: Scattered through rock matrix.
Zone: Interval or layer characterized by some particular property, such as color or accessory content.

2. Textures.

Sandy: Composed predominantly of grains between 1/16 mm and 2.0 mm in diameter.
Silty: Composed predominantly of grains smaller than 1/16 mm in diameter.
Dense: Compact, microgranular or amorphous.
Sparry: Composed of interlocked crystals that break along cleavage planes.
Oolitic: Containing fine spherical to ellipsoidal concretionary grains.
Porous: Containing common fine cavities.
Breccia: Composed of angular rock fragments.
Drusy: Mineral linings composed of well-formed crystals in cavities or on natural fracture surfaces.

3. Distribution.

Quantity terms are used in two distinct senses in the descriptions. As applied to large masses or thick layers they indicate the percentage of accessory material in the core. As applied to small scattered accessory features or thin layers the terms indicate frequency of occurrence. In either case they are only visual estimates and not measured or counted quantities.

Percentage.
Rare: Less than 5 percent.
Some: 5 to 15 percent.
Common: More than 15 percent.

Frequency of occurrence.
Rare: Fewer than 50 per square foot of core surface for scattered features or fewer than 3 per foot of core length for layers.
Some: 50 to 150 per square foot for scattered features or 3 to 6 per foot of core for layers.
Common: More than 150 per square foot for scattered features or more than 6 per foot for layers.

4. Sizes.

Large or thick: Greater than 1.0 inch.
Medium: 0.5 to 1.0 inch.
Small or thin: 0.1 to 0.5 inch.
Fine: Smaller than 0.1 inch.

H. Minerals by X-ray diffraction.

Minerals identified by X-ray diffraction analyses of described samples are reported in the descriptions, listed according to estimated amounts in descending order. Samples were selected to represent typical rock and unusual material.

The term "ferroan" is used in the X-ray reports to indicate ferrous iron-magnesium carbonates of the siderite-magnesite isomorphous series represented by the formula $(Fe_xMg_{1-x})CO_3$, where x can vary from 1 to zero.

Table A-1.—*Lithologic description of core samples from Laney Member of Green River Formation in Washakie Basin corehole 1*

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY[1/]

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole drilled in 1968 and 1969 in NW1/4 SW1/4 (2,277 ft N/S and 404 ft E/W) of sec 17, T 14 N, R 99 W, Sweetwater County, Wyoming

Surface elevation: 7,703 feet
Cored intervals: 102.7-683.1 and 2,172.5-2,857.3 feet

From	To	Description
		LANEY MEMBER OF GREEN RIVER FORMATION
		SAND BUTTE BED
101.0	102.7	(Junk-basket sample) Claystone and mudstone: Medium olive-gray claystone in upper part (5Y 4/1-5/1), light gray-green silty mudstone in lower part (7.5Y to 10Y 7/1-7/2); slightly calcareous. Very faintly bedded to massive. Abundant very fine pyrite crystals in claystone. Irregular discontinuous sample pieces.
102.7	104.0	Sandstone: Light to medium gray (N6-5) and greenish gray (7.5Y to 10Y 6/1-5/1), medium grained, massive, calcareous in upper part. Abundant pyrite in upper part. Very rare biotite. Buff marlstone and faintly laminated medium to light gray silty mudstone in upper 0.2 foot.
104.0	106.0	Sandstone: Medium to light gray green (7.5Y to 5GY 5/1 and 5/2 to 6/1 and 6/2), medium grained, porous. Massive to very faintly bedded. Common very fine irregular buff earthy blebs in some parts. Few very fine black carbonaceous streaks.
106.0	110.0	Sandstone: As above with few thick zones of light gray fine-grained sandstone. Abundant very fine black carbonaceous streaks from 106.9 to 108.1; rare in other parts.
110.0	114.0	Siltstone and sandstone: Gray buff to medium gray (2.5Y 7/1-5/1; darker colors almost neutral). Distinct distorted streaked bedding and some fairly regular laminae. Common black carbonaceous streaks. Common 1- to 3-inch zones of medium to fine grained gray-green sandstone.
114.0	124.3	Sandstone: Very light gray (N7-8), salt and pepper, medium grained, porous. Massive to faintly bedded. Fairly abundant biotite. Some pyrite. Very rare pink grains. A 1-inch zone of black carbonaceous streaks at 121.5; rare in other parts. Sample of sandstone from 116.6 feet: X-ray - dolomite, quartz, feldspar, illite, analcite, pyrite.
124.3	130.5	Sandstone: Light to rare medium gray green (7.5Y 7/1 and 7/2 to 6/1 and 6/2, rare 5/2) and some gray buff (2.5Y 7/1), fine grained, porous. Faintly

1/ By L. G. Trudell

Illustration No. SBR-4181P (Sheet 1 of 90)

Laramie Petroleum Research Center, Laramie, Wyoming April 8, 1969

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
		Bedded with common distinct gray to black carbonaceous streaks. Finely interbedded with gray-buff to light brownish-gray siltstone in lower foot. Common very fine buff earthy blebs in greenest zones.
130.5	133.8	Siltstone: Medium to light brownish gray and some gray-buff (2.5Y 5/1-6/1, some 7/1). Faintly bedded with some faint irregular laminae. Some 0.1- to 0.3-foot bands of gray-green sandstone with black carbonaceous streaks in upper half.
133.8	136.0	Sandstone: Light gray green (7.5Y and 10Y 7/1-6/2), fine to medium grained. Very faintly bedded to massive. Rare very fine black carbonaceous streaks.
136.0	140.2	Sandstone: Light gray green in upper part (7.5Y and 10Y 6/1-6/2) grading to light gray in lower part (N6), medium to coarse grained, salt and pepper. Massive with some very faint irregular bedding. Some pyrite. Rare pink grains.
140.2	144.0	Sandstone: Gray-buff (10YR 7/1, almost neutral gray), very fine grained, slightly calcareous. Massive to very faintly bedded with some medium to dark gray carbonaceous laminae in upper part and some black carbonaceous streaks showing contorted bedding in middle part.
144.0	145.0	Siltstone and very fine sandstone: Gray buff to light brownish gray (10YR 7/1-6/1; almost neutral), slightly calcareous. Very faintly bedded; some gray and gray-green streaks and very fine laminae in upper part. Common very fine black carbonaceous flecks.
145.0	147.3	Siltstone: Light gray green (5Y to 7.5Y 6/1-8/1) and light to medium gray (N7-5). Faint to distinct very fine distorted laminae; some massive to very faintly bedded zones. Common fine black carbonaceous specks in some parts.
147.3	149.5	Sandstone: Light gray green (5Y to 7.5Y 7/1-6/1), very fine grained. Very faintly bedded. Some very fine carbonaceous streaks. Very irregular gray pyritic stringers at 148.2 and 149.4.
149.5	150.3	Siltstone: Light gray green (5Y to 7.5Y 7/1-6/1; some almost neutral). Faintly laminated to very faintly bedded. Some very fine carbonaceous streaks.
150.3	151.8	Siltstone: Light to rare medium gray and gray green (N7-6, rare 5 and 7.5Y 7/1-6/1), slightly calcareous. Faint to moderately distinct, distorted to smooth streaks and very fine laminae. Some very fine carbonaceous specks.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
151.8	152.8	Siltstone and mudstone: Light gray (N6), slightly calcareous. Massive with some thin contorted light gray and gray-green siltstone stringers. Some very fine carbonaceous specks.
152.8	153.8	Mudstone and siltstone: Medium to light gray (N5-7) and some light olive gray (5Y 7/1-7/2), slightly calcareous. Moderately distinct smooth laminae to slightly distorted streaks and stringers. Sample of gray laminated mudstone from 152.8 feet: X-ray - quartz, feldspar, analcite, dolomite, illite.
153.8	155.1	Sandstone: Medium to light olive gray (5Y and 7.5Y 5/2-6/2), medium to fine grained. Massive to very faintly bedded. A 1-inch very pyritic zone at 154.7. A 1-inch gray silty zone at 154.9. Sample of olive-gray sandstone from 154.1 feet: X-ray - quartz, feldspar, analcite, illite.
155.1	157.7	Sandstone: Light olive gray and gray green (7.5Y and 10Y 6/2-7/2), fine grained, slightly calcareous. Very faintly bedded with some faint irregular laminae and bands. Some very fine black carbonaceous streaks and specks.
157.7	159.0	Siltstone: White to very pale greenish gray (N9 to 5GY 8/1), slightly chalky in white parts. Faint bedding emphasized by very abundant very fine black carbonaceous streaks. Sample of white siltstone from 157.8 feet: X-ray - clinoptilolite, quartz, feldspar, illite, montmorillonite.
159.0	160.0	Siltstone: Nearly white to light gray green in upper part (7.5Y and 10Y 9/1-6/2) and buff to light brownish gray in lower part (2.5Y and 5Y 8/2-6/1). Faint very fine laminae and streaked bedding; some small scale crossbedding in upper part. Few very fine carbonaceous specks.
160.0	160.2	Shale: Medium olive gray (5Y 5/1-4/2). Very faintly bedded. Irregular thin parting; irregular coarse hackly fracture. Some fine white earthy blebs and streaks. Sample of olive-gray shale from 160.1 feet: X-ray - montmorillonite, quartz, feldspar, illite.
160.2	160.7	Siltstone and very fine sandstone: Light olive gray (5Y 6/1 and 6/2) and some light gray green (5GY 6/2). Faintly banded. Very abundant carbonaceous streaks.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
160.7	162.0	Mudstone and siltstone: Light olive gray (5Y 7/1-6/1, rare 6/2), slightly calcareous. Faintly bedded with some very fine laminae. Some very fine-grained buff pyritic sandstone streaks in upper part. Abundant carbonaceous streaks at 161.2 to 161.5.
162.0	165.8	Mudstone, siltstone, and sandstone: Light to medium gray mudstone and siltstone (N6-5, rare 7; slight brown tint) interbedded with 0.1- to 0.3-foot zones of light gray-green fine-grained sandstone (7.5Y 7/2-6/2). Very faintly bedded with common distinct distorted streaks and stringers. Abundant carbonaceous streaks.
165.8	168.0	Sandstone: Light brownish gray and olive gray (2.5Y and 5Y 7/1-7/2), fine grained. Very faintly bedded to massive. Interbedded with very irregular contorted gray siltstone and mudstone stringers in upper part. Abundant carbonaceous specks and streaks.
168.0	170.0	Mudstone, siltstone, and fine sandstone: Medium to light gray mudstone and siltstone (N5-6; slight brown tint) interbedded with light gray-green sandstone (7.5Y and 10Y 7/1-7/2). Faintly bedded with some moderately distinct streaks and laminae. Abundant carbonaceous streaks in sandstone.
170.0	172.0	Mudstone: Light to medium brownish gray (2.5Y 6/2-5/2, some 5/1), slightly calcareous. Faintly bedded to very finely laminated. Common fine streaks and rare bands of gray-buff to light gray-green very fine-grained sandstone and siltstone. Common carbonaceous streaks in sandy parts. Sample of very finely laminated brownish-gray silty mudstone from 171.3 feet: X-ray - dolomite, quartz, feldspar, analcite, illite.
172.0	176.0	Mudstone and siltstone: Medium to light brownish-gray (2.5Y 5/1-6/1, some 6/2), slightly calcareous. Faintly bedded with abundant distinct fine streaks and rare bands of gray-buff siltstone and fine-grained sandstone -- becoming predominantly siltstone and sandstone in lower part. Sparse carbonaceous specks in upper part becoming abundant in lower part. Some very fine irregular vertical calcite-filled fractures in lower 0.5 foot.
176.0	178.7	Sandstone and siltstone: Very light gray-green fine-grained calcareous sandstone (7.5Y 8/1-9/1) and light brownish-gray sandy siltstone (2.5Y 6/1, almost neutral gray). Interbedded in thick zones. Abundant carbonaceous streaks in sandstone.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core sample of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
178.7	182.5	Sandstone: As above with some fine light brownish-gray siltstone laminae and streaks. Contorted bedding in upper 0.2 foot. A fine vitreous black coal streak resting on a fine brown shale laminae at 180.7.
182.5	184.0	Siltstone: Light to some medium brownish gray (10YR 6/1, some 7/1 and 5/1), slightly calcareous. Faintly laminated to very faintly bedded. A 1-inch gray-buff fine-grained sandstone band at 183.2.
184.0	185.0	Siltstone and very fine sandstone: Gray buff (10YR 7/1), slightly calcareous. Very faintly bedded to massive. Some very fine carbonaceous specks.
185.0	186.0	Siltstone: Medium brownish gray to gray buff (2.5Y 5/1-8/1; almost neutral gray), slightly calcareous. Very fine distinct smooth laminae and streaks. Rare very fine black carbonaceous streaks. Some thin light gray fine-grained sandstone stringers with small irregular pyrite blebs in lower part.
186.0	190.0	Siltstone and mudstone: Light brownish gray to gray buff (2.5Y 6/1-7/1, rare 8/1; almost neutral), slightly calcareous. Very faintly bedded with some fine distinct laminae. Light gray fine-grained sandstone with carbonaceous streaks in lower 0.3 foot. A 1/8-inch lamina of very dark brownish-gray shale at 186.2.
190.0	191.0	Mudstone: Light to medium and rare dark brownish gray (2.5Y 6/1-5/1, rare 4/1-3/1). Faint smooth to distorted bedding with some very faint laminae. Some light gray to gray-buff siltstone streaks and laminae. Some fine pyrite blebs near top.
191.0	193.3	Mudstone: Medium to light brownish gray (10YR and 2.5Y 5/1 and 5/2 to 6/1 and 6/2, 4/1 in lower 0.4 foot), slightly calcareous. Faintly bedded with some very faint laminae. A very irregular intertongued injected stringer, about one inch thick, of light gray silty mudstone at 191.3; few thin to fine stringers and streaks in other parts. Sample of mudstone from 191.9 feet: X-ray - quartz, feldspar, calcite, illite, analcite, dolomite, siderite?
193.3	194.6	Mudstone: As above with numerous light gray silty mudstone bands and streaks. A 1-inch band of very light gray-green siltstone at 194.0.
194.6	199.6	Mudstone: Medium to light brownish gray (2.5Y 5/2-6/2), calcareous. Faintly laminated. Very abundantly interbedded with fine laminae and streaks of very light gray fine-grained calcareous sandstone and siltstone.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
		Abundant very fine black carbonaceous streaks in sandstone. Medium gray shaly mudstone at 198.3-198.6. Two small oval veined leaves on parting surfaces at 196.9. Sample of sandstone streak from 195.9 feet: X-ray - quartz, feldspar, analcite, illite, dolomite, ferroan?
199.6	200.6	Mudstone: Medium and rare light brownish gray (2.5Y 5/2-4/2, rare 6/2), calcareous. Faintly bedded with some very fine laminae. Abundant very fine light gray sandstone and siltstone streaks. Gray shaly mudstone at 200.2 to 200.4 with vertical fracture with chalky white coating. Sample of gray shaly mudstone from 200.2-200.4 feet: X-ray - quartz, montmorillonite, illite, feldspar, calcite, dolomite.
		TOP OF LACLEDE BED
200.6	202.7	Oil shale (mudstone): Medium brownish gray (2.5Y 5/2-4/2), calcareous. Faint very fine smooth laminae. Very regular thick parting. Common very fine tan dolomite streaks and rare fine lenses. Rare very fine pyrite streaks. A very thin band of gray shaly mudstone at 200.8. Sample of oil shale from 202.2 feet: X-ray - calcite, quartz, illite, pyrite, dolomite.
202.7	206.0	Oil shale (mudstone): Medium grayish brown (2.5Y 5/3-5/2, some 4/2), calcareous. Faint very fine smooth laminae. Regular to irregular thick parting. Some very fine tan dolomite streaks. A very thin stringer of light gray crumbly mudstone with abundant very fine biotite at 204.2. Sample of light gray biotitic mudstone from 204.2 feet: X-ray - montmorillonite, biotite, feldspar, pyrite, analcite, calcite.
206.0	207.0	Oil shale (marlstone?): Medium grayish brown (2.5Y 5/2 and 5/3 to 4/2), calcareous. Faint very fine laminae and streaked bedding. Irregular thick parting. Some very fine tan streaks. Several small irregular tan lenses with very small round inclusions of buff slightly earthy material.
207.0	207.6	Missing.
207.6	208.2	Oil shale (mudstone): Medium brownish gray (2.5Y 4/2, some 5/2), calcareous. Faint very fine laminae. Regular thick to thin parting. Some very fine tan streaks. Sparsely scattered ostracods. Sample of oil shale from 207.9 feet: X-ray - calcite, quartz, illite, montmorillonite, pyrite.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
208.2	213.6	Oil shale (marlstone?): Medium brownish gray (2.5Y 5/2-4/2, some 5/3 lower part), calcareous. Faintly laminated. Regular to irregular thick parting. Some very fine tan streaks. Very rare ostracods. A 1-inch band of dark oil shale with very fine loop structures at base. A small brownish-black glassy lens with tan earthy rims at 208.8. Sample of brownish-black glassy lens from 208.8 feet: X-ray - apatite.
213.6	215.6	Oil shale (marlstone): Medium grayish brown to olive gray (2.5 5/3 and 5/2 to 5Y 5/2), calcareous. Faintly laminated. Some ostracod-covered parting surfaces.
215.6	216.6	Oil shale (marlstone): Medium olive gray and brownish gray (5Y and 2.5Y 5/2, rare 4/2), calcareous. Very faintly laminated. Regular thick to thin parting. Some very fine tan streaks.
216.6	217.5	Oil shale (marlstone): Medium to very dark olive gray (5Y 4/2-2/2) from 216.6 to 216.8 and 217.3 to 217.5, medium grayish brown (2.5Y 5/3-5/2, rare 4/2) in middle part; dark parts dolomitic, lighter parts calcareous. Faintly laminated to very faintly bedded. Regular thick to thin parting; coarse hackly fracture in dark parts. Some very fine pyrite streaks in dark shale. A very fine horizontal silky calcite seam with vertically oriented prismatic crystals near base of upper dark zone. Sample of silky calcite from 216.8 feet: X-ray - calcite, trace quartz.
217.5	217.9	Dolomite: dark brownish gray (2.5Y 3/2). Very faint smoothly curved bedding. Hard and dense. Some irregular fine fractures with white to yellow-orange crystalline fillings. Sample of dolomite from 217.7 feet: X-ray - dolomite, trace quartz. Sample of calcite(?) fracture fillings from 217.8 feet: X-ray - calcite, trace dolomite.
217.9	219.6	Oil shale (marlstone): Medium grayish brown to some black, rare tan (2.5Y 5/3-2/2, some 1/2, rare 6/3), calcareous to dolomitic. Faintly laminated in thick light and dark zones. Regular thick to very thin parting. A very thin stringer of brownish-gray to light gray earthy crumbly mudstone at 218.1. Some ostracod-covered parting surfaces. Sample of dark brownish-gray to black oil shale from 219.1 feet: X-ray - quartz, illite, montmorillonite, pyrite, dolomite, calcite, feldspar.

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Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
219.6	220.2	Oil shale (marlstone): Medium grayish brown and rare tan (2.5Y 5/2-5/3, rare 4/2 and 6/3), calcareous. Very faintly laminated. Numerous small black clams on parting surfaces near top. A fine yellowish-buff calcite lamina at 220.0.
220.2	221.1	Oil shale (marlstone): Medium to dark brownish gray and some tan (2.5Y 5/2-3/2, some 6/3), calcareous. Faintly laminated in thick darker and lighter zones. Regular medium to very thin parting. Common ostracods. Some very fine silky calcite streaks (like 216.8 feet).
221.1	221.2	Oil shale (marlstone): Medium brownish-gray (2.5Y 5/2-5/1), calcareous. Faintly laminated.
221.2	221.6	Mudstone: Medium to light gray (N5-6; slight brown tint), slightly calcareous to noncalcareous. Very faintly bedded. Sharp smooth contacts with oil shale above and below. Sample of gray mudstone from 221.4 feet: X-ray - montmorillonite, feldspar, quartz, illite, calcite.
221.6	221.7	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 4/2-5/2, 3/2 in lower half inch), calcareous. Faintly laminated. Numerous small chalky white clams and planispiral snails on one parting surface. Rare fine silty-textured pyrite streaks near base.
221.7	221.9	Calcite: Grayish brown to pale yellowish green. Silky textured with vertical fibers. Very smooth sharp contacts at top and bottom.
221.9	222.0	Marlstone: As below with 1/2-inch gray (5N) silty-textured band in middle. Sample of thin gray silty band from 221.9 feet: X-ray - calcite, montmorillonite, feldspar, illite, pyrite.
222.0	228.0	Marlstone (oil shale?): Light to some medium olive gray and brownish gray (5Y and 2.5Y 6/2, some 5/2), calcareous. Very faintly bedded. Rare very small white planispiral snails.
228.0	232.0	Marlstone (oil shale?): Medium to light olive gray and brownish gray (5Y and 2.5Y 5/2-6/2, rare 4/2), tan at 229.2-229.5 (2.5Y 6/3); calcareous. Very faintly bedded. A nearly vertical light fracture with crystalline calcite crusts at 230.8-231.1.
232.0	238.0	Marlstone (oil shale?): Medium to light olive gray and brownish gray (5Y and 2.5Y 5/2-6/2), calcareous. Very faintly bedded. A fine horizontal seam of silky calcite at 233.5.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
		Sample of olive-gray marlstone from 235.6 feet: X-ray - quartz, calcite(peak shift), pyrite, montmorillonite, feldspar.
238.0	240.0	Marlstone (oil shale?): Medium to light olive gray (5Y 5/2-6/2), calcareous, silty in lower part. Very faintly bedded. A fine dark gray blebby limestone stringer at 239.3.
240.0	248.0	Marlstone (oil shale?): Medium to light olive gray and brownish gray (5Y and 2.5Y 5/2-6/2, rare 4/2), calcareous. Very faintly bedded. A 1/2-inch light gray to buff-white earthy bentonitic(?) band at 240.6. Jumbled rubble at 243.0-244.0.
		Sample of thin earthy band from 240.6 feet: X-ray - montmorillonite, clinoptilolite, feldspar, calcite, pyrite, quartz.
248.0	256.0	Marlstone (oil shale?): Light to medium brownish gray (2.5Y 6/2-5/2), calcareous. Very faintly bedded.
256.0	262.0	Marlstone (oil shale?): Medium to light brownish gray (2.5Y 5/2-6/2, some 4/2 lower part), calcareous. Very faintly bedded to laminated. A vertical fracture with very fine calcite crusts at 260.5-260.8.
262.0	264.0	Marlstone and mudstone: Light to medium brownish gray (2.5Y 6/2-5/2), calcareous. Very faintly laminated. Small amount of gray-buff earthy bentonitic(?) rubble at 263.3
264.0	266.0	Mudstone: Medium to light brownish gray (2.5Y 5/2-6/2), calcareous. Very faintly laminated. Some very fine carbonaceous streaks and specks in upper part. A very fine tight irregular calcite-filled vertical fracture from 264.0 to 264.9.
		Sample of mudstone from 265.1 feet: X-ray - quartz, calcite, feldspar, clinoptilolite, illite, montmorillonite.
266.0	266.1	Missing?
266.1	269.6	Mudstone: Light to medium brownish gray (2.5Y 5/2-6/2), calcareous. Very faintly laminated. A fine irregular light gray silty-textured stringer at 267.1. A fine light brownish-gray calcite layer near base.
269.6	270.6	Mudstone and marlstone: Medium to light brownish gray (2.5Y 5/2-6/2), calcareous. Faintly laminated. Abundant ostracods in lower part.
270.6	272.4	Oil shale (mudstone and marlstone): Medium brownish gray (2.5Y 5/2, rare 4/2), calcareous. Faintly laminated to very faintly bedded. Abundant ostracods. A very fine gray-white silty layer with common black specks at 271.5.

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Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
272.4	273.4	Marlstone (oil shale?): Medium to light brownish gray and olive gray (2.5Y to 5Y 5/2-6/2), calcareous. Very faintly laminated. Sparsely scattered ostracods.
273.4	274.4	Oil shale(marlstone): Medium to rare light brownish gray and olive gray (2.5Y to 5Y 5/2, some 4/2, rare 6/2), calcareous. Very faintly laminated to faintly banded. Sparse ostracods.
274.4	275.4	Oil shale (marlstone): Medium to rare light brownish gray and some grayish brown (2.5Y 5/2-4/2, some 5/3-4/3, rare 6/2), calcareous. Very faint to some moderately distinct laminae. Abundant ostracods. Very rare very small buff earthy blebs.
275.4	277.9	Marlstone (oil shale?): Light to medium brownish gray and some tan (2.5Y 6/2-5/2, some 6/3), calcareous. Very faintly laminated. Abundant ostracods in upper part.
277.9	279.2	Marlstone (oil shale?): Light to some medium brownish gray and olive gray (2.5Y and 5Y 6/2, some 5/2), calcareous. Very faintly bedded with some very faint laminae. Abundant ostracods. A fine light gray biotitic stringer at 278.8.
279.2	281.2	Marlstone (oil shale?): Light to medium brownish gray (2.5Y 6/2-5/2), calcareous. Faintly laminated. A fine light to dark gray earthy bentonitic layer at 280.0. Some fine gray discolored streaks in lower part. No ostracods.
281.2	281.7	Claystone (tuff?): Light gray in upper inch (N7), buff white in other parts (2.5Y 9/2); calcareous. Massive; sharp smooth contacts at top and bottom. Water-swollen (bentonitic?) with numerous desiccation cracks. Thickness uncertain because of swelling. Sample of buff-white bentonitic(?) tuff from 281.5 feet: X-ray - montmorillonite, trace calcite.
281.7	283.1	Oil shale (marlstone): Medium brownish gray (2.5Y 5/2-4/2), calcareous. Very faint laminae and streaked bedding. A fine high angle fracture filled with calcite and pyrite extends from top to 282.5. Sparse ostracods. Sample of oil shale from 283.0 feet: X-ray - quartz, calcite, illite, clinoptilolite, feldspar, pyrite.
283.1	284.1	Oil shale (marlstone): Light to medium and rare dark brownish gray and olive gray (2.5Y and 5Y 6/2-5/2, some 4/2, rare 3/2), calcareous to slightly calcareous. Very faint streaked bedding to faintly laminated.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
		Thin shaly to papery parting in middle part. A very fine light gray silty layer at 283.4. Rare ostracod-covered parting surfaces in middle part. Sample of olive-gray papery oil shale from 283.7 feet: X-ray - quartz, illite, feldspar, pyrite, montmorillonite.
284.1	285.2	Marlstone and mudstone (oil shale?): Light to medium brownish gray (2.5Y 6/2-5/2, very rare 4/2), calcareous. Very faint laminae and streaked bedding. Rare very fine buff streaks in upper part.
285.2	286.5	Oil shale (marlstone and mudstone): Medium to light brownish gray (2.5Y 5/2-6/2, some 4/2), calcareous. Very faint to some moderately distinct laminae. Several very fine en echelon vertical calcite-filled fractures from top to 286.1
286.5	287.7	Marlstone and mudstone (oil shale?): Light to some medium brownish gray (2.5Y 6/2, some 5/2), calcareous. Very faint streaked bedding with some very faint laminae. A very fine vertical fracture filled with calcite and pyrite extends from 286.8 into interval below.
287.7	289.6	Oil shale (marlstone): Medium to some light brownish gray and olive gray (2.5Y and 5Y 5/2, some 6/2), calcareous. Very faint laminae and streaked bedding. Some ostracods in upper part. Very fine vertical fracture with calcite and pyrite continues through interval. Rare very fine buff earthy streaks and blebs.
289.6	290.2	Oil shale (marlstone): Medium to rare dark brownish gray (2.5Y and 10YR 5/2-4/2, rare 3/2), calcareous. Very faint streaked bedding and some laminae. Thick to thin shaly parting. Fine calcite-filled fracture continues to 290.1.
290.2	291.4	Oil shale (marlstone): Medium to light brownish gray (2.5Y 5/2-6/2), calcareous. Faintly laminated. A very thin light brownish-gray clayey stringer at 290.4. A 2-inch band of very faintly bedded buff-white earthy tuff at 291.0; thin gray clayey zone at top. Sample of buff-white tuff from 291.0 feet: X-ray - montmorillonite, clinoptilolite, feldspar.
291.4	292.8	Oil shale (marlstone): Medium and rare light brownish gray (2.5Y and 10YR 5/2-4/2, rare 6/2), slightly calcareous. Faintly laminated. Rare fine light gray to gray-buff clayey streaks. A 3-inch white earthy tuff at 292.0; very finely speckled with gray in lower 1/4 inch. Few very fine crystalline calcite streaks near base.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
292.8	299.0	Oil shale (marlstone): Medium and some dark brownish gray to light brownish gray and some buff (2.5Y 4/2-6/2, some 3/2 and 7/2), calcareous to slightly calcareous. Very faint to some distinct laminae commonly in thick lighter and darker zones; some very faintly bedded slightly silty light bands up to 3 inches thick. Rare fine light brownish-gray to gray-buff earthy stringers. A 3/4-inch medium gray (slightly green) silty-textured tuff with yellowish-green stains at 294.5. A very fine irregular calcite-filled vertical fracture from 294.7 to 297.3. Sample of gray tuff from 294.5 feet: X-ray - marcasite, pyrite, montmorillonite, analcite, feldspar.
299.0	300.1	Oil shale (marlstone): Medium to some light and dark brownish gray (2.5Y and 10YR 4/2-5/2, some 6/2 and 3/2), slightly calcareous. Very faint to fairly distinct laminae; dark oil shale with some very fine buff streaks in lower 0.2 foot. Some papery parting near base. Sample of dark brownish-gray oil shale from 300.0 feet: X-ray - quartz, calcite, feldspar, illite, analcite, siderite?
300.1	302.2	Oil shale (marlstone and mudstone): Medium and rare dark brownish gray (2.5Y 5/2-4/2, rare 3/2 upper part), calcareous. Very faintly bedded with some faint to rare distinct laminae and bands. A very small buff earthy bleb at 301.2. Sample of brownish-gray mudstone from 301.3 feet: X-ray - quartz, feldspar, calcite, illite, clinoptilolite, analcite, pyrite.
302.2	303.2	Oil shale (marlstone and mudstone): Medium to dark brownish gray (2.5Y 5/2-3/2), calcareous. Faintly banded.
303.2	304.5	Oil shale (marlstone): Medium to rare light and dark brownish gray (2.5Y and 10YR 5/2, some 4/2, rare 6/2 and 3/2), calcareous. Very faintly bedded with some faint laminae and rare moderately distinct bands.
304.5	305.5	Oil shale (marlstone): Medium to some dark and rare light brownish gray (2.5Y and 10YR 5/2-4/2, some 3/2, rare 6/2), slightly calcareous. Very faint to moderately distinct laminae and some bands. Some very fine buff specks and streaks in lower part.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
305.5	308.5	Oil shale (marlstone): Medium and some dark brownish gray (2.5Y and 10YR 5/2-4/2, some 3/2 in upper and lower parts), calcareous. Faint to moderately distinct laminae. Some shaly to papery parting in upper and lower parts. Common very fine tan to buff streaks and specks. A very thin gray calcareous silty-textured lamina at 307.7. Some ostracods in dark papery shale near base. Sample of very thin gray lamina from 307.7 feet: X-ray - analcite, calcite, siderite, feldspar, pyrite.
308.5	310.0	Oil shale (marlstone): Medium brownish gray to some grayish brown (2.5Y and 10YR 5/2, some 5/3 and 4/2), slightly calcareous. Faintly laminated to very faintly bedded. A 1-inch gray to buff clay band at 309.3; fine clay layer at 309.1. Dark brown fish(?) fragments on parting surfaces at 309.0
310.0	311.0	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y 5/2-4/2, some 3/2 lower part), calcareous. Faintly bedded to laminated. Shaly to papery parting in lower 0.3 foot. Rare ostracods. Some very fine buff-white earthy streaks near base.
311.0	313.1	Oil shale (marlstone): Medium to light brownish gray (2.5Y 5/2-6/2, rare 4/2), calcareous. Faintly laminated to very faintly bedded. Some very fine tan to buff streaks in upper part. Some very small planispiral snails in upper part. A thin gray to light brownish-gray silty stringer at 312.3.
313.1	313.9	Oil shale (marlstone): Tan to medium and rare dark brownish gray (2.5Y 6/3-4/2, rare 3/2), calcareous. Distinct wavy laminae and streaks. Very common fine to 1-inch dark brownish-gray dense silty-textured crystalline blebs and nodules; bedding commonly distorted around larger nodules. Sample of dense dark brownish-gray nodule from 313.6 feet: X-ray - calcite, some quartz, illite, dolomite.
313.9	314.5	Oil shale (marlstone): Medium to rare light brownish gray (2.5Y 4/2-5/2, rare 6/2), dolomitic. Very faint and rare distinct laminae. Regular shaly to papery parting in upper part. Very rare fine buff earthy porous lenses. Sample of brownish-gray dolomitic oil shale from 314.2 feet: X-ray - quartz, illite, dolomite, calcite, pyrite, feldspar, montmorillonite, ferroan.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
314.5	315.0	Oil shale (marlstone and mudstone): Light to some medium brownish gray (2.5Y 6/2, some 5/2-4/2), calcareous. Very faintly bedded; a thin distinct darker band at 214.7. Rare very fine buff earthy blebs and streaks.
315.0	321.8	Oil shale (marlstone): Light to medium brownish gray (2.5Y 6/2-4/2), calcareous. Faint to moderately distinct laminae. Some very fine tan to buff streaks. A thin very light yellowish-buff earthy bentonitic(?) stringer with desiccation cracks at 316.0; a 2-inch light brownish-gray to buff-white earthy band at 319.2; fine buff earthy layers at 317.4 and 319.5. Sample of thin yellowish-buff bentonitic(?) stringer from 316.0 feet: X-ray - montmorillonite.
321.8	322.8	Oil shale (marlstone): Tan to medium brownish gray (2.5Y 6/3-5/3 and 5/2, rare 4/2), calcareous. Faintly laminated. Some very fine buff earthy streaks and rare small porous blebs. Fine bentonitic(?) layer at 321.9.
322.8	324.0	Oil shale (marlstone): Medium brownish gray in upper part to very dark in lower part (2.5Y 5/2-2/2), calcareous to dolomitic. Faint laminae to very faint streaked bedding. Shaly to papery parting. Some thin to fine chalky white stringers at 323.6-323.7.
324.0	326.0	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 4/2-3/2, some 2/2), some grayish brown to tan in lower part (2.5Y 5/3-6/3); dolomitic to slightly calcareous. Faint streaked bedding in upper part to faint and some distinct laminae in lower part. Shaly to papery parting. Very fine white clayey layer at 324.3.
326.0	326.8	Oil shale (marlstone): Very dark brownish gray to black (2.5Y 2/2-1/2), common slight satiny luster, dolomitic. Very faintly bedded. Thick shaly to some papery parting. Very rare very fine yellowish-buff earthy streaks. Abrupt change to leaner oil shale at base. Sample of very dark brownish-gray to black oil shale from 326.3 feet: X-ray - quartz, illite, pyrite, calcite, ferroan, montmorillonite, feldspar, dolomite.
326.8	328.1	Oil shale (marlstone): Medium brownish gray to some tan (2.5Y 4/2-5/2, some 5/3-6/3), calcareous. Very faintly laminated with some moderately distinct banding. A very fine vertical calcite-filled fracture in upper 0.2 foot. Irregular thick parting; conchoidal fracture.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
328.1	329.3	Oil shale(marlstone): Light to medium brownish gray and some buff (2.5Y 6/2-4/2, some 7/2 lower part), calcareous to dolomitic. Faintly bedded; some fairly distinct banding in lower part. A very thick light gray siltstone stringer in upper part with irregular boundaries sharply crosscutting bedding; common fine irregular calcite-filled fractures in stringer. Sample of light gray siltstone stringer from 328.5 feet: X-ray - quartz, feldspar, illite, calcite, dolomite, analcite.
329.3	330.3	Oil shale (marlstone): Medium brownish gray (2.5Y 5/2-4/2), slightly calcareous. Faintly laminated to very faintly bedded. A 2-inch light gray silty tuff band with abundant very fine biotite at base (common fine sparry cleavage faces). Sample of light gray biotitic tuff from 330.2 feet: X-ray - calcite, biotite, feldspar.
330.3	331.3	Oil shale (marlstone): Medium to rare light brownish gray (2.5Y 5/2, some 4/2, rare 6/2), calcareous. Very faintly bedded with some moderately distinct laminae and thin bands. Irregular thick parting; conchoidal fracture.
331.3	332.3	Oil shale (marlstone): Medium to light brownish gray (2.5Y 5/2-6/2, rare 4/2), calcareous. Very faintly bedded to laminated. A thin light gray calcareous siltstone(?) band with some very fine biotite at 331.7.
332.3	333.4	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y 5/2-4/2, some 3/2), calcareous. Faintly bedded with some indistinct banding. Some very fine buff streaks. A fine pale yellow calcite lamina at 332.5.
333.4	334.5	Oil shale (marlstone): Medium to rare light brownish gray (2.5Y 5/2-4/2, rare 6/2), slightly calcareous. Faintly laminated.
334.5	335.2	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y 5/2-4/2, some 3/2), slightly calcareous. Faintly bedded to laminated. A very thin dark gray fine grained pyritic calcite band at 334.8.
335.2	338.0	Oil shale (marlstone): Medium to some light brownish gray (2.5Y 5/2-4/2, some 6/2 lower part), calcareous. Very faintly laminated. A thin light gray earthy cracked clay layer at 336.2 Rare fine buff earthy blebs in lower part.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core sample of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
338.0	338.9	Oil shale (marlstone): Medium and some light brownish gray (2.5Y and 10YR 5/2-4/2, some 6/2 upper part), calcareous. Faint to moderately distinct laminae. Rare fine buff earthy streaks and lenses.
338.9	339.9	Oil shale (marlstone): Medium brownish gray (10YR 4/2-5/2), calcareous. Faint laminae and streaked bedding. Common very fine buff streaks.
339.9	340.8	Oil shale (marlstone): Medium to dark brownish gray (10YR 4/2-3/2), calcareous. Faint laminae and streaked bedding. Common very fine buff streaks.
340.8	342.8	Oil shale (marlstone): Medium to some light and rare dark brownish gray (10YR and 2.5Y 4/2-5/2, some 6/2, rare 3/2), calcareous. Faintly laminated. Common very fine buff streaks. A very fine light gray silky calcite layer at 342.5. A fine light gray silty biotitic tuff at 342.7.
342.8	346.0	Oil shale (marlstone): Medium to rare dark brownish gray (2.5Y 5/2-4/2, rare 3/2 middle part), calcareous. Faintly laminated. Rare very fine buff streaks and lenses. A fine buff-white silty calcareous stringer with some very fine black specks at 344.4.
346.0	347.4	Oil shale (marlstone): Medium to some dark and light brownish gray (2.5Y 5/2-4/2, some 3/2 upper part, some 6/2 lower part), calcareous. Fairly distinct to faint laminae. Common very fine buff streaks.
347.4	348.5	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2), calcareous. Faint streaked bedding. Very common very fine buff streaks.
348.5	350.5	Oil shale (marlstone): Medium to some dark and light brownish gray (2.5Y 5/2-4/2, some 3/2 and 6/2), calcareous. Faint to some fairly distinct laminae. Some very fine buff streaks.
350.5	353.5	Oil shale (marlstone): Medium to some light brownish gray and olive gray (2.5Y and 5Y 5/2-4/2, some 6/2 lower 0.3 foot), calcareous. Faintly laminated. Common very fine buff streaks. A very fine dark gray silty lamina with abundant biotite(?) at 350.8 (rusty brown stains on edge of core). Very thin shaly parting in lower part. Sample of very fine dark gray silty lamina from 350.8 feet: X-ray - pyrite, quartz, feldspar, biotite, analcite.
353.5	355.3	Oil shale (marlstone): Medium to some dark olive gray (5Y 5/2 and 5/1 to 4/2 and 4/1, some 3/1) and some brownish gray (2.5Y 5/2-4/2), calcareous to

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Core sample of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
		slightly calcareous. Faintly laminated. Very common very fine buff streaks. A very fine light gray silty biotitic lamina at 354.4. A fine resinous to vitreous black brittle organic layer at 355.1; striated with closely spaced vertical fractures. Sample of olive-gray oil shale with very fine buff earthy streaks from 354.3 feet: X-ray - quartz, calcite, analcite, illite, pyrite, feldspar.
355.3	356.8	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y and 10YR 5/2-4/2, some 3/2, rare 2/2), slightly calcareous. Faint to some moderately distinct laminae. Some very fine buff streaks. Very fine gray silty laminae at 355.3 and 355.4.
356.8	359.7	Oil shale (marlstone): Very dark to some medium brownish gray (2.5Y 2/2-3/2, some 4/2-5/3 lower part), slightly calcareous to dolomitic. Very faint and rare distinct laminae. Shaly to papery parting. Rare fine light gray to buff-white earthy bentonitic(?) layers in upper part.
359.7	360.7	Oil shale (marlstone): Medium grayish brown (2.5Y 5/3-4/3, some 5/2), calcareous. Moderately distinct to faint laminae.
360.7	361.7	Oil shale (marlstone): Medium grayish brown to some very dark brownish gray and black (10YR 4/3-5/3 and 5/2, some 3/2-1/2), slightly calcareous. Faintly laminated with some dark bands. Sample of grayish-brown oil shale from 361.5 feet: X-ray - quartz, calcite (peak shift), analcite, illite, feldspar, pyrite.
361.7	364.9	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 4/2-3/2), dolomitic. Very faintly laminated. Some very fine to 1/4-inch dark gray laminae in upper part; appear to be same texture and material as surrounding oil shale. Sample of dark gray lamina from 262.6 feet: X-ray - quartz, illite, pyrite, analcite, feldspar, montmorillonite, calcite, dolomite.
364.9	366.5	Oil shale (marlstone): Medium brownish gray (10YR and 2.5Y 5/2-4/2), calcareous. Faintly laminated. Some very fine buff streaks.
366.5	368.4	Oil shale (marlstone): Medium to rare light and dark brownish gray (2.5Y and 10YR 5/2-4/2, rare 6/2 and 3/2), very calcareous. Faintly laminated. Very common very fine buff earthy streaks. Sample of oil shale with very fine buff earthy streaks from 368.1 feet: X-ray - quartz, aragonite, calcite, illite, analcite, dolomite, pyrite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core sample of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
368.4	369.7	Oil shale (marlstone): Medium to some dark olive gray (5Y to 10Y 5/2 and 5/1 to 4/2 and 4/1, some 3/1) and some brownish gray (2.5Y 5/2-5/3), calcareous. Fairly distinct to faint laminae. Fairly common very fine buff streaks.
369.7	371.0	Oil shale (marlstone): Medium and some dark olive gray in upper part (5Y to 10Y 5/2 and 5/1 to 4/1, some 3/1) grading to medium and dark brownish gray in lower part (2.5Y 4/2-3/2), calcareous. Faintly laminated. Common very fine buff streaks. A fine gray-buff earthy stringer at 370.2.
371.0	372.8	Oil shale (marlstone): Medium to some dark grayish brown and rare tan (2.5Y and 10YR 5/3-4/3, some 3/2, rare 6/3 lower part), calcareous. Faint to some distinct laminae. Some shaly to papery parting in dark zones. Some very fine buff streaks in upper part. Sample of papery shale from 371.5 feet: X-ray - quartz, aragonite, illite, pyrite, montmorillonite, calcite, dolomite.
372.8	373.9	Oil shale (marlstone): Medium to very dark brownish gray and some black (2.5Y 4/2-2/2, some 1/2), some slight satiny luster, slightly calcareous to dolomitic. Faintly laminated. Shaly to papery parting in darkest parts. A small dense black cherty nodule at 373.0. A fine buff silty to earthy streak at 373.7.
373.9	374.3	Missing.
374.3	377.3	Oil shale (marlstone): Medium to dark brownish gray and olive gray (2.5Y and 5Y 4/2-3/2, some 2/2 and 5/2 upper part), dolomitic. Faintly laminated to very faintly bedded. Some shaly parting in upper part. A 1-inch light to medium gray, earthy to silty band at 374.8.
377.3	379.3	Oil shale (marlstone): Medium to dark brownish gray and olive gray (2.5Y and 5Y 4/2-3/2, some 5/2 at 377.3-377.5 and 378.8-378.9), dolomitic. Faintly laminated to very faintly bedded. A very fine buff calcite layer at 378.4 Sample of dark olive-gray oil shale from 377.7 feet: X-ray - quartz, illite, feldspar, dolomite, marcasite, pyrite, analcite, montmorillonite.
379.3	380.6	Oil shale (marlstone): Dark to some medium brownish gray (2.5Y 3/2, some 4/2), dolomitic. Very faintly bedded to laminated. Irregular thick to medium shaly parting. Rare fine yellow-buff to light brownish-gray calcareous laminae and streaks in lower part.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
380.6	381.4	Oil shale (marlstone): Dark to medium grayish brown (10YR 3/2-4/3), dolomitic to slightly calcareous. Very faintly bedded to faintly laminated. Shaly to papery parting in lower part. Fine yellow-buff to light gray, earthy to silty layers with dark gray crystalline blebs at 380.8 and 380.9. Some very fine buff streaks near base. Sample of light gray layer with dark gray analcite(?) blebs from 380.9 feet: X-ray - analcite, feldspar, pyrite, calcite, quartz.
381.4	383.4	Mudstone (tuff?): Light to medium gray (N6-5), non-calcareous. Massive injection (?) with sharp boundaries crosscutting oil-shale bedding at top and bottom. Some ragged shreds and stringers of oil shale as above and below. Some fine irregular calcite-filled fractures cutting through mudstone and oil-shale stringers. Uneven sample split. Sample of mudstone from 381.7 feet: X-ray - quartz, analcite, feldspar.
383.4	385.6	Oil shale (shaly marlstone): Dark to rare medium brownish gray (2.5Y and 10YR 3/2, some 2/2, rare 4/2), noncalcareous.Very faintly laminated; faintly laminated tan to grayish-brown (2.5Y 6/3-5/3) marlstone at 383.6-383.8. Papery parting in upper 0.2 foot; irregular medium to thick parting in other parts. Some thin injected gray mudstone stringers near top. A fine white biotitic tuff layer at base of tan marlstone (383.8). A tight vertical fracture with sparsely scattered very fine pyrite at 384.4 to 384.9. Very rare fine dark gray silty blebs in lower part. Sample of very dark brownish-gray oil shale from 384.7 feet: X-ray - illite, quartz, pyrite, dolomite, feldspar, analcite.
385.6	386.8	Oil shale (marlstone): Medium brownish gray (2.5Y 4/2-5/2), dolomitic. Faint laminae and streaked bedding. Rare fine dark gray discolored patches in middle part. A very thin pinch-and-swell stringer of dense tan dolomite at 386.6. Sample of thin dense tan stringer from 386.6 feet: X-ray - dolomite; some analcite, quartz, feldspar.
386.8	388.0	Marlstone and some oil shale: Light to medium olive gray and rare brownish gray (5Y 6/2-5/2, rare 2.5Y 5/2), dolomitic. Faint to moderately distinct bands, laminae, and streaks--some slightly distorted. Some fine stringers to 3/4-inch lenses of dense tan dolomite.

