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RESULTS OF CORE DRILLING IN THE MAHOGANY ZONE AND
SOME ADJACENT BEDS OF THE GREEN RIVER FORMATION,
WINTER RIDGE AREA, SOUTHEASTERN UINTA BASIN, UTAH

By

W. B. Cashion

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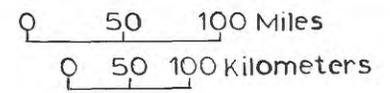
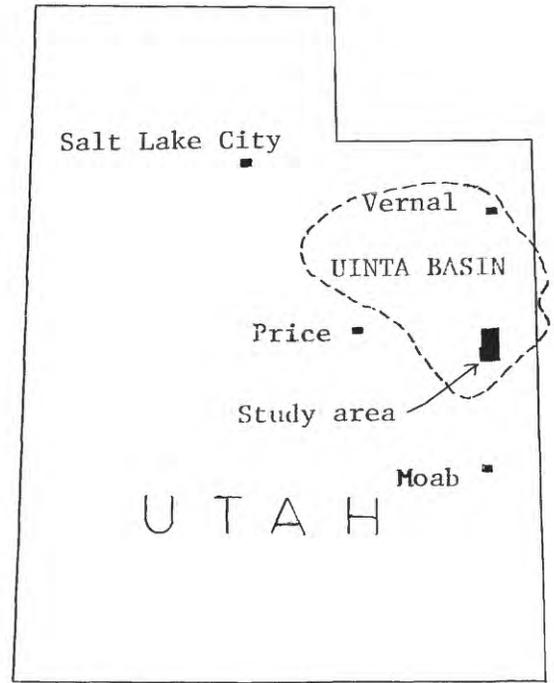
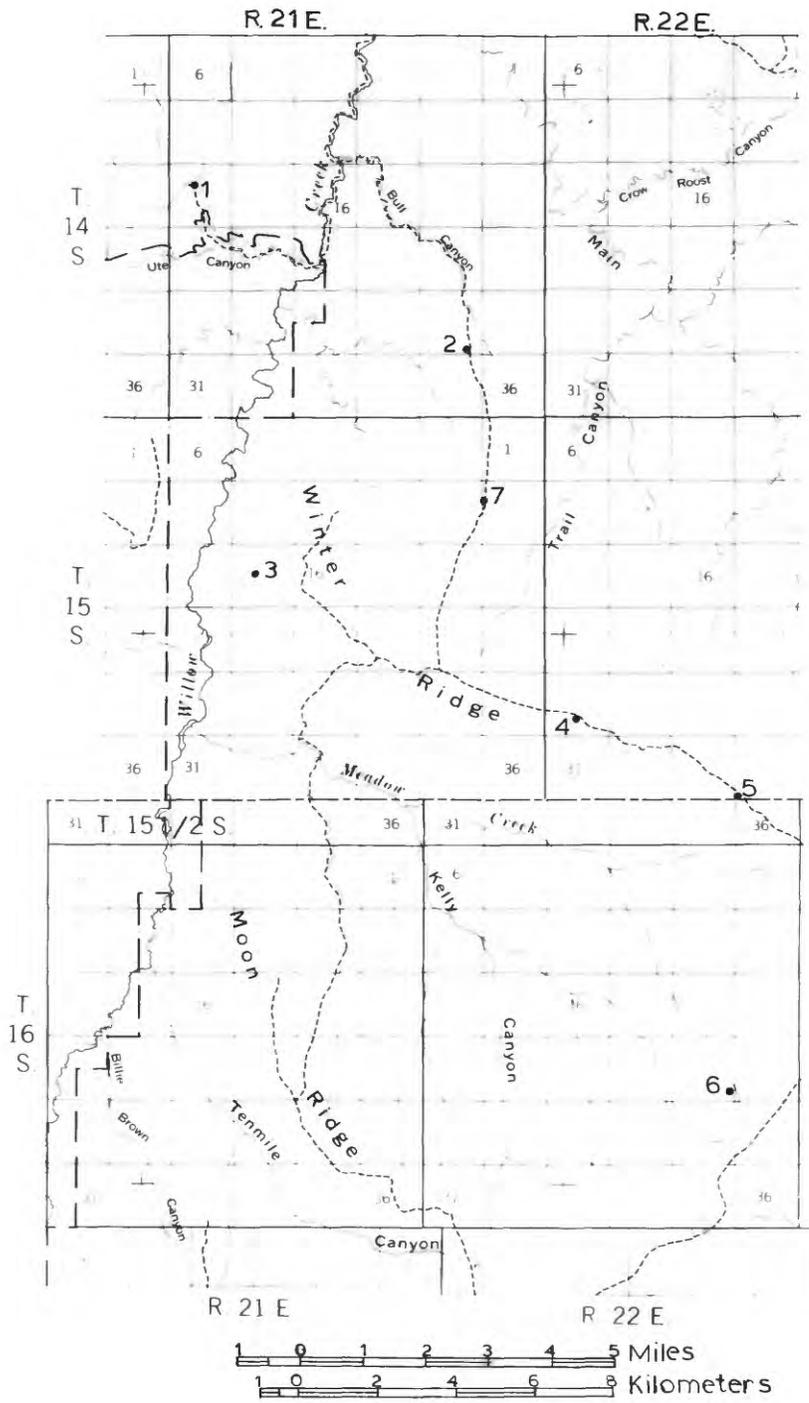
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INTRODUCTION

The area discussed in this report is in south central Uintah County and north central Grand County, Utah in T. 14 S., R. 21 E.; T. 15 S., R. 21 E.; T. 15 S., R. 22 E., and T. 16 S., R. 22 E. (fig. 1). Seven shallow core holes (table 1) were drilled in the area to evaluate the oil-shale beds of the Mahogany zone and to determine the approximate position of the 15-foot isopach for the oil-shale sequence with an average yield of 15 gallons of shale oil per ton. Sandstone beds immediately above and below the Mahogany zone were also cored in order to sample those beds that contain bitumen. The cores were examined and described (table 2) and cores from sequences containing appreciable amounts of kerogen or bitumen were assayed by the Fischer retort method. The core drilling was done by Wildcat Drilling Service, Inc. of Montrose, Colorado, and the assaying was done by the Colorado School of Mines Research Institute, Golden, Colorado (table 3).



INDEX MAP



EXPLANATION

2.

Core hole

(numbers keyed to tables)

Figure 1.--Map showing location of core holes, southeastern Uinta Basin, Utah

Table 1.--List of core holes, data-bank file numbers and depths to Mahogany oil-shale bed

<u>Core hole no.</u>	<u>Data-bank file No.</u>	<u>Depth to Mahogany oil-shale bed (in feet)</u>
1	U-94	81
2	U-95	63
3	U-96	107
4	U-97	49
5	U-98	54
6	U-99	39
7	U-100	77

GEOLOGY

The study area is located approximately 30 miles southwest of the Tertiary depositional axis of the Uinta Basin. The thickest and richest oil-shale sequence in the Green River Formation of Utah was deposited along that axis. Rocks of the Green River Formation in the study area are principally mudstones, siltstones, sandstones, and grainstones deposited in a marginal lacustrine environment. Oil shale and marlstone, deposited in an open lacustrine environment, comprise a small part of the total sequence. The Mahogany zone is the only significant oil-shale sequence in the study area and it is relatively thin and low grade compared to the oil shales of the Mahogany zone deposited along the trough of Lake Uinta.

RESOURCES

Fischer assays of core from the Mahogany zone show that the thickness of the oil-shale sequence yielding an average of 15 gallons of oil per ton ranges from approximately 8 feet in core hole WR-6 to approximately 20 feet in core holes WR-1 and WR-2 (figs. 2-8). Much of the study area is underlain by less than 15 feet of oil shale averaging 15 gallons of oil per ton. The assay results show a general trend of decreasing oil-shale values from northeast to southwest, if the anomalously low values for core hole WR-7 are disregarded. Selected intervals of bitumen-bearing sandstone were assayed by the Fischer method. Although the selected intervals are, in general, those that apparently have the highest content of bitumen, Fischer assay results do not show significant amounts of bitumen in the sandstones. Perhaps some other assay method should be used to test the bitumen content.

