

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 223

Summary of the Sinclair Oil & Gas Co., #1 Joe Muecke  
Stark County, North Dakota  
Well No. 1935 - Permit No. 1947

by Herbert A. Mendoza  
December 1959

The Sinclair Oil and Gas C., #1 Joe Muecke is located in the SE 1/4, NE 1/4, Sec. 29, T. 140N., R. 94W., Stark County, North Dakota. Elevation K.B. 2427; G.L. 2417.

The well was spudded July 17, 1958 and drilled to a depth of 11,080 feet, plugged and abandoned as a dry hole on October 5, 1958.

DST #1; 7488'-7510'. Tool plugged, prepare to rerun test.

DST #2; 7493'-7510'. Tool open 3 hours, no blow or recovery. 1 hour IBHSIP 10#. BHFP 10#. 2 hour FBHSIP 10#.

DST #3; 8440'-8488'. Tool open 3 hours, air immediately, very weak blow and died in 1 minute. Recovered 435' of mud cut salt water with no show. 1 hour IBHFP 3917#. BHFP 71# to 269#. 3 hour FBHSIP 3577#.

DST #4; 8487'-8534'. Tool open 3 hours, air immediately, weak blow throughout test. Recovered 364' of gas and mud cut salt water and 273' of black salty sulphur water. IBHSIP after 1 hour, 3917#. BHFP 54# to 341#. FBHSIP after 3 hours 3631#.

Casing Record:

30 feet of 24 inch surface casing cemented 2 yards.  
722 feet of 13 3/8 inch surface casing cemented in with 575 sacks.

Core Record:

1. 8433'-58', recovered 25 feet.
2. 8458'-88', recovered 30 feet.
3. 8488'-8534', recovered 46 feet.
4. 8534'-73', recovered 39 feet.
5. 8646'-8692.5', recovered 46.5 feet.

Logs Run:

Laterolog-gamma ray, microlaterolog, (Schlumberger)

Plugging Record:

25 sacks of cement at 10,950'.  
25 sacks of cement at 9,830'.  
25 sacks of cement at 8,342'.  
25 sacks of cement at 7,525'.  
25 sacks of cement at 6,780'.  
25 sacks of cement at 5,280'.

Washed plug at 725'. Replugged at 725' with 25 sacks cement and capped well with 10 sacks cement in top of surface casing. Surface casing was cut off well below planing depth.

Formation tops were determined from samples and mechanical logs. Not all formation tops were picked, colors and identifying numbers are taken from the Rock-Color Chart distributed by the Geological Society of America.

#### FORMATION TOPS

Cretaceous System	
Pierre formation	2110
Niobrara formation	3795
Greenhorn formation	4392
Graneros formation	
Belle Fourche-Mowry members	4800
Newcastle member	4937
Inyan Kara formation	
Fall River member	5250
Jurassic System	
Morrison formation	5576
Piper limestone	6334
Triassic (?) System	
Spearfish formation	6480 (?)
Permian System	
Minnekahta formation	6733
Opeche formation	6775
Pennsylvanian System	
Minnelusa formation	6876
Amsden formation	7055
Mississippian System	
Big Snowy Group	
Kibbey sandstone	7810
Kibbey limestone	7878
Madison Group	7995
Bakken formation	9685
Devonian System	
Three Forks formation	9780
Birdbear formation	10,001
Duperow formation	10,090
Dawson Bay formation	10,560
Prairie Evaporite member	10,651
Winnipegosis formation	10,846
Silurian System	
Interlake formation	10,943
T. D. 11,080 feet.	

0-60	Lignite, dark gray to black.
60-390	Lignite, brownish-gray to vitreous black, common impurities.
390-420	Lignite, brownish gray to black, abundant quartz sand grains.
420-660	Lignite, black, impure, abundant clay aggregates, slightly calcareous.
660-720	Lignite, brownish black to black, vitreous.
730-850	Sandstone, light greenish gray (5GY8/1), fine grained, silty, calcareous, quartz grains.
850-940	Sandstone, light greenish gray, (5GY8/1) fine grained, impure, common lignite brownish black.

940-980 Lignite, brownish black, abundant clay aggregates, slightly calcareous, spongy.

980-1010 Claystone, light greenish gray (5GY8/1), abundant lignite black.

1010-1050 Sandstone, light greenish gray (5GY8/1), fine to medium grained, poorly cemented, slightly calcareous.