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Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
388.0	393.0	Marlstone: Light to some medium olive gray and gray green (5Y to 10Y 6/2, some 5/2), dolomitic. Massive with some very faint banding and rare laminae. Thin to 0.1-foot hard dense massive light to medium brownish-gray dolomite(?) bands at 388.1, 388.7, 389.0, 389.1, 390.8, 391.6, and 392.7. Rare dark gray discolored blebs and streaks. Some very fine tight irregular high angle fractures with dull black fillings in lower part. A 0.1-foot very faintly and evenly bedded buff slightly earthy tuff(?) band at 392.5. Sample of hard dense light brownish-gray dolomite from 391.6 feet: X-ray - dolomite; some analcite, quartz. Sample of light gray-green marlstone from 392.1 feet: X-ray - illite, quartz, dolomite, analcite, feldspar, pyrite.
393.0	395.4	Marlstone: Light to some medium olive gray and rare brownish gray (5Y 6/2, some 5/2, rare 2.5Y 5/2), dolomitic. Very faint streaked bedding with some faint banding. Rare thin tan to buff dolomite stringers. Some very fine fractures with dull black fillings in upper part. Few thin dark brownish-gray oil-shale shreds near base.
395.4	396.2	Marlstone and oil shale: Light to medium olive-gray marlstone (5Y 6/2-5/2) and dark to rare medium brownish-gray oil shale (10YR 3/2, rare 4/2), dolomitic. Intertongued in thick jagged stringers; very faint undisturbed bedding in oil shale. Rare fine buff dolomite streaks and small lenses in oil shale.
396.2	398.5	Oil shale (marlstone): Dark to medium brownish gray (10YR 3/2-4/2, some 5/2 lower part), dolomitic to slightly calcareous. Faint smooth to contorted and displaced laminae. Common fine to thin dense buff dolomite streaks--some very contorted. Some fine vermiform olive-gray marlstone stringers near top. A 1/4- to 3/4-inch wavy silty-textured tan limestone stringer at base.
398.5	399.5	Oil shale (marlstone): Dark brownish gray to medium grayish brown (10YR 3/2-4/3, some 2/2), calcareous. Faint smooth laminae to very faint streaked bedding. Thick to thin shaly parting. Some very fine buff streaks. A very fine calcite-filled fracture with en echelon discontinuity starts at 398.9 and continues into interval below.

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Core samples of the Green River Formation from Bureau of Mines
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From	To	Description
399.5	400.3	Oil shale (marlstone): Medium to rare dark grayish brown (2.5Y 5/3-4/3, rare 3/2), calcareous. Faintly laminated. Very common very fine buff earthy streaks. Some fine distorted buff limestone stringers and lenses near top. A very fine dark gray silty-textured calcite layer with some pyrite at 400.2. Calcite-filled fracture passes out of core at 399.9.
400.3	401.0	Oil shale (marlstone): Medium to dark brownish gray (2.5Y and 10YR 4/2-3/2, some 5/2), calcareous. Fairly distinct to very faint laminae.
401.0	402.0	Oil shale (marlstone): Dark and rare medium brownish gray (10YR and 2.5Y 3/2, some 2/2, rare 4/2), dolomitic. Faint laminae to very faint streaked bedding. Papery shale with some very fine buff streaks in upper 3 inches; thick parting in lower part. Rare fine light gray silty streaks. Very rare fine dark brownish-gray silty-textured crystalline streaks.
402.0	403.3	Oil shale (marlstone): Dark to medium brownish gray, some grayish brown to rare tan in lower part (2.5Y 3/2-4/2, some 5/2-5/3 and rare 6/3 lower part), dolomitic. Faint streaked bedding with some thin faint to distinct bands and stringers. Some very irregular fine streaks and very small blebs of light brownish-gray to dark gray silty crystalline calcite in lower part. A 3/16-inch fracture filled with moderately coarse crystalline white calcite and some marcasite enters edge of core at 402.6 and continues into interval below. Sample of marcasite with small amount of calcite from fracture at 403.2 feet: X-ray - marcasite, some calcite.
403.3	404.1	Oil shale (marlstone): Medium to rare dark brownish gray (2.5Y 4/1-5/1, some 4/2-5/2, rare 3/1-3/2; commonly almost neutral gray), dolomitic. Faintly bedded with some very faint laminae. Fracture with calcite and marcasite continues through interval. Sample of almost neutral gray oil shale from 403.8 feet: X-ray - quartz, dolomite, feldspar, illite, analcite, pyrite.
404.1	405.1	Oil shale (shaly marlstone): Dark to some medium brownish gray (2.5Y 3/2, some 4/2 lower part), dolomitic to very slightly calcareous. Very faintly bedded to faintly laminated. Medium to thick shaly parting. Fracture from above passes out of edge of core at 404.4.

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Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
405.1	406.2	Oil shale (marlstone): Medium brownish gray (2.5Y and 10YR 4/2-5/2), calcareous. Faintly laminated. Two parallel very thin to fine diagonal streaks (discontinuous fracture fillings?) of buff to gray-buff slightly earthy calcareous material at 405.8 to 406.0.
406.2	407.4	Oil shale (marlstone): Medium and rare dark reddish brown in upper part (7.5YR and 10YR 4/2, rare 3/2) grading to medium and rare light brownish gray in lower part (2.5Y 4/2-5/2, rare 6/2), slightly calcareous in upper part to calcareous in lower part. Faintly laminated. Some very fine tan to buff slightly earthy streaks and rare dark brownish-gray silty crystalline streaks in upper part. A thin very irregular broken and dislocated gray-buff slightly earthy stringer near base. Sample of medium to dark reddish-brown oil shale from 406.5 feet: X-ray - quartz; some analcite, calcite, pyrite.
407.4	408.9	Oil shale (marlstone): Medium to rare dark brownish gray (2.5Y to some 10YR 4/2-5/2, rare 3/2), slightly calcareous to calcareous. Faint to moderately distinct laminae. A fine medium to dark gray silty crystalline calcite lamina at 407.7 with some light gray (slightly green) streaks in upper part. Some very fine buff streaks in middle part. Very rare fine black lenses.
408.9	409.2	Tuff: Chalky white in upper 1/2 inch grading to medium gray at base (N9-5.5), slightly calcareous. Massive to very faintly mottled and speckled. Medium-grained interlocked crystalline texture; slightly sparry at base. Some very fine pyrite masses near base. Sample of chalky white material from 408.9 feet: X-ray - quartz, analcite, feldspar. Sample of light to medium gray crystalline material from 409.2 feet: X-ray - dolomite, analcite, quartz, calcite, pyrite.
409.2	410.4	Oil shale (marlstone): Medium brownish gray (2.5Y 4/2-5/2), some reddish brown in upper part (7.5YR 4/2-5/3), calcareous to dolomitic. Faint and some moderately distinct laminae to very faint streaked bedding. Very papery in middle part. Some fine white to gray crystalline streaks at top. Very fine dark to medium gray silty crystalline layers at 402.9 and 403.1; abundant pyrite in upper layer.

Illustration No. SBR-4181P (Sheet 22 of 90)

Laramie Petroleum Research Center, Laramie, Wyoming April 8, 1969

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core sample of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
410.4	411.3	Oil shale (shaly marlstone): Black to dark brownish gray (2.5Y 1/2-3/2), slightly dolomitic. Very faintly bedded. Irregular thick parting. Sample of black oil shale from 410.7 feet: X-ray - quartz, analcite, dolomite, illite, feldspar, pyrite.
411.3	412.0	Oil shale (shaly marlstone): Dark brownish gray with thin medium grayish-brown bands at top and bottom (2.5Y 3/2-2/2, 5/3 bands), slightly dolomitic. Faintly bedded with distinct bands at top and bottom. Rare fine dark gray pyritic crystalline layers. Sample of fine dark gray crystalline layer from 411.8 feet: X-ray - analcite; some quartz, feldspar, pyrite.
412.0	412.7	Oil shale (mudstone): Very dark brownish gray to black (2.5Y 2/1 to N 1), slightly silty. Very faintly bedded. Some very fine pyrite.
412.7	413.1	Marlstone and oil shale: Buff and some medium brownish gray to black (2.5Y 7/2-7/3, some 5/2-1/2), calcareous in buff parts. Thin buff marlstone bands alternating with fine dark oil-shale laminae; a 1-inch band of black oil shale as above at 412.9. Fine dark gray crystalline layer at base of oil-shale band (like 411.8 feet).
413.1	413.6	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2), dolomitic. Faintly laminated to very faintly bedded. An irregular 1-inch gray silty to crystalline tuff(?) at 413.4 (similar to 408.9-409.2 feet) and a very irregular thin stringer at base.
413.6	414.7	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2 and 3/1), calcareous. Very faint to moderately distinct laminae. Common very fine buff ostracodal streaks.
414.7	415.8	Oil shale (marlstone): Medium brownish gray (2.5Y 4/2-5/2, some 4/1 upper part), calcareous. Faintly laminated. Common very fine buff ostracodal streaks in upper part.
415.8	417.7	Oil shale (marlstone): Medium brownish gray to grayish brown and tan (2.5Y 5/2-5/3 and 6/3), calcareous. Faintly laminated. Abundant ostracods. A 1-inch gray silty crystalline band at 417.4; a fine chalky white layer with abundant fine gray crystalline blebs at 417.6. Sample of white layer with gray blebs from 417.6 feet: X-ray - analcite, quartz, feldspar, pyrite.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core sample of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
417.7	418.7	Oil shale (marlstone): Medium to dark brownish gray (2.5Y and 10YR 4/2-3/2, some 2/2 near base), calcareous to slightly calcareous. Faintly laminated to bedded. Some ostracods. A 1/2-inch chalky to silty, white to very light gray band with some fine medium gray blebs and streaks at 418.1; a fine dark gray pyritic crystalline lamina 1/4-inch above white band.
418.7	420.2	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2, some 2/2), calcareous to some dolomitic. Faint to some moderately distinct laminae. Some ostracods in upper part. A 1/4-inch tan to buff limestone lamina at top. A very fine gray crystalline layer at 419.9.
420.2	421.0	Oil shale (marlstone): Medium brownish gray (2.5Y 5/2-4/2), calcareous. Faintly laminated. Very abundant very fine tan to buff streaks in upper part. A very fine gray crystalline lamina at 520.6.
421.0	422.0	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y and 10YR 4/2, some 5/2 and 3/2), calcareous to dolomitic. Faintly laminated. Rare very fine buff streaks.
422.0	423.0	Oil shale (shaly marlstone): Very dark brownish gray (2.5Y and 10YR 2/2-3/2), slightly dolomitic. Very faintly bedded with some faint laminae. Rare fine medium brownish-gray silty streaks and laminae.
423.0	424.0	Oil shale (shaly marlstone): Dark to medium brownish gray (2.5Y 3/2-4/2), slightly dolomitic. Faint streaked bedding.
424.0	425.0	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y 4/2, some 5/2 upper part, some 3/2 lower part), dolomitic. Faint streaked bedding; some faint laminae in lower part. A thin zone of common fine distorted dark gray silty pyritic streaks and stringers at 424.3.
425.0	426.0	Oil shale (marlstone): Very dark brownish gray to some medium grayish brown (10YR and 2.5Y 2/2-3/2, some 4/2-4/3), dolomitic. Faint to some distinct laminae and bands; rare loop structures. A thin blade-like streak of vitreous black organic material on parting surface at 425.5. Sample of very dark to medium brownish-gray oil shale from 425.6 feet: X-ray - dolomite, quartz, feldspar, illite.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
426.0	427.7	Oil shale (marlstone): Dark brownish gray (10YR and 2.5Y 3/2-2/2), dolomitic. Very faintly bedded. Irregular thin crinkly parting at 426.9 to 427.1. A very thin irregular brown fine crystalline layer with some pyrite at 427.3. Very sharp conformable contact with marlstone below. Sample of brown fine-grained layer from 427.3 feet: X-ray - feldspar, quartz, pyrite, analcite, biotite, dolomite?
427.7	428.7	Marlstone: Very light buff to some tan and brown (10YR 8/2-7/2, some 6/3-5/3), slightly earthy to silty, calcareous. Faintly bedded to massive with some moderately distinct streaks, laminae, and bands. Sample of massive buff marlstone from 428.2 feet: X-ray - dolomite, quartz, feldspar, calcite, analcite, illite.
428.7	429.9	Marlstone, mudstone, and siltstone: Very light buff marlstone and mudstone (10YR and 2.5Y 8/2-7/2), some light gray siltstone in lower part (N 6); slightly calcareous. Massive to very faintly laminated and banded. Some distinct brownish-gray sandy streaks in middle part. Light gray siltstone streaks, laminae, and thin bands in lower part. Sample of light gray siltstone from 429.7 feet: X-ray - dolomite; some quartz, feldspar, illite.
429.9	430.5	Marlstone: Buff to tan (2.5Y 7/3-6/3, some 8/2 upper part), slightly calcareous to dolomitic. Faint streaked bedding; distorted near base. Some very light buff silty streaks in upper part.
430.5	431.2	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2), dolomitic. Faint streaked bedding. Some very fine dark gray silty blebs and streaks.
431.2	432.9	Oil shale (marlstone): Dark brownish gray, rare grayish brown to tan near base (2.5Y 3/2-2/2, rare 4/3-6/2); dolomitic. Faint streaked bedding; some distinct laminae near base. Rare fine medium brownish gray silty streaks. Sample of dark brownish-gray oil shale from 431.9 feet: X-ray - quartz, feldspar, analcite, dolomite, pyrite, illite.
		TOP OF BUFF MARKER
432.9	456.0	Mudstone, marlstone, and siltstone: Buff and gray buff to buff white (2.5Y 7/2 and 7/1-9/2), slightly calcareous to very calcareous. Moderately distinct to faint bands and laminae--some very irregular. Sample of buff mudstone from 434.2 feet: X-ray - dolomite, quartz, illite, feldspar, analcite, pyrite.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
456.0	480.0	Marlstone, mudstone, and rare siltstone: Buff to buff white (2.5Y and 5Y 7/2-9/2), very calcareous to dolomitic Faint bands, laminae, stringers, and streaks. Some marlstone bands have turned to light brownish gray and olive gray on split surfaces. Sample of buff marlstone from 460.2 feet: X-ray - dolomite, quartz, analcite, feldspar, illite.
480.0	490.5	Marlstone and rare mudstone: Buff white to very light buff and gray buff (5Y 9/2-8/2 and 8/1), dolomitic to slightly calcareous. Very faint thick banding to faint streaked bedding. Some fine to thin, light to dark gray silty pyritic streaks, laminae, and stringers.
490.5	492.4	Marlstone, mudstone, and siltstone: Buff to some buff white (2.5Y 7/2-8/2, some 9/2), slightly calcareous. Very faintly bedded marlstone with abundant patches, streaks, and stringers of mudstone and siltstone.
492.4	495.2	Marlstone, siltstone, and some fine sandstone: Buff marlstone (2.5Y 7/2-8/2) and gray-buff to buff-white siltstone and sandstone (2.5Y 7/1-9/1), slightly calcareous. Very faintly bedded marlstone with interbedded siltstone and sandstone laminae and some vermiform stringers. Orange-buff algal limestone in lower 0.4 foot with faint wavy to curly laminae in upper part and irregular lenticular nodules in lower part; very irregular contact with oil shale below. Marlstone altered to light brownish gray on split surfaces. Sample of fine-grained sandstone from 493.0 feet: X-ray - dolomite, quartz, feldspar, analcite, illite, pyrite.
		BOTTOM OF BUFF MARKER
495.2	496.6	Oil shale and algal limestone: Medium to dark brownish-gray calcareous oil shale (2.5Y 5/2-3/2, some 2/2) and buff to tan limestone (2.5Y 7/3-6/3). Irregularly bedded oil shale with fine distinct buff specks and streaks and some irregular limestone nodules and stringers in upper part; wavy bedded to brecciated limestone with rare oil-shale stringers in lower 0.5 foot.
496.6	498.0	Oil shale (marlstone): Dark brownish gray, to light reddish brown (10YR to 7.5YR 3/2-6/2, some 2/2 lower part), calcareous. Faint to very distinct laminae. Thin gray fine crystalline laminae at 497.2 and 497.4; fine vermiform stringers extend into shale below lower lamina. Sample of distinctly laminated light and dark oil shale from 497.3 feet: X-ray - quartz, calcite, analcite, dolomite, pyrite.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
498.0	498.8	Oil shale (marlstone): Dark brownish gray to black and rare light reddish brown (7.5YR 3/2-1/2, rare 6/2-7/2), some resinous luster, slightly calcareous. Faintly bedded with rare distinct laminae and streaks. Sample of very dark brownish-gray to black resinous oil shale from 498.7 feet: X-ray - calcite, some quartz, analcite, dolomite, pyrite, feldspar.
498.8	499.9	Oil shale (marlstone): Dark to medium brownish gray and some light reddish brown (7.5YR to 10YR 3/2-4/2, some 6/2, rare 2/2), calcareous. Faint to very distinct laminae; some slightly wavy laminae and rare loop structures. Rare fine gray and brownish-gray silty crystalline layers.
499.9	500.6	Oil shale (marlstone): Medium to dark brownish gray (10YR and 2.5Y 4/2-3/2), calcareous. Faintly laminated.
500.6	501.2	Oil shale (marlstone): Very dark brownish gray to rare black (10YR 2/2-3/2, rare 1/2) dolomitic. Very faintly bedded. Common very fine pyrite streaks in lower half. Sample of oil shale with very fine pyrite streaks from 501.0 feet: X-ray - dolomite, quartz, analcite, illite, feldspar.
501.2	502.4	Oil shale (marlstone): dark to some medium brownish gray (2.5Y 3/2, some 4/2 and 2/2), dolomitic. Very faint streaked bedding. Some very fine pyrite blebs.
502.4	502.9	Marlstone: Light olive gray (5Y to 7.5Y 6/2-7/2), some medium brownish-gray oil shale in upper inch (2.5Y 5/2-4/2), slightly calcareous. Very faint streaked bedding. Some fine distorted medium to dark brownish-gray, fine sandy to silty streaks in lower part. Sample of light olive-gray marlstone from 502.6 feet: X-ray - dolomite, quartz, illite, analcite, feldspar, ferroan.
502.9	503.5	Oil shale (mudstone): Very dark brownish gray to some black (10YR 2/2-3/2, some 1/2), some very slight satiny luster, slightly dolomitic. Faint streaked bedding. A very fine vermiform stringer of light olive-gray marlstone extends 1 inch into oil shale from above. A fine irregular brown dolomite streak near top. Sample of very dark slightly silty oil shale from 503.3 feet: X-ray - dolomite, quartz, illite, feldspar, pyrite, analcite, ferroan.
503.5	504.3	Oil shale (mudstone and marlstone): Medium to dark brownish gray and rare black (2.5Y 5/2-2/2, rare 1/2), slightly dolomitic. Faint to fairly distinct distorted streaks and stringers. Some fine to thin irregular medium to dark brown and rare tan dolomite streaks and lenses. Few very irregular small light to dark brownish-gray, silty to sparry crystalline nodules.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
		Sample of small crystalline nodule from 503.6 feet: X-ray - analcite, dolomite, biotite, magnesite, feldspar.
504.3	505.0	Oil shale (mudstone and marlstone): Very dark brownish gray to black (2.5Y 2/2-1/2), slightly dolomitic. Very faint very distorted to smooth bedding. A thin tortuously curved stringer of light brownish-gray claystone in upper 4 inches; indistinct jagged to finely shredded oil-shale boundaries are bleached to medium brownish gray up to 1/4 inch from stringer; a very fine vermiform stringer with irregular adjacent patches of bleached oil shale in lower 2 inches.
505.0	507.0	Oil shale (shale and mudstone): Very dark brownish gray to black (2.5Y 2/2-1/2), slightly dolomitic. Very faintly bedded. A very fine vermiform light brownish-gray stringer at 505.3-505.6. Some thin to fine irregular to vermiform, very dark brownish-gray to black silty crystalline streaks and stringers at 505.4 (cut by light brownish-gray stringer). Sample of thin black silty crystalline stringer from 505.4 feet: X-ray - analcite, pyrite, feldspar, quartz.
507.0	508.2	Oil shale (shale): Dark brownish gray (2.5Y 3/2 and 3/1-2/2), slightly dolomitic. Very faintly bedded with rare faint laminae.
508.2	508.8	Oil shale (shale): Dark brownish gray (2.5Y 3/2-3/1), noncalcareous. Very faintly bedded. Irregular thick to thin shaly parting. Sample of dark brownish-gray shale from 508.7 feet: X-ray - quartz, feldspar, illite, pyrite, dolomite, ferroan.
508.8	509.2	Oil shale (mudstone): Medium to light and rare dark brownish gray (2.5Y 5/2 and 5/1-6/2, rare 4/2-3/2), light olive-gray (5Y 6/2) barren marly mudstone in upper 0.1 foot; slightly calcareous. Faint and rare distinct distorted streaks and stringers. Some very thin to fine vermiform buff to light brownish-gray stringers.
509.2	510.9	Marly mudstone: Buff white (2.5Y 9/2), slightly calcareous. Very faintly bedded to massive with common fine irregular light gray streaks and stringers. Buff-white to tan weathered and bleached oil shale with faint distorted and broken laminae in lower 0.1 foot. Sample of marly mudstone from 509.4 feet: X-ray - dolomite, quartz, feldspar, illite, analcite.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
510.9	511.7	Oil shale (marlstone): Dark to medium brownish gray (2.5Y 3/2-4/2 and 4/1), dolomitic. Very faint smooth laminae. Bleached to tan and brown in upper 0.1 foot. A vermiform buff marlstone stringer (1-1/2 inches thick in upper part to fine in lower part) with irregular to finely shredded edges cuts through oil shale with very little distortion of laminae; adjacent shale is irregularly bleached to medium and light brownish gray in lower part. Sharp irregular contact between oil shale and marlstone at base. Sample of buff marlstone stringer from 511.1 feet: X-ray - dolomite, quartz, feldspar, ferroan.
511.7	512.6	Marlstone: Buff white to buff and some light brownish gray (2.5Y 9/2-7/2, some 6/2 lower part), slightly calcareous. Massive to very faint distorted to smooth bedding. Common fine short open high angle fractures with colorless drusy crystals from 511.9 to 512.1. Sharp smooth contact with oil shale below. Sample of smoothly bedded buff marlstone from 512.4 feet: X-ray - dolomite, quartz, analcite, feldspar, illite.
512.6	514.1	Oil shale (marlstone): Light to dark brownish gray (2.5Y 6/2 and 6/1-5/2 and 5/1), calcareous. Fairly distinct smooth to contorted laminae and streaks. Common very fine buff streaks. A very irregular vertical mass of brecciated oil shale with irregular fine fractures filled with milky white to smokey gray massive crystalline material extends from 513.4 to 513.9; contorted fingers of unfractured oil shale extend into breccia; few small breccia masses and discontinuous fractures in other parts. Sample of brecciated oil shale with white to light gray fracture fillings and some buff earthy material from 513.5 feet: X-ray - quartz; some analcite, calcite, dolomite, illite.
514.1	515.8	Oil shale (marlstone): Light to dark brownish gray and some grayish brown to tan (2.5Y and 10YR 6/2-3/2, some 6/1-3/1 upper part, some 5/3-6/3 lower part), calcareous. Moderately distinct to very distinct smooth laminae. Common fine buff streaks in upper part. A 2-inch nodular breccia mass with white fracture fillings at 515.2. A 1-1/2-inch band of dark brownish-gray fine sandy-textured tuff at top with fine short vermiform stringers extending into shale below; A 3/4-inch medium grayish-brown tuff band at 515.7 with vermiform stringers extending to base of interval.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
		Sample of dark brownish-gray fine-grained tuff from 514.1 feet: X-ray - analcite, quartz, dolomite, feldspar, pyrite.
515.8	517.0	Oil shale (marlstone): Dark and some medium brownish gray (2.5Y 3/2-2/2, some 4/2-5/2), slightly calcareous. Very faintly bedded dark oil shale with fairly abundant fine distinct lighter laminae. Few fine brownish-gray blebby to silty tuff laminae.
517.0	518.0	Oil shale (mudstone): Dark and some medium brownish gray (2.5Y 2/2-3/2, some 4/2, rare 5/2), dolomitic. Very faintly bedded with some faint and rare distinct lighter laminae. Few very fine brownish-gray silty tuff laminae and streaks--striated with very fine dark vertical streaks which have a common orientation from layer to layer. Sample of dark to medium brownish-gray (2.5Y 3/2-4/2) oil shale from 517.5 feet: X-ray - quartz, dolomite, analcite, illite, calcite, feldspar, pyrite.
518.0	519.2	Oil shale (marlstone): Very dark brownish gray to rare black (2.5Y 2/2, some 3/2, rare 1/2), some very slight satiny luster, dolomitic. Very faintly bedded with some very faint laminae. Rare very fine resinous black lenses. A very fine dark brownish-gray fine sandy-textured tuff layer at 518.1. Few very small resinous to vitreous black fossil(?) fragments on parting surfaces at 518.6.
519.2	520.4	Oil shale (marlstone): Dark to some medium brownish gray and rare black (2.5Y 3/2-2/2, some 4/2, rare 1/2), some very slight satiny luster, dolomitic to non-calcareous. Very faintly bedded with some faint laminae and bands. A fine vermiform tan stringer with some milky white crystalline material (like 513.5 feet) from 519.3 to 519.5; appears to be an irregular high angle fracture which was filled with tan dolomite(?) and white crystalline material and then deformed by compaction of still-plastic oil shale. Sample of very dark oil shale from 520.3 feet: X-ray - quartz, analcite, dolomite, feldspar, illite, pyrite.
520.4	521.2	Oil shale (marlstone): Dark to medium brownish gray (2.5Y 2/2-4/2, some 5/2 near top), dolomitic. Very faintly bedded to faintly laminated and banded; distinct lighter laminae and streaks in upper 0.1 foot. Some very fine grayish-brown crystalline streaks at 520.6. A very small milky white massive crystalline bleb at 520.9.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
521.2	522.2	Oil shale (marlstone): Dark to medium brownish gray and rare black (2.5Y and 10YR 2/2-5/2, rare 1/2 middle part), dolomitic. Faint smooth to distorted laminae and streaked bedding. Some thin to fine, irregular to vermiform dark brownish-gray fine sandy-textured stringers near top. Some thin irregular dark grayish-brown dense dolomite(?) stringers in middle. A thick irregular vertical mass of fractured to finely brecciated oil shale with some crystalline fillings extends through oil shale with smoothly curved wavy laminae in lower 0.3 foot.
522.2	523.0	Oil shale (shaly marlstone): Dark to medium brownish gray (2.5Y 2/2-4/2), slightly calcareous. Faintly laminated. A 1-inch band of faintly bedded tan dolomitic marlstone at 522.3. A fine medium to dark gray silty-textured tuff(?) layer at 522.6.
523.0	524.1	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2), slightly calcareous. Moderately distinct to faint laminae. A 1-inch band of brownish-gray to brown, fine to medium-grained analcite at 523.5. Some very fine gray to buff crystalline layers near base.
524.1	525.5	Oil shale (marlstone): Light to dark brownish gray, rare buff and medium grayish brown (2.5Y and 10YR 6/2-3/2, rare 7/2 and 5/3), slightly calcareous to calcareous.Very distinct to some faint laminae. A 1/4-inch gray fine sandy-textured analcite layer at 524.3. Rare fine dense dark brownish-gray layers in lower part. Sample of gray analcite layer from 524.3 feet: X-ray - analcite; some quartz, feldspar, pyrite.
525.5	527.0	Oil shale (marlstone): Dark and rare medium brownish gray to some black (10YR 3/2-2/2, some 1/2, rare 4/2-5/2), dolomitic. Faintly laminated to very faintly bedded. Very rare fine brown silty crystalline streaks. Rare fine silty-textured pyrite streaks in lower part.
527.0	528.7	Oil shale and marlstone: Buff to dark brownish gray and some black (2.5Y 7/2-2/2, some 1/2), tan to grayish brown in upper 0.4 foot (10YR 6/3-4/3); dolomitic to noncalcareous. Medium to dark oil shale with moderately distinct irregular laminae to very faint bedding; very faintly bedded to massive 1/2- to 2-inch irregular bands of buff to light brownish-gray and tan marlstone. Sample of buff marlstone from 527.7 feet: X-ray - dolomite, quartz, illite, feldspar, analcite.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
528.7	529.5	Oil shale (marlstone): Light to medium and some dark brownish gray (2.5Y 6/2-4/2, some 3/2-2/2), dolomitic. Distinctly laminated in upper part to faintly bedded at base. Few fine dark brownish-gray silty crystalline lenses at 529.0.
529.5	530.6	Oil shale (marlstone): Dark to some medium brownish gray, and black (10YR 3/2-2/2 and some 1/2 upper part to 2.5Y 3/2-2/2, some 4/2 lower part), some very slight satiny luster upper part, dolomitic. Faintly bedded with some faint banding. A very fine discontinuous dark brownish-gray very fine-grained layer at 530.1.
530.6	531.7	Oil shale (shaly marlstone): Dark brownish gray (2.5Y 3/2-2/2), slightly dolomitic. Very faintly bedded. A 1-inch dense grayish-brown dolomite(?) band 530.8.
531.7	532.9	Oil shale (shaly marlstone): Medium to dark brownish gray (2.5Y 4/2-3/2, some 2/2), slightly dolomitic. Faint streaked bedding with some faint banding. A 0.1-foot dark brownish-gray silty crystalline stringer at 531.9.
532.9	533.7	Dolomite and some oil shale: Brownish-gray to brown and some tan dolomite (2.5Y and 10YR 5/2-5/4, some 6/3) and some dark brownish-gray oil shale (2.5Y 3/2-3/1). Irregularly banded dense dolomite with some interbedded oil shale. Thin oolitic zone at 533.4. Silty to very fine crystalline dolomite(?) in lower 0.1 foot. Sample of brown oolitic dolomite from 533.4 feet: X-ray - dolomite; some quartz, analcite, feldspar. Sample of grayish-brown silty to very fine crystalline dolomite(?) from 533.7 feet: X-ray - analcite, feldspar, quartz.
533.7	534.2	Oil shale (marlstone): Medium to some dark brownish gray and rare black (2.5Y 4/2, some 3/2, very thin zone of 2/2-1/2 at top), slightly calcareous. Faintly bedded to laminated.
534.2	536.0	Oil shale (marlstone): Medium to light and rare dark brownish gray (2.5Y 4/2 and 4/1 to 6/2 and 6/1, rare 3/2-3/1), calcareous. Fairly distinct laminae. Very rare fine gray to buff crystalline laminae. Common very fine buff streaks and lenses in lower part. Sample of light to dark brownish-gray laminated oil shale from 534.7 feet: X-ray - quartz, calcite, dolomite, analcite, feldspar.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
536.0	537.0	Oil shale (marlstone): Light to dark brownish gray (2.5Y 6/2-3/2), calcareous. Faint to distinct laminae. Common very fine buff streaks and lenses. A fine very dark gray silty-textured lamina at 536.3 with bright yellow stains on outside of core. Sample of fine dark gray lamina from 536.3 feet: X-ray - analcite, pyrite, quartz, feldspar.
537.0	538.0	Oil shale (marlstone): Light to dark brownish gray (10YR and 2.5Y 6/2-3/2), calcareous. Distinct to some faint laminae. A fine dense dark brownish-gray dolomite(?) lamina at 537.8.
538.0	539.0	Oil shale (marlstone): Medium to dark and rare light brownish gray (2.5Y 5/2-3/2, rare 6/2-6/1), calcareous. Moderately distinct to faint laminae. Rare fine light brownish-gray to medium gray silty laminae.
539.0	540.0	Oil shale (marlstone): Dark and some medium brownish gray (2.5Y 3/2, some 2/2 and 4/2-5/1), calcareous. Faint to some moderately distinct laminae. A fine grayish-brown granular analcite(?) layer at 539.3.
540.0	541.0	Oil shale (marlstone): Dark to some light brownish gray (2.5Y 3/2-5/1, some 2/2 and 6/1), calcareous. Faint to distinct laminae. Rare very fine analcite(?) layers and streaks. A small fossil fish on parting surfaces at 540.1. Smoothly bedded buff to tan slightly earthy limestone interlaminated with dark oil shale in lower 0.2 foot.
541.0	542.6	Oil shale (marlstone): Light to dark brownish gray (2.5Y 6/2-3/2, rare 2/2), calcareous. Distinctly laminated. A fine dark gray silty lamina at top(like 536.3 feet). A 1/4-inch silty to blebby gray analcite(?) layer at 541.8. Some tan to buff limestone laminae near top. Sample of very thin gray silty to blebby layer from 541.8 feet: X-ray - analcite, quartz, feldspar, calcite, pyrite.
542.6	543.6	Oil shale (marlstone): Light to medium brownish gray (2.5Y 6/2-4/2), calcareous. Faint to some moderately distinct laminae; a thin crosslaminated zone at 543.3. Dull dark brownish-gray to black material on some parting surfaces.
543.6	544.6	Oil shale (marlstone): Medium to dark and rare light brownish gray (2.5Y and 10YR 5/2-4/2, rare 6/2), calcareous to slightly calcareous. Moderately distinct to very faint laminae. Very smooth thick to thin shaly parting in lower part. A fine gray silty-textured lamina at 544.2.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
		Sample of dark brownish-gray oil shale from 544.4 feet: X-ray - dolomite, quartz, analcite, calcite, illite, feldspar, pyrite.
544.6	550.0	Mudstone and marlstone: Light brownish gray and olive gray to very light buff (2.5Y and 5Y 6/2-8/2), calcareous. Very faintly bedded with some faint irregular streaks, stringers, and bands. Samples of very light buff mudstone from 547.7 feet: X-ray - dolomite, quartz, feldspar, calcite, illite, ferroan.
550.0	552.0	Marlstone and some mudstone: Very light buff (5Y 8/2, rare 7/2), calcareous. Very faintly bedded. A 0.1-foot wavy laminated band of dense buff to brownish-gray dolomite with some fine porous layers at 551.5. Sample of buff marlstone from 550.4 feet: X-ray - dolomite, quartz, feldspar, calcite, illite, pyrite.
552.0	552.9	Mudstone and marlstone: Brownish gray to buff (2.5Y 5/1-7/2), calcareous. Faint distorted streaked bedding to massive. A very irregular 0.1-foot stringer of very light buff algal(?) dolomite at 552.2; few short irregular open fractures at top. A very irregular 0.1-foot dark brownish-gray to medium gray fine slightly sparry crystalline stringer at 552.5; some white to yellow efflorescence in lower part. Irregular interfingering contact with oil shale at base. Sample of dark brownish-gray crystalline stringer from 552.5 feet: X-ray - analcite, calcite, pyrite, feldspar. Sample of light brownish-gray massive mudstone from 552.8 feet: X-ray - analcite, calcite, dolomite, quartz, feldspar, illite.
552.9	554.0	Oil shale (marlstone): Light to medium and some dark brownish gray (10YR and 2.5Y 6/2-4/2, some 3/2-3/1), calcareous. Moderately distinct to faint laminae. Some very fine buff streaks. A 1-inch nodule of light brownish-gray mudstone at 553.1 with some fine dark brownish-gray pyritic crystalline rims. A 1-1/2-inch faintly bedded buff to tan slightly earthy and porous dolomite band at base.
554.0	555.2	Oil shale (marlstone): Medium olive gray to dark bluish gray green (10Y 5/1 to 5G 2/1; darker parts are almost neutral gray), calcareous. Faintly laminated. Some fine vermiform dark to medium brownish-gray crystalline stringers in upper part; a fine dark brownish-gray crystalline layer at 555.1. Few very fine buff streaks.

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From	To	Description
		Sample of dark, slightly greenish, gray oil shale with rare very fine buff streaks from 554.7 feet: X-ray - calcite, quartz, dolomite, analcite, feldspar.
555.2	556.7	Oil shale (marlstone): Light to medium and some dark brownish gray (2.5Y 6/2-4/2, some 3/2), calcareous. Faint to distinct laminae--slightly curved in upper 0.3 foot. Rare very fine buff streaks in upper part. A fine dark gray crystalline lamina with some pyrite at 555.8.
556.7	557.7	Oil shale (marlstone): Light to medium brownish gray and rare buff (2.5Y 6/2 and 6/1-4/2 and 4/1, rare 7/2), calcareous. Moderately distinct to faint laminae. A 3/4-inch light brownish-gray (almost neutral) to medium gray fine-crystalline band at 556.9; slightly sparry at base. A very small grayish-brown earthy nodule at 557.0; laminae smoothly curved over and under nodule. Sample of light brownish-gray crystalline band from 556.9 feet: X-ray - dolomite, analcite, calcite, quartz, feldspar.
557.7	558.5	Oil shale (marlstone): Medium to dark and rare light brownish gray (10YR and 2.5Y 4/2-3/2, some 5/2, rare 6/2, mostly 2.5Y 3/2-3/1 in lower half), calcareous in upper part to dolomitic at base. Faint and rare distinct laminae in upper part to very faint streaked bedding at base. Some very fine buff streaks. A 1-inch band of brownish-gray to colorless, fine to coarse crystalline analcite at 558.3; some dark brown tarry impregnation. Sharp wavy contact with marlstone below.
558.5	558.9	Marlstone and mudstone: Buff to brownish gray (2.5Y 7/2-5/2), dolomitic to slightly calcareous. Faintly bedded with some faint banding. A 1-inch gray to light brownish-gray, silty to fine crystalline analcite stringer at base.
558.9	559.2	Mudstone: Light to medium brownish gray and olive gray (2.5Y and 5Y 6/2-5/2, some 4/1). Faintly variegated. Riddled with very fine fractures with dark gray fillings. Some slight yellowish-green stains on outside of core. Irregular wavy broken contact with algal bed below. Sample of fractured mudstone from 559.1 feet: X-ray - analcite, feldspar, pyrite, quartz.
559.2	559.5	Algal limestone: Buff to light brownish gray, some medium brown near top (2.5Y 8/2-6/2, some 5/4). Thin wavy broken laminated zone at top; mosaic breccia in lower part.

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From	To	Description
559.5	560.5	Oil shale (marlstone and mudstone): Medium to some light and rare dark brownish gray (2.5Y 5/2-4/2, some 6/2, rare 3/2), calcareous. Faintly bedded with some faint laminae. Abundant very fine buff blebs in lighter zones. Fairly common thin stringers and small inclusions of buff dolomitic limestone.
560.5	561.5	Oil shale (marlstone): Medium to some light brownish gray (2.5Y 5/2-4/2, some 6/2) and medium to dark slightly greenish gray (5Y 5/1-3/1), calcareous. Very faint to some moderately distinct laminae; a 1-inch very faintly bedded light brownish-gray band at 561.2. A very thin brownish-gray crystalline laminae at 561.3; rare very fine gray-buff crystalline streaks and laminae below. A very small brownish-black lens in light brownish-gray band at 561.2.
561.5	562.9	Oil shale (marlstone): Light to dark brownish gray (2.5Y 6/2-3/2), calcareous. Fairly distinct laminae. Fine gray to brownish-gray silty crystalline layers at 562.5 and 562.6. A 3/4-inch gray silty band at base. Sample of gray silty band from 562.9 feet: X-ray - feldspar, analcite, pyrite, quartz.
562.9	564.4	Oil shale (marlstone): Medium to some light and rare dark brownish gray (2.5Y 5/2-4/2, some 6/2, rare 3/2 lower part), calcareous. Moderately distinct to very faint laminae. Rare fine gray-buff to gray crystalline laminae; some pyrite in darker laminae. Sample of faintly laminated brownish-gray oil shale from 563.6 feet: X-ray - calcite, quartz, analcite, illite, pyrite, dolomite, feldspar.
564.4	565.4	Oil shale (shaly marlstone): Dark and some medium brownish gray (2.5Y 3/2-2/2, some 4/2 upper part), slightly calcareous to noncalcareous. Faint laminae to very faint streaked bedding. Sharp very wavy contact with marlstone below. Sample of faintly bedded dark brownish-gray oil shale from 564.9 feet: X-ray - quartz, analcite, dolomite, illite, pyrite, feldspar, pyrite, calcite.
565.4	566.8	Marlstone: Buff to some light brownish gray (2.5Y 8/2-7/2, some 6/2), slightly calcareous. Very faint distorted bedding. Very light buff slightly earthy marlstone in upper 0.1 foot (partly brecciated) with a 1-inch zone of dense brownish-gray fractured dolomite below. Mosaic breccia near base.

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From	To	Description
566.8	567.4	Mudstone: White to light gray (N 9-6), earthy to chalky. Riddled with very fine fractures with light to dark gray fillings. A very irregular wavy tan dolomitic limestone stringer near base. Very irregular wavy contacts at top and bottom. Slight greenish stain on outside of core. Sample of white earthy to chalky fractured mudstone from 567.1 feet: X-ray - analcite, feldspar, pyrite, ferroan.
567.4	570.8	Oil shale (marlstone): Light to dark brownish gray (2.5Y 6/2-3/2, some 5/1-4/1 middle part), calcareous. Moderately distinct to faint laminae. Fine light to medium gray crystalline layers at 567.8 and 568.5. A very thin dark gray silty crystalline lamina at 568.9. Common very fine buff streaks in lower 0.4 foot.
570.8	572.0	Oil shale(marlstone): Dark and rare medium brownish gray (2.5Y 3/2 and 3/1-2/2, rare 4/2), dolomitic. Faintly laminated. Rare fine light brownish-gray to gray-buff crystalline laminae.
572.0	572.4	Oil shale (marlstone): Medium and rare dark brownish gray (2.5Y 5/2-4/2, rare 2/2), dolomitic. Faint smooth to distorted streaked bedding. Few very thin to fine crystalline stringers.
572.4	573.1	Limestone: Buff to medium brownish gray (2.5Y 7/2-5/2). Very faintly bedded to massive. A very irregular tight fracture extends through interval; some very fine calcite fillings in upper part. Sample of buff limestone from 572.5 feet: X-ray - dolomite; some quartz, analcite, feldspar.
573.1	574.2	Oil shale (marlstone): Medium to light and rare dark brownish gray (2.5Y 4/2-6/2, rare 3/2), calcareous. Faint to moderately distinct laminae displaced by irregular tight vertical fractures; distorted streaks and stringers at 573.2-573.5 and 573.9-574.1; slight unconformity at base. Some buff limestone streaks, inclusions, and stringers in distorted zones.
574.2	574.9	Oil shale (marlstone): Medium to dark and rare light brownish gray (2.5Y 5/2 and 5/1-3/2, rare 6/1 upper part). Faint and some moderately distinct smooth laminae. Rare very fine crystalline laminae. Common very fine buff streaks near base.
574.9	575.2	Limestone: Buff (10YR 8/2-7/2), earthy. Pisolitic in upper part to oolitic in middle; very faintly bedded in lower inch. Slightly wavy contact at top; smooth contact at base. Sample of buff earthy pisolitic limestone from 574.9 feet: X-ray - dolomite, some quartz, trace analcite.

