

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 50

Summary of the Amerada Petroleum Corp. - Herman May #1
Billings County, North Dakota
Permit #307, Well #291

By Sidney B. Anderson

Amerada Petroleum Corp. - Herman May Unit #1 well, Billings County, North Dakota, NW NE Section 9, T. 139N., R. 100W. (660 feet from north line, 1983 feet from east line). Elevation G.L. 2761, K.B. 2274.

The Amerada Herman May #1 was spudded April 6, 1953, drilled to a total depth of 13,325 feet, plugged back to 9430 and completed as an oil well for an IFP of 217 barrels of 40.6° oil per day through and 18/64" choke, following perforation with 2 shots per foot and acidizing with 2000 gallons from 9404-9430.

Ten and three-fourths inch surface casing was set at 625 feet with 500 sacks and 7 5/8 inch casing was set at 9402.82 with 1475 sacks of cement.

TESTING:

The well was drill stem tested quite extensively, the results are as follows:

- DST #1. 9386-9466. Weak blow for 40 minutes, fair blow for 30 minutes, packer gave way; recovered 4100' of fluid as follows: 2000' heavily oil and gas cut water and 1390' of slightly gas cut rotary mud. Gravity of the oil is 40.1° at 80°. HP 5350, IFP 1050, FFP 1450, No BHP.
- DST #1. Rerun. 9376-9466. Open 4 hours, shut in 15 minutes; light blow for 40 minutes. Fair blow to 30 minutes, increasing to good blow, gas to surface in 2 hours; pulled tool, hit fluid after pulling 26 stands, recovered 210' oil cut water cushion (est. 40% oil) 90' water cushion. (est. 30% oil), well unloaded for 17 minutes, (est. 80% oil, 20% water) reversed out 13.7 barrels oil, cut fluid (est. 80% water, 20% oil) recovered 490' black brackish water in drill collars. FHP 5300, IFP 1100, FFP 2600, BHP 4000.

With the total depth at 9466 production tests were run with the following results.

Flowed 324 barrels oil, 165.55 barrels water in 21 hours on 24/64" choke, P 200, GOR 790/1, Gravity 40.1°.

Flowed 98 barrels oil, 1 barrel water in 4 1/4 hours on 24/64" choke, shut in 19 3/4 hours for BHP, SIP 790.

Flowed 392 barrels oil, 167 barrels water in 24 hours on 24/64" choke, GOR 501/1.

Flowed 119 barrels oil, 38 barrels water in 11 hours on 16/64" choke,

TP 350, shut in 13 hours for BHP. Flowed 204 barrels oil, 65 barrels water in 24 hours on 16/64" choke. TP 300.

Flowed 47 barrels oil, 4 barrels water in 6 1/4 hours on 1/4" choke, TP 300, killed well.

DST #3. 9468-9508. Test failed, recovered 2000' water cushion, 7425' drilling mud.

DST #3. (run #2) 9471-9508. Test failed, recovered 2000' water cushion, 7425' drilling mud.

DST #3. (run #3) 9469-9508. Open 4 hours, shut in 15 minutes air immediately to very weak blow for 4 hours, reversed out 2000' muddy water cushion, 2000' drilling mud, with no show of gas or oil and 500' gray slightly salty water. IHP 5200, FHP 5175, IFP 1100, FFP 2100, BHP 3775.

DST #4. 9601-9666. Open 2 hours, shut in 15 minutes, air immediately, strong blow, water cushion to surface in 45 minutes, flowed water cushion for 55 minutes, flowed rat hole mud for 10 minutes, flowed fresh water for 10 minutes at the rate of 17 barrels per hour, reversed out. IHP 5400, FHP 5450, FFP 4425, BHP 4550.

DST #5. (rerun #1) 10,658-10,699. Open 4 hours, shut in 15 minutes 3000' water cushion, weak blow throughout test, recovered 3000' slightly oil cut water cushion, 2500' salt water. IFP 1575, FFP 2800, BHP 4125, FHP 5550.

