NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 101

Summary of the Blackwood & Nichols Company - M. E. Gilman #1
Golden Valley County, North Dakota
Well #470 - Permit #486

By Clarence G. Carlson
January 1955

Blackwood & Nichols Company - Gilman and Lang #1, Golden Valley County, North Dakota C NE 1/4 SE 1/4 Section 15, T. 140N., R. 105W. (2030 feet from South line and 660 feet from East line. Elevation K.B. 2867.

The Blackwood and Nichols - Gilman #1 was spudded November 10, 1953, and 13 3/8 inch casing was set at 624 feet and cemented with 525 sacks of cement. 7 5/8 inch casing set at 8564 with 300 sacks of cement. The well was completed as a dry hole March 21, 1954. Total depth 12,692 feet.

TESTS

DST #1 9058-9135 Tool open 78 minutes, weak blow 60 minutes and died. Recovered 2160 feet of fluid, of which 180 feet was salt water and gas cut mud and 1980 feet of drilling mud. F.B.H.P. 295-400#

DST #2 9260-9290 Tool open 75 minutes, no blow. Recovered 225 feet of oil, gas, and water cut mud.

DST #3 9287-9319 Tool open 4 hours, weak blow of air which increased slightly after 50 minutes with intermittent blow to the end of the test. Recovered 1620 feet of fluid, 180 feet was gas and salt water cut mud, 900 feet of muddy sulfur water and 540 feet of heavily water and gas cut drilling mud. Flowing pressure 110-835#, S.I.P. 3475#.

DST #4 9245-9287 Tool open 4 hours, shut in 45 minutes. Weak blow for 1 hour and 39 minutes and died. Recovered 120 feet gas and sulphur water cut mud. 720 feet gas cut, muddy sulphur water. F.P. 0-445#, 45 minutes S.I.P. 3755#, H.P. 4980#.

DST #5 10,423-10,467 Tool open 2 1/4 hours, shut in 3 hours, and 45 minutes. Recovered 9380 feet of salt water, top 60 feet muddy and gas cut. F.P. 225-4450#, 30 minutes S.I.P. 4760#, H.P. 5475#.

DST #6 11,013-11,063 Tool open 4 hours, shut in 30 minutes. Slight blow increasing to fair blow. Recovered 2340 feet of fluid, 390 feet was muddy, slightly gas cut salt water. 1860 feet gas cut salt water, 90 feet muddy salt water with few flecks green oil. F.P. 110-1130#, 30 minutes S.I.P. 4970#, H.P. 5890#.

DST #7 11,525-11,570 Tool open 3 hours, slight blow. Recovered 690 feet total fluid. 195 feet was slightly gas cut, muddy salt water and 495 feet was slightly oil cut salt water. F.P. 125-295#. Tool did not close for S.I.P.
DST #8  11,728-11,778 Tool open 3 hours, weak blow throughout. Recovered 2740 feet of slightly gas cut salty sulphur water. F.P. 0-1375#, 30 minutes S.I.P. 4475#, H.P. 6100#.

DST #9  11,830-11,860 Tool open 2 hours, weak blow throughout. Recovered 660 feet of water blanket, 690 feet mud, 15 feet of salt water, F.P. 720-810#, 30 minutes S.I.P. 4475#, H.P. 6150#.

DST #10  11,826-11,860 Tool open 3 hours, very weak blow throughout. Recovered 1000 feet of water blanket. 123 of slightly gas cut, salt water cut mud. Testing 132,000 PPM Chloride F.P. 435-505#, H.P. 6150#.

DST #11  11,919-11,974 Tool open 1 hour and 10 minutes, no blow. Recovered 1000 feet of water blanket. 550 feet of muddy salt water testing 266,000 PPM Chloride F.P. 660-685#, H.P. 6125#.

DST #12  11,917-11,974 Tool open 2 1/2 hours, weak blow 10 minutes and died. Recovered 1000 feet water blanket. 240 feet slightly oil and gas cut drilling mud, 270 feet slightly gas cut muddy salt water with rainbow of oil. F.P. 550-885#, 30 minutes S.I.P. 4780, H.P. 6075#.

Cores

| 8560'-8565' | 9290'-9305' |
| 8854'-8860' | 9305'-9319' |
| 9074'-9084' | 9332'-9362' |
| 9084'-9099' | 11,007'-11,037' |
| 9260'-9275' | 11,037'-11,063' |
| 9275'-9290' | 12,405'-12,425' |

Cement plugs were set at the following depths:

- 11,555-11,730 - 35 sacks
- 11,050-10,835 - 35 sacks
- 10,380-10,205 - 35 sacks
- 8,670- 8,470 - 45 sacks
- 630- 625 - 5 sacks
- 0- 20 - 5 sacks

Left 7,890 feet of 7 5/8 inch casing and 624 feet of 13 3/8 inch casing in hole.

