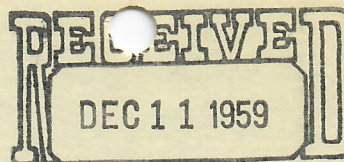




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OIL & GAS
CONSERVATION COMMISSION

VICTOR GALLAGHER

No. 1 Government Hoyo

C NE NW, Section 21, T. 9 N., R. 78 W.

Jackson County, Colorado

Geological Report
1 July 1959

Max R. Mott
Geologist





99999999

VICTOR DRILLING

No. 1 Government Hoyer

LOCATION: C NE NW, Section 21, T. 9 N., R. 78 W.,
Jackson County, Colorado.

ELEVATION: 8214 G. L., 8224 K. B.

SPUD: 7:00 P. M., May 12, 1959

COMPLETED:

TOTAL DEPTH: 5,915'

FORMATION TOPS

Pierre	Surface
"A" Bed	1787
Niobrara	3570
Lower Niobrara Shale	4690
Frontier	4922
Mowry	5500
Muddy	5650
Thermopolis	5688
Dakota	5734
Folsom	5780
Lakota	5802
Morrison	5866



CORES

Core #1 - 4939-50, recovered 11'.

Siltstone, gray to buff, sandy, quartzose, numerous black grains, white clayey cementing material, slightly friable, numerous calcite filled veins, gives off fair petro-liferous odor, has faint stain, porosity and permeability appears low.

Core #2 - 5055-80, recovered 25'.

Shale, black, highly fossiliferous, thinly laminated with thin silt laminae, dips indicated by laminae are from 35° to 45°, fossils present were cephalopods and brachiopods.

Core #3 - 5650-74, recovered 24'.

- 5650-54 Siltstone, very fine grained, gray, becoming coarser at base.
- 5654-58 Sandstone, tan, very fine grained to silty, appears to have low porosity and permeability, some fractures at 5656-57.
- 5658-61 Shale, gray, with thin sand stringers.
- 5661-62 Sandstone, as above.
- 5662-64 $\frac{1}{2}$ Shale, dark gray.
- 5664 $\frac{1}{2}$ -71 Sandstone, as above, with thin shale laminae.
- 5671-73 Shale, gray.
- 5673-74 Sandstone, tan to gray, very fine grained, tight, well cemented, light stain and odor, porosity and permeability appears low.

Core #4 - 5674-96, recovered 22'.

- 5674-75 $\frac{1}{4}$ Shale, gray, silty.
- 5675 $\frac{1}{4}$ -91 Sandstone, tan, medium grained, well rounded quartz grains, slightly cemented with ashy clay, lightly stained, fluoresces, has good gasy odor, appears to have fair porosity and permeability.

CORESCore #4, continued.

5691-96 Shale, gray, silty to sandy, hard, brittle.

Core #5 - 5743-69, recovered 26'.

5743-44 Shale, dark gray, silty.

5744-48 Siltstone, gray, shaley to sandy, badly fractured, some carbonaceous material in thin laminae.

5748-63 Sandstone, gray to tan, very fine grained to silty firm, difficulty friable, rounded, to subrounded grains, sand is primarily quartz with scattered carbonaceous material; zone is highly fractured; sand gives off good odor; the porosity and permeability appear low.

5763-69 Sandstone, gray to tan, fine grained, clean, quartzose, some clayey interstitial material, appears to have fair porosity and permeability, fractured throughout, gives off good odor; sand is generally massive with faint laminae.

Core #6 - 5769-85, recovered 16'.

5769-83 Sandstone, gray to tan, fine grained, friable, to well cemented, well rounded to subrounded grains, clean, quartzose, scattered mud balls, massive to crossbedded, some mud cracks, gives off good petroliferous odor; from 5780 to 5783 sand appears very tight and bentonitic.

5783-85 Shale, light green, siliceous, sandy.

Core #7 - recovered 10'.

5821-23 Sandstone, gray with green cast, very fine grained, tight, no visible porosity and permeability.

5823-25 Shale, green, siliceous.

5825-31 Shale, red.

CORES

Core #8 - 5870-5895, recovered 25'.

Shale, gray, hard, siliceous with numerous black specks, brittle, massive, sandy to silty, with rounded quartz grains; numerous thin veins or fractures filled with calcite; one fracture 5' from top of core had space filled with dark brown oil; slickenside zone 6' from top of core.

Some indistinct bedding indicated dips of 37°. Shale breaks with conchoidal fracture; pyrite is scattered throughout core.