DST #7. (rerun #2) 12,368-12,446. 5000' water cushion used open 15 minutes, packer failed, air to surface immediately, fair blow 5 minutes, good blow 10 minutes, recovered 1860', water cushion, 460' gas cut water cushion, reversed out 1755' gas cut water cushion, with light scum and rainbow of oil, 585' gas cut water cushion, no oil, 585' gray gas cut water with slightly salty taste and slightly oil cut, 936' dark gray gas cut salt water, 234' foamy gas cut drilling mud, 507' drilling mud, IHP 6875', IFP 2500, FFP 2800, FHP 6700.

DST #10. 12,997-13,051. Open 3 hours, shut in 15 minutes 5000' water cushion, air immediately, weak blow for 14 minutes and died, recovered 5000' water cushion, 140' slightly gas cut mud, last 130' of water cushion was muddy; water cushion was slightly gas cut throughout, just enough gas to burn. IHP 6935, IFP 2310, FHP 6855, BHP 3937.

DST #11. 13,051-13,129. Open 3 hours, shut in 15 minutes, 5100' water cushion, air at once, weak blow for 5 minutes increasing to strong blow for 35 minutes and good blow to end of test, recovered 5100' water cushion and 4400' salt water. FHP 6700, IFP 2443, FFP 4653, BHP 5617.

Formation tops determined by sample, electric and radioactivity logs, not an lithologic formation tops called in following list. Colors determined from rock color chart.

FORMATION TOPS

Cretaceous System	
Pierre Formation	1922
Niobrara Formation	4052
Greenhorn Formation	4642
"Muddy"	5292
Dakota Silt Zone	5555
Dakota	5594
Jurassic System	
Morrison Formation	5922
Sundance Formation	5987
Piper Formation	6295
Triassic System	
Spearfish Formation	6695 electric log 6650 samples
Permian System	
Minnekahta Formation	7375
Pennsylvanian System	
Minnelusa Formation	7695
Mississippian System	
Amsden Formation	7758
Big Snowy Group	7965
Kibby Formation	8485
Charles Formation	8710
Mission Canyon Formation	9403
Lodgepole Formation	9780
Englewood Formation	10,412
Devonian System	
Lyleton Formation	10,485
Nisku Formation	10,650
Duperow Formation	10,730
Souris River Formation	11,012
Dawson Bay Formation	11,135
Ashern Formation	11,295
Silurian System	
Interlake Group	11,335
Ordovician System	
Upper Stony Mountain	12,030
Lower Stony Mountain	12,143
Winnipeg Formation	12,808
Winnipeg Sand	12,925
Cambrian System	
"Deadwood" Formation	13,165
Total Depth	13,325

Amerada-May No. 1

<u>From</u>	<u>To</u>	<u>Formation</u>
1800	1890	Sandstone, light olive gray, silty sand, fine to medium grain.
1890	1920	Siltstone, light olive gray, very little sand.
1920	1950	Sandstone, very fine grained and light olive gray siltstone as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
1950	1980	Shale, olive gray, silty.
1980	2160	Shale, olive gray.
2160	2220	Shale, olive gray to medium gray.
2220	2250	Shale, olive gray.
2250	2460	Shale, olive gray to medium gray.
2460	2550	Shale, medium gray.
2550	3240	Shale, medium light gray to medium gray.
3240	4040	Shale, medium light gray to medium dark gray.
Niobrara 4052		
4040	4090	Shale, medium dark gray to medium gray with white specks, N4.
4090	4650	Shale, medium gray.
Greenhorn 4642		
4650	4690	Shale, medium dark gray to dark gray with white specks.
4690	4740	Shale, medium gray to medium dark gray.
4740	4750	Shale, gray black, N2.
4750	4770	Shale, medium dark gray to gray black.
4770	4890	Shale, medium dark gray.
4890	5300	Shale, dark gray, N3.
5300	5305	Shale as above and few pieces of very fine grain white sandstone.
5305	5309	Shale, dark gray.
5309	5330	Shale as above and few pieces of very fine grain white sandstone.
5330	5480	Shale, dark gray to medium gray.
5480	5510	Shale, dark gray.
5510	5540	Shale, dark gray and few pieces of very fine grain, light brown sandstone.
5540	5555	Shale, dark gray.
Dakota Silt Zone 5555		
5555	5560	Shale, dark gray and little white to light brown, very fine grain sandstone and little fine to medium free quartz.
5560	5570	Shale, dark gray.
Dakota 5594		
5570	5600	Shale as above and some fine grain white sandstone.
5600	5610	Sandstone, much fine grain white and shale as above.
5610	5630	Shale as above and some sandstone as above.
5630	5640	Shale as above and very fine grain white sandstone.
5640	5670	Shale as above and little sandstone as above.
5670	5680	Shale as above, white fine grain sandstone.
5680	5730	Sandstone, white fine grained.
5730	5740	Shale, dark gray, very little sandstone.
5740	5750	Sandstone, white fine grained as above and some shale as above.
5750	5770	Shale, dark gray, very little sandstone.
5770	5780	Shale, dark gray, some sandstone as above.
5780	5800	Missing.