Formation tops determined by sample, electric and gamma ray neutron logs, not all lithologic tops called in following list.

Tops

Cretaceous System
- Pierre Formation  1610
- Niobrara Formation  3960
- Greenhorn Formation  4532
- Muddy Sand  5210
- Dakota  5495

Jurassic System
<table>
<thead>
<tr>
<th>Formation/Level</th>
<th>Depth (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morrison Formation</td>
<td>5785</td>
</tr>
<tr>
<td>Sundance Formation</td>
<td>5930</td>
</tr>
<tr>
<td>Piper Lime</td>
<td>6685</td>
</tr>
<tr>
<td><strong>Triassic System</strong></td>
<td></td>
</tr>
<tr>
<td>Spearfish Formation</td>
<td>6820</td>
</tr>
<tr>
<td><strong>Permian System</strong></td>
<td></td>
</tr>
<tr>
<td>Minnekahta Formation</td>
<td>7345</td>
</tr>
<tr>
<td>Opeche Formation</td>
<td>7385</td>
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<tr>
<td><strong>Pennsylvanian System</strong></td>
<td></td>
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<tr>
<td>Minnelusa Formation</td>
<td>7685</td>
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<tr>
<td><strong>Mississippian System</strong></td>
<td></td>
</tr>
<tr>
<td>Amsden Formation</td>
<td>7800</td>
</tr>
<tr>
<td>Big Snowy Group</td>
<td>8095</td>
</tr>
<tr>
<td>Kibbey Sand</td>
<td>8420 samples</td>
</tr>
<tr>
<td>Kibbey Limestone</td>
<td>8520</td>
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<tr>
<td>Charles Formation</td>
<td>8660</td>
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<tr>
<td>Mission Canyon Formation</td>
<td>9200</td>
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<tr>
<td>Lodgepole Formation</td>
<td>9650</td>
</tr>
<tr>
<td>Englewood Formation</td>
<td>10,255</td>
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<tr>
<td><strong>Devonian System</strong></td>
<td></td>
</tr>
<tr>
<td>Lyleton</td>
<td>10,340</td>
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<tr>
<td>Nisku</td>
<td>10,410</td>
</tr>
<tr>
<td>Duperow</td>
<td>10,458</td>
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<tr>
<td>Souris River</td>
<td>10,745</td>
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<tr>
<td>Dawson Bay</td>
<td>10,828</td>
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<tr>
<td>Ashern</td>
<td>10,992</td>
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<tr>
<td><strong>Silurian System</strong></td>
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<tr>
<td>Interlake Group</td>
<td>11,018</td>
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<tr>
<td><strong>Ordovician System</strong></td>
<td></td>
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<tr>
<td>Upper Stony Mountain</td>
<td>11,525</td>
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<tr>
<td>Lower Stony Mountain</td>
<td>11,638</td>
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<tr>
<td>Red River Formation</td>
<td>11,705</td>
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<tr>
<td>Winnipeg Formation</td>
<td>12,265</td>
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<tr>
<td>Winnipeg Sand</td>
<td>12,380</td>
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<tr>
<td><strong>Cambrian System</strong></td>
<td></td>
</tr>
<tr>
<td>Deadwood Formation</td>
<td>12,545</td>
</tr>
</tbody>
</table>

0-50 Sandstone, light gray, fine to medium grained, lignite, pyrite; shale, dark gray to black.

50-80 Sandstone, light gray, fine grained, much lignite, shell fragments, little shale, greenish gray, limestone, light gray, dense, pyrite.

80-120 Sandstone as above, much lignite, pyrite, little shale, greenish gray and dark gray, shell fragments.

120-140 Lignite, pyrite, little sandstone as above.

140-190 Sandstone, fine to medium grained, light gray, much lignite, some shale, greenish gray, reddish brown, dark gray, pyrite.

190-210 Lignite, some sandstone as above, pyrite, shell fragments.

210-220 Lignite.

220-280 Lignite, sandstone, light gray, fine to medium gray, slightly calcareous.

280-310 Sandstone as above, much lignite, pyrite, shell fragments.