DRILL STEM TESTS

- D.S.T. #1 @ T. D. 1190
Tested 1125-1190
Open 2 hours; recovered 175' slightly oil and gas cut mud.
I.F. 55#, F.F. 55#, S.I.P. 130#, H.P. 635#.
- D.S.T. #2 - 2537-2638
Open 1 hour, recovered 75' mud.
I.S.P. 107#, I.F. 42#, F.F. 63#, S.I.P. 107#,
H.P. 1263#, Temperature 104°.
- D.S.T. #3 - 3537-3739
Open 6 hours; recovered 180' gas cut mud.
I.F. 100#, F.F. 200#, S.I.P. (1 hour) 360#,
H.P. 1750#, Temperature 106°.
Strong blow decreasing to medium blow in 1 hour,
surges of 20 minute blows in 2 hours, chart
showed plugging for 3 hours, gas blow was too
weak to measure. Gas was inflammable and
burned with a blue flame.
- D.S.T. #4 - 4165-4371
Open 2 hours, S.I. 20 minutes, recovered 160'
drilling mud. H.P. 2163#, I.F. 62#, F.F. 100#,
S.I.P. 104#.
- D.S.T. #5 - 4925-4950
Open 1 hour, S.I. 20 minutes, recovered 200'
drilling mud. H.P. 2766#, I.F. 126#, EF. 148#,
S.I.P. 1473#.
- D.S.T. #6 - 5654-5697
Recovered 540' mud cut oil.
H.P. 3115#, I.F. 627#, F.F. 1265#, S.I. (1 hour)
2245#, Temperature 126°(?).
Gas to surface in 3 minutes.
1,305 MMCFD @ 150 psi on 3/4" choke.
1.225 MMCFD @ 327 psi on 1/2" choke.
- D.S.T. #7 - 5735-5769
H.P. 3030#, I.F. 627#, F.F. 1265#, S.I.P. (1 hour)
2240#, Temperature 168°, Maximum F.P. 1637#.
Gas to surface immediately; distillate in 43 minutes;
3/4" prover indicated 4.5 MMCFD; GOR 78,000.
- D.S.T. #8 - 5766-5790
H.P. 3115#, I.F. 965#, F.F. 1593#, S.I. (1 hour)
2250#, Temperature 168°.
Gas to surface immediately, distillate in 51 minutes.
3.71 MMCFD on 3/4".

HISTORY

6-20-59	5743-5768'	Coring #5, 5743-5768'
		D.S.T. #7, ream core hole.
6-21-59	5768-5790'	Core #6, 5768-5785', ream core hole,
		drill to 5790'. D.S.T. #8
6-22-59	5790-5801'	
6-23-59	5801-5828'	Core #7, 5821-5831', D.S.T. #9 (failed)
6-24-59	5828-5869'	Finished Core #7 at 5831', reamed
		core hole.
6-25-59	5869-5895'	Core #8, 5870-5895'
		D.S.T. #10 failed @ 5870'.
6-26-59	5895-5900'	Ream core hole, condition for logging.
6-27-59		Run 7½" casing.

BIT RECORD

	<u>Size</u>	<u>Make</u>	<u>Type</u>	<u>Footage</u>	
1.	8-3/4"	Sec.	S-3	0-370'	370'
2.	"	HTC	OSC-3	370-714'	344'
3.	"	CP	ES-1D	714-984'	270'
4.	"	CP	ES-26	984-1190'	206'
5.	"	Hughes	OSC-16	1190-1466'	
6.	"	CP	ES-26	1466-1697'	
7.	"	HTC	OSC-3	1697-1883'	
8.	"	CP	ES-1D	1883-2082'	
9.	"	CP	ES-1D	2082-2256'	
10.	"	HTC	OSC-16	2256-2417'	
11.	"	Sec.	S-4	2417-2638'	
12.	"	HTC	OSC-16	2638-2857'	
13.	"	CP	EMV	2857-2978'	
14.	"	CP	ES-26	2978-3158'	
15.	"	HTC	OSC-16	3158-3404'	
16.	"	HTC	OSC-16	3404-3739'	
17.	"	Sec.	S-4	3739-3954'	
18.	"	HTC	OSC-16	3954-4193'	
19.	"	HTC	OSC-16	4193-4371'	
20.	"	CP	ES-26	4371-4671'	
21.	"	Sec.	S-4	4671-4925'	
22.	"	Sec.	S-3	4925-4939'	(pulled to core)
23.	"	CP	EMIV	4950-5055'	(ream core hole)
24.	"	HTC	OSC-16	5080-5335'	
25.	"	HTC	OSC-16	5335-5509'	
26.	"	HTC	OWV	5509-5570'	
27.	"	HTC	OWV	5570-5636'	
28.	"	HTC	W7	5636-5652'	
29.	"	CP	EMV	5652-5676'	(rerun)
30.	"	HTC	OW	5697-5743'	
31.	"	CP	EM-16	5743-5785'	
32.	"	CP	EM-16	5785-5790'	(rerun)
33.	"	CP	EM-3	5790-5801'	
34.	"	HTC	OWV	5801-5821'	
35.	"	HTC	W7	5831-5870'	(ream core hole)
36.	"	HTC	W7	5895-5900'	(ream 25' core hole)
37.	"	HTC	OSC-16	5900'	