<u>From</u>	<u>To</u>	<u>Formation</u>
5800	5830	Sandstone, fine to medium grained, white to colorless and free quartz, some shale as above.
5830	5860	Sandstone, fine grained, white.
5860	5900	Sandstone as above and much medium to dark gray shale.
5900	5920	Sandstone, light gray, glauconitic.
Morrison 5922		
Sundance 5987		
5920	6010	Sandstone as above and dark gray shale.
6010	6030	Sandstone, light gray to white, calcareous, with some glauconitic and medium to dark gray shale.
6030	6040	Shale, medium gray and some sandstone as above.
6040	6100	Sandstone, light gray, very fine grained, calcareous, dark to greenish gray shale.
6100	6110	Shale, dark gray and little green gray; little sandstone, as above.
6110	6120	Sandstone and shale as above.
6120	6140	Sandstone as above, some shale as above.
6140	6150	Sandstone, light gray to slightly tan, fine grain, calcareous.
6150	6170	Sandstone, very light gray to whitish, fine grain, calcareous.
6170	6180	Shale, dark gray to green gray.
6180	6200	Shale as above, and white slightly greenish, fine grain sandstone.
6200	6230	Sandstone, light gray, fine grain, calcareous and greenish gray shale to dark gray shale.
6230	6260	Sandstone, light gray, fine grain, calcareous and some shale as above.
Piper 6295		
6260	6300	Sandstone as above, dark gray to green gray shale.
6300	6330	Limestone, white to light gray, oolitic.
6330	6350	Limestone as above and much medium gray to dark gray shale.
6350	6370	Shale, medium gray and little limestone.
6370	6420	Shale, dark gray to green gray shale.
6420	6470	Shale as above and few pieces of reddish shale.
6470	6479	Shale as above and light gray sandstone and limestone.
6479	6510	Shale as above and much light gray calcareous sandstone.
6510	6520	Sandstone and shale as above and few pieces of oolitic limestone.
6520	6540	Shale, dark gray and green gray and few pieces of reddish shale.
6540	6550	Dolomite, white, fine grained, dense.
6550	6560	Limestone, light gray, fine grained, dense, and reddish shale and shaly limestone.
6560	6570	Shale and limestone as above, mostly dark gray shale.
6570	6580	Limestone, pale yellow brown, fine grained, dense and reddish shaly limestone.
6580	6590	Limestone, reddish shaly.
6590	6600	Limestone, pale brown to light gray, very fine grain, dense.