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah

CORE HOLE NO. 1

Depth to top and base of unit (in feet)	Thickness of unit (in feet)	Location: NE $\frac{1}{2}$ SE $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 18, T. 14 S., R. 21 E. (Approximately 2,300' E/W line and 1,800' S/N line) Ground elevation: 6,760 feet	Description
			Coring began at a depth of 20 feet
20.0-22.0	2.0		Oil shale, olive-gray to brownish-black, laminated; upper $\frac{1}{2}$ contains more kerogen than lower $\frac{1}{2}$; includes several stringers of tuft near middle of unit
22.0-27.5	5.5		Mudstone and marlstone interbedded, calcareous, silty, micaceous; irregularly bedded mudstone is light olive-gray and marlstone is yellow-brown; numerous small-scale load structures; carbonized plant remains. Tar-filled fracture extends vertically through the unit
27.5-30.0	2.5		Mudstone, olive-gray, silty, calcareous, slightly micaceous; minor amount of kerogen; carbonized plant remains
30.0-35.0	5.0		Mudstone and marlstone; mudstone is olive-gray, silty; marlstone is yellow-brown; unit is slightly micaceous and laminated to massive
35.0-40.0	5.0		Mudstone and very fine grained sandstone, light olive-gray, calcareous; sandstone is abundantly micaceous; much irregular bedding as a result of load structures
40.0-50.0	10.0		Mudstone, olive-gray, calcareous, silty, micaceous, with yellow-brown marlstone in lower 1/3 of unit
50.0-60.0	10.0		Mudstone, olive-gray, calcareous, silty, micaceous, with a few thin beds of yellow-brown silty marlstone
60.0-70.0	10.0		Mudstone and marlstone interbedded, light olive-gray and yellow-brown
70.0-76.1	6.1		Marlstone, yellow-brown, silty in part, laminated to thin-bedded; with a few thin beds of low-grade oil shale
76.1-87.2	11.1		Oil shale, dark-brown; includes 0.05 ft thick tuffs at depths of 76.5 and 87.1 ft. Tuffs have irregular upper and lower boundaries
87.2-89.5	2.3		Oil shale and marlstone, light olive-gray and dark-brown; includes 0.05 ft thick tuff at depth of 89.0 ft
89.5-95.2	5.7		Marlstone and low-grade oil shale, olive-gray and yellow-brown; slumped bedding in lowermost one ft.
95.2-100.0	4.8		Sandstone, light to medium-gray, very fine grained, micaceous; with some light olive-gray mudstone. Some laminae are stained with bitumen in a thin zone at a depth of 98.4 ft.

Total Depth: 100 feet

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah--Continued

CORE HOLE NO. 2

Depth to top and base of unit (in feet)	Thickness of unit (in feet)	Location: SW1/4SE1/4SE1/4 sec. 26, T. 14 S., R. 21 E. (Approximately 900' W/E line and 300' N/S line) Ground elevation: 7,002 feet	Description
			Coring began at a depth of 20 feet
20.0-30.0	10.0		Sandstone, gray, very fine grained, calcareous, and siltstone, gray and greenish-gray, calcareous; contains 1-foot thick punky, ochre sandstone at a depth of 28.0 feet; and 0.5-foot thick brown, silty marlstone at a depth of 29.0 feet; unit contains abundant carbonized plant remains.
30.0-39.0	9.0		Mudstone, greenish-gray, very calcareous; abundant plant remains; contains two thin very fine grained, punky, ochre sandstones; one 0.2-foot thick at a depth of 31 feet and one 0.1-foot thick at depth of 38.5 feet.
39.0-41.0	2.0		Marlstone, gray and brown, silty, varved, slightly kerogenaceous
41.0-48.0	7.0		Mudstone, gray and greenish-gray, calcareous, silty
48.0-50.0	2.0		Marlstone, gray and brown, silty.
50.0-50.2	0.2		Oil shale, dark-gray and dusky-yellow, laminated
50.2-53.1	2.9		Mudstone, gray, calcareous, silty, micaceous; carbonized plant remains
53.1-53.3	0.2		Tuff(?), greenish-black; contains pyrite
53.3-58.3	5.0		Marlstone and thin beds of low-grade oil shale, gray and brown; some tuffaceous laminae and carbonized plant remains
58.3-69.4	11.1		Oil shale, dark-gray and olive-gray; laminated in part; some undulatory bedding in uppermost 1-foot; includes very thin tuffs of irregular thickness at depths of 61.4 and 65.1 feet; contains pyrite
69.4-70.1	0.7		Sandstone, gray, very fine grained, calcareous, irregularly bedded; contains kerogenaceous stringers
70.1-71.3	1.2		Oil shale, olive-gray, laminated
71.3-71.5	0.2		Brecciated zone; matrix of yellow-brown tuff or sandstone; some bitumen stained
71.5-74.5	3.0		Oil shale, olive-gray; interbedded with mudstone in lower part; contains thin lenticular tuffs at depths of 72.4 and 74.2-feet
74.5-85.2	10.7		Sandstone, greenish-gray, very fine grained, and silty mudstone; unit is calcareous and micaceous; upper 0.4-feet is bitumen impregnated and may be tuffaceous; some pyrite
85.2-85.6	0.4		Mudstone and marlstone, gray and brown, punky, silty
85.6-86.7	1.1		Oil shale, olive-gray, laminated in part, tuffaceous
86.7-100.0	13.3		Sandstone, greenish-gray, very fine grained, calcareous, micaceous; uppermost 3 feet impregnated with bitumen and remainder has some bitumen staining; unit yielded very small amount of water from interval between depths of 91 and 93 feet

Total depth 100 feet

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah--Continued

CORE HOLE NO. 3

Depth to top and base of unit (in feet) Thickness of unit (in feet) Location: NE1/4NE1/4SW1/4 sec. 17, T. 15 S., R. 21 E. (Approximately 2000' E/W line and 2500' N/S line)
Ground elevation: 7,282 feet

Depth to top and base of unit (in feet)	Thickness of unit (in feet)	Description
		Coring began at a depth of 70-feet
70.0-88.8	18.8	Sandstone, dark greenish-gray to light olive-gray, very fine grained, and siltstone, greenish-gray; very calcareous, micaceous; some carbonized plant remains; sandstone is, in part, slightly stained with bitumen
88.8-92.9	4.1	Mudstone, light olive-gray, silty, and marlstone, yellow-brown; laminated to thin-bedded; irregular bedding planes
92.9-101.0	8.1	Sandstone, greenish-gray, very fine grained, very calcareous, and mudstone, olive-gray, silty; slightly micaceous; some carbonized plant remains; lowermost few feet contain thin kerogenaceous layers
101.0-113.1	12.1	Oil shale, olive-gray to dark-gray; contains bitumen-stained tuff 0.2-foot thick at depth of 108.8
113.1-113.7	0.6	Tuff(?), yellow-brown; some laminae of oil shale; bedding is contorted
113.7-115.0	1.3	Oil shale, olive-gray to dark-gray, laminated
115.0-115.2	0.2	Breccia; dark-gray fine-grained matrix; bitumen impregnated; contains yellow-brown limestone rip-up clasts
115.2-115.3	0.1	Oil shale, light- to dark-gray, laminated; contains tuff stringers
115.3-115.5	0.2	Tuff(?), yellow-brown
115.5-115.9	0.4	Breccia; dark-gray fine-grained matrix, yellow-brown limestone rip-up clasts; blebs of bitumen
115.9-130.0	14.1	Sandstone, olive-gray, very fine to medium grained; some thin zones stained with bitumen; laminated to thin-bedded; a few low-angle cross beds; some scouring; contains a few very thin-beds of calcareous mudstone
130.0-160.0	30.0	Sandstone, olive-gray and dark-gray, very fine to medium grained; calcareous in part, some intervals slightly stained with bitumen