1050-1350 Shale, light greenish gray (5GY8/1), impure, micaceous, rare lignite black, common quartz sand grains, some pyrite amorphous.

1350-1500 Sandstone, light olive gray to light greenish gray (5GY8/1), fine to medium grained, well cemented, calcareous; abundant shale as above.

1500-1530 Shale, olive gray to greenish gray (5GY6/1), lightly calcareous, spongy, partly silty.

1530-2100 Sandstone, greenish gray, fine to medium grained, calcareous, shaly, poorly cemented, common lignite, black.

#### Pierre 2110

2100-2370 Shale, light olive gray (5Y6/1), abundant sandstone as above.

2370-2400 Siltstone, greenish gray (5GY6/1), slightly calcareous, common shale olive gray, and lignite black.

2400-2490 Shale, light olive gray (5Y6/1), silty, spongy, micaceous, slightly calcareous, common lignite.

2490-2730 Shale, light greenish gray (5GY8/1), compact, clayey.

2730-2760 Shale, as above, common micaceous black shale, soft.

2760-3010 Shale, light greenish gray (5GY8/1) slightly silty and calcareous, impure, rare quartz sand grains, pyrite, shell fragments, gypsum.

3010-3070 Shale, as above, abundant sandstone, very light gray (N8), well cemented, medium hard, slightly calcareous, fine to medium grained.

3070-3550 Shale, light olive gray (5Y6/1), silty, spongy, slightly calcareous, shell fragments.

3550-3780 Shale, light olive gray (5Y6/1), silty, abundant sandstone, very light gray (N8), well cemented, rare pyrite, quartz sand grains, lignite, *Nodosaria* specie.

#### Niobrara 3795

3780-4110 Shale, greenish gray to medium light gray (N6), splintery, slightly calcareous, common "white specks" common sandstone, very light gray (N8).

4110-4380 Shale, light olive gray (5Y6/1), soft, "white specks", other impurities, slightly calcareous, rare calcite prisms.

#### Greenhorn 4392

4380-4500 Shale, light olive gray to medium light gray (N6) soft, slightly calcareous, common white, calcareous specks, *Inoceramus* prisms, rare limestone light brownish gray (5Y4/1).

4500-4530 Shale, medium light gray (N6), calcareous, common limestone light brownish gray (5YR4/1), abundant white calcareous specks, calcite prisms.

4530-4620 Limestone, light brownish gray (5YR4/1), fine to medium grained, abundant shale medium light gray (N6), calcareous, common white specks, calcite prisms.

4620-4790 Shale, greenish gray to medium gray (N5), calcareous, common limestone, brownish gray (5YR4/1), calcite prisms, common white specks.

4790-4800 Shale, same as above, rare limestone, rare white specks, common calcite prisms, sandstone, light olive gray (5Y6/1), medium grained, poorly cemented.

Belle-Fourche-Mowry 4800

4800-4940 Shale, grayish black to black (N1), fissile, and some shale olive gray (5Y4/1), calcareous, few calcite prisms, rare white specks.

Newcastle 4937

4940-4950 Shale, as above.

4950-4980 Shale, black, fissile, compact.

4980-5070 Shale, as above, some sandstone, white, fine to medium grained, poorly cemented, abundant clay aggregates.

5070-5080 Shale, grayish black to black (N1), and light olive gray (5Y6/1), abundant clay aggregates.

5080-5250 Shale, black, fissile, compact, rare sandstone, white, fine grained, poorly cemented.

Fall River 5250

5250-5290 Shale, medium gray (N5), splintery, soft, partly calcareous.

5290-5330 Shale, black, fissile, compact, and sandstone, white, fine to medium grained, some shale, medium gray (N5), soft, slightly calcareous, rare lignite.

5330-5440 Shale, as above, and sandstone, moderate red (5R4/6), some white, fine to medium grained, well cemented, rare glauconitic green sandstone.

5440-5450 Shale, light medium gray to dark gray (N6-N3), splintery, and sandstone, white to pale red (5R6/2), fine to medium grained, well cemented, common quartz sand grains.

5455 Circulation

5450-5480 Shale, and sandstone, as above.

5480-5500 Shale, dark gray (N6), soft, splintery.

5500-5510 Shale as above, rare sandstone, white.

5510-5576 Shale, dark gray (N6) and black (N1), fissile, little sandstone, white to pale red (5R6/2), fine grained, well cemented.