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Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
575.2	576.4	Oil shale (marlstone): Medium to some dark olive gray and brownish gray (5Y and 2.5Y 5/1-4/2, some 3/1), calcareous. Faint to moderately distinct laminae. Rare very small brown slightly earthy nodules. Two very thin fine grained gray analcite laminae near top and a very fine layer at 576.3. Sample of gray analcite from 575.3 feet: X-ray - analcite; trace feldspar, quartz.
576.4	577.5	Oil shale (marlstone): Medium to light and rare dark brownish gray (2.5Y 4/2-6/2, rare 3/2), calcareous. Moderately distinct laminae; slightly displaced by an irregular tight fracture at 577.1-577.2. A 1-inch bitumen-impregnated band of gray fine grained analcite at 576.6.
577.5	579.0	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/1-3/1, some 2/2 near base), calcareous. Moderately distinct to faint laminae. Fish fragments at 577.8. Fine light gray crystalline lamina at 578.5. A very irregular thick stringer (crevice filling?) of medium to light brownish-gray oil-shale breccia in dark oil shale in lower 0.2 foot.
579.0	579.5	Oil shale (marlstone): Very dark brownish gray to black (2.5Y 2/2-1/2), dolomitic. Very faintly bedded with some distinct laminae and abundant very fine brown to buff calcareous streaks. Rare fine gray crystalline laminae and streaks. Sample of very dark oil shale from 579.3 feet: X-ray - quartz, calcite, analcite, feldspar, pyrite, dolomite, illite.
579.5	579.9	Marlstone: Buff and rare light to medium brownish gray (10YR and 2.5Y 8/2-7/2, rare 6/2-5/2), calcareous. Faint slightly curved laminae; 3/4-inch reverse displacement along a tight curved diagonal fracture. A fine dark oil-shale lamina at 579.8.
579.9	581.0	Oil shale (marlstone): Light to medium and very rare dark brownish gray (2.5Y 6/2-4/2, rare 3/2), buff to light and some medium brownish gray at 580.3-580.5 (2.5Y 7/2-6/2, some 5/2); calcareous. Faint to fairly distinct laminae. A fine vermiform buff marlstone stringer in upper 0.2 foot.
581.0	582.0	Oil shale (marlstone): Medium to some light and rare dark brownish gray (2.5Y 5/2-4/2, some 6/2 upper part, rare 3/2), calcareous. Faint to moderately distinct laminae. Sample of medium to dark brownish-gray laminated oil shale from 581.6 feet: X-ray - calcite, quartz, analcite, illite, pyrite, feldspar, dolomite.

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From	To	Description
582.0	584.0	Oil shale (marlstone): Medium to rare light and dark brownish gray (2.5Y 5/2-4/2, rare 6/2 and 3/2), calcareous. Faint to moderately distinct laminae.
584.0	586.3	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 5/2-3/2, rare 2/2 lower part; very slight olive tint), calcareous. Faint to moderately distinct laminae. A 1/2-inch light to medium gray calcareous very fine-grained to blebby crystalline band at 584.4. A 1-inch buff to brownish-gray laminated zone at 585.5. A very thin gray crystalline lamina at 585.9.
586.3	587.1	Oil shale (marlstone): Very dark brownish gray to black (2.5Y 2/2-1/2, some 3/2 and very rare 4/3 in upper 0.1 foot), dolomitic. Very faintly bedded; some faint laminae in upper part. Rare fine dark to medium brownish-gray silty crystalline streaks and laminae in lower part. Dark almost neutral gray (2.5Y 3/1) slightly silty oil shale in lower inch. Slightly wavy contact with limestone below. Sample of very dark brownish-gray to black oil shale from 586.5 feet: X-ray - quartz, calcite, analcite, illite, pyrite, feldspar. Sample of dark gray slightly silty oil shale from 587.1 feet: X-ray - quartz, analcite, feldspar, illite, pyrite, calcite.
587.1	587.7	Limestone: Buff to tan (10YR and 2.5Y 7/2-6/3). Distinctly to faintly laminated with very fine layers of dark to medium gray and brownish-gray oil shale. A fine analcite layer between irregular limestone and oil-shale laminae near top.
587.7	588.0	Tuff: Light to medium gray (N 6.5-5.5), calcareous. Massive; silty in upper part to blebby crystalline in lower part. Rare very fine pyrite--mostly in lower part. Smooth contacts at top and bottom. Sample of tuff from 587.9 feet: X-ray - analcite, quartz, calcite, pyrite.
588.0	589.2	Oil shale (marlstone): Buff to medium and rare dark brownish gray (2.5Y 7/2-4/2, rare 3/2 near top), calcareous. Distinct to faint laminae. Rare very fine medium to light gray crystalline layers.
589.2	591.2	Oil shale (marlstone): Medium to some dark and rare light brownish gray (2.5Y 5/2-4/2, some 3/2, rare 6/2), calcareous. Moderately distinct to faint laminae. Some very thin to very fine, medium to light gray crystalline layers. Very rare fine tan earthy lenses in lower part. A thin crosslaminated zone near base.

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From	To	Description
591.2	592.2	Oil shale (marlstone): Medium brownish gray (2.5Y 4/2 and 4/1-5/2 and 5/1; common slight olive tint), calcareous Faintly laminated.
592.2	593.0	Oil shale (marlstone): Medium to dark brownish gray (2.5Y 4/2-3/2, some 2/2 lower part), calcareous to dolomitic. Faint laminae in upper part accentuated by very abundant very fine light brownish-gray to buff ostracodal streaks commonly concentrated in fine zones; very faintly bedded to laminated in lower 0.3 foot. A fine tan to buff crystalline layer at 592.6. Smooth contact with limestone below. Sample of dark oil shale with very abundant light ostracodal streaks from 592.5 feet: X-ray - calcite, dolomite, quartz, analcite, feldspar, pyrite, illite.
593.0	593.2	Limestone: Buff to light brownish gray and some tan (10YR and 2.5Y 8/2-6/1, some 6/3). Porous and slightly earthy with small dense angular limestone inclusions in upper part; dense very fine blebby textured dolomitic limestone with small irregular spongy tan masses in lower part. Sharp slightly wavy contact with mudstone below.
593.2	596.6	Mudstone: Light and rare medium gray (N 7-6, rare 5; some very slight brown tint), very slightly calcareous. Very faint smooth bedding and rare laminae in upper part; very faint distorted bedding with rare broken laminae in lower part. Common very fine colorless mica flakes. Sample of gray mudstone from 593.3 feet: X-ray - quartz, feldspar, illite, pyrite.
596.6	596.9	Mudstone: Light greenish gray (5GY 8/1-6/1), slightly dolomitic. Massive with very faint fine mottling. Sample of mudstone from 596.7 feet: X-ray - quartz, feldspar, illite, analcite, pyrite, dolomite.
596.9	597.6	Limestone: Buff (10YR and 2.5Y 8/2-7/2). Very faintly bedded. Slightly earthy to silty textured in upper part; medium to fine sandy textured in lower part (possible oolites). Sample of medium-grained limestone from 597.5 feet: X-ray - dolomite; some calcite, quartz, feldspar.
597.6	598.1	Mudstone (like 596.6-596.9) grading downward to light brownish-gray fine-grained limestone.
598.1	598.4	Marlstone (oil shale?): Light to medium brownish gray (2.5Y 6/2-5/2 and 5/1), calcareous. Very faint laminae and streaked bedding. Sample of light to medium brownish-gray marlstone from 598.3 feet: X-ray - dolomite, calcite, quartz, illite, feldspar, pyrite.

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From	To	Description
598.4	599.8	Limestone: Light brownish gray in upper 2 inches (2.5Y 6/1), buff in other parts (10YR and 2.5Y 8/2-7/2). Massive to very faint distorted bedding in upper part; limestone conglomerate in middle grading to limestone with very abundant thin to fine, angular to shredded inclusions of light to medium brownish-gray laminated oil shale.
599.8	600.8	Limestone and oil shale: A very irregular thick stringer of buff limestone as above with abundant oil-shale shreds in medium to rare dark brownish-gray (2.5Y 5/2-4/2, rare 3/2) oil shale with faint smooth to distorted laminae. Hackly to shredded boundary between oil shale and limestone.
600.8	601.4	Limestone: Buff (10YR 8/2, some 7/2). Massive; silty to very fine oolitic texture. Some very fine crystals in upper part. A 1-inch band of light to medium gray mudstone in middle. Sample of limestone with some very fine crystals from 600.9 feet: X-ray - dolomite, some calcite.
601.4	607.0	Mudstone, siltstone, and sandstone: Light to medium gray (N 7-5), slightly calcareous and rarely very calcareous. Faintly bedded with some irregular streaks, laminae, and bands. A 3/4-inch stringer of buff to light brownish-gray conglomeratic limestone at 601.8.
607.0	610.9	Sandstone: Light gray to gray buff (N 7 to 2.5Y 7/1), very fine grained, micaceous. Faintly crossbedded.
610.9	620.9	Sandstone: Gray buff to medium brownish gray (2.5Y 7/1-5/1, almost neutral), fine to medium grained, micaceous, slightly friable in lower part. Very faintly bedded to massive. Black coaly streaks at 620.2-620.3.
620.9	623.8	Mudstone: Light to medium gray (N 6-4; some slight brown tint), light to medium olive gray in lower 0.4 foot (5Y 7/1-5/2). Faintly bedded to laminated and banded. Common thin to 1-inch light brownish-gray fine-grained micaceous sandstone bands in upper foot; some fine sandy streaks and laminae in middle part. Medium to dark brownish-gray faintly laminated oil shale at 623.3-623.4; fine coaly layer at base.
623.8	624.8	Limestone: Buff and some light brownish gray (10YR and 2.5Y 7/2, some 6/2), oolitic in lower part. Very faint distorted to smooth bedding. A fine dark brownish-gray oil-shale lamina 1/2 inch above base.
624.8	627.0	Mudstone and marlstone: Medium to light olive gray (5Y 5/2 and 5/1-6/1; almost neutral in lower part), non-calcareous in upper part to calcareous in lower part.

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Washakie Basin No. 1 corehole (con.)

From	To	Description
		Faintly mottled to massive. Medium to dark brownish-gray oil shale with common coal streaks in upper 2 inches. Sample of massive almost neutral-gray marlstone from 626.4 feet: X-ray - calcite, quartz, illite, pyrite, dolomite, feldspar.
627.0	628.0	Marlstone: Light to medium olive gray (5Y 6/2-5/2, rare 4/2) and neutral gray (N 6-5), calcareous. Faintly laminated olive-gray marlstone with some gray marlstone streaks patches, and nodules in upper half; massive gray marlstone with some fine olive-gray shreds and one thick laminated stringer in lower part. Common very fine gray-buff to buff, silty to earthy streaks and blebs in upper part.
628.0	629.3	Marlstone (oil shale in part): Buff to medium and rare dark brownish gray (2.5Y 7/2-5/2, some 4/2 and rare 3/2 lower part), calcareous. Faint to distinct, smooth to distorted laminae. Very thin shaly parting in upper part. Grayish-brown to light brownish-gray faintly laminated to massive limestone in upper 0.2 foot; common very fine dark blebs in lower part. A 1/2-inch gray sparry limestone band at 628.4. A 1-inch light brownish gray oolitic band at 628.9 with some thin oolitic stringers and small algal blebs below. Half-inch coaly layers at 629.1 and 629.3. Very rare black bone(?) fragments.
629.3	631.1	Marlstone: Light to medium brownish gray and gray (2.5Y 6/1-5/1 and N 6-5), slightly silty near top, calcareous. Faintly mottled and streaked in upper part; very faintly laminated in lower part. Very rare fishbones(?) in lower part.
631.1	632.2	Marlstone(oil shale?): Light to medium brownish gray (2.5Y 6/2-5/2), calcareous. Faint laminae and streaked bedding. A very fine calcite-filled fracture in upper inch. Very common very irregular fine to thick gray silty stringers (fracture fillings) in lower 0.6 foot.
632.2	633.9	Oil shale (marlstone): Medium olive gray in upper part (5Y 5/1-4/1) to brownish gray in lower part (10YR 5/2-4/2), calcareous. Faint to moderately distinct laminae; common very fine distinct tan to buff laminae and streaks in lower part. A 3/4-inch light to medium gray silty crystalline band at 633.2; rare fine medium to dark gray laminae in other parts. Rare very small tan earthy lenses. Sample of brownish-gray oil shale with very fine buff laminae from 633.4 feet: X-ray - quartz, aragonite, calcite, illite, analcite, pyrite, dolomite.

Illustration No. SBR-4181P (Sheet 42 of 90)

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
633.9	636.1	Oil shale (marlstone): Medium to light brownish gray (2.5Y 5/2 and 5/1-6/2 and 6/1, some 4/2 lower part), calcareous. Faint to moderately distinct laminae; common very fine buff laminae in upper 0.6 foot. A fine gray silty crystalline lamina near top. A very fine slightly prismatic calcite layer at 634.1. Few very thin gray mudstone laminae at 634.7-635.0. Some very thin shaly parting in upper part. Slightly wavy contact with limestone below.
636.1	636.8	Limestone: Buff to some tan (10YR and 2.5Y 8/2-7/2 and 7/3, some 6/3). Very faintly bedded with some very fine faint laminae; few fine distinct medium to dark brownish-gray oil-shale laminae. Very fine oolitic texture in upper 0.2 foot; sparry at 636.4-636.5; silty to earthy in other parts. Fine dark gray to black layers at 636.4 and 636.5. Sample of fine black layer with some buff limestone from 636.5 feet: X-ray - analcite; some quartz, dolomite, pyrite, calcite.
636.8	637.8	Marlstone and mudstone (oil shale in part): Medium to light brownish gray, some buff in upper part (2.5Y 4/2-6/2 and some 7/2 upper part, 5/1-6/1 lower part), calcareous. Moderately distinct laminae in upper part to very faint streaked bedding in lower part. A very fine dark gray silty layer with yellowish-green stains at 637.0.
637.8	638.8	Marlstone (oil shale?): Light to medium olive gray (5Y 6/1-5/1; almost neutral), calcareous. Very faintly laminated. Shaly to papery parting. Common very fine buff earthy streaks.
638.8	640.0	Oil shale (marlstone): Medium to light olive gray (5Y 4/1-6/1), calcareous. Moderately distinct to very faint laminae. Rare very small tan earthy nodules. A very fine gray silty crystalline layer at 639.6.
640.0	642.0	Oil shale (marlstone): Medium olive gray in upper part (5Y 5/1-4/1) to brownish gray in lower part (2.5Y 5/2-4/2), calcareous. Faintly laminated; very common very fine distinct buff laminae and streaks. Some papery parting. Fine gray silty laminae at 640.5 and 641.8.
642.0	643.0	Oil shale (marlstone): Medium to light brownish gray (2.5Y 5/2-6/2), calcareous. Faintly laminated. Thick to thin shaly parting. A fine silky calcite lamina near top.
643.0	644.1	Oil shale (marlstone): Medium to light brownish gray (2.5Y 5/2-6/2, some 4/2 lower part), calcareous. Faintly laminated. Papery parting in lower part. Faintly laminated barren buff marlstone at 643.7-643.9.

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Laramie Petroleum Research Center, Laramie, Wyoming April 8, 1969

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines
Washakie Basin No. 1 corehole (con.)

From	To	Description
644.1	645.1	Limestone: Buff (2.5Y 8/2-7/2). Wavy algal structure in upper 0.2 foot; sparry with some oolitic streaks at 644.3-644.4; faintly laminated with rare distinct dark oil-shale laminae in lower part.
645.1	646.1	Oil shale (marlstone): Medium to some light olive gray and brownish gray (5Y and 2.5Y 5/2, some 6/2, rare 4/2), calcareous. Faintly laminated; distorted in lower 0.1 foot. Fine prismatic calcite lamina at 645.4. Common very fine buff laminae and streaks in lower part.
646.1	647.1	Oil shale (marlstone): Medium brownish gray (2.5Y 5/2-4/2), calcareous. Faintly laminated with very common very fine distinct buff earthy laminae and streaks. Flat laminae lying unconformably on thin truncated fold at 646.2.
647.1	649.1	Oil shale (marlstone): As above with very common very fine buff earthy laminae. Very thin shaly to papery parting. A fine gray silty to earthy layer with prismatic calcite seams at top and bottom at 647.6. Sharp smooth contact with sandstone below. Sample of papery shale with very common buff earthy laminae from 648.7 feet: X-ray - aragonite, quartz, analcite, illite, calcite.
649.1	649.6	Sandstone and mudstone: Medium to light olive gray and brownish gray (5Y and 2.5Y 5/1-6/1, almost neutral), slightly calcareous. Massive fine grained sandstone band in upper 2 inches; mudstone with fine sandy streaks in other parts.
649.6	649.9	Dolomite: Light brownish gray (2.5Y 6/2). Dense dolomite with common fine calcareous sandy to porous and earthy streaks. Sample of dense dolomite from 649.9 feet: X-ray - dolomite; trace quartz, analcite.
		TOP CATHEDRAL BLUFFS TONGUE OF WASATCH FORMATION
649.9	651.5	Sandstone and mudstone: Light to medium olive gray (7.5Y 6/1 and 6/2-5/1 and 5/2), slightly calcareous. Very faint irregular bedding. Massive light brownish-gray (almost neutral) dolomite at 651.0-651.4.
651.5	653.5	Mudstone: Medium gray green (5GY 5/1 and 5/2-4/1 and 4/2). Faintly mottled with sandy patches and streaks. Sample of gray-green mudstone from 652.9 feet: X-ray illite, quartz, analcite, feldspar, siderite?

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples of the Green River Formation from Bureau of Mines Washakie Basin No. 1 corehole (con.)

From	To	Description
653.5	655.5	Sandstone and mudstone: Light olive gray to medium gray green (7.5Y 7/2 to 5GY 5/1). Massive to very faint irregular bedding.
655.5	657.5	Mudstone: Like 651.5-653.5.
657.5	659.8	Sandstone and siltstone: Medium olive gray in upper part to gray buff in lower part (7.5Y 5/2 to 5Y 7/1), slightly calcareous to very calcareous, micaceous. Massive to very faintly bedded. Grades to light gray sandy limestone with some very fine buff oolites in lower 0.3 foot.
659.8	660.4	Limestone: Buff (2.5Y 7/2-8/2), sandy to silty. Faintly mottled. Rare oolites.
660.4	662.5	Sandstone and mudstone: Very light to medium gray green (10Y 8/2 to 5GY 5/1 and 5/2), calcareous. Faintly mottled.
662.5	663.5	Sandy mudstone in upper part to claystone in lower part: Medium gray green (10Y to 5GY 5/2). Massive. Broken core.
663.5	667.4	Missing.
667.4	671.8	Mudstone and claystone: As above. Badly broken by desiccation cracks. Some core pieces are worn down to less than 1-1/2 inches in diameter. Grab sampled. Sample of claystone from 669.5 feet: X-ray - illite, quartz, feldspar, kaolin, siderite?
671.8	679.4	Missing.
679.4	683.1	Mudstone and claystone: Purplish gray (10RP 5/1-4/1) and some medium to light gray green (10Y 5/2-6/2). Badly broken by desiccation cracks. Grab sampled. Sample of purplish-gray to gray-green mudstone from 681.8 feet: X-ray - illite, quartz, feldspar, kaolin.

BOTTOM OF UPPER CORED INTERVAL

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Table A-2.—*Lithologic description of core samples from lower part of Green River Formation in Washakie Basin corehole 1A*

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY[1/]

Core samples from Bureau of Mines Washakie Basin No. 1A corehole drilled in 1969 in SW1/4SW1/4SW1/4 (281 ft N/S and 567 ft E/W) of sec 24, T 14 N, R 100 W, Sweetwater County, Wyoming

Surface elevation: 7,078 feet
Cored interval: 209.8-1,493.0 feet

From	To	Description
		WILKINS PEAK MEMBER OF GREEN RIVER FORMATION
209.8	211.1	Sandstone: Light slightly greenish gray (10Y and 5GY 7/1), fine to medium grained, micaceous. Very faint streaked bedding. Irregular parting and fracture. Some thin to fine, regular to very distorted olive-gray mudstone stringers and streaks. Some fine distorted and broken platy fragments of buff marlstone in lower part.
211.1	212.2	Mudstone: Medium to light gray green (5GY 4/1-6/1). Faint distorted streaked bedding. Irregular parting; irregular to conchoidal fracture. Some fine light silty streaks in upper inch. Dense massive slightly brownish gray dolomite at 211.3-211.5; gradational contacts at top and bottom.
212.2	214.0	Sandstone: Light gray (N 7, rare 6; some slight olive to brown tint), fine grained, micaceous. Moderately distinct to very faint streaked bedding; some small crossbedding. Rare thin to fine olive-gray mudstone streaks and stringers.
214.0	214.4	Mudstone and siltstone: Buff to medium brownish gray and olive gray (2.5Y and 5Y 7/1-5/1), micaceous. Faintly laminated.
214.4	216.2	Mudstone, siltstone, and fine sandstone: Light slightly olive to greenish gray (7.5Y to 5GY 6/1-8/1), micaceous, slightly calcareous. Faint distorted streaked bedding to nearly massive.
216.2	217.0	Siltstone and mudstone: Light to rare medium greenish gray (10Y to 5GY 7/1-6/1, rare 5/1-5/2), micaceous, slightly calcareous. Faintly laminated.
217.0	218.0	Sandstone and siltstone: Light gray and olive gray (N 8-7 and 7.5Y 7/1-6/1), micaceous, calcareous. Very faintly bedded sandstone in upper part to faintly variegated siltstone in lower part.
218.0	218.7	Siltstone, mudstone, and marlstone: Light greenish gray in upper part to medium olive gray in lower part (10Y 7/1-6/1 in upper part to 5Y 5/2 in lower part), slightly calcareous to dolomitic. Faintly variegated siltstone

1/ By L. G. Trudell, completed August 27, 1970

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Laramie Energy Research Center September 18, 1970

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		and mudstone in upper part grading to faintly bedded marlstone with abundant fine light silty streaks, blebs, and stringers in lower part.
218.7	219.9	Mudstone, siltstone, and sandstone: Light to medium olive-gray mudstone and siltstone (7.5Y 7/1-5/1) and light gray fine-grained sandstone (N 7-6), micaceous, slightly to very calcareous. Very faintly bedded to faintly streaked and variegated.
219.9	220.7	Siltstone, mudstone, and claystone: Light to medium olive gray and gray green (5Y to 10Y 8/1-5/1 and 5/2), micaceous, slightly calcareous to noncalcareous. Moderately distinct to faint bands and laminae in upper part to very faint streaked bedding in lower part. Common fine light vermiform silty stringers in some parts.
220.7	221.7	Mudstone, siltstone, and some claystone: Light to rare medium olive gray and gray green (7.5 to 10Y 6/1 and 6/2-8/1, rare 5/1-5/2), micaceous, slightly calcareous. Faint streaked bedding and some laminae. Common irregular silty streaks, stringers, and blebs.
221.7	223.7	Siltstone and very fine sandstone: Light slightly olive gray (7.5Y 7/1-8/1), micaceous, calcareous. Faint streaked bedding; rare slight crossbedding. Some sparry calcite cement near top and bottom. Common fine olive-gray mudstone and claystone streaks and stringers in lower half foot.
223.7	226.7	Mudstone and claystone: Light to medium olive gray (7.5Y 6/2 and 6/1-5/2), slightly calcareous to dolomitic. Faint streaked bedding. Abundant fine to thin light gray calcareous silty streaks and stringers.
226.7	228.2	Mudstone and claystone: Medium to light olive gray (7.5 to 5Y 5/2-6/2), dolomitic. Faint streaked bedding and rare laminae. Rare fine silty streaks and laminae. Sample of olive-gray slightly silty claystone from 227.8 feet: X-ray - quartz, illite, dolomite, analcite, feldspar, pyrite, kaolin.
228.2	228.8	Algal dolomite: Medium brown in upper part to tan and buff in lower part (10YR 4/3-6/3 and 7/2, rare 8/2), slightly calcareous in lower part. Faint to distinct wavy bands and laminae. Some irregular stringers and patches of coarsely crystalline colorless transparent calcite. Wavy contacts at top and bottom.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
228.8	229.6	Claystone: Light to medium olive gray (7.5Y 6/2-5/2), dolomitic. Very faint very fine laminae and streaked bedding; inclined about 40°. A thin steeply inclined faintly laminated wavy buff algal bed at 229.4.
229.6	229.9	Algal dolomite: Buff and tan to brownish gray and gray (10YR 7/2 and 6/3-4/1, and N 4), calcareous. Steeply inclined wavy laminae in upper part to platy algal fragments in granular gray matrix in lower part. Some light greenish-gray mudstone fragments near base.
229.9	230.5	Claystone and mudstone: Medium to light gray (N 5-6; some very slight green tint). Faint streaked bedding. Thin to fine vermiform light gray silty stringers extend through interval.
230.5	231.4	Siltstone and mudstone: Light to medium slightly olive gray (5 to 10Y 8/1-5/1), micaceous, slightly calcareous. Faint to moderately distinct irregular streaks, stringers, and laminae.
231.4	232.4	Mudstone: Light to some medium slightly greenish gray (10Y 7/1-6/1, some 5/1), very slightly calcareous. Very faintly bedded. Common fine light siltstone streaks and laminae below 232.0.
232.4	234.0	Mudstone and siltstone: Light slightly greenish gray (10Y 6/1-8/1). Faintly mottled mudstone and siltstone in upper part grading to massive sandstone in lower part.
234.0	239.8	Sandstone: Gray buff (5Y 7/1-8/1), fine to medium grained, very micaceous. Massive to very faintly bedded.
239.8	241.4	Mudstone and claystone: Light to some medium greenish gray and olive gray (10GY to 7.5Y 7/1-6/1, some 5/1-5/2), slightly calcareous to slightly dolomitic. Faint irregular streaked bedding; some faintly variegated to mottled. Some irregular silty to sandy stringers, streaks, and patches. Some very fine vitreous carbonaceous streaks in lower part.
241.4	244.6	Mudstone, siltstone, and very fine sandstone: Light olive gray (7.5Y 8/1-6/1 and 6/2), micaceous, slightly calcareous. Faint streaked bedding. Some gray-green claystone at 243.8-244.2
244.6	245.9	Sandstone: Light slightly olive gray (7.5 to 10Y 7/1-6/1), fine grained, micaceous. Massive in upper part to moderately distinct streaked bedding in lower part.

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Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
245.9	251.8	Claystone: Light olive gray (5 to 7.5Y 7/1 and 7/2-6/1 and 6/2), some light gray green near top (5GY 6/1-6/2); dolomitic. Very faintly laminated. Some fine silty streaks and blebs. Fine streaks to thick zones of light gray fine-grained micaceous sandstone from 246.9 to 247.8. A 3/4-inch band of dense light brownish-gray marlstone at 250.6.
251.8	253.5	Oil shale (claystone and mudstone): Medium and some light olive (5 to 7.5Y 5/2, some 6/2 upper part and some 4/2 lower part), dolomitic. Faint streaked bedding. Some fine light gray vermiform mudstone stringers and streaks in upper part. Rare fine gray pyritic blebs and streaks in lower part.
253.5	254.5	Oil shale (claystone and marlstone): Medium to light olive gray (5 to 7.5Y 4/2-6/2) and buff to some very dark brownish gray (2.5Y 7/2 and 7/3-3/2, some 2/2), dolomitic. Faint to very distinct slightly irregular laminae, streaks, and some thin bands. Some reddish brown dolomite laminae at 253.9-254.0. Few thin to fine, gray to buff silty stringers near base. Sample of distinctly laminated buff to very dark brownish-gray oil shale from 253.8 feet: X-ray - dolomite; some quartz, analcite, feldspar.
254.5	257.0	Sandstone and siltstone: Gray buff to some light brownish gray and olive gray (2.5 to 5Y 7/1-8/1, some 6/1), very fine grained, micaceous. Faint irregular to smooth streaks and laminae. Sparry calcite cement near top.
257.0	259.2	Claystone and mudstone: Light greenish gray and olive gray (5GY to 7.5Y 6/1 and 6/2-7/1 and 7/2), slightly dolomitic. Very faintly streaked to mottled. Some fine buff to tan blebs in lower part.
259.2	260.2	Mudstone and siltstone: Light gray green (10Y 7/1 and 7/2-6/1). Faintly streaked to massive.
260.2	262.7	Sandstone and siltstone: Light gray green (10Y 8/1 and 8/2-7/2), very fine grained, micaceous. Faintly streaked to massive. A 3/4-inch medium olive-gray claystone band at 260.4.
262.7	263.0	Missing.
263.0	265.9	Mudstone, siltstone, and some claystone: Light gray green (10Y to 5GY 6/1 and 6/2-8/1), slightly dolomitic. Faintly streaked and mottled. Buff to light brownish-gray dolomitic mudstone at 264.0-264.4.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
265.9	270.0	Siltstone and some mudstone: Light slightly greenish gray (10Y to 5GY 8/1-7/1, rare 6/1), micaceous, slightly calcareous. Very faintly variegated to faintly streaked.
270.0	272.0	Mudstone and claystone: Light gray green (10Y to 10GY 7/1-7/2), slightly calcareous. Very faintly streaked to nearly massive. Some very light siltstone layers and streaks near base.
272.0	274.7	Siltstone and very fine sandstone: Very light gray green (5GY 8/1-7/1, rare 6/1-6/2), micaceous, calcareous. Faintly streaked to massive.
274.7	276.2	Mudstone: Light gray green (5 to 10GY 6/1 and 6/2-7/1), slightly calcareous. Faintly mottled. Some buff silty and slightly earthy blebs and irregular vertical stringers in lower part.
276.2	277.6	Siltstone and very fine sandstone: Light gray green (5GY 7/1-7/2), micaceous, slightly calcareous. Faintly mottled in upper part to finely streaked in lower part.
277.6	278.8	Very fine sandstone and siltstone: Very light gray green (5GY 8/1-7/1), micaceous, slightly calcareous. Faintly streaked; some small crossbedding. Sparry calcite cement near base.
278.8	280.6	Claystone, siltstone, and fine sandstone: Light to medium slightly olive gray claystone (5 to 7.5Y 6/1 and 6/2-5/1 and 5/2). Thick zones of faintly bedded claystone alternating with thick zones of siltstone and sandstone as above.
280.6	281.6	Siltstone, mudstone, and claystone: Light to medium olive gray (7.5 to 10Y 7/1-5/1 and 5/2). Very faint streaked bedding. Common fine silty blebs and vermiform stringers.
281.6	282.6	Mudstone, siltstone, and very fine sandstone: Light olive gray (7.5 to 10Y 6/1-8/1), slightly to very calcareous. Faintly streaked and mottled to nearly massive.
282.6	283.0	Missing.
283.0	285.5	Siltstone, mudstone, and claystone: Light olive gray (7.5 to 10Y 7/1 and 7/2-6/1 and 6/2), slightly calcareous to slightly dolomitic. Thinly interbedded siltstone and mudstone in upper part grading to very faintly bedded claystone in lower part. Some fine yellow-buff blebs and streaks in lower part.
285.5	286.5	Mudstone: Light to medium olive gray (7.5Y 6/2-5/2), dolomitic. Faintly bedded. Common fine gray-buff silty blebs and streaks.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
286.5	288.2	Mudstone, siltstone, and fine sandstone: Mudstone as above interbedded with gray-buff to light gray calcareous siltstone and fine sandstone.
288.2	289.7	Mudstone, siltstone, and some fine sandstone: Light gray-green mudstone (10Y to 5GY 7/1-7/2) faintly mottled with gray-buff to light gray silty to sandy patches and streaks.
289.7	291.1	Claystone, mudstone, and siltstone: Light to rare medium gray green and olive gray (10 to 5Y 7/1-6/1, rare 5/1-5/2), dolomitic to calcareous. Faintly streaked to laminated claystone with gray-buff silty streaks and blebs in upper and lower parts; faintly mottled to streaked mudstone and siltstone from 290.1 to 290.5.
291.1	293.0	Mudstone and siltstone: Light olive gray to gray-buff (7.5 to 5Y 7/1-8/1, some 6/1-6/2 lower part). Thinly to thickly interbedded and streaked.
293.0	297.3	Mudstone and siltstone: Light olive gray and gray green to some gray buff (7.5Y to 5GY 6/1-7/1, some 8/1), slightly calcareous to slightly dolomitic. Faintly variegated and mottled.
297.3	299.9	Siltstone and very fine sandstone: Gray buff to very light gray green (10Y to 5GY 8/1-7/1), micaceous, calcareous. Very faintly streaked to massive. Some interbedded gray-green mudstone in lower part.
299.9	302.1	Mudstone and very fine sandstone: Light gray-green to olive-gray mudstone in upper part (5GY to 7.5Y 7/1-6/1) grading to gray-buff sandstone in lower half foot (7.5Y 8/1). Faintly mottled to massive.
302.1	303.3	Mudstone and marlstone: Buff to light olive gray (5Y 7/2-6/2), slightly calcareous to dolomitic. Very faintly bedded to massive. Some fine gray-buff silty streaks. Conchoidal fracture in lower part. Sample of marlstone from 303.1 feet: X-ray - dolomite, analcite, quartz, illite, feldspar, pyrite.
303.3	308.0	Mudstone: Like 299.9-302.1 becoming faintly laminated to banded in lower part. Some siltstone and fine sandstone in middle. Some buff to brownish-gray slightly earthy blebs and patches in upper part.
308.0	322.7	Mudstone, siltstone, and very fine sandstone: Like 293.0-308.0.
322.7	323.0	Missing.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
323.0	324.4	Sandstone: Gray white to light greenish gray (10Y 9/1-7/1), very fine grained, micaceous, calcareous. Faintly streaked.
324.4	328.6	Mudstone and some claystone: Light to rare medium olive gray (7.5 to 5Y 6/1, some 7/1, rare 5/1), slightly calcareous to dolomitic. Massive to faintly streaked and laminated. Fairly common fine gray-buff silty streaks, laminae, and blebs. Sample of light olive-gray claystone with some fine silty streaks and blebs from 328.0 feet: X-ray - quartz, illite, analcite, ferroan, feldspar, dolomite.
328.6	329.9	Claystone: Light to medium olive gray (5Y 6/2 and 6/1-5/2), dolomitic. Very faintly streaked to laminated. Some very fine gray-buff silty streaks.
329.9	331.0	Oil shale (claystone): Olive gray (5Y 5/2-4/2) and rare medium to dark brownish gray (2.5Y 4/2-3/2), slightly dolomitic. Very faintly laminated and streaked. Irregular thick to thin parting. A 1-inch slightly irregular finely laminated buff to light brownish-gray limestone band at 330.7; rare very fine buff laminae and streaks elsewhere. Sample of olive-gray oil shale from 330.1 feet: X-ray - analcite, illite, dolomite, quartz, ferroan, feldspar.
331.0	333.7	Claystone and some mudstone: Light to some medium olive gray and rare gray buff (5 to 7.5Y 6/2-6/1, some 5/2, rare 7/1), dolomitic to slightly calcareous. Faint streaked bedding. Abundant fine gray-buff silty streaks and short vermiform stringers. Some fine buff platy limestone fragments near top.
333.7	338.0	Siltstone, mudstone, and rare claystone: Light olive gray (7.5 to 10Y 6/1-7/1), calcareous. Thinly to thickly interbedded and streaked; contorted bedding at 336.4-336.7; rare crossbedding in lower part.
338.0	341.0	Mudstone, siltstone, and some very fine sandstone: Gray buff to light and rare medium olive gray (10 to 5Y 8/1-6/1, rare 5/1), slightly to very calcareous, micaceous. Nearly massive to faintly streaked and irregularly layered.
341.0	345.0	Mudstone, very fine sandstone, and some claystone: Gray buff to olive gray and gray green (7.5Y to 5GY 8/1-6/1), micaceous, calcareous. Thickly interbedded to finely laminated and streaked. Some thin to fine vertical stringers in lower part (siltstone in claystone, mudstone in siltstone, etc).

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
345.0	348.5	Claystone and mudstone: Light gray green (10Y to 5GY 6/1-7/1), slightly calcareous to noncalcareous. Faintly bedded with abundant fine to thin gray-buff silty layers and irregular streaks, stringers, and blebs.
348.5	351.0	Claystone and mudstone: Light olive gray (7.5Y 6/1-7/1), slightly calcareous. Faintly bedded with abundant fine gray-buff silty layers and streaks. Rare fine to thin dark gray pyritic streaks and lenses.
351.0	352.8	Claystone and mudstone: As above with rare silty layers and streaks. A 2-inch layer of very fine micaceous sandstone at 352.0. A 1-inch light brownish-gray marlstone band at 352.7 with fine to very thin dark gray pyritic streaks and blebs near top and bottom.
352.8	353.1	Siltstone and very fine sandstone: Gray buff (7.5Y 8/1-7/1), micaceous, slightly calcareous. Finely streaked. Rare very small fine-grained pyrite lenses. Cut by a very fine diagonal calcite-filled fracture.
353.1	353.5	Claystone and mudstone: Like 345.0-348.5.
353.5	354.2	Sandstone: Light gray (N 7), medium to fine grained, micaceous, calcareous. Massive; salt-and-pepper. Irregular gradational contact at top; fairly sharp smooth contact at base.
354.2	359.0	Claystone and mudstone: Like 348.5-352.8.
359.0	362.9	Claystone and mudstone: Light olive gray (7.5Y 7/1-7/2), slightly calcareous. Faintly bedded with abundant fine to 1-inch gray-buff silty layers. Some fine to small pyritic blebs and streaks in silty layers.
362.9	363.0	Missing.
363.0	364.6	Claystone and mudstone: Light olive gray to buff (7.5 to 5Y 7/1-7/2), slightly calcareous. Faintly laminated to banded with common very fine to thin gray-buff silty layers. Rare fine pyritic streaks and blebs. Sample of buff claystone with very fine silty layers from 364.3 feet: X-ray - dolomite, quartz, fledspar, illite, analcite.
364.6	365.6	Claystone and mudstone: Buff to light olive gray (5Y 7/2 and 7/1-6/2 and 6/1), slightly dolomitic. Very faintly laminated with common very fine gray-buff silty laminae and streaks.
365.6	366.6	Claystone and mudstone (oil shale in part): Buff to light olive gray (5Y 7/2 and 7/1-6/2 and 6/1) and some light to rare medium brownish gray (2.5Y 6/2-5/2), dolomitic. Faintly streaked and laminated; common very fine gray-buff silty streaks and laminae in upper part. Rare very

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Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		fine pyrite streaks and blebs. Sample of dark to rare medium olive-gray and brownish-gray oil shale from 366.5 feet: X-ray - dolomite, quartz, feldspar, illite, analcite, pyrite, ferroan.
366.6	368.3	Oil shale (marlstone): Medium to rare dark olive gray and brownish gray (5 to 2.5Y 5/2-4/2, some 10YR 4/2 to rare 3/2), dolomitic. Faint very fine laminae and some zones with distorted streaked bedding. Irregular to regular, thick to medium parting; irregular and rare slight to coarse hackly fracture. Very rare fine dense brown dolomite streaks and nodules in browner zones. Sample of olive-gray oil shale from 367.2 feet: X-ray - dolomite, quartz, analcite, fledspar, illite.
368.3	370.4	Oil shale (marlstone): Very dark to medium brownish gray and some black (10YR 2/2-4/2, some 1/2), some satiny luster, dolomitic. Faint to some moderately distinct very fine laminae; rare fine loop structures and displacements. Regular to irregular, thick to medium parting; irregular to slightly hackly fracture. A very regular high angle fracture with rare pyrite in upper 3 inches.
370.4	371.4	Oil shale (marlstone): Black to some medium brownish gray and brown (10YR 1/2-3/2, some 4/2-4/3), some slight satiny luster, dolomitic. Faint to some distinct laminae; rare fine loop structures. Slightly irregular thick to rare thin parting; slightly irregular and conchoidal fracture. A regular vertical fracture in lower 6 inches. Sample of very dark brownish-gray to black oil shale from 370.6 feet: X-ray - dolomite, quartz, analcite, illite, feldspar, magnesite.
371.4	372.7	Oil shale (marlstone): Dark to medium brownish gray and brown (10YR to some 2.5Y 2/2-4/2 and 4/3), dolomitic. Faint to moderately distinct laminae and some very faintly bedded zones. Regular to some irregular thick parting; slightly irregular and conchoidal fracture. Some fine dense to blebby brown layers and streaks in lower part. Some fine vitreous black fish (?) fragments at base. Abrupt change from brown to olive at base. Sample of dark brownish-gray and brown oil shale from 372.2 feet: X-ray - dolomite, quartz, analcite, feldspar, ferroan, illite.
372.7	373.3	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 4/2-6/2), dolomitic to slightly calcareous. Very faintly laminated to streaked. Slightly irregular parting and fracture. Common fine irregular silty streaks in lower 0.2 foot.

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From	To	Description
		Sample of olive-gray oil shale from 372.9 feet: X-ray - quartz, analcite, ferroan, feldspar, illite, calcite?
373.3	376.1	Oil shale (marlstone and mudstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, very rare 7/2), dolomitic. Faint streaked bedding. Common fine irregular gray-buff silty streaks and blebs with some dark gray pyritic spots.
376.1	377.6	Oil shale (marlstone and some mudstone): Light to medium olive (7.5Y 6/2-5/2, some 7/2), dolomitic. Faintly laminated to streaked. Some fine gray-buff silty streaks and blebs.
377.6	378.9	Mudstone and siltstone: Light and rare medium olive gray to gray buff (7.5 to 5Y 6/1 and 6/2-7/1, rare 5/2), calcareous. Faintly streaked to mottled. Some fine silty streaks and short vermiform stringers.
378.9	381.1	Oil shale: Like 373.3-376.1.
381.1	381.5	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, rare 4/2 and 7/2), dolomitic. Faint to some moderately distinct laminae. Some very fine silty streaks.
381.5	383.6	Oil shale (marlstone and mudstone): Light to medium olive gray (5 to 7.5Y 6/2 and 6/1-5/2), slightly calcareous to dolomitic. Faint streaked bedding and some laminae. Some fine gray-buff silty streaks and blebs.
383.6	384.6	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, rare 7/2), dolomitic. Faint to some moderately distinct laminae. Some fine gray-buff silty streaks with dark gray pyritic specks.
384.6	386.4	Marlstone (some oil shale): Light to some medium olive gray (7.5Y 6/2-7/2 and 7/1, some 5/2 in middle), dolomitic to very slightly calcareous. Faintly laminated. Some very fine silty streaks. A thin irregular stringer of tan to dark brownish-gray oil shale near base. Sample of light olive-gray marlstone from 384.8 feet: X-ray - quartz, feldspar, dolomite, illite, ferroan.
386.4	389.5	Oil shale (marlstone): Light to medium olive gray (7.5 to 5Y 6/2-5/2), dolomitic. Faintly laminated. Rare fine tan to buff marlstone laminae and streaks. Rare fine gray to gray-buff silty pyritic streaks in lower part.
389.5	390.1	Oil shale (marlstone): Medium to light olive gray (5Y 5/2-6/2, rare 4/2), dolomitic. Faint very fine laminae and streaked bedding. Rare very fine buff marlstone streaks.

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From	To	Description
390.1	391.2	Oil shale (marlstone): Medium to some light brownish gray and olive gray (2.5 to 5Y 4/2-5/2, some 6/2), dolomitic. Faint to some moderately distinct laminae. Slightly irregular thick to thin parting; irregular hackly fracture. Rare fine grayish-brown to tan slightly silty layers. A low angle glossy slickensided shear surface near base.
391.2	392.6	Oil shale (marlstone and claystone): Medium olive gray (5Y 4/2-5/2, some 4/1-5/1 upper part), moderately to slightly dolomitic. Faint very fine laminae and streaked bedding. Regular to irregular, thick to some thin parting; irregular hackly fracture. Rare high angle glossy shear surfaces in lower part. A fine buff marlstone lamina at 392.4. Sample of olive-gray claystone from 392.1 feet: X-ray - illite, quartz, feldspar, dolomite, ferroan.
392.6	394.0	Oil shale (claystone and marlstone): Medium olive gray (5 to 7.5Y 5/2-4/2), slightly to moderately dolomitic. Faint very fine laminae. Irregular thick to some thin parting; irregular hackly fracture. Rare glossy shear surfaces. Some irregular 1- to 2-inch brownish-gray to buff algal limestone nodules in upper part. Rare very fine gray-buff silty streaks.
394.0	395.0	Oil shale (claystone): Medium to some dark and rare light olive gray and brownish gray (5 to 2.5Y 4/2, some 5/2 and 3/2, rare 6/2), slightly dolomitic. Faint very fine laminae and streaked bedding. Irregular thick to some thin part; irregular hackly fracture. Fine buff to light brownish-gray platy limestone fragments and some laminae at 394.2-394.3 and 394.6. A 1-inch buff-white to gray-buff blebby to fine sandy-textured band at 394.4; 2-inch zone of common fine irregular gray-buff earthy streaks below band. Sample of buff-white to gray-buff band from 394.4 feet: X-ray - dolomite, montmorillonite, ferroan, quartz, feldspar.
395.0	395.6	Oil shale (marlstone): Medium olive gray (5 to 7.5Y 4/2-5/2), dolomitic. Faint very fine laminae and streaked bedding. Irregular thick to rare thin parting; irregular hackly fracture. Rare very fine gray pyritic streaks. Some very fine light brownish-gray silty streaks in upper 2 inches.

