Summary of the California Company - Rough Creek Unit No. 1
McKenzie County, North Dakota
Well No. 5279 - Permit No. 540

By John L. Hainer

California Company - Rough Creek Unit No. 1, McKenzie County, North Dakota. Location - 810 feet from north line and 1980 feet from east line of section 13, T. 148N., R. 98W. Elevation: K.B. 2472 feet. Total Depth: 12,050 feet.

The California Company - Rough Creek Unit No. 1 was spudded February 8, 1954; drilled to a total depth of 12,050 feet; plugged back to 9,764 feet; plugged and abandoned September 4, 1954.

Casing Record

<table>
<thead>
<tr>
<th>Size</th>
<th>Put in Well</th>
<th>Pulled Out</th>
<th>Left In</th>
<th>Sacks of Cement</th>
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<tr>
<td>16&quot;</td>
<td>41'10&quot;</td>
<td>-</td>
<td>41'10&quot;</td>
<td>75</td>
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<tr>
<td>10 3/4&quot;</td>
<td>1190'6&quot;</td>
<td>-</td>
<td>1190'6&quot;</td>
<td>850</td>
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<tr>
<td>7&quot;</td>
<td>10,481'9&quot;</td>
<td>5800'9&quot;</td>
<td>4681'0&quot;</td>
<td>800</td>
</tr>
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Drill Stem Test Data

DST 1 Interval 8390 to 8420 feet - Packers failed - Missrun.
DST 2A Interval 8328 to 8420 feet - Packers failed - Missrun.
DST 1B Interval 8265 to 8420 feet. 2000 feet water cushion, no bottom hole choke. Tool opened with weak blow remaining fairly steady for 30 minutes, slowly decreasing to dead in 55 minutes, dead thereafter. Tool open 2 hours, shut in 1 hour. Recovered 2000 feet water cushion, 90 feet Rathole mud very slightly gas-cut with slight rainbow of oil at base.
Pressures: Top bomb: IF 1125, FF 1125, SI 1300, HH 4650
Bottom Bomb: IF 1150, FF 1150, SI 1625, HH 5000
Formation tested: Heath

DST 2 Stuck drill pipe at 3740 feet - Missrun.
DST 2A Set Johnson packers to test interval 9340 to 9365 feet. No chokes, 1440 feet water cushion. Tool opened with weak blow decreasing to very weak blow in 1/2 hour, decreasing slowly to dead in 2 1/2 hours, total time open 3 hours, shut in 1/2 hour. Recovered 1440 feet water cushion, 90 feet very slightly gas cut drilling mud. Salinity of drilling mud before test 128,000 PPM NaCl, salinity of recovered mud 198,000 PPM NaCl.
Pressures: IF 740, FF 725, SI 4375, HH 5375
Formation Tested: Charles

DST 3 Set Johnson packers to test interval 9659 to 9683 feet. No chokes, 1600 feet water cushion, tool opened with weak blow decreasing to dead in 2 1/2 hours, total open 3 hours, shut in 1/2 hour. Recovered 1600 feet very slightly gas-cut water cushion, 30 feet slightly gas-cut Rathole mud, no show of oil.
Pressures: IF 845, FF 845, SI 1600, PH 5650
Formation Tested: Mission Canyon (Base of last salt)
DST 4
Set Johnson packers to test interval 9672 to 9740 feet. No chokes, no water cushion. Tool opened with very weak blow decreasing to dead in 1 hour, total open 2 1/4 hours, shut in 1 hour. Recovered 120 feet slightly gas-cut rathole mud, no show of oil.
Pressures: IF 125, FF 125, SI 2325, HH 5875
Formation Tested: Mission Canyon (Base of last salt)
DST 5
Interval 9730 to 9814 feet - packers failed - Missrun.
DST 5A
Interval 9718 to 9814 feet - tool failed to open - Missrun.
DST 5B
Interval 9718 to 9814 feet. No cushion, no choke, tool opened with very weak blow decreasing to dead in 10 minutes. After one hour closed and reopened tool with very weak blow decreasing to dead in 5 minutes. Total open 3 hours, shut in 1 hour. Recovered 540 feet very slightly gas-cut rathole mud.
Pressures: IF 200, FF 275, SI 2875, HH 5655
Formation Tested: Mission Canyon (Base of last salt and Mission Canyon shale)
DST 6
Interval 9829 to 9880 feet. No cushion, no chokes, tool opened with weak blow slowly increasing to fair blow steady thereafter, total open 5 hours, shut in 1 hour, no gas to surface. Recovered 120 feet of fluid as follows: 30 feet slightly gas-cut mud, 90 feet mud apparently very slightly sulphur water-cut and very slightly gas-cut with rainbow of oil.
Pressures: IF 0, FF 0, SI 450, PH 5650
Formation Tested: Mission Canyon Shale.
DST 7
Interval 9895 to 9937 feet, no cushion, no chokes, tool opened with very weak blow increasing to strong blow in 15 minutes, slowly decreasing to fair blow after 1 hour. Gas to surface in 1 hour 15 minutes, gas flame very rich, approximately one gallon of 59° API. Distillate collected in surface connections while gas was flowing. Tool open 3 hours, shut in 1 hour. Recovered 280 feet fluid as follows: top 20 feet water-cut mud, black, strong sulphur odor, 170 feet very heavily gas-cut mud black, with very strong sulphur odor, 90 feet heavily oil and gas-cut mud black, very strong sulphur odor, oil gravity 35° API. Salinities run on mud samples did not indicate salt content higher than that of drilling mud.
Pressures: IF 0, FF 0, SI 1550, HH 5600.
Formation Tested: Mission Canyon Shale.
DST 8
Interval 9936 to 9994 feet. Tool plugged, did not fully open, missrun.
DST 8A
Interval 9936 to 9994 feet, no cushion, no chokes, tool opened with a fair blow decreasing slowly to weak in 4 hours, total open 6 hours, shut in 1 hour. Recovered 475 feet fluid as follows: top 100 feet water cut rathole mud, black, strong sulphur odor, slightly gas-cut. 375 feet salt water, black, strong sulphur odor, heavily gas-cut with rainbow of oil, salinity 292,000 PPM NACL.
Pressures: IF 0, FF 250, SI 4200, HH 5775
Formation Tested: Mission Canyon Shale.
DST 9
Interval 10,158 to 10,179 feet, no chokes, no water cushion. Tool opened with fair blow increasing immediately to strong blow, remained steady throughout test. Tool open 4 hours, shut in 1 hour. Recovered 1290 feet gas-cut salt water with very strong sulphur odor, black. Salinity 303,000 PPM NACL.
Pressures: IF 110, FF 484, (4 hours) FF 590 (5 hours), HH 6000
Tool did not shut in, tool actually open 5 hours.
Formation Tested: Mission Canyon Shale.