Morrison 5576

5576-5760 Shale, light medium gray to dark gray (N6), soft and sandstone, white to pale red (5R6/2), to varicolored, and siltstone, pale red (10R6/2), well cemented, common loose quartz sand grains, rare calcite prisms.

5760-5790 Shale, medium gray (N5), soft, slightly calcareous and very little sandstone as above, common pyrite, amorphous.

5790-5840 Shale, greenish gray (5GY6/1), soft, and some sandstone, dusky red (5R3/4), ferruginous, well cemented, medium grained, rare calcite prisms.

5840-5890 Shale, greenish gray to dark gray, soft, to compact, and sandstone, pale reddish brown 10R5/4, medium grained, well cemented.

5890-5940 Sandstone, grayish pink (5R8/2) to light red (5R6/6), fine to medium grained, well cemented, and shale, greenish gray (5GY6/1), soft.

5940-5980 Shale, greenish gray to dark gray (N6), soft to compact, and sandstone, pale red (5R6/2), medium grained, well cemented, slightly calcareous.

5980-6100 Sandstone, white to pale red (5R6/2), medium grained, well cemented, and shale as above.

6100-6130 Sandstone, as above, slightly calcareous and shale, greenish gray to dark gray, soft, calcareous, little limestone, white with red specks, rare dolomite, light brownish gray (5YR6/1).

6130-6200 Shale, medium light gray to medium gray (N5), and limestone, pale yellowish brown (10YR6/2), oolitic, rare pyrite, amorphous, quartz grains, common sandstone, white to pale red (5R6/2), rare anhydrite.

6200-6240 Limestone, light olive gray (5Y6/1), dense, some oolitic, and shale medium gray, common sandstone, pale red as above, common *Inoceramus* calcite prisms.

6240-6250 Sandstone, white to pale red (5R6/2), medium grained, well cemented, calcareous, and shale, dark gray (N6), soft, some limestone, light olive gray (5Y6/1), dense.

6250-6320 Shale, medium gray (N5), slightly calcareous, soft, and sandstone as above, little limestone.

6317 Circulation

6320-6370 Shale, as above, and sandstone pale red, some limestone, light olive gray (5Y/1), dense, rare anhydrite grains.

#### Piper Limestone 6334

6370-6380 Limestone, white, crystalline, sucrosic, some shale medium gray (N5), soft, calcareous, common chert, white, smooth.

6380-6410 Shale, medium gray (N5), soft, some limestone as above.

6410-6440 Limestone, pinkish gray (5YR8/1) fine crystalline, dense, and shale, medium gray (N5), some sandstone, pale reddish brown (10R5/4), fine grained, calcareous.

6440-6490 Shale, medium gray (N5), and limestone as above.

6490 Circulation.

6490-6550 Shale, medium gray (N5), and dolomitic limestone pale reddish brown (10R5/4), little limestone, light brownish gray (5YR6/1).

6550-6580 Shale, dark gray to black, and limestone pale red (10R6/2) to moderate red (5R4/6) to white, medium to coarse crystalline, porous, some calcite prisms, rare sandstone, pale red (10R6/2).

#### Spearfish ? 6580

6580-6600 Limestone, pale red to moderate red as above, and shale, dark gray (N6), some sandstone, white, fine grained, abundant quartz sand, subrounded.

6600-6650 Shale, greenish gray to dark gray (N6), medium hard, and sandstone, moderate red (5R4/6), fine grained, well cemented, calcareous, some limestone, pale red (10R6/2), dense, hard, quartz grains, rounded, common chert.

6650 Circulation

6650-6660 Same as above.

6660-6730 Sandstone, moderate red (5R4/6), fine grained, slightly calcareous, and limestone, pale red (10R6/2), dense, little shale, medium gray (N5), medium hard.

#### Minnekahta 6733

6730-6775 Same as above, common calcite prisms.

Opeche 6775

- 6775-6800 Limestone, white to light red (5R6/6), sublithographic, chalky, and sandstone, moderate red (5R4/6), fine grained, some shale, medium gray (N5), common quartz, angular, clear.
- 6800-6850 Limestone, white to moderate orange pink (10R7/4), chalky, and shale, dark gray (N6), abundant siltstone, moderate red (5R4/6), medium grained, poorly cemented, common gypsum, white, soft.
- 6850-6870 Siltstone, moderate red (5R4/6), medium grained, calcareous, and limestone as above, some shale, dark gray (N6).