Total depth: 160 feet

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah--Continued

CORE HOLE NO. 4

Depth to top and base of unit (in feet)	Thickness of unit (in feet)	Location: SW1/4NW1/4SE1/4 sec. 30, T. 15 S., R. 22 E. (Approximately 2,400' W/E line and 1,500' N/S line) Ground elevation: 7,430 feet	Description
			Coring began at a depth of 20 feet
20.0-26.0	6.0		Mudstone, greenish-gray, silty, calcareous; some carbonized plant remains; slightly micaceous
26.0-29.0	3.0		Siltstone and very fine grained sandstone interbedded; siltstone is greenish gray and sandstone is yellowish gray; many tiny crystal faces and minute mica flakes in sandstone
29.0-29.3	0.3		Sandstone, yellow-brown, very fine grained, limonitic
29.3-42.0	12.7		Mudstone and very fine grained sandstone, greenish-gray, calcareous, some carbonized plant remains; thin sequences (3"-4" thick) of banded greenish-gray and light brown marlstone. Unit is mostly massive with little evidence of bedding
42.0-46.8	4.8		Marlstone, pale-brown to gray; laminated in part; contains lenses of tuff(?)
46.8-51.4	4.6		Oil shale, olive-black, laminated; contains lenses of tuff(?)
51.4-51.6	0.2		Tuff, yellowish-gray, micaceous; load structures
51.6-56.2	4.6		Oil shale with light-gray lenticular clasts
56.2-57.8	1.6		Mudstone, olive-gray, silty, calcareous; some carbonized plant remains; micaceous; load structures at base
57.8-59.7	1.9		Limestone, light-tan, oolitic, sandy, porous; stromatolitic at top; lower part is sandy with some small (1/8") clasts
59.7-90.0	30.3		Sandstone, yellowish-brown to brownish-black, very fine to fine grained; slightly calcareous; micaceous; some carbonized plant remains; cross-bedded in part; most of unit is slightly to moderately stained by bitumen
90.0-99.0	9.0		Sandstone and mudstone interbedded; sandstone is gray to brownish-gray, very fine to fine-grained and contains scattered blebs of bitumen; mudstone is greenish gray, silty, micaceous and calcareous

Total depth: 99 feet

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah--Continued

CORE HOLE NO. 5		
Depth to top and base of unit (in feet)	thickness of unit (in feet)	Location: SW1/4SW1/4SW1/4 sec. 34, T. 15 S., R. 22 E. (Approximately 400' E/W line and 600' N/S line) Ground elevation: 7,542 feet
Description		
		Coring began at a depth of 20 feet
20.0-23.0	3.0	Sandstone, very fine grained, gray, micaceous
23.0-30.0	7.0	Mudstone, olive-gray, calcareous, silty, micaceous, limonitic(?); abundant carbonized plant remains; lowermost 3 feet includes thin (less than 1") marlstone stringers which contain very small amounts of kerogen; bitumen staining on fracture faces
30.0-30.5	0.5	Sandstone, gray, slightly impregnated with bitumen
30.5-32.0	1.5	Mudstone, olive-gray, silty, calcareous
32.0-37.0	5.0	Sandstone, yellow-brown, fine- to medium-grained; numerous flecks of bitumen. Drill encountered small amount of water at depth of approximately 37 feet (less than 1 gallon per minute)
37.0-40.0	3.0	Mudstone, gray, silty, calcareous; some carbonized plant remains
40.0-50.0	10.0	Mudstone and marlstone interbedded, gray and light-brown, silty
50.0-50.6	0.6	Marlstone, gray, silty
50.6-52.0	1.4	Oil shale, olive-gray to black; irregular laminae, interlaminated with tuff; intricate load structures
52.0-53.9	1.9	Mudstone, yellowish-gray, silty; abundant carbonized plant remains
53.9-56.2	2.3	Oil shale, olive-gray to olive-black; irregular laminae; contains stringers of tuff(?); intricate load structures
56.2-56.8	0.6	Marlstone, grayish olive-green
56.8-60.0	3.2	Mudstone, greenish-gray, silty, slightly kerogenaceous
60.0-61.2	1.2	Marlstone, gray and brown
61.2-61.6	0.4	Tuff, greenish-gray; irregular top and base
61.6-65.2	3.6	Oil shale, dark olive-gray, laminated; contains tuff stringers; some load structures
65.2-65.3	0.1	Tuff, greenish-gray; irregular top and base
65.3-67.2	1.9	Oil shale, laminated; contains thin, very contorted tuff stringers
67.2-67.6	0.4	Oil shale, olive-gray to black; contains load structures or stromatolitic structures
67.6-68.0	0.4	Missing
68.0-69.1	1.1	Mudstone and very fine grained sandstone interbedded, greenish-gray; with thin interbeds of moderately rich oil shale
69.1-69.5	0.4	Breccia; yellow-brown sandstone matrix with subangular mudstone clasts
69.5-69.8	0.3	Oil shale, olive-gray, interlaminated with brown carbonate layers
69.8-69.9	0.1	Tuff(?), brownish-gray; impregnated with bitumen
69.9-72.3	2.4	Sandstone, greenish-gray, very fine grained, micaceous; thin (0.2') bitumen-impregnated sandstone 0.3' below top of unit
72.3-72.7	0.4	Sandstone, greenish-gray, very fine grained; impregnated with bitumen; contains light-gray angular calcareous clasts
72.7-88.0	15.3	Sandstone, greenish-gray, very fine grained; most of unit is impregnated with bitumen
88.0-90.0	2.0	Sandstone, greenish-gray, very fine grained
90.0-97.7	7.7	Sandstone, greenish-gray, very fine to medium grained; most of unit is impregnated with bitumen; some interbeds of very fine grained sandstone that contain no bitumen; mostly thin even bedding; some load structures
97.7-103.0	5.3	Sandstone, greenish-gray, very fine grained; thin even bedding; slightly stained with bitumen

Total depth: 103 feet

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah--Continued

CORE HOLE NO. 6

Depth to top and base of unit (in feet)	Thickness of unit (in feet)	Description
		Location: NE1/4SE1/4SE1/4 sec. 23, T. 16 S., R. 22 E. (Approximately 200' W/E line and 1,200' N/S line) Ground elevation: 7,728 feet
		Coring began at a depth of 20 feet
20.0-25.0	5.0	Mudstone, greenish-gray, silty, micaceous, massive, calcareous; some carbonized plant remains
25.0-30.0	5.0	Sandstone, greenish-gray, very fine grained, micaceous, massive
30.0-35.0	5.0	Mudstone, olive-green, silty, micaceous, calcareous
35.0-35.3	0.3	Sandstone, yellowish-gray, very fine grained, poorly cemented
35.3-37.0	1.7	Mudstone, olive-gray, silty, thin bedded; numerous tuff lenses
37.0-41.9	4.9	Oil shale, olive-brown to black; silty in part. Drill encountered a very small amount of water at a depth of approximately 40 feet
41.9-42.0	0.1	Tuff, grayish-green, micaceous; slightly stained with bitumen
42.0-43.2	1.2	Marlstone, olive-green to dark-gray, laminated; contains several very thin tuff layers
43.2-46.2	3.0	Sandstone, greenish-gray, with thin oil shale (0.1-0.2 ft) layers; slightly calcareous; some contorted bedding or stromatolites
46.2-58.2	12.0	Sandstone, yellow-brown to greenish-gray, fine-grained; contains numerous argillaceous, limonitic(?) stringers
58.2-58.6	0.4	Mudstone, greenish-gray, silty, calcareous
58.6-65.0	6.4	Sandstone, greenish-gray, fine-grained; spotty bitumen staining
65.0-75.0	10.0	Sandstone, greenish-gray, very fine grained; slightly stained with bitumen
75.0-85.0	10.0	Sandstone, light-gray-green, very fine to fine-grained; mostly thin bedded; some irregular bedding; lowermost 10 feet contains numerous micaceous (?) laminae; numerous flecks of bitumen and spots stained with bitumen
85.0-86.0	1.0	Mudstone, greenish-gray, silty, argillaceous, calcareous
86.0-87.0	1.0	Sandstone, greenish-gray, very fine to fine-grained; spotty bitumen staining
87.0-94.0	7.0	Sandstone, yellow-brown, very fine grained; abundant limonite (?); scattered flecks of bitumen
94.0-95.0	1.0	Mudstone, greenish-gray, silty, calcareous
95.0-98.0	3.0	Sandstone, yellow-brown and greenish-gray, fine- to-medium grained; spotty bitumen staining
98.0-100.0	2.0	Sandstone, greenish-gray, very fine grained; some flecks of bitumen

Total depth 100 feet

Table 2.--Lithologic logs of cores from holes WR-1 thru WR-7, southeastern Uinta Basin, Utah--Continued