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From	To	Description
395.6	396.1	Marlstone: Light to medium olive and greenish gray (7.5 to 10Y 6/2 and 6/1-5/2), dolomitic to very slightly calcareous. Faintly laminated and streaked. Irregular thick to rare thin parting; slightly irregular and hackly fracture. Rare fine silty streaks. Sample of light to medium greenish-gray marlstone from 395.8 feet: X-ray - quartz, illite, feldspar, dolomite.
396.1	396.7	Oil shale: Like 395.0-395.6.
396.7	402.4	Oil shale (marlstone): Medium to light olive and greenish gray (7.5 to 10Y 5/2-6/2, rare 4/2, some 5Y 5/2-4/2 at 397.7-398.1), dolomitic. Faintly laminated and streaked. Fairly regular to irregular, thick to some thin parting; irregular hackly fracture. Some fine gray to gray-buff silty streaks and blebs. A very fine brownish-gray to buff wavy dolomite layer at 401.5
402.4	403.0	Missing.
403.0	403.8	Oil shale (marlstone): Olive gray (7.5Y 5/2-4/2), dolomitic. Faint streaked bedding and very fine laminae. Slightly irregular thick to some thin parting; slightly irregular to hackly fracture. A 3/4-inch very irregular dense grayish-brown dolomite stringer at top. Common very fine light gray silty streaks and lenses in lower part.
403.8	404.4	Algal dolomite: Medium to light grayish brown (10YR 5/2-6/2), dense. Faint wavy streaked bedding. Some very fine irregular discontinuous calcite-filled fractures. Rare very fine cavities. A thin stringer of light olive-gray marlstone at 403.9.
404.4	405.1	Oil shale (claystone): Medium to some dark and rare light brownish gray (2.5Y 5/2-4/2, some 3/2, rare 6/2), slightly dolomitic. Faint streaked bedding and some laminae. some fine buff marlstone specks and streaks.
405.1	406.3	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, some 4/2), dolomitic to slightly calcareous. Faint streaked bedding. Common very fine gray-buff silty streaks. A thin pinched out buff slightly silty marlstone stringer at 405.6. A thin gray-buff calcareous mudstone stringer with some very small angular oil-shale inclusions at base.
406.3	407.5	Oil shale (marlstone): Medium to rare light olive gray and brownish gray (5 to 2.5Y 5/2-4/2, rare 6/2), dolomitic. Faint streaked bedding and very fine laminae. Some fine gray-buff silty streaks. Some small buff to brownish-gray dolomite nodules at top. A tight high angle fracture at 406.9-407.2.

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From	To	Description
407.5	411.8	Oil shale (marlstone): Medium to some light olive gray (5 to 7.5Y 5/2-4/2, some 6/2), dolomitic. Faint laminae and streaked bedding. Rare very fine gray-buff silty streaks. A 3/4-inch irregular buff silty marlstone lens at 408.9. A 1/4-inch brownish-black resinous layer with fine brown dolomite (?) streaks at 410.6; some very fine vertical calcite-filled fractures. Sample of thin resinous black layer with fine brown streaks from 410.6 feet: X-ray - ferroan; trace quartz, feldspar, calcite, dolomite.
411.8	412.8	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, some 4/2), dolomitic to slightly calcareous. Faint streaked bedding. Some fine gray-buff to brownish-gray silty streaks and blebs--rarely pyritic. Rare very fine buff marlstone streaks.
412.8	413.8	Mudstone and marlstone: Light olive gray to buff (5Y 6/2-7/2), slightly calcareous. Faint streaked bedding. Some gray-buff silty streaks and blebs. Sample of light olive-gray mudstone from 412.9 feet: X-ray - quartz, illite, feldspar, dolomite, calcite, ferroan.
413.8	414.8	Mudstone: Light olive gray to buff (5Y 6/2 and 6/1-7/2), slightly calcareous. Faint streaked bedding and very fine laminae. Some gray-buff silty streaks.
414.8	415.8	Oil shale (marlstone): Medium olive gray to some buff (5Y 5/2-6/2, some 7/2, rare 4/2), slightly calcareous to dolomitic. Faint laminae and streaked bedding. Some very fine gray-buff to light brownish-gray silty streaks and very small blebs.
415.8	417.8	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, some 7/2-7/1, rare 4/2 in lower part), slightly calcareous. Faint streaked bedding; some very fine laminae in lower part. Some fine buff to gray silty streaks and laminae. A thin dense brownish-gray dolomite lens at 416.4. Sample of olive-gray oil shale from 416.9 feet: X-ray - illite, quartz, feldspar, dolomite, calcite.
417.8	419.1	Oil shale (marlstone): Medium to light olive gray (5Y 5/2-6/2, rare 4/2), dolomitic to very slightly calcareous. Faint streaked bedding and very fine laminae. Some fine gray-buff silty streaks. Rare fine to thin buff marlstone streaks.

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From	To	Description
419.1	420.1	Oil shale (marlstone): Medium and rare light olive gray (5Y 5/2-4/2, rare 6/2), dolomitic. Faint very fine laminae; rare fine displacements. Slightly irregular thick to some thin parting; slightly hackly fracture. Some broken core with diagonal glossy shear surfaces at base.
420.1	421.2	Oil shale (shaly marlstone): Medium to rare light and dark olive gray (5Y 5/2-4/2, rare 6/2 and 3/2), dolomitic. Faint laminae and streaked bedding. Irregular to regular, thick to thin parting; irregular hackly fracture. A 0.1-foot slightly curved dense brownish-gray dolomite band with buff slightly earthy rims at 420.7. Diagonal glossy shear surface at 420.8. Sample of dark olive-gray oil shale from 420.8 feet: X-ray - illite, quartz, feldspar, dolomite.
421.2	422.2	Oil shale: Like 419.1-420.1. Irregular brownish-gray to tan, dense to earthy dolomite band in lower 3 inches.
422.2	423.2	Oil shale: Like 420.1-421.2. Some broken core.
423.2	424.2	Oil shale (claystone): Medium to rare dark olive gray (5Y 4/2-5/2, rare 3/2), slightly dolomitic. Faint very fine laminae and streaked bedding. Irregular to fairly regular, thick to some thin parting; hackly fracture. Few irregular fine to thin buff marlstone layers.
424.2	425.2	Oil shale (claystone): Medium to some dark olive gray and brownish gray (5 to 2.5Y 4/2-5/2, some 3/2), slightly dolomitic. Faint streaked bedding. Irregular thick to rare thin parting; irregular coarse hackly fracture. Rare fine buff marlstone layers. A 1-inch light to medium gray silty biotitic band at base. Sample of gray silty band from 425.2 feet: X-ray - montmorillonite, biotite, kaolin.
425.2	426.2	Oil shale (shale): Medium to dark brownish gray and brown (2.5Y to 10YR 4/2 and 4/3-3/2, some 2/2 lower part), dolomitic in lighter parts. Moderately distinct to very faint very fine laminae and some fine to thin irregular streaks and stringers. Irregular to regular, thick to very thin parting; hackly fracture. Rare fine light gray earthy to silty blebs and layers. Sample of dark brownish-gray oil shale from 426.0 feet: X-ray - quartz, illite, feldspar, montmorillonite dolomite, ferroan, pyrite.

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From	To	Description
426.2	427.2	Oil shale (shale): Medium and rare dark olive gray (5Y 4/2, some 5/2, rare 3/2), slightly dolomitic. Faint streaked bedding and very fine laminae. Irregular thick to thin parting; irregular hackly fracture. Some slightly glossy low angle shear surfaces. Some thin to fine, buff to grayish-brown marlstone and dolomite stringers near top.
427.2	428.2	Oil shale (shaly marlstone): Medium and rare dark olive gray (5 to 7.5Y 4/2-5/2, rare 3/2 in upper part), dolomitic. Faint very fine laminae. Slightly irregular thick to rare thin parting; irregular slightly hackly fracture. Rare fine to thin buff marlstone layers and streaks. Low angle glossy shear surface at 428.0.
428.2	429.6	Oil shale (shaly marlstone): Olive gray (5 to 7.5Y 4/2-5/2 and 5/1), dolomitic. Faint very fine laminae. Irregular thick to rare thin parting; irregular coarse hackly fracture. Rare fine buff marlstone streaks and layers.
429.6	430.6	Oil shale (claystone): Olive gray to some medium and rare dark brownish gray (5Y 4/2-5/2, some 2.5Y 4/2 and rare 3/2 in lower part), slightly dolomitic. Faint streaked bedding and very fine laminae. Irregular thick parting; irregular coarse hackly fracture. Rare glossy shear surfaces. Dense brownish-gray to buff dolomite bands at 429.7-429.8 and 430.1-430.4.
430.6	431.6	Oil shale: Like 428.2-429.6.
431.6	433.0	Oil shale (shaly marlstone): Olive gray (5Y 4/2-5/2), dolomitic. Faint streaked bedding. Irregular thick to some thin parting; irregular coarse hackly fracture. Rare glossy shear surfaces.
433.0	434.3	Oil shale (claystone): Olive gray (5 to 7.5Y 5/2-4/1), slightly dolomitic. Faint streaked bedding. Irregular thick to some thin parting (slightly unctuous parting surfaces); irregular coarse hackly fracture. A 3/4-inch irregular buff marlstone nodule at 434.1. Very rare fine brown blebs.
434.3	435.3	Oil shale and marlstone: Medium to rare dark olive-gray and brownish-gray oil shale (5 to 2.5Y 4/2, rare 3/2-2/2 in lower part), buff to grayish-brown dolomitic marlstone (2.5Y 7/2-5/3). Very faintly streaked oil shale. A 1-inch irregular massive dolomite band at 434.6; 1- to 2-inch faintly bedded marlstone bands and thin distorted stringers interbedded with some dark oil shale in lower 0.4 foot. Some irregular patches of abundant fine dense brownish-gray

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From	To	Description
		granules in marlstone in lower part. Sample of buff marlstone with fine dense granules from 434.9 feet: X-ray - dolomite; trace calcite, quartz, feldspar.
435.3	436.3	Oil shale (shale): Very dark brownish gray to rare medium grayish brown (10YR 2/2-3/2, rare 4/3), rare satiny luster. Faint streaked bedding with some fine brown laminae. Slightly irregular thick to thin parting; slightly hackly fracture. Rare very fine fish (?) fragments. A very light gray-buff slightly earthy band with some fine oil-shale stringers at 435.5-435.7 Sample of gray-buff slightly earthy band from 435.6 feet: X-ray - montmorillonite, ferroan, feldspar. Sample of dark brownish-gray oil shale from 436.1 feet: X-ray - quartz, illite, dolomite, feldspar, ferroan, pyrite.
436.3	437.3	Oil shale (marlstone): Medium to some light brownish gray and olive gray (2.5 to 7.5Y 4/2-5/2, some 6/2), dolomitic. Faint streaked bedding. Irregular to fairly regular thick parting; slightly irregular fracture. A 2-inch irregular stringer or nodule of buff marlstone with fine to small dense brownish-gray blebs and some porous patches near top; a thin massive buff marlstone stringer at 436.7. Some fine gray-buff to light gray silty streaks and blebs in lower part. Some high to low angle glossy slickensided shear surfaces in upper part.
437.3	439.5	Oil shale (marlstone): Medium to light olive gray (5 to 7.5Y 5/2-6/2, some 4/2 upper part), slightly calcareous. Faint streaked bedding to nearly massive. Some very small irregular buff marlstone blebs and fine gray-buff to gray silty streaks in upper part. A 3-inch massive light brownish-gray to buff dolomite nodule at 438.0. A 0.1-foot faintly bedded hard tight silty light to medium slightly brownish gray band at 439.4. Woody plant fragment on parting surface at base. Sample of hard tight silty band from 439.4 feet: X-ray - dolomite, quartz, illite, feldspar, pyrite.
439.5	441.6	Oil shale (marlstone): Medium and rare dark to some light olive gray (5Y 4/2-5/2 and rare 3/2 in upper part to 5 and 7.5Y 5/2 and some 6/2 in lower part), dolomitic to slightly calcareous. Faint streaked bedding. Some fine gray-buff silty streaks in upper part. A 1-inch buff slightly earthy

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From	To	Description
		and silty marlstone stringer with some dense dolomite at 440.1; common small to fine irregular buff inclusions at 440.8-441.0; occasional fine blebs, streaks, and layers in other parts. A very thin irregular very light gray-buff silty layer with abundant very fine black specks at 440.3.
		Sample of olive-gray oil shale from 441.4 feet: X-ray - quartz, illite, feldspar, dolomite, siderite.
441.6	442.6	Oil shale (shaly marlstone): Olive gray (7.5 to 5Y 5/2-4/2), dolomitic. Faint streaked bedding. Irregular thick to some thin parting (slightly unctuous); irregular slight to coarse hackly fracture. A 1-inch massive buff marlstone stringer near base.
442.6	443.0	Missing.
443.0	443.6	Oil shale: As above. A thin buff marlstone stringer at base.
443.6	444.6	Oil shale (shaly marlstone): Olive gray (5Y 4/2-5/2, some 4/1 to rare 3/1 in upper part), dolomitic. Faint streaked bedding and some very fine laminae. Fairly regular to irregular, thick to some thin parting (slightly unctuous); irregular hackly fracture. Thin buff marlstone stringers at 443.9 and 444.2.
444.6	447.0	Oil shale (shaly marlstone): Dark to some medium brownish gray (10YR to 2.5Y 3/2, some 4/2, rare 2/2,upper part), dolomitic. Faint streaked bedding and very fine laminae. Regular to irregular, thick to very thin parting; hackly fracture. Rare very fine fish (?) fragments. A thin very light gray unctuous claystone layer at 444.8. A 1-inch faintly bedded grayish-brown dolomite band at 445.0.
		Sample of light gray claystone from 444.8 feet: X-ray - montmorillonite, siderite, feldspar.
447.0	448.0	Oil shale (claystone): Medium to rare light olive gray (5Y 4/2-5/2 and 5/1, rare 6/2), slightly calcareous. Faint streaked bedding. Irregular thick to thin parting (unctuous in upper part); irregular hackly fracture. A 3/4-inch white silty claystone band with very fine black specks at top. A 1-1/2-inch buff marlstone band at 447.5. A 1-inch ostracodal limestone band at 447.6 with a fine seam of silky calcite at base.
		Sample of buff marlstone band from 447.5 feet: X-ray - dolomite, some quartz.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
448.0	451.3	Claystone (oil shale?): Olive gray (7.5 to 10Y 5/1-5/2), slightly to moderately calcareous. Faintly streaked to nearly massive. Irregular thick to thin parting (slightly unctuous); very irregular hackly fracture. Hard light olive-gray marlstone at 448.6-448.8.
451.3	452.3	Claystone (oil shale?): Medium to rare light olive gray and greenish gray (10Y to 5GY 5/1-5/2, rare 6/1-6/2), slightly calcareous. Massive to very faintly bedded. Irregular thick parting; very irregular hackly fracture. A large dense buff dolomite nodule at 451.6. Sample of greenish-gray claystone from 451.4 feet: X-ray - illite, quartz, dolomite, calcite, analcite, feldspar.
452.3	455.9	Oil shale (claystone): Olive gray (7.5 to 5Y 5/2-4/2), slightly calcareous. Very faintly bedded. Irregular thin to thick parting (slightly unctuous); very irregular hackly fracture. Irregular dense buff to grayish-brown dolomite band at 453.9-454.1.
455.9	456.9	Oil shale (claystone): Medium to rare dark brownish gray (2.5Y 4/2, some 5/2, rare 3/2 near base), slightly dolomitic. Faint streaked bedding. Irregular to fairly regular, thick to thin parting (slightly unctuous); irregular hackly fracture. Sample of brownish-gray oil shale from 456.5 feet: X-ray - dolomite, quartz, illite, montmorillonite, feldspar.
456.9	459.0	Oil shale (shale): Medium to very dark brownish gray (2.5Y to 10YR 4/2-2/2), slightly to moderately dolomitic. Faint streaked bedding and very fine laminae. Slightly irregular thick to some thin parting; irregular coarse to slight hackly fracture. Some glossy shear surfaces near base.
459.0	459.7	Missing.
459.7	461.1	Oil shale (shale): Medium to some dark brownish gray (2.5Y 4/2, some 3/2), dolomitic. Very faint streaked bedding. Slightly irregular thick to thin parting (slightly unctuous); irregular hackly fracture. Irregular core pieces with some buff marlstone nodules in upper 0.3 foot.
461.1	461.7	Oil shale (shale): Medium to rare dark brownish gray and olive gray (2.5 to 5Y 4/2, some 5/2, rare 3/2). Faint streaked bedding. Slightly irregular medium to thin parting; very hackly fracture. A thin buff marlstone band at top.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
461.7	462.1	Limestone: Buff to light brownish gray (2.5Y 7/2-6/1). Irregularly mottled and streaked to faintly bedded. Abundant ostracods. Sharp smooth contacts with oil shale above and below.
462.1	463.0	Oil shale (shale): Dark to rare medium olive gray (5Y 3/1-2/1, rare 4/1 near base), slightly dolomitic. Very faint streaked bedding. Slightly irregular thick to thin parting (slightly unctuous); hackly fracture. Some glossy shear surfaces near top. A short vertical fracture with fine calcite crusts at 462.3. Rare fish (?) fragments in lower part.
463.0	466.0	Oil shale (shaly marlstone): Medium to some dark brownish gray (2.5Y 4/2-5/2, some 3/2 and 3/1-4/1 in lower half), dolomitic to slightly calcareous. Faint streaked bedding and very fine laminae. Regular thick to some thin parting; slightly hackly fracture. A 2-inch massive gray claystone band at 463.5 with fine irregular stringers extending into shale below. A thin light gray biotitic claystone layer at 464.3. Some fine resinous black lenses in middle part. Abundant very small planispiral snails in lower part (Gyraulus?). Sample of thin light gray biotitic claystone layer from 464.3 feet: X-ray - montmorillonite, biotite.
466.0	467.1	Oil shale (shaly marlstone): Dark to medium brownish gray (2.5Y 3/1-4/1 and 4/2, some 2/1 lower part), slightly calcareous to dolomitic. Faint very fine laminae. Regular thick to thin parting; slightly conchoidal fracture. Rare Gyraulus; common ostracods in lower part. Rare very small black to brown lenses. Sample of very dark almost neutral gray oil shale from 466.7 feet: X-ray - quartz, illite, aragonite, pyrite, feldspar.
467.1	468.1	Oil shale (marlstone): Medium to rare dark brownish gray (2.5Y 5/2 and 5/1-4/2 and 4/1, rare 3/1), calcareous. Faint to moderately distinct very fine laminae and some streaked bedding. Slightly irregular thick parting; slightly irregular fracture. Occasional fine buff to tan lenses. A thin pinched out light gray layer with some very fine biotite at top. A thin crumbly buff claystone layer at 467.5.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
468.1	468.8	Oil shale (marlstone): Dark and rare medium brownish gray (2.5Y 3/2-2/2, rare 4/2), dolomitic to slightly calcareous. Very faintly bedded with some faint laminae. Regular thick to medium parting; slightly irregular fracture. Some ostracods.
468.8	471.3	Oil shale (shaly marlstone): Medium to dark brownish gray (2.5Y to 10YR 4/2-3/2), dolomitic. Faint streaked bedding and very fine laminae. Regular to some irregular, thick to thin parting; slightly irregular to hackly fracture. Rare small resinous black blebs. Abundant ostracods and rare small planispiral snails in upper part. Rare fine light gray biotitic layers in lower part.
471.3	472.7	Oil shale (shaly marlstone): Medium and some dark brownish gray (2.5Y to 10YR 4/2, some 5/2 and 3/2), dolomitic to slightly calcareous. Faint streaked bedding and very fine laminae. Regular to irregular, thick to some thin parting; slightly irregular to coarse hackly fracture. Rare to fairly abundant ostracods. A thick light gray band at 471.9-472.2: claystone in upper part grading to biotitic siltstone in lower part. Sample of brownish-gray oil shale from 471.5 feet: X-ray - calcite, quartz, pyrite, illite.
472.7	475.0	Oil shale (shaly marlstone): Olive gray (5Y 4/2 and 4/1-5/2), calcareous to dolomitic. Faint very fine laminae and streaked bedding. Regular to irregular, thick to very thin parting (slightly unctuous); hackly fracture. Abundant ostracods.
475.0	476.0	Oil shale (shaly marlstone): Dark to medium slightly olive gray (5Y 3/1-4/1), calcareous to dolomitic. Faintly streaked and laminated. Regular to irregular, thick to thin parting; hackly fracture. Common ostracodal streaks. A 0.1-foot band of buff ostracodal limestone at 475.2; a 0.2-foot band of calcareous mudstone at 475.7. Sample of buff mudstone from 475.7 feet: X-ray - dolomite, quartz.
476.0	477.0	Oil shale (shaly marlstone): Medium olive gray to brownish gray (5 to 2.5Y 4/2, some 5/2), dolomitic. Faint very fine laminae and streaked bedding. Slightly irregular thick to thin parting; irregular slightly hackly fracture. Abundant ostracods. Light to medium gray claystone and biotitic siltstone with common very fine dark tight fractures at 476.4-476.6; fine vermiform stringers extending into shale below.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
477.0	479.0	Oil shale (shaly marlstone): Medium to dark brownish gray (2.5Y 4/2-3/2, rare 2/2), dolomitic. Faint very fine laminae and streaked bedding. Regular to irregular, thick to thin parting; irregular slight to coarse hackly fracture. Fairly abundant ostracods in upper part becoming sparse in lower part. Rare fine to small resinous black lenses. Vertical fracture with calcite crusts at 477.4-477.7.
479.0	480.0	Oil shale (shaly marlstone): Medium and some dark brownish gray (2.5Y 4/2, some 3/2 upper part), dolomitic to calcareous. Faint very fine laminae and streaked bedding. Fairly regular medium to thin shaly parting; hackly fracture. Sparse ostracods. Rare small resinous black nodules. Rare very fine light gray claystone layers. Sample of oil shale with very small black nodule from 479.4 feet: X-ray - aragonite, quartz, illite, montmorillonite, ferroan, pyrite.
480.0	482.0	Oil shale (shale): Medium brownish gray to olive gray (2.5 to 5Y 4/2), calcareous. Faint streaked bedding. Slightly irregular shaly to some papery parting; hackly fracture. Abundant ostracods. Sample of olive-gray papery oil shale from 481.7 feet: X-ray - illite, quartz, calcite, feldspar, pyrite.
482.0	482.7	Marlstone: Buff (2.5Y 8/2-7/2), slightly calcareous. Faint distorted bedding. Broken core.
482.7	484.0	Mudstone (oil shale?): Olive gray (5 to 7.5Y 4/2 and 4/1-5/2 and 5/1), calcareous. Faint streaked bedding and some slightly irregular laminae. Irregular to fairly regular, thick to some thin parting; irregular slightly hackly fracture. Abundant ostracods. Some fish scales and bone fragments near top.
484.0	486.9	Mudstone and claystone: Medium to light olive gray and gray green (7.5Y to 5GY 5/2 and 5/1-6/2 and 6/1), calcareous. Faint streaked bedding to some nearly massive. Irregular to some fairly regular, thick to thin parting; irregular hackly fracture. Some nearly obliterated ostracods. Sample of gray-green claystone from 485.6 feet: X-ray - illite, quartz, dolomite, calcite, feldspar, analcite.
486.9	488.0	Claystone (oil shale?): Olive gray (7.5 to 5Y 5/2 and 5/1-4/2 and 4/1), moderately to slightly calcareous. Faint streaked bedding. Irregular to fairly regular, thick to some thin parting (unctuous); irregular fracture; some broken core. Some ostracods and rare fish (?) fragments. Rare fine light gray claystone layers.

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From	To	Description
488.0	490.0	Claystone and mudstone (oil shale): Medium to light olive gray and greenish gray (5 to 10Y 5/2 and 5/1-6/2 and 6/1, some 4/2-4/1), slightly to moderately calcareous. Faint streaked bedding. Irregular thick to some thin parting (slightly unctuous); irregular hackly fracture. Rare ostracods.
490.0	492.2	Claystone: Medium to some dark slightly olive gray (7.5 to 5Y 5/1 and 5/2-4/1 and 4/2, some 3/1 in lower part), slightly calcareous to slightly dolomitic. Faint streaked bedding. Irregular to regular, thick to thin parting (unctuous); hackly fracture.
492.2	492.3	Marlstone: Buff (5Y 7/2), dolomitic. Some fine light gray streaks and very fine fracture fillings.
492.3	492.4	Claystone (oil shale): Like 492.6-493.2.
492.4	492.6	Limestone: Buff (5Y 7/2), ostracodal. Regularly banded with a fine layer of very dark oil shale 1/2 inch above base.
		TOP OF TIPTON MEMBER OF GREEN RIVER FORMATION
492.6	493.2	Oil shale (shale): Medium to dark olive gray and brownish gray (5Y 4/2-3/2 upper part to 2.5Y 3/2 and rare 2/2 lower part), dolomitic. Faint streaked bedding. Slightly irregular medium to very thin parting (unctuous); hackly fracture. Sample of olive-gray unctuous shale from 492.7 feet: X-ray - quartz, illite, montmorillonite, dolomite, feldspar, pyrite.
493.2	494.0	Oil shale (shaly marlstone): Dark to medium brownish gray (2.5Y 3/1 and 3/2-4/2), calcareous. Faint very fine laminae with abundant very fine distinct tan to buff streaks. Very regular thick to medium parting; fairly regular fracture. Some fine to very small buff nodules. Rare clam shell fragments near base. Sample of oil shale with abundant fine buff streaks from 493.4 feet: X-ray - calcite, quartz, pyrite.
494.0	495.4	Oil shale (marlstone): Brownish gray (2.5Y 4/2-5/2, some 4/1 upper part), calcareous. Moderately distinct to faint laminae. Regular to irregular thick parting; slightly irregular to conchoidal fracture. Some very fine buff streaks in upper part.
495.4	496.4	Oil shale (marlstone): Medium to some dark brownish gray (2.5Y 4/2 and 4/1-5/2, some 3/1 lower part), calcareous. Faintly laminated. Fairly regular thick and rare thin

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		parting; slightly conchoidal and rare slightly hackly fracture. Rare very small to fine tan nodules. A fine light gray silty biotitic layer at 495.5 and a 1/4 inch unctuous gray claystone layer at 496.1.
496.4	498.6	Oil shale (marlstone): Brownish gray (2.5Y 5/2, some 4/2), calcareous. Faintly laminated. Irregular thick parting; slightly conchoidal to irregular fracture. Rare fine buff streaks and blebs. Some very fine tight irregular high angle fractures with dark gray fillings from 496.8 to 497.9.
498.6	500.0	Oil shale (marlstone): Medium to rare dark brownish gray (2.5Y 4/2-5/2, some 4/1 to rare 3/1), calcareous. Faintly laminated. Fairly regular thick to rare thin parting; slightly irregular and conchoidal fracture. Rare small tan to buff nodules. Very rare ostracods.
500.0	501.2	Oil shale (marlstone): Brownish gray (2.5Y to 10YR 5/2, some 4/2-4/1 lower part), calcareous. Very faintly laminated. Irregular thick to medium parting; slightly conchoidal to irregular slightly hackly fracture. Rare ostracods. Sample of brownish-gray oil shale from 500.4 feet: X-ray - calcite, quartz, montmorillonite, pyrite.
501.2	502.0	Oil shale (shale): Dark to medium brownish gray (2.5Y 3/2 and 3/1-4/2; common slight olive tint), moderately to slightly calcareous. Faint streaked bedding and very fine laminae. Regular thick to thin parting; very hackly fracture. A very fine buff-white earthy layer at 501.7. Very rare very fine resinous black blebs. Sample of dark oil shale from 501.5 feet: X-ray - quartz, aragonite, illite, montmorillonite, pyrite, dolomite, calcite.
502.0	502.9	Oil shale (shale and marlstone): Dark to medium brownish gray (2.5Y 3/2-5/2; some slight olive tint), calcareous. Faint streaked bedding to moderately distinct laminae. Slightly irregular thin to thick parting; hackly to irregular and conchoidal fracture. Rare small to fine, tan to buff lenses. A thin gray silty layer at 502.2. Very rare ostracods in lower part.
502.9	503.0	Missing.
503.0	508.0	Oil shale (marlstone): Medium to some light brownish gray and rare buff (2.5Y 5/2-4/2, some 6/2, rare 7/2), calcareous. Moderately distinct to faint laminae and some very faint streaked bedding. Fairly regular to irregular, thick to medium parting; slightly conchoidal to irregular

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		fracture. A vertical fracture with fine calcite crusts in upper 3 inches; some very fine irregular tight high angle fractures with dark fillings in other parts. A thin light gray silty layer 507.1. Very rare ostracods.
508.0	510.1	Oil shale (marlstone): Brownish gray (2.5Y 5/2 upper part to 4/2 lower part), calcareous. Very faintly laminated and streaked. Regular to irregular, thick to rare thin parting; slightly conchoidal and irregular fracture. Rare ostracods. A very fine light gray silty biotitic layer at 508.2 and a thin gray claystone layer at 509.7.
510.1	512.2	Oil shale (shaly marlstone): Medium to dark brownish gray (2.5Y 4/2-3/2 upper part, 4/2-5/2 and rare 3/2 lower part), moderately to slightly calcareous. Faintly laminated and streaked. Regular to irregular, thick to thin parting (slightly unctuous); irregular hackly fracture. Rare ostracods.
512.2	513.5	Oil shale (shaly marlstone): Medium to some dark brownish gray (2.5Y to 10YR 4/2, some 3/2, and some olive gray in lower part (5Y 4/2-3/2), moderately to slightly calcareous. Faint very fine laminae. Regular medium to thin parting; slightly hackly fracture. Some ostracods. Rare very fine tan to buff streaks and laminae. A fine gray silty layer at 512.6.
513.5	514.8	Oil shale (shaly marlstone): Medium and rare dark brownish gray (2.5Y 4/2, rare 3/2), slightly to moderately calcareou Faint very fine laminae. Regular to some irregular, thick to thin parting; slightly hackly fracture. Some ostracods. A very fine short calcite-filled vertical fracture at 514.7 A very fine gray silty to earthy layer near base.
514.8	516.6	Oil shale (marlstone): Medium brownish gray (2.5Y 5/1 and 5/2-4/1 and 4/2), calcareous. Faintly laminated. Fairly regular thick parting; regular to conchoidal fracture. Common very fine buff streaks. Some ostracods and rare small planispiral snails in upper part.
516.6	517.4	Oil shale (shaly marlstone): Dark to medium brownish gray (2.5Y 3/2-4/2), dolomitic. Faint very fine laminae. Regular medium to some thin parting; fairly regular to slightly hackly fracture. Some low angle glossy shear surfaces. A very fine gray claystone layer at 516.9. Sample of dark oil shale from 517.0 feet: X-ray - quartz, illite, montmorillonite, feldspar, pyrite, calcite.
517.4	517.9	Oil shale (shale): Brownish gray (2.5Y 4/2). Very unctuous papery rubble; grab sampled.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		Sample of very unctuous papery shale from 517.4 to 517.9 feet: X-ray - montmorillonite, quartz, illite, kaolin.
517.9	518.2	Dolomite: Medium to some light reddish grayish brown (7.5YR 4/2-5/2, some 6/2-7/2), hard and dense. Faintly laminated near top; massive with some small nodular masses in other parts. Some very fine irregular intersecting calcite-filled fractures.
518.2	521.0	Oil shale (claystone): Medium to some light olive gray (5 to 7.5Y 4/2-5/2, some 6/2), dolomitic. Faint streaked bedding. Irregular thick to some thin parting (slightly unctuous); irregular hackly fracture. Some fine gray-buff silty streaks and blebs. Some thin to 1-inch buff marlstone layers in upper part. Some irregular broken core pieces in upper part.
		Sample of olive-gray claystone from 519.0 feet: X-ray - illite, quartz, montmorillonite, feldspar, dolomite, kaolin.
521.0	528.2	Oil shale? (claystone and mudstone): Medium to light olive gray and greenish gray (5 to 10Y 5/2-6/2, some 4/2), dolomitic to slightly calcareous. Faint streaked bedding. Irregular thick parting; irregular to conchoidal fracture. Abundant fine gray-buff silty streaks and blebs (commonly crossing bedding). A 1-1/2 inch irregular buff marlstone band at 522.3. Abundant fine to very small rounded to lenticular light olive-gray marlstone inclusions at 522.8-523.0. A large irregular buff earthy calcareous nodule at 523.8. Irregular variegated stringer of brownish-gray to buff, dense to silty dolomite at 524.8-525.2 and 1-1/2 inch band at 526.5.
		Sample of light olive-gray mudstone from 524.4 feet: X-ray - quartz, illite, dolomite, calcite, feldspar, ferroan.
528.2	530.0	Oil shale (claystone): Medium to rare dark brownish gray and olive gray (2.5 to 5Y 4/2-5/2, rare 3/2), slightly dolomitic. Faint very fine laminae to very faint streaked bedding. Fairly regular to irregular, thick to some thin parting (slightly unctuous in upper part); irregular to hackly fracture. Hard dense brownish-gray dolomite with some open to calcite-filled fractures at 528.8-529.2. Common fine gray-buff to buff, silty to marly streaks at 529.2-529.6.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
530.0	531.5	Oil shale (claystone): Olive gray (5Y 5/2-4/2), slightly dolomitic. Very faint streaked bedding. Irregular thick to rare thin parting; irregular slight to coarse hackly fracture.
531.5	532.8	Oil shale (claystone); Medium to some light and dark olive gray (5Y 4/2-5/2, some 3/2 and 6/2), dolomitic. Faint streaked bedding to very fine laminae. Irregular to fairly regular, thick to medium parting; irregular hackly to slightly conchoidal fracture. Some very fine gray-buff silty streaks and blebs. Irregular light brownish-gray to rare buff dense to silty dolomite band at 531.8-532.0. Sample of light brownish-gray dolomite (?) from 531.9 feet: X-ray - dolomite, trace quartz, feldspar.
532.8	533.8	Oil shale (shaly marlstone): Medium to some dark olive gray and brownish gray (5Y to 10YR 4/2-5/2, some 3/2), dolomitic. Faint streaked bedding and very fine laminae. Slightly irregular thick to medium parting; irregular and slightly hackly fracture. Common fine gray-buff silty streaks in upper part.
533.8	535.6	Oil shale (marlstone): Medium to light olive gray and brownish gray (5 to 2.5Y 4/2-6/2, rare 7/2), dolomitic. Faint to some moderately distinct laminae and streaks. Fairly regular to irregular thick parting; irregular to slightly conchoidal fracture. Rare fine gray-buff silty streaks and very rare small buff marlstone nodules; some dark limonite-stained material in silty streaks at 535.2.
535.6	536.6	Oil shale (marlstone): Medium olive gray and brownish gray (5 to 2.5Y 5/2-4/2), dolomitic. Faintly laminated. Slightly irregular thick to rare thin parting; irregular slightly hackly fracture. Common thin to fine buff marlstone lenses and streaks at 535.8.
536.6	537.3	Oil shale (marlstone): Medium to rare dark brownish gray and olive gray (2.5 to 5Y 4/2-5/2, rare 3/2), dolomitic. Faint to some moderately distinct laminae. Regular to irregular thick parting; irregular to slightly conchoidal fracture. Sample of oil shale from 536.9 feet: X-ray - dolomite, illite, quartz, feldspar, ferroan, kaolin.
537.3	540.3	Oil shale (marlstone): Medium to some light olive gray (5Y 5/2, some 6/2 and 4/2), dolomitic. Faintly laminated to very faintly streaked. Slightly irregular thick parting;

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		slightly irregular and hackly fracture. Rare fine gray-buff to gray silty streaks. Light brownish-gray dolomite (like 531.9) with some dark streaks and short vertical fractures with chalky coatings at 539.4-539.6.
540.3	541.8	Oil shale (claystone): Medium to some dark brownish gray and olive gray (2.5 to 5Y 4/2-5/2, some 3/2), slightly dolomitic. Faint streaked bedding. Slightly irregular thick to medium parting (slightly unctuous); irregular slight to coarse hackly fracture. Some very fine gray-buff silty streaks. A 1-inch zone of abundant fine to 1/2 inch buff earthy limestone streaks and lenses at 541.6.
541.8	544.2	Oil shale (marlstone): Medium to rare light brownish gray and olive gray (2.5 to 5Y 5/2, some 4/2, rare 6/2), dolomitic. Faint streaked bedding; some faint laminae in upper part. Fairly regular to irregular, thick to medium parting (slightly unctuous in parts); slightly irregular to some irregular coarse hackly fracture. Thin irregular to nodular buff earthy limestone stringers at top and 542.1. Some very fine silty streaks and blebs in browner zones. (542.9-543.0 missing)
544.2	545.2	Oil shale (marlstone): Medium olive gray and brownish gray (5 to 2.5Y 5/2, some 4/2), dolomitic. Faint streaked bedding. Slightly irregular parting and fracture. Some fine gray-buff silty streaks.
545.2	548.2	Oil shale (marlstone): Medium to light olive gray (5Y 5/2-6/2, rare 4/2), dolomitic. Faint streaked bedding and some fine laminae to thin bands. Some very fine gray-buff silty streaks in lower half. Rare fine dark gray pyritic streaks. Light brownish-gray to buff silty dolomite with some irregular vertical fractures partly filled with light gray-green marlstone at 547.0-547.3. Sample of light olive-gray marlstone from 546.5 feet: X-ray - quartz, illite, dolomite, feldspar, ferroan.
548.2	549.2	Oil shale (marlstone): Medium olive gray and brownish gray (5 to 2.5Y 5/2, some 4/2), dolomitic. Faint streaked bedding. Irregular thick parting; irregular to conchoidal fracture. A large irregular buff limestone nodule at 548.4. Some fine buff silty streaks in lower part.
549.2	550.2	Oil shale (marlstone): Medium to some light olive gray (5Y 5/2, some 6/2 and 4/2), dolomitic. Faint streaked bedding and some laminae. Fairly regular thick parting; slightly irregular fracture. Some fine buff to gray-buff silty streaks.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
550.2	551.4	Oil shale (marlstone): Medium olive gray and brownish gray (5 to 2.5Y 5/2-4/2), dolomitic. Faint streaked bedding. Fairly regular thick to rare thin parting; irregular fracture. Some fine buff marlstone streaks at 550.4. Rare very fine buff to gray silty streaks.
551.4	552.4	Oil shale (marlstone): Medium olive gray (5Y 4/2-5/2), dolomitic. Faint streaked bedding to some very fine laminae. Regular to irregular thick parting; irregular fracture. Few fine to thin buff marlstone streaks.
552.4	553.4	Oil shale (claystone): Medium to dark brownish gray and some grayish brown (2.5Y 4/2-3/2, some 4/3), slightly dolomitic. Faintly streaked to very finely laminated. Regular thick to some thin parting; slightly irregular to some coarse hackly fracture. A fine displaced tan marlston layer and some very fine gray-buff earthy streaks near top. Sample of very finely laminated medium to dark grayish-brown oil shale from 552.9 feet: X-ray - dolomite, illite, quartz, montmorillonite, ferroan, feldspar.
553.4	554.4	Oil shale (claystone): Medium to dark brownish gray (2.5Y 4/2-3/2), very slightly dolomitic. Faint streaked bedding and very fine laminae. Regular to some irregular, thick to rare thin parting (slightly unctuous); irregular coarse to slight hackly fracture. A very fine vitreous black streak at 553.5. Several thin to fine brown to tan dolomite layers between 553.6 and 553.9; irregular 1/2-inch tan to buff slightly earthy layer at base. A very thin dark gray silty layer at 554.3. Sample of thin brown dolomite layer from 553.9 feet: X-ray - dolomite; some quartz, feldspar.
554.4	555.1	Oil shale (claystone): Medium to some dark brownish gray and olive gray (2.5 to 5Y 4/2-5/2, some 3/2 upper part), very slightly dolomitic. Faintly laminated. Regular thick to thin parting (slightly unctuous); hackly to slightly irregular fracture. A 3/4-inch marlstone (?) layer at 554.5: gray to brownish-gray blebby wavy zone in upper half and buff slightly earthy zone with very faint flat bedding in lower half. Some very fine gray-buff to dark gray silty streaks and layers in middle part. Sample of brownish-gray to gray upper part of marlstone band from 554.5 feet; X-ray - dolomite, quartz, pyrite, feldspar. Sample of buff slightly earthy lower part of marlstone band from 554.5 feet: X-ray - dolomite, some quartz, feldspar.

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From	To	Description
555.1	555.4	Oil shale (marlstone): Medium and rare dark brownish gray to buff (2.5Y 4/2-7/2, rare 3/2-2/2), dolomitic. Faintly to distinctly laminated. Regular thick parting; fairly regular fracture.
555.4	555.8	Oil shale (shaly marlstone): Medium brownish gray (2.5Y 4/2-5/2), dolomitic. Faint very fine laminae and streaked bedding. Regular thick to thin parting (slightly unctuous); irregular fracture. A 1-inch band of fibrous to prismatic brownish-gray calcite at 555.5 with fine zones of gray claystone at top and bottom. Sample of fibrous to prismatic calcite band from 555.5 feet: X-ray - calcite, trace quartz, dolomite.
555.8	556.1	Marlstone: Buff (2.5Y to 10YR 7/2), slightly silty, dolomitic. Faint very smooth bedding.
556.1	559.0	Oil shale (shale): Dark to rare medium brownish gray (2.5Y 3/2-2/2, rare 4/2), very slightly dolomitic to noncalcareous. Faint streaked bedding. Regular thick to thin parting (unctuous); coarse to slight hackly fracture. Rare irregular glossy shear surfaces. A thin layer of light brownish-gray dolomitic marlstone at 558.5. Sample of very dark shale from 556.6 feet: X-ray - quartz, illite, montmorillonite, dolomite, pyrite, ferroan, feldspar, kaolin.
559.0	559.3	Dolomite: Buff to tan (10YR 7/2-6/3). Hard, dense, massive. Some oolitic streaks and fine crevice fillings. Uneven sample split.
559.3	561.0	Oil shale (claystone): Dark to medium olive gray (5Y 3/2 and 4/2 in upper part to 4/2 and 5/2 in lower part), dolomitic to slightly calcareous in lower part. Faint streaked bedding. Regular to irregular, thick to medium parting (unctuous); irregular to slightly hackly fracture. Thin to 1-inch buff marlstone lenses at 559.8. A fine vermiform buff ostracodal stringer at 560.5-560.7. Fractured core pieces in upper 0.5 foot; uneven sample split.
561.0	563.6	Oil shale (claystone): Medium to some light olive gray (5 to 7.5Y 5/2, some 5/1 in upper part, some 6/2 in lower part), slightly calcareous to dolomitic. Faint streaked bedding. Irregular thick to medium parting (slightly unctuous); slightly irregular to coarse hackly fracture. Hard, dense, massive light brownish-gray to buff dolomite with rare fine cavities and very short open fractures at 562.2-562.8 and 563.2-563.3. Some broken "stringers?" of brownish-gray oil shale as below in lower 2 inches.