SAMPLE DESCRIPTION

260-270	Sample mostly cement.
270-280	Shale, dark gray, silty.
280-290	Shale, dark gray, silty.
290-300	Shale, dark gray, silty.
300-310	Shale, dark gray, silty.
310-320	Shale, dark gray, silty.
320-330	Shale, dark gray, silty.
330-340	Shale, dark gray, silty.
340-350	Shale, dark gray, silty.
350-360	Shale, dark gray, silty.
360-370	Shale, dark gray, silty.
370-380	Shale, gray, silty, few iron stained concretions.
380-390	Shale, dark gray, scattered limonite stained chips.
390-400	Shale, as above.
400-410	Shale, as above.
410-420	Shale, dark gray, silty to sand, some limonite stained chips.
420-430	Shale, as above.
430-440	Shale, as above, few iron stained concretions.
440-450	Shale, as above, iron stained concretions more common.
450-460	Shale, as above, iron stained concretions, spherical nodules.
460-470	Silt, gray, scattered limonite, tan chert.
470-480	Silt, gray, scattered limonite, tan chert.
480-490	Silt, gray, shaley, scattered limonite.
490-500	Silt, gray, shaley, scattered black chert, scattered iron stained concretions.
500-510	Silt, gray, iron stained.
510-520	Silt, gray, abundant iron stained chips.
520-530	Shale, gray, silty.
530-540	Shale, gray, silty.
540-550	Shale, gray, silty, trace white calcareous shale.
550-560	Silt, light gray, shaley.
560-570	Shale, gray, silty, trace black shale.
570-580	Shale, gray, silty, trace chert.
580-590	Shale, dark gray, silty, trace chert, trace iron stain.
590-600	Shale, as above.
600-610	Shale, gray, some dark gray, some silt, iron stained Inoceramus prisms, trace chert.
610-620	Shale, as above.
620-630	Shale, gray, silty.
630-640	Shale, as above, selenite crystals noted.
640-650	Shale, dark gray, brown chert.
650-660	Shale, dark gray.
660-670	Shale, dark gray.
670-680	Shale, dark gray, silty.
680-690	Shale, dark gray, silty.
690-700	Shale, gray, trace brown bentonite, trace chert.

SAMPLE DESCRIPTION

700-710	Shale, gray, abundant brown bentonite.
710-720	Shale, gray, abundant brown bentonite, <u>Inoceramus</u> <u>prisms</u> , trace gray lime.
720-730	Shale, as above, scattered bentonite and lime.
730-740	Shale, as above, trace chert, bentonite and lime.
740-750	Shale, as above, bentonite common.
750-760	Shale, as above, bentonite common.
760-770	Shale, dark gray.
770-780	Shale, dark gray.
780-790	Silt, gray, shaley.
790-800	Silt, gray, uncemented.
800-810	Silt, gray, uncemented.
810-820	Silt, gray, uncemented.
820-830	Silt, as above.
830-840	Shale, gray.
840-850	Shale, gray.
850-860	Sand, medium grained to fine grained, scattered brown bentonite, Inoceramus prisms, fair to poor porosity and permeability.
860-870	Sand, as above.
870-880	Sand, as above.
880-890	Sand, as above.
890-900	Sand, as above.
900-910	Sandstone, gray, fine to medium, angular to subrounded quartz grains, friable, scattered pink and black grains; porosity and permeability fair to poor.
910-920	Sand, as above, trace brown bentonite.
920-930	Sand, as above, some silty sand.
930-940	Sand, as above; white bentonite.
940-950	Sand, as above, trace coal.
950-960	Sand, as above, finer grained, trace coal.
960-970	Sand, as above.
970-980	Shale, dark gray.
980-990	Shale, gray, silty.
990-1000	Shale, gray, silty.
1000-1010	Shale, gray, silty.
1010-1020	Shale, gray, silty.
1020-1030	Shale, gray, silty.
1030-1040	Silt, gray, shaley.
1040-1050	Silt, gray, shaley.
1050-1060	Siltstone, gray, sandy.
1060-1070	Siltstone, gray, sandy to shaley.
1070-1080	Siltstone, gray, buff bentonite.
1080-1090	Siltstone, gray, sandy.
1090-1100	Siltstone, gray, sandy.
1100-1110	Siltstone, gray, sandy, faint oil stain, faint fluorescence.
1110-1120	Siltstone, as above.
1120-1130	Siltstone, as above, gray shale.
1130-1140	Siltstone, sandy, oil stain and fluorescence.
1140-1150	Siltstone, as above.