Minnelusa 6876

- 6870-6920 Shale, greenish gray to medium gray (N5), soft, some siltstone and limestone as above, common gypsum, rare quartz grains, rounded.
- 6928 Circulation.
- 6920-6930 Shale, same as above, abundant siltstone, moderate red (5R4/6), medium grained, calcareous, common limestone, pink, soft, rare gypsum, clear, common quartz grains, rounded.
- 6930-6950 Limestone, white to pale red (5R6/2), medium to coarse, dense to porous, abundant shale, medium gray (N5), some siltstone, moderate red (5R4/6), medium grained, common quartz grains.
- 6950-6975 Limestone, as above, abundant sandstone, pale red (5R6/2), medium grained, calcareous, little shale, medium gray (N5).
- 6975-7010 Sandstone and limestone, same as above, very little shale, quartz grains, rounded, rare chert, smooth.
- 7012 Circulation
- 7010-7025 Same as above.
- 7025-7055 Shale, medium gray to dark gray (N3), soft, sandstone, moderate reddish brown (10R4/6), medium grained, limestone, pale red (10R6/2), dense to chalky, common quartz grains, rounded, calcite prisms.

Amsden 7055

- 7055-7070 Same as above.
- 7070-7090 Limestone, very light gray (N8), to pale red (5R6/2), coarse crystalline, shale, medium gray, and sandstone, moderate reddish brown to white, common quartz grains.
- 7092 Circulation.
- 7090-7110 Shale, medium gray (N5) to dusky red (5R3/4), some limestone and sandstone as above, common chert, milky, smooth.
- 7112 Circulation.
- 7110-7125 Shale, medium gray (N5) to dusky red (5R3/4), little limestone, pale red (5R6/2) to very light gray (N8), common chert, rare sandstone, white, fine grained.
- 7126 Circulation
- 7125-7135 Shale, medium light gray (N6), limestone, pale red (5R6/2), dense, common halite, clear.
- 7135-7140 Shale, greenish gray to medium gray (N5), and limestone, pale red (10R6/2), dense, crystalline.
- 7140-7155 Limestone, moderate pink (5R7/4), to pale red (5R6/2), to pale brown (5YR5/2) and shale, medium gray, (N5).
- 7162 Circulation
- 7160-7190 Limestone grayish pink (5R8/2), crystalline, dense, shale, medium gray (N5), soft, slightly calcareous chert, milky, rare sandstone, white to pale red.

7190-7220 Limestone, pale brown (5YR5/2), dense, common dolomite, grayish pink (5R8/2), cryptocrystalline, some shale, medium gray (N5), soft, little sandstone, white, fine grained, poorly cemented.

7223 Circulation.

7220-7235 Shale, medium gray (N5), to dusky red (5R3/4), soft, slightly calcareous, little limestone and dolomite as above.

7235-7250 Limestone, grayish pink (5R8/2), dense, dolomite, moderate pink (5R7/4), hard, sandstone, white, fine grained, calcareous, and shale, medium gray (N5).

7257 Circulation.

7255-7280 Same as above.

7284 Circulation.

7280-7305 Shale, medium gray to dusky red (5R3/4), soft, calcareous, limestone, grayish pink (5R8/2), some dolomite, moderate pink (5R7/4), hard, rare sandstone, white.

7305-7350 Shale, greenish gray to medium gray, sandstone, white to grayish pink (5R8/2), some limestone and dolomite as above.

7359 Circulation.

7355-7360 Limestone, white to grayish pink (5R8/2), to light brownish gray (5YR6/1), chalky to dense, some shale, dark gray (N6), soft, common quartz grains.

7360-7385 Shale, greenish gray to dark gray, soft, slightly calcareous, limestone as above, common sandstone, white, fine grained.

7385-7410 Limestone, white to grayish pink (5R8/2), dense, some shale, dark gray (N6) to dusky red (5R3/4), soft, abundant sandstone, white to moderate pink (5R7/4), fine grained, poorly cemented, common chert, smooth, chalcedonic.

7413 Circulation.

7410-7425 Same as above.

7426 Circulation.

7425-7455 Same as above.

7455-7475 Limestone, light brownish gray (5YR6/1), to grayish pink (5R8/2), dense, shale, dark gray (N6), soft, slightly calcareous.