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From	To	Description
563.6	566.0	Oil shale (shale): Brownish gray (2.5Y 4/2, very rare 5/2 and 3/2), moderately dolomitic to noncalcareous. Faint streaked bedding and some very fine laminae. Irregular to regular, thick to thin parting (slightly unctuous); irregular hackly fracture. Common fine hackly to vermiform stringers of olive-gray claystone in upper 2 inches. A 1-inch grayish-brown to tan marly zone at 563.8. A thin brown dolomite layer at 564.6 (like 553.9).
566.0	567.2	Oil shale (claystone): Medium to dark brownish gray (2.5Y 4/2-3/2, rare 5/2), slightly dolomitic. Faint streaked bedding and very fine laminae. Irregular to regular thick parting (slightly unctuous); irregular hackly fracture. A faint very irregular fissure filling of massive brownish-gray claystone extends through most of interval; some laminae displaced up to 1/4 inch. Irregularly laminated to massive and nodular, buff to light brownish-gray earthy marlstone in upper 3 inches. Sample of buff earthy marlstone from 566.1 feet: X-ray - dolomite, some quartz.
567.2	568.2	Oil shale (shale): Medium to dark brownish gray (2.5Y 4/2-3/2). Faint very fine laminae and streaked bedding. Regular to irregular, thick to thin parting (slightly unctuous); irregular hackly fracture. Rare fine tan to buff marlstone layers and lenses in upper part. Some irregular glossy shear surfaces in lower part.
568.2	569.9	Oil shale (marlstone and shale): Buff to medium and rare dark brownish gray (2.5Y 7/2-4/2, rare 3/2), dolomitic. Faintly streaked and laminated in thick to thin distinct interbedded lighter marly and darker shaly zones. Fairly regular to irregular, thick to thin parting; irregular coarse hackly fracture. Small irregular tan marlstone inclusions in massive gray claystone in upper inch. Rare very fine gray-buff silty streaks in lower part.
569.9	570.9	Oil shale (shale): Dark and rare medium brownish gray (2.5Y 3/2-2/2, rare 4/2), slightly dolomitic. Faint streaked bedding. Fairly regular to irregular, thick to thin parting (slightly unctuous); irregular coarse hackly fracture. Rare glossy shear surfaces. Thin light brownish-gray to buff dolomitic marlstone layers at 570.3 and 570.7.

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From	To	Description
570.9	572.0	Oil shale (marlstone and shale): Light to dark brownish gray and olive gray (2.5 to 5Y 6/2-2/2, some 4/1-3/1 lower part), dolomitic to noncalcareous. Thick distinctly laminated lighter marlstone zones alternating with very faintly bedded dark shale. Regular thick to thin parting; regular to coarse hackly fracture. Some 1/2-inch buff marlstone lenses at base.
572.0	573.9	Shale (oil shale?): Dark and rare medium slightly brownish gray (2.5Y 3/1 and 3/2-2/1 and 2/2, rare 4/1), noncalcareous. Very faint streaked bedding and some very fine laminae. Regular to irregular, thick to thin parting (slightly unctuous); very irregular hackly fracture. A 1-1/2-inch dark to light slightly olive gray silty limestone band with thin wavy buff marlstone streaks and irregular nodules at 572.4. Very faintly bedded buff earthy marlstone at 572.5-572.8. Some fine medium to light brownish-gray slightly silty streaks and irregular laminae near base. Sample of dark to light gray silty limestone (?) with buff inclusions from 572.4 feet: X-ray - dolomite, quartz, calcite, pyrite, marcasite?, siderite. Sample of dark almost neutral gray shale from 573.4 feet: X-ray - quartz, illite, dolomite, feldspar, montmorillonite, pyrite, kaolin.
573.9	574.6	Oil shale (shale): Dark and rare medium brownish gray (2.5Y 3/2-3/1, rare 4/2). Faint streaked bedding and very fine laminae. Irregular to regular, thick to thin parting (slightly unctuous in upper part); irregular hackly fracture. Thin to fine light brownish-gray to buff silty dolomitic marlstone layers in upper 0.2 foot.
574.6	574.8	Marlstone: Buff to brownish gray (2.5Y 7/2-5/2 and rare 5/1), dolomitic. Massive to faintly laminated. Fine gray-buff blebby marlstone streaks and one fine vermiform vertical stringer in lower inch.
574.8	575.9	Claystone (oil shale?): Medium to dark slightly brownish gray (2.5Y 5/1-3/1 and 3/2); dolomitic and slightly silty in upper part. Faintly laminated and streaked. Slightly irregular thick to medium parting; fairly regular fracture. Some very irregular gray-buff to tan marlstone nodules and short vermiform stringers near top.
575.9	576.9	Oil shale (shale): Dark brownish gray (2.5Y 3/2 and 3/1-2/2), dolomitic in lower part. Very faint very fine laminae and streaked bedding. Fairly regular thick to

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		thin parting (slightly unctuous); irregular hackly fracture. Common very fine gray slightly silty clay streaks and laminae at 576.2-576.3. Sample of shale with very fine gray streaks and laminae from 576.3 feet: X-ray - quartz, illite, (and mica?), montmorillonite, calcite, feldspar, dolomite, pyrite, kaolin.
576.9	578.6	Oil shale (claystone): Medium to dark brownish gray (2.5Y 5/2 and 5/1-3/2 and 3/1), dolomitic in lighter zones. Faintly laminated to very faintly streaked. Irregular thick to rare thin parting (slightly unctuous); irregular hackly and some conchoidal fracture. Fine brown to amber fossil (?) fragments at 577.8.
578.6	583.3	Oil shale (shale): Dark and very rare medium brownish gray (2.5Y 3/2, rare 4/2 lower part), dolomitic. Very faint streaked bedding. Fairly regular to irregular, thick to thin parting (very slightly unctuous); irregular hackly fracture. Some ostracods. Faintly layered medium to light brownish-gray dolomitic marlstone at 582.2-582.4. Vertical fracture with very abundant very fine micaceous crystals in lower half foot. (579.8-580.0 missing) Sample of oil shale with very fine micaceous crystals on fracture surface from 583.0 feet: X-ray - quartz, illite, feldspar, calcite, pyrite, dolomite, kaolin.
583.3	584.2	Oil shale (shale): Dark brownish gray (2.5Y 3/2-2/2), dolomitic to slightly calcareous. Very faint streaked bedding. Slightly irregular thick to thin parting; irregular hackly fracture. Abundant ostracods.
584.2	585.7	Oil shale (shale): Medium to dark brownish gray (2.5Y 4/2-3/2), dolomitic. Very faint streaked bedding. Irregular to fairly regular, thick to thin parting; irregular hackly fracture. Broken core with high angle fractures with rare crusty dolomite patches in upper part. Some ostracods. Uneven sample split.
585.7	590.0	Oil shale (shale): Dark gray (N 3, common very slight brown tint), slightly calcareous. Faint streaked bedding. Irregular thick to thin parting; hackly fracture. Abundant scattered ostracods. Some small to fine brown nodules at 587.6.
590.0	591.0	Oil shale (shale): Medium to dark brownish gray (2.5Y 4/2-3/2 and 3/1), dolomitic to noncalcareous. Very faint streaked bedding. Slightly irregular to very regular,

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From	To	Description
		medium to thin parting (slightly unctuous); hackly fracture. Abundant ostracods in upper part. A fine gray slightly silty claystone layer near top.
591.0	591.4	Marlstone: Tan to some brownish gray (2.5Y 6/3, some 5/2-5/1), dolomitic. Faintly streaked and layered. Sample of tan marlstone from 591.2.feet: X-ray - dolomite, trace quartz.
591.4	592.1	Oil shale: Like 593.1-594.3.
592.1	593.1	Marlstone: Buff to some medium brownish gray (2.5Y 7/2-6/2, some 5/1-4/1), dolomitic. Faintly laminated marlstone in upper 0.2 foot and very faintly banded marlstone from 592.5 to 593.0; dark gray shale at 592.3-592.5; faintly laminated brownish-gray oil shale in lower inch. A very tight diagonal fracture with 1/4-inch displacement in upper part.
593.1	595.3	Oil shale (shale): Dark brownish gray (2.5Y 2/2 in upper part to 3/2 in lower part), slightly dolomitic to slightly calcareous. Faint streaked bedding. Slightly irregular thick to very thin parting (slightly unctuous in upper part); hackly fracture. Abundant ostracods in lower part. Sample of shale from 593.5 feet: X-ray - quartz, illite, montmorillonite, feldspar, pyrite, dolomite, kaolin.
595.3	597.8	Shaly mudstone: Dark to medium gray (N 3 and some 2 in upper part to 4 in lower part; very slight brown tint in lower part), calcareous. Very faintly bedded. Irregular to fairly regular, thick to medium parting; irregular coarse hackly fracture. Very abundant ostracods.
597.8	600.0	Shaly mudstone and claystone: Medium slightly brownish gray (2.5Y 4/1), calcareous. Very faintly bedded. Regular to irregular, thick to some thin parting; irregular hackly fracture. Very abundant ostracods. Sample of ostracodal claystone from 599.4 feet: X-ray - quartz, illite, montmorillonite, calcite, pyrite, feldspar, dolomite, kaolin.
600.0	602.0	Oil shale (shale): Medium to dark brownish gray (2.5Y 4/2-3/2), moderately to slightly calcareous. Very faint streaked bedding. Fairly regular thick to some thin parting; coarse to fine hackly fracture. Abundant ostracods.
602.0	605.0	Oil shale (shale): Brownish gray (2.5Y 4/2), slightly to moderately calcareous. Very faint streaked bedding. Regular to some irregular, thin to thick parting; coarse to slight hackly fracture. Very abundant ostracods.

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From	To	Description
605.0	613.0	Shale and shaly mudstone (oil shale?): Brownish gray (2.5Y 4/2 and 4/1-5/2 and 5/1), calcareous. Faint streaked beddin Regular to irregular, thick to thin parting; hackly to slightly irregular fracture. Abundant ostracods and very rare snail fragments and fish scales. Rare fine to small, buff to brown slightly earthy blebs. Sample of mudstone from 608.3 feet: X-ray - calcite, quartz, illite, pyrite, feldspar.
613.0	615.0	Oil shale (shale): Medium to dark brownish gray (2.5Y 4/2-3/2), slightly calcareous. Faint streaked bedding. Slightly irregular thick to thin parting; irregular fine to coarse hackly fracture. Abundant ostracods. Abundant planispiral snails (Australorbis) in lower part.
615.0	621.5	Oil shale (shale and shaly marlstone?): Medium to dark brownish gray (2.5Y 4/2 and 4/1-3/2), calcareous. Faintly bedded. Irregular thick to thin parting; hackly to irregular fracture. Very abundant clam and snail (Goniobasis) shells and shell fragments. Some ostracods. Broken core at 618.5-620.5; grab sampled.
621.5	622.9	Oil shale (shaly marlstone?): Medium to some dark brownish gray (2.5Y to 10YR 4/2, some 3/2), calcareous. Faintly bedded. Irregular to fairly regular, thick to some thin parting; irregular to hackly fracture. Abundant clam and Goniobasis shells-mostly fragmental. Rare ostracods.
622.9	623.0	Missing.
623.0	624.0	Oil shale (shale) and coquina: Medium to dark brownish gray (10YR 4/2-3/2, rare 2/2), noncalcareous shale. Very faintly bedded shale with thick to thin coquina zones. Irregular to regular, thin to very thin parting; irregular to sharp hackly fracture. Abundant clam and Goniobasis fragments. Some ostracods. Sample of coquina from 623.3 feet: X-ray - calcite; some quartz, illite, pyrite. Sample of dark brownish-gray oil shale with some ostracods and rare shell fragments from 623.8 feet: X-ray - quartz, illite, montmorillonite, feldspar, pyrite, calcite, kaolin.
624.0	626.0	Mudstone and some shale (oil shale in part): Medium to some light and dark brownish gray and rare gray-buff (10YR 4/2-5/2 and 5/1, some 6/1 and 3/2, rare 7/1), moderately to slightly calcareous. Faint to some moderately distinct streaked bedding--irregular in middle

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From	To	Description
		part. Irregular to some regular, thick to medium parting; irregular fracture. Abundant clam and Goniobasis fragments near top and bottom; sparse in middle. Shaly coal with vertical calcite-filled fractures at 624.2-624.4. Sample of mudstone from 624.8 feet: X-ray - quartz, illite, feldspar, montmorillonite, kaolin.
626.0	627.0	Mudstone and some shale: As above. Abundant shell fragments throughout.
627.0	629.0	Oil shale (shale): Dark to medium brownish gray (10YR 3/2-4/2, some 5/2 lower part), calcareous. Faintly bedded. Fairly regular to irregular, thick to thin parting; irregular hackly fracture. Abundant clam and Goniobasis fragments; few thick coquinas. Rare ostracodal zones.
629.0	632.0	Oil shale (shale): Brownish gray (10YR 4/2-5/2), slightly calcareous. Very faintly bedded. Irregular to fairly regular, thin to some thick parting; irregular hackly fracture. Abundant clams in upper and lower parts becoming sparse in middle. Some ostracods.
632.0	634.0	Oil shale (shaly mudstone?): Medium and some dark brownish gray (10YR to 2.5Y 4/2, some 3/2 upper part, some 5/2 lower part), calcareous. Faintly bedded. Irregular to regular, thick to thin parting; irregular hackly fracture. Abundant clams and some snails.
634.0	636.0	Oil shale (claystone?): Medium to some dark brownish gray (10YR 4/2-5/2, some 3/2 lower part), calcareous. Faintly bedded. Irregular thick to rare thin parting; irregular slight to coarse hackly fracture. Abundant clams and snails; some thin coquinas. Sample of oil shale from 634.3 feet: X-ray - calcite, quartz, illite.
636.0	640.4	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2), moderately to slightly calcareous. Faintly bedded. Irregular to fairly regular, thick to thin parting; hackly fracture. Abundant clams and snails; some thin coquinas. Some ostracods.
640.4	641.2	Mudstone and shale: Medium to some light and rare dark brownish gray (10YR 5/1 and 5/2-4/1 and 4/2, some 6/1, rare 3/2), slightly calcareous. Faintly streaked. Slightly irregular thick to thin parting; irregular to hackly fracture. Rare ostracods and small Goniobasis; one small Australorbis. Fine-grained limestone with abundant Goniobasis in upper 0.2 foot.

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From	To	Description
641.2	642.0	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous to slightly dolomitic. Very faintly bedded. Slightly irregular thick to very thin parting; irregular sharp hackly fracture. Fairly abundant ostracods. Some snails and clams. A 1-inch massive tan dolomite band with some snails at 641.4. Sample of tan dolomite with rare calcite-filled snails from 641.4 feet: X-ray - siderite, trace quartz.
642.0	643.0	Oil shale: As above and below with thick to thin irregular brownish-gray fine-grained fossiliferous limestone layers and streaks.
643.0	645.0	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2), slightly to noncalcareous. Faintly bedded. Regular to irregular, thin to thick parting; hackly fracture. Some ostracods. Sparse clams and Goniobasis in upper part becoming fairly abundant in lower part. A thin tan dolomitic layer at 643.6 and a 1-inch grayish-brown layer at 644.1. A thin layer of brownish-gray silky calcite at 644.7.
645.0	657.4	Oil shale (shale): Dark to medium brownish gray (10YR 3/2-5/2), slightly to moderately calcareous. Faintly bedded. Irregular thick to thin parting; hackly fracture. Abundant clam and snail fragments; common thin to 3-inch coquinas. Some ostracodal zones. A very thin coal layer at 656.7. NOTE: Core 27 (663-683) was partly jumbled while flushing jammed core from barrel. Core sequence uncertain--especially lower half.
657.4	676.8	Oil shale (shale): Dark to medium brownish gray (10YR to 2.5Y 3/2-4/2), slightly to moderately calcareous. Faintly bedded. Slightly irregular very thin to thick parting; hackly to slightly irregular fracture. Abundant ostracods and mollusk fragments. Very rare fish scales. Rare coquinas.
		TOP OF NILAND TONGUE OF WASATCH FORMATION
676.8	677.2	Coal: Black, subvitreous, brittle. Very faintly bedded.
677.2	677.6	Oil shale (shale): Dark brownish gray (10YR 3/2), calcareous. Faintly bedded. Irregular thick to medium parting; hackly to slightly irregular fracture. Abundant ostracods and some Goniobasis.

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From	To	Description
677.6	679.0	Oil shale (shale): Medium to very dark brownish gray (10YR 4/2-2/2), calcareous. Faintly bedded. Irregular thick to thin parting; irregular to hackly fracture. Some snail and clam fragments. Fine-grained brownish-gray fossiliferous limestones at 677.9-678.1 and 678.5-678.7.
679.0	681.8	Claystone: Brownish gray (10YR 4/1-5/1), calcareous. Faintly bedded. Irregular thick to thin parting; very irregular hackly fracture; commonly soft and crumbly. Abundant ostracods. Some mollusk fragments in upper part. Uneven sample split. Sample of crumbly claystone from 680.5 feet: X-ray - illite, quartz, pyrite, kaolin.
681.8	682.6	Coaly shale and coal: Very dark brownish gray to black (10YR 2/2-1/2), resinous to vitreous. Very faint streaked bedding. Irregular to fairly regular, thick to rare thin parting; coarse hackly to irregular fracture. Uneven sample split.
682.6	683.5	Shale: Dark to medium brownish gray (10YR 2/2 and 2/1-4/2 and 4/1), some resinous to vitreous coaly streaks. Faintly bedded. Fairly regular to irregular, thick to some thin parting; irregular fracture. Some irregular calcite-filled fractures.
683.5	686.2	Coal and shale: Black subvitreous coal at 683.5-684.0, 684.3-684.6 and 685.9-686.2; very dark brownish-gray shale (10YR 2/2-3/2) in other parts--commonly with coaly streaks in upper part. Fairly regular thick to thin parting; irregular to hackly fracture. Some very fine high angle calcite-filled fractures in coal. Uneven sample split.
686.2	689.0	Claystone: Like 679.0-681.8. Some hard limy fossiliferous zones. Uneven sample split.
689.0	693.0	Shale: Brownish gray (10YR to 2.5Y 4/2-5/2), calcareous. Faintly bedded. Irregular to fairly regular, thick to thin parting; irregular to hackly fracture. Common thin to thick coquinas (mostly Goniobasis, some clams).
693.0	694.3	Shale (oil shale?): Medium to dark brownish gray (10YR 4/2-3/2), calcareous. Faint streaked bedding. Irregular thick to some thin parting; irregular to coarse hackly fracture. Abundant ostracods. Some mollusk fragments. Some high angle calcite-filled fractures in upper part.
694.3	695.0	Siltstone and some mudstone: Medium to light gray (N 5-6; common slight brown tint), calcareous. Faintly mottled and streaked. Irregular parting and fracture. Some muscovite flakes.

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From	To	Description
695.0	696.0	Mudstone and shale: Brownish gray (10YR 5/2-4/2), moderately to slightly calcareous. Faint streaked bedding. Irregular thick to rare thin parting; irregular to slightly hackly fracture. Some clams.
696.0	696.7	Oil shale (mudstone and shale): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous. Faint streaked bedding. Irregular thick to rare thin parting; irregular to hackly fracture. Fairly abundant ostracods. Some clams and Goniobasis.
696.7	699.7	Siltstone and very fine sandstone: Light gray (N 6-7; some very slight brown tint), very calcareous, micaceous. Massive with some very faint streaks, becoming finely layered with slightly brownish gray mudstone in lower part. Irregular thick parting; slightly irregular fracture.
699.7	700.5	Coaly shale: Very dark brownish gray to black (10YR 2/2-1/2), very common resinous to vitreous streaks. Faintly bedded. Regular thick parting; irregular slight to coarse hackly fracture.
700.5	701.3	Shaly mudstone: Dark brownish gray (10YR 2/2-3/2), noncalcareous. Very faintly bedded. Fairly regular thick to medium parting; irregular hackly fracture. Vertical fracture with fine-grained patchy pyrite crusts in upper 0.3 foot.
701.3	703.8	Siltstone and fine sandstone: Light gray (N 7) and medium to light slightly brownish gray (10YR 5/1-6/1), calcareous, micaceous. Faint to fairly distinct irregular to streaks and fine layers. Irregular to fairly regular thick parting and fracture; medium to thin parting and irregular hackly fracture at 702.4-703.0. NOTE: Core 29 (703-723) spilled from core barrel. Core sequence uncertain.
703.8	704.2	Shale: Medium to dark brownish gray (10YR 4/2 and 4/1-3/2), slightly calcareous. Faintly bedded. Slightly irregular shaly to papery parting; fine sharp hackly fracture. Rare Goniobasis.
704.2	706.5	Siltstone and fine sandstone: Light to medium gray (N 7-5, rare 8; common slight brown tint), moderately to slightly calcareous, micaceous. Faint to fairly distinct fairly regular to very irregular streaks and fine layers. Irregular parting and fracture. Medium to dark brownish-gray shale at 705.3-705.5.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
706.5	707.6	Siltstone and fine sandstone: Medium to light gray (N 4-8), slightly to moderately calcareous. Distinct very fine regular to irregular laminae and streaks. Fairly regular thick parting; slightly irregular fracture.
707.6	708.9	Siltstone and mudstone: Light to medium slightly brownish gray (N 6-5, rare 7), slightly calcareous, micaceous. Faint streaked bedding. Slightly irregular parting and fracture. Rare fine sandy layers.
708.9	709.5	Shale: Medium to dark brownish gray (10YR 4/1-3/1 and 3/2). Faint streaked bedding. Slightly irregular thick to rare thin parting; slightly hackly fracture. Some very fine silty streaks. Some ostracods.
709.5	710.8	Claystone: Gray (N 5; very slight brown tint), very slightly calcareous. Very faint streaked bedding. Irregular thick to some thin parting (unctuous); very irregular fine hackly fracture. Irregularly streaked dark to light slightly brownish gray siltstone and fine sandstone in upper 0.2 foot.
710.8	713.0	Shale: Like 708.9-709.5; becoming interbedded with gray claystone as above in lower part. Rare clam fragments.
713.0	713.9	Shaly mudstone: Dark brownish gray (10YR 3/1-3/2), slightly calcareous. Faint streaked bedding. Irregular to fairly regular, thick to rare thin parting; irregular hackly fracture. A 1-inch coal bed at 713.3 with a 2-inch band of slightly brownish gray limestone with abundant clam and snail fragments below. Rare plant fragments.
713.9	714.3	Coal: Black, vitreous to subvitreous. Vertical fractures with rare calcite crusts.
714.3	715.5	Mudstone (oil shale?): Medium and rare dark brownish gray (10YR to 2.5Y 4/2-4/1, rare 3/2), calcareous. Very faint streaked bedding. Slightly irregular thick parting; irregular to slightly conchoidal fracture. Abundant ostracods, some snails (Australorbis and Goniobasis), and rare clams. Sample of mudstone from 715.1 feet: X-ray - calcite, quartz, illite, pyrite.
715.5	716.4	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2, some 2/2 lower part), slightly calcareous in upper part. Very faint streaked bedding. Slightly irregular thick to thin parting (slightly unctuous in upper part); irregular very fine to moderately coarse hackly fracture. Some ostracods, clams, and snails near top.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
716.4	720.6	Coaly shale and coal: Very dark brownish gray to black (10YR 2/2 and 1/2 to N 1), resinous to vitreous. Mostly shale with thin to papery parting and common coaly streaks in upper and lower parts; mostly coal in middle. A dark to medium brownish-gray faintly bedded coaly zone with abundant very fine buff specks and some fish scales at 717.1-717.4 and a 2-inch band of medium brownish-gray marlstone with abundant very fine buff specks and rare very small clams? at 719.8. Sample of brownish-gray marlstone with very fine buff specks from 719.8 feet: X-ray - calcite, trace quartz.
720.6	722.8	Siltstone: Light gray (N 6, some 7), slightly calcareous. Faintly streaked and mottled. Medium to light slightly brownish gray claystone and some coal in lower 0.3 foot.
722.8	726.4	Coal: Black, vitreous to subvitreous. Some calcite-filled fractures. Dark brownish-gray coaly shale with abundant ostracods and rare clams at 725.0-725.6 and 725.9-726.0.
726.4	727.1	Mudstone and siltstone: Medium to light slightly brownish gray (N 5-6), slightly calcareous. Faint streaked bedding. Irregular parting and fracture. Some carbonaceous plant trash.
727.1	728.5	Mudstone and shale: Medium to light brownish gray (10YR 4/2-6/1), calcareous. Faint streaked bedding. Irregular thick to thin parting (unctuous); irregular hackly fracture. Abundant ostracods and some clams and snails in upper 0.4 foot; rare clams near base. Uneven sample split. Sample of light slightly brownish gray shale from 727.6 feet: X-ray - quartz, illite, calcite, kaolin, dolomite, pyrite.
728.5	729.8	Limestone: Light to some dark brownish gray (10YR 6/1-5/1, some 4/1-3/1 lower part). Massive, hard, tight. Conchoidal to irregular fracture. Common tight high angle fractures. Rare very small snails and fish scales. Sample of hard massive limestone from 728.7 feet: X-ray - calcite, some quartz, illite.
729.8	730.2	Shale and coal: Dark brownish-gray shale with fine coal streaks and thin layers. Some very fine pyrite crystals.
730.2	730.9	Mudstone: Light gray (N 6, very slight brown tint). Very faintly streaked. Irregular parting and fracture. Some very fine variously oriented dark gray to black pyritic streaks.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
730.9	733.0	Mudstone, siltstone, and very fine sandstone: Gray buff to medium and rare dark brownish gray (7.5 to 10YR 7/1-4/2, rare 3/2), very slightly calcareous, slightly micaceous. Mottled to irregularly streaked and layered. Irregular to fairly regular thick parting; irregular to some slightly hackly fracture. Some very fine vertical to horizontal dark gray pyritic streaks in upper part. A fine coal layer at top.
733.0	735.8	Siltstone and very fine sandstone: Light to medium brownish gray and gray (7.5 to 10YR 6/1-4/1 and 4/2, and N 6-7), calcareous, micaceous. Faintly layered in upper part to irregularly streaked in lower part. Fairly regular to irregular thick parting; irregular fracture. Rare mollusk (?) fragments.
735.8	739.9	Sandstone: Very light gray (N 7-8), fine grained, micaceous, calcareous. Massive in upper foot; bedding distinctly marked in other parts by abundant very fine irregular to regular black coaly streaks and seams. Irregular to fairly regular parting and fracture.
739.9	740.7	Claystone: Brownish gray (10YR 5/2-4/2), slightly calcareous. Massive. Irregular thick to thin parting (slightly unctuous); very irregular fine hackly fracture; common desiccation cracks. Some mollusk fragments in lower part.
740.7	741.7	Mudstone and claystone: Light slight brownish gray to gray buff (2.5Y 6/1-8/1), slightly calcareous. Faint streaked bedding. Irregular parting and fracture.
741.7	744.1	Claystone: Brownish gray (10YR 5/2 and 5/1-4/2), calcareous. Massive to very faintly streaked. Irregular thick to some thin parting; very irregular hackly fracture. Abundant ostracods. Some clam and snail fragments.. (742.2-743.0 missing)
744.1	745.3	Claystone: As above. Abundant clam and snail fragments. Coal and coaly shale in lower 0.4 foot.
745.3	750.6	Sandstone: Very light gray (N 7-8), very fine grained, micaceous, calcareous. Faintly streaked to massive; some very fine distinct black carbonaceous streaks in middle part. Irregular parting and fracture. A fine high angle calcite-filled fracture at 746.0-746.3; thin irregular pyrite-impregnated zones along very fine high angle fractures at 746.4-746.8, 748.4-748.6, and 749.7-750.6.

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Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
750.6	753.7	Fault breccia: Brownish-gray (10YR 5/2-4/2) claystone breccia with very abundant coarsely crystalline calcite and some massive to disseminated pyrite. A thick irregular high angle vein of very coarse sparry milky white to very pale brown calcite from 752.1 to 752.6. Very irregular parting and fracture. Small water flow from this zone. (Probably lost 4 feet of core here) Sample of claystone breccia with very abundant calcite from 751.3 feet: X-ray - calcite; some quartz, illite, kaolin. Sample of white calcite vein from 752.4 feet: X-ray - calcite, trace quartz.
753.7	756.7	Claystone: Medium to rare dark brownish gray and tan (10YR 5/2-4/2, rare 3/2 and 6/3), calcareous. Faint very distorted bedding; some fault breccia with calcite and rare pyrite. Rare mollusk shell fragments. Very irregular parting and fracture; uneven sample split. Sample of brownish-gray claystone from 755.8 feet: X-ray - quartz, illite, kaolin, calcite, pyrite, dolomite.
756.7	757.6	Claystone and siltstone: Light gray (N 6-7), calcareous. Distorted gray claystone with some thin brownish-gray stringers in upper 0.3 foot. Massive siltstone with fine to thin calcite- and pyrite-filled fractures in lower part.
757.6	762.0	Missing (core loss probably in fault zone)
762.0	767.2	Sandstone: Light gray to buff white (N 7 to 10YR 9/1), fine grained, calcareous, massive. Few fine irregular high angle fractures with pyrite and calcite fillings. Some broken core with irregular slightly open fractures in middle part.
767.2	771.3	Siltstone and fine sandstone: Light gray (N 7-6; common slight brown tint), calcareous. Faint streaked bedding; inclined about 45° below 770.5. Some light slightly brownish gray claystone in upper part. Some irregular areas with sparry calcite and fine pyrite patches from 769.8 to 770.3. Common fine diagonal to vertical calcite-filled fractures at 770.4-770.7.
771.3	775.9	Claystone: Brownish gray (10YR 5/2-4/2), calcareous. Faint streaked bedding. Very irregular parting and fracture; common desiccation cracks. Abundant clam and snail fragments (probably Goniobasis and Viviparus). A 1-1/2 inch round hard dense olive-gray nodule at 775.0. Uneven sample split. Sample of hard dense olive-gray nodule from 775.0 feet: X-ray - pyrite, calcite.

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Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
775.9	779.7	Coal and some coaly shale: Black to very dark brownish gray, subvitreous. Some fractures with calcite and pyrite. Fibrous white efflorescence in some shaly zones. Sample of coaly shale with fibrous white efflorescence from 779.6 feet: X-ray - siderotil, marcasite, pyrite.
779.7	786.2	Sandstone: Very light gray (N 7-8), fine grained, calcareous. Faintly streaked to massive. Some micaceous streaks. Light gray claystone in upper 0.3 foot.
786.2	790.4	Sandstone and siltstone: Light to some medium slightly brownish gray (N 6-8, some 5), calcareous. Faint streaked bedding; common very fine distinct dark micaceous streaks in upper part. Light slightly brownish-gray claystone in lower 0.3 foot.
790.4	790.7	Coal: Black, subvitreous. Badly broken; grab sampled.
790.7	791.3	Shale: Very dark brownish gray (10YR 2/2). Very faintly bedded. Slightly irregular thick parting; irregular hackly fracture. Common very fine coaly streaks in upper part. Sample of shale from 791.2 feet: X-ray - quartz, mica, pyrite, chlorite, feldspar.
791.3	793.0	Claystone and mudstone: Medium brownish gray to light gray (10YR 4/1 and 4/2 to N 6 and rare 7). Very faintly streaked brownish gray claystone in upper and lower parts grading to light gray nearly massive slightly calcareous mudstone in middle. Some ostracods and rare mollusk fragments in claystone.
793.0	797.3	Claystone (oil shale?): Brownish gray (10YR 4/2-5/2), slightly calcareous. Very faint streaked bedding. Irregular to fairly regular, thick to rare thin parting; irregular fracture. Very abundant ostracods and snail and clam fragments commonly in thick coquinas (snails not identified but some fragments suggest Viviparus or possibly Physa).
797.3	798.3	Shale and claystone (oil shale?): Brownish gray (10YR 4/2), slightly calcareous. Very faint streaked bedding. Regular to irregular, thin to thick parting; slightly hackly to irregular fracture. Abundant ostracods and snail (Goniobasis) and clam fragments.
798.3	799.6	Coal: Black, subvitreous. Some vertical fractures with pyrite and calcite. Dark brownish-gray carbonaceous siltstone in upper 0.2 and lower 0.1 foot. Badly broken; uneven sample split.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

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From	To	Description
799.6	803.7	Sandstone: Very light gray (N 7-8), fine grained, calcareous. Faint irregular to regular bedding with common distinct dark carbonaceous streaks and stringers; some thick medium to very dark brownish-gray carbonaceous to coaly siltstone layers in lower part.
803.7	804.2	Coaly shale: Very dark brownish gray to black (10YR 2/2-1/2); very common very fine subvitreous streaks and rare thin layers. Very faint streaked bedding. Regular thick to thin parting; irregular slightly hackly fracture.
804.2	806.1	Coal and coaly shale: Black to dark brownish gray (10YR 1/2-3/1), subvitreous. Common vertical fractures with pyrite and calcite.
806.1	807.4	Siltstone and very fine sandstone: Gray buff to light brownish gray (10YR 7/1-6/1), slightly calcareous. Faint irregular to contorted streaked bedding. Light brownish-gray claystone in upper 0.2 foot.
807.4	808.4	Mudstone and claystone: Light to medium brownish gray (10YR 6/1-4/2). Very faint streaked bedding. Regular to irregular, thick to thin parting; fine hackly to very irregular fracture. Some thin gray-buff siltstone stringers in upper part. Coaly shale with fine streaks of white efflorescent powder at 808.0-808.1.
808.4	810.4	Siltstone and mudstone: Medium to light slightly brownish gray (10YR 5/1-6/1, some N 7 in lower part), very slightly calcareous. Very faintly bedded to irregularly layered and streaked.
810.4	812.1	Shaly mudstone and shale: Dark to medium brownish gray (10YR 3/2-4/2, rare 5/2-5/1). Very faint streaked bedding. Irregular thick to thin parting; irregular hackly fracture. Rare ostracods and mollusk fragments. Light slightly brownish gray mudstone conglomerate at 811.2-811.3. A high angle fracture with very fine patchy tan calcite (?) crusts at 811.3-811.5.
812.1	813.6	Mudstone: Dark to medium brownish gray (10YR 3/2-4/2 and 4/1), slightly to moderately calcareous. Faint streaked bedding. Irregular to regular, thick to rare thin parting; irregular to slightly hackly fracture. Abundant ostracods and some mollusk fragments. A 3/4-inch irregular grayish-brown dolomitic layer at 812.3.
813.6	814.9	Shale: Dark to medium brownish gray (10YR to 2.5Y 3/2-4/2). Faint streaked bedding. Slightly irregular thick to thin parting; irregular to hackly fracture. Abundant clam and Goniobasis fragments, some ostracods. Fossiliferous limestone in upper 0.3 foot.

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Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
814.9	816.7	Mudstone and siltstone: Medium to light brownish gray and gray (10YR 4/2-6/1 and N 6), slightly to moderately calcareous. Faint to moderately distinct irregular streaks and layers. Slightly irregular to irregular parting and fracture. Very fine-grained fossiliferous limestone in upper 3 inches.
816.7	818.1	Shale: Medium to dark brownish gray (10YR 4/2-3/2). Very faint streaked bedding. Slightly irregular thick to thin parting; slightly hackly fracture. Fairly abundant Goniobasis and clam fragments; some ostracods. A 3/4-inch tan dolomitic layer at 816.8 and thin layers at 817.3 and 817.9. Sample of fossiliferous shale from 817.5 feet: X-ray - quartz, illite, kaolin, pyrite, calcite.
818.1	819.9	Shale: As above with abundant thin to 1-inch mollusk coquinas. Sample of 1-inch coquina band from 819.2 feet: X-ray - calcite, some quartz, illite, kaolin.
819.9	821.0	Mudstone: Medium brownish gray (10YR 4/2-5/2), calcareous. Faint irregular streaked bedding. Slightly irregular thick to medium parting; irregular fracture. Abundant Goniobasis and clam fragments, mostly concentrated in thin to thick zones. Sample of mudstone from 820.1 feet: X-ray - quartz, illite, feldspar, kaolin.
821.0	822.4	Shale: Very dark to medium brownish gray (10YR 2/2-4/2), common very fine black coaly streaks in some zones. Faint streaked bedding. Slightly irregular thick to some thin parting; slight to rare coarse hackly fracture. Some fine to thick fossiliferous zones as above. Sample of very dark coaly shale from 821.9 feet: X-ray - quartz, illite, pyrite, feldspar, calcite, kaolin.
822.4	823.3	Mudstone: Brownish gray (10YR 4/2), slightly calcareous. Very faint streaked bedding. Fairly regular thick parting; slightly irregular fracture. Some mollusks and ostracods.
823.3	824.0	Siltstone and mudstone: Medium to light gray (N 5-6), some brownish gray in upper and lower parts (10YR 5/2 and 5/1-4/2); moderately to slightly calcareous. Moderately distinct irregular brownish-gray and gray streaks and stringers in upper 0.2 foot; faint very fine regular

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		streaked bedding in other parts. Irregular parting and fracture. Some mollusks in upper and lower parts. Sample of hard gray calcareous siltstone from 823.6 feet: X-ray - quartz, calcite, illite, feldspar, dolomite, kaolin.
824.0	825.4	Claystone and shale (oil shale?): Medium to dark brownish gray (10YR 4/2-3/2), moderately to very slightly calcareous. Very faint streaked bedding. Slightly irregular thick to some very thin parting; slightly irregular to hackly fracture. Abundant thin to thick mollusk coquinas. A 1-inch massive grayish-brown dolomite (?) band at 825.2. Sample of grayish-brown dolomite (?) from 825.2 feet: X-ray - siderite, trace quartz.
825.4	826.8	Mudstone: Brownish gray (10YR 4/2-4/1), very to slightly calcareous. Faint irregular streaked bedding. Irregular parting and fracture. Very abundant clam and rare snail fragments--almost a coquina in upper half.
826.8	827.4	Claystone (oil shale?): Dark brownish gray (10YR 3/2; 2/2 in upper 0.1 foot), rare very fine coaly streaks near top, very slightly calcareous. Very faint streaked bedding. Slightly irregular thick parting; slightly hackly fracture. Some mollusks and ostracods.
827.4	828.7	Mudstone: Brownish gray (10YR 4/2 and 4/1-5/2 and 5/1), very to slightly calcareous. Faint irregular streaked bedding. Irregular parting and fracture. Abundant mollusk fragments--almost coquina in middle part.
828.7	832.7	Claystone: Brownish gray (10YR 4/2), slightly to moderately calcareous. Faint streaked bedding. Irregular thick to rare thin parting; irregular slightly hackly fracture. Abundant mollusk fragments and ostracods; some thin to thick coquinas.
832.7	833.0	Missing.
833.0	850.7	Claystone: Medium to some dark brownish gray (10YR to 2.5Y 4/2, some 3/2), slightly to moderately calcareous. Faint streaked bedding. Fairly regular thick to rare thin parting; slightly hackly fracture. Abundant ostracods and mollusk fragments (clams, Goniobasis, possible Viviparus, rare Australorbis). Very rare fish scales. Rare fine to very small, tan to brown blebs (coprolites?). Sample of claystone from 844.5 feet: X-ray - quartz, calcite, illite, pyrite, feldspar, kaolin.

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From	To	Description
850.7	854.7	Claystone: Brownish gray (10YR 5/2-6/2), slightly calcareous. Faint streaked bedding. Fairly regular to irregular, thick to medium parting; slightly irregular and hackly fracture. Abundant mollusk fragments concentrated in thin to 2-inch zone. A 3-inch gray fossiliferous limestone at top.
854.7	857.3	Claystone (oil shale?): Medium to dark and rare light brownish gray (10YR 4/2-3/2, some 5/2 to rare 6/2), very slightly calcareous. Very faint streaked bedding with some fairly distinct thin lighter layers. Fairly regular thick to medium parting; slightly hackly fracture. Abundant mollusk fragments mostly concentrated in thin to fine zones. Sample of dark oil shale with some shell fragments from 856.8 feet: X-ray - quartz, illite, kaolin, feldspar, calcite.
857.3	859.0	Siltstone and very fine sandstone: Light to medium and some dark gray (N 6-4, some 3 lower part; very slight brown tint in darker parts), micaceous; moderately calcareous in sandy parts to very slightly calcareous in silty parts. Faint distorted streaked bedding in upper part to moderately distinct regular streaks and rare bands in lower part. Irregular to fairly regular parting and fracture.
859.0	860.2	Siltstone and mudstone: Light to medium slightly brownish gray and rare tan to buff (N 6-5 and 10YR 6/1-5/1, rare 4/1 and 6/3-7/2), very slightly calcareous to noncalcareous. Faint streaked bedding. Slightly irregular thick to medium parting; slightly irregular to irregular fracture. Rare mollusk fragments.
860.2	861.2	Claystone (oil shale?): Dark to some medium brownish gray (10YR 3/2, some 4/2), slightly to moderately calcareous. Faint streaked bedding. Slightly irregular thick parting; slightly irregular and some very slight hackly fracture. Fairly abundant mollusk fragments.
861.2	861.7	Claystone (oil shale?): Medium to some light brownish gray and buff (10YR to 2.5Y 4/2-5/2, 6/2-7/2 at 861.6-861.7), very slightly calcareous. Faint streaked bedding. Regular thick parting; slightly irregular and hackly fracture. Rare mollusk fragments.
861.7	862.4	Sandstone: Medium to light slightly brownish gray (2.5Y 5/1-6/1), very calcareous. Mottled and speckled to massive. Irregular parting and fracture. Very abundant snail fragments (probably Viviparus).

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From	To	Description
862.4	867.6	Sandstone: Very light gray to nearly white (N 7 to 10YR 9/1), fine to medium grained, micaceous, calcareous in upper part. Massive in upper part becoming faintly to distinctly bedded with very fine dark regular to slightly irregular streaks in lower part. Light to medium gray and brown siltstone and mudstone as below at 865.3-865.5 (not out of place). A 1/2-inch regular very pyritic zone at 865.1; limonite-stained zone with some fine black pyritic (?) blebs at 867.4-867.5.
867.6	869.0	Siltstone and mudstone: Light to medium gray (N 7-4) and some brownish gray to rare brown (10YR 5/2 and 5/3-4/2 and 4/1, rare 5/4). Distinct to faint, regular to irregular streaks and fine to thick layers. Slightly irregular thick to medium parting; slightly irregular fracture. Rare mollusks.
869.0	870.7	Claystone (oil shale): Medium to dark brownish gray (10YR and 2.5Y 4/2-3/2), very slightly calcareous. Faint streaked bedding and some laminae. Regular to irregular, thick to rare thin parting; slightly irregular to irregular hackly fracture. Abundant clams and snails (mostly Goniobasis, one possible Gyraulus).
870.7	871.0	Missing.
871.0	872.5	Mudstone near top grading to siltstone and very fine sandstone: Medium to light slightly brownish gray (10YR to 2.5Y 5/1-6/1), very slightly to moderately calcareous. Faint slightly irregular streaked bedding. Fairly abundant mollusks near top becoming sparse in lower part. NOTE: Core 39 (873-889) was left out exposed to weather for several days after fishing out twisted off drill string.
872.5	876.0	Sandstone, siltstone, and some mudstone: Light gray to gray buff and some light to medium brownish gray (N 6 to 10YR 8/1 and some 10YR 6/2-5/2 and 5/1, rare 4/2-4/2), calcareous in sandy parts. Massive to faintly streaked sandstone and siltstone becoming interbedded with thin to fine irregular to fairly regular mudstone streaks and layers.
		TOP LUMAN TONGUE OF GREEN RIVER FORMATION
876.0	877.0	Shaly mudstone and shale: Brownish gray (10YR to 2.5Y 5/2-4/2). Faint streaked bedding. Irregular thick to thin parting; very irregular hackly fracture. Abundant mollusk fragments.

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From	To	Description
877.0	879.1	Shale (oil shale?): Brownish gray (2.5Y 5/2-4/2). Very faintly bedded. Irregular thin to rare thick parting; irregular coarse to sharp hackly fracture; middle part badly broken and mixed from splitting. Abundant snails (mostly Goniobasis) and rare clams. Partly grab sampled.
879.1	884.0	Shale (oil shale?): Medium to dark brownish gray (10YR and 2.5Y 4/2-3/2, rare 5/2), slightly calcareous in parts. Very faintly bedded. Irregular to regular, shaly to papery parting; hackly fracture. Abundant mollusk fragments (mostly Goniobasis, some possible Physa and/or Viviparus) and ostracods.
884.0	889.0	Shale (oil shale?): Medium to some dark brownish gray (2.5Y 4/2, some 10YR 3/2), slightly calcareous. Very faintly bedded. Shaly to papery parting; hackly fracture. Abundant ostracods. Some mollusk fragments in upper part. Some fish scales in lower part. Sample of shale from 886.3 feet: X-ray - quartz, illite, montmorillonite, feldspar, calcite, pyrite, kaolin.
889.0	889.6	Missing.
889.6	891.0	Shale: As above. Mostly broken and mixed up core; grab sampled.
891.0	893.0	Missing.
893.0	895.0	Claystone (oil shale?): Brownish gray (2.5Y 5/2-4/2), calcareous. Very faintly laminated. Regular to irregular, thick to some thin parting (unctuous); slightly conchoidal to some hackly fracture. Very rare fine buff blebs (coprolites?). Sample of claystone from 893.7 feet: X-ray - calcite, quartz, illite, pyrite.
895.0	901.0	Shale (oil shale): Medium to rare dark brownish gray (2.5Y 4/2, rare 3/2), calcareous. Very faint laminae and streaked bedding. Regular thick to thin parting (unctuous); slightly irregular to hackly fracture. Rare fine buff blebs. Very rare ostracods.
901.0	903.0	Shale (oil shale?): Medium to dark brownish gray (2.5Y 4/2-3/2), moderately to slightly calcareous. Faint very fine laminae. Regular thick to very thin parting (slightly unctuous); slightly to very hackly fracture. Sample of dark brownish-gray shale from 902.4 feet: X-ray - quartz, illite, calcite, pyrite, kaolin.

