

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 204

Summary of the Amerada Petroleum Corporation - Clarence Iverson #1
Williams County, North Dakota
Well No. 25 - Permit No. 41

by Jay Garske
June, 1958

Amerada Petroleum Corporation - Clarence Iverson #1. Location: Center SW 1/4 SW 1/4 Section 6, T. 155N., R. 95W. Elevation: 2390 derrick floor; 2379 ground. Total Depth: 11,955 feet.

The Amerada Petroleum Corporation - Clarence Iverson #1 was spudded September 3, 1950 and completed as a producing well April 4, 1951. The well was originally completed in the Silurian, and it produced a total of 3,092 barrels of oil from rocks of Silurian age. The well was then plugged back, and on July 19, 1951 the Clarence Iverson #1 was recompleted in the Devonian. The well produced a total of 17,408 barrels of oil from the Devonian before it was once again plugged back. On December 17, 1951 the well was recompleted as a Madison producer. At the present time the well is still producing from the Madison. The Clarence Iverson #1 was the discovery well of the Beaver Lodge field (Silurian-Devonian) and was the first producing oil well in North Dakota.

Logs: Electrical and gamma ray-neutron.

Cores:

#1 10,438-10,488	#8 11,489-11,539
#2 10,493-10,538	#9 11,539-11,589
#3 10,538-10,588	#10 11,589-11,644
#4 11,161-11,211	#11 11,644-11,689
#5 11,401-11,451	#12 11,689-11,739
#6 & 7 11,457-11,489	

Tests:

DST #1; 10,450-10,780. Open 2 hours. Recovered: 620 feet of drilling mud.

DST #2; 10,452-10,803. Failed.

DST #3; 10,452-10,803. Open 2 hours. Recovered: 3500 feet of water cushion and 824 feet of gas cut mud, with 1 pint of free oil in bottom of testing tool.

DST #4; 11,736-11,795. Open 3 hours; shut in 15 minutes. Recovered: 2000 feet of water cushion, and 4500 feet of oil and gas cut mud (30% oil in last 8 strands). Pressures: FP 3350#, BHP 3600#, HP 6600#.

DST #5; 11,734-11,852: Open 4 1/2 hours, shut in 30 minutes. Recovered: 2000 feet of water cushion, 540 feet of gas cut mud, 630 feet of oil and gas cut mud, and 3,400 feet of sulfur water. Pressures: FP 3100#, BHP 5150#, HP 6600#.

DST #6; 11,862-11,937. Open 2 3/4 hours, shut in 30 minutes: gas to surface in 90 minutes. Recovered: 129 feet of oil and gas cut mud and no water cushion. Pressure bombs failed.

DST #7; 11,864-11,955. Gas to surface in 3 hours and 30 minutes. Pipe stuck when trying to close tool; reversed out gas cut mud, gas cut water cushion with scum of oil and very slightly oil and gas cut sulfurous water.

DST #8; 8,530-8,540. Set hook wall packer at 8,456 feet; open 9 hours, shut in 15 minutes; gas to surface in 2 hours and 55 minutes, continued light blow of gas by heads; reversed out 3,724 feet of oil and gas cut mud (10% oil), and 60 feet of black sulfur water. Pressures: HP 4680#, FP 855#, BHP 3600#.

Perforations:

11,706-11,720 with 4 shots per foot; swabbed to 8000 feet, well showed strong kick, swabbed 2 hours; some gas reported.

11,678-11,706 with 4 shots per foot; recovered small amount of gas and 1/2 barrel of distillate.

11,630-11,660 with 4 shots per foot; acidized with 4000 gallons; flowed 307 barrels of oil and 25 barrels of mud and water in 17 hours through a 3/4 inch choke, 53 to 55 gravity with an estimated 6 to 7 million cubic feet of gas per day; Tbg. pressure 325#, & casing pressure 1100#; flowed 159 barrels of oil in 13 1/2 hours through a 3/4 inch choke, with 5 to 6 million CFGPD. TP 350#, CF 1000#. Acidized with 8000 gallons; flowed 108 barrels of oil in 8 hours through a 1/2 inch choke; Tbg. pressure 875#, volume of gas 3,610 million cubic feet on 24 hour basis, corrected gravity 52.2; shut in Tbg. pressure 2600# casing pressure 2000#.

10,490-10,530 with 4 shots per foot; acidized with 3000 gallons; flowed 303 barrels of oil in 24 hours; flowed 224 barrels of oil in 18 hours through a 1/2 inch choke; no information on pressures.

8520-8528 with 4 shots per foot; acidized with 2000 gallons; flowed 238 barrels of 37.8 gravity oil with 273,669 cubic feet of gas in 6 1/2 hours through a 18/64 inch choke; tubing pressure 1575#; flowed 687 barrels of oil in 24 hours through a 1/4 inch choke; flowed 638 barrels of oil in 24 hours through a 15/64 inch choke; tubing pressure 1650#, casing pressure 425#, gas volume 849,515 CF.

Completion Data:

On a 13 1/2 hour Silurian test April 5, 1951 the well flowed 157 barrels of 54 gravity oil (2% water) through a 3/4 inch choke.

On a 24 hour Devonian test July 19, 1951 the well flowed 290 barrels of 39.8 gravity oil through a 1/2 inch choke.

On a 24 hour Madison test December 17, 1951 the well flowed 677 barrels of 43 gravity oil, through a 1/4 inch choke; tubing pressure 1475#, casing pressure 80#.