7474 Circulation.

7475-7490 Limestone, light olive gray (5Y6/1) to pinkish gray (5YR8/1), dense, cryptocrystalline.

7492 Circulation.

7490-7520 Same as above, ostracods, common quartz grains, rounded.

7522 Circulation.

7520-7525 Limestone, light olive gray (5Y6/1), sandstone, white to pinkish gray (5YR8/1), fine grained, poorly cemented, calcareous, quartz sand grains, rounded, rare shale, dark gray (N6).

Big Snowy Group 7525

7525-7535 Same as above.

7535-7570 Limestone, light olive gray (5Y6/1) fine crystalline, dense, little shale dark gray, rare sandstone, white, fine grained, rare quartz grains.

7572 Circulation.

7570-7600 Limestone same as above, abundant sandstone, white to very light gray (N8), fine grained, well cemented, calcareous, little shale, dark gray.

7600-7605 Limestone, light olive gray (5Y6/1), dense, abundant shale, dark gray (N3), soft, little sandstone, common quartz grains, rounded.

7605-7675 Shale, dark gray (N3), soft, slightly calcareous, common limestone, light olive gray (5Y6/1), dense, little sandstone white to light bluish gray (5B7/1), fine grained.

7675 Circulation.

7675-7690 Limestone, light olive gray to grayish green (10GY5/2), dense, shale dark gray (N3), soft, and sandstone, white poorly cemented, quartz sand grains, rounded.

7690-7715 Shale, dark gray (N3), splintery, limestone and sandstone as above.

7715-7765 Limestone, light olive gray to grayish green (10GY5/2), to dark greenish gray (5GY4/1), dense, coarse crystalline to crypto-crystalline, little shale, dark gray (N3) to moderate red (5R4/6), soft.

7765 Circulation.

7765-7800 Limestone and shale as above.

7800-7810 Limestone and shale as above, common sandstone, pale reddish brown (10R5/4), fine grained, poorly cemented, common quartz grained, subrounded.

#### Kibbey Sandstone 7810

7810-7850 Sandstone, pale reddish brown (10R5/4), fine grained, slightly calcareous, little limestone, light olive gray (5Y6/1), and shale dark gray (N3) to moderate yellow green (5GY7/4).

7850-7865 Shale, greenish gray (5G6/1) to medium gray (N5), soft, sandstone and limestone as above.

7865-7875 Sandstone, pale reddish brown (10R5/4), fine to medium grained, slightly calcareous, shale as above quartz grains, frosted, subrounded.

#### Kibbey Limestone 7878

7875-7905 Same as above.

7905-7910 Limestone, very light gray (N8) to light greenish gray (5GY8/1), coarse crystalline, sandstone as above, little shale medium gray.

7911 Circulation.

7910-7950 Same as above.

7950-7970 Shale, greenish gray (5GY8/1), to medium gray (N5), soft, slightly calcareous, some limestone and sandstone as above.

7970-7990 Limestone, moderate reddish brown (10R4/6), coarse crystalline, silty, little sandstone, pale reddish brown (10R5/4), fine to medium grained, common shale, medium gray (N5), soft.

7991 Circulation.

7990-7995 Same as above.

#### Charles 7995

7995-8015 Limestone, moderate reddish brown (10R4/6), coarse crystalline, dolomitic, silty, partly oolitic, little sandstone, white to bluish white (5B9/1), fine to medium grained, calcareous, shale, medium gray (N5), soft.

8015-8050 Same as above, little anhydrite, moderate reddish orange (10R6/6) and selenite, clear, euhedral, little dolomite, pale red (5R6/2), dense.

8050-8095 Limestone, moderate reddish brown (10R4/6) to dark yellowish brown (10YR4/2) coarse crystalline, silty, slightly dolomitic, dense to oolitic, sandstone, pale red (10R6/2), fine to medium grained, little shale, common anhydrite, quartz grains.



8095-8125 Limestone, light bluish gray (5B7/1), dense to oolitic, fine crystalline, dolomitic, silty, little anhydrite, white.

8121 Circulation.

8125-8170 Same as above.

8170-8240 Limestone, light bluish gray (5B7/1) to dark yellowish brown (10YR4/2) fine to medium, dense to porous, oolitic in part, common anhydrite, white, common shale, dark brown (N3) to moderate red (5R4/6), soft, slightly calcareous.

8238 Circulation.

8240-8255 Same as above.