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From	To	Description
903.0	905.0	Shale (oil shale?): Medium to rare dark brownish gray 2.5Y 4/2, rare 3/2 and 5/2), moderately to very slightly calcareous. Faint very fine laminae to very faint streaked bedding. Regular thick to thin parting (slightly unctuous); hackly fracture. Rare buff blebs and very rare fish scales. Rare very ostracodal parting surfaces in lower part. A fine vitreous black brittle organic layer at 903.9.
905.0	908.0	Shaly mudstone and shale: Medium slightly brownish and olive gray (2.5 to 5Y 4/1), very slightly calcareous. Very faint streaked bedding. Regular to irregular, thick to thin parting; slight to coarse hackly fracture. Abundant ostracods. Sample of slightly brownish-gray mudstone from 905.5 feet: X-ray - quartz, illite, feldspar, siderite, calcite, pyrite, kaolin.
908.0	910.0	Shale (oil shale?): Brownish gray (2.5Y 4/2-4/1), calcareous. Very faintly bedded. Regular to some irregular, thick to thin parting; coarse to slight hackly fracture. Abundant ostracods. Rare mollusk fragments in lower part.
910.0	912.5	Oil shale (shale): Medium to dark brownish gray (2.5Y to 10YR 4/2-3/2), slightly calcareous. Faint streaked bedding. Regular to irregular, thick to rare thin parting; slight to coarse hackly fracture. Very abundant ostracods and clam fragments; some very small planispiral snails. Sample of dark brownish-gray fossiliferous oil shale from 912.2 feet: X-ray - quartz, illite, calcite, pyrite, montmorillonite, kaolin.
912.5	913.0	Missing.
913.0	915.5	Oil shale: As above. Clams becoming fairly rare in lower part.
915.5	927.7	Oil shale (claystone and shale): Medium to some dark brownish gray (10YR 4/2, some 3/2), slightly to moderately calcareous. Very faintly bedded; very uniform. Regular to slightly irregular, thick to some thin parting; slightly irregular to slight and rare coarse hackly fracture. Abundant ostracods and rare mollusk fragments in upper part. Rare fine buff to brown blebs (coprolites?). Sample of brownish-gray oil shale from 922.5 feet: X-ray - calcite, quartz, illite, pyrite, montmorillonite kaolin.

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
927.7	929.7	Oil shale (claystone): Brownish gray (10YR 4/2), calcareous. Very faintly bedded. Regular thick to rare thin parting; slightly irregular and conchoidal fracture. Some fine tan to brown coprolites? Abrupt change to dark oil shale below.
929.7	932.9	Oil shale (claystone): Dark to some medium brownish gray (10YR 3/2, some 4/2 lower part), slightly calcareous. Very faintly bedded. Regular thick to rare thin parting; slight to coarse hackly fracture. Some fine coprolites? Sample of dark brownish-gray oil shale from 930.8 feet: X-ray - quartz, illite, calcite, pyrite, feldspar, kaolin.
932.9	933.0	Missing.
933.0	937.2	Oil shale (claystone): Medium to some dark brownish gray (10YR to 2.5Y 4/2, some 3/2), slightly to moderately calcareous. Very faintly bedded. Slightly irregular thick to rare thin parting; slight to coarse hackly fracture. Some fine buff to brown coprolites. Fairly abundant ostracods in lower part.
937.2	938.2	Oil shale (shale): Dark to medium brownish gray (10YR 3/2-4/2), slightly calcareous. Very faintly bedded. Regular thick to thin parting; hackly fracture. Abundant ostracods. Rare very fine fish (?) fragments.
938.2	939.4	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2), very slightly calcareous. Faintly bedded. Regular thick to thin parting; slightly hackly fracture. Abundant ostracods. Rare fine coprolites. Some fine streaks composed of very small white planispiral snails in lower part.
939.4	942.8	Oil shale (shale): Medium to some dark brownish gray (10YR to 2.5Y 4/2, some 3/2, rare 5/2), slightly calcareous. Faint to moderately distinct streaked bedding. Regular to some irregular, thick to thin parting; slight to coarse hackly fracture. Abundant ostracods. Abundant very small white planispiral snails and rare clam fragments concentrated in fine to thin streaks and layers; a 1/2-inch irregular vertical crevice filled predominantly with very small snails from 941.5 to 942.2.
942.8	943.8	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous. Faint to moderately distinct streaked bedding. Regular thick to thin parting; slightly hackly fracture. Abundant ostracods and small snails, some clams, and rare Goniobasis.

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From	To	Description
943.8	944.9	Limestone and some oil shale: Medium to light gray and brownish-gray fossiliferous limestone (N 5-6 and 10YR 5/1-6/1). Massive limestone mottled with buff to buff-white calcite-filled snails (probably Goniobasis); few 1-inch zones of shale as above and below. Sample of fossiliferous limestone from 944.2 feet: X-ray - calcite, quartz, pyrite, illite, kaolin.
944.9	947.4	Oil shale (shale): Dark to some medium brownish gray (10YR 3/2, some 4/2), slightly calcareous to noncalcareous. Faint streaked bedding. Regular to some irregular, thick to thin parting; hackly fracture. Abundant Goniobasis; some clam fragments and small planispiral snails. Fossiliferous limestone as above at 945.8-946.1 and 946.7-946.9; few thin limestones elsewhere.
947.4	948.6	Limestone, fossiliferous: Like 943.8-944.9 with common thin to 2-inch shale zones.
948.6	949.9	Oil shale: Like 944.9-947.4.
949.9	950.0	Missing.
950.0	952.0	Oil shale (shale): Dark to some medium brownish gray (10YR 3/2, some 4/2), very slightly calcareous. Faint streaked bedding. Fairly regular thick to thin parting; coarse to slight hackly fracture. Abundant Goniobasis, small planispiral snails, and some clam fragments. Few thin to 2-inch fossiliferous limestones.
952.0	956.0	Oil shale (shale): Dark to medium brownish gray (10YR 3/2-4/2), slightly calcareous. Faint streaked bedding. Regular to some irregular, thick to thin parting; slight to some coarse hackly fracture. Very abundant small planispiral snails and some clams. Rare coprolites. Sample of dark fossiliferous shale from 952.3 feet: X-ray - quartz, illite, calcite, pyrite, montmorillonite, feldspar, kaolin.
956.0	959.8	Oil shale (claystone): Medium to dark brownish gray (10YR 4/2-3/2), slightly to moderately calcareous. Very faintly bedded. Regular thick to some thin parting; slightly hackly fracture. Abundant ostracods. Abundant mollusks as above and below becoming very sparse from 957.5 to 958.9. Rare very fine brown coprolites. Sample of dark ostracodal claystone from 958.4 feet: X-ray - quartz, illite, calcite, montmorillonite, pyrite, kaolin.

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From	To	Description
959.8	960.8	Oil shale (claystone): Dark brownish gray (10YR 3/2), very slightly calcareous. Faint streaked bedding. Regular thick to medium parting; very slight hackly fracture. Abundant ostracods and very small planispiral snails, rare clams. Rare very fine coprolites.
960.8	965.0	Oil shale (claystone): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous. Faint streaked bedding and some very fine laminae. Regular thick to some thin parting; slightly hackly fracture. Abundant small planispiral snails and clams, some Goniobasis.
965.0	967.3	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2, some 2/2 lower part), very slightly calcareous. Very faintly bedded. Regular thick to thin parting; slightly hackly fracture. Rare mollusks as above in upper part becoming abundant in lower part.
967.3	972.2	Oil shale (claystone): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous. Faint streaked bedding. Regular to some irregular, thick to rare thin parting; irregular to slightly hackly fracture. Very abundant clams, Goniobasis, and very small planispiral snails. Rare thin to 1-inch fossiliferous limestones.
972.2	974.2	Oil shale (shale): Medium to dark brownish gray (10YR to 2.5Y 4/2-3/2), slightly calcareous. Very faintly bedded. Fairly regular to irregular, thick to thin parting; irregular hackly fracture. Very abundant mollusks as above. Common thin to thick fossiliferous limestones.
974.2	975.2	Shale (oil shale?): Brownish gray (10YR to 2.5Y 4/2-4/1), slightly calcareous to noncalcareous. Very faint streaked bedding. Slightly irregular thick to some thin parting; slightly irregular fracture. Abundant Goniobasis, clams, and small planispiral snails.
975.2	978.5	Oil shale (shale): Dark to medium brownish gray (10YR 3/2-4/2). Very faintly bedded. Fairly regular thick to thin parting; slightly hackly fracture. Abundant mollusks as above. Fossiliferous limestones at 975.3-975.5, 975.8-975.9, 976.8-977.0, 977.3-977.4, 977.8-977.9, and 978.3-978.4.
978.5	982.0	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2, rare 5/2 upper part). Very faintly bedded; rare faint laminae in upper part. Fairly regular thick to some thin parting; slightly hackly fracture. Abundant Goniobasis, small planispiral snails, and some clams. Coquina at 981.2-981.4.

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From	To	Description
982.0	984.7	Oil shale (shale): Dark to medium brownish gray (10YR to 2.5Y 3/2-4/2). Very faintly bedded. Regular to irregular, thick to some thin parting; slightly hackly to irregular fracture. Abundant mollusks as above, commonly in thin to thick coquinas.
984.7	987.1	Oil shale (claystone): Dark brownish gray (10YR to 2.5Y 3/2). Faintly bedded. Fairly regular thick to rare thin parting; slightly hackly fracture. Abundant mollusks as above becoming mostly very small planispiral snails in lower part.
987.1	989.3	Oil shale (claystone): Dark to medium brownish gray (10YR to 2.5Y 3/2-4/2). Faintly bedded. Regular thick to medium parting; slight to some coarse hackly fracture. Abundant very small planispiral snails and some clams in upper part becoming comparatively sparse in lower part. Some fine brown to buff coprolites in lower part.
989.3	994.0	Oil shale (shale): Dark to medium brownish gray (10YR to 2.5Y 4/2-3/2), slightly to moderately calcareous. Very faintly bedded. Regular to some irregular, thick to thin parting; irregular slight to coarse hackly fracture. Rare fine coprolites. Some diagonal glossy slickensided shear surfaces and irregular vertical fractures with papery calcite crusts at 992.7-993.0.
994.0	999.0	Oil shale (claystone): Medium to some dark brownish gray (10YR to 2.5Y 4/2, some 3/2), moderately calcareous. Very faintly bedded. Regular thick to medium parting; slightly irregular and conchoidal fracture. Rare fine coprolites. Very sparse ostracods. Sample of brownish-gray oil shale from 996.8 feet: X-ray - quartz, calcite, illite, siderite, montmorillonite, pyrite, kaolin.
999.0	1,002.2	Oil shale (claystone): Dark to medium brownish gray (10YR 3/2-4/2), slightly calcareous. Very faintly bedded. Regular thick to medium parting; irregular to slightly conchoidal fracture. Rare ostracods and coprolites. Very rare mollusk fragments.
1,002.2	1,003.2	Oil shale (claystone and some mudstone): Medium to some dark brownish gray (2.5Y to 10YR 4/2, some 3/2, rare 5/2), slightly calcareous. Very faint streaked bedding. Regular thick parting; slightly irregular fracture. A very fine gray fossiliferous layer at 1,002.4 overlying a 2-inch zone

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From	To	Description
		of brownish-gray slightly silty mudstone. Sample of brownish-gray mudstone from 1,002.5 feet: X-ray - quartz, illite, calcite, pyrite, feldspar, montmorillonite.
1,003.2	1,005.2	Oil shale (claystone): Dark to medium brownish gray (2.5Y to 10YR 3/2-4/2), very slightly calcareous. Very faintly bedded. Regular thick to medium parting; slightly irregular and rare coarse hackly fracture. Rare ostracods and fine brown coprolites.
1,005.2	1,007.2	Oil shale (claystone): Medium to dark brownish gray (10YR 4/2-3/2, some 5/2 near top), slightly calcareous. Very faintly bedded. Regular thick parting; slightly irregular fracture. Rare fine coprolites.
1,007.2	1,009.2	Oil shale (claystone): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous. Faintly bedded. Regular thick parting; slightly irregular fracture. Fairly abundant ostracods and very rare mollusk fragments.
1,009.2	1,010.2	Oil shale (claystone): Dark to medium brownish gray (10YR 3/2 in upper and lower parts to 4/2 and rare 5/2 in middle), very slightly calcareous. Very faintly bedded. Regular thick to medium parting; slightly irregular fracture. Rare ostracods, fine coprolites, and fish scales? Sample of dark brownish-gray oil shale from 1,010.0 feet: X-ray - quartz, illite, calcite, pyrite, siderite, montmorillonite, feldspar, kaolin.
1,010.2	1,013.0	Oil shale (claystone): Medium to some dark brownish gray (10YR 4/2, some 3/2), slightly to moderately calcareous. Very faintly bedded. Regular thick to rare thin parting; slightly irregular to coarse hackly fracture. Rare fine streaks and layers with abundant ostracods, coprolites, and fish scales.
1,013.0	1,015.0	Oil shale (shale): Medium to dark brownish gray (10YR 4/2-3/2), slightly calcareous. Very faintly bedded. Regular thin to thick parting; irregular fairly coarse to slight hackly fracture. Some ostracods and rare fine brown coprolites. Sample of dark brownish-gray shale from 1,013.3 feet: X-ray - illite, quartz, calcite, pyrite, montmorillonite.

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From	To	Description
1,015.0	1,018.3	Oil shale (claystone): Medium to some dark brownish gray (10YR 4/2, some 3/2), slightly to moderately calcareous. Very faintly bedded. Regular thick to rare thin parting; slightly hackly to irregular fracture. Abundant ostracods. Rare fine brown to buff coprolites.
1,018.3	1,021.5	Oil shale (claystone): Medium to dark brownish gray (10YR to 2.5Y 4/2-3/2), slightly calcareous. Very faintly bedded. Fairly regular thick to rare thin parting; slightly hackly fracture. Very abundant ostracods, small planispiral snails, clams, and some Goniobasis.
1,021.5	1,023.1	Shale (oil shale?): Medium to dark brownish gray (2.5Y 4/2-3/2 and 3/1), slightly calcareous. Very faintly bedded. Slightly irregular thick to thin parting; irregular slight to coarse hackly fracture. Abundant mollusks in upper part becoming very sparse below 1,022.4.
1,023.1	1,033.0	Oil shale (claystone): Dark to medium brownish gray (10YR to 2.5Y 3/2-4/2). Very faintly bedded. Regular to irregular, thick to rare thin parting; slight to rare coarse hackly fracture. Very abundant Goniobasis, small planispiral snails, Viviparus (?), and clams. Gray and brownish-gray fossiliferous limestones at 1,025.0-1,025.3 and 1,032.6-1,033.0. Sample of oil shale with some fine mollusk fragments from 1,030.7 feet: X-ray - quartz, calcite, illite, pyrite, siderite, kaolin.
1,033.0	1,033.8	Oil shale (shale): Dark brownish gray (10YR 3/2, some 2/2 upper part), slightly calcareous in lower part. Very faintly bedded. Slightly irregular thick to thin parting; hackly fracture. Some ostracods and rare mollusk fragments. Sample of very dark oil shale from 1,033.2 feet: X-ray - quartz, illite, pyrite, kaolin, feldspar, calcite.
1,033.8	1,034.3	Fossiliferous limestone: Medium to dark slightly brownish gray (N 4-3), very fine grained. Mottled and streaked with mollusk fragments.
1,034.3	1,034.9	Oil shale (shaly mudstone): Dark brownish gray (10YR 3/2-2/2). Very faintly bedded. Irregular thick parting; irregular fine slight hackly fracture. Very abundant clam and Goniobasis fragments.

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From	To	Description
1,034.9	1,036.4	Oil shale (shale): Dark to medium brownish gray (10YR 3/2-4/2), slightly calcareous. Regular to irregular, thick to thin parting; slightly hackly to irregular fracture. Abundant mollusks. Some 1- to 2-inch fossiliferous limestones. Shaly coal in upper 0.2 foot.
1,036.4	1,040.0	Oil shale (claystone): Medium and some dark brownish gray (10YR 4/2, some 3/2 upper part), moderately calcareous. Very faintly bedded. Fairly regular thick to rare thin parting; slight to rare coarse hackly fracture. Abundant small planispiral snails and clams in upper part becoming sparse in lower part.
1,040.0	1,044.0	Oil shale? (claystone and shale): Brownish gray to almost neutral gray (10YR 4/2 upper part to 4/1 lower part), moderately to very slightly calcareous. Very faintly bedded. Regular to irregular, thick to thin parting; slight to fairly coarse hackly fracture. Occasional small clams and Goniobasis fragments. Ostracods becoming abundant in lower part. Sample of slightly brownish gray shale from 1,043.6 feet: X-ray - quartz, illite, kaolin, pyrite, siderite, feldspar, calcite.
1,044.0	1,044.6	Oil shale (shale): Medium to dark brownish gray (10YR 4/1-3/2). Very faintly bedded. Slightly irregular thick to thin parting; irregular hackly fracture. Abundant ostracods, some small clams, rare Goniobasis. A 2-inch massive grayish-brown band with some Goniobasis at 1,044.4 Sample of massive grayish-brown band from 1,044.4 feet: X-ray - siderite, calcite, quartz.
1,044.6	1,046.6	Sandstone and some siltstone: Medium gray (N 5-4; very slight brown tint), fine grained, calcareous. Massive and very faintly mottled in upper part to faintly streaked and layered in lower part. Slightly irregular parting and fracture. Very rare mollusk fragments in upper part.
1,046.6	1,048.6	Siltstone and mudstone: Medium and rare dark gray (N 4-5, rare 3; slight brown tint), slightly calcareous. Very faint streaked bedding; few fine dark laminae at 1,047.7-1,047.8. Irregular parting and fracture. Very rare mollusk fragments.
1,048.6	1,049.8	Mudstone and claystone: Gray to brownish gray (N 4-5 to 2.5Y 5/2 and rare 4/2), very slightly calcareous. Faint

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From	To	Description
		streaked bedding. Irregular thick to thin parting; irregular and some hackly fracture. Some Goniobasis and small clams. Very fossiliferous limestone in lower 0.2 foot.
1,049.8	1,051.4	Shale (oil shale?): Dark to medium brownish gray (2.5Y to 10YR 3/2-4/2). Very faintly bedded. Fairly regular thick to some thin parting; slightly hackly fracture. Abundant finely fragmented Goniobasis; some clams.
1,051.4	1,053.7	Claystone (oil shale?): Dark to medium brownish gray (2.5Y to 10YR 3/2-4/2, rare 5/2 lower part), slightly calcareous. Very faintly bedded. Regular to some irregular, thick to rare thin parting; slightly hackly fracture. Abundant Goniobasis and clam fragments. Gray fossiliferous limestones at 1,051.5-1,051.6, 1,052.0-1,052.3, and 1,052.6-1.052.7.
1,053.7	1,055.6	Mudstone and claystone (oil shale in part?): Medium to dark brownish gray (10YR 5/1-3/1 and 3/2), very slightly calcareous. Faint streaked bedding. Irregular to fairly regular thick parting; slightly irregular and some hackly fracture. Some Goniobasis and small clams. A 2-inch fossiliferous limestone at top. Sample of brownish-gray mudstone from 1,054.3 feet: X-ray - quartz, illite, calcite, feldspar, pyrite, kaolin.
1,055.6	1,056.1	Siltstone: Gray to brownish gray (N 5 to 10YR 4/1), calcareous. Massive to faintly streaked.
1,056.1	1.056.6	Mudstone and claystone: Brownish gray to black (10YR 4/1 and 4/2-1/2). Faint streaked bedding. Regular thick to thin parting; slightly irregular to hackly fracture. Very coaly from 1,056.3 to 1,056.5. Some fine gray siltstone layers and streaks in upper half.
1,056.6	1,059.0	Claystone (oil shale?): Dark to medium brownish gray (10YR 3/2-4/2), slightly calcareous. Faint streaked bedding. Regular to irregular, thick to rare thin parting; slightly irregular and hackly fracture. Abundant clams and Goniobasis. Fossiliferous limestones at 1,056.6-1,056.8, 1,057.1 (3/4-inch), 1,057.5 (1-inch), and 1,058.3-1,058.5. Sample of brownish-gray oil shale from 1,057.4 feet: X-ray - quartz, illite, calcite, feldspar, pyrite, kaolin, siderite.

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From	To	Description
1,059.0	1,060.0	Claystone (oil shale): Medium to dark brownish gray (10YR 4/2-3/2). Very faintly bedded. Irregular thick parting; irregular hackly fracture. Very abundant clams and Goniobasis.
1,060.0	1,062.0	Shale (oil shale?): Dark brownish gray (10YR 3/2-3/1). Very faintly bedded. Irregular to fairly regular, thick to thin parting; irregular hackly fracture. Very abundant mollusk fragments as above.
1,062.0	1,063.5	Shale and mudstone (oil shale?): Dark to medium brownish gray (10YR 3/1 and 3/2-4/1 and 4/2). Faint streaked bedding. Irregular thick to thin parting; irregular hackly fracture. Abundant mollusk fragments (mostly Goniobasis).
1,063.5	1,070.1	Sandstone: Light gray to white (N 6-9), fine to medium grained, moderately micaceous, calcareous. Massive to faintly streaked. Irregular thick parting; slightly irregular fracture. Finely layered to irregularly streaked with gray siltstone at 1,067.3-1,067.9 and 1,069.4-1.069.7.
1,070.1	1,071.1	Siltstone and very fine sandstone: Medium to very light gray (N 5-8; slight brown tint). Distinct slightly irregular laminae; irregular slightly crossbedded streaks at 1,070.7-1,070.9. Slightly irregular thick to medium parting; slightly irregular and rare hackly fracture. Some very thin to fine tan marly layers.
1,071.1	1,072.0	Claystone: Gray to brownish gray (N 5 to 10YR 4/1), very slightly calcareous in lower part. Faint streaked bedding. Regular to irregular, thick to medium parting (slightly unctuous parting surfaces); irregular slight to coarse hackly fracture. Some small tan patches and streaks in upper part. Rare mollusks in lower part.
1,072.0	1,074.0	Claystone (oil shale?): Dark to medium brownish gray (10YR to 2.5Y 3/2-4/2), very slightly calcareous. Faint streaked bedding and some very fine laminae. Slightly irregular thick to rare thin parting; slightly hackly fracture. Abundant clams and Goniobasis. Sample of dark fossiliferous shale from 1,073.3 feet: X-ray - quartz, illite, calcite, feldspar, pyrite, kaolin.
1,074.0	1,076.0	Claystone (oil shale): Medium to rare dark brownish gray (10YR to 2.5Y 4/2-4/1, rare 3/2), very slightly calcareous. Faintly bedded. Slightly irregular thick to rare thin parting; slightly hackly fracture. Abundant Goniobasis and some clams, commonly in thin coquinas. Rare fish scales.

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From	To	Description
1,076.0	1,077.2	Claystone (oil shale?): Medium to dark brownish gray (10YR 4/2 and 4/1-3/2), very slightly calcareous, becoming slightly silty in lower part. Very faint streaked bedding. Slightly irregular thick parting; slightly irregular and hackly fracture. Fairly abundant ostracods and Goniobasis.
1,077.2	1,078.2	Coaly shale and fossiliferous limestone: Dark brownish-gray to black shale (10YR 3/2-1/2), common resinous to vitreous streaks. Fairly regular thick to rare thin parting; slight fine hackly fracture. Abundant mollusks. Gray fine-grained fossiliferous limestone from 1,077.4 to 1,077.8. Sample of black coaly shale from 1,078.0 feet: X-ray - quartz, illite, pyrite, calcite, feldspar, kaolin.
1,078.2	1,079.3	Mudstone: Brownish gray (10YR 5/2 and 5/1-4/2). Massive to faintly streaked. Slightly irregular thick to medium parting; irregular fracture. Some Goniobasis and clams. Common fine lacy dark gray silty fracture fillings in upper part. Sample of mudstone from 1,078.7 feet: X-ray - quartz, illite, feldspar, kaolin.
1,079.3	1,081.7	Mudstone and claystone: Medium to some dark brownish gray (2.5Y to 10YR 4/2-4/1, some 3/2), slightly calcareous. Faint to moderately distinct streaked bedding. Regular to irregular, thick to thin parting; irregular slightly hackly fracture. Very abundant clams and Goniobasis. Interbedded tight gray calcareous siltstone at 1,080.8-1,081.2. Abrupt change in rock character at base. Sample of fossiliferous mudstone from 1,081.5 feet: X-ray - quartz, illite, feldspar, calcite, pyrite, kaolin.
1,081.7	1,083.5	Shaly mudstone and shale (oil shale?): Dark brownish gray (10YR 3/2-2/2), slightly calcareous. Faint very fine smooth streaks and laminae in upper part to very faintly bedded in lower part. Very regular thick to medium parting; fairly regular to irregular coarse hackly fracture. Moderately abundant Goniobasis and rare clams. Sample of dark shaly mudstone from 1,081.8 feet: X-ray - quartz, illite, feldspar, pyrite, calcite, kaolin. Sample of very dark shale from 1,083.3 feet: X-ray - quartz, illite, pyrite, feldspar, calcite, kaolin.

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From	To	Description
1,083.5	1,083.7	Fossiliferous limestone: Dark slightly brownish gray.
1,083.7	1,083.8	Coal: Black, vitreous. Some papery calcite fracture fillings.
1,083.8	1,085.6	Shale and claystone: Very dark to medium brownish gray (10YR 2/2-5/2 and 5/1); very common black coaly streaks in upper and lower 3 inches and some in middle. Faint commonly distorted streaked bedding. Fairly regular thick to rare thin parting; slightly irregular to hackly fracture. Some mollusk fragments in upper part.
1,085.6	1,087.0	Claystone and shale: Brownish gray (10YR 4/2-4/1). Faint distorted to smooth streaked bedding. Regular to irregular, thick to thin parting; irregular to hackly fracture. Rare very fine coaly streaks near top. Dark gray fossiliferous limestone in lower 2 inches.
1,087.0	1,088.0	Shaly mudstone: Very dark to rare medium brownish gray (10YR 2/2-3/2, rare 4/2); common very fine coaly streaks. Faintly bedded. Fairly regular thick to thin parting; slightly irregular fracture. Abundant ostracods. Some clams and Goniobasis.
1,088.0	1,089.8	Coal and coaly mudstone: Black subvitreous to vitreous coal. Some vertical fractures with papery calcite crusts. Coaly fossiliferous shaly mudstone as above at 1,088.8-1,089.3.
1,089.8	1,091.5	Claystone and mudstone: Dark to medium brownish gray (10YR 3/2-4/2, rare 2/2), some very fine coaly streaks. Faint streaked bedding. Fairly regular thick to rare thin parting; slightly irregular and some hackly fracture. Fairly abundant mollusk fragments; 1-1/2 inch coquina near top. Coal at 1,091.0-1,091.2.
1,091.5	1,093.8	Claystone: Brownish gray (10YR to 2.5Y 4/1, rare 3/2 in upper part), very slightly calcareous. Faint streaked bedding. Slightly irregular thick parting; slightly hackly fracture. Abundant Goniobasis and clam fragments, commonly in thin coquinas. Brownish-gray fossiliferous limestone in upper 0.4 foot with a 1-inch dark brownish-gray shale layer with rare coaly streaks in middle.
1,093.8	1,095.0	Claystone (oil shale?): Dark to medium brownish gray (10YR 3/2-4/2). Faint streaked bedding. Fairly regular thick to rare thin parting; slight to rare coarse hackly fracture. Abundant mollusk fragments as above. Sample of dark oil shale with rare shell fragments from 1,094.2 feet: X-ray - quartz, illite, pyrite, calcite, feldspar, kaolin.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

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From	To	Description
1,095.0	1,098.0	Shale (oil shale?): Medium to dark brownish gray (10YR to 2.5Y 4/2-3/2). Very faintly bedded. Regular to irregular, thick to thin parting; irregular slight to coarse hackly fracture. Abundant mollusk fragments in thin coquinas in upper part becoming scattered in lower part.
1,098.0	1,100.0	Claystone (oil shale?): Medium to dark brownish gray (2.5Y 4/2-3/2, some 4/1-3/1), very slightly calcareous. Very faintly bedded. Fairly regular thick to rare thin parting; slight hackly fracture. Abundant fine mollusk fragments (mostly very small planispiral snails and clams) becoming sparse in lower part. Rare fish scales. Some ostracods in lower part. Rare very fine brown to tan coprolites?
1,100.0	1,105.0	Claystone (oil shale??): Medium to dark slightly brownish gray (2.5Y 4/1-3/1), very slightly to moderately calcareous. Very faintly bedded. Regular thick to rare thin parting; slightly irregular and conchoidal to rare coarse hackly fracture. Fairly abundant fine buff to brown blebs (coprolites?) in upper part becoming very rare in lower part. Some scattered ostracods. Abundant very small planispiral snails and some Goniobasis in upper foot. Sample of dark slightly brownish gray claystone from 1,102.6 feet: X-ray - quartz, illite, calcite, pyrite, feldspar, kaolin.
1,105.0	1,106.0	Dolomite (?): Medium to dark slightly brownish gray (2.5Y 4/1-3/1, some 4/2). Massive; very indistinct gradational boundaries. Hard and dense; conchoidal fracture. Sample of hard dense slightly brownish gray rock from 1,105.4 feet: X-ray - dolomite; trace quartz, calcite, pyrite.
1,106.0	1,110.7	Claystone (oil shale?): Medium to dark brownish gray (10YR and 2.5Y 4/1 and 4/2-3/1), calcareous. Very faintly bedded with some very faint very fine laminae. Regular to slightly irregular, thick to medium parting; slightly irregular fracture. Some ostracods and fine brown to tan blebs. Occasional fish scales; small vertebrae and ribs at 1,110.5. Sample of brownish-gray claystone from 1,107.2 feet: X-ray - calcite, quartz, illite, pyrite, feldspar, kaolin.

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From	To	Description
1,110.7	1,113.7	Shale (oil shale?): Dark to some medium brownish gray (2.5Y to 10YR 3/2-3/1, some 4/2), slightly calcareous in parts. Very faintly bedded. Regular to slightly irregular, thick to thin parting; irregular slight to coarse hackly fracture. Rare fine to very small, brown to tan blebs. Very rare ostracods and fish scales. Vertical fracture with very fine patchy calcite crusts at 1,112.2-1,112.5. Sample of dark brownish-gray shale from 1,111.1 feet: X-ray - quartz, illite, pyrite, calcite, feldspar, kaolin.
1,113.7	1,115.6	Shale (oil shale?): Dark to some medium brownish gray (10YR to 2.5Y 3/2 and 3/1, some 4/1), slightly calcareous. Very faintly bedded. Slightly irregular thick to medium parting; slightly hackly fracture. Fairly abundant ostracods, small planispiral snails, and occasional fish scales. Some fine brown to buff blebs (coprolites?). Rare clam fragments.
1,115.6	1,119.9	Sandstone and siltstone: Very light gray (N 7-8, some 6 upper part), slightly calcareous. Faint regular to irregular streaks and some fine to thin layers. Slightly irregular parting and fracture. Brownish-gray sandy calcareous siltstone with some olive-gray shell casts (?) in upper 2 inches.
1,119.9	1,123.8	Sandstone and siltstone: Very light to medium gray (N 8-4), slightly calcareous. Distinct fairly regular fine to thick layers and some faintly streaked zones; some crossbedding in lower part. Fairly regular thick parting; fairly regular to some slightly hackly fracture.
1,123.8	1,126.6	Sandstone and siltstone: Very light gray (N 7-8), fine-grained, faintly crossbedded sandstone in upper part becoming interbedded with fairly regular thick to thin gray (N 5) siltstone layers in lower part.
1,126.6	1,130.5	Siltstone, sandstone, and mudstone: Very light to medium gray (N 7-4), calcareous. Distinct to faint, fairly regular to some irregular interbedded thick to fine layers and streaks. Slightly irregular parting and fracture.
1,130.5	1,133.0	Mudstone and claystone: Light to medium gray (N 6-5, rare 4; very slight brown tint), slightly calcareous. Faint streaked bedding and some very faint laminae. Fairly regular to irregular, thick to some thin parting (slightly unctuous in lower part); slightly irregular to some irregular coarse hackly fracture.

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
		Sample of gray claystone from 1,132.2 feet: X-ray - quartz, illite, dolomite, calcite, feldspar, kaolin.
1,133.0	1,134.2	Claystone (oil shale?): Dark to medium brownish gray (2.5Y 3/1 in upper part to 10YR 3/2 and 4/2 lower part). Faint streaked bedding. Fairly regular to some irregular thick to rare thin parting; coarse hackly to slightly irregular fracture. Abundant Goniobasis and clam fragments. Slightly brownish gray fossiliferous limestone at 1,133.6-1,133.7.
		Sample of dark brownish-gray oil shale from 1,133.9 Feet: X-ray - quartz, illite, calcite, feldspar, dolomite, pyrite, kaolin.
1,134.2	1,135.5	Claystone (oil shale?): Medium to dark brownish gray (10YR 4/2-3/2), very slightly calcareous. Faint streaked bedding. Slightly to moderately irregular thick parting; slightly irregular fracture. Abundant Goniobasis and clam fragments.
1,135.5	1,136.9	Claystone (oil shale?): Dark to some medium brownish gray (10YR 3/2, some 4/2-4/1), very slightly calcareous. Very faintly bedded. Slightly irregular thick to medium parting; slightly hackly fracture. Abundant small clams and some Goniobasis.
1,136.9	1,137.9	Mudstone: Dark to medium slightly brownish gray (2.5Y 3/1-5/1). Faint streaked bedding; becoming irregularly interbedded and streaked with light gray siltstone and very fine sandstone in lower part. Some mollusk fragments.
1,137.9	1,143.0	Sandstone: Light gray (N 6), fine grained, calcareous. Massive in upper part becoming finely streaked with brownish gray in lower foot. Irregular thick parting; fairly regular fracture.
1,143.0	1,146.2	Sandstone: As above with abundant fine to thin, light to dark brownish-gray (10YR 6/1-3/1) silty streaks and fairly regular layers.
1,146.2	1,147.2	Siltstone and mudstone: Medium to light brownish gray and gray (10YR 4/1-6/1 and N 6), very slightly calcareous. Very faint to some distinct, irregular to regular streaked bedding. Slightly irregular to regular thick parting; slightly irregular fracture. Few clams and Goniobasis in upper part. Some sandy streaks near top.
1,147.2	1,149.0	Mudstone: Light slightly brownish gray and some gray buff (2.5Y 6/1, some 7/1; becoming almost neutral in

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From	To	Description
		lower part), slightly calcareous. Very faintly streaked and mottled in upper part to faint smooth streaked bedding with some fine light gray siltstone layers in lower part. Fairly regular thick parting; conchoidal to slightly irregular fracture. Hard tight gray dolomitic siltstone with very faint regular bedding at 1,148.5-1,148.8.
1,149.0	1,150.9	Claystone: Light to medium slightly brownish gray (2.5Y 6/1-5/1, some 4/1 lower part; almost neutral in upper part). Faint slightly distorted streaked bedding; abundant very fine dark gray flecks and blebs in lower part. Irregular to regular, thick to medium parting (slightly unctuous); irregular to slightly conchoidal fracture. Some very fine pyrite blebs in dark flecks in lower part. Sample of claystone with very fine dark flecks from 1,150.6 feet: X-ray - quartz, illite, dolomite, calcite, feldspar, pyrite, kaolin.
1,150.9	1,152.2	Claystone (oil shale??): Dark to some medium brownish gray (2.5Y 3/1-3/2, some 4/1). Very faintly bedded; some faint irregular streaks in upper part. Irregular thick to medium parting; irregular slight to coarse hackly fracture. Abundant large and small clams, some ostracods, rare Goniobasis. Sample of dark brownish-gray claystone with some snail fragments from 1,151.9 feet: X-ray - quartz, illite, pyrite, feldspar, calcite, kaolin.
1,152.2	1,153.2	Claystone (oil shale?): Medium to dark brownish gray (2.5Y and 10YR 4/1 and 4/2-3/1 and 3/2), very slightly calcareous. Very faintly bedded. Irregular to regular, thick to some thin parting; irregular slightly hackly fracture. Abundant clams, some ostracods, Goniobasis, and very small planispiral snails.
1,153.2	1,154.3	Siltstone and mudstone: Medium slightly brownish gray with light gray streaks (2.5Y 5/1-4/1, N 6 streaks), very slightly calcareous in upper part. Moderately distinct fine light gray streaks in upper half, very faintly bedded in lower half. Slightly irregular parting and fracture. Rare clam fragments near base.
1,154.3	1,157.4	Sandstone: Light gray (N 6; common very slight brown tint), fine to very fine grained, calcareous in lower part. Very faintly streaked to massive; irregularly streaked and mottled with medium slightly brownish gray siltstone in upper foot. Some mollusks in upper foot.

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From	To	Description
1,157.4	1,159.6	Sandstone and siltstone: Sandstone as above interbedded with faint fairly regular streaks and layers of light to rare medium slightly brownish gray siltstone.
1,159.6	1,160.6	Siltstone: Light to medium slightly brownish gray (N 6-5, some 10YR 4/1 lower part), very slightly calcareous. Faint to moderately distinct streaked bedding.
1,160.6	1,161.6	Siltstone and some shaly mudstone: Medium to some dark brownish gray (10YR to 2.5Y 4/1, some 3/1-3/2). Faintly mottled and irregularly streaked in upper part to very faint fairly regular streaked bedding in lower part. Some clams and Goniobasis, frequently partly replaced by olive-gray silty pyrite? A 2-inch sandy-textured fossiliferous pyritic limestone at base.
1,161.6	1,161.8	Marlstone (?) and coal: Brown (10YR 5/3) silty to earthy very calcareous marlstone with very abundant fine vitreous black coal streaks. Regular thick parting; fairly regular fracture; light weight. Separated from limestone above by a 1/2-inch coal seam. Sample of brown marlstone and black coal from 1,161.7 feet: X-ray - calcite.
1,161.8	1,162.3	Coal and coaly shale: Vitreous black coal in upper part grading to black shale with very abundant coaly streaks in lower part.
1,162.3	1,163.0	Shale and marlstone(?): Dark brownish-gray shale grading to grayish brown calcareous marlstone (?) in lower part (10YR 3/2-4/3), resinous luster near top. Very faint smooth bedding. Regular thin parting and slightly hackly fracture in upper part becoming fairly dense with very regular fracture in lower part. Very abundant very fine buff specks. Abundant very small and rare large clams in upper part.
1,163.0	1,165.4	Coal: Black, subvitreous to vitreous. Mostly badly broken and mixed up; grab sampled.
1,165.4	1,165.8	Marlstone (?): Brown to grayish brown (10YR 5/3-4/2), very calcareous, some fine coaly streaks near base. Massive to very faintly streaked. Irregular to conchoidal fracture. Very abundant fine buff specks. Sample of marlstone from 1,165.6 feet: X-ray - calcite.
1,165.8	1,167.7	Coal: Black, vitreous to subvitreous. Some vertical fractures with papery calcite crusts. A thin fossiliferous limestone layer near top and a 1-inch fractured and displaced buff calcareous mudstone band at 1,166.0. Partly grab sampled.

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From	To	Description
1,167.7	1,169.0	Mudstone and siltstone: Medium to light gray (N 5-6, some 4 upper part; some very slight blue-green tint). Faintly variegated. Irregular parting and fracture. Some very irregular very fine medium to dark olive-gray silty pyritic (?) streaks, flecks, and blebs. Sample of gray mudstone from 1,168.4 feet: X-ray - quartz, illite (and mica?), feldspar, pyrite, kaolin, chlorite.
		TOP MAIN BODY OF WASATCH FORMATION
1,169.0	1,181.0	Mudstone, siltstone, and very fine sandstone: Medium to light gray mudstone and light gray siltstone and sandstone. Interbedded in very thick massive to very faintly mottled and streaked zones. Coarsely fractured zone with very coarse pale to bright yellow-orange calcite fillings at 1,173.0-1,173.6. Sample of calcite fracture fillings from 1,173.0 to 1,173.6 feet: X-ray - calcite.
1,181.0	1,196.3	Sandstone: Very light gray, fine grained, salt-and-pepper in lower part. Abundant faint to distinct regular to irregular light gray to medium brownish-gray silty streaks in upper part becoming sparse in lower part.
1,196.3	1,202.0	Sandy mudstone and siltstone: Medium to light gray, very slight blue-green tint in upper part, slightly to very calcareous. Massive to very faintly mottled and streaked.
1,202.0	1,210.0	Sandstone: Very light gray, very fine grained, slightly calcareous. Massive to very faintly streaked. Some irregular light gray-green mudstone stringers and inclusions at 1,207.0-1,207.5.
1,210.0	1,219.0	Sandstone: Very light gray, fine grained, slightly calcareous, some salt-and-pepper. Faintly streaked; some irregular crossbedding in lower part.
1,219.0	1,221.0	Siltstone and mudstone: Light to medium gray. Faintly streaked to irregularly layered. Irregular thick to rare thin parting; irregular fracture.
1,221.0	1,222.0	Mudstone: Medium and some light gray (N 5, some 6 and 4). Faint to moderately distinct distorted streaked bedding. Irregular thick to rare thin parting; irregular fracture. Some very fine dark silty specks commonly with pale greenish-yellow alteration stains. Some fine stellate fibrous efflorescent patches on parting surfaces.

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From	To	Description
1,222.0	1,224.1	Mudstone, shale, and coal: Medium to very dark gray mudstone and shale (N 4-2; common slight olive to brown tint) at 1,222.0-1,222.6 and 1,223.1-1,223.4; subvitreous black coal elsewhere. Faint irregular streaked bedding. Irregular thick to thin parting; irregular to coarse hackly fracture. Some vertical fractures with papery calcite crusts in coal. Some fibrous efflorescence. A 3/4-inch light to medium brownish-gray calcareous marlstone layer at 1,222.9.
1,224.1	1,226.9	Coal: Black, subvitreous to vitreous. A 3-inch brown calcareous layer with very abundant fine coal streaks at top and a 1-1/2-inch layer at 1,225.2 (like 1,161.7 feet). Some coaly claystone at 1,225.0. Some fibrous efflorescence.
1,226.9	1,227.9	Marlstone: Buff to medium and rare dark brownish gray (10YR 7/2-5/2, some 4/2-3/2 lower part); some fine coaly streaks becoming abundant in lower 0.2 foot, very calcareous. Faint to some distinct, fairly regular to distorted streaked bedding. Slightly irregular thick parting; slightly irregular and some slight hackly fracture. Sample of buff marlstone from 1,227.3 feet: X-ray - calcite.
1,227.9	1,232.5	Siltstone and mudstone: Light to medium gray (N 7-5, 4 in upper 0.4 foot), slightly calcareous. Massive to very faintly streaked. Irregular to slightly irregular parting and fracture. Occasional fine high angle dark brownish-gray silty streaks.
1,232.5	1,233.7	Mudstone: Medium gray (N 5-4), very slightly calcareous. Very faint irregular streaked bedding. Irregular thick to medium parting; irregular fracture. Some fine dark brownish-gray silty streaks and irregular lacy masses.
1,233.7	1,234.0	Coal: Black, vitreous.
1,234.0	1,234.1	Marlstone: Buff to brownish gray (10YR 7/2-5/2), abundant fine coaly streaks, very calcareous. Fairly distinct very fine streaked bedding.
1,234.1	1,234.7	Mudstone and claystone: Light to dark slightly brownish gray (2.5Y 6/1-3/1, some 2/1). Faint streaked bedding. Irregular parting and fracture. Some fine coaly streaks. Abundant fibrous powdery white efflorescence in upper part.
1,234.7	1,236.1	Claystone and mudstone: Dark to medium gray (N 3-4; some slightly brown to olive patches). Very faintly mottled and variegated. Very irregular parting and fracture in upper part to slightly irregular in lower part. Some irregular glossy shear surfaces in upper part.