DST 10
Set Johnson double 5" packers in 6" hole at 11,882 feet and 11,874 feet to test interval 11,882 to 11,945 feet. No bottom hole choke, 1500 feet water cushion, tool opened with weak blow slowly decreasing to dead in 2 hours. Total open 5 hours, shut in 1 hour. Recovered 1500 feet water cushion and 1950 feet muddy salt water very slightly gas-cut, salinity 355,000 PPM NACL.
Pressures: Top Bomb: IF 900, FF (5 hrs.) 1660, FF (6 hrs.) 1720, HH greater than 7500.
No shut-in pressure recorded, tool did not shut in.
Bottom Bomb: Clock did not run, no pressures recorded.
Formation Tested: Duperow.

DST 11
Set Howco Packers at 11,840 and 11,789 feet to straddle test that interval. Total depth 12,050 feet. No water cushion, no bottom hole choke. Tool opened with weak blow decreasing to dead in 55 minutes, after 3 hours and 15 minutes, mud fell in casing and blow increased. Suspected that drill pipe had collapsed, backed off of top of tool and reverse circulated test out of hole, unable to tell when test recovery was circulated out, apparently only small amount of rathole mud. Fished test tools out of hole. Pressure charts no good due to tools being worked to bottom and then jarred loose; however, charts showed that tools had opened. When tool was dismantled, it was found that the packers had failed and that the packing in the tool had been cut out causing the tool not to shut in when it was pulled off bottom. It was decided to not run this test again due to the possibility of losing the tools.
Formation Tested: Duperow.

PLUGGING RECORD

Cement Plugs Placed: 11,742-12,050 with 55 sacks
11,516-11,628 with 20 sacks
10,383-10,579 with 35 sacks
5,584- 5,797 with 100 sacks
1,091- 1,316 with 100 sacks

Baker cast iron bridge plug set at 1075' and a 20-sack cement plug placed in top of 10 3/4" surface casing with 4" iron pipe marker extending 4' above ground level.

CORED INTERVALS

Core #1 9683 to 9740 57 feet Core #11 11,225 to 11,283 58 feet
Core #2 9740 to 9765 25 feet Core #12 11,283 to 11,340 57 feet
Core #3 9765 to 9779 14 feet Core #13 11,720 to 11,735 15 feet
Core #4 9779 to 9813 34 feet Core #14 11,812 to 11,862 50 feet
Core #5 9816 to 9850 34 feet Core #15 11,862 to 11,889 27 feet
Core #6 9850 to 9880 30 feet Core #16 11,889 to 11,917 28 feet
Core #7 9880 to 9937 57 feet Core #17 11,917 to 11,945 28 feet
Core #8 9937 to 9994 57 feet Core #18 11,949 to 11,975 26 feet
Core #9 10,050 to 10,107 57 feet Core #19 11,975 to 12,002 27 feet
Core #10 10,490 to 10,497 7 feet
Formation tops picked from samples, electric logs and radioactivity logs; adjusted to electric logs. Colors determined from rock color chart.