310-320 Lignite, pyrite, little sandstone as above.
320-380  Sandstone as above, much lignite, pyrite, shell fragments, little limestone, light gray, dense, shale greenish gray.
380-430  Lignite, pyrite, much sandstone as above.
430-500  Sandstone as above, much lignite, pyrite, shell fragments, little limestone, light gray, dense, shale, greenish and brownish gray.
640-670  Lignite, limestone, light brownish gray, fine grained, silty, some sandstone light gray, fine to medium grained, calcareous.
670-800  Lignite.
800-830  Lignite, little limestone, light brownish gray, earthy, silty.
850-910  Sandstone, very light brownish gray, medium to fine grained, argillaceous.
910-1000  Sandstone, light brownish gray, fine to coarse.
1000-1110  Sandstone, light gray, fine to coarse grained, some shale, yellowish brown, light gray, silty.
1110-1130  Sandstone, light gray, medium to coarse grained, calcite cement, some siltstone, light brownish gray.
1130-1220  Sandstone, light gray, fine to medium grained, calcareous, siltstone as above.
1220-1280  Sandstone, light gray, light brownish gray, fine grained, silty, little shale, very light gray, brownish gray.
1280-1310  Shale, light gray, brownish gray, silty, sandstone, light gray, light brown, medium to fine grained, very calcareous.
1310-1320  Sandstone as above, limestone conglomerate, white to light gray, shale as above.
1320-1380  Sandstone, brownish gray, medium to fine grained, silty.
1380-1510  Sandstone, light gray, fine to coarse grained, some silty.
1510-1550  Lignite, sandstone as above.
1530-1550  Sandstone as above, much lignite.
1550-1580  Sandstone, light gray, medium to fine grained, silty, shale, brownish gray.
1580-1590  Sandstone as above, lignite.
1590-1600  Sandstone as above, shale, light gray, reddish brown.
1610-1620  Sandstone as above, lignite, shale, light gray, reddish brown.
1630-1720  Shale, light greenish gray, bentonitic, silty.
1720-1740  Shale, medium gray and dark gray.
1740-1750  Shale, light greenish gray, bentonitic, silty.
1770-1800  Shale as above.
1850-1870  Shale, medium gray, bentonitic.
1880-1930  Shale as above.
2000-2010  Shale, medium light gray, bentonitic.
2150-2200  Shale, medium light gray.
2200-2240  Shale, medium gray.
2240-2250  Shale, medium gray, little bentonite, white.
2250-2310  Shale, medium gray, slightly bentonitic, shell fragments.
2320-2390  Shale, medium gray, bentonitic, pyrite.
2390-2470  Shale, medium gray, bentonitic, shell fragments.
2470-2490  Shale, medium gray, slightly bentonitic, pyrite, shell fragments, little white bentonite with Biotite.
2490-2530  Shale, medium to medium light gray, bentonitic, shell fragments, pyrite.
3340-3350  Shale, medium light gray, bentonitic, shell fragments, pyrite.
3400-3440  Shale, medium gray, bentonitic, pyrite.
3450-3490  Shale, as above.
3500-3520  Shale, medium gray, bentonitic, pyrite, shell fragments.
3520-3590 Shale, medium to medium dark gray, slightly bentonitic, shell fragments, pyrite.
3640-3650 Shale, medium gray, pyrite, shell fragments, little bentonite, white with Biotite.
3690-3720 Shale, medium gray, bentonitic, pyrite, shell fragments.
3720-3730 Shale as above, pyrite, shell fragments, bentonite, white.
3730-3860 Shale, medium gray, bentonitic, pyrite, shell fragments.
3860-3880 Shale, medium gray, bentonitic, pyrite, forams.
3880-3920 Shale, medium gray, bentonitic, pyrite.
3920-3950 Shale, medium gray to medium dark gray, slightly calcareous, pyrite, shell fragments.
3950-3960 Shale, medium gray, bentonitic, shell fragments, little white bentonite.
3960-3980 Shale as above, pyrite, shell fragments, little sandstone, fine grained, very calcareous.
3980-4000 Shale, medium gray, bentonitic, few white specks, little sandstone as above.
4000-4030 Shale, medium gray, bentonitic.
4030-4180 Shale as above, pyrite, shell fragments.
4180-4220 Shale, medium gray, bentonitic, pyrite.
4220-4250 Shale as above, bentonitic, pyrite, few shell fragments.
4250-4260 Shale, as above, bentonitic, pyrite, shell fragments, little light gray bentonite, micaceous.
4260-4290 Shale, medium to medium dark gray, bentonitic, pyrite, shell fragments.
4290-4440 Shale, medium dark gray, few shell fragments.
4440-4550 Shale, dark gray, platy.
4550-4620 Limestone, white to light gray, fragmental, shale as above, shell fragments.
4620-4660 Shale, dark gray, little limestone as above.
4660-4710 Shale, dark gray, pyrite, shell fragments.
4710-4720 Shale as above, little white bentonite.
4720-4840 Shale, dark gray, pyrite, shell fragments.
4840-4850 Shale, dark gray, little white bentonite.
4850-4870 Shale, dark gray, pyrite, shell fragments.
4880-5050 Shale, dark gray, pyrite, shell fragments.
5050-5210 Shale, dark gray, little pyrite, few shell impressions and fragments.
5210-5230 Sandstone, light brownish gray, medium grained.
5230-5250 Sandstone as above, shale, dark gray.
5250-5270 Shale, dark gray, little sandstone as above.
5270-5340 Shale, dark gray and light gray, bentonitic.
5400-5520 Shale, dark gray.
5520-5530 Shale as above, sandstone, light gray, fine grained, argillaceous.
5530-5540 Shale as above, sandstone, light gray, fine grained, argillaceous, glauconitic.
5540-5560 Sandstone, light gray, fine grained, argillaceous, thinly laminated.
5560-5580 Sandstone as above, and light gray, medium to coarse grained, subrounded quartz.
5580-5610 Sandstone, light gray, medium to coarse, subrounded quartz grains.
5610-5630 Sandstone as above, also light gray, fine grained, some shale, medium gray, silty.
5630-5650 Shale, medium gray, silty, some sandstone as above.
5650-5730  Shale, medium gray and greenish gray 5GY6/1, some sandstone as above.
5730-5790  Shale, medium gray, dark gray, sandstone, colorless, medium to coarse grain, subangular.
5790-5810  Shale, medium gray and greenish gray 5GY6/1, sandstone as above.
5810-5840  Shale, medium to dark gray, sandstone light gray, medium to fine grain.
5833  Circulation. Sandstone, light gray, medium to fine grain, shale as above.
5840-5860  Shale, light gray, dark gray, silty, sandstone as above.
5860-5880  Shale, light to dark gray, silty, siltstone, light brownish gray, calcareous, some sandstone as above.