Casing Record:

Set 16 inch surface casing at 44 feet with 40 sacks of cement.
Set 10 3/4 inch casing at 1,206 feet with 589 sacks of cement.
Set 5 1/2 inch casing at 11,743 feet with 1800 sacks of cement.

Formation tops were determined from samples and electric logs, corrected to the electric logs. Doubtful or obscure formations were not picked. Colors and descriptive numbers were taken from the Goddard, et. al., 1951 Rock Color Chart distributed by the Geological Society of America, New York, N.Y.

FORMATION TOPS

Cretaceous System	
Pierre formation	1453
Niobrara formation	3498
Greenhorn formation	3866
Mowry formation	4202
Newcastle formation	4337
Fall River formation	4618
Jurassic System	4995
Piper limestone	5735
Triassic System	
Spearfish formation	5988
Mississippian System	
Kibbey limestone	7476
Charles	7637
Main "Nelson" pay	8488
Englewood formation	9810
Devonian System	
Lyleton formation	9913
Nisku formation	10,110
Duperow formation	10,200
Souris River formation	10,638
Dawson Bay formation	10,900
Prairie evaporites	11,035
Winnipegosis formation	11,300
Ashern formation (core)	11,609
Silurian System	
Interlake group (core)	11,644

Note: The sample cuttings examined in the preparation of the following lithologic description were of generally poor quality. The samples were very poor throughout most of the Mississippian, where they consisted mostly, and at times entirely of caved material.

0-45	No samples.
45-55	Shale, dark gray, compact, micaceous.
55-85	Siltstone, very pale orange to grayish orange 10YR7/4, compact, some with included shale fragments, and little dark gray shale as above.
85-105	Lignite, brownish black to black and some shale, light gray, compact.

105-115 Shale, light gray, lumpy, compact, slightly bentonitic, and little lignite, as above.

115-125 Lignite, brownish black to black.

125-135 Shale, dark gray to blackish red 5R2/2, compact to brittle, lignitic in part, and some lignite as above.

135-155 Shale, light olive gray 5Y6/1, lumpy, soft.

155-175 Lignite, brownish black to black.

175-185 Missing.

185-195 Siltstone, light olive gray 5Y6/1, lumpy, compact with included lignite fragments.

195-235 Lignite, woody, brownish black to black.

235-245 Siltstone, light olive gray 5Y6/1, lumpy, compact, lignite fragment inclusions, and little lignite as above.

245-255 Siltstone, as above.

255-275 Siltstone, as above, and some very fine grained silty sandstone, friable, calcareous, light olive gray 5Y6/1.

275-295 Lignite, as above (195-235).

295-305 Siltstone, as above (235-245).

305-315 Lignite, brownish black to black, glassy in part.

315-345 Shale, silty, yellowish gray 5Y8/1, lumpy, compact, some with lignite fragment inclusions and carbonaceous streaks.

345-355 Lignite, woody, brownish black to black.

355-405 Sandstone, fine to medium grained, subangular, moderately well cemented argillaceous, very calcareous, speckled with fragments of black carbonaceous material, very light gray to very pale orange 10YR8/2.

405-415 Lignite, as above (345-355) and some sandstone as above.

415-435 Limestone, cryptocrystalline, dense, argillaceous, pale yellowish brown 10YR6/2.

435-465 Lignite, as above (345-355).

465-505 Missing.

505-535 Sandstone, as above (355-405).

535-545 Missing.

545-550 Sandstone as above.

550-560 Lignite, and little sandstone, as above.

560-590 Lignite, and some sandstone, fine to medium grained, moderately well cemented, argillaceous, very calcareous, pyritic, very light gray.

590-600 Shale, light olive gray 5Y6/1, lumpy, compact.

600-800 Poor samples, apparently shale as above with some sandstone and lignite as above.

800-850 Shale, yellowish gray 5Y8/1 and brownish gray 5YR4/1, lumpy, compact, and some lignite.

850-970 Sandstone, fine to medium grained, subangular to subrounded, moderately, well cemented, argillaceous, bentonitic in part, light gray to light brownish gray, speckled with fragments of black carbonaceous material.

970-1000 Sandstone as above and little lignite.

1000-1020 Sandstone, as above to brownish gray 5YR4/1.

1020-1060 Sandstone, as above, and some shale, brownish gray, lumpy, compact.

1060-1070 Siltstone, pale yellowish brown 10YR6/2, lumpy, compact.

1070-1080 Siltstone as above, and little sandstone, medium grained, subangular to rounded, friable to moderately well cemented, calcareous, light gray and brownish gray.