FORMATION TOPS

Cretaceous System
Pierre Formation 2,095
Niobrara Formation 4,305
Greenhorn Formation 4,805
Dakota Silt 5,617
Dakota Sand 5,728

Jurassic System
Morrison Formation 5,945
Sundance Formation 6,347
Piper Formation 6,856

Triassic System
Spearfish Formation 7,075

Permian System
Minneahata Formation 7,513
Opeche Formation 7,565

Pennsylvanian System
Minnelusa Formation 7,888

Mississippian System
Amsden Formation 8,132
Big Snowy Group 8,320
Kibbey Lime 8,790
Charles Formation 8,945
Mission Canyon(base of last salt) 9,591
Lodgepole Formation 10,285
Englewood Formation 11,198

Devonian System
Lyleton Formation 11,283
Nisku Formation 11,523
Duperow Formation 11,620
Souris River Formation 12,002

Total Depth 12,050

ROUGH CREEK UNIT #1

100-120  Lignite, little shale, light gray, lumpy.
120-130  Lignite.
130-140  Lignite, and shale as above.
140-150  Lignite, and shale as above. Little limestone, pinkish gray, 5YR8/1, crystalline, dense, silty.
150-200  Shale, light olive gray 5Y6/1 to brownish gray 5YR4/1, lumpy. Some lignite as above.
200-260  Shale, light gray, pale brown, massive to lumpy.
260-300  Shale, medium light gray, pale brown, massive to lumpy.
300-360  Shale, medium light gray as above, little limestone, medium gray, crystalline, silty.
360-390  Shale, light gray, pale brown, massive to spongy. Little lignite.
390-400  Shale, light olive gray 5Y6/1, lumpy.
400-410  Shale, light olive gray, pale brown, little sandstone, white, medium grained, loosely cemented.
410-430 Shale, light olive gray 5Y6/1, lumpy. Lignite.
430-440 Shale, light olive gray, sandy, lumpy. Shale, pale brown, lumpy.
440-480 Quartz sand grains, clear to stained, 1/4 mm in diameter, subangular, individual grains or imbedded in light olive gray shale matrix.
480-490 Shale, medium gray, pale brown, lumpy.
490-500 Shale, medium gray to brownish gray 5YR4/1, lumpy. Little lignite.
500-510 Shale, medium gray, sandy, lumpy.
510-520 Shale, medium gray, pale brown 5YR5/2, sandy, lumpy.
520-560 Shale, medium gray, grayish brown 5YR3/2, sandy, lumpy.
560-570 Shale, light olive gray 5Y6/1, sandy, lumpy.
570-600 Lignite. Shale, light olive gray, lumpy.
600-700 Missing.
700-710 Lignite.
710-720 Missing.
720-750 Lignite.
750-780 Missing.
780-800 Lignite.
800-870 Lignite. Little shale, light olive gray, lumpy.
870-890 Missing.
890-910 Lignite.
910-950 Lignite. Shale, light olive gray, lumpy, sandy.
950-970 Lignite. Shale, light olive gray, lumpy.
970-980 Lignite, shale as above. Little limestone, light olive gray 5Y6/1, fine grained, crystalline, dense.
980-1040 Lignite and limestone as above.
1040-1100 Lignite and limestone as above. Siltstone, grayish orange 10YR7/4.
1100-1300 Missing.
1300-1320 Sandy shale, medium light gray, lumpy, with quartz grains 1/4 to 1/2 mm in diameter.
1320-1330 Lignite, sandy shale as above.
1330-1340 Shale, medium gray, lumpy.
1340-1410 Shale, medium gray to grayish red 10R4/2, lumpy to spongy.
1410-1520 Shale as above. Little sandstone, white to pale brown, calcareous, cement, friable.
1520-1560 Shale, medium gray to brownish gray 5YR4/1, massive to lumpy.
1560-1580 Shale, grayish red 10R4/2, silty, lumpy. Shale, medium to dark gray, lumpy.
1580-1610 Lignite.
1610-1630 Lignite, shale, medium gray, lumpy.
1630-1660 Lignite.
1660-1700 Lignite and little shale, medium to dark gray, lumpy.
1700-1720 Missing.
1720-1730 Shale, medium to dark gray, pale brown 5YR5/2, sandy, lumpy to spongy.
1730-1760 Quartz sand, clear to stained, 1/4 to 1/2 mm in diameter, subangular. Shale, medium to dark gray, sandy, lumpy. Lignite.
1760-1790 Shale, medium gray, brownish gray, 5YR4/1, lumpy, sandy.
1790-1800 Sand, free quartz grains up to 0.5 mm in diameter, also poorly cemented calcareous sandstone.
1800-1820 Sand and sandstone as above. Lignite. Shale, medium to dark gray, massive do spongy.
1820-1830 Lignite, some sand as above.
1830-1850  Shale, medium to dark gray, lumpy, sandy. Little lignite.
1850-1870  Shale, medium gray, lumpy, dusty brown 5YR2/2, fissile.
1870-1910  Sandy shale, medium gray, lumpy. Some lignite.
1910-1950  Shale, brownish gray 5YR4/1, lumpy. Little lignite and sand as above.
1970-2010  Shale, lignite and sand as above.
2010-2070  Shale, medium gray, lumpy. Some shale, brownish gray.
2070-2100  Shale, medium light gray, lumpy, brownish gray 5YR4/1, lumpy.
2100-2140  Sandy limestone, white to brownish gray, glauconitic. Shale, light olive gray 5Y6/1, micaceous, lumpy.
2140-2160  Shale, light olive gray 5Y6/1 to olive gray 5Y4/1, silty, lumpy. Sandy limestone as above.
2160-2170  Shale, light olive gray, compact to spongy.
2170-2180  Shale, light olive gray to olive gray, lumpy.