5880-5940  Shale as above and greenish gray 5G6/1.
5935  Circulation 1 hour. Shale, greenish gray, brownish gray, medium to dark gray.
5940-5970  Shale as above, little sandstone, light gray, fine grained.
5970-6000  Shale, medium to dark gray, greenish gray, light brownish gray.
6000-6050  Shale as above, little sandstone, light gray, fine grained, glauconitic.
6050-6060  Shale, brownish gray, dark to light gray, gray bentonite.
6060-6250  Shale as above.
6258  Circulation 1 hour. Shale as above, little sandstone, light gray, fine grain.
6250-6270  Shale, brownish gray, greenish gray, light gray, little white earthy limestone and sandstone as above.
6270-6340  Shale as above.
6350-6400  Shale, light greenish gray, light brownish gray, light gray, platy.
6400-6450  Shale as above, little sandstone, light brownish gray, very fine grain.
6450-6480  Shale, light brownish gray, greenish gray 5GY6/1.
6480-6560  Shale as above, some sandstone, light brownish gray, fine grain.
6560-6600  Shale, grayish red 10R4/2, greenish gray, brownish gray.
6600-6610  Shale as above, limestone, light gray, fine grained.
6620-6650  Shale as above.
6670-6680  Shale as above, little sandstone, light gray, very fine grained.
6690-6700  Shale, as above, little gypsum, white crystalline.
6700-6730  Limestone, white to light above gray, dense, shale as above.
6730-6740  Shale as above, sandstone, moderate reddish orange, fine grained, calcareous.
6740-6760  Shale, brownish gray, greenish gray 5G6/1, grayish red 10R4/2 silty, calcareous, little limestone, light gray, dense.
6760-6780  Shale as above, limestone as above and moderate red dense, dolomite, light pink, fine grained.
6780-6830  Siltstone, moderate reddish brown, 10R4/6, little gypsum.
6830-6860  Shale, moderate reddish brown 10R4/6, silty, siltstone, moderate reddish orange 10R6/6 to pale reddish brown 10R5/4, arenaceous, slightly calcareous.
6860-6880  Shale as above.
6880-6930  Shale as above, siltstone, moderate reddish orange 10R6/6, gypsum.
6930-6960  Shale as above.
6960-7020  Shale as above, little gypsum, siltstone as in 6880-6930.
7020-7060  Shale as above, gypsum, colorless, crystalline.
7060-7130  Shale and gypsum as above, siltstone, moderate reddish orange.
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7130-7190</td>
<td>Shale, moderate reddish brown 10R4/6, silty, little gypsum.</td>
</tr>
<tr>
<td>7190-7360</td>
<td>Shale, gypsum as above, siltstone as in 7060-7130.</td>
</tr>
<tr>
<td>7360-7380</td>
<td>Limestone, grayish pink 5R8/2, microcrystalline, slight to fair porosity.</td>
</tr>
<tr>
<td>7380-7450</td>
<td>Siltstone, moderate reddish brown 10R4/6, shaly, slightly calcareous, some gypsum, colorless to white.</td>
</tr>
<tr>
<td>7450-7510</td>
<td>Shale, moderate reddish brown, 10R4/6, silty, slightly calcareous.</td>
</tr>
<tr>
<td>7510-7550</td>
<td>Siltstone, moderate reddish orange, very calcareous.</td>
</tr>
<tr>
<td>7550-7700</td>
<td>Siltstone as above, shale, grayish red 10R4/2, little gypsum.</td>
</tr>
<tr>
<td>7700-7720</td>
<td>Sandstone, medium grained, subrounded, frosted, siltstone as above.</td>
</tr>
<tr>
<td>7720-7760</td>
<td>Sandstone, very light gray, fine grained, and as above.</td>
</tr>
<tr>
<td>7760-7820</td>
<td>Sandstone, very light gray to pale red 5R6/2, fine grained, calcareous.</td>
</tr>
<tr>
<td>7820-7960</td>
<td>Dolomite, grayish pink, fine grained, limey sandstone as above.</td>
</tr>
<tr>
<td>7960-7970</td>
<td>Limestone, grayish orange pink, fine grained, dolomitic.</td>
</tr>
<tr>
<td>7970-7990</td>
<td>Limestone as above, shale, dusky red, dolomitic.</td>
</tr>
<tr>
<td>7990-8030</td>
<td>Shale as above, some limestone as above.</td>
</tr>
<tr>
<td>8030</td>
<td>Circulation. Shale as above, much reddish orange siltstone, little limestone, light gray, fine grained.</td>
</tr>
<tr>
<td>8030-8040</td>
<td>Shale, dusky red, dolomitic.</td>
</tr>
<tr>
<td>8040-8070</td>
<td>Shale, grayish red 10R4/2, pale red 5R6/2, dark reddish brown 10R3/4, dark gray, dolomitic.</td>
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<tr>
<td>8080-8120</td>
<td>Shale as above, many ostracods.</td>
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<tr>
<td>8116</td>
<td>Circulation 1 hour. Shale as above, many ostracods, reddish orange siltstone.</td>
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<tr>
<td>8120-8200</td>
<td>Shale, grayish red 5R4/2, dark reddish brown, light brownish gray, greenish gray, dark gray, some slightly dolomitic, some ostracods.</td>
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<tr>
<td>8205</td>
<td>Circulation 1 1/2 hours. Shale as above, some reddish orange siltstone.</td>
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<tr>
<td>8200-8240</td>
<td>Shale, dark gray, grayish red and brownish gray.</td>
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<tr>
<td>8240-8270</td>
<td>Limestone, very light gray, finely crystalline.</td>
</tr>
<tr>
<td>8270-8290</td>
<td>Limestone as above, shale, dark gray, brownish gray.</td>
</tr>
<tr>
<td>8290-8310</td>
<td>Shale, dark reddish brown, dark gray, greenish gray.</td>
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<tr>
<td>8304</td>
<td>Circulation. Limestone as above, siltstone, reddish orange, shale as above.</td>
</tr>
<tr>
<td>8310-8360</td>
<td>Shale, dark gray, light brownish gray, dark reddish brown.</td>
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<tr>
<td>8360-8390</td>
<td>Siltstone, moderate reddish orange, calcareous, shale as above, anhydrite.</td>
</tr>
<tr>
<td>8396</td>
<td>Circulation 1 hour. Siltstone, shale as above.</td>
</tr>
<tr>
<td>8390-8420</td>
<td>Shale, medium to dark gray, sandstone, light gray, fine grained calcareous, limestone, light gray, dense.</td>
</tr>
<tr>
<td>8420-8490</td>
<td>Sandstone, pale red, 5R6/2, fine grained, calcareous.</td>
</tr>
<tr>
<td>8490-8530</td>
<td>Sandstone, light gray to pale red, fine to medium grained, calcareous, shale, medium to dark gray, dark reddish brown, light brownish gray.</td>
</tr>
<tr>
<td>8530-8560</td>
<td>Siltstone, moderate reddish orange, anhydrite, white limestone, light brownish gray, finely crystalline.</td>
</tr>
</tbody>
</table>