<u>From</u>	<u>To</u>	<u>Formation</u>
6600	6620	Red shale and some limestone as above.
6620	6640	Some red shale and light brown to white limestone, dense, fine grained.
6640	6650	Limestone, reddish shaly and pale brown, fine grain, dense.
6650	6660	Reddish shale and little lime as above.
6660	6680	Shale and limestone as above, few pieces of white anhydrite.
Spearfish 6695		
6680	6780	Shale, reddish and little pink gray.
6780	6840	Shale, gray and red, mostly medium dark gray.
6840	6860	Shale as above and few pieces of reddish sandy shale.
6860	6870	Shale, red and grays mostly reddish and few pieces of reddish, sandy shale.
6870	6890	Shale as above and few pieces of reddish fine grain sandstone.
6890	6930	Shale as above and few pieces of pinkish, fine grain sandstone.
6930	6950	Shale as above and few pieces of colorless to pink anhydrite.
6950	7000	Shale, dark gray and reddish mostly dark gray.
7000	7030	Shale, dark gray.
7030	7060	Shale, dark gray and a few pieces of red shale.
7060	7080	Shale as above, few pieces of white to pink anhydrite.
7080	7090	Shale, red and gray as above.
7090	7180	Shale as above, mostly gray, few pieces of white anhydrite.
7180	7200	Shale, red and gray shale.
7200	7260	Shale, red and medium gray and few pieces of white anhydrite.
7260	7280	Shale, medium gray.
7280	7290	Shale, red and medium gray.
7290	7370	Shale as above, mostly medium gray.
7370	7376	Shale, medium gray.
Minnekahta 7375		
7376	7384	Limestone, pinkish, fine grained, dense.
7384	7440	Limestone as above and few pieces of pink anhydrite.
7440	7450	Little limestone as above, red and gray shale, coarse angular quartz.
7450	7595	Missing.
7595	7600	Shale, red and medium dark gray.
Minnelusa 7695		
7600	7760	Missing.
Amsden 7758		
7760	7770	Shale, red and medium dark gray.
7770	7780	Missing.
7780	7790	Shale, red and medium dark gray.
7790	7805	Missing.
7805	7815	Shale, red and medium dark gray.
7815	7820	Shale as above, little white to pinkish fine grained sandstone, fine grain dense pinkish dolomite.

<u>From</u>	<u>To</u>	<u>Formation</u>
7825	7831	Shale, medium dark gray and little red.
7820	7830	Shale, dark gray and some red.
7830	7835	Shale as above and pinkish fine granular to lithographic dolomite.
7835	7880	Dolomite, pinkish, fine grained to fine granular, dense, and some shale as above.
7880	7895	Dolomite, pinkish to yellow gray as above and little white to pink anhydrite; shale as above.
7895	7905	Missing.
7905	7915	Dolomite, white to pinkish, dense, fine grained, and fine grained whitish sandstone, little red and gray shale.
7915	7920	Dolomite, pinkish, fine grain to fine granular, dense; little pinkish fine to medium grain sandstone.
7920	7925	Dolomite, pinkish and pale brown to white; fine grain to fine granular, dense.
7925	7985	Missing.
Big Snowy 7965		
7985	7990	Dolomite as above and much fine to medium free quartz, some shale as above.
7990	8005	Missing.
8005	8025	Dolomite as above, some red and gray shale and little sandstone as above.
8025	8420	Missing.
8420	8425	Limestone, little white to light gray, fine grained, dense; pinkish dolomite, fine grain dense, red and gray shale.
8425	8430	Limestone, light gray, fine grained; dolomite as above, few pieces of anhydrite and little red and gray shale.
8430	8435	Limestone, brown, fine grained, dense. Dolomite and shale as above.
8435	8465	Missing.
8465	8470	As above and little pinkish sandstone.
8470	8475	Mostly gray shale and some gray limestone, dense, fine grain.
8474	8480	Mostly gray shale, few pieces of red shale, little limestone as above and few pieces of chert.
Kibby 8485		
8480	8490	Mostly gray shale and little pale brown limestone.
8490	8495	Sandstone, much reddish, fine grain, little gray shale and limestone as above.
8495	8535	Missing.
8535	8540	Sandstone, reddish, fine grained.
8540	8605	Missing.
8605	8615	Sandstone as above, brown limestone and little gray and red shale.
8615	8685	Missing.
8685	8690	Shale and limestone as above, much reddish shale, some sandstone.
8690	8990	Missing.
8990	8995	Limestone, light gray, fine grained, dense.
8995	9020	Missing.