2180-2200  Shale, light olive gray, silty, lumpy. Sandy limestone, very light gray, glauconitic.
2200-2240  Shale, medium gray, micaceous, lumpy.
2240-2280  Shale, greenish gray 5GY6/1, medium to dark gray, lumpy.
2280-2340  Shale, medium gray, lumpy.
2340-2400  Shale, olive gray 5Y4/1, massive.
2400-2430  Shale as above. Shale, light olive gray 5Y6/1, lumpy.
2430-2450  Shale, olive gray 5Y4/1, fissile, light olive gray, lumpy.
2450-2460  Shale, olive gray to light olive gray, lumpy.
2460-2470  Shale, olive gray, fissile.
2470-2490  Shale, light olive gray to olive gray, lumpy.
2490-2500  Missing.
2500-2510  Shale as above.
2510-2530  Missing.
2530-2550  Shale as above.
2550-2610  Shale, olive gray, fissile to lumpy.
2610-2630  Shale, brownish gray 5YR4/1, fissile.
2620-2630  Missing.
2630-2640  Shale, olive gray, fissile to lumpy.
2640-2660  Missing.
2660-2710  Shale, medium gray to olive gray, lumpy to massive.
2710-2730  Missing.
2730-2740  Shale, light olive gray to olive gray, lumpy.
2740-2760  Missing.
2760-2770  Shale, brownish gray 5YR4/1, lumpy.
2770-2780  Missing.
2780-2790  Shale, brownish gray to olive gray, lumpy.
2790-2820  Missing.
2820-2840  Shale, light olive gray to olive gray, lumpy.
2840-2850  Missing.
2850-2860  Shale as above.
2860-2990  Missing.
2990-3030  Shale, medium light gray, massive to lumpy.
3030-3050  Missing.
3050-3060  Shale, dark yellowish brown 10YR4/2, lumpy.
3060-3090  Missing.
3090-3100  Shale, medium gray, lumpy.
3100-3120  Missing.
3120-3130  Shale, olive gray 5Y4/1, lumpy.
3130-3140  Missing.
3140-3160  Shale as above.
3160-3170  Missing.
3170-3200  Shale, medium light gray, massive to lumpy.
3200-3300  Missing.
3300-3380  Shale, medium gray, lumpy.
3380-3390  Missing.
3390-3470  Shale, olive gray 5Y4/1, massive to lumpy.
3470-3550  Shale, light olive gray to olive gray, lumpy.
3550-3570  Shale, light olive gray 5Y6/1, lumpy.
3570-3580  Shale, light olive gray, olive black 5Y2/1, lumpy.
3580-3600  Shale, light olive gray, lumpy.
3600-3760  Shale, light olive gray to olive gray, massive to lumpy.
3760-3770  Shale, olive gray 5Y4/1, lumpy, moderate brown 5YR4/4, fissile.
3770-3830  Shale, olive gray, lumpy.
3830-3840  Shale, olive black 5Y2/1, lumpy.
3840-3900  Shale, olive gray to light olive gray, lumpy.
3900-3920  Shale, olive black 5Y2/1, lumpy.
3920-3980  Shale, light olive gray to olive gray, lumpy.
3980-4030  Shale as above. Little limestone, very pale orange, 10YR8/2, sublithographic.
4030-4060  Shale, olive gray, spongy to fissile. Little limestone as above.
4060-4070  Shale, olive gray, lumpy to massive.
4070-4090  Shale, dark yellowish brown, 10YR4/2, spongy to lumpy.
4090-4140  Shale, olive gray, dense to lumpy.
4140-4170  Shale, olive gray to dark yellowish brown, spongy to lumpy.
4170-4200  Shale, medium gray, lumpy.
4200-4230  Shale, light olive gray, lumpy.
4230-4240  Shale, olive gray to dark yellowish brown.
4240-4260  Shale, medium gray, lumpy.
4260-4310  Shale, medium gray to dark yellowish brown.
4310-4360  Shale, medium gray.
4360-4420  Shale, light olive gray, lumpy.
4420-4480  Shale, light olive gray to olive gray.
4480-4530  Shale, light olive gray to olive gray. Some white specks.
4530-4560  Missing.
4560-4640  Shale, olive gray 5Y4/1. Some shale, olive black 5Y2/1 with white specks.
4640-4700  Shale, light olive gray to olive black, lumpy to massive.
4700-4750  Shale, light olive gray, lumpy.
4750-4780  Shale, light olive gray to olive gray, lumpy.
4780-4790  Shale, medium light gray, dark yellowish brown 10YR4/2.
4790-4810  Shale, olive gray, dense.
4810-4860  Shale, light olive gray to olive black.
4860-4870  Shale, olive gray to black, few white specks.
4870-4920  Shale, dark gray to black, white specks.
4920-4960  Shale, medium dark gray to brownish black 5YR2/1, whitespecks.
4960-5000  Shale, olive gray to olive black, white specks.
5000-5040  Shale, medium to dark gray.
5040-5140  Shale, light olive gray to olive gray, lumpy to foliated, few white specks.
5140-5190  Shale, olive gray to black, few white specks.
5190-5210  Shale, olive gray to brownish black 5YR2/1, few white specks.
5210-5260  Shale, olive gray to black, foliated.
6400-6420  Shale, dark gray, light gray, dark greenish gray 5GY4/1, brownish gray 5YR4/1, foliated to fissile.
6420-6440  Shale as above. Sandstone, white, fine grained, some glauconitic.
6440-6460  Shale, light olive gray, medium gray, lumpy.
6460-6660  Shale, light olive gray, lumpy, greenish gray 5GY6/1, waxy, fissile. Siltstone, greenish gray 5GY6/1, calcareous.
6560-6660  Shale, greenish gray 5GY6/1, brownish gray 5YR4/1, fissile to foliated. Siltstone as above.