**Cores**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8560-8562</td>
<td>Limestone, brownish gray, fine to medium grain, mostly dense, slightly vugular porosity.</td>
</tr>
<tr>
<td>8562-8565</td>
<td>Limestone, brownish gray, finely crystalline, dense.</td>
</tr>
<tr>
<td>8560</td>
<td>Circulation. Shale, dark gray.</td>
</tr>
</tbody>
</table>
Samples
8560-8570 Limestone, brownish gray, finely crystalline, dense.
8570-8590 Limestone, grayish orange pink, fine grained.
8590-8610 Limestone as above, also brownish gray, fine grained, shale, dark gray.
8610-8630 Limestone, pale red 10R6/2, fine grained, silty.
8630-8680 Limestone as above, anhydrite, white.
8680-8720 Limestone as above, anhydrite, dolomite, grayish red 10R4/2.
8720-8740 Limestone, medium light to medium dark gray, dense.
8740-8780 Limestone as above, anhydrite, white.
8765 Circulation. Limestone as above, anhydrite.
8780-8800 Limestone, very light gray, fine grained, dolomitic, limestone as above.
8800-8840 Limestone, very light gray to medium gray, finely crystalline.
8850 Circulation. Limestone as above.

Cores
8854-8858 Anhydrite, light gray, dense, brown stain.
8858-8860 Anhydrite, light gray to white, fragmental, shaly partings.
8860-8869 Anhydrite, light gray dense, brown stain.