SAMPLE DESCRIPTION

1650-1660	Shale, as above.
1660-1670	Shale, as above.
1670-1680	Shale, as above.
1680-1690	Shale, as above.
1690-1700	Shale, as above.
1700-1710	Shale, gray, very silty.
1710-1720	Shale, gray, very silty.
1720-1730	Shale, as above.
1730-1740	Shale, as above.
1740-1750	Shale, as above.
1750-1760	Shale, as above.
1760-1770	Shale, as above.
1770-1780	Shale, as above.
1780-1790	Siltstone, fine grain, gray with faint oil stain, numerous black grains, no visible porosity.
1790-1800	Siltstone, as above.
1800-1810	Siltstone, as above.
1810-1820	Shale, gray, silty, micaceous.
1820-1830	Shale, as above.
1830-1840	Shale, as above.
1840-1850	Shale, as above.
1850-1860	Shale, as above.
1860-1870	Shale, as above.
1870-1880	Shale, as above.
1880-1890	Shale, as above.
1890-1900	Shale, as above.
1900-1910	Shale, as above.
1910-1920	Shale, as above.
1920-1930	Shale, dark gray to gray, silty.
1930-1940	Shale, as above.
1940-1950	Shale, as above.
1950-1960	Shale, as above.
1960-1970	Shale, as above.
1970-1980	Shale, as above.
1980-1990	Shale, as above.
1990-2000	Shale, gray, silty.
2000-2100	Shale, gray, silty, interbedded with thin siltstone stringers.
2100-2110	Shale, gray, silty, micaceous, siltstone, gray, sandy to shaley, numerous black specks.
2110-2120	Shale and siltstone as above.
2120-2130	As above.
2130-2140	As above.
2140-2150	As above.
2150-2160	As above, mostly siltstone.
2160-2170	Shale, as above.
2170-2180	Shale and siltstone, as above.
2180-2190	As above.
2190-2200	As above.

SAMPLE DESCRIPTION

2200-2210'	As above.
2200-3000'	All samples were examined in this interval. The interval is primarily gray micaceous shale interbedded with thin siltstone stringers.
3000-3400'	Shale, gray, brittle, finely micaceous.
3400-3410'	Shale, gray, brittle, very finely micaceous, slightly silty, trace white siltstone, glauconitic fine black inclusions (carbonaceous material ?) in shale.
3410-3420'	Shale, as above, some pieces with slickensides on them.
3420-3430'	Shale, as above, siltstone more abundant, trace white calcite.
3430-3440'	Shale, gray, finely micaceous, occasionally silty, some dark inclusions, traces siltstone/
3440-3450'	Shale, as above, siltstone, as above, traces white bentonite.
3450-3460'	Shale, gray, micaceous, traces white bentonite.
3460-3470'	Shale, gray, micaceous, <u>Inoceramus prisms</u> , blue bentonite.
3470-3480'	Shale, as above, trace siltstone.
3480-3490'	Shale, as above, fossil fragments.
3490-3500'	Shale, as above, <u>Inoceramus prisms</u> .
3500-3510'	Shale, as above, trace bentonite.
3510-	Shale, as above, trace white lime, trace white siltstone.
3510-3580'	Shale, as above, traces white siltstone, <u>Inoceramus prisms</u> .
3580-3590'	Speckled shale, dark gray with brown specks, calcareous.
3590-3600'	Speckled shale, as above.
3600-3610'	Shale, light to dark gray, speckled, calcareous.
3610-3620'	Speckled shale, as above.
3620-3630'	Shale, gray, soft, micaceous.
3630-3640'	Speckled shale.
3640-3650'	Speckled shale, trace white siltstone.
3650-3660'	Gray shale and speckled shale.
3660-3670'	As above.
3670-3680'	As above.
3680-3690'	As above, trace calcite.
3690-3700'	As above, blue bentonite.
3700-3710'	As above, blue bentonite.
3710-3720'	As above, trace siltstone, trace calcite, mostly gray shale.
3720-3730'	Gray shale and speckled shale, traces siltstone.
3730-3740'	Gray shale, micaceous.
3740-3750'	As above.
3750-3760'	Speckled shale, calcite vein material.
3760-3770'	Speckled shale, gray shale.
3770-3780'	Speckled shale, chalky.
3780-3790'	As above.
3790-3800'	Gray shale and speckled shale.