6660-6720  Shale, greenish gray 5GY6/1, fissile to foliated. Siltstone as above.
6720-6760  Shale, greenish gray, splintery, grayish red 10R4/2. Siltstone as above.
6760-6820  Shale and siltstone as above. Little limestone, pale yellowish brown 10YR6/2, fragmental.
6820-6850  Shale, greenish gray, 5GY6/1, moderate red. Calcereous siltstone, pale red 5R6/2.
6850-6870  Limestone, pale red, 5R6/2, finely crystalline. Shale as above.
6870-6930  Limestone as above. Dolomitic limestone, white, finely crystalline, shale as above.
6930-6960  Limestone, pale red, pale yellowish brown, finely crystalline, shale as above.
6960-6970  Limestone, pale yellowish brown, finely crystalline.
6970-6990  Shale, greenish gray 5GY6/1, fissile, moderate reddish brown 10R4/6, massive. Limestone as above. Little gypsum.
6990-7050  Dolomite, white to grayish pink 5R8/2, finely crystalline. Shale and little gypsum as above.
7050-7090  Shale and gypsum as above.
7090-7110  Siltstone, pale reddish brown 10R5/4, friable. Shale, dark greenish gray 5GY4/1, foliated.
7110-7180  Siltstone and shale as above. Few loose quartz grains, frosted, 0.25 to 0.50 mm in diameter.
7180-7210  Siltstone and shale as above.
7260-7280  Missing.
7280-7350  Shale, dark greenish gray 5GY4/1, foliated, moderate reddish brown 10R4/6 to grayish red 10R4/2, subwaxy.
7390-7400  Shale, medium gray, lumpy to foliated. Little shale and siltstone as above.
7400-7480  Shale, moderate reddish brown 10R4/6, subwaxy. Shale, dark greenish gray 5GY4/1, foliated.
7480-7510  Shale, moderate reddish brown as above, medium to dark gray.
7510-7540  Shale as above, Some gypsum. Little limestone, grayish pink 5R8/2, finely crystalline.
7540-7560  Siltstone, moderate reddish orange 10R6/6, highly calcareous. Little gypsum.
7560-7590  Shale, medium gray, lumpy, greenish gray 5GY6/1, foliated, little siltstone as above.
7590-7610  Shale, moderate reddish brown 10R4/6, foliated, slightly dolomitic.
7610-7660  Shale as above. Shale, pale reddish brown 10R5/4, silty, dolomitic.
7660-7690 Shale, moderate reddish brown 10R4/6, foliated, slightly dolomitic.
7690-7740 Shale as above with little anhydrite.
7740-7800 Shale, moderate reddish brown 10R4/6, foliated to lumpy, dolomitic. Some anhydrite, white.
7800-7860 Shale, moderate reddish brown, lumpy, dolomitic, some anhydrite, white.
7860-7950 Shale and anhydrite as above. Siltstone, moderate reddish brown, friable.
7950-7980 Dolomite, very pale orange 10YR8/2 to pale pink 5RP8/2, finely crystalline, little anhydrite.
7980-8000 Dolomite, very pale orange, pale red, crystalline to granular, anhydritic.
8000-8030 Dolomite, very pale orange, little pale red, granular, anhydritic, anhydrite, white.
8030-8060 Dolomite, pale yellowish brown 10YR6/2, crystalline. Dolomite and anhydrite as above.
8060-8070 Dolomite as above, some silty. Anhydrite. Shale, pale reddish brown 10R5/4, lumpy, dolomitic.
8070-8094 Dolomite, pale red 10R6/2, crystalline to granular, pale yellowish brown, silty.
8094-8140 Dolomite as above. Shale, pale reddish brown, lumpy, dolomitic. Little anhydrite.
8140-8210 Dolomite, very pale orange, finely crystalline, dense.
8210-8250 Dolomite, very pale orange to moderate red 5R5/4, finely crystalline.
8250-8290 Dolomite, pale red to grayish red, finely crystalline. Limestone, light olive gray 5Y6/1, fine grained, dense.
8290-8330 Limestone, grayish red, pale yellowish brown, very pale orange, fine grained.
8330-8360 Shale, grayish red 5R4/2, splintery, greenish gray 5GY6/1, splintery.
8360-8400 Shale, grayish red as above, also black carbonaceous, splintery.
8400-8420 Shale, black, highly carbonaceous, splintery to fissile.
8420-8480 Shale, black, moderate red 5R5/4, splintery.
8480-8510 Limestone, brownish gray 5YR4/1, fossiliferous, finely crystalline. Shale as above.
8510-8550 Dolomite, very pale orange 10YR8/2, finely crystalline.
8550-8590 Limestone, medium light gray, argillaceous. Shale, dark greenish gray, 5GY4/1, calcareous.
8590-8600 Shale, dark gray, calcareous.
8600-8620 Variegated shale.
8620-8700 Sandstone, white to grayish orange pink 5YR7/2, very fine grained, angular quartz grains, calcareous cement.
8700-8760 Sandstone, white to grayish pink 5R8/2, fine to medium grained, friable, calcareous cement.
8760-8800 Sandstone as above, siltstone, pale reddish brown 10R5/4, calcareous.
8800-8810 Sandstone and siltstone as above. Gypsum, white.
8810-8830 Limestone, brownish black, finely crystalline.
8830-8900 Limestone as above, gypsum, white.
8900-8906 No returns.
8906-8990 Limestone as above.
8990-9040 Missing - Microlog indicates salt.
Salt indicated on microlog but not present in samples as gypsum base mud was used.