Samples
8870-8910 Anhydrite, white to light gray, dense.
8914 Circulation. Anhydrite, light gray, dense, limestone, brownish gray, dense.
8914-8950 Limestone, medium gray to brownish gray, dense, anhydrite.
8953 Circulation. Limestone as above.
8960-8990 Limestone, light gray to brownish gray, dense, little anhydrite.
8990 Circulation. Limestone as above, much anhydrite, white, dense.
8990-9010 Limestone as above, white anhydrite.
9005 Circulation. Limestone as above, and very light gray, fine grained.
9010 Circulation 1 1/2 hours. Anhydrite, some limestone as above.
9010-9030 Limestone as above, some anhydrite.
9030-9060 Anhydrite, white to light gray, dense.
9067 Circulation 1 hour. Limestone, brownish gray, dense, anhydrite.
9060-9070 Limestone as above, much anhydrite.
9074 Circulation. Limestone as above, anhydrite.

Cores
9074-9077 Limestone, brownish gray to medium gray, finely crystalline, dense, little anhydrite.
9077-9078 Limestone, brownish gray, as above and yellowish gray, finely crystalline.
9078-9079 Limestone, light brownish gray, fine to medium crystalline, fair porosity.
9079-9083 Limestone, brownish gray, fine to medium crystalline, dense, slight oil stain in fractures.
9084-9086 Limestone, brownish gray, fine to medium crystalline, dense, oil stains.
9086-9089 Limestone, light brownish gray, fine to medium crystalline, slight oil stain in fractures.
9089-9091 Limestone, brownish gray, fine to medium crystalline, slight oil stain.
9091-9095 Limestone, light brownish gray, finely crystalline, pinpoint porosity.
9095-9098 Limestone, brownish gray, fine to medium crystalline.

Samples
9100-9130 Limestone, light gray to brownish gray, finely crystalline.
9130-9140 Limestone as above, shale, dark gray.
9143 Circulation 1 hour. Limestone as above.
9143 Circulation 1 1/2 hours. Limestone as above.
9140-9160 Limestone, light gray to brownish gray, finely crystalline dense, anhydrite.
9160-9210 Limestone as above.
9210-9260 Limestone as above, little anhydrite.