CORE HOLE NO. 7

Depth to top and base of unit (in feet)	Thickness of unit (in feet)	Description
		Location: NW1/4SW1/4NW1/4 sec. 12, T. 15 S., R. 21 E. (Approximately 200' E/W line and 1,700' S/N line) Ground elevation: 7,187 feet
		Coring began at a depth of 20 feet
20.0-22.0	2.0	Sandstone, dark-gray, fine-grained; impregnated with bitumen
22.0-50.0	28.0	Mudstone, olive-gray, silty, calcareous, slightly micaceous; some carbonized plant remains; sequence contains a few thin (less than 0.3 feet thick) sandstone beds impregnated with bitumen
50.0-51.5	1.5	Marlstone, yellow-brown, silty; slightly kerogenous; irregular bedding
51.5-60.0	8.5	Mudstone, greenish-gray, silty; slightly kerogenous; contains carbonaceous plant remains
60.0-64.2	4.2	Mudstone, yellowish-gray, silty, very calcareous
64.2-69.9	5.7	Marlstone, yellow-brown, silty; contains two thin sandstone beds
69.9-70.0	0.1	Core missing
70.0-78.4	8.4	Oil shale, olive-gray to black, laminated; contains .05 ft thick oil-stained tuff at depth of 71.9 ft
78.4-78.5	0.1	Tuff, yellow-brown, slightly irregular upper and lower surfaces
78.5-81.8	3.3	Oil shale, olive-gray to black, laminated
81.8-82.4	0.6	Tuff(?), yellow-brown; contorted bedding
82.4-82.9	0.5	Oil shale and marlstone, yellow-gray to black, laminated
82.9-83.7	0.8	Sandstone, yellow-brown, very fine grained, slightly oolitic, porous, slightly calcareous
83.7-84.4	0.7	Oil shale, olive-gray to black
84.4-84.5	0.1	Limestone, yellow-gray, oolitic, sandy; may contain ostracodes
84.5-84.6	0.1	Oil shale, olive-gray to black
84.6-85.8	1.2	Breccia, greenish-gray, calcareous matrix, irregularly shaped limestone clasts
85.8-95.0	9.2	Sandstone, greenish-gray, very fine grained, calcareous; lower part is silty
95.0-98.0	3.0	Sandstone, greenish-gray, fine-grained, micaceous; impregnated with bitumen

Total depth: 98 feet

Table 3.--Fischer assay results for core holes WR-1 through WR-7

U-94					
		USGS	W.R.-1	14S 21E 18	
Depth-St	Depth-Ed	Gas + Loss	Oil GPT	Wtr GPT	Oil Spec Grav
20	21	2.2	28.0	4.7	0.909
21	22	1.6	12.1	4.2	0.914
22	23	0.9	4.5	3.0	0.910
23	24	0.9	0.9	1.4	0.910
24	25	0.5	0.8	2.1	0.910
25	28	0.0	0.6 e	0.0	0.000
28	29	0.1	0.0	4.2	0.910
29	30	0.3	0.1	3.0	0.910
30	31	0.8	0.2	3.0	0.910
31	32	1.0	0.5	3.7	0.910
32	33	1.0	3.6	2.5	0.910
33	34	0.8	4.7	3.7	0.910
34	35	1.2	4.6	2.3	0.910
35	36	0.4	0.6	1.6	0.910
36	37	0.0	0.0	0.2	0.910
37	38	0.0	0.0	1.4	0.910
38	39	0.0	0.2	0.7	0.910
39	40	0.0	0.1	1.3	0.910
40	70	0.0	0.1 e	0.0	0.000
70	71	0.8	0.5	5.8	0.910
71	72	0.9	1.7	4.5	0.910
72	73	1.2	2.2	5.2	0.910
73	74	1.4	1.8	3.5	0.910
74	75	1.3	3.0	5.4	0.910
75	76	1.2	6.6	4.7	0.910
76	77	1.7	15.5	4.2	0.918
77	78	1.9	20.6	6.8	0.912
78	79	1.5	11.9	3.3	0.903
79	80	2.0	20.8	4.1	0.910
80	81	2.7	32.2	5.8	0.900
81	82	4.5	50.2	5.8	0.901
82	83	3.8	49.1	5.2	0.900
83	84	3.6	36.6	5.5	0.908
84	85	1.6	11.1	4.2	0.923
85	86	1.7	15.8	3.1	0.917
86	87	1.7	13.9	1.6	0.914
87	88	1.8	18.8	4.6	0.907
88	89	1.3	7.9	4.1	0.890
89	90	1.6	8.7	2.1	0.919

e - estimated.

Table 3.--Fischer assay results for core holes WR-1 through WR-7--Continued

U-95					
		USGS	W.R.-2	14S 21E 26	
Depth-St	Depth-Ed	Gas + Loss	Oil GPT	Wtr GPT	Oil Spec Grav
40	41	0.3	0.5	4.3	0.910
41	42	0.7	0.0	5.2	0.910
42	43	0.5	0.0	7.6	0.910
43	44	0.3	0.0	6.2	0.910
44	45	0.5	0.0	4.5	0.910
45	46	0.8	0.8	1.4	0.910
46	47	0.5	2.3	4.1	0.910
47	48	0.1	1.2	4.0	0.910
48	49	0.4	0.0	4.3	0.910
49	50	0.3	2.0	5.9	0.910
50	51	1.2	1.6	7.1	0.910
51	52	0.5	0.8	6.6	0.910
52	53	0.6	0.1	9.0	0.910
53	54	0.2	0.9	7.4	0.910
54	55	1.1	2.0	5.9	0.910
55	56	0.5	1.9	5.6	0.910
56	57	0.6	1.4	4.6	0.910
57	58	0.1	1.4	5.1	0.910
58	59	0.8	5.2	7.4	0.910
59	60	1.6	11.9	5.7	0.920
60	61	1.1	18.5	6.2	0.904
61	62	1.7	24.9	5.2	0.911
62	63	2.3	35.2	4.5	0.901
63	64	5.1	60.9	7.5	0.903
64	65	3.0	37.0	3.8	0.900
65	66	2.0	16.2	3.8	0.920
66	67	1.3	14.1	1.8	0.910
67	68	1.6	18.9	2.6	0.908
68	69	1.3	10.5	4.7	0.896
69	70	0.4	7.9	2.1	0.910
70	71	2.1	12.9	3.4	0.917
71	72	0.8	12.6	2.5	0.906
72	73	0.5	11.7	2.8	0.905
73	74	0.3	10.2	1.6	0.906
74	75	0.3	4.8	1.9	0.910
75	76	0.0	0.0	5.9	0.910
76	77	0.2	0.0	6.0	0.910
77	78	0.0	0.0	6.8	0.910
78	79	0.0	0.0	7.1	0.910
79	80	0.0	0.3	3.0	0.910
80	81	0.9	0.0	4.9	0.910
81	82	0.9	0.0	5.5	0.910
82	83	0.2	0.2	7.3	0.910
83	84	0.4	0.0	6.0	0.910
84	85	0.7	0.0	7.6	0.910
85	86	0.0	4.3	1.6	0.910
86	87	1.1	13.0	0.4	0.930
87	88	1.0	6.5	0.4	0.910
88	89	0.1	5.3	0.7	0.910
89	90	0.1	0.0	2.4	0.000