SAMPLE DESCRIPTION

4210-4220' Shale, dark gray to black, micaceous, some salt and pepper sandy siltstone, some chalky shale.

4220-4230' As above, traces sandy siltstone, gray to buff, salt and pepper, gray to buff, angular grains, firm, well cemented, abundant speckled shale.

4230-4240' As above, some sand coarser than siltstone above - mostly calcite grains.

4240-4250' As above.

4250-4260' Shale, as above, trace blue lime, some blue-gray shale.

4260-4270' Shale, gray, some gray silty shale, abundant speckled shale.

4270-4280' Shale, gray, pyrite, fossil fragments.

4280-4290' Shale, gray, trace white glauconite siltstone.

4290-4300' Shale, gray, and white calcite siltstone, as above.

4300-4310' Shale, gray, pyrite common, siltstone and silty shale common.

4310-4320' As above, blue bentonite and gray lime.

4320-4330' Shale as above.

4330-4340' Shale, as above, gray silty shale common.

4340-4350' Shale, as above.

4350-4360' Shale, as above.

4360-4370' Shale, as above, sample mostly speckled shale.

4370-4371' Shale, as above.

4370-4380' Shale, dark gray, micaceous.

4380-4390' As above.

4390-4400' As above.

4400-4410' As above.

4410-4420' As above.

4420-4430' As above, trace siltstone.

4430-4440' As above, siltstone more common.

4440-4450' Shale, dark gray.

4450-4460' Cavings.

4460-4470' Shale, as above, trace white limestone.

4470-4480' Cavings.

4480-4490' Shale, as above.

4490-4500' Shale, as above.

4500-4510' Cavings.

4510-4520' Shale, as above.

4520-4530' Cavings.

4530-4540' Cavings.

4540-4550' Shale, dark gray to black.

4550-4560' Mostly speckled shale.

4560-4570' Shale, dark gray to black.

4570-4580' Shale, dark gray.

4580-4590' Shale, as above.

4590-4600' Shale, as above.

SAMPLE DESCRIPTION

3800-3810' Gray shale and speckled shale, trace siltstone.
3810-3820' Gray shale and lightly speckled shale.
3820-3830' Speckled shale and gray shale.
3830-3840' Speckled shale and gray shale, gray lime.
3840-3850' Gray shale, speckled shale, Inoceramus prisms.
3850-3860' as above, blue bentonite.
3860-3870' As above, blue bentonite.
3870-3880' Chalky shale, speckled.
3880-3890' Gray silty shale, white bentonite.
3890-3900' Speckled shale, gray shale, trace siltstone.
3900-3910' Chalky shale, trace white siltstone.
3910-3920' As above.
3920-3930' As above.
3930-3940' Chalky shale, almost white, trace dark gray shale.
3940-3950' Dark gray shale, trace limestone.
3950-3960' Cavings
3960-3970' Cavings
3970-3980' Cavings
3980-3990' White chalky shale and dark gray shale.
3990-4000' Cavings
4000-4010' Cavings, silty gray shale.
4010-4020' Shale, gray, micaceous.
4020-4030' Shale, dark gray, micaceous, trace dark gray siltstone, trace speckled shale.
4030-4040' Shale, dark gray, micaceous, trace white siltstone, trace speckled shale.
4040-4050' Shale, gray to dark gray, trace dark gray silt.
4050-4060' As above.
4060-4070' Shale, gray to dark gray, speckled shale.
4070-4080' Shale, gray, trace gray siltstone, specks common.
4080-4090' Shale, gray, silty.
4090-4100' As above.
4100-4110' Shale, dark gray, silty, trace siltstone, speckled shale common.
4110-4120' Shale, as above, speckled shale more common, brown bentonite.
4120-4130' Speckled gray shale and gray shale, trace glauconitic siltstone.
4130-4140' Speckled shale and black shale.
4140-4150' Chalky shale and light gray shale.
4150-4160' Speckled shale and gray shale.
4160-4170' Speckled shale and dark gray shale.
4170-4180' As above, trace brown siltstone, white bentonite.
4180-4190' Shale, dark gray, speckled shale, some light gray shale, trace tan fine grained sandstone.
4190-4200' Shale, gray to dark gray, occasionally silty, black carbonaceous specks, some light gray silty shale.
4200-4210' Shale, dark gray to black, micaceous, some salt and pepper sandy siltstone, some chalky shale.