1080-1090 Sandstone, as above.
 1090-1110 Sandstone as above, and few pieces of limey shale, brittle, light brown 5YR5/6 and dark yellowish brown.
 1110-1120 Missing.
 1120-1130 Shale, pale yellowish brown, brittle, very calcareous and little sandstone as above.
 1130-1150 Missing.
 1150-1160 Shale, light gray to grayish black, fissile, compact, calcareous.
 1160-1204 Missing.
 1204-1210 Limestone, very fine granular, dense, dark gray.
 1210-1240 Poor sample, apparently shale as above (1150-1160).
 1240-1270 Lignite, brownish black to black.
 1270-1300 Siltstone, shaly, light olive gray 5Y6/1, lumpy, compact, and little lignite as above.
 1300-1330 Sandstone, fine to medium grained, subangular to subrounded, friable bentonitic, light gray, some shale, light olive gray to greenish gray 5GY6/1, compact and some lignite as above.
 1330-1360 Sandstone and lignite as above.
 1360-1390 Shale, light olive gray 5Y6/1, lumpy, compact, slightly bentonitic, and some lignite.
 1390-1450 Lignite, brownish black to black.
 1450-1540 Shale, light gray and light olive gray 5Y6/1, lumpy, compact, silty in part, and much lignite as above.
 1540-1630 Missing.
 1630-1660 Limestone, fine crystalline, dense, dark yellowish brown 10YR4/2, and some shale as above (1450-1540).
 1660-1720 Missing.
 1720-1840 Shale, light olive gray 5Y6/1, lumpy, compact, bentonitic, slightly calcareous.
 1840-1870 Shale as above, and few pieces of limestone, fine granular, dense, light gray.
 1870-2290 Shale, as above.
 2290-2380 Shale as above, and numerous clay ironstone fragments.
 2380-2410 Poor sample, mostly shale as above.
 2410-2530 Missing.
 2530-2620 Shale, greenish gray 5GY6/1 to light olive gray 5Y6/1, fissile to lumpy, compact, bentonitic, and numerous clay ironstone fragments.
 2620-2650 Missing.
 2650-2710 Shale and clay ironstone fragments, as above.
 2710-2740 Shale as above, and little limy shale, light olive gray.
 2740-2980 Shale, greenish gray to light olive gray, fissile to lumpy, compact, bentonitic.
 2980-3320 Shale, as above, and some clay ironstone fragments.
 3320-3330 Missing.
 3330-3350 Shale and some clay ironstone fragments, as above.
 3350-3360 Missing.
 3360-3390 Shale and ironstone fragments as above.
 3390-3410 Missing.
 3410-3430 Shale, as above.
 3430-3460 Missing.
 3460-3500 Shale, as above.
 3500-3540 Shale, medium dark gray, fissile, compact, some with white calcareous specks.
 3540-3580 Shale, medium gray, fissile, compact.

3580-3600 Shale, greenish gray 5GY6/1, compact.

3600-3690 Shale, light olive gray 5Y6/1, lumpy, compact, slightly bentonitic.

3690-3710 Shale as above, and some medium dark gray shale, fissile compact.

3710-3750 Shale, medium dark gray, fissile, compact.

3750-3760 Missing.

3760-3790 Shale, as above.

3790-3800 Missing.

3800-3870 Shale, medium gray to dark gray, compact, some with white calcareous specks.

3870-3890 Shale, dark gray, fissile, compact, some with white calcareous specks, and little fine fragmental limestone, prismatic, argillaceous, soft, crumbly, pale brown 5YR5/2.

3890-3930 Shale as above, and some light olive gray shale, fissile to lumpy, compact.

3930-4000 Shale, medium dark gray, fissile, compact, some with white calcareous specks.

4000-4240 Shale, dark gray, fissile, compact.

4240-4340 Shale, medium gray, fissile, compact.

4340-4370 Sandstone, very fine grained, moderately well cemented, argillaceous, light gray, and some shale as above.

4370-4380 Missing.

4380-4400 Shale, dark gray, fissile, compact, and little sandstone, as above.

4400-4410 Shale, as above.

4410-4430 Missing.

4430-4520 Shale, as above

4520-4530 Missing.

4530-4620 Shale, as above, and little sandstone, very fine grained, well cemented yellowish gray 5Y8/1.

4620-4660 Sandstone, fine to medium grained, subangular, vitreous, friable, porous, very light gray to yellowish gray 5Y8/1, and much caved shale.

4660-4680 Shale, light olive gray, lumpy, compact, little dark gray, fissile.

4680-4690 Sandstone, very fine grained, friable, very light gray and much shale, as above.

4690-4710 Shale, as above.

4710-4750 Shale, dark gray, fissile, compact.

4750-4770 Sandstone, and shale as above (4680-4690).

4770-4820 Shale, dark gray, flaky to splintery, compact, micaceous.

4820-4840 Sandstone, fine to medium grained, subangular, friable, porous, very light gray to yellowish gray 5Y8/1, and much shale as above.

4840-4850 Shale, dark gray, flaky to splintery, compact.

4850-4880 Sandstone, as above (4820-4840) and little shale, grayish red 10R4/2, waxy, compact.

4880-4960 Shale, dark gray, light olive gray and grayish red, fissile to lumpy, compact, and little yellowish gray, friable, silty sandstone.

4960-4970 Sandstone, fine to medium grained, friable, very light gray, and some very coarse grained, subangular to rounded, medium gray to black chert and colorless quartz.

4970-5000 Sandstone as above, and much light olive gray shale.

5000-5080 Shale, mostly dark gray, little greenish gray 5GY6/1, flaky to splintery, compact.

5080-5120 Shale, greenish gray and dark gray, fissile, compact, and little very fine grained, silty sandstone, very light gray and light greenish gray 5GY8/1.

5120-5140 Missing.

5140-5180 Shale as above, mostly greenish gray, and some silty sandstone, as above.

5180-5250 Missing.

5250-5280 Sandstone, fine grained, friable, glauconitic, calcareous, very light gray to white, and some shale as above.

5280-5340 Shale, greenish gray 5GY6/1, and grayish black, fissile, compact, silty in part.

5340-5390 Shale, as above, and little sandstone, very fine grained, friable, silty, calcareous, very light gray to light greenish gray 5GY8/1.

5390-5460 Shale, mostly greenish gray, little dark gray, fissile to splintery, compact, very calcareous in part.