Cores
9260-9262 Limestone, brownish gray, finely crystalline, dense.
9262-9264 Limestone, yellowish gray, finely crystalline, pinpoint porosity.
9264-9265 Limestone, brownish gray, fine to medium crystalline, dense.
9265-9266 Limestone, yellowish gray, finely crystalline, slight intergranular porosity.
9266-9267 Limestone, brownish gray, fine to medium crystalline, slight intergranular porosity, slight oil stain.
9267-9271 Limestone as in 65-66.
9271-9272 Chert, light gray.
9272-9275 Limestone, light brownish gray, finely crystalline, slight porosity.
9275-9289 Limestone as above, slight stain in fracture.
9290-9306 Limestone, light brownish gray, fine to medium crystalline, dense.
9306-9307 Limestone, light brownish gray, fine to medium grained, slight oil stain.
9307-9312 Limestone as above, few brachiopod fragments.
9312-9319 Limestone, light brownish gray, fine to medium grained, dense to slight porosity.
9332-9336 Limestone, light brownish gray, fine grained, slight porosity, little anhydrite, 33-34.
9336-9349 Limestone, light brownish gray, fine to medium crystalline, dense.
9350-9352 Limestone as above.
9353-9355 Limestone, light brownish gray, fine to medium crystalline, fragmental, dense to slight pinpoint porosity, little anhydrite.
9355-9362 Limestone as above.
9360-9370 Limestone, light gray to brownish gray, fine to medium crystalline, dense.
9370-9390 Limestone, light gray to light brownish gray, fine to medium grained, dense to slight pinpoint porosity, little anhydrite.
9390-9430 Limestone as above, little anhydrite and dolomite, medium gray, sublithographic.
9430-9490 Limestone as above, little anhydrite.
9490 Circulation 1/2 hour. Limestone as above.
Circulation 1 hour. Limestone as above.
Circulation 1 1/2 hours. Limestone as above, few brachiopod fragments.
9490-9550 Limestone, light gray to light brownish gray, fine to medium grained, little anhydrite.
9550-9590 Limestone, light yellowish gray, microsucrosic, fair porosity.
9590-9620  Limestone as above, and light brownish gray, fine grained to fragmental.
9620    Circulation 1 hour. Limestone as above.
9620-9650  Limestone as above.
9660-9720  Limestone, light gray, fine grained to fragmental, some brachiopod fragments.
9720-9850  Limestone, light to medium gray, fine grained to fragmental, brachiopod fragments.
9850-9880  Limestone, light gray to brownish gray, fine grained to fragmental, dense.
9880-9930  Limestone, light to medium gray, fine grained to fragmental, brachiopod fragments.
9930-9960  Limestone as above, and limestone, light gray, very fine grained, shaly.
9960-10180 Limestone, light to medium gray, fine grain to fragmental, brachiopod fragments.
10180-240  Limestone as above, and light gray, very fine grained, shaly.
10240-270  Limestone to medium gray, finely crystalline, dense.
10270-310  Limestone, very light gray, fine grained, slight porosity, also limestone as above.
10310-340  Limestone, light to medium gray, finely crystalline, dense.
10340-360  Limestone as above and as in 10270-310.
10360-370  Limestone, yellowish gray, fine grained, dolomitic.
10370-430  Dolomite, grayish red 10R4/2, fine grained, silty, limestone as above.
10430-450  Dolomite, very pale orange, fine grained, shale, dark gray.
10450-470  Dolomite, light brownish gray, finely crystalline to microsucrosic.
10467    Circulation 2 hours. Dolomite, light brownish gray, finely crystalline, dense.
10470-490  Dolomite as above.
10490-520  Dolomite, light brownish gray, fine grained, little white gypsum.
10520-580  Dolomite as above, limestone very light gray, fine grain, earthy.
10580-590  Dolomite, light brownish gray, fine grain to microsucrosic, some shale, dark gray.
10590-630  Limestone, light brownish gray, fine grained, earthy, dolomite as above.
10630-650  Limestone, light gray to brownish gray, finely crystalline, dense, anhydrite some brownish gray, microsucrosic limestone.
10650-710  Dolomite, light brownish gray, microsucrosic, anhydrite, limestone as above.
10710-750  Limestone, light gray to brownish gray, fine to medium grain, dolomite as above.
10750-770  Limestone as above, some dolomite as above, little shale, dark gray.
10770-800  Limestone as above, dolomite as above, shale, pale reddish brown, calcareous.
10800-830  Dolomite, light gray, fine grained, limey, some limestone as above.
10830-860  Dolomite as above, some limestone as above and light gray, fine grained containing fine to medium quartz grains.
10860-900  Limestone, very light gray, fine grained, shaly, also light brownish gray, finely crystalline, dense.
10900-920  Limestone as above, some shale, reddish brown, very calcareous.
10920-950 Dolomite, brownish gray, finely crystalline, limestone, light gray, fine grained, some dolomite, reddish orange, fine grained.
10950-970 Dolomite as above, sandstone, light greenish gray, fine grained, calcareous, few coarse rounded, frosted quartz grains.
10970-11000 Sandstone, pinkish gray, fine to coarse, subrounded, frosted grains, calcareous and pyrite cement.
11000 Circulation 2 hours. Dolomite, light brownish gray, dense sandstone as above.

Cores
11007-012 Dolomite, medium gray to brownish gray, dense.
11012-019 Dolomite, light gray, dense, with a few fine to medium grain quartz.
11019-020 Dolomite, brownish gray, dense.
11020-022 Dolomite, light brownish gray to light gray, large percent of fine to medium rounded quartz grains.
11022-026 Dolomite, very light gray, finely crystalline, dense, iron stained, with colorless crystalline anhydrite.
11026-028 Dolomite, light gray, fine grained, containing few medium grained quartz grains iron stained, some anhydrite, good fluorescence.
11028-032 Dolomite, light gray, fine to medium crystalline, mostly dense, some small vugular.
11032-035 Dolomite, light gray, fine to medium crystalline, fair fluorescence 34-35.

Core
11037-044 Dolomite, grayish pink to light gray, fine to medium crystalline, dense.
11044-046 Dolomite as above, some anhydrite.
11046-051 Dolomite, white to light gray, finely crystalline, dense.
11051-054 Dolomite as above, some anhydrite.
11054-055 Dolomite, light brownish gray, finely crystalline, dense.
11055-063 Dolomite, white to light gray, finely crystalline, mostly dense, some vugular porosity.
11060-190 Dolomite, very light gray, fine grained.
11190-230 Dolomite as above, small amounts of light gray, dense chert, sandstone, light gray, fine grained, calcareous.
11230-240 Dolomite, very light gray, fine grained, dense, small amounts of chert.
11240-360 Dolomite, white to light gray, fine grained, some anhydrite.
11360-400 Dolomite as above, with a few medium quartz grains.
11400-440 Dolomite, white to yellowish gray, fine grained.
11440-490 Dolomite, very light gray, sublithographic, limey.
11490-530 Dolomite, light brownish gray, finely crystalline, some dolomite as above.
11530-550 Dolomite, light gray, fine grained, containing medium quartz grains, some as above.
11550-590 Limestone, light brownish gray, finely crystalline, dolomite, light gray, fine grained, with medium to fine grained quartz, some dolomite, light brownish gray, fine grained.
11590-610 Dolomite, light brownish gray, fine grain to microsucrosic, limey.
11610-640 Dolomite, as above, little shale, medium dark gray, limestone, brownish gray, finely crystalline.
11640-670 Limestone, light gray to light brownish gray, fine grain, shaly. Shale, pale reddish brown, calcareous, dark gray, dolomite, light brownish gray, fine grained.