<u>From</u>	<u>To</u>	<u>Formation</u>
9020	9025	Limestone as above to brown, fine grained, dense. Few pieces of white anhydrite.
9025	9225	Missing.
9225	9235	Limestone, light gray, fine grain, dense.
9235	9380	Missing.
9280	9300	Limestone, light gray to very light brown gray, fine grained, dense.
9300	9305	Limestone as above and light brown to whitish anhydrite.
9305	9310	Some limestone as above and colorless to light gray anhydrite.
9310	9315	Anhydrite, colorless to light gray and light brown gray.
9315	9365	Missing.
9365	9370	White anhydrite, brownish anhydritic limestone, brown fine grained dense limestone, gray shale and little red shale.
9370	9375	Anhydrite, whitish and light gray; brownish fine grain dense limestone.
9375	9390	Whitish anhydrite and brown, fine granular to fine grain dense limestone.
9390	9395	Limestone as above, whitish to light gray anhydrite.
9395	9408	Missing.
Mission Canyon 9403		
9408	9416 1/2	Limestone, light brown gray, fine granular, dolomitic with a little intergranular porosity, good fluorescence. Core #1
9416	9421	Limestone, light brown, fragmental, dense.
9421	9426	Limestone, light brown gray, very fine granular with intergranular porosity.
9426	9431	Limestone as above with some, large vugs.
9431	9434 1/2	Limestone as above to fragmental.
9434	9436 1/2	Limestone, light brown gray, fine granular with intergranular porosity.
9436	9439	Limestone as above, dense.
9439	9448	Limestone, color as above, fine granular to slightly fragmental, dense.
9448	9456 1/2	Limestone as above to fragmental, dense.
9456	9458 1/2	Limestone as above with some intergranular porosity.
9458	9466	Limestone, light brown gray, fine granular, dense.
9466	9471	Core #2. Limestone, brown, fine grained, dense.
9471	9476	Limestone as above and medium light gray, fine granular dolomite.
9476	9486	Limestone, brown gray, fine grained, dense.
9486	9491	Limestone, light brown gray, fine granular.
9491	9496	Limestone, light brown gray, fine granular to fragmental, dense.
9496	9501	Limestone, brown gray, fragmental, dense.
9501	9503	Limestone, brown gray to light brown gray, fragmental, dense.
9608	9613	Core #3. Limestone, light brown gray, fine granular to fragmental.
9613	9618	Limestone, light brown gray, fine granular and dolomite.
9618	9623	Limestone, light brown gray, fine granular, dense.
9623	9628	Limestone, dark yellow brown, fine granular.