5460-5470 Shale as above, and few pieces of brownish gray, dense limestone.

5470-5480 Shale, as above.

5480-5490 Shale, light olive gray to greenish gray, little dark gray, fissile to splintery, compact to brittle, very limy in part, and some sandstone, fine grained, moderately well cemented, glauconitic, slightly calcareous, white and light greenish gray 5GY8/1.

5490-5530 Shale and limy shale, as above.

5530-5540 Shale as above, and little dark reddish brown 10R3/4, compact shale.

5540-5590 Shale, greenish gray, dark gray and dark reddish brown, fissile, compact, and much siltstone, light greenish gray, compact.

5590-5640 Shale, greenish gray, dusky yellow green, 5GY5/2, and light brownish gray 5YR6/1, fissile to splintery, brittle, calcareous.

5640-5680 Shale as above, with some limestone, fine fragmental and medium oolitic, very pale orange to dusky yellowish brown 10YR2/2.

5680-5690 Shale, dark gray, greenish gray and dark reddish brown, fissile, compact.

5690-5710 Shale as above, and little limestone, medium oolitic, with brownish gray to black, elliptical oolites, and a very pale orange, very fine granular matrix.

5710-5730 Shale, as above.

5730-5760 Limestone, very fine granular to fine crystalline, dense, very pale orange to pale yellowish brown, and much caved shale.

5760-5770 Shale, dusky yellow green, greenish gray, and brownish gray, fissile to splintery, brittle.

5770-5780 Limestone, as above (5730-5760).

5780-5790 Missing.

5790-5830 Limestone, as above to grayish orange pink 5YR7/2.

5830-5840 Missing.

5840-5870 Limestone, as above.

5870-5880 Shale, varicolored mostly dark reddish brown and greenish gray, fissile to splintery, brittle, calcareous.

5880-5890 Sandstone, fine grained, friable, porous, well sorted, light brown 5YR5/6, and some shale as above.

5890-5900 Shale as above, and little sandstone as above.

5900-5950 Shale, varicolored as above (5870-5880), and some limestone, fine crystalline, dense, very pale orange to pale yellowish brown.

5950-6120 Shale, as above.

6120-6150 Sandstone, very fine grained, friable, silty, moderate reddish orange 10R6/6, little white, earthy gypsum and some shale as above.

6150-6160 Shale, pale reddish brown to dark reddish brown 10R3/4, silty, compact, gypsiferous in part and few pieces of snowy, white gypsum.

6160-6170 Missing.

6170-6220 Shale as above, and little earthy to snowy, white gypsum.

6220-6240 Shale and little gypsum as above, and little limestone, fine crystalline, dense, very pale orange to pale yellowish brown.

6240-6300 Shale, dark reddish brown and greenish gray, compact, calcareous.

6300-6320 Missing.

6320-6370 Sandstone, fine grained, friable, silty, moderate reddish orange, and some shale as above.

6370-6410 Siltstone, arenaceous, moderate reddish brown 10R4/6, and some shale, dark reddish brown 10R3/4.

6410-6440 Shale, light red and moderate reddish orange, silty, lumpy, compact, arenaceous in part, and some white to grayish, orange pink gypsum.

6440-6640 Shale and gypsum as above and some dark reddish brown compact shale.

6640-6670 Missing.

6670-6820 Shale and gypsum, as above.

6820-6835 Dolomite, fine crystalline to microcrystalline, mostly dense, some with pinpoint and fair interstitial porosity, grayish orange pink to pale red 10R6/2.

6835-6845 Shale, dark gray, fissile, compact.

6845-6850 Dolomite, as above (6820-6835).

6850-6860 Missing.

6860-6875 Dolomite, fine crystalline to very fine granular, little dense, much with pinpoint to tubular porosity grayish orange pink to pale red 10R6/2.

6875-6900 Dolomite as above, and little fine crystalline, dense dolomite, grayish red purple to grayish purple 5P4/2.

6900-6910 Shale, moderate red 5R4/6 to very dark red 5R2/6 and grayish purple 5P4/2, fissile to splintery, brittle.

6910-6920 Shale, dark, gray and greenish gray 5GY6/1, fissile, compact.

6920-6975 Shale, moderate red 5R4/6 and pale reddish brown 10R5/4, compact to brittle, some mottled and laminated with various colors, and little greenish gray and dark gray shale as above.

6975-7010 Shale as above, varicolored, mostly splintery and brittle.

7010-7040 Shale, grayish black, calcareous, compact, and some varicolored, splintery shale, mostly moderate red and pale reddish brown.

7040-7045 Shale, grayish black to black, carbonaceous, fissile to splintery, brittle.

7045 Circulation sample: Shale, as above.

7045-7050 Shale as above.

7050-7090 Shale as above, and some varicolored shale cavings, mostly moderate reddish brown to dark reddish brown.

7090-7115 Sandstone, medium grained, angular to subrounded, friable to moderately well cemented, argillaceous and slightly siliceous in part, white and moderate brown 5YR4/4, scattered good porosity, well sorted to poorly sorted, and some shale as above.

7115-7130 Shale, grayish black to black, moderate reddish brown and grayish red purple 5RP4/2, fissile to splintery, brittle.

7130-7170 Shale as above, with increasing amounts of black carbonaceous shale.

7170-7205 Dolomite, very fine granular, some fine crystalline, dense, greenish gray 5G6/1.

7205-7210 Shale, black, carbonaceous, flaky to splintery, compact.