8255-8280 Limestone, very light gray (N5) to light olive gray (5Y6/1), fine, dense, dolomitic, anhydrite, white to very light gray, soft, little shale, dark gray (N3).

8280-8300 Limestone, same as above, fluorescent, slight cut with  $\text{CCl}_4$ , little anhydrite and shale as above.

8300-8360 Limestone, very light gray (N8), coarse, to very fine, sucrosic, pinpoint porosity, dolomitic to calcitic, little shale dark gray (N3), splintery, common anhydrite, white, abundant halite, clear, euhedral.

8360-8370 Halite, euhedral and rock salt, common anhydrite.

8370-8375 Limestone, very light gray (N8), fine to coarse, little shale, gray, anhydrite, white.

8376 Circulation.

8375-8395 Limestone, very light gray, fine to coarse, common shale, gray to greenish gray, soft, anhydrite, white.

8395-8400 Shale, greenish gray to medium gray (P5), soft limestone, very light gray (N8), common anhydrite.

8400-8410 Anhydrite, very light gray (N8) to light greenish gray (5GY8/1), soft.

8410-8430 Limestone, light olive gray (5Y6/1), dense, anhydrite, same as above.

Core #1

8433-8441 Anhydrite, light olive gray (5Y6/1), soft, calcareous.

8441-8444 Limestone, pale brown (5YR5/2), very fine crystalline, dense.

8444-8446 Dolomite, very light gray (N8), dense.

8446-8448 Anhydrite, white, soft, good fluorescence, slight cut with  $\text{CCl}_4$ .

8448-8449 Anhydrite, pale red (10R6/2), slight fluorescence, no cut, limestone, pale brown (5YR5/2), subcrystalline.

8449-8450 Limestone, same as above.

Core #2

8450-8453 Limestone, pale brown (10R6/2), very fine crystalline sucrosic, hard.

8453-8462 Anhydrite, light gray (N7), soft, slightly calcareous.

8462-8466 Limestone, pale brown (5YR5/2), very fine crystalline, dense.

8466-8472 Anhydrite, white to very light gray (N8), soft.

8472-8487 Limestone, pale brown (5YR5/2), sucrosic, calcitic, Spirifer ? fragments.

8487-8488 Anhydrite, light gray (N7), soft, calcareous.

Core #3

8488-8489 Limestone, dark gray (N3), very fine crystalline, dense, good cut, banding.

8489-8492 Anhydrite, pale brown (10R6/2), soft, calcareous.  
8492-8500 Limestone, light olive gray (5Y6/1), soft, sucrosic, anhydritic, fossiliferous.  
8500-8504 Limestone, light olive gray (5Y6/1), fine to very fine, sucrosic, anhydritic, stylolites, fossiliferous, good cut.  
8504-8506 Anhydrite, light brownish gray (5YR6/1), soft, calcareous.  
8506-8507 Limestone, grayish black (N2), fine to medium crystalline, shaly, stylolites, anhydritic, good cut, some anhydrite as above.  
8507-8509 Anhydrite, light brownish gray (5YR6/1), soft, calcareous.  
8509-8510 Limestone, light gray (N7), medium, grainy, anhydritic.  
8510-8519 Limestone, same as above, good cut, suboolitic.

"Nesson" zone 8520  
8519-8522 Limestone, olive gray (5Y4/1), subcrystalline, dense, good cut.  
8522-8523 Limestone, medium light gray (N6), fine to medium, dense, fluorescent, no cut.  
8523-8527 Anhydrite, white, medium hard.  
8527-8528 Limestone, very light gray (N8), medium crystalline grainy, slight cut.  
8528-8532 Limestone, dusky yellowish brown (10YR2/2), subcrystalline, dense, calcitic, slight cut.  
8532-8533 Anhydrite, pale brown (10R6/2), medium hard, slightly calcareous.  
8533-8534 Limestone, light brownish gray (5YR6/1), slight cut.

Core #4  
8534-8535 Anhydrite, medium gray (N5), hard, dense.  
8535-8541 Limestone, pale brown, medium, grainy, shows banding, anhydritic, slight cut.  
8541-8545 Anhydrite, medium gray (N5), hard, dense.  
8545-8546 Limestone, pale brown, subcrystalline, dense, anhydrite inclusions.  
8546-8563 Anhydrite, very light gray (N8) to medium gray (N5), to dark gray (N3), dense, hard, breaks with subconchoidal fracture.  
8563-8571 Limestone, light gray (N7), fine, dense, banded anhydritic.  
8571-8646 Missing.