DRILL STEM TESTS

D.S.T. #9 - 5809-21 - tool plugged.

D.S.T. #10 - 5862-70 - tool plugged.

HISTORY

5-12-59	Spudded 7:00 P. M.	0-125'
5-13-59		125-370' - reamed 14" 0-100'
5-14-59	Ran surface pipe and cement	
5-15-59	370-470'	1° @ 450'
5-16-59	470-818'	1° @ 505 and 1° @ 565'
5-17-59	818-1155'	
5-18-59	1155-1320'	D.S.T. #1
5-19-59	1320-1605'	
5-20-59	1605-1864'	
5-21-59	1864-2088'	
5-22-59	2088-2325'	
5-23-59	2325-2444'	
5-24-59	2444-2638'	Start D.S.T. #2
5-25-59	2638-2764'	DST bottom at 2638'
5-26-59	2764-2890'	
5-27-59	2890-3036'	
5-28-59	3036-3158'	
5-29-59	3158-3338'	
5-30-59	3338-3573'	
5-31-59	3573-3739'	Start D.S.T. #3 at 3739'
6- 1-59	3739-3824'	Finish D.S.T. #3.
6- 2-59	3824-3960'	
6- 3-59	3960-4144'	
6- 4-59	4144-4340'	
6- 5-59	4340-4474'	D.S.T. #4 at 4371'
6- 6-59	4474-4677'	
6- 7-59	4677-4872'	
6- 8-59	4872-4950'	Core #1, 4939-50 - 11'
6- 9-59	4950-5045'	D.S.T. #5
6-10-59	5045-5125'	Core #2, 5060-5080'
6-11-59	5125-5335'	
6-12-59	5335-5432'	
6-13-59	5432-5530'	
6-14-59	5530-5589'	
6-15-59	5589-5636'	
6-16-59	5636-5658'	Start Core #3, 5652-5676'
6-17-59	5658-5697'	Finish Core #3, ream core hole, start Core #4 at 5676'
6-18-59	5697-	D.S.T. #6, reaming core hole
6-19-59	5697-5743'	

SAMPLE DESCRIPTION

1150-1160	Siltstone, as above, shale, gray, silty.
1160-1170	Siltstone, as above.
1170-1180	Siltstone, as above.
1180-1190	Siltstone, as above, also gray shale.
1190-1200	Siltstone, as above, also gray shale.
1200-1210	Siltstone, gray, sandy, faint oil stain, faint fluorescence and cut.
1210-1220	Siltstone, as above.
1220-1230	Siltstone, as above.
1230-1240	Siltstone, as above.
1240-1250	Siltstone, as above.
1250-1260	Siltstone, as above, good oil stain.
1260-1270	Siltstone, as above, good oil stain.
1270-1280	Siltstone, as above, good oil stain.
1280-1290	Siltstone, as above, good oil stain.
1290-1300	Siltstone, as above.
1300-1310	Siltstone, as above, fair oil stain.
1310-1320	Siltstone, gray, shaley.
1320-1330	Siltstone, gray, shaley.
1330-1340	Siltstone, gray, shaley.
1340-1350	Siltstone, as above, and gray shale.
1350-1360	Siltstone, as above, and gray shale.
1360-1370	Siltstone, gray, shaley.
1370-1380	Shale, gray, silty, some siltstone as above.
1380-1390	Siltstone and shale, as above.
1390-1400	Shale and siltstone, as above.
1400-1410	Shale, gray, silty, micaceous, also siltstone as above.
1410-1420	As above.
1420-1430	As above.
1430-1440	Shale, gray, micaceous, silty.
1440-1450	Shale, as above, and siltstone, gray.
1450-1460	Shale and siltstone, as above.
1460-1470	Shale, gray, silty, calcareous.
1470-1480	Shale, as above.
1480-1490	Shale, as above.
1490-1500	Shale, as above.
1500-1510	Shale, as above.
1510-1520	Shale, as above.
1520-1530	Shale, as above.
1530-1540	Shale, as above.
1540-1550	Shale, as above.
1550-1560	Shale, as above.
1560-1570	Shale, as above.
1570-1580	Shale, as above.
1580-1590	Shale, as above.
1590-1600	Shale, gray, slightly silty, slightly calcareous.
1600-1610	Shale, as above.
1610-1620	Shale, as above.
1620-1630	Shale, as above.
1630-1640	Shale, as above.
1640-1650	Shale, as above.