7210-7220 Limestone, dolomitic, fine crystalline, dense, light olive gray 5Y6/

7220-7230 Shale, as above (7205-7210).

7230-7245 Limestone, fine crystalline, dense, light olive gray to olive gray 5Y4/1.

7245-7255 Shale, varicolored, mostly dark gray to black, fissile to splintery, brittle.

7255-7305 Shale, as above, and some limestone, fine crystalline, dense, mottled, pale yellowish brown to dusky yellowish brown 10YR2/2.

7305-7345 Shale, varicolored, mostly grayish black to black carbonaceous, fissile to splintery, compact.

7345-7350 Shale as above, and few pieces of limestone, fine crystalline, dense, pale yellowish brown.

7350-7355 Sandstone, very fine to fine grained, friable to moderately well cemented, calcareous, white to moderate orange pints 10R7/4, and much shale as above.

7355-7365 Missing.

7365-7370 Sandstone and shale, as above.

7370-7385 Shale, varicolored, mostly dark gray to black, carbonaceous, fissile.

7385-7475 Shale as above, some sandstone, fine to medium grained, subangular to rounded, frosted, friable, white to moderate pink 5R7/4, and much caved material.

7475-7500 Poor samples, mostly cavings, probably shale and sandstone, as above.

7500-7525 Sandstone, very fine grained, moderately well cemented, calcareous, light brown 5YR6/4, and some white, snowy, anhydrite.

7525-7535 Limestone, cryptocrystalline, dense, grayish brown 5YR3/2.

7535-7540 Missing.

7540-7560 Limestone, as above, and much caved material.

7560-7565 Missing.

7565-7585 Shale, black, carbonaceous, fissile to splintery.

7585-7600 Sandstone, very fine grained, silty, well cemented, very calcareous, light brown 5YR6/4.

7600-7655 Poor samples, nearly all cavings, probably reddish shales and salt.

7655-7660 Missing.

7660 Circulation sample: 1 3/4 hours, as above.

7660-7700 Salt, poor samples, composed entirely of cavings.

7700-7725 Shale, moderate reddish brown and moderate red 5R4/6, fissile to splintery.

7725-7765 Shale as above, apparently some salt, and much caved material.

7765-7900 Shale and much caved material as above, some anhydrite, snowy, moderate orange pink to white, and possibly some salt.

7900-7950 Poor samples, mostly cavings, some white crystalline anhydrite, and apparently some salt.

7950-7975 Salt, poor samples, all cavings.

7975-7995 Missing.

7995-8005 Anhydrite, snowy to earthy, white, and much caved material.

8005-8060 Limestone, very fine granular, dense, pale yellowish brown, some white anhydrite as above, poor samples, mostly cavings.

8060-8085 Limestone, very fine granular, good pinpoint porosity, pale yellowish brown, and some white anhydrite.

8085-8105 Limestone, fine crystalline, dense, pale yellowish brown, and much white crystalline, anhydrite.

8105-8125 Limestone, mostly very fine granular with pinpoint porosity, little fine crystalline, dense, pale yellowish brown.

8125-8145 Limestone, as above, some earthy to snowy, white anhydrite, and cavings.

8145-8175 Anhydrite, earthy to crystalline, white to light bluish gray 5B7/1 and much caved material.

8175-8205 Limestone, very fine crystalline, dense, dusky yellowish brown, and some anhydrite as above.

8205-8265 Anhydrite as above, poor samples, nearly all cavings.

8265-8290 Poor samples, probably limestone, very fine granular, pale yellowish brown.

8290-8310 Poor samples, probably anhydrite, earthy to crystalline, white to light bluish gray.

8310-8335 Missing.

8335-8395 Limestone, dolomitic, very fine granular, pale yellowish brown, and some fine to medium crystalline limestone, dense, dusky yellowish brown.

8395-8420 Limestone as above, and some fine to medium fragmental limestone, dense, dusky yellowish brown.

8420-8485 Limestone, fine to medium fragmental and fine crystalline, dense, dark yellowish brown to dusky yellowish brown, some dolomitic limestone, very fine granular, scattered pinpoint porosity, very pale orange to pale yellowish brown.

8485-8490 Missing.

8490-8500 Limestone, as above.

8500-8510 Missing.

8510-8515 Limestone, as above.

8515-8520 Missing.

8520-8530 Limestone, fine to medium fragmental, dense, dark yellowish brown to dusky yellowish brown, and some very fine granular limestone, chalky in part, very pale orange.

8530-8540 Missing.

8540-8560 Limestone, as above.

8560-8575 Missing.

8575-8600 Limestone, as above.

8600-8640 Limestone as above, some cryptocrystalline limestone, dense, dark yellowish brown, and little oolitic limestone, pale yellowish brown.

8640-8730 Limestone, fine to medium fragmental, fair to good porosity, pale yellowish brown to dusky yellowish brown, some fine crystalline, dense limestone, pale yellowish brown to dark yellowish brown and little fine to medium oolitic limestone, very pale orange to dusky yellowish brown.

8730-8805 Limestone as above, mostly fragmental and oolitic.

8805-8925 Limestone, fine to medium fragmental, dense, pale yellowish brown to dusky yellowish brown and brownish black 5YR2/1, argillaceous in part, and some very pale orange, chalky limestone.

8925-9010 Limestone as above, and some fine to medium granular limestone, grayish orange pink, with scattered dense limestone fragment inclusions, dark yellowish brown to dusky yellowish brown.