<u>From</u>	<u>To</u>	<u>Formation</u>
9628	9633	Limestone, pale yellow brown, fine granular, fragmental, dense.
9633	9638	Limestone, pale yellow brown, fine granular, dense.
9638	9643	Limestone as above and white anhydrite.
9643	9648	Limestone, light brown, fragmental, dense.
9648	9653	Limestone, light brown,, fine granular and white anhydrite.
9653	9658	Limestone, light brown, fine granular to fragmental, dense.
9658	9666	Limestone, light brown, oolitic, fair porosity. End Core #3.
9666	9670	Limestone, brown fragmental to oolitic.
9670	9680	Limestone, brown fragmental with some pinpoint porosity.
9680	9700	Limestone, brown, fine granular to fragmental with some pinpoint porosity.
9700	9705	Limestone, brown, fragmental to fine granular, dense with little pinpoint porosity.
9705	9715	Limestone, dusky yellow brown to pale yellow brown, and as above.
9715	9720	Limestone, color as above, fine to medium granular.
9720	9725	Limestone, dark yellow brown, saccharoidal, intergranular porosity.
9725	9730	Limestone, dark yellow brown and pale yellow brown, fine grain to fine granular, dense.
9730	9750	Limestone, dusky yellow brown, fine grain, dense, crystalline to pale yellow brown, fine grained, dense.
Lodgepole	9780	
9750	9805	Limestone, dusky yellow brown, fine grained, dense, crystalline.
9805	9810	Limestone, pale yellow brown, fine grained, dense and some limestone as above.
9810	9815	Limestone, pale yellow brown to dusky yellow brown, fine grain dense.
9815	9930	Limestone as above, mostly dusky yellow brown.
9930	9950	Missing.
9950	10,010	Limestone as above to light gray, fine grained.
10,010	10,040	Limestone, dusky yellow brown, fine grained, crystalline, dense, and light gray, fine grained, dense.
10,040	10,050	Limestone, dusky yellow brown to dark gray, fine grained, crystalline, dense.
10,050	10,070	Limestone, dusky yellow brown as above and little fine grained pale yellow brown to light gray.
10,070	10,140	Limestone, brown black, fine grained, crystalline, dense and little light gray, fine grained, dense.
10,140	10,160	Limestone as above and little light gray fragmental.
Englewood	10,412	
10,160	10,465	Limestone, brown black, fine grained, crystalline, dense.
10,465	10,470	Limestone, dark yellow brown, fine grained, dense, crystalline, to brown black as above.
10,470	10,480	Shale, dark gray to black carbonaceous, some dark yellow brown limestone as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
Lyleton	10,485	
10,480	10,510	Shale, green gray, limey and brown gray, fine granular limestone, dense; few pieces of white anhydrite.
10,510	10,520	Limestone, gray red, little light tan, fine grained, dense, crystalline dolomite, green gray shale.
10,520	10,540	Limestone, gray red, shaly.
10,540	10,550	Limestone as above and light brown, fine grained dolomitic; some greenish shaly limestone.
10,550	10,560	Limestone, gray red, shaly and light brown, fine grained, dolomitic.
10,560	10,570	Limestone, gray red, shaly and silty.
10,570	10,580	Limestone as above and greenish shaly.
10,580	10,610	Limestone as above and little white anhydrite.
10,610	10,630	Limestone, gray red as above and green shaly; little white anhydrite.
10,630	10,640	Limestone, gray red, silty and greenish fine grained.
Nisku	10,650	
10,640	10,650	Limestone, gray red, silty with some medium grain, rounded quartz grains, and greenish, fine grain limestone, little anhydrite.
10,650	10,655	Limestone, dusky yellow brown, very fine grain, dense, crystalline and tan silty limestone, little red and green as above.
10,655	10,660	Limestone, pale brown to light tan, fine grain, dense and red and green as above.
10,660	10,665	Limestone, very light tan, little pale brown, fine grained, dense, and dusky yellow brown, fine grain dense limestone.
10,665	10,670	Limestone, very light tan, fine grained, dense, pale brown, fine grain to fine granular, dense.
10,670	10,675	Limestone, very light tan, fine grained and pale brown, medium saccharoidal.
10,675		Circulation. Limestone, brown gray, fragmental to saccharoidal and tan, fine grained, dense.
10,675	10,700	Missing.
10,700	10,705	Limestone as above, little pinpoint porosity in brown gray and some fine grained dense, brown black limestone.
10,705	10,710	Limestone, very light brown or tan, very fine granular to fine grained, dense; some dense brown black.
10,710	10,715	Limestone, medium gray with light brown tinge, fine grained, very fine granular, dense.
10,715	10,725	Limestone, very pale yellow brown, fine granular and fragmental to fine grained, dense.
Duperow	10,730	
10,725	10,730	Limestone as above and light gray, argillaceous.
10,730	10,735	Limestone, very pale yellow brown, fine granular and little light gray, argillaceous.
10,735	10,740	Limestone, very pale yellow brown, fine granular and light brown to light gray anhydrite.
10,740	10,750	Dolomite, light brown fine grain to fine granular and light gray, dense, fine grained with some white to light brown anhydrite.