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From	To	Description
1,236.1	1,237.1	Mudstone: Slightly brownish gray (2.5Y 4/1), massive. Slightly irregular thick to medium parting; slightly irregular fracture.
1,237.1	1,242.0	Mudstone and some claystone: Medium to light gray (N 5-6; common very slight green tint). Massive to very faint irregular streaked bedding; some brown mottling near top. Claystone with very irregular parting and fracture and some shear surfaces from 1,240.8 to 1,241.7.
1,242.0	1,248.2	Mudstone and siltstone: Light to medium slightly greenish gray, slightly calcareous in parts, massive.
1,248.2	1,252.0	Claystone: Medium to light slightly olive gray. Massive; rarely variegated with slightly brownish gray patches. Badly broken and mixed up irregular lumpy to rounded fragments; commonly crumbly. Common very irregular glossy shear surfaces and some fine to very coarse pyrite in upper part.
1,252.0	1,256.6	Mudstone, siltstone, and some very fine sandstone: Medium to very light slightly olive gray. Faintly variegated.
1,256.6	1,263.2	Claystone and some mudstone: Medium slightly brownish to olive gray. Massive; some brown to maroon mottling in lower part. Commonly soft and crumbly; some very irregular shear surfaces. Uneven sample split.
1,263.2	1,264.4	Sandstone and mudstone: Buff-white, fine-grained, micaceous sandstone and slightly olive gray mudstone. Thickly zoned.
1,264.4	1,265.6	Mudstone, siltstone, and some very fine sandstone: Medium slightly olive gray to buff white. Distinct to faint fairly regular fine layers and streaks.
1,265.6	1,268.0	Mudstone and claystone: Medium to rare light slightly olive, brownish, greenish, and rare purplish gray. Very faintly streaked to thickly layered. Some irregular thin parting and coarse hackly fracture. Common brown limonitic mottling.
1,268.0	1,270.2	Claystone: Medium and rare dark slightly olive and brownish gray. Faintly variegated. Very irregular parting and fracture; some parts finely laced with silty fracture fillings and tight glossy shear surfaces. Uneven sample split. Sample of claystone with fine silty fracture fillings from 1,268.4 feet: X-ray - quartz, illite, kaolin, chlorite.
1,270.2	1,274.9	Siltstone and mudstone: Light to medium and rare dark slightly greenish gray. Faintly variegated to irregularly streaked. Some broken claystone with shear surfaces at 1,273.0-1,274.0.

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From	To	Description
1,274.9	1,276.6	Sandstone: Very light gray buff, fine grained, micaceous, calcareous. Massive; salt-and-pepper in lower part.
1,276.6	1,278.5	Siltstone and mudstone: Light to medium slightly greenish and brownish gray. Faintly streaked to massive. A 2-inch medium to dark brownish-gray carbonaceous siltstone zone at 1,277.5.
1,278.5	1,283.0	Claystone: Medium to rare dark slightly brownish gray and olive gray. Badly broken; commonly soft and crumbly to friable. Common shear surfaces. Rare fine coaly streaks. Grab sampled.
1,283.0	1,285.0	Claystone and coaly shale: Claystone as above and below. Dark slightly brownish gray papery shale with fine coaly streaks and rare thin seams from about 1,283.5 to 1,284.5.
1,285.0	1,289.0	Claystone and mudstone: Slightly brownish gray, massive. Rubble and crumbly core pieces in lower half. Gray-buff to slightly brownish gray fine-grained sandstone with fairly distinct very fine micaceous streaks at 1,285.8-1,286.8; fine coaly streaks with abundant fibrous white efflorescent material and some yellow stains in lower inch. Sample of alteration products scraped from coaly zone at 1,286.8 feet: X-ray - siderotil, pyrite, quartz.
1,289.0	1,290.8	Claystone and mudstone: Slightly brownish gray to gray green. Massive; common brown limonitic mottling in lower half. Broken core in upper part.
1,290.8	1,295.0	Siltstone: Light gray green. Massive to faintly variegated. Calcareous in parts. (1,292.5-1,293.0 missing)
1,295.0	1,296.8	Claystone: Gray green. Massive; some purplish-gray mottling. Crumbly; common irregular glossy shear surfaces. Some fine lacy calcareous yellowish-buff fracture fillings in lower part.
1,296.8	1,298.1	Mudstone: Moderately dark to medium gray green. Massive with faint slightly brownish-gray mottling. Common very fine discontinuous lacy dark brownish-gray fracture fillings.
1,298.1	1,299.1	Siltstone and mudstone: Medium to light gray green. Faint to moderately distinct streaked bedding.
1,299.1	1,304.4	Sandstone: Very light gray buff, fine grained, calcareous. Faint very fine micaceous streaks in upper part to massive in lower part. Rare pink grains. Some small gray pyritic nodules at 1,301.3-1,301.5 and 1,303.4.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
1,304.4	1,305.4	Siltstone: Gray buff to light slightly greenish gray. Faintly streaked.
1,305.4	1,306.4	Claystone: Medium slightly greenish gray, some medium to dark slightly purplish brownish gray near top. Massive. Some very irregular glossy shear surfaces in lower part.
1,306.4	1,307.5	Mudstone: Light slightly greenish gray with light brownish gray to buff mottling. Massive to very faintly streaked.
1,307.5	1,310.0	Siltstone: Light slightly greenish gray to gray buff, slightly calcareous. Faintly streaked; rare slight crossbedding. Some buff to brownish-gray mottling and irregular high angle fracture fillings.
1,310.0	1,311.5	Mudstone: Light to medium slightly greenish gray. Very faint streaked bedding.
1,311.5	1,311.6	Coaly shale: Very dark brownish gray with abundant black subvitreous streaks.
1,311.6	1,311.9	Siltstone: Slightly brownish gray. Cut by a high angle fracture with very abundant fine black patches and yellowish-green stains.
1,311.9	1,313.7	Mudstone and siltstone: Medium gray, slightly calcareous. Massive; speckled with fine buff earthy calcareous blebs in lower part.
1,313.7	1,314.5	Siltstone and very fine sandstone: Gray to gray buff, calcareous. Faint irregular streaked bedding.
1,314.5	1,315.2	Claystone: Slightly brownish gray. Chunky crumbly rubble. Some shear surfaces.
1,315.2	1,318.7	Sandy siltstone: Medium olive gray to gray green, calcareous. Massive to very faintly variegated. Some very fine irregular fractures with black fillings in upper part. Common very irregular brown mottling from 1,316.8 to 1,317.4 and some in lower half foot.
1,318.7	1,326.7	Claystone: Purplish gray, greenish gray, and olive gray; variegated. Eroded chunky core and rubble; crumbly. Common very irregular glossy shear surfaces. Some brown to ocher mottling.
1,326.7	1,329.4	Mudstone: Mostly purplish gray and maroon in upper part to mostly gray green in lower part, some grayish brown to ocher. Variegated to mottled, firm.
1,329.4	1,331.4	Sandy siltstone and very fine sandstone: Light to very light gray green, slightly calcareous. Faintly variegated.
1,331.4	1,332.8	Mudstone and claystone: Gray green and olive gray. Faintly variegated and mottled. Some slightly crumbly broken core.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
1,332.8	1,333.5	Sandstone: Very light to light slightly greenish gray, very fine grained, common dark grains. Faintly mottled.
1,333.5	1,334.1	Mudstone: Slightly greenish gray, massive. Some eroded and broken core.
1,334.1	1,337.9	Sandstone: Light gray green to buff white, very fine to fine grained, calcareous. Faintly streaked to massive; some crossbedding in lower half.
1,337.9	1,339.8	Mudstone and claystone: Gray green and olive gray. Eroded lumpy crumbly core. Some black carbonaceous streaks near top.
1,339.8	1,342.8	Mudstone: Gray green becoming slightly brownish gray near base, massive. Broken core in upper foot. Rare small to 1-inch dense brownish-gray dolomite (?) nodules with pyrite in lower part.
1,342.8	1,347.5	Siltstone grading to very fine sandstone: Light slightly greenish gray to gray buff, slightly calcareous. Massive to faintly streaked.
1,347.5	1,353.4	Sandstone: Buff white to light gray, fine to medium grained, salt-and-pepper, calcareous. Massive; common very fine micaceous streaks in middle. Very rare pink grains. Some thin to thick gray shale layers at 1,349.1-1,349.4 and 1,351.0-1,351.7. Broken core and rubble from 1,351.7 to 1,352.8.
1,353.4	1,354.9	Siltstone, mudstone, shale, and some very fine sandstone: Medium to very light gray. Faint fairly regular streaks and very fine to thick layers; displaced by irregular fine sand-filled fractures in lower part.
1,354.9	1,368.0	Sandstone: Very light gray, medium grained, salt-and-pepper. Massive with rare very faint streaks. Very rare pink grains.
1,368.0	1,372.5	Sandstone: As above. Friable, broken core. Rare carbonaceous streaks.
1,372.5	1,376.7	Sandstone: As above. Firm. Becoming very calcareous in lower part. Rare fine gray-green shaly streaks in lower part.
1,376.7	1,381.8	Mudstone and siltstone: Light slightly greenish gray, calcareous. Massive; becoming mottled with medium gray in lower part.
1,381.8	1,384.0	Mudstone and siltstone: Gray to slightly greenish gray, slightly calcareous. Irregularly streaked to variegated.
1,384.0	1,387.0	Siltstone and mudstone: Medium to light gray, calcareous. Faint to distinct, distorted to contorted streaks and stringers.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
1,387.0	1,392.5	Siltstone and very fine sandstone: Medium to light gray. Thick irregular faintly streaked to variegated zones.
1,392.5	1,394.9	Very fine sandstone and siltstone: Very light to light gray. Sandstone with very faint distorted bedding in upper part grading to finely streaked and layered siltstone in lower part.
1,394.9	1,401.3	Mudstone: Gray green. Massive; some slightly brownish gray variegation near top. Some very irregular small to large buff calcareous nodules in lower part.
1,401.3	1,404.0	Siltstone and very fine sandstone: Gray green to very light gray, calcareous. Faintly mottled to streaked to massive.
1,404.0	1,406.0	Siltstone and mudstone: Light to medium gray green and some slightly brownish gray, slightly calcareous. Variegated and mottled to streaked. Common fine dark gray and buff streaks and inclusions in lower inch.
1,406.0	1,406.5	Limestone: Medium brownish gray with a 1-1/2-inch dark layer at top and 1/2-inch light layer at base (7.5YR 5/1-5/2, with 2/1 and 6/2), very tight, slightly silty textured. A very thin gray-green mudstone stringer in dark layer at top with common fine buff streaks, some oolites with very fine black outlines, and possible snail fossils.
1,406.5	1,406.6	Mudstone: Brownish gray with a very thin dark carbonaceous layer at top. Finely speckled with moderately abundant tan to buff blebs.
1,406.6	1,409.4	Mudstone and siltstone: Gray green to light gray, calcareous. Massive to faintly variegated and mottled. A thin brownish-gray limestone lens at top.
1,409.4	1,415.6	Siltstone and very fine sandstone: Gray buff to light slightly greenish gray, slightly to moderately calcareous. Massive and faintly layered to finely streaked with rare crossbedding. Some thin to thick gray-green mudstone layers mostly in upper half.
1,415.6	1,416.6	Mudstone: Slightly greenish gray. Very faintly bedded with rare fine light silty streaks and layers. Grades to claystone near base.
1,416.6	1,417.0	Coaly shale: Black to dark brownish gray; very common very fine to thin vitreous black streaks. Slightly irregular thin parting; hackly fracture. Grades to carbonaceous mudstone in lower 1/2 inch.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
1,417.0	1,425.0	Mudstone and siltstone: Light to some medium slightly greenish gray, moderately to slightly calcareous. Massive to very faintly mottled and variegated. Very light gray massive siltstone at 1,423.3-1,423.9.
1,425.0	1,426.0	Mudstone: Gray green to gray with some brownish gray mottling.
1,426.0	1,427.7	Siltstone and mudstone: Light slightly brownish gray to medium bluish gray green. Massive with some faint to distinct rusty brown mottling.
1,427.7	1,428.3	Mudstone: Maroon, brown, and gray green. Very irregular blotchy mottling.
1,428.3	1,429.6	Siltstone and mudstone: Light gray to slightly yellowish brownish gray, calcareous in upper part. Massive to faintly variegated.
1,429.6	1,431.3	Mudstone: Maroon, gray green, purplish gray, and brownish gray. Distinctly mottled and variegated.
1,431.3	1,433.0	Mudstone grading to siltstone: Light to very light slightly greenish gray, slightly to moderately calcareous. Faintly mottled in upper part to massive in lower part.
1,433.0	1,437.5	Very fine sandstone and siltstone: Very light slightly greenish to neutral gray, calcareous, becoming micaceous in lower part. Massive; becoming finely streaked with some slight crossbedding in lower part.
1,437.5	1,440.2	Mudstone and claystone: Medium to rare light gray, gray green, and maroon with some brownish gray and purplish gray. Faintly variegated to mottled.
1,440.2	1,441.0	Mudstone: Yellowish brown, purplish gray, maroon, and some gray green. Distinctly mottled and variegated.
1,441.0	1,443.6	Mudstone and siltstone: Light grayish maroon to maroon and purplish gray and some slightly brownish gray. Distinctly mottled to faintly variegated.
1,443.6	1,444.3	Mudstone: Maroon, some slight brownish mottling.
1,444.3	1,450.0	Siltstone and mudstone: Light grayish maroon to medium slightly brownish gray and some yellowish brown. Faintly variegated with some distinct to faint mottling.
1,450.0	1,451.8	Mudstone and some claystone: Gray and gray green, variegated and mottled with rusty brown. Coarse breccia with carbonaceous mudstone filling at 1,450.1-1,450.3. Medium to very dark slightly brownish gray carbonaceous mudstone at 1,450.7-1,451.0.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
1,451.8	1,455.2	Siltstone and mudstone: Maroon to light grayish maroon, mottled and variegated with yellowish brown and rare gray green.
1,455.2	1,456.2	Siltstone and mudstone: Light to medium slightly pinkish brownish gray and some gray green. Faint to moderately distinct, thin to fine, irregular and displaced streaks, stringers, and layers.
1,456.2	1,456.9	Siltstone and very fine sandstone: Light brownish gray to buff. Faint very fine fairly regular streaked bedding. Sharp slightly wavy contact with massive sandstone below.
1,456.9	1,457.4	Sandstone: Very light gray, very fine grained, calcareous, massive.
1,457.4	1,460.5	Mudstone grading to claystone: Light to medium slightly brownish gray. Massive to very faint streaked bedding; some rusty brown and rare maroon mottling.
1,460.5	1,461.2	Claystone: Gray green; some slight brownish mottling near top. Very faint streaked bedding.
1,461.2	1,462.2	Mudstone: Medium to light gray green, some purplish brownish gray near top. Very mottled with pale rusty brown.
1,462.2	1,463.8	Siltstone and very fine sandstone: Medium to light very slightly greenish to brownish gray and some slightly yellowish gray. Massive to variegated.
1,463.8	1,465.4	Siltstone and mudstone: Medium to light maroon and almost neutral gray with some ocher brown. Faintly variegated to distinctly mottled.
1,465.4	1,467,2	Mudstone and claystone: Maroon and purplish brown to some ochre. Irregular crumbly broken chunks with common glossy surfaces.
1,467.2	1,470.2	Mudstone and some claystone: Maroon, ocher brown, and light gray green. Distinctly mottled. Very irregular parting and fracture.
1,470.2	1,472.2	Claystone: Light to medium gray green, mottled with ocher brown and rare maroon. Commonly crumbly; some rubble. Some glossy shear surfaces.
1,472.2	1,474.2	Mudstone: Medium and light gray green to slightly brownish gray, firm, becoming calcareous in lower part. Massive; some brown mottling in upper part.
1,474.2	1,475.0	Claystone: Slightly greenish and brownish gray. Faintly mottled to irregularly streaked. Slightly crumbly in upper part. Some glossy shear surfaces. A thin black carbonaceous layer at 1,474.5.

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LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Bureau of Mines Washakie Basin No. 1A corehole (Con.)

From	To	Description
1,475.0	1,477.0	Mudstone: Slightly greenish and rarely slightly brownish gray. Very faintly streaked to massive. Rare fine carbonaceous stringers in lower part.
1,477.0	1,477.7	Mudstone: Buff to gray buff, very calcareous, massive, very tight and firm.
1,477.7	1,482.1	Siltstone: Light gray, slightly calcareous, massive.
1,482.1	1,484.5	Mudstone and siltstone: Light to some medium gray, slightly calcareous in upper part. Massive to irregularly streaked. Some very irregular fine fractures with dark pyritic fillings in lower part.
1,484.5	1,485.0	Coal and coaly shale: Black subvitreous coal with a high angle fracture with papery calcite patches. Very dark brownish-gray shale with abundant very fine coaly streaks in upper 0.1 foot. Some white fibrous powdery efflorescence on parting surface at top of coal.
1,485.0	1,486.0	Mudstone: Dark to medium very slightly brownish to greenish gray. Massive to faintly mottled and irregularly streaked. Very irregular parting and fracture. Some irregular fine carbonaceous streaks and blebs in upper part.
1,486.0	1,488.9	Claystone: Medium and rare dark gray. Irregular crumbly lumpy rubble and eroded core. (Dark claystone gave no oil in test tube.)
1,488.9	1,491.4	Claystone: Medium slightly olive and greenish gray. Massive; some rusty brown mottling in lower part. Very irregular parting and fracture. Rare low angle glossy shear surfaces. Dark slightly brownish gray carbonaceous (?) zone at 1,489.6-1,489.8. Light to medium gray tight calcareous mudstone at 1,490.7-1,490.9. Irregular gradational transition to sandstone below. Sample of slightly greenish gray claystone with rusty brown mottling from 1,490.5 feet: X-ray - quartz, illite, pyrite, dolomite, kaolin.
1,491.4	1,493.0	Sandstone: Very light gray, fine grained, moderately calcareous. Massive; slightly salt-and-pepper, rare pink grains.

Bottom of core.

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APPENDIX B.—OIL-YIELD TABLES

Oil yields of core and drill-cutting samples from the three Bureau of Mines Washakie Basin coreholes are presented in the following tables. These oil yields were determined by the Fischer retort method. Depths of stratigraphic units in the coreholes are given in table 2 (page 9), and average oil-yield data are summarized in table 3 (page 12).

Table B–1.—*Oil yields of samples from Washakie Basin corehole 1*
(NS = no sample)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
0	0	----	276.7	8.9	0.832	346.0	15.2	1.576
10.0	1.6	----	277.9	5.9	.612	347.4	12.1	1.010
15.0	0	----	279.2	8.7	.679	348.5	13.6	1.020
20.0	2.3	----	280.2	6.8	.539	349.5	13.3	1.000
25.0	4.8	----	281.2	0.0	.000	350.5	11.8	.898
30.0	5.9	----	281.7	11.5	1.228	351.5	12.7	.959
35.0	0	----	283.1	7.9	.620	352.5	13.1	.986
133.0	.2	----	284.1	3.6	.323	353.5	15.7	2.086
134.0	0	----	285.2	3.3	.351	355.3	19.4	2.091
170.0	.2	----	286.5	1.9	.190	356.8	40.0	3.007
172.0	0	----	287.7	4.3	.349	358.0	35.5	3.890
191.0	.5	----	288.7	4.6	.335	359.7	16.8	1.230
192.2	0	----	289.6	7.4	.350	360.7	26.8	1.829
194.6	<2	----	290.2	3.8	.371	361.7	25.8	2.837
200.6	6.2	0.494	291.4	9.4	1.021	363.3	22.7	2.549
201.6	10.3	.872	292.8	5.9	.518	364.9	20.2	2.309
202.7	6.4	.662	293.9	1.7	.155	366.5	22.0	2.949
204.0	6.7	.532	295.0	3.9	.317	368.4	15.6	1.498
205.0	7.0	.554	296.0	3.7	.302	369.7	21.7	1.994
206.0	7.9	.620	297.0	6.0	.479	371.0	24.1	1.508
207.0	NS	----	298.0	8.5	.664	371.9	19.1	1.238
207.6	9.1	.424	299.0	16.6	1.339	372.8	25.3	1.918
208.2	9.5	.589	300.1	7.1	.617	373.9	NS	----
209.0	8.7	.679	301.2	7.8	.613	374.3	19.3	1.388
210.0	10.9	.835	302.2	9.2	.715	375.3	25.6	1.761
211.0	8.4	1.051	303.2	9.3	.939	376.3	19.6	1.406
212.6	8.0	.628	304.5	11.2	.856	377.3	20.8	1.480
213.6	5.8	.464	305.5	20.7	1.474	378.3	20.5	1.461
214.6	7.3	.576	306.5	15.8	1.166	379.3	24.9	2.237
215.6	13.9	1.040	307.5	20.7	1.474	380.6	27.8	1.508
216.6	20.2	1.299	308.5	11.7	1.336	381.4	2.2	.364
217.5	4.5	.146	310.0	15.8	1.166	383.4	21.7	1.534
217.9	17.4	1.141	311.0	6.6	.524	384.4	22.9	1.926
218.8	26.3	1.441	312.0	7.6	.658	385.6	12.5	1.135
219.6	13.2	.596	313.1	7.3	.461	386.8	4.5	.437
220.2	19.1	1.238	313.9	10.0	.463	388.0	.7	.065
221.0	2.8	.207	314.5	8.3	.325	389.1	NS	----
222.0	9.8	1.516	315.0	7.4	.584	389.2	1.6	.239
224.0	10.1	1.558	316.0	7.7	.606	391.0	1.2	.200
226.0	8.6	1.342	317.0	6.7	.532	393.0	2.8	.322
228.0	8.6	1.342	318.0	7.9	.620	394.4	1.2	.100
230.0	9.2	1.430	319.0	5.6	.449	395.4	9.4	.583
232.0	9.9	1.530	320.0	8.1	.635	396.2	18.4	1.598
234.0	9.4	1.458	321.0	12.7	.767	397.4	17.6	1.409
236.0	8.0	1.256	321.8	12.5	.946	398.5	24.7	1.710
238.0	5.5	.882	322.8	42.7	3.156	399.5	14.5	.864
240.0	5.0	.806	324.0	41.2	2.562	400.3	16.1	.830
242.0	6.1	.974	325.0	36.2	2.323	401.0	21.3	1.510
244.0	6.5	1.034	326.0	38.2	1.936	402.0	15.1	1.456
246.0	6.9	1.094	326.8	7.4	.759	403.3	10.3	.634
248.0	6.7	1.064	328.1	5.8	.557	404.1	26.0	1.784
250.0	7.8	1.226	329.3	9.4	.729	405.1	14.4	1.181
252.0	7.7	1.212	330.3	9.1	.707	406.2	18.3	1.590
254.0	6.0	.958	331.3	6.9	.547	407.4	13.3	1.500
256.0	5.9	.942	332.3	4.2	.375	408.9	0.0	.000
258.0	5.7	.912	333.4	8.1	.698	409.2	15.4	1.367
260.0	5.0	.806	334.5	7.7	.424	410.4	20.3	1.304
262.0	2.7	.444	335.2	10.5	.646	411.3	16.0	.825
264.0	2.1	.348	336.0	10.5	.807	412.0	27.9	1.323
266.0	NS	----	337.0	10.2	.786	412.7	10.2	.707
266.1	2.5	.391	338.0	15.1	1.008	413.6	18.7	1.485
268.0	2.2	.291	338.9	15.0	1.113	414.7	19.2	1.519
269.6	3.9	.317	339.9	14.4	.967	415.8	9.6	1.412
270.6	6.4	.916	340.8	13.7	1.027	417.7	22.6	1.587
272.4	4.0	.325	341.8	13.8	1.034	418.7	20.1	2.156
273.4	8.3	.650	342.8	14.6	1.087	420.2	12.1	.734
274.4	11.7	.891	343.8	16.1	1.185	421.0	13.0	.980
275.4	7.9	.806	344.8	11.4	1.044	422.0	25.6	1.761

See footnotes at end of table.

Table B–1.—*Oil yields of samples from Washakie Basin corehole 1*—Continued
(NS = no sample)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
423.0	27.5	1.868	552.9	8.6	0.738	679.4	0	----
424.0	18.4	1.332	554.0	8.2	.770	1,670.0	<1	----
425.0	24.1	1.675	555.2	7.7	.909	1,680.0	0	----
426.0	38.7	2.444	556.7	7.0	.554	2,181.4	0	----
427.0	40.7	1.777	557.7	13.5	.810	2,198.9	2.3	----
427.7	5.3	.426	558.5	2.6	.214	2,200.0	8.1	----
428.7	2.5	.247	559.5	10.1	.779	2,201.1	0	----
429.9	5.8	.278	560.5	8.0	.628	2,216.0	.4	----
430.5	18.1	.919	561.5	10.8	1.159	2,217.1	0	----
431.2	27.1	1.477	562.9	10.1	1.168	2,239.3	3.4	----
432.0	27.5	1.681	564.4	18.2	1.319	2,240.3	3.2	----
432.9	2.0	----	565.4	1.2	.200	2,241.5	6.5	----
434.0	0	----	567.4	11.5	.965	2,242.5	6.0	----
456.0	<1	----	568.5	8.5	.664	2,243.7	7.9	----
487.0	<3	----	569.5	11.3	1.122	2,244.7	9.7	----
493.4	3.0	.443	570.8	16.8	1.476	2,245.7	.3	----
495.2	15.2	1.576	572.0	8.1	.698	2,247.0	0	----
496.6	21.9	2.164	573.1	7.8	.674	2,258.4	1.6	----
498.0	36.8	1.882	574.2	13.4	.705	2,260.8	0	----
498.8	22.6	1.746	574.9	1.2	.030	2,263.0	.6	----
499.9	20.8	1.036	575.2	11.1	1.019	2,265.2	2.7	----
500.6	29.0	1.170	576.4	10.5	.888	2,268.0	4.3	----
501.2	18.3	1.590	577.5	12.9	1.460	2,269.8	4.5	----
502.4	6.5	.258	579.0	26.7	.912	2,271.4	3.3	----
502.9	28.1	1.141	579.5	5.0	.161	2,273.3	<1	----
503.5	21.9	1.237	579.9	8.7	.747	2,277.8	0	----
504.3	25.8	1.241	581.0	9.7	.750	2,293.0	<1	----
505.0	26.2	1.795	582.0	10.9	.835	2,300.4	13.3	----
506.0	31.8	2.100	583.0	11.5	.877	2,301.6	12.0	----
507.0	25.7	2.120	584.0	12.3	.932	2,302.7	22.7	----
508.2	27.3	1.114	585.0	15.0	1.447	2,303.7	0	----
508.8	7.2	.228	586.3	29.4	1.578	2,309.0	.9	----
509.2	.9	.128	587.1	9.1	.636	2,312.4	0	----
510.9	9.6	.594	588.0	7.5	.709	2,325.0	<1	----
511.7	2.1	.157	589.2	14.4	1.074	2,348.7	3.3	----
512.6	13.0	1.470	590.2	11.4	.870	2,350.3	0	----
514.1	19.3	2.360	591.2	8.5	.664	2,402.6	.2	----
515.8	26.6	2.182	592.2	27.2	1.481	2,404.1	1.8	----
517.0	30.1	2.010	593.0	0	----	2,405.6	3.0	----
518.0	35.8	2.764	598.4	.5	----	2,406.7	8.5	----
519.2	37.1	2.840	599.8	4.5	----	2,407.4	12.5	----
520.4	28.4	1.534	600.8	0	----	2,408.0	8.2	----
521.2	25.6	1.761	622.8	.3	----	2,408.6	2.4	----
522.2	23.9	1.331	623.8	1.1	----	2,410.0	2.0	----
523.0	16.6	1.339	624.8	0	----	2,411.3	0	----
524.1	21.1	2.097	628.0	6.0	.623	2,413.4	0	----
525.5	32.5	3.204	629.3	0.0	.000	2,445.0	.6	----
527.0	19.7	2.400	631.1	2.5	.227	2,448.0	1.4	----
528.7	15.0	.890	632.2	8.2	1.091	2,451.0	4.7	0.494
529.5	27.4	2.049	633.9	5.1	.451	2,452.3	16.9	1.607
530.6	21.4	1.668	635.0	12.1	1.010	2,453.6	18.5	1.873
531.7	18.7	1.620	636.1	2.2	.127	2,455.0	28.1	1.900
532.9	19.8	1.135	636.8	7.1	.561	2,456.0	30.2	2.015
533.7	18.7	.675	637.8	5.7	.456	2,457.0	25.7	1.767
534.2	10.2	.629	638.8	8.7	.815	2,458.0	27.3	1.856
535.0	10.8	.828	640.0	10.0	.772	2,459.0	25.4	1.750
536.0	13.8	1.034	641.0	10.8	.828	2,460.0	27.7	1.878
537.0	12.6	.952	642.0	10.0	.772	2,461.0	18.7	1.350
538.0	15.1	1.120	643.0	11.7	.980	2,462.0	10.9	.835
539.0	21.3	1.510	644.1	2.0	.166	2,463.0	12.0	.912
540.0	16.6	1.217	645.1	8.7	.679	2,464.0	13.3	1.000
541.0	11.2	1.370	646.1	12.9	.973	2,465.0	14.0	1.570
542.6	8.8	.686	647.1	11.3	.863	2,466.5	4.8	.426
543.6	11.8	.898	648.1	10.9	.835	2,467.6	10.9	1.169
544.6	3.8	.865	649.1	0	----	2,469.0	9.6	1.116
547.4	2.1	.452	663.5	NS	----	2,470.5	6.7	.798
550.0	3.5	.572	667.4	0	----	2,472.0	10.7	1.067
552.0	2.9	.214	671.8	NS	----	2,473.3	NS	----

See footnotes at end of table.

Table B–1.—*Oil yields of samples from Washakie Basin corehole 1*—Continued
(NS = no sample)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
2,473.8	9.9	1.071	2,554.9	10.5	1.210	2,627.4	6.6	0.838
2,475.2	4.7	0.418	2,556.4	6.7	.532	2,629.0	7.7	.606
2,476.3	11.2	1.198	2,557.4	11.7	.980	2,630.0	6.0	.718
2,477.7	13.9	1.352	2,558.5	10.7	.821	2,631.5	7.7	.848
2,479.0	15.7	1.158	2,559.5	11.6	1.238	2,632.9	5.6	.449
2,480.0	11.4	.870	2,560.9	12.5	.568	2,633.9	10.7	.739
2,481.0	16.2	1.191	2,561.5	7.5	.414	2,634.8	2.4	.079
2,482.0	11.6	.972	2,562.2	11.8	.629	2,635.2	14.5	.864
2,483.1	14.0	.733	2,562.9	12.6	.572	2,636.0	12.7	.960
2,483.8	10.6	.977	2,563.5	12.4	.939	2,637.0	10.4	.800
2,485.0	15.2	1.126	2,564.5	14.3	1.067	2,638.0	8.6	1.008
2,486.0	20.9	1.485	2,565.5	16.6	1.582	2,639.5	11.1	1.274
2,487.0	19.3	1.388	2,566.8	13.6	1.020	2,641.0	12.7	.960
2,488.0	15.9	1.172	2,567.8	6.7	.532	2,642.0	14.7	1.093
2,489.0	13.7	1.027	2,568.8	6.1	.583	2,643.0	13.2	.993
2,490.0	13.2	.993	2,570.0	5.7	.547	2,644.0	15.6	1.152
2,491.0	15.1	1.120	2,571.2	5.4	.260	2,645.0	21.5	1.826
2,492.0	11.0	.842	2,571.8	6.7	.532	2,646.2	15.9	1.172
2,493.0	11.1	.849	2,572.8	8.0	.377	2,647.2	18.1	1.312
2,494.0	13.6	.714	2,573.4	NS	----	2,648.2	17.8	1.940
2,494.7	13.4	1.108	2,574.9	19.8	1.419	2,649.7	12.7	.960
2,495.8	12.1	1.103	2,575.9	14.9	1.106	2,650.7	11.1	1.104
2,497.0	13.3	1.100	2,576.9	7.2	.569	2,652.0	14.6	1.087
2,498.1	13.0	1.862	2,577.9	4.0	.325	2,653.0	13.3	1.000
2,500.0	12.3	1.118	2,578.9	.3	.028	2,654.0	12.5	.946
2,501.2	9.4	1.239	2,580.0	.7	.065	2,655.0	9.4	.729
2,502.9	4.2	.341	2,581.1	.6	.060	2,656.0	8.5	.664
2,503.9	6.0	.527	2,582.3	.9	.114	2,657.0	14.3	1.067
2,505.0	6.4	.814	2,583.8	2.4	.238	2,658.0	14.4	1.073
2,506.6	9.8	.834	2,585.0	3.6	.322	2,659.0	18.5	1.338
2,507.7	4.2	.648	2,586.1	1.1	.110	2,660.0	16.7	1.224
2,509.6	11.2	1.455	2,587.3	2.7	.333	2,661.0	23.1	2.911
2,511.3	8.7	1.154	2,588.8	13.7	1.540	2,662.8	18.1	1.312
2,513.0	14.4	1.073	2,590.3	7.5	1.005	2,663.8	19.5	1.680
2,514.0	14.2	1.060	2,592.0	8.2	.643	2,665.0	19.4	1.533
2,515.0	16.6	1.582	2,593.0	6.5	.516	2,666.1	18.5	1.338
2,516.3	22.6	2.539	2,594.0	6.7	.532	2,667.1	NS	----
2,517.9	11.4	.957	2,595.0	9.9	.765	2,667.3	10.7	.575
2,519.0	10.6	1.221	2,596.0	11.3	1.467	2,668.0	19.9	1.425
2,520.5	11.2	.856	2,597.7	8.1	.698	2,669.0	16.0	1.531
2,521.5	7.3	.576	2,598.8	8.2	.643	2,670.3	12.5	.946
2,522.5	7.5	.591	2,599.8	10.1	.779	2,671.3	8.1	.635
2,523.5	18.4	1.464	2,600.8	8.7	.815	2,672.3	9.2	1.216
2,524.6	18.1	.656	2,602.0	5.8	.464	2,674.0	7.9	.621
2,525.1	28.4	2.684	2,603.0	7.0	.554	2,675.0	5.5	.441
2,526.5	9.4	.437	2,604.0	8.2	.643	2,676.0	6.5	.516
2,527.1	7.3	.806	2,605.0	8.3	.650	2,677.0	8.3	.650
2,528.5	9.4	1.094	2,606.0	6.9	.546	2,678.0	19.6	1.406
2,530.0	7.2	1.138	2,607.0	6.8	.539	2,679.0	17.6	1.281
2,532.0	7.0	.831	2,608.0	7.6	.598	2,680.0	21.5	2.587
2,533.5	13.9	1.248	2,609.0	8.0	.628	2,681.7	20.9	1.485
2,534.7	NS	----	2,610.0	16.2	1.191	2,682.7	15.2	1.239
2,535.1	18.4	2.263	2,611.0	9.2	.715	2,683.8	13.2	1.092
2,536.8	17.7	1.544	2,612.0	8.9	.694	2,684.9	NS	----
2,538.0	16.5	1.210	2,613.0	14.0	1.047	2,687.6	11.6	1.238
2,539.0	13.0	.980	2,614.0	13.5	1.014	2,689.0	16.7	1.224
2,540.0	4.0	.292	2,615.0	14.2	1.060	2,690.0	11.6	.884
2,540.9	1.5	.138	2,616.0	11.2	.856	2,691.0	17.1	1.374
2,542.0	.5	.084	2,617.0	11.3	.863	2,692.1	12.8	1.159
2,544.0	1.4	.234	2,618.0	11.8	.988	2,693.3	11.7	.891
2,546.0	3.4	.334	2,619.1	2.2	.109	2,694.3	11.1	.849
2,547.2	2.1	.174	2,619.7	7.0	.554	2,695.3	11.2	.856
2,548.2	4.7	.380	2,620.7	12.1	1.195	2,696.3	12.8	.966
2,549.2	10.6	.895	2,622.0	12.8	.966	2,697.3	9.3	.217
2,550.3	22.0	2.949	2,623.0	14.7	1.093	2,697.6	12.2	.926
2,552.2	10.8	.911	2,624.0	10.5	.807	2,698.6	14.3	1.494
2,553.3	11.8	.898	2,625.0	10.0	.772	2,700.0	15.8	1.165
2,554.3	12.2	.556	2,626.0	4.7	.532	2,701.0	8.2	.643

See footnotes at end of table.

Table B–1.—*Oil yields of samples from Washakie Basin corehole 1*—Continued
(NS = no sample)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
2,702.0	7.7	0.606	2,745.5	2.9	0.357	2,793.0	3.7	----
2,703.0	5.6	.449	2,747.0	4.3	.348	2,794.0	4.1	----
2,704.0	5.9	.801	2,748.0	3.2	.262	2,795.0	2.8	----
2,705.7	10.3	.793	2,749.0	5.6	.449	2,796.0	4.0	----
2,706.7	11.7	.713	2,750.0	3.6	.293	2,797.0	3.5	----
2,707.5	17.2	2.010	2,751.0	4.3	.348	2,798.0	3.8	----
2,709.1	7.2	.569	2,752.0	3.1	.254	2,799.0	3.0	----
2,710.1	14.6	1.739	2,753.0	3.2	.262	2,800.0	4.2	----
2,711.7	8.7	.340	2,754.0	3.8	.309	2,801.0	3.4	----
2,712.2	5.5	.353	2,755.0	2.1	.174	2,802.0	<3	----
2,713.0	4.8	.387	2,756.0	3.6	.293	2,808.3	6.6	----
2,714.0	3.4	.278	2,757.0	4.4	.356	2,809.1	[2] 6.2	----
2,715.0	3.5	.286	2,758.0	4.0	.325	2,810.3	2.4	----
2,716.0	4.3	.348	2,759.0	5.1	.411	2,811.3	1.5	----
2,717.0	10.2	.786	2,760.0	5.3	.426	2,812.3	[2] 9.8	----
2,718.0	12.3	.932	2,761.0	3.5	.286	2,813.6	[2] 11.8	----
2,719.0	6.9	.546	2,762.0	4.2	.341	2,814.7	[2] 19.3	----
2,720.0	7.6	.598	2,763.0	4.2	.341	2,815.9	0	----
2,721.0	7.4	.584	2,764.0	3.5	.315	2,817.3	.5	----
2,722.0	4.1	.333	2,765.1	.9	.076	2,819.0	2.2	----
2,723.0	5.3	.426	2,766.1	.6	.055	2,820.0	[2] 14.8	----
2,724.0	5.8	.464	2,767.2	2.2	.218	2,821.0	<3	----
2,725.0	5.3	.554	2,768.4	2.3	.190	2,833.4	3.9	----
2,726.3	NS	----	2,769.4	3.2	.262	2,834.8	<1	----
2,726.6	3.6	.410	2,770.4	4.4	.356	2,837.9	[2] 8.5	----
2,728.0	1.8	.150	2,771.4	4.3	.348	2,838.7	<1	----
2,729.0	1.6	.266	2,772.4	3.7	----	2,842.2	2.5	----
2,731.0	6.4	.509	2,773.4	3.1	----	2,843.2	.7	----
2,732.0	12.8	.966	2,774.4	2.8	----	2,844.9	[2] 3.3	----
2,733.0	8.8	.686	2,775.4	4.5	----	2,846.3	1.0	----
2,734.0	5.6	.449	2,776.4	4.1	----	2,847.6	[2] 3.4	----
2,735.0	6.4	.509	2,777.4	3.8	----	2,848.4	1.7	----
2,736.0	3.4	.278	2,778.4	4.0	----	2,849.8	1.6	----
2,737.0	5.1	.411	2,779.6	3.3	----	2,851.3	[2] 11.4	----
2,738.0	5.1	.411	2,780.7	3.8	----	2,852.3	4.6	----
2,739.0	4.6	.372	2,785.3	5.4	----	2,853.3	[2] 7.8	----
2,740.0	3.8	.309	2,786.5	4.1	----	2,854.0	[2] 10.0	----
2,741.0	3.5	.286	2,787.5	4.3	----	2,855.0	[2] 17.1	----
2,742.0	3.8	.309	2.789.0	2.9	----	2,856.0	[2] 27.8	----
2,743.0	4.2	.546	2,790.0	3.9	----	2,857.3	Bottom	
2,744.6	NS	----	2,791.0	3.9	----			
2,745.0	12.9	.486	2,792.0	3.1	----			

[1] Sample depths are top of sample below surface elevation 7,703 feet.
[2] Sample contains coal.

Table B–2.—*Oil yields of samples from Washakie Basin corehole 1A*
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
0	0	----	251.8	8.8	----	366.6	15.2	1.914
195.0	NS	----	253.5	12.0	----	368.3	25.4	1.750
209.8	0	----	254.5	0	----	369.3	25.3	1.918
218.0	<1	----	280.6	.2	----	370.4	25.8	1.773
220.7	0	----	281.6	0	----	371.4	25.6	2.289
223.7	1.5	----	285.5	3.4	----	372.7	14.1	.632
225.7	.8	----	286.5	0	----	373.3	5.6	.314
226.7	4.5	----	327.6	.3	----	374.0	9.1	.708
228.2	.3	----	328.6	1.9	----	375.0	8.6	.739
228.8	4.7	----	329.9	7.2	----	376.1	10.5	1.210
229.6	0	----	331.0	.3	----	377.6	2.2	.237
247.9	.3	----	333.7	0	----	378.9	7.8	.981
249.8	0	----	364.6	.8	----	380.5	9.9	.765
250.8	1.1	----	365.6	2.1	----	381.5	5.5	.485

See footnotes at end of table.

Table B–2.—*Oil yields of samples from Washakie Basin corehole 1A*—Continued
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
382.6	5.1	0.411	453.9	2.8	0.230	526.2	7.5	0.591
383.6	12.2	.926	454.9	3.0	.246	527.2	5.3	.426
384.6	5.5	.794	455.9	12.5	.946	528.2	5.3	.426
386.4	8.3	.780	456.9	22.6	1.587	529.2	11.2	.685
387.6	13.5	1.420	457.9	19.7	1.553	530.0	8.5	.996
389.0	9.3	.794	459.0	NS	----	531.5	8.3	.845
390.1	11.9	.996	459.7	11.9	1.267	532.8	11.0	.842
391.2	11.3	1.208	461.1	7.0	.554	533.8	11.1	1.528
392.6	7.8	.858	462.1	7.9	.559	535.6	13.4	1.007
394.0	10.1	.779	463.0	6.9	.546	536.6	15.6	.806
395.0	12.9	.584	464.0	9.6	.744	537.3	17.5	1.274
395.6	2.9	.119	465.0	11.2	.856	538.3	18.5	1.338
396.1	12.3	.559	466.0	11.5	.965	539.3	14.0	1.047
396.7	8.7	.679	467.1	5.6	.449	540.3	15.6	1.728
397.7	17.4	1.268	468.1	14.0	.733	541.8	10.6	.895
398.7	16.9	1.607	468.8	12.9	.973	542.9	NS	----
400.0	13.8	1.448	469.8	14.4	.966	543.0	14.1	1.265
401.4	12.3	.932	470.7	16.6	.730	544.2	11.8	.898
402.4	NS	----	471.3	5.6	.404	545.2	8.8	.686
403.0	9.6	.595	472.2	10.6	.407	546.2	8.2	.643
403.8	.6	.030	472.7	4.4	.463	547.2	12.5	.946
404.4	11.9	.634	474.0	5.5	.441	548.2	16.9	1.236
405.1	13.6	1.224	475.0	4.3	.348	549.2	14.1	1.054
406.3	11.1	1.019	476.0	5.0	.403	550.2	21.2	1.804
407.5	10.4	.800	477.0	14.9	1.106	551.4	22.6	1.587
408.5	12.7	.960	478.0	16.6	1.217	552.4	17.9	1.300
409.5	13.6	1.020	479.0	12.1	.919	553.4	16.5	1.210
410.5	11.4	1.131	480.0	4.7	.380	554.4	18.0	.914
411.8	8.3	.650	481.0	2.5	.206	555.1	9.2	.715
412.8	2.8	.230	482.0	0	.000	556.1	16.3	1.677
413.8	3.2	.262	486.9	1.6	.146	557.5	11.4	1.305
414.8	6.5	.516	488.0	1.9	.158	559.0	7.4	.584
415.8	5.4	.433	489.0	1.7	.141	560.0	8.8	.686
416.8	5.5	.441	490.0	.3	.025	561.0	6.6	.838
417.8	11.1	1.104	491.0	.6	.050	562.2	4.4	.356
419.1	7.9	.621	492.0	2.9	.143	563.6	18.5	1.338
420.1	8.7	.747	492.6	11.1	.509	564.6	14.0	1.466
421.2	5.4	.433	493.2	12.3	.746	566.0	23.9	1.996
422.2	11.5	.877	494.0	6.4	.713	567.2	22.9	1.605
423.2	15.5	1.146	495.4	7.5	.591	568.2	12.4	1.596
424.2	14.8	1.100	496.4	5.2	.502	569.9	19.2	1.381
425.2	19.8	1.419	497.6	8.1	.635	570.9	18.6	1.478
426.2	7.7	.606	498.6	9.1	.991	572.0	9.7	1.427
427.2	9.1	.708	500.0	6.5	.619	573.9	18.3	.928
428.2	6.2	.692	501.2	10.4	.640	574.6	8.5	.863
429.6	6.2	.494	502.0	7.6	.538	575.9	15.7	1.158
430.6	6.3	.502	502.9	NS	----	576.9	12.2	1.574
431.6	8.4	.920	503.0	4.8	.387	578.6	10.4	.960
433.0	3.7	.391	504.0	5.9	.471	579.8	NS	----
434.3	12.4	1.939	505.0	7.4	.584	580.0	11.0	.842
435.3	21.6	1.528	506.0	5.9	.471	581.0	10.9	1.002
436.3	8.0	.628	507.0	5.0	.403	582.2	11.8	.988
437.3	6.2	.494	508.0	6.4	.560	583.3	13.4	.906
438.3	7.0	.665	509.1	8.5	.664	584.2	12.4	1.408
439.5	7.6	.598	510.1	13.1	1.086	585.7	7.2	.740
440.5	8.3	.715	511.2	8.2	.643	587.0	4.4	.356
441.6	13.3	1.000	512.2	14.6	1.413	588.0	4.7	.380
442.6	NS	----	513.5	13.2	1.291	589.0	6.6	.524
443.0	17.8	.776	514.8	9.5	1.325	590.0	18.8	1.356
443.6	16.5	1.210	516.6	12.5	.757	591.0	19.0	1.369
444.6	13.0	.980	517.4	3.3	.216	592.0	6.6	.576
445.6	13.4	1.410	518.2	8.1	1.143	593.1	18.4	1.597
447.0	2.2	.182	520.0	10.6	.814	594.3	10.3	.793
448.0	.5	.042	521.0	9.8	.758	595.3	5.0	.484
449.0	.2	.017	522.0	8.2	.643	596.5	2.6	.278
450.0	.8	.087	523.0	4.8	.387	597.8	3.2	.314
451.3	.5	.042	524.0	4.1	.400	599.0	2.8	.230
452.3	2.6	.342	525.2	3.6	.293	600.0	8.4	.657

See footnotes at end of table.