SAMPLE DESCRIPTION

4600-4610' Shale, as above.
4610-4650' Shale, as above.
4650-4700' Shale, light gray, finely micaceous, soft, calcareous, abundant specks.
4700-4710' Shale, as above, gray, trace sucrose buff limestone.
4710-4720' Shale, as above, trace siliceous shale.
4720-4730' As above.
4730-4740' As above.
4740-4750' Siliceous gray, splintery shale.
4750-4800' Shale, as above.
4800-4810' Shale, gray, finely micaceous, few fish scales, scattered pyrite, trace greenish gray siltstone, trace lime.
4810-4820' Shale, as above, scattered fossil fragments.
4820-4830' Sample mostly cavings, appears to be same as above.
4830-4840' No sample.
4840-4850' Shale, gray to dark gray, white calcite, trace white bentonite, few fossil fragments.
4850-4860' Shale, as above, trace pyrite, trace white calcite, light gray lime.
4860-4870' As above.
4870-4880' Shale, as above, trace light gray siltstone.
4880-4890' Shale, as above.
4890-4900' Shale, as above, white calcite, light gray siltstone.
4900-4910' Shale, gray, white calcite, pyrite, white bentonite.
4910-4920' Shale, gray to dark gray, black carbonaceous specks, slightly silty, trace white chert.
4920-4930' As above, also light gray siltstone, pyrite, light colored chert.

Core #1

4950-4960' Siltstone, light gray to tan, scattered sand grains, pyrite, gray shale as above.
4960-4970' Siltstone, as above.
4970-4980' Siltstone, as above.
4980-4992' Siltstone, as above.
4992-5000' Shale, dark gray to black.
5000-5055' Shale, dark gray, hard, splintery fracture, micaceous, traces calcite, traces calcareous siltstone.

Core #2

SAMPLE DESCRIPTION

5080-5210'	Shale, dark gray, fossiliferous, slightly calcareous.
5210-5225'	Shale, gray, brittle, slightly calcareous, scattered fossil fragments.
5225-5250'	Shale, as above, with scattered brown and gray, lime chips.
5250-5300'	Shale, as above, traces blue bentonite.
5300-5325'	Shale, as above.
5325-5350'	Shale, as above.
5350-5375'	Shale, as above.
5375-5400'	Shale, dark gray, micaceous, slightly calcareous, traces blue and white bentonite.
5400-5425'	Shale, as above.
5425-5450'	Shale, as above.
5450-5460'	Shale, dark gray, as above.
5460-5470'	As above.
5470-5480'	As above.
5480-5490'	As above.
5490-5500'	Shale, as above, and siltstone, gray, sandy.
5500-5510'	Shale, as above, abundant slickensides.
5510-5520'	Shale, tan, silty, siliceous, abundant pyritized fossil fragments.
5520-5530'	Shale, as above.
5530-5540'	Shale, gray and tan, siliceous, pyrite common.
5540-5550'	Shale, as above.
5550-5555'	Shale, gray, silty, siliceous, numerous fossil fragments.
5555-5560'	Shale, as above.
5560-5565'	Shale, as above, trace gray siltstone.
5565-5570'	Shale, as above.
5570-5575'	Shale, gray to dark gray, brittle, siliceous, light gray siltstone with green specks common, fish scales in shale, some shale black, trace bentonite, few calcite crystals.
5575-5580'	Shale, as above, gray to black, trace siltstone, trace pyrite, fossil fragments, some slickensides, on shale chips, trace blue green bentonite.
5580-5585'	Shale, as above, mostly gray.
5585-5590'	Shale, gray, some black, as above, scattered bentonite.
5590-5595'	Shale, as above, also gray brown shale, white and buff bentonite, scattered calcite.
5595-5600'	Shale, gray to black, brownish cast, siliceous, bentonite common, pyrite, scattered fossil fragments.
5600-5605'	Shale, as above.
5605-5610'	Shale, as above, blue gray bentonite common, some sandy quartzitic shale.
5610-5615'	Shale, as above, trace sandstone, white to buff, well cemented.