Dolomite, pale yellowish brown, anhydritic, granular.

Salt indicated as above. Anhydrite, white.

Anhydrite, white.

Salt indicated as above. Anhydrite, white.

Dolomite, pale yellowish brown, granular. Anhydrite, white.

Anhydrite, white. Limestone, medium gray to brownish black, finely crystalline.

Missing - Salt indicated on microlog.

Anhydrite, white. Little limestone, pale yellowish brown to brownish black, finely crystalline.

Limestone, pale yellowish brown, finely crystalline, anhydrite, white.

Limestone as above. Limestone, dark yellowish brown 10YR4/2, oolitic, anhydrite, white.

Anhydrite, white. Little limestone as above.

Missing.

Salt indicated on microlog. Anhydrite, white. Dolomite, dark yellowish brown, granular.

Anhydrite, white. Dolomite, pale yellowish brown, finely granular.

Limestone, dark yellowish brown, crystalline. Anhydrite.

Missing.

Limestone, dark yellowish brown to dusky brown, finely crystalline. Little anhydrite.

Missing.

Limestone as above. Little anhydrite.

Salt indicated on microlog. Limestone and anhydrite as above.

Missing.

Limestone, dark yellowish brown to brownish black, finely crystalline. Anhydrite, white.

Limestone, dusky brown, coarsely crystalline.

Anhydrite, white, dense with dolomite, medium dark gray interbeds.

Dolomite, dusky brown, finely crystalline.

Limestone, brownish gray 5YR4/1, coarsely crystalline, dense.

Limestone as above with some carbonaceous residue.

Limestone, brownish black 5YR2/1, coarsely crystalline.

Limestone, brownish gray 5YR4/1, crystalline to fragmental.

Limestone as above.

Missing.

Limestone, brownish black 5YR2/1, finely crystalline, dense.

Limestone, pale yellowish brown, finely granular to fragmental.

Limestone, brownish black, finely crystalline, to fragmental, dense.

Limestone, brownish gray 5YR4/1, finely crystalline with scattered medium to coarse crystals.
9813-9816 Missing.

Core #5
9816-9820 Anhydrite, white.
9820-9830 Anhydrite, brownish gray to olive gray.
9830-9840 Anhydrite as above. Dolomite, yellowish gray 5Y7/2, finely crystalline. Limestone, brownish gray, coarsely crystalline.
9840-9850 Dolomite, light brownish gray 5YR6/1, medium crystalline. Limestone as above with pockets of white anhydrite.

Core #6
9850-9860 Limestone, brownish black, coarsely crystalline. Limestone, medium light gray, slightly oolitic.
9860-9880 Limestone, brownish gray to brownish black, medium crystalline.

Core #7
9880-9900 Anhydrite, white, limestone as above.
9900-9920 Limestone, pale yellowish brown to dark yellowish brown, medium to coarsely crystalline. Dense to vuggy with anhydritic filling.
9920-9937 Limestone, brownish gray, medium crystalline, dense.