9010-9050 Limestone, fine to medium fragmental, dense, very pale orange to dusky yellowish brown, and some very fine granular limestone, chalky in part, very pale orange to white.

9050-9060 Missing.

9060-9130 Limestone, as above.

9130-9135 Missing.

9135-9145 Limestone, as above.

9145-9150 Missing.

9150-9165 Limestone, as above.

9165-9175 Missing.

9175-9185 Limestone, as above.

9185-9195 Missing.

9195-9215 Limestone, as above.

9215-9230 Missing.

9230-9255 Limestone, as above.

9255-9270 Missing.

9270-9275 Limestone, fine crystalline and fine to medium fragmental, dense, medium gray to dark gray, and light brownish gray to brownish black, and little very fine granular limestone, very pale orange.

9275-9285 Missing.

9285-9300 Limestone, as above.

9300-9310 Missing.

9310-9315 Limestone, as above.

9315-9320 Missing.

9320-9330 Limestone, as above.

9330-9335 Missing.

9335-9340 Limestone, as above.

9340-9345 Missing.

9345-9350 Limestone, as above.

9350-9370 Missing.

9370-9375 Limestone, as above.

9375-9380 Missing.

9380-9400 Limestone, as above.

9400-9410 Missing.

9410-9465 Limestone, as above.

9465-9475 Missing.

9475-9535 Limestone, as above.

9535-9555 Missing.

9555-9565 Limestone, as above.

9565-9610 Missing.

9610-9655 Limestone, fine crystalline, dense, dark gray to grayish black and brownish black 5YR2/1.

9655-9665 Missing.
 9665-9695 Limestone, as above.
 9695-9705 Missing.
 9705-9800 Limestone, as above.
 9800-9835 Missing.
 9835-9850 Shale, black, carbonaceous, compact, slightly calcareous.
 9850-9855 Missing.
 9855-9885 Shale, as above.
 9885-9920 Limestone, fine crystalline, dense, brownish gray to brownish black, and some black shale, as above.
 9920-9930 Missing.
 9930-9945 Limestone and much black shale, as above.
 9945-9950 Limestone and some shale as above and little dolomitic limestone, microsucrosic, porous, very pale orange to pale yellowish brown.
 9950-9955 Missing.
 9955-10,005 Limestone, dolomitic limestone and some shale as above.
 10,005-10,025 Limestone, fine crystalline, dense, medium gray to dark gray and light brownish gray to brownish black, with much iron oxide staining forming rust colored spots, also some black shale and much pyrite.
 10,025-10,045 Limestone, fine crystalline, dense, medium gray to dark gray and some black shale.
 10,045-10,070 Limestone and shale as above, and little dolomite, fine crystalline, dense, very pale orange.
 10,070-10,085 Missing.
 10,085-10,090 Limestone and shale as above, with some rusty iron stain.
 10,090-10,095 Missing.
 10,095-10,100 Limestone and shale as above.
 10,100-10,155 Missing.
 10,155-10,160 Limestone, fine crystalline, dense, dusky yellowish brown.
 10,160-10,165 Missing.
 10,165-10,170 Limestone as above, and much caved material.
 10,170-10,175 Missing.
 10,175-10,195 Dolomite, calcitic, sucrosic, some pinpoint porosity, pale yellowish brown, some limestone, very fine granular, chalky in part, very pale orange to white, and some fine crystalline, limestone as above.
 10,195-10,200 Missing.
 10,200-10,230 Dolomite and limestone, as above.
 10,230-10,240 Missing.
 10,240-10,245 Limestone and some dolomite, as above.
 10,245-10,265 Missing.
 10,265-10,315 Limestone, fine crystalline, dense, dark yellowish brown to dusky yellowish brown, some chalky limestone, very pale orange to white, and some dolomite, calcitic, sucrosic, very pale orange to dark yellowish brown.
 10,315-10,325 Poor samples, mostly cavings, probably anhydrite, earthy to snowy, white.
 10,325-10,335 Missing.
 10,335-10,340 Poor sample, probably anhydrite.
 10,340-10,345 Missing.
 10,345-10,350 Poor sample, probably anhydrite.
 10,350-10,360 Missing.
 10,360-10,370 Limestone and dolomite as above (10,265-10,315).

10,370-10,380 Poor samples, mostly shale cavings, with little limestone and dolomite as above.

10,380-10,385 Missing.

10,385-10,395 Poor samples, mostly cavings, with little earthy, white anhydrite.

10,395-10,405 Missing.

10,405-10,425 Poor samples, probably limestone, fine crystalline, dense, dusky yellowish brown.

10,425-10,438 Missing.

Core #1 (10,438-10,488)

10,438-10,442 Limestone, fine crystalline, dense, dusky yellowish brown, contains mold of a brachiopod fragment.

10,422-10,446 Limestone, as above.

10,446-10,454 Dolomite, sucrosic, dense, dusky yellowish brown, and limestone, fine crystalline, dense, brownish black.

10,454-10,456 Dolomite, sucrosic, apparently some interstitial porosity, pale yellowish brown to dark yellowish brown.

10,456-10,458 Limestone, dolomitic, sucrosic, dense, dark yellowish brown.

10,458-10,463 Limestone as above, and fine crystalline dense limestone, dusky yellowish brown.

10,463-10,468 Limestone and dolomite, fine to coarsely crystalline, dense, dark yellowish brown to dusky yellowish brown, with secondary dolomite and clear calcite filling fractures.