Table 3.--Fischer assay results for core hole WR-1 through WR-7--Continued

U-96
USGS W.R.-3 15S 21E 17

Depth-St	Depth-Ed	Gas + Loss	Oil GPT	Wtr GPT	Oil Spec Grav
90	91	0.3	0.7	2.2	0.910
91	92	0.4	1.1	1.4	0.910
92	93	0.1	0.8	2.1	0.910
93	94	0.4	1.0	5.6	0.910
94	95	0.8	1.6	7.4	0.910
95	96	0.4	0.0	7.0	0.910
96	97	0.2	0.1	6.0	0.910
97	98	0.0	0.6	4.7	0.910
98	99	0.0	0.4	4.2	0.910
99	100	0.0	0.8	4.7	0.910
100	101	0.6	0.6	2.8	0.910
101	102	0.4	2.0	3.2	0.910
102	103	0.9	3.9	5.4	0.910
103	104	1.0	19.6	3.0	0.912
104	105	0.0	12.6	5.2	0.898
105	106	1.7	27.6	3.4	0.907
106	107	2.5	42.0	4.7	0.897
107	108	3.9	63.7	6.9	0.903
108	109	1.9	30.4	3.7	0.907
109	110	1.4	10.5	3.5	0.917
110	111	1.5	14.8	2.3	0.914
111	112	1.4	9.4	2.1	0.892
112	113	1.0	13.6	3.2	0.901
113	114	0.9	6.9	3.9	0.917
114	115	1.2	6.5	2.1	0.910
115	116	0.8	8.1	0.7	0.919
116	117	0.4	0.0	1.0	0.910
117	118	0.0	0.0	1.6	0.910
118	119	0.1	0.1	1.4	0.910
119	120	0.4	0.3	0.4	0.910
120	121	0.1	0.0	0.5	0.910
121	122	0.0	0.0	0.8	0.910
122	123	0.0	0.0	0.9	0.910
123	124	0.2	0.0	1.8	0.910
124	125	0.3	0.1	1.1	0.910
125	126	0.0	0.6	0.9	0.910
126	127	0.1	0.2	1.4	0.910
127	128	0.0	2.2	0.0	0.910
128	129	0.0	0.3	0.7	0.910
129	130	0.1	1.1	0.2	0.910
130	140	0.0	0.0e	0.0	0.000
140	141	0.2	0.5	3.7	0.910
141	142	0.3	0.6	2.1	0.910
142	143	0.0	0.0	2.8	0.910
143	144	0.0	0.0	2.3	0.910
144	145	0.0	0.2	2.1	0.910
145	146	0.1	0.0	2.5	0.910
146	147	0.0	0.0	3.3	0.910
147	148	0.4	0.6	1.1	0.910
148	149	0.2	0.6	0.4	0.910
149	150	0.5	0.8	0.2	0.910

e - estimated

Table 3.--Fischer assay results for core holes WR-1 through WR-7--Continued

		<u>U-97</u>			
		USGS	W.R.-4	15S 22E 30	
Depth-St	Depth-Ed	Gas + Loss	Oil GPT	Wtr GPT	Oil Spec Grav
39	40	0.3	0.4	4.9	0.910
40	41	0.0	2.4	3.2	0.910
41	42	0.0	1.7	2.7	0.910
42	43	0.0	0.3	7.6	0.910
43	44	0.0	2.1	2.0	0.910
44	45	0.1	4.1	2.8	0.910
45	46	0.0	2.3	2.5	0.910
46	47	0.0	5.5	3.0	0.910
47	48	1.2	20.7	4.6	0.914
48	49	1.2	19.5	4.7	0.913
49	50	2.5	30.3	3.2	0.907
50	51	2.5	28.3	2.9	0.910
51	52	1.2	13.2	3.5	0.920
52	53	1.0	11.6	2.8	0.923
53	54	1.4	16.8	1.9	0.912
54	55	1.1	6.9	1.8	0.889
55	56	1.1	17.0	1.6	0.919
56	57	0.5	0.8	3.5	0.910
57	58	0.1	0.2	2.3	0.910
58	59	0.0	0.5	1.8	0.910
59	60	0.0	0.9	3.0	0.910
60	61	0.1	2.3	1.4	0.910
61	62	0.0	9.0	0.7	0.929
62	63	0.3	10.9	0.7	0.928
63	64	0.3	10.5	0.2	0.930
64	65	0.7	11.3	0.4	0.929
65	66	0.5	11.8	0.7	0.929
66	67	0.2	5.7	0.7	0.910
67	68	0.5	4.9	0.2	0.910
68	69	0.4	1.4	0.4	0.910
69	70	0.7	1.4	0.7	0.910
70	71	0.8	1.6	1.2	0.910
71	72	0.8	1.6	1.4	0.910
72	73	0.6	1.9	0.9	0.910
73	74	0.4	0.6	0.2	0.910
74	75	0.5	0.0	0.7	0.910
75	76	0.6	0.9	0.9	0.910
76	77	0.8	1.3	0.4	0.910
77	78	0.6	1.0	0.9	0.910
78	79	0.3	0.1	1.6	0.910
79	80	0.8	1.5	2.6	0.910
80	81	0.7	1.9	0.7	0.910
81	82	1.0	0.8	0.7	0.910
82	83	0.6	1.3	0.7	0.910
83	84	0.6	1.3	0.6	0.910
84	85	0.4	0.0	0.4	0.910
85	86	0.8	0.0	2.1	0.910
86	87	0.4	0.0	6.5	0.910
87	88	0.6	0.7	1.1	0.910
88	89	0.0	0.6	0.7	0.910

Table 3.--Fischer assay results for core holes WR-1 through WR-7--Continued

U-98					
		USGS	W.R.-5	15S 22E 34	
Depth-St	Depth-Ed	Gas + Loss	Oil GPT	Wtr GPT	Oil Spec Grav
48	49	0.0	1.3	3.2	0.910
49	50	0.0	0.6	3.8	0.910
50	51	0.5	2.6	2.1	0.910
51	52	2.1	13.4	7.8	0.931
52	53	0.9	1.5	4.2	0.910
53	54	1.2	9.2	5.2	0.929
54	55	4.2	56.4	5.7	0.910
55	56	3.1	35.7	5.4	0.913
56	57	1.4	10.4	3.4	0.914
57	58	0.4	2.4	4.7	0.910
58	59	0.3	2.7	3.1	0.910
59	60	0.2	1.0	5.6	0.910
60	61	1.3	1.3	5.7	0.910
61	62	0.9	2.2	6.7	0.910
62	63	1.8	21.1	3.3	0.921
63	64	1.6	17.6	2.8	0.924
64	65	1.4	10.2	3.1	0.926
65	66	1.6	14.8	3.0	0.925
66	67	1.5	8.9	2.3	0.904
67	67.6	1.2	12.1	1.8	0.929
67.6	68	0.0	6.0 e	0.0	0.000
68	69	0.3	3.7	1.3	0.910
69	70	0.4	2.2	0.7	0.910
70	71	0.1	1.3	0.6	0.910
71	72	0.4	0.1	1.3	0.910
72	73	0.1	6.7	0.4	0.910
73	74	0.1	4.7	0.9	0.910
74	75	0.1	5.8	0.0	0.910
75	76	0.0	0.2	1.6	0.910
76	77	0.3	4.4	0.9	0.910
77	78	0.3	4.1	0.4	0.910
78	79	0.6	5.2	0.1	0.910
79	80	0.2	5.1	0.1	0.910
80	81	0.0	5.2	0.2	0.910
81	82	0.5	0.8	0.1	0.910
82	83	0.1	5.6	0.4	0.910
83	84	1.1	3.2	0.4	0.910
84	85	0.4	4.8	0.0	0.910
85	86	0.3	2.9	0.3	0.910
86	87	0.6	3.4	0.0	0.910
87	88	0.0	1.3	0.7	0.910
88	89	0.0	1.0 e	0.0	0.000
89	90	0.0	1.0 e	0.0	0.000
90	91	0.5	3.6	0.4	0.910
91	91.7	0.5	4.3	0.4	0.910
91.7	92.7	0.1	2.7	0.0	0.910
92.7	93.7	0.0	3.3	0.2	0.910
93.7	94.7	0.0	1.3	0.2	0.910
94.7	95.7	0.0	0.2	0.7	0.910
95.7	96.7	0.0	2.4	0.2	0.910
96.7	97.7	0.7	1.0	0.6	0.910

e - estimated

Table 3.--Fischer assay results for core holes WR-1 through WR-7--Continued

U-99

Depth-St	Depth-Ed	USGS	W.R.-6	16S 22E 23		011 Spec Grav
		Gas + Loss	011 GPT	Wtr GPT		
30	31	0.0	1.0	4.7	0.910	
31	32	0.0	0.1	6.6	0.910	
32	33	0.0	0.0	5.9	0.910	
33	34	0.0	1.0	4.0	0.910	
34	35	0.5	0.1	5.2	0.910	
35	36	0.2	0.9	7.5	0.910	
36	37	0.0	5.1	7.0	0.910	
37	38	1.4	25.5	7.6	0.899	
38	38.5	0.0	15.0 e	0.0	0.000	
38.5	39	0.8	14.9	6.1	0.908	
39	40	2.2	48.0	7.3	0.890	
40	41	1.3	15.3	5.3	0.913	
41	41.3	1.1	10.0	3.0	0.906	
41.3	42	0.0	8.0 e	0.0	0.000	
42	43	1.9	7.7	3.9	0.902	
43	44	0.9	0.6	3.0	0.910	
44	45	1.0	4.9	1.6	0.910	
45	46	0.7	0.0	0.7	0.000	
46	47	0.4	0.0	0.7	0.000	
47	48	0.0	0.0	0.7	0.000	
48	49	0.4	0.0	0.7	0.000	
49	50	0.3	0.0	1.4	0.000	
50	65	0.0	0.0 e	0.0	0.000	
65	66	0.0	0.0	1.4	0.000	
66	67	0.0	0.0	0.1	0.000	
67	68	0.0	0.0	0.0	0.000	
68	69	0.2	0.0	0.1	0.000	
69	70	0.0	0.0	0.1	0.000	
70	71	0.0	0.0	0.0	0.000	
71	72	0.0	0.0	0.9	0.000	
72	73	0.3	0.0	0.0	0.000	
73	74	0.0	0.0	1.6	0.000	
74	75	0.5	0.0	1.3	0.000	