<u>From</u>	<u>To</u>	<u>Formation</u>
10,750	10,755	Limestone, brown gray, fine grained, dense, little very light brown or tan, fine grained, dense some anhydrite as above.
10,755	10,770	Limestone, brown gray, fine grained dense, and very light brown gray, fine granular, little anhydrite as above.
10,770	10,775	Limestone, light tan, very fine granular; white to tan anhydrite.
10,775	10,780	Limestone, brown gray, fine grained, dense and light gray, very fine granular.
10,780	10,800	Limestone, brown gray to pale brown, fine grained, dense.
10,800	10,805	Limestone as above and light gray anhydritic limestone.
10,805	10,810	Limestone, brown gray, fine gained, dense, pale brown and little light gray to tan limestone, fine grained to fine granular.
10,810	10,815	Limestone, brown gray, fine grained, dense, pale brown, very fine granular.
10,815	10,830	Limestone, medium brown gray, fine granular.
10,830	10,835	Limestone, brown gray, fine granular to fine grained, dense.
10,835	10,855	Limestone, brown gray, fine grained, dense to medium brown gray, fine granular.
10,855	10,860	Limestone, pale brown, fine granular.
10,860	10,865	Limestone as above to brown gray, fine grained, dense.
10,865	10,890	Limestone, brown gray, fine grained, dense.
10,890	10,910	Limestone, brown gray, fine grained, dense and medium brown gray, fine granular.
10,910	10,920	Limestone as above and little anhydritic limestone.
10,920	10,925	Limestone as above and little light tan, fine granular.
10,925	10,930	Limestone, brown gray, fine grained, dense, and light tan, fine grain to fine granular.
10,930	10,935	Limestone, brown gray to light tan, fine grained, dense.
10,935	10,940	Limestone, brown gray to medium brown gray, fine grained, dense.
10,940	10,960	Limestone, brown gray, fine grained, dense to medium brown gray, fine granular.
10,960	10,965	Limestone, medium brown gray, granular, little pinpoint porosity.
10,965	10,970	Limestone, brown gray, fine grained, dense and some as above.
10,970	10,975	Limestone, brown gray, fine grained, dense.
10,975	10,987	Limestone, brown gray, fine grained, dense and some medium brown gray, fine granular.
10,987	10,995	Limestone, brown gray, to pale yellow brown, dense, fine grain.
10,995	11,005	Limestone, pale yellow brown, fine granular.
Souris River 11,012		
11,005	11,015	Limestone as above to brown gray, fine grained, dense.
11,015	11,025	Limestone, brown gray, fine grained, dense, crystalline.
11,025	11,030	Limestone, light gray, fine grained, dolomitic and some brown gray, fine grained, dense crystalline.
11,030	11,040	Limestone, light gray to light brown gray, fine grained, dolomitic.

<u>From</u>	<u>To</u>	<u>Formation</u>
11,040	11,045	Limestone, light gray to light brown gray, fine grained.
11,045	11,050	Dolomite, light gray, fine grained.
11,050	11,055	Dolomite as above and some light brown gray, fine grained limestone.
11,055	11,070	Limestone, brown gray, fine grained, dense, crystalline, and little light gray, fine grained.
11,070	11,120	Limestone, brown gray, fine grained, dense, crystalline to light gray and light brown gray, fine grained, little white anhydrite.
11,120	11,125	Limestone, light gray, fine grained to fine granular, some brown gray, fine grained, dense.
11,125	11,130	Limestone as above and very dusky red argillaceous.
Dawson Bay 11,135		
11,130	11,135	Limestone, pale yellow brown, very fine grained, dense, crystalline and some red argillaceous.
11,135	11,145	Limestone, dusky yellow brown to dark yellow brown, fine grained, dense, crystalline.
11,145	11,160	Limestone, dusky yellow brown, fine grained, dense, crystalline.
11,160	11,175	Limestone, dusky yellow brown to dark yellow brown, fine grain, dense, crystalline.
11,175	11,200	Limestone, brown black to dark yellow brown, fine grained, dense, crystalline.
11,200	11,205	Brown black limestone as above and light brown, fine grain limestone; light gray, fine grained dolomite.
11,205	11,215	Limestone, brown black, fine grained, dense, crystalline.
11,215	11,260	Limestone as above and medium light gray, dense, dolomitic.
11,260	11,270	Limestone as above and little reddish argillaceous dolomite.
11,270	11,275	Limestone, brown black as above and reddish, fine grain dolomite.
11,275	11,285	Limestone, brown black as above and little reddish, fine grain dolomite.
Ashern 11,295		
11,285	11,295	Limestone, brown black as above.
11,295	11,300	Limestone, brown black as above, some light gray, fine grain and little pinkish orange, fine grained, dolomitic limestone.
11,300	11,310	Limestone, light gray, fine grained, some brown black and little pinkish or dolomitic.
11,310	11,315	Limestone, gray, red, very fine granular, dolomitic.
11,315	11,330	Sandstone, medium to coarse, green friable some calcareous and some limestone as above, some of the sandstone is slightly reddish.
Interlake 11,335		
11,330	11,335	Sandstone, limestone, sandstone as above and brown black fine grained dense limestone, few pieces of black shale.
11,335	11,345	Limestone, brown black to brown gray, fine grain, dense.
11,345	11,350	Limestone, brown black to brown gray, and light gray, fine grain.