Core #5  
8646-8651 Anhydrite, light gray, hard, dense, dolomitic.  
8651-8658 Limestone, pale yellowish brown (10YR6/2), fine dense, with inter-bedded anhydrite.  
8658-8688 Limestone, medium dark gray (N4), to medium light gray (N6), medium, dolomitic, grainy, slight cut, stylolites.  
8688-8692½ Limestone, olive gray (5Y4/1), medium crystalline, grainy.

Samples  
8690-8855 Limestone, light olive gray (5Y5/2), medium, grainy slight cut, rare anhydrite, white.  
8852 Circulation.  
8855-8970 Limestone, light gray (N7), medium hard, grainy to porous, anhydrite, white to light bluish gray (5B7/1), soft.  
8974 Circulation.  
8970-9005 Limestone, light gray to light brownish gray (5YR6/1), hard, dense.  
9005-9015 Limestone, same as above, anhydrite, white to very light gray (N8), soft, some black shale cavings?

9014 Circulation.  
 9015-9050 Limestone, light gray (N7), to light brownish gray (5YR6/1),  
 sucrosic to subcrystalline to pseudo-oolitic.  
 9050-9055 Shale, dark gray (N3), oily, splintery, common limestone as above.  
 9055-9085 Limestone, light gray to light brownish gray (5YR6/1), fine,  
 sucrosic to subcrystalline.  
 9083 Circulation.  
 9085-9200 Limestone, same as above.  
 9200-9490 Limestone, light gray to medium light gray (N6), fine, grainy to  
 oolitic, common fossil fragments.  
 9490-9680 Limestone, medium light gray to medium dark gray (N4), fine,  
 grainy to subcrystalline.

Bakken 9685  
 9680-9700 Same as above.  
 9700-9760 Limestone as above, little shale, dark gray (N3), platy, soft.  
 9760-9780 Shale, dark gray (N3), medium hard, platy to splintery,  
 calcareous, abundant limestone, light gray (N7), grainy to sub-  
 crystalline.  
 9779 Circulation.  
 9780-9840 Same as above.  
 9840-9875 Shale, dark gray (N3), platy, calcareous, abundant limestone,  
 medium light gray (N6) to moderate reddish orange (10R6/6), fine,  
 grainy to subcrystalline.  
 9875 Circulation.  
 9875-9890 Limestone, moderate reddish orange (10R6/6), grainy to sub-  
 crystalline, dolomitic, siliceous, little shale, dark gray.  
 9886 Circulation.  
 9890-9975 Limestone as above, common shale, grayish green (5G5/2), waxy,  
 platy, calcareous, common anhydrite, white, soft.  
 9975-10030 Limestone, moderate red (5R4/6), to moderate reddish brown  
 (10R4/6) grainy, slightly dolomitic, common shale grayish green  
 (5G5/2) to dark gray (N3), platy, slightly calcareous, little  
 anhydrite, white, soft.  
 10030-10045 Limestone, pale brown (5YR5/2) to moderate reddish brown (10R4/6),  
 subcrystalline to grainy, common shale as above.  
 10045-10050 Limestone, pale yellowish brown (10YR6/2) to moderate brown  
 (5YR3/4), grainy to cryptocrystalline.  
 10050-10055 Limestone, moderate brown (5YR3/4) to moderate reddish brown  
 (10R4/6), grainy, common shale, grayish green (5G5/2), massive to  
 platy, slightly calcareous.  
 10051 Circulation.  
 10055-10090 Limestone, pale yellowish brown to moderate brown (5YR3/4), sub-  
 crystalline.

Duperow 10090  
 10090-10110 Limestone, pale brown (5YR5/2) to light brownish gray (5YR6/1),  
 fine to medium crystalline, dolomitic.  
 10110-10120 Limestone, light brownish gray (5YR6/1) to light gray (N7), sub-  
 lithographic.  
 10119 Circulation.  
 10120-10125 Limestone as above.  
 10128 Circulation.  
 10125-10175 Limestone, light gray (N7) to light brownish gray (5YR6/1), grainy  
 to subcrystalline.