Core #8
9937-9950 Limestone, brownish gray, finely crystalline, dolomitic.
9950-9960 Limestone, brownish gray, medium crystalline, dense.
9960-9994 Limestone, brownish gray to brownish black, medium crystalline, dark oil stain, petrolierous odor.

Samples
9994-10,000 Missing.
10,000-10,044 Limestone, grayish brown, medium crystalline.
10,044-10,050 Missing.

Core #9
10,050-10,070 Limestone, grayish brown, medium crystalline, slight petrolierous odor, dense.
10,070-10,090 Limestone, dark yellowish brown, finely crystalline to fragmental, dolomitic, residual carbonaceous material.
10,090-10,100 Missing.
10,100-10,107 Limestone, dark yellowish brown, fragmental.

Samples
10,107-10,150 Limestone, pale yellowish brown, microsucrosic to dark yellowish brown, fragmental.
10,150-10,160 Limestone, light gray, microsucrosic, dolomitic.
10,160-10,200 Limestone, brownish gray, fragmental. Limestone as above.
10,200-10,260 Dolomite, dark yellowish brown, microsucrosic.
10,260-10,280 Limestone, pale yellowish brown, fragmental, dolomite as above.
10,280-10,300 Limestone, brownish gray, microsucrosic, argillaceous.
10,300-10,330 Limestone, medium light gray to dark gray, argillaceous, thin bedded.
10,330-10,370 Limestone, pale yellowish brown to grayish brown, argillaceous.
10,370-10,484 Limestone, medium gray to dark gray, argillaceous.
10,484-10,497 Missing.
10,497-10,550 Limestone, brownish gray, medium crystalline.
<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,550-10,560</td>
<td>Missing.</td>
</tr>
<tr>
<td>10,560-10,730</td>
<td>Limestone, medium dark to dark gray, fine to medium crystalline, argillaceous.</td>
</tr>
<tr>
<td>10,730-10,790</td>
<td>Limestone, medium dark gray, finely crystalline, argillaceous.</td>
</tr>
<tr>
<td>10,790-10,940</td>
<td>Limestone as above, splintery.</td>
</tr>
<tr>
<td>10,940-10,990</td>
<td>Limestone, medium dark gray to brownish gray, finely crystalline, argillaceous, splintery.</td>
</tr>
<tr>
<td>10,990-11,020</td>
<td>Limestone as above, little free quartz, white.</td>
</tr>
<tr>
<td>11,020-11,070</td>
<td>Limestone, medium dark to dark gray, finely crystalline, splintery.</td>
</tr>
<tr>
<td>11,070-11,115</td>
<td>Limestone, dark gray to olive gray 5Y4/1, finely crystalline, argillaceous.</td>
</tr>
<tr>
<td>11,115-11,130</td>
<td>Limestone as above. Anhydrite, pale yellowish brown, dolomitic.</td>
</tr>
<tr>
<td>11,130-11,140</td>
<td>Anhydrite as above.</td>
</tr>
<tr>
<td>11,140-11,180</td>
<td>Limestone, dark gray, finely crystalline, argillaceous. Little anhydrite as above.</td>
</tr>
<tr>
<td>11,180-11,195</td>
<td>Missing.</td>
</tr>
<tr>
<td>11,195-11,200</td>
<td>Limestone, dark gray, argillaceous, thin bedded, finely crystalline.</td>
</tr>
<tr>
<td>11,200-11,205</td>
<td>Missing.</td>
</tr>
<tr>
<td>11,205-11,225</td>
<td>Shale, black, carbonaceous, fissile.</td>
</tr>
</tbody>
</table>

**Core #11**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,225-11,245</td>
<td>Calcareous sandstone composed of angular quartz grains up to 1/16 mm in major diameter with muscovite, little pyrite and calcareous cement, dense.</td>
</tr>
<tr>
<td>11,245-11,260</td>
<td>Calcareous shale, dark gray with little silt.</td>
</tr>
<tr>
<td>11,260-11,283</td>
<td>Shale, black, carbonaceous, dense.</td>
</tr>
</tbody>
</table>

**Core #12**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,283-11,313</td>
<td>Dolomite, pale red 10R6/2, crystalline, interbedded with shale, greenish gray 5GY6/1.</td>
</tr>
<tr>
<td>11,313-11,318</td>
<td>Dolomite and shale as above with pyrite crystals imbedded in the shale.</td>
</tr>
<tr>
<td>11,318-11,328</td>
<td>Dolomitic shale, pale red and greenish gray interbedded, few imbedded pyrite crystals.</td>
</tr>
<tr>
<td>11,328-11,333</td>
<td>Limestone, blackish red, finely crystalline, some pyrite, dense.</td>
</tr>
<tr>
<td>11,333-11,340</td>
<td>Shale, dark gray, carbonaceous.</td>
</tr>
</tbody>
</table>