10,468-10,473 Limestone and dolomite fine to coarsely crystalline, dense, brownish black, and sucrosic dolomite, dense, dark yellowish brown.

10,473-10,478 Limestone and dolomite, fine crystalline, dense, brownish black.

10,478-10,479½ Dolomite, sucrosic, dense, brownish gray.

10,479½-10,481 Dolomite, microsucrosic to subcrystalline, dense, very pale orange to pale yellowish brown, some fractures, few with clear calcite filling.

10,481-10,481½ Dolomite, sucrosic, dense, dark yellowish brown to dusky yellowish brown.

10,481½-10,488 Limestone, fine crystalline, dense, brownish black.

10,488-10,493 Limestone, sucrosic, dark yellowish brown.

Core #2 (10,493-10,538)

10,493-10,498 Dolomite, sucrosic, pale yellowish brown to dark yellowish brown, some brown oil stain, fair fluorescence and slight cut.

10,498-10,500 Limestone, sucrosic, some porosity, dark yellowish brown, slight fluorescence and cut.

10,500-10,503 Dolomite, sucrosic, some interstitial porosity, dark brownish gray 5YR3/1, good stain, good spotty fluorescence and good cut.

10,503-10,508 Limestone, sucrosic, slightly mottled, dense, very pale orange 10YR8/2, and dark brownish gray 5YR3/1, some apparent stain, fair scattered fluorescence and slight cut.

10,508-10,518 Dolomite, sucrosic, good interstitial porosity, dark yellowish brown, good black oil stain, very good fluorescence and good cut.

10,518-10,520 Limestone, fine crystalline, dense, anhydritic, dusky yellowish brown.

10,520-10,521 Anhydrite, crystalline, dense, grayish orange pink and little dolomite, sucrosic, anhydritic, dark yellowish brown.
10,521-10,528 Dolomite, subcrystalline, dense, banded, dusky yellowish brown, and limestone, sucrosic to cryptocrystalline, dense, brownish black.
10,528-10,533 Limestone, fine crystalline, dense, anhydritic in part, brownish gray to brownish black.
10,533-10,538 Limestone, sucrosic, dense, brownish gray.

Core #3 (10,538-10,588)

10,538-10,541 Limestone, fine crystalline, dense, medium gray.
10,541-10,545 Dolomite, calcitic, microsucrosic, dense, very pale orange.
10,545-10,551 Limestone, fine crystalline, dense, brownish black, and anhydrite cryptocrystalline, dense, brownish black.
10,551-10,558 Limestone, cryptocrystalline, dense, brownish black.
10,558-10,568 Dolomite, calcitic, microsucrosic, dense, very pale orange.
10,568-10,578 Limestone, fine crystalline, dense, brownish black.
10,578-10,583 Limestone, as above, and anhydrite, cryptocrystalline, dense, yellowish gray 5Y8/1.
10,583-10,588 Missing.

Samples

10,588-10,755 Limestone, fine crystalline, dense, brownish gray to brownish black.
10,755-10,765 Missing.
10,765-10,860 Limestone, as above.
10,860-10,880 Limestone, as above, little dolomitic limestone, sucrosic, very pale orange, and few pieces of earthy to snowy, white anhydrite.
10,880-10,890 Missing.
10,890-11,025 Limestone and dolomitic limestone, as above.
11,025-11,030 Missing.
11,030-11,120 Limestone, fine crystalline, dense, brownish gray to brownish black, little very fine granular limestone, chalky in part, very pale orange to pale yellowish brown, and little dolomitic limestone, sucrosic, slightly porous, dark yellowish brown.
11,120-11,160 Poor samples, probably salt and moderate reddish orange shale.

Core #4 (11,161-11,211)

11,161-11,211 Salt, with some included moderate reddish brown shale.

Samples

11,211-11,255 Limestone, fine crystalline, dense, brownish gray, little very fine granular limestone, pinkish gray to yellowish gray 5Y8/1.
11,255-11,270 Missing.
11,270-11,320 Limestone, fine crystalline, dense, brownish gray to brownish black and much dolomite, calcitic, sucrosic, grayish orange pink to pale brown 5YR5/2.
11,320-11,330 Dolomite as above, and little dense limestone as above.
11,330-11,340 Missing.
11,340-11,355 Dolomite and limestone, as above.
11,355-11,400 Limestone, dolomitic, very fine granular, grayish orange pink to pale brown.

Core #5 (11,401-11,451)

- 11,401-11,406 Limestone, fine, granular, dense, brownish black.
- 11,406-11,411 Limestone, fine crystalline, dense, dark brownish gray 5YR3/1, with some included snowy, white anhydrite.
- 11,411-11,416 Limestone, fine to medium granular, dense, brownish black, with little earthy to crystalline, white to brownish gray anhydrite.
- 11,416-11,421 Limestone, as above, with Trilobite, fossil fragment, possibly the pygidium of Proetus?
- 11,421-11,426 Limestone, as above with white, snowy anhydrite inclusions.
- 11,426-11,431 Limestone as above with mold of a brachiopod fragment.
- 11,431-11,436 Limestone, as above.
- 11,436-11,441 Limestone as above with brachiopod fragments.
- 11,441-11,451 Limestone, as above.
- 11,451-11,457 Missing.

Cores #6 and #7 (11,457-11,489)

- 11,457-11,479 Limestone, fine granular, dense, dark brownish gray 5YR3/1.
- 11,479-11,484 Limestone, fine granular, dense, brownish black.
- 11,484-11,489 Limestone, fine to medium granular, mottled, dense, brownish gray.