SAMPLE DESCRIPTION

5615-5620'	Shale, brownish gray, sandy, siliceous, (almost a quartzite), also shale as above, traces gray fine grained, quartzitic sandstone, traces white bentonite.
5616-5620'	Slow break.
5620-5625'	Shale, as above, brownish, sandy, siliceous, some fine grained gray sand. Abundant gray shale.
5625-5630'	Sandy shale, fine grained shaley sand, siliceous, well cemented, brownish.
5630-5635'	Sandy shale and shaley sand; as above.
5635-5640'	As above, trace white calcite.
5640-5645'	As above, shale becoming more sandy.
5645-5650'	As above.
5650-74'	Core #3
5674-5696'	Core #4
5696-5700'	Shale, dark gray, silty.
5700-5705'	Shale, as above.
5705-5710'	Shale, dark gray, slightly silty.
5710-5715'	Shale, as above, some black shale.
5715-5720'	Shale, as above.
5720-5725'	Shale, as above, becoming more silty.
5725-5730'	Shale, gray, silty to sandy, traces gray sand in samples, sand is tight, fine grained, well cemented.
5730-5735'	Shale and sand, as above, traces white chert.
5735-5740'	Sand, gray with tan stain, very fine grained, tight, quartzose, well cemented, angular grains.
5740-5743'	Sand, gray, fine grained, well cemented, tight, no visible porosity and permeability, faint stain and fluorescence.
5743-5769'	Core #5
5769-5785'	Core #6
5785-5790'	Shale, gray, hard, siliceous.
5790-5795'	Shale, as above.
5795-5800'	Shale, as above, trace pink siltstone.
5800-5805'	Shale, red, silty.
5805-5810'	Shale, red, silty.
5810-5815'	Sand, gray, medium grained, quartzose, friable, subround to sub angular grains, loosely cemented, clean, faint stain, fluoresces, fair cut, appears porous and permeable.
5815-5820'	Sand, as above.
5821-5831'	Core #7

SAMPLE DESCRIPTION

5831-5835'	Shale, pink, and red siltstone.
5835-5840'	Shale, pink.
5840-5845'	Shale, as above, traces gray sandy stilstone.
5845-5850'	Shale and siltstone, as above.
5850-5855'	Shale and siltstone, as above, abundant white bentonite.
5855-5860'	Sand, buff, medium grained, clean quartzose, angular to well rounded grains, numerous coarse chert grains, fair porosity and permeability, fair fluorescence and stain.
5860-5865'	Sand, as above.
5865-5870'	Sand, as above.
5870-5895'	Core #8
5895-5900'	Shale, greenish, siliceous.
5900-5905'	Shale, as above.
5905-5910'	Shale, as above.
5910-5915'	Shale, as above.

DISCUSSION

The Pierre Shale, which is present from the surface to a depth of 3,570', consists of gray, marine shale with thin beds of siltstone; a porous, medium grained sand occurs from 850' to 960', and another sand occurs in the formation from 1,787' to 1,805'. Shows of oil were observed in the samples from 1,130' to 1,320' in a sandy siltstone. A drillstem test was made from 1,125' to 1,190' to evaluate these shows. Oil cut mud was recovered on the test, and the data indicated there was insufficient porosity or permeability in the zone to produce oil or gas in commercial amounts. The sand from 1,787' to 1,805' had oil stain on the grains and showed a good fluorescence; no test was made of this zone. The siltstones from 2,510' to 2,620' showed fluorescence and oil stain; a drill stem test from 2,537' to 2,638' recovered mud and indicated the zone had no porosity or permeability.

A Baroid portable gas detector was used from a depth of 2,500' through 5,700'.

The gas detector showed gas present in the upper portion of the Niobrara formation. A drill stem test of the Niobrara (3,537-3,739') recovered sweet gas and carbon dioxide in an amount estimated to be less than 50,000 cubic feet per day. The final flow pressure was 200# and the shut in pressure was 360#. The gas recovery of the zone was insufficient for commercial production of gas.

The lower portion of the Niobrara was tested on the basis of shows on the gas detector. Mud was recovered on the test.

The Frontier formation was cored and tested (Core #1 and DST #5). The core indicated the formation was an extremely tight sandy siltstone with no visible porosity or permeability. The cored interval gave off a good petroliferous odor, and the core analyses indicated oil saturation. The drill stem test of the interval recovered mud with no oil or gas.

The Muddy formation was cored and tested (Core #3 and #4, and DST #6). A maximum of 1,305 MMCFD of a mixture of carbon dioxide and 44' gravity oil was recovered on the test. Five hundred forty feet (540') of mud cut oil was in the drill pipe.

The Dakota formation was cored and tested (Core #5 and #6, and DST #7 and #8). The cores and tests indicated the formation is capable of producing carbon dioxide and 48' gravity oil.

The Lakota formation was not cored and the attempted drill stem tests of the zone failed. The Schlumberger engineer calculated the water saturations of the two benches of the Lakota and determined that water saturations in the zones were low enough for the production of carbon dioxide and oil.

As the productive formations were at a lower structural position than had been anticipated it was decided to suspend drilling operations and test the Muddy, Dakota, and Lakota formations through casing.

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