e - estimated

Table 3.--Fischer assay results for core holes WR-1 through WR-7--Continued

U-100

USGS W.R.-7 15S 21E 12

Depth-St	Depth-Ed	Gas + Loss	Oil GPT	Wtr GPT	Oil Spec Grav
50	51	0.2	1.1	0.7	0.910
51	52	0.9	0.1	0.7	0.910
52	53	1.5	0.2	2.3	0.910
53	54	0.5	0.1	3.2	0.910
54	55	0.7	0.2	3.3	0.910
55	56	0.2	0.9	5.2	0.910
56	57	0.1	0.0	4.9	0.910
57	58	0.8	0.8	3.5	0.910
58	59	0.7	0.4	3.3	0.910
59	60	0.8	1.3	4.0	0.910
60	61	0.0	0.8	6.7	0.910
61	62	0.3	0.6	5.2	0.910
62	63	0.1	0.3	7.1	0.910
63	64	0.5	0.1	6.6	0.910
64	65	0.8	1.4	5.4	0.910
65	66	0.0	1.0	5.7	0.910
66	67	1.0	2.5	4.4	0.910
67	68	0.0	1.5	5.5	0.910
68	69	0.1	0.7	5.3	0.910
69	70	0.5	2.6	3.9	0.910
70	71	0.9	5.8	6.4	0.910
71	72	1.4	10.1	3.5	0.915
72	73	2.1	31.4	4.5	0.913
73	74	0.9	16.7	4.4	0.904
74	75	0.9	12.7	3.5	0.903
75	76	1.3	9.1	3.0	0.917
76	77	1.5	14.6	4.0	0.910
77	78	2.7	38.3	4.9	0.903
78	79	1.0	14.7	4.5	0.916
79	80	0.6	10.6	2.0	0.920
80	81	0.7	12.6	3.1	0.897
81	82	1.0	12.7	4.4	0.861
82	83	0.2	5.9	3.3	0.910
83	84	0.0	5.9	7.3	0.910
84	85	0.6	7.0	1.6	0.910
85	86	0.0	0.7	0.9	0.910
86	87	0.0	0.1	1.6	0.910
87	88	0.0	0.0	1.8	0.910
88	89	0.0	0.5	1.1	0.910
89	90	0.0	0.1	2.7	0.910

USGS Core Hole WR-1

sec. 18, T. 14 S., R. 21 E.

Fischer Assay Oil Yield
(gallons per ton)

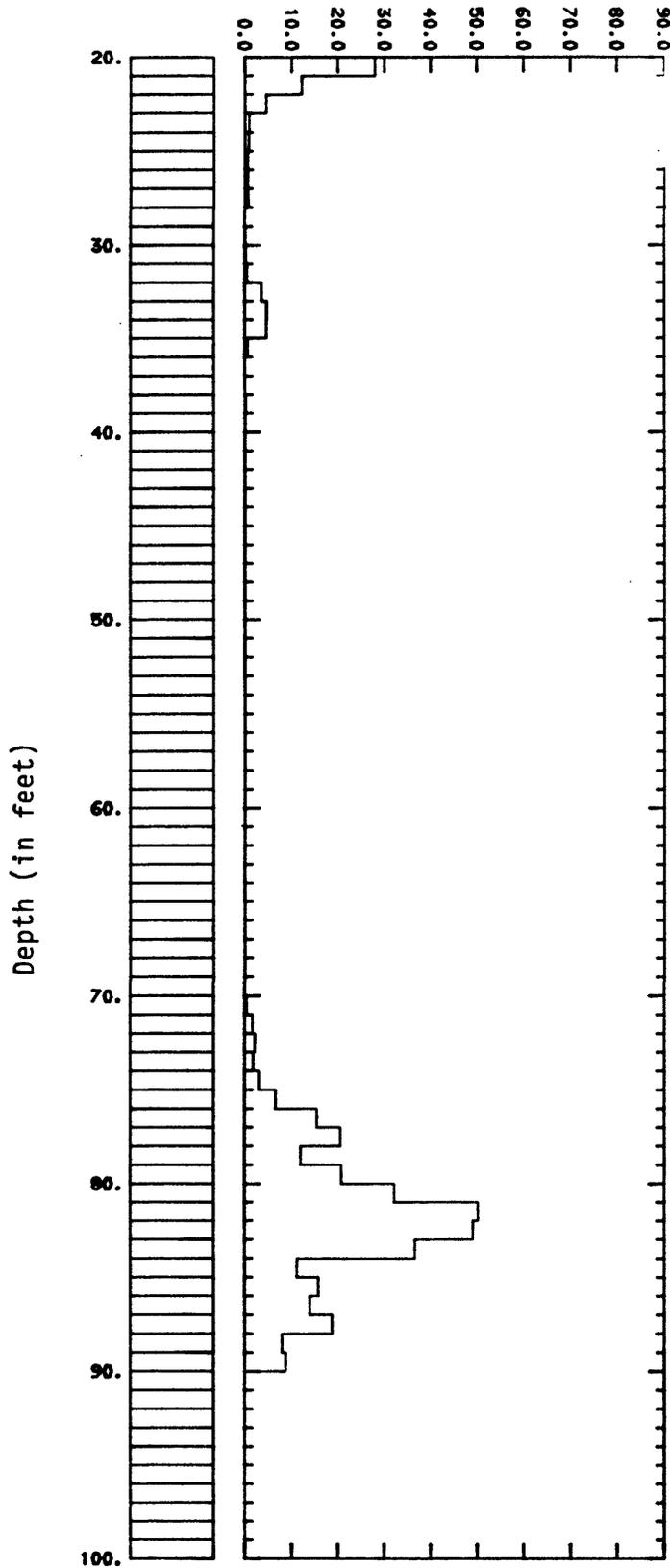


Figure 2.--Histogram of Fischer assays, core hole WR-1. Assayed intervals (in feet): 20.0 to 25.0, 28.0 to 40.0, 70.0 to 90.0. Values for intervening intervals are estimated.

USGS Core Hole WR-2
sec. 26, T. 14 S., R. 21 E.
Fischer Assay Oil Yield
(gallons per ton)