10175 Circulation.  
 10175-10185 Limestone, pale yellowish brown (10YR6/2) to light brownish gray (5YR6/1), grainy to subcrystalline.  
 10184 Circulation.  
 10185-10210 Limestone as above, very fine to medium crystalline, slightly dolomitic.  
 10207 Circulation.  
 10210-10280 Limestone, pale yellowish brown (10YR6/2) to light brownish gray (5YR6/1), very fine to medium crystalline, grainy, slightly dolomitic, little shale, dark gray (N3), platy.  
 10280-10310 Limestone as above, and abundant shale, dark gray (N3), platy to splintery.  
 10310-10335 Limestone, light yellowish brown (10YR6/2) to light brownish gray (5YR6/1), fine to medium crystalline, sucrosic to grainy, calcitic.  
 10332 Circulation.  
 10335-10360 Limestone as above.  
 10357 Circulation.  
 10360-10370 Limestone, light yellowish brown (10YR6/2) to moderate brown (5YR4/4), fine to medium crystalline, grainy, slightly oil-stained with no cut, low porosity.  
 10370 Circulation.  
 10370-10375 Same as above.

#### Souris River 10375

10375-10430 Limestone as above.  
 10429 Circulation.  
 10430-10505 Limestone, medium light gray to pale brown (5YR5/2), fine to medium crystalline, grainy.  
 10505-10510 Limestone as above, common shale, greenish gray (5G6/1), waxy and platy.  
 10509 Circulation.  
 10510-10535 Limestone as above, common quartz grains, subrounded, frosted.  
 10535-10560 Limestone, yellowish gray (5Y7/2) to grayish pink (5R8/2) to pale brown (5YR5/2), fine to medium crystalline, sucrosic to grainy, little quartz grains, subrounded.  
 10558 Circulation.

#### Dawson Bay 10560

10560-10580 Limestone, yellowish gray (5Y7/2), sublithographic to medium, little shale, greenish gray (5G6/1), platy.  
 10580-10615 Limestone, yellowish gray to medium light gray (N6) to light brownish gray (5YR6/1), sublithographic to medium crystalline, grainy to subcrystalline, dense.  
 10615 Circulation.  
 10615-10630 Limestone, yellowish gray (5Y7/2) to pale brown (5YR5/2), fine to medium crystalline, sucrosic, dense.  
 10630-10650 Limestone, pale yellowish brown (10YR6/2) to brownish gray (5YR4/1), very fine to fine crystalline, dense.

#### Prairie Evaporites 10651

10650-10670 Limestone as above.  
 10670-10680 Limestone as above, little anhydrite, white to pale green (10G6/2), medium hard, and shale, dark gray (N3), platy.

10678 Circulation.  
 10680-10715 Limestone as above, common shale, medium light gray (N6) to dark gray, splintery, slightly silty, little anhydrite, white.  
 10715-10760 Limestone, light brownish gray (5YR6/1), fine crystalline, dense, common shale and anhydrite as above, rare gypsum selenite crystals.  
 10759 Circulation.  
 10760-10835 Limestone, olive gray (5Y4/1), fine crystalline, dense, little shale, greenish gray (5G6/1) to dark gray (N3), platy, little anhydrite, white.  
 10835 Circulation.  
 10835-10845 Limestone, medium light gray (N6) to light olive gray (5Y4/1), fine to medium, grainy to dense, little shale as above.  
  
 Winnipegosis 10846  
 10845-10890 Same as above.  
 10889 Circulation.  
 10890-10950 Limestone, yellowish gray (5Y7/2) to olive gray (5Y4/1), fine to medium crystalline, dense, sucrosic, little shale, medium dark gray (N4), platy, soft.  
  
 Interlake 10953  
 10950-10990 Same as above.  
 10989 Circulation.  
 10990-11000 Limestone, olive gray (5Y4/1) to yellowish gray (5Y7/2), fine crystalline, dense, abundant dolomite, very pale orange (10YR8/2), fine crystalline, dense, sucrosic.  
 11000-11015 Dolomite, moderate orange pink (10R7/4) to very pale orange (10YR8/2), fine to very fine crystalline, sucrosic, common limestone as above.  
 11015-11035 Dolomite, white to very pale orange, crystalline, little limestone, olive gray (5Y4/1), medium to fine crystalline, dense.  
 11035 Circulation.  
 11035-11080 Dolomite, white to moderate reddish orange (10R6/6), crystalline, sucrosic, dense, little limestone, light bluish gray (5B7/1), fine crystalline, dense.  
 11080 Circulation.