11670-700 Limestone, light gray, finely crystalline and fragmental.

12700-740 Limestone, light gray to light brownish gray, finely crystalline, dense, few shell fragments.

11740-780 Limestone, light gray, fine gained, shaly and limestone as above.

11778 Circulation 1 hour. Limestone as above.

11778 Circulation 2 hours. Limestone, light gray to brownish, gray, finely crystalline, dense.

11780-810 Limestone as above.

11820-840 Limestone, light gray to light brownish gray, finely crystalline, some shale, dark gray.

11840-860 Limestone, light gray to light brownish gray, finely crystalline and fragmental. Dolomite, light brownish gray, fine grained, little pyrite.

11860 Circulation 1 hour. Limestone and dolomite as above.

11860 Circulation 2 hours. Limestone and dolomite as above, little shale, dark gray, pyrite.

11860-900 Limestone, very light gray to light brownish gray, dense crystalline to fine grained.

11900-930 Limestone, very light gray to light brownish gray, finely crystalline, dense and fine grained, shaly.

11930-960 Limestone, medium gray, fine grained, shaly, dolomite, light brownish gray. microsucrosic.

11960-980 Limestone, light to medium gray, fine grained, shaly, dolomite as above.

11974 Circulation 1 hour. Limestone and dolomite as above.

11974 Circulation 2 hours. Limestone and dolomite as above, little shale, dark green.

11980-12040 Limestone, light gray to light brownish gray, fine grained, earthy, dolomite as above.

12040-050 Limestone, light gray to light brownish gray, fine grained to microsucrosic, little shale, dark gray, chert, white.

12050-060 Limestone as above, some shale, dark gray.

12060-070 Limestone as above, shale, dark gray, little white chert.

12070-080 Limestone, light gray to light brownish gray, fine grained, earthy. 

12080-090 Limestone as above, little shale, olive gray 5Y4/1.

12090-120 Limestone, very light gray to light brownish gray, fine grained to dense crystalline.

12120-150 Limestone as above, some white anhydrite.

12150-170 Limestone as above.

12170-210 Limestone, as above, some shale, olive gray.

12210-280 Limestone, very light gray to brownish gray, finely crystalline, some anhydrite.

12280-380 Shale, dark greenish gray 5R4/1, platy, some pyrite.

12380-390 Shale as above, sandstone, greenish gray 5R6/1, fine grained.

12390 Circulation 1 hour. Shale, dark greenish gray, platy.

12390 Circulation 2 hours. Shale as above, some dark greenish gray, sandy.

12390-400 Shale as above, sandstone, white, fine to medium grained.

12405 Circulation 2 hours. Shale and sandstone as above.

12405-407‡ Sandstone, very light gray, fine to medium, rounded grains, shaly.
4074-408 Shale, greenish gray 5R6/1.
12408-409 Sandstone, vary light gray, fine to medium, rounded grains, shaly.
12409-416 Shale, greenish gray, 5R6/1 with sandy lenses.
12416-417 Sandstone, light greenish gray, fine to medium gray.
12417-419 Limestone, light brownish gray, dense, with a few shaly partings.
12419-423 Limestone, light gray, dense.

Samples
12425-430 Limestone, light gray, finely crystalline and fragmental, shale, dark greenish gray, with thin sand lenses.
12430-510 Limestone as above, shale as above, sandstone, light greenish gray to light gray, fine to medium grained, glauconitic, shaly.
12510-540 Shale, dark greenish gray with few small sand lenses, sandstone as above.
12540-560 Shale, dark greenish gray to dark gray, slightly sandy, some pyrite, little sandstone as above.
12560-600 Shale as above, little sandstone as above, little limestone, light gray, dense with glauconite nodules.
12600-620 Shale as above, some limestone as above.
12619 Circulation 2 hours. Shale, greenish gray to dark gray, slightly sandy.
12620-640 Shale as above, sandstone, light gray to light greenish gray, fine grained, calcareous, some limestone, light gray, dense with glauconite nodules.
12640-690 Limestone, white to light gray, fine grain to dense, with glauconite nodules, shale as above.
12692 Circulation 2 hours. Shale, greenish gray to dark gray, some pyrite, limestone as above, sandstone, light gray to light greenish gray, fine grain, glauconitic.