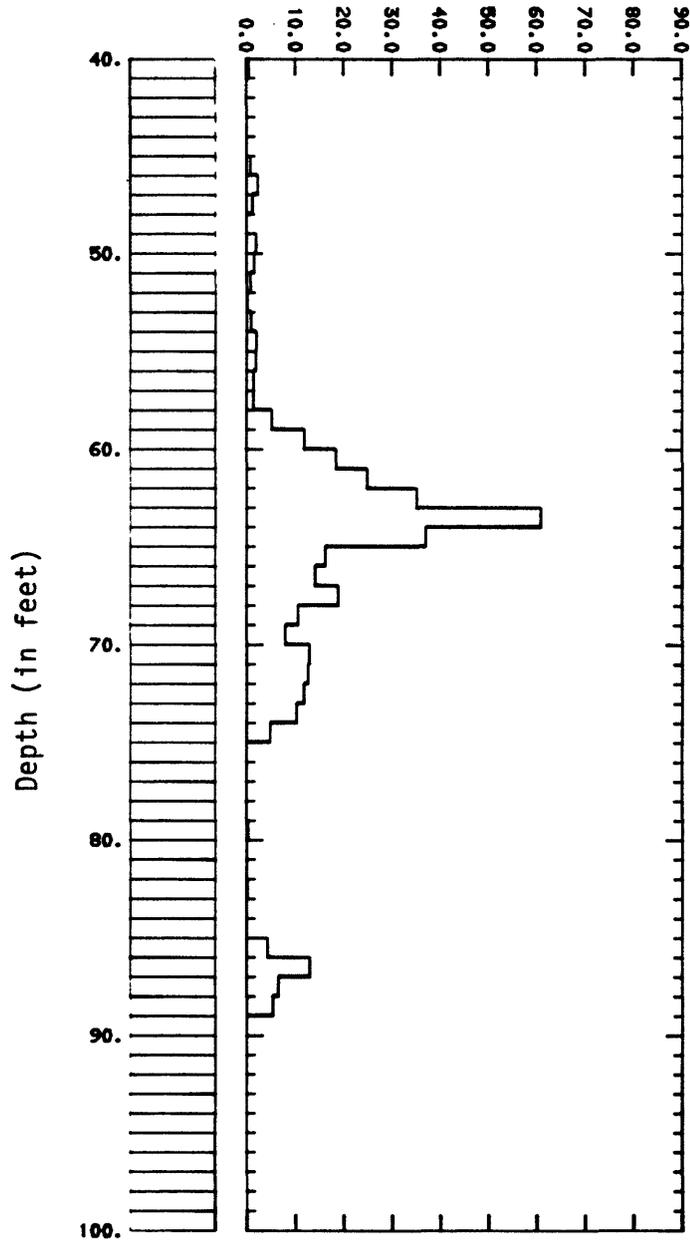


Figure 3.--Histogram of Fischer assays, core hole WR-2. Assayed interval: 40.0 to 90.0 ft.

USGS Core Hole WR-3
 sec. 17, T. 15 S., R. 21 E.
 Fischer Assay Oil Yield
 (gallons per ton)

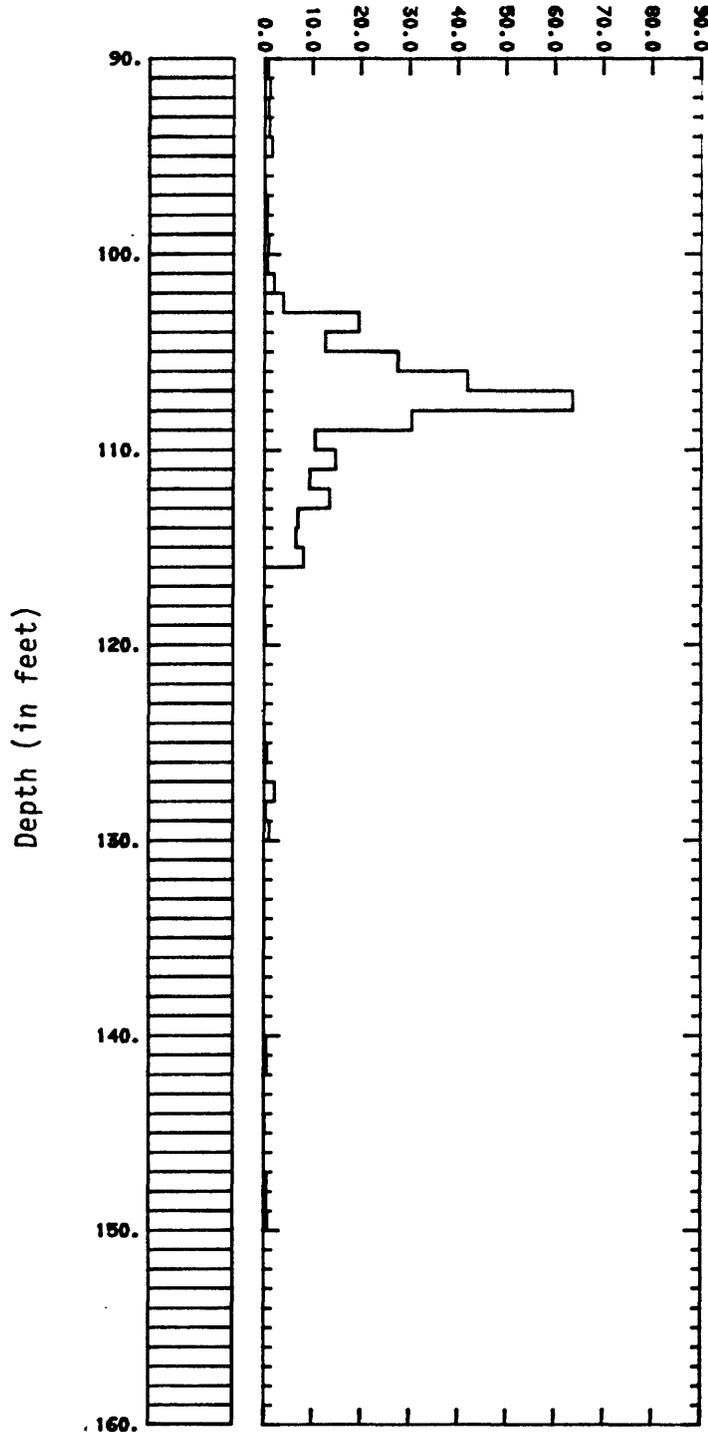


Figure 4.--Histogram of Fischer assays, core hole WR-3. Assayed intervals (in feet): 90.0 to 130.0, 140.0 to 150.0. Values for intervening interval are estimated.

USGS Core Hole WR-4
sec. 30, T. 15 S., R. 22 E.
Fischer Assay Oil Yield
(gallons per ton)

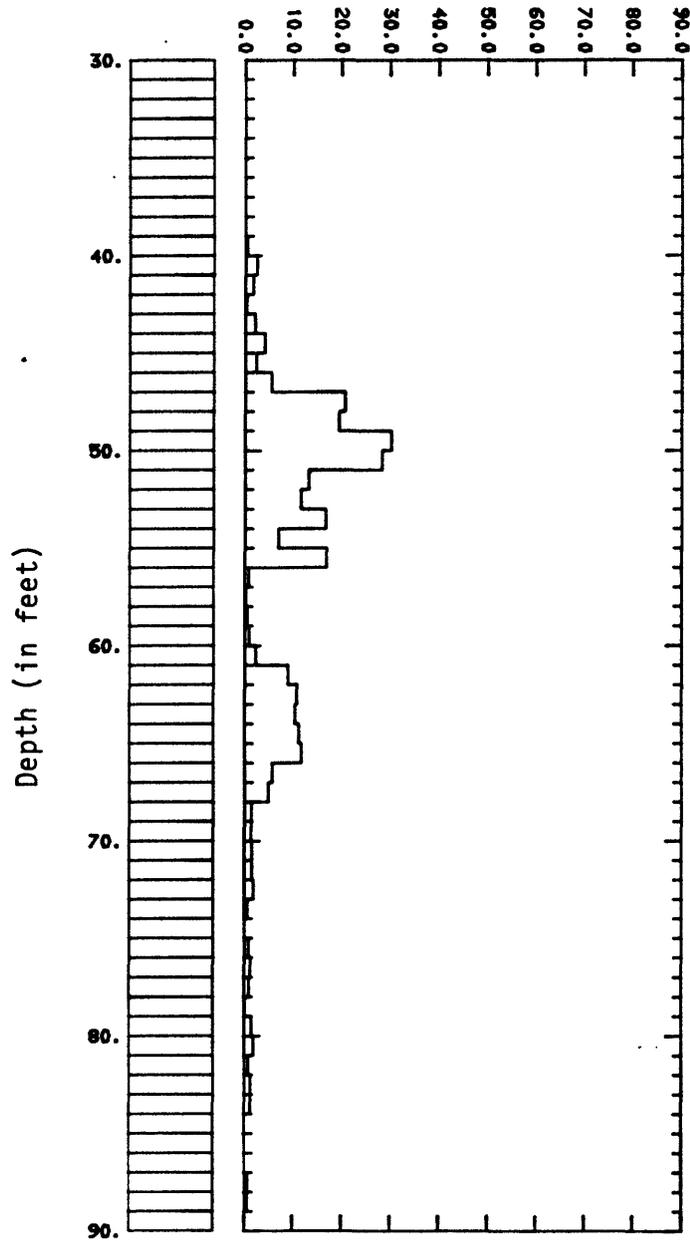


Figure 5.--Histogram of Fischer assays, core hole WR-4. Assayed interval: 39.0 to 89.0 ft.