**Samples**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,350-11,390</td>
<td>Dolomite, pinkish gray 5YR8/1, and greenish gray 5GY6/1, fine grained, dense, argillaceous.</td>
</tr>
<tr>
<td>11,390-11,400</td>
<td>Dolomite as above, calcareous shale, light gray.</td>
</tr>
<tr>
<td>11,400-11,420</td>
<td>Calcareous shale, pale red 10R6/2, and greenish gray 5GY6/1.</td>
</tr>
<tr>
<td>11,420-11,440</td>
<td>Dolomite, pale red 10R6/2, greenish gray 5GY6/1, finely crystalline.</td>
</tr>
<tr>
<td>11,440-11,445</td>
<td>Calcareous shale, yellowish gray 5Y8/1, anhydrite, white.</td>
</tr>
<tr>
<td>11,445-11,485</td>
<td>Calcareous shale, pale red and greenish gray.</td>
</tr>
<tr>
<td>11,485-11,490</td>
<td>Missing.</td>
</tr>
<tr>
<td>11,490-11,515</td>
<td>Calcareous shale, pale brown 5YR5/2, greenish gray 5GY6/1, dolomite, grayish red 10R4/2, anhydritic.</td>
</tr>
</tbody>
</table>
11,515-11,525 Anhydrite. Calcareous shale as above.
11,525-11,550 Limestone, brownish gray 5YR4/1, finely crystalline, dense.
11,550-11,555 Limestone as above, little anhydrite.
11,555-11,565 Limestone, brownish gray to brownish black, medium grained, anhydritic.
11,565-11,575 Limestone, brownish gray 5YR4/1, medium grained, some pinpoint porosity, few oolites, little anhydritic.
11,575-11,600 Limestone, brownish gray, medium grained, little anhydritic.
11,600-11,625 Limestone, brownish gray, fine grained, dense.
11,625-11,635 Limestone as above, little anhydritic.
11,635-11,650 Limestone as above, anhydritic. Anhydrite, white.
11,650-11,675 Limestone, brownish gray to brownish black, medium grained, dense.
11,680-11,685 Anhydrite, white to light gray, limestone as above.
11,685-11,705 Limestone, brownish gray to brownish black, fine to medium grained, dense.
11,705-11,715 Limestone, as above, anhydrite, white.
11,715-11,720 Limestone, pale yellowish brown, medium grained.

Core #13
11,720-11,730 Limestone, grayish brown 5YR3/2, finely crystalline, dense.
11,730-11,732 Anhydrite, medium gray.

Samples
11,735-11,750 Limestone, brownish gray, fine grained, dense.
11,750-11,790 Limestone, brownish gray to brownish black, fine to medium grained, dense.
11,790-11,805 Limestone, as above, anhydrite, white.
11,805-11,812 Limestone, as above, dolomite, pale yellowish brown, microsucrosic.

Core #14
11,812-11,817 Anhydrite.
11,817-11,822 Dolomite, dark yellowish brown, microsucrosic, medium light gray, crystalline with few included quartz pebbles.
11,822-11,827 Limestone, grayish brown 5YR3/2, finely crystalline, dense, fractured with carbonaceous residue in fractures.
11,827-11,832 Limestone as above. Limestone, dark yellowish brown, finely crystalline, vugs filled with secondary anhydrite.
11,832-11,847 Limestone, light to dark yellowish brown, fine to medium grained, fossiliferous.
11,847-11,852 Anhydrite, brownish black to white.
11,852-11,867 Dolomite, dark yellowish brown, microsucrosic, carbonaceous residue.

Core #15
11,867-11,872 Dolomite, grayish brown, extremely fine grained to sucrosic.
11,872-11,882 Anhydrite. Dolomite, brownish gray, finely crystalline, dense.
11,882-11,887 Limestone, brownish gray, finely crystalline, dense.
11,887-11,889 Limestone, grayish brown, coarse crystalline, pinpoint porosity.
Core #16
11,889-11,900  Dolomite, pale brown, sucrosic. Limestone, grayish brown, finely crystalline, dense, anhydrite.
11,900-11,910  Limestone, brownish gray, finely crystalline, dense, anhydrite.

11,910-11,917  Limestone, dusky brown 5YR2/2, finely crystalline, dense.

Core #17
11,917-11,920  Limestone, as above. Dolomite, dark yellowish brown, sucrosic.
11,920-11,925  Limestone, grayish brown, finely crystalline, dense.
11,925-11,945  Limestone, dark yellowish brown, finely crystalline, dense.
11,945-11,949  Missing.

Core #18
11,949-11,960  Limestone, grayish brown to grayish black, finely crystalline, dense.
11,960-11,962  Anhydrite, brownish black.
11,962-11,975  Missing.

Core #19
11,975-11,985  Limestone, brownish black, fine to medium crystalline, dense.
11,985-11,990  Limestone as above, anhydrite.
11,990-12,002  Dolomite, pale yellowish brown, sucrosic, anhydritic.

Samples
12,002-12,025  Limestone, brownish black, finely crystalline.
12,025-12,045  Limestone as above, anhydrite, white.
12,045-12,050  Limestone as above. Dolomite, pale yellowish brown, microsucrosic.
12,050       Total Depth.