Table B–2.—*Oil yields of samples from Washakie Basin corehole 1A*—Continued
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
601.0	10.3	0.793	676.8	[2] 13.5	0.811	887.0	2.7	----
602.0	6.7	.532	677.6	2.2	.255	889.0	NS	----
603.0	6.0	.479	679.0	.2	.024	889.6	4.2	0.477
604.0	4.6	.372	680.4	.2	.024	891.0	NS	----
605.0	4.5	.364	681.8	[2] 8.8	.549	893.0	7.3	1.152
606.0	6.0	.479	682.6	5.1	.370	895.0	13.0	1.960
607.0	3.6	.293	683.5	[2] 12.3	1.398	897.0	12.6	.953
608.0	2.2	.182	685.0	[2] 9.7	.901	898.0	10.4	.800
609.0	2.0	.166	686.2	<3	----	899.0	12.9	.973
610.0	1.6	.133	696.0	3.2	----	900.0	11.2	.856
611.0	1.5	.125	696.7	0	----	901.0	15.4	1.139
612.0	2.7	.222	699.7	[2] 4.4	----	902.0	15.4	1.139
613.0	12.0	.912	701.3	<1	----	903.0	9.3	.722
614.0	6.9	.546	708.9	2.0	----	904.0	9.9	.765
615.0	4.4	.356	709.5	0	----	905.0	1.9	.158
616.0	2.3	.190	710.8	.9	----	906.0	1.2	.100
617.0	3.9	.476	713.0	[2] 4.0	----	907.0	2.9	.238
618.5	4.2	.682	714.3	3.3	----	908.0	3.8	.309
620.5	1.8	.150	715.5	8.7	----	909.0	3.5	.286
621.5	3.7	.421	716.4	[2] 10.5	----	910.0	6.6	.524
622.9	NS	----	717.4	[2] 22.0	----	911.0	8.5	.996
623.0	4.1	.333	719.0	[2] 6.2	----	912.5	NS	----
624.0	[2] 5.2	.418	720.6	2.3	----	913.0	3.2	.262
625.0	1.5	.125	722.8	[2] 22.8	----	914.0	4.5	.546
626.0	1.7	.141	725.0	5.0	----	915.5	8.5	.664
627.0	4.8	.387	726.4	<1	----	916.5	12.4	1.408
628.0	2.0	.166	728.5	[2] 3.6	----	918.0	11.2	.856
629.0	2.3	.190	730.2	0	----	919.0	8.0	.628
630.0	2.5	.206	733.0	<3	----	920.0	10.0	.772
631.0	2.1	.174	745.3	0	----	921.0	10.2	.786
632.0	1.9	.158	753.7	1	----	922.0	8.9	.694
633.0	1.7	.141	756.7	0	----	923.0	8.5	.664
634.0	2.9	.238	757.6	NS	----	924.0	11.8	.898
653.0	3.0	.246	762.0	0	----	925.0	6.0	.479
636.0	3.8	.309	771.3	<2	----	926.0	5.6	.763
637.0	2.8	.230	775.9	[2] 24.8	----	927.7	4.1	.333
638.0	2.8	.230	778.0	[2] 22.8	----	928.7	4.3	.348
639.0	2.7	.311	779.7	0	----	929.7	6.8	.539
640.4	1.1	.074	790.4	[2] 4.9	----	930.7	5.3	.511
641.2	2.3	.152	791.3	<2	----	931.9	4.5	.364
642.0	.9	.076	798.3	[2] 21.6	----	932.9	NS	----
643.0	1.4	.117	799.6	.3	----	933.0	5.6	.449
644.0	1.6	.133	801.3	1.6	----	934.0	6.5	.516
645.0	1.4	.117	802.7	[2] 8.1	----	935.0	8.7	.679
646.0	2.7	.222	803.7	[2] 16.8	----	936.0	7.9	.745
647.0	2.0	.166	804.2	[2] 14.9	----	937.2	8.4	.657
648.0	4.1	.333	806.1	<3	----	938.2	8.7	.815
649.0	2.4	.198	821.0	[2] 5.8	----	939.4	6.9	.655
650.0	1.7	.141	822.4	<3	----	940.6	7.1	.673
651.0	1.3	.109	841.0	3.1	----	941.8	7.3	.576
652.0	2.4	.198	843.0	3.4	----	942.8	10.3	.793
653.0	3.0	.246	845.0	3.2	----	943.8	2.9	.262
654.0	2.4	.277	847.0	3.2	----	944.9	5.1	.493
655.4	1.6	.133	849.0	3.3	----	946.1	5.3	.554
656.4	3.6	.293	850.7	2.1	----	947.4	2.3	.228
657.4	3.4	.306	852.7	2.2	----	948.6	7.7	.788
658.5	2.8	.345	854.7	2.7	----	949.9	NS	----
660.0	2.8	.230	855.7	3.6	----	950.0	7.1	.561
661.0	3.0	.246	857.3	0	----	951.0	6.7	.532
662.0	2.3	.190	860.2	5.5	----	952.0	5.7	.456
663.0	2.8	.230	861.2	1.5	----	953.0	3.0	.246
664.0	2.6	.428	861.7	0	----	954.0	5.2	.418
666.0	2.7	.444	876.0	1.0	----	955.0	4.2	.341
668.0	3.0	.492	877.0	.7	----	956.0	4.0	.325
670.0	4.1	.666	879.1	1.6	----	957.0	4.2	.443
672.0	2.9	.476	880.1	1.7	----	958.3	5.1	.616
674.0	1.9	.205	882.0	2.4	----	959.8	7.2	.569
675.3	.8	.100	884.0	2.6	----	960.8	5.8	.557

See footnotes at end of table.

Table B–2.—*Oil yields of samples from Washakie Basin corehole 1A*—Continued
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
962.0	6.2	0.494	1,016.3	8.8	0.686	1,095.0	6.6	____
963.0	4.6	.372	1,017.3	10.8	.828	1,096.0	4.8	____
964.0	6.6	.524	1,018.3	5.3	.426	1,097.0	4.2	____
965.0	6.8	.539	1,019.3	4.0	.325	1,098.0	3.0	____
966.0	9.1	.920	1,020.3	5.0	.484	1,099.0	3.1	____
967.3	4.4	.498	1,021.5	3.5	.458	1,100.0	<3	____
968.7	5.8	.464	1,023.1	4.8	.697	1,104.0	3.6	____
969.7	5.4	.520	1,024.9	4.2	.341	1,105.0	2.1	____
970.9	5.8	.603	1,025.9	7.9	.683	1,106.0	3.9	____
972.2	1.7	.282	1,027.0	4.4	.356	1,107.0	4.8	____
974.2	2.3	.190	1,028.0	4.5	.364	1,108.0	5.1	____
975.2	5.1	.493	1,029.0	4.4	.356	1,109.7	5.2	____
976.4	4.8	.387	1,030.0	5.1	.411	1,110.7	4.1	____
977.4	3.4	.306	1,031.0	3.5	.286	1,111.7	3.8	____
978.5	6.3	.502	1,032.0	3.5	.286	1,112.7	<3	____
979.5	7.3	.749	1,033.0	7.5	.473	1,114.7	4.6	____
980.8	6.7	.638	1,033.8	.9	.038	1,115.6	0	____
982.0	6.5	.877	1,034.3	5.0	.242	1,133.0	3.5	____
983.7	3.1	.254	1,034.9	[2] 6.1	.729	1,134.2	3.4	____
984.7	8.5	.930	1,036.4	4.1	.533	1,135.5	4.7	____
986.1	9.1	.708	1,038.0	3.5	.286	1,136.9	<2	____
987.1	4.8	.387	1,039.0	3.9	.317	1,161.6	[2] 24.4	____
988.1	7.0	.665	1,040.0	4.9	.395	1,163.0	[2] 40.0	____
989.3	6.7	.638	1,041.0	4.2	.341	1,165.4	[2] 10.9	____
990.5	6.8	.808	1,042.0	<3	____	1,166.0	[2] 37.4	____
992.0	7.1	.561	1,049.8	3.5	____	1,167.7	0	____
993.0	6.5	.516	1,051.4	<3	____	1,169.0	BR	____
994.0	6.8	.539	1,056.1	[2] 7.8	____	1,221.0	0	____
995.0	6.7	.532	1,056.6	3.3	____	1,222.0	[2] 12.6	____
996.0	7.2	.569	1,057.6	<3	____	1,224.1	[2] 23.9	____
997.0	5.8	.464	1,063.5	.6	____	1,225.3	[2] 39.9	____
998.0	5.4	.433	1,071.1	<3	____	1,226.9	[2] 9.2	____
999.0	8.5	.664	1,073.0	3.3	____	1,227.9	0	____
1,000.0	7.9	.745	1,074.0	<3	____	1,233.7	[2] 12.8	____
1,001.2	8.6	.672	1,077.2	[2] 8.2	____	1,234.7	0	____
1,002.2	6.1	.486	1,078.2	<3	____	1,242.0	BR	____
1,003.2	7.9	.621	1,081.7	6.0	____	1,256.6	0	____
1,004.2	6.9	.546	1,083.5	[2] 8.5	____	1,263.2	BR	____
1,005.2	7.0	.554	1,084.5	[2] 9.6	____	1,268.0	0	____
1,006.2	8.2	.643	1,085.6	1.4	____	1,270.2	BR	____
1,007.2	6.8	.539	1,087.0	[2] 7.4	____	1,278.5	0	____
1,008.2	6.4	.509	1,088.0	[2] 29.0	____	1,289.0	BR	____
1,009.2	7.5	.591	1,088.8	[2] 8.1	____	1,416.6	[2] 7.4	____
1,010.2	8.4	.920	1,089.3	[2] 34.1	____	1,417.0	BR	____
1,011.6	8.9	.972	1,089.8	[2] 6.8	____	1,484.5	[2] 18.3	____
1,013.0	8.1	.635	1,091.5	2.2	____	1,485.0	BR	____
1,014.0	10.2	.786	1,092.6	3.5	____	1,493.0	Bottom	
1,015.0	5.8	.603	1,093.8	7.4	____			

[1] Sample depths are top of sample below surface elevation 7,078 feet.
[2] Sample contains coal.

Table B–3.—*Oil yields of samples from Washakie Basin corehole 2*
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
0.0	0	____	2,330.0	2.4	____	2,395.5	0	____
1,510.0	<3	____	2,340.0	5.4	____	2,404.0	NS	____
1,520.0	0	____	2,350.0	11.8	____	2,411.0	0	____
2,170.0	<3	____	2,360.0	.3	____	2,433.8	6.9	____
2,190.0	0	____	2,370.0	7.3	____	2,435.1	9.6	____
2,280.0	5.5	____	2,380.0	.7	____	2,436.5	12.9	____
2,290.0	0	____	2,390.0	1.5	____	2,437.8	6.0	____
2,320.0	NS	____	2,395.0	NS	____	2,438.3	33.3	____

[1] Sample depths are top of sample below surface elevation 7,000 feet.

Table B–3.—*Oil yields of samples from Washakie Basin corehole 2*—Continued
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
2,439.4	0	----	2,572.5	5.0	----	2,712.2	6.4	0.509
2,448.5	1.1	----	2,573.7	3.4	----	2,713.2	3.6	.294
2,450.0	0	----	2,574.4	0	----	2,714.2	6.3	.502
2,465.2	NS	----	2,575.3	2.0	----	2,715.2	6.2	.741
2,467.0	0	----	2,575.9	0	----	2,716.7	5.8	.464
2,470.2	1.6	----	2,579.0	BR	----	2,717.7	7.2	.569
2,471.0	11.6	----	2,644.4	0	----	2,718.7	NS	----
2,472.0	12.7	----	2,648.5	1.1	----	2,719.0	9.2	.715
2,473.0	9.0	----	2,650.2	8.4	0.657	2,720.0	6.3	.753
2,474.0	14.4	----	2,651.2	18.0	1.437	2,721.5	9.5	.883
2,475.0	NS	----	2,652.3	17.6	1.537	2,722.7	11.4	.870
2,479.4	13.3	----	2,653.5	12.1	1.285	2,723.7	9.5	.736
2,480.5	2.6	----	2,654.9	10.4	.880	2,724.7	6.1	.487
2,481.5	.6	----	2,656.0	9.5	.736	2,725.7	4.3	.349
2,482.3	0	----	2,657.0	12.5	.946	2,726.7	6.3	.502
2,484.4	4.6	----	2,658.0	8.5	.664	2,727.7	7.2	.569
2,485.5	.8	----	2,659.0	8.5	.664	2,728.7	8.7	.679
2,486.3	6.2	----	2,660.0	8.1	.826	2,729.7	9.6	.743
2,487.2	11.8	----	2,661.3	6.7	.532	2,730.7	8.4	.657
2,488.2	1.9	----	2,662.3	7.9	.868	2,731.7	10.9	.835
2,488.9	0	----	2,663.7	10.0	1.004	2,732.7	6.7	.532
2,490.3	2.8	----	2,665.0	15.8	.583	2,733.7	10.8	1.490
2,491.3	5.5	----	2,665.5	1.5	.088	2,735.5	14.1	1.054
2,492.3	1.2	----	2,666.2	9.1	1.060	2,736.5	20.9	1.486
2,492.8	6.6	----	2,667.7	12.7	.959	2,737.5	27.1	2.400
2,493.4	NS	----	2,668.7	5.7	.456	2,738.8	3.3	.162
2,494.4	5.6	----	2,669.7	6.8	.701	2,739.4	31.5	1.042
2,495.8	0	----	2,671.0	6.3	.502	2,739.9	22.2	1.564
2,507.0	NS	----	2,672.0	5.2	.418	2,740.9	20.3	1.449
2,508.6	0	----	2,673.0	6.5	.517	2,741.9	7.4	1.110
2,511.4	3.1	----	2,674.0	7.1	.617	2,743.8	10.1	.779
2,512.3	3.3	----	2,675.1	NS	----	2,744.8	9.1	.848
2,513.3	7.7	----	2,676.0	6.6	.524	2,746.0	9.8	.758
2,514.5	1.9	----	2,677.0	7.3	.576	2,747.0	10.8	.828
2,515.8	13.9	----	2,678.0	7.4	.584	2,748.0	9.8	.758
2,516.8	18.8	----	2,679.0	9.9	.765	2,749.0	10.2	.786
2,517.8	13.5	----	2,680.0	11.0	.842	2,750.0	9.5	.736
2,518.5	0	----	2,681.0	11.6	.884	2,751.0	8.9	.693
2,519.1	10.9	----	2,682.0	9.3	.722	2,752.0	8.7	.679
2,520.4	18.2	----	2,683.0	10.2	.786	2,753.0	8.6	.671
2,521.5	18.8	----	2,684.0	14.7	.765	2,754.0	9.8	.758
2,522.8	22.4	----	2,684.7	4.6	.112	2,755.0	9.5	.736
2,523.8	28.4	----	2,685.0	25.3	2.093	2,756.0	9.9	.765
2,524.8	19.7	----	2,686.2	13.3	.800	2,757.0	9.9	.765
2,525.8	5.5	----	2,687.0	9.5	.736	2,758.0	10.8	.828
2,526.8	5.8	----	2,688.0	11.1	.849	2,759.0	12.0	.911
2,527.8	4.1	----	2,689.0	16.3	1.557	2,760.0	10.8	.828
2,528.6	NS	----	2,690.3	15.5	1.719	2,761.0	10.7	.821
2,529.5	4.0	----	2,691.8	11.8	.898	2,762.0	8.2	.642
2,531.1	0	----	2,692.8	16.7	1.469	2,763.0	8.7	.679
2,533.6	3.4	----	2,694.0	14.0	1.047	2,764.0	8.0	.628
2,535.0	<3	----	2,695.0	11.7	.891	2,765.0	7.3	.576
2,540.3	3.6	----	2,696.0	10.3	.793	2,766.0	9.2	.715
2,541.5	5.2	----	2,697.0	8.8	.686	2,767.0	10.8	.828
2,542.5	<3	----	2,698.0	10.3	.793	2,768.0	8.8	.686
2,547.6	4.0	----	2,699.0	9.1	1.202	2,769.0	7.6	.598
2,548.6	6.2	----	2,700.7	14.1	1.054	2,770.0	9.0	.840
2,549.6	10.4	----	2,701.7	15.3	.566	2,771.2	6.5	.724
2,550.6	15.6	----	2,702.2	13.8	1.034	2,772.6	7.7	.848
2,552.2	.5	----	2,703.2	13.2	1.490	2,774.0	8.2	.642
2,553.0	15.7	----	2,704.7	14.3	1.067	2,775.0	6.2	.494
2,554.0	14.2	----	2,705.7	12.7	.959	2,776.0	7.8	.613
2,555.0	10.5	----	2,706.7	0.0	.000	2,777.0	7.8	.613
2,555.6	7.6	----	2,707.0	13.4	1.007	2,778.0	7.8	.613
2,556.6	2.0	----	2,708.0	14.7	1.530	2,779.0	8.2	.963
2,557.6	0	----	2,709.4	12.3	.932	2,780.5	7.2	.740
2,560.0	BR	----	2,710.4	19.3	1.110	2,781.8	7.0	.554
2,570.4	4.6	----	2,711.2	8.2	.642	2,782.8	8.4	.657

[1] Sample depths are top of sample below surface elevation 7,000 feet.

Table B–3.—*Oil yields of samples from Washakie Basin corehole 2*—Continued
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
2,783.8	9.1	0.707	2,856.0	18.4	1.332	2,931.6	13.0	0.980
2,784.8	12.1	.918	2,857.0	15.1	1.120	2,932.6	16.2	.476
2,785.8	20.3	1.449	2,858.0	13.3	1.000	2,933.0	16.4	1.565
2,786.8	10.9	1.002	2,859.0	16.7	1.224	2,934.3	27.6	1.874
2,788.0	12.7	.959	2,860.0	15.3	1.246	2,935.3	16.8	1.230
2,789.0	6.0	.479	2,861.1	16.4	1.686	2,936.3	19.0	1.369
2,790.0	11.1	1.189	2,862.5	14.4	1.396	2,937.3	18.5	1.338
2,791.4	12.8	1.352	2,863.8	15.9	1.172	2,938.3	16.2	1.191
2,792.8	0.0	.000	2,864.8	14.4	1.074	2,939.3	14.9	1.107
2,793.4	16.7	1.224	2,865.8	13.8	1.034	2,940.3	12.8	1.449
2,794.4	14.1	1.054	2,866.8	11.0	.842	2,941.8	24.4	1.862
2,795.4	6.3	.803	2,867.8	16.7	1.224	2,942.9	19.5	2.240
2,797.0	9.8	.758	2,868.8	12.2	1.388	2,944.5	13.5	1.013
2,798.0	7.1	.561	2,870.3	14.7	1.093	2,945.5	18.0	1.698
2,799.0	5.7	.456	2,871.3	11.4	.870	2,946.8	26.1	2.685
2,800.0	5.1	.410	2,872.3	12.3	.932	2,948.3	28.6	2.894
2,801.0	3.6	.294	2,873.3	13.6	1.020	2,949.8	22.4	1.576
2,802.0	3.6	.294	2,874.3	10.5	.726	2,950.8	36.9	2.357
2,803.0	2.8	.322	2,875.2	15.2	1.013	2,951.8	34.1	2.218
2,804.4	10.0	.695	2,876.1	23.0	2.094	2,952.8	11.2	.856
2,805.3	3.2	.079	2,877.4	19.1	1.925	2,953.8	12.2	.925
2,805.6	15.2	.788	2,878.8	37.6	2.869	2,954.8	11.0	.842
2,806.3	7.5	.827	2,880.0	37.2	3.558	2,955.8	14.9	.554
2,807.7	4.4	.463	2,881.5	26.8	2.561	2,956.3	24.8	2.231
2,809.0	5.0	.403	2,882.9	29.6	2.380	2,957.6	24.9	1.033
2,810.0	5.0	.645	2,884.1	23.7	2.478	2,958.2	4.8	.387
2,811.6	8.9	.693	2,885.6	22.5	2.215	2,959.2	.7	----
2,812.6	20.1	1.293	2,887.0	21.2	2.106	2,962.0	1.8	----
2,813.5	6.5	.517	2,888.4	24.3	1.687	2,967.0	2.6	----
2,814.5	5.1	.615	2,889.4	23.1	1.617	2,970.0	<1	----
2,816.0	9.8	.758	2,890.4	18.8	1.357	3,010.0	1.0	----
2,817.0	9.2	.715	2,891.4	19.8	1.419	3,020.0	.7	----
2,818.0	10.6	.814	2,892.4	24.2	1.681	3,025.0	2.3	----
2,819.0	10.7	.821	2,893.4	24.7	1.710	3,027.4	4.4	.712
2,820.0	11.9	.904	2,894.4	23.0	2.255	3,029.4	NS	----
2,821.0	19.2	1.381	2,895.8	20.0	1.431	3,029.6	7.0	.776
2,822.0	21.0	1.492	2,896.8	19.2	1.381	3,031.0	7.1	.561
2,823.0	14.8	1.430	2,897.8	21.3	1.812	3,032.0	11.7	1.069
2,824.3	21.1	1.947	2,899.0	24.2	1.681	3,033.2	16.7	1.714
2,825.6	13.2	1.490	2,900.0	28.0	2.275	3,034.6	36.7	2.348
2,827.1	15.8	1.166	2,901.2	25.3	2.442	3,035.6	28.4	1.918
2,828.1	7.1	.954	2,902.6	23.0	1.611	3,036.6	22.5	1.582
2,829.8	6.6	.314	2,903.6	29.2	1.961	3,037.6	21.9	1.855
2,830.4	9.9	.459	2,904.6	23.2	2.434	3,038.8	26.2	1.795
2,831.0	7.7	.606	2,906.1	14.2	1.166	3,039.8	17.2	1.256
2,832.0	7.4	.584	2,907.2	7.9	.620	3,040.8	19.5	1.400
2,833.0	7.1	.561	2,908.2	2.0	.199	3,041.8	19.9	1.425
2,834.0	6.6	.524	2,909.4	24.2	2.858	3,042.8	28.9	1.945
2,835.0	7.4	.584	2,911.1	2.9	.238	3,043.8	21.4	1.516
2,836.0	11.9	1.266	2,912.1	2.0	.199	3,044.8	NS	----
2,837.4	13.8	1.137	2,913.3	1.7	.141	3,045.0	23.6	1.646
2,838.5	43.5	2.666	2,914.3	3.3	.270	3,046.0	21.5	1.674
2,839.5	39.6	2.487	2,915.3	1.3	.130	3,047.1	28.0	1.896
2,840.5	30.8	2.047	2,916.5	1.2	.100	3,048.1	1.6	.160
2,841.5	37.4	2.382	2,917.5	3.8	.309	3,049.3	0.0	.000
2,842.5	9.4	.875	2,918.5	19.0	1.369	3,050.3	2.1	.174
2,843.7	6.2	.494	2,919.5	17.3	1.262	3,051.3	5.0	.443
2,844.7	10.1	1.013	2,920.5	23.7	1.652	3,052.4	6.8	.539
2,846.0	9.2	.715	2,921.5	26.2	1.795	3,053.4	12.6	.857
2,487.0	5.6	.449	2,922.5	19.2	1.381	3,054.3	10.9	.752
2,848.0	7.8	.613	2,923.5	19.3	1.388	3,055.2	13.4	.806
2,849.0	8.7	.679	2,924.5	17.4	1.268	3,056.0	15.3	1.133
2,850.0	11.7	.891	2,925.5	17.0	1.243	3,057.0	18.6	1.344
2,851.0	10.6	.814	2,926.5	13.0	.980	3,058.0	17.9	1.300
2,852.0	10.6	.814	2,927.5	20.2	1.443	3,059.0	23.4	1.635
2,853.0	14.4	1.074	2,928.5	18.2	1.319	3,060.0	25.7	1.767
2,854.0	14.5	1.080	2,929.5	21.9	1.546	3,061.0	30.6	2.036
2,855.0	15.9	1.172	2,930.5	17.1	1.374	3,062.0	36.5	2.338

[1] Sample depths are top of sample below surface elevation 7,000 feet.

Table B–3.—*Oil yields of samples from Washakie Basin corehole 2*—Continued
(NS = no sample; BR = barren rock by visual examination)

Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft	Sample depth, ft [1]	Oil, gal/ton	Length times gal/cu ft
3,063.0	39.9	2.501	3,096.6	9.9	0.994	3,131.0	9.2	1.001
3,064.0	35.8	2.303	3,097.9	12.7	.959	3,132.4	24.2	1.009
3,065.0	28.7	1.934	3,098.9	2.9	.214	3,133.0	0	----
3,066.0	22.2	1.564	3,099.8	12.5	.946	3,143.7	.6	----
3,067.0	19.1	1.375	3,100.8	12.2	1.110	3,145.0	0	----
3,068.0	22.1	1.558	3,102.0	13.4	1.007	3,184.0	1.7	----
3,069.0	19.7	1.412	3,103.0	12.7	1.151	3,184.9	.2	----
3,070.0	39.8	2.496	3,104.2	16.1	1.185	3,186.4	9.5	1.251
3,071.0	31.0	2.057	3,105.2	6.5	.465	3,188.1	4.8	.310
3,072.0	18.6	1.344	3,106.1	11.3	.949	3,188.9	.5	.042
3,073.0	19.9	1.425	3,107.2	11.0	1.179	3,189.9	3.6	.294
3,074.0	23.8	1.492	3,108.6	11.1	.849	3,190.9	8.1	.635
3,074.9	NS	----	3,109.6	13.7	1.027	3,191.0	10.6	.814
3,075.0	16.2	1.429	3,110.6	18.3	1.855	3,192.9	NS	----
3,076.2	15.3	1.133	3,112.0	10.9	.668	3,193.0	7.8	.797
3,077.2	15.2	1.351	3,112.8	9.3	.722	3,194.3	13.0	.980
3,078.4	13.3	1.000	3,113.8	12.3	.839	3,195.3	3.7	.242
3,079.4	13.9	1.040	3,114.7	5.6	.314	3,196.1	9.6	.669
3,080.4	17.3	1.388	3,115.4	12.8	1.352	3,197.0	8.5	.664
3,081.5	15.5	1.146	3,116.8	11.9	1.085	3,198.0	10.0	.772
3,082.5	18.8	1.357	3,118.0	12.5	.946	3,199.0	10.7	.821
3,083.5	24.4	1.693	3,119.0	22.5	2.057	3,200.0	11.8	.898
3,084.5	16.0	1.297	3,120.3	12.4	.939	3,201.0	12.2	.925
3,085.6	13.0	.980	3,121.3	12.2	.925	3,202.0	16.5	.606
3,086.6	12.4	1.408	3,122.3	13.1	1.479	3,202.5	2.7	.355
3,088.1	14.0	1.047	3,123.8	12.7	.959	3,204.1	11.3	.863
3,089.1	3.6	.382	3,124.8	14.4	1.074	3,205.1	13.4	1.007
3,090.4	2.6	.235	3,125.8	14.7	1.093	3,206.1	12.0	1.093
3,091.5	2.8	.322	3,126.8	24.1	1.675	3,207.3	0	----
3,092.9	13.6	1.530	3,127.8	3.6	.265	3,236.0	Bottom	
3,094.4	11.4	1.044	3,128.7	7.5	.532			
3,095.6	10.9	.835	3,129.6	14.0	1.466			

[1] Sample depths are top of sample below surface elevation 7,000 feet.

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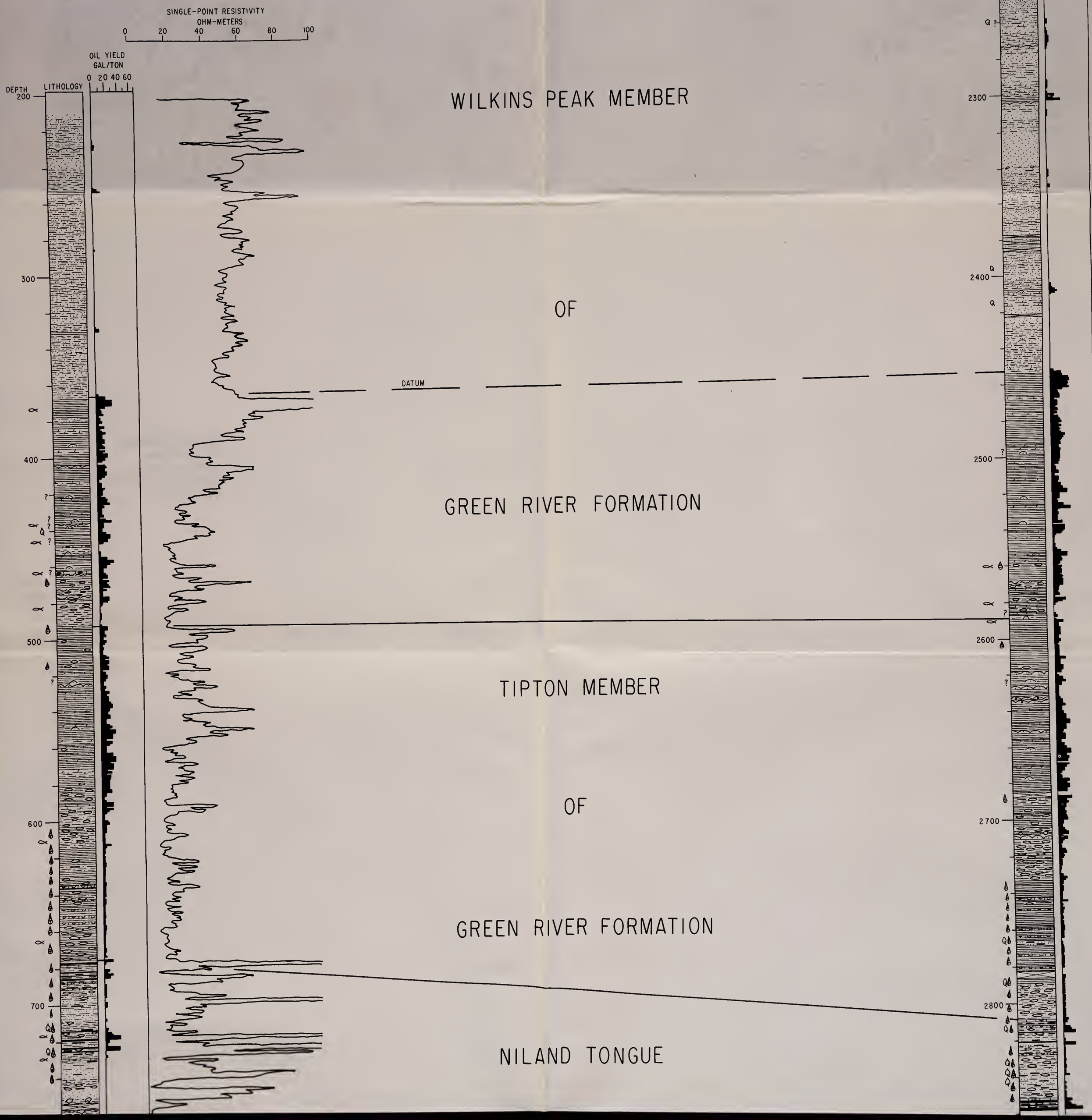
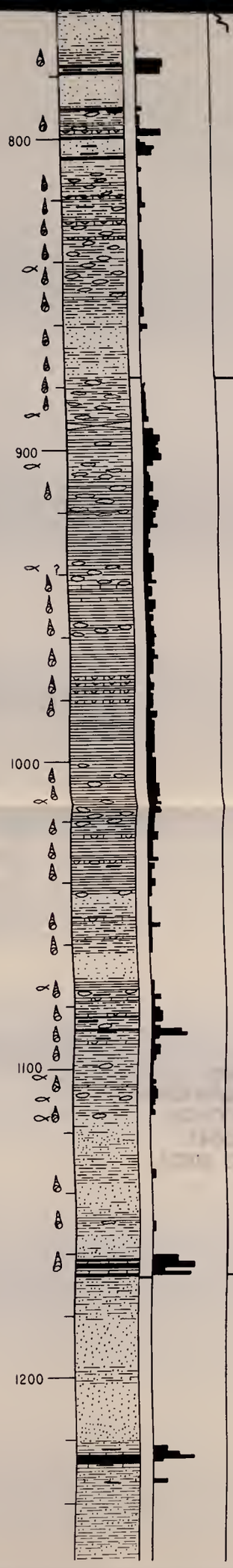
BUREAU OF MINES, WASHAKIE BASIN
COREHOLE NO. 1A
SW1/4 SW1/4 SEC. 24, T14N, R100W

BUREAU OF MINES, WASHAKIE BASIN
COREHOLE NO. 1
NW1/4 SW1/4 SEC. 17, T14N, R99W





OF

WASATCH FORMATION

LUMAN TONGUE

OF

GREEN RIVER FORMATION

MAIN BODY OF

WASATCH FORMATION

(UPPER PART)

LEGEND

SANDSTONE

CROSSBEDDED SANDSTONE

SILTSTONE

CARBONACEOUS SILTSTONE

MUDSTONE

CARBONACEOUS MUDSTONE

CLAYSTONE

SHALE

CARBONACEOUS SHALE

COAL

OIL SHALE

CALCAREOUS MARLSTONE

DOLOMITIC MARLSTONE

LIMESTONE

OOLITIC LIMESTONE

COQUINA

LIMESTONE NODULES

DOLOMITE

ALGAL BED

ALGAL LENSES OR STRINGERS

TUFF, THICKER THAN 0.1 FT.

TUFFACEOUS

CONGLOMERATE

BRECCIA

OSTRACODS

OOLITE

NO SAMPLE

MOLLUSK SHELLS

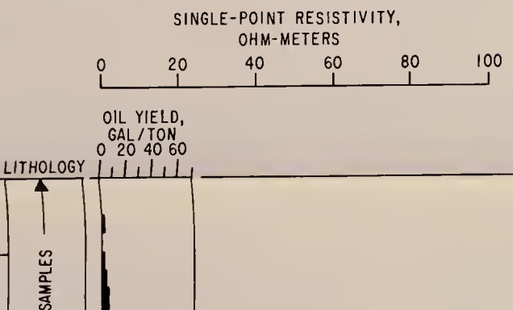
PLANT FOSSIL

FISH FOSSIL

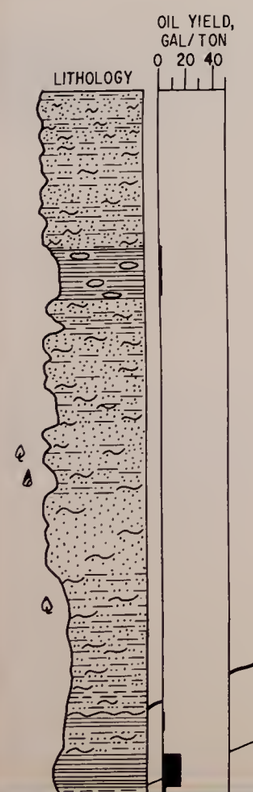
SEE FIGURE 6 FOR LEGEND
OF LITHOLOGIC SYMBOLS

LANEY MEMBER

BUREAU OF MINES, WASHAKIE BASIN
COREHOLE NO. 1
NW1/4SW1/4 SEC. 17, T14N, R99W



TRAIL DUGWAY
MEASURED OUT-
CROP SECTION
SE 1/4 SEC. 18, SW 1/4 SEC. 17,
NE 1/4 SEC. 19, T 14 N, R 99W

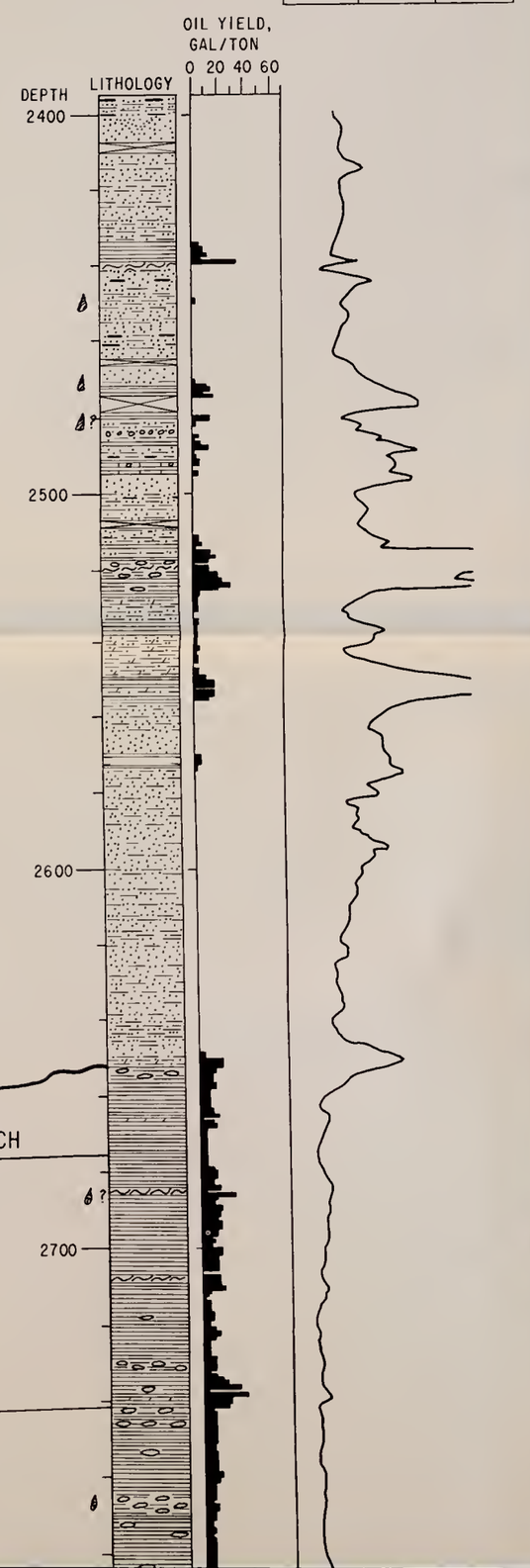


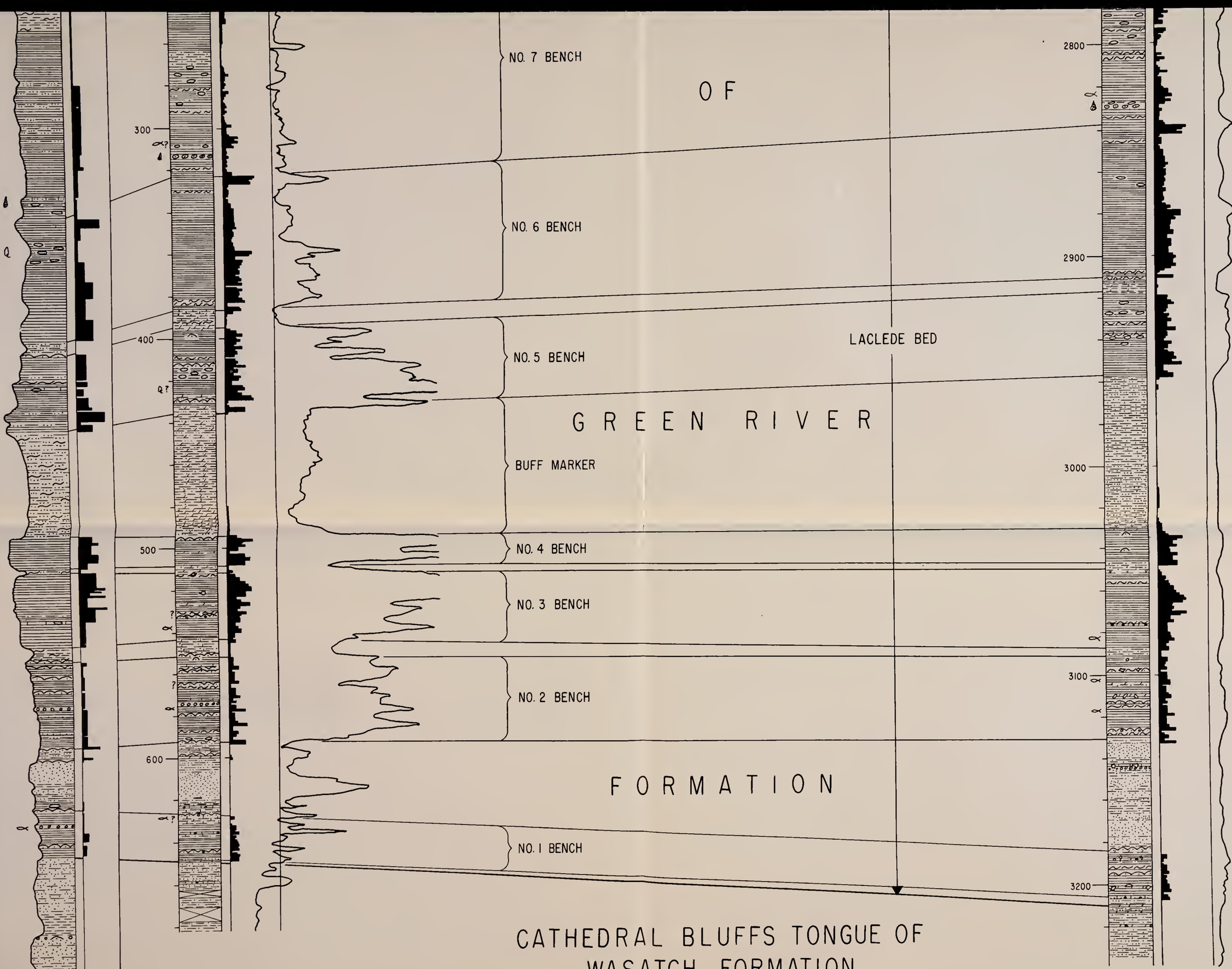
SAND BUTTE BED
(LOWER PART)

NO. 9 BENCH

NO. 8 BENCH

BUREAU OF MINES, WASHAKIE BASIN
COREHOLE NO. 2
SW1/4SW1/4 SEC. 6, T14N, R98N





CATHEDRAL BLUFFS TONGUE OF WASATCH FORMATION (UPPER PART)

N

S

SEE FIGURE 6 FOR LEGEND

OF LITHOLOGIC SYMBOLS

SCALE, feet: 0, 20, 40, 60, 80, 100

SCALE, miles: 0, 1, 2, 3, 4, 5

SAND BUTTE

SW 1/4 SEC 22, AND E 1/2 SEC 21, T16N, R100W

OIL YIELD GAL/TON

LITHOLOGY 0 20 40

SPRING DRAW

SE 1/4 SEC22, T15N, R100W

OIL YIELD GAL/TON

LITHOLOGY 0 20 40

TRAIL DUGWAY

SE 1/4 SEC 18, SW 1/4 SEC 17, AND NE 1/4 SEC 19, T14N, R99W

OIL YIELD GAL/TON

LITHOLOGY 0 20 40

EAST PIONEER FIELD

SW 1/4 SEC 23, T13N, R99W

OIL YIELD GAL/TON

LITHOLOGY 0 20 40

SHELL CREEK

SECS. 9 AND 10, T12N, R98W

OIL YIELD GAL/TON

LITHOLOGY 0 20 40

SAND BUTTE BED (LOWER PART)

GYRAULUS MARKER

ALGAL MARKER

BUFF MARKER

LACLEDE BED

SILVER BENCH

CATHEDRAL BLUFFS TONGUE OF WASATCH FORMATION (UPPER PART)

LANEY MEMBER OF GREEN RIVER FORMATION

GREEN SHALE MARKER

NO. 9 BENCH

NO. B BENCH

NO. 7 BENCH

GYRAULUS MARKER

NO. 6 BENCH

NO. 5 BENCH

NO. 4 BENCH

NO. 3 BENCH

NO. 2 BENCH

NO. 1 BENCH

(3 pieces)