USGS Core Hole WR-5
 sec. 34, T. 15 S., R. 22 E.
 Fischer Assay Oil Yield
 (gallons per ton)

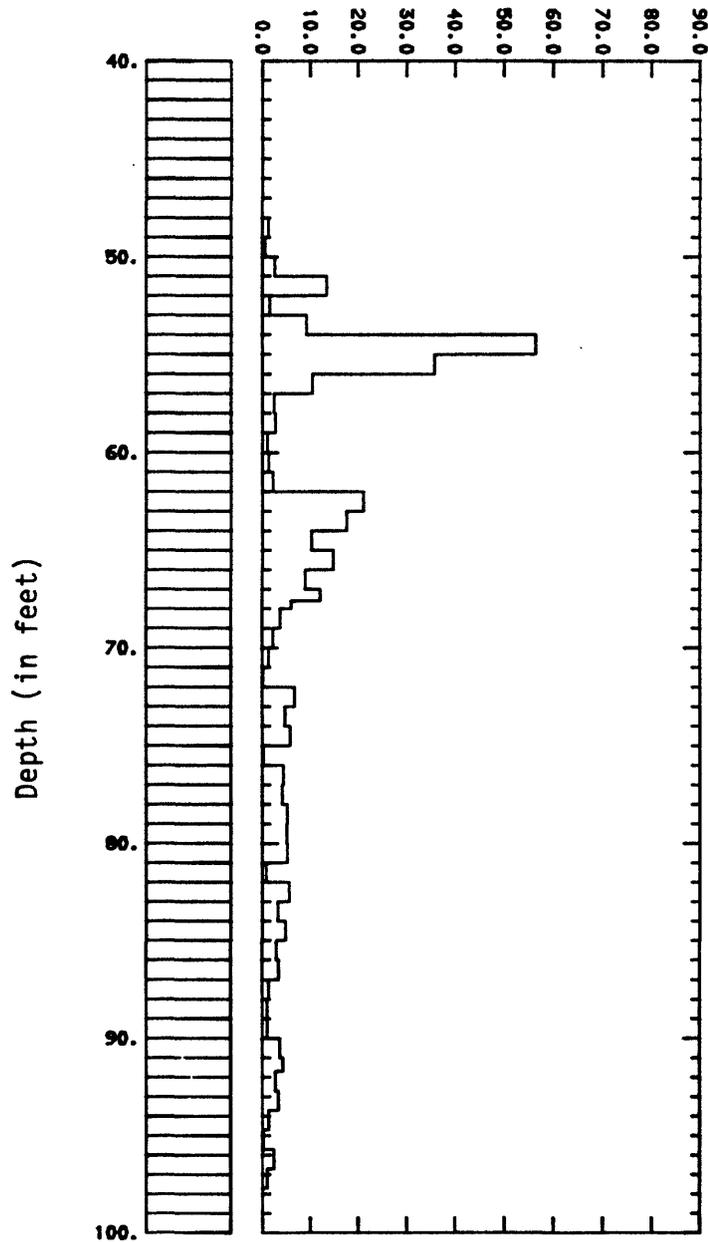


Figure 6.--Histogram of Fischer assays, core hole WR-5. Assayed intervals (in feet): 48.0 to 67.6, 68.0 to 88.0, 90.0 to 97.7. Values for intervening intervals are estimated.

USGS Core Hole WR-6
 sec. 23, T. 16 S., R. 22 E.
 Fischer Assay Oil Yield
 (gallons per ton)

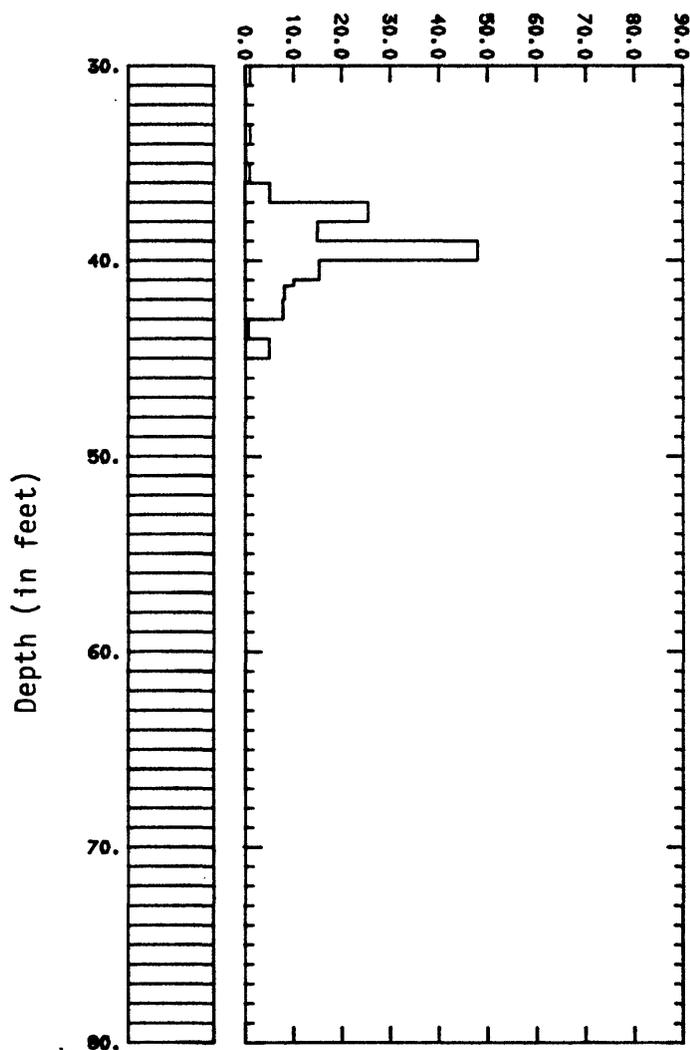


Figure 7.--Histogram of Fischer assays, core hole WR-6. Assayed intervals (in feet): 30.0 to 38.0, 38.5 to 41.3, 42.0 to 50.0, 65.0 to 75.0. Values for intervening intervals are estimated.

USGS Core Hole WR-7
sec. 12, T. 15 S., R. 21 E.
Fischer Assay Oil Yield
(gallons per ton)

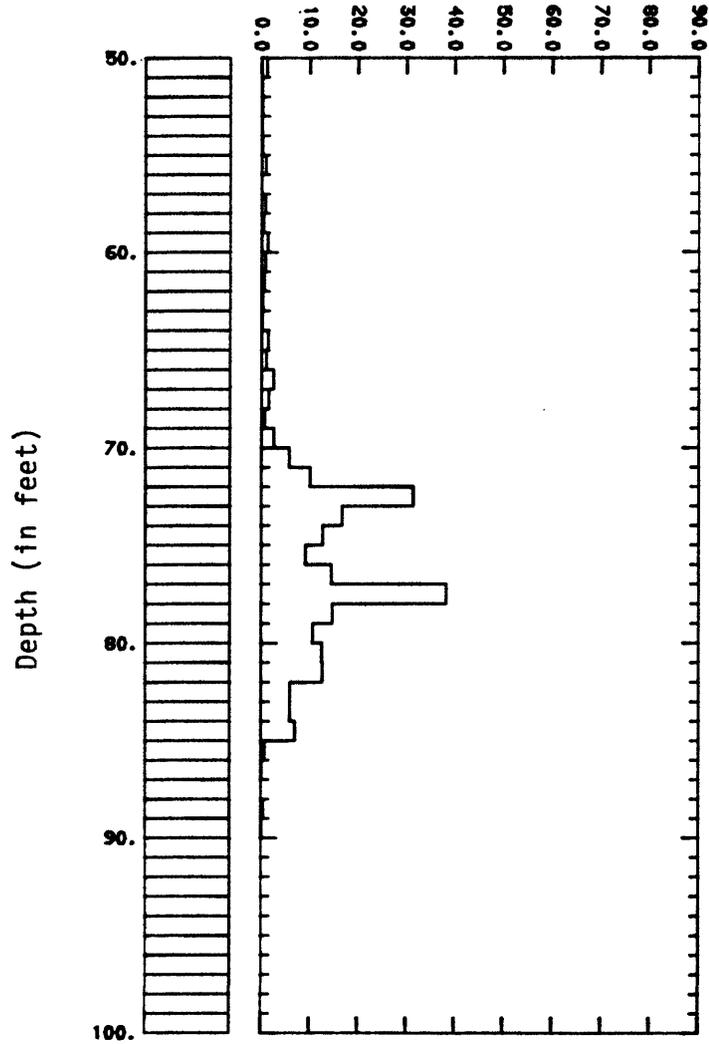


Figure 8.--Histogram of Fischer assays, core hole WR-7. Assayed inter 50.0 to 90.0 ft.