Core #8 (11,489-11,539)

- 11,489-11,514 Dolomite, very fine granular, dense, medium dark gray to brownish gray.
- 11,514-11,519 Limestone, fine granular, dense, dark gray.
- 11,519-11,524 Limestone, sublithographic, dense, medium dark gray.
- 11,524-11,534 Limestone, very fine granular, dense, medium dark gray.
- 11,534-11,539 Limestone as above, with numerous vugs and fractures filled with colorless to moderate reddish orange salt.

Core #9 (11,539-11,589)

- 11,539-11,544 Limestone, fine granular, dense, medium dark gray.
- 11,544-11,569 Limestone as above, with a little salt, colorless to moderate reddish orange.
- 11,569-11,589 Limestone, as above.

Core #10 (11,589-11,644)

- 11,589-11,609 Limestone, as above.
- 11,609-11,619 Dolomite, fine crystalline, to fine granular, dense, moderate orange pink to grayish orange pink.
- 11,619-11,624 Dolomite, calcitic, sucrosic, dense, moderate orange pink.
- 11,624-11,629 Dolomite, calcitic, very fine granular, dense, grayish orange pink.
- 11,629-11,634 Limestone, medium to coarse fragmental with fine granular matrix, medium gray, some calcite lined vugs with bead-like black carbonaceous residue.
- 11,634-11,639 Limestone, dolomitic, coarsely crystalline, vuggular, grayish orange pink, with some black carbonaceous residue in calcite lined vugs, and some mottled limestone, with an algal appearance, possibly a secondary solution filling of vuggular cavities.
- 11,639-11,644 Limestone, fine crystalline, dense, vuggular, grayish orange pink.

Core #11 (11,644-11,689)

- 11,644-11,649 Dolomite, calcitic, very fine granular, some vuggy porosity, pale brown 5YR5/2, with slight oil stain and spotty fluorescence.
- 11,649-11,659 Dolomite, calcitic, coarse granular, fair to good porosity, grayish orange pink 5YR7/4, with black carbonaceous residue in pore spaces.
- 11,659-11,664 Limestone, dolomitic, very fine granular, dense, very pale orange.
- 11,664-11,669 Dolomite, fine granular, dense, pale yellowish brown and medium dark gray.
- 11,669-11,674 Limestone, fine to medium granular, mottled, dense, grayish orange pink.
- 11,674-11,679 Limestone, fine crystalline, to earthy, dense, brecciated, with salt and calcite filling fractures.
- 11,679-11,684 Dolomite, calcitic, very fine granular, dense, grayish orange pink.
- 11,684-11,689 Dolomite, calcitic, sucrosic, dense, very pale orange.

Core #12 (11,689-11,739)

- 11,689-11,699 Dolomite, calcitic, fine granular to earthy, slight porosity, very pale orange.
- 11,699-11,709 Dolomite, calcitic, fine to medium granular, dense, very pale orange to pale yellowish brown.
- 11,709-11,714 Dolomite as above, with little vuggy porosity and traces of black carbonaceous residue.
- 11,714-11,719 Dolomite, calcitic, very fine granular, little porosity, slight fluorescence and cut, very pale orange to pale yellowish brown.
- 11,719-11,729 Limestone, dolomitic, very fine granular, dense, very pale orange.
- 11,729-11,739 Limestone, dolomitic, fine to medium granular, scattered pinpoint porosity, very pale orange.

Samples

- 11,739-11,747 Missing.
- 11,747-11,750 Limestone, dolomitic, very fine granular, dense, very pale orange.
- 11,750-11,755 Missing.
- 11,755-11,760 Dolomite, calcitic, microsucrosic, little porosity, very pale orange to grayish orange pink.
- 11,760-11,765 Missing.
- 11,765-11,790 Dolomite, calcitic, very fine to medium granular, some scattered pinpoint porosity, very pale orange to grayish orange pink.
- 11,790-11,800 Dolomite as above, and some shale, dark gray and moderate red 5R4/6, fissile, compact.
- 11,800-11,810 Dolomite, calcitic, very fine granular, little scattered pinpoint porosity, very pale orange to grayish orange pink.
- 11,810-11,815 Circulation sample: 2 hours: Dolomite, as above.
- 11,815-11,820 Dolomite as above.
- 11,820-11,825 Limestone, dolomitic, very fine to fine granular, slightly porous, light brownish gray to brownish gray.
- 11,824 Circulation sample; 2 hours: Limestone, as above.

11,825-11,838 Limestone, as above.
 11,838-11,856 Dolomite, fine grained to subcrystalline, scattered pinpoint porosity, pinkish gray to brownish gray.
 11,856-11,862 Missing.
 11,862-11,880 Dolomite, very fine granular, slightly porous, pinkish gray.
 11,880-11,888 Missing.
 11,888-11,900 Dolomite as above, and little fine to medium fragmental dolomite with good porosity, pinkish gray.
 11,900-11,910 Dolomite as above to brownish gray.
 11,910-11,930 Missing.
 11,930-11,944 Dolomite, very fine granular, slightly porous, pinkish gray, and some medium to coarse fragmental dolomite, with rounded fragments of brownish gray, subcrystalline dolomite in a very fine grained, pinkish gray matrix
 11,944-11,954 Dolomite, very fine granular, little porosity pinkish gray to brownish gray.
 11,954 Total depth.