<u>From</u>	<u>To</u>	<u>Formation</u>
11,350	11,390	Limestone, brown black, fine grain dense.
11,390	11,423	Limestone, brown black, and brown gray, fine grain dense, and light gray, very fine granule.
11,423	11,425	Limestone, light gray, granular dolomitic.
11,425	11,430	Limestone, pale yellow brown 10YR6/2 granular dolomitic.
11,430	11,433	Limestone, pinkish to light gray, fine granular, dolomitic.
11,433	11,440	Limestone, pinkish to light gray, to very pale brown, dolomitic.
11,440	11,445	Limestone, as above and few pieces of calcite.
11,445	11,450	Limestone, pinkish dolomitic, as above, light olive gray, lithographic, and little light gray fragmental limestone.
11,450	11,465	Limestone, light olive gray, as above, light brown to dark gray, very fine grain, dense.
11,465	11,475	Limestone, light gray and brown gray, fine grain, dense.
11,475	11,485	Limestone, as above, mostly dark brown gray, fine grain, dense.
11,485	11,495	Limestone, dark brown gray, fine grain, dense.
11,495	11,520	Limestone, very light tan to whitish, fine grain, dense, dolomitic, some dark brown gray.
11,520	11,525	Limestone, white to very light tan, fine grain, and dark brown, gray, dense, few pieces slightly pinkish.
11,525	11,540	Dolomite, white to pale brown, fine grain, dense.
11,540	11,550	Dolomite, white to pale brown, fine grain, dense, and dark brown gray, granular.
11,550	11,570	Dolomite, very light brown to brown gray, fine granular.
11,570	11,575	Dolomite, limestone, very light tan, fine grain, and brown gray, fine grain, dense.
11,575	11,585	Dolomite, very pale yellow brown, fine grain, dense.
11,585	11,725	Limestone, very pale yellow brown, fine grain to fine granular, dolomitic.
11,725	11,755	Limestone, pale yellow brown, fine grain to fine granular dense, dolomitic limestone, and brown gray, fine grain, dense.
11,755	11,770	Dolomite, pale yellow brown, fine grained, dense.
11,770	11,780	Dolomite, white, very fine granular.
11,780	11,800	Dolomite, white to pale yellow brown, fine grained to fine granular, dense.
11,800	11,810	Limestone, very pale yellow brown, fine grained, dolomitic.
11,810	11,835	Dolomite, pale yellow brown, fine grained, dense, slightly calcitic.
11,835	11,910	Dolomite, pale yellow brown, fine grained, dense.
11,910	11,925	Dolomite, pale yellow brown, to pale brown, dense, fine grain.
11,925	11,930	Limestone, brown gray, fine grained, dense, dolomitic.
11,930	11,970	Limestone, dark brown gray, fine grained, dense, dolomitic.
11,970	11,980	Limestone, very pale yellow brown to dark brown gray, fine grained, dense dolomitic.
11,980	12,005	Limestone, dark brown gray, fine grained, dense, dolomitic.
12,005	12,025	Limestone, pale yellow brown to dark brown gray, fine grain, dense, dolomitic.

<u>From</u>	<u>To</u>	<u>Formation</u>
Upper Stony Mountain 12,030		
12,025	12,040	Limestone, dark brown gray and fine grained, dense, dolomitic.
12,040	12,055	Limestone, pale yellow brown, fine grained dense to fine granular and dark brown gray, dense, fine grained.
12,055	12,060	Limestone, pale yellow brown and dark brown gray, fine grained, dense.
12,060	12,090	Limestone as above, mostly dark brown gray.
12,090	12,100	Limestone, pale brown to dark brown gray, fine grained, dense, crystalline, limestone mostly pale brown.
Lower Stony Mountain 12,143		
12,100	12,185	Limestone, pale yellow brown to dark brown gray, fine grained, dense.
12,185	12,210	Limestone as above, few pieces of gray shale to shaly limestone.
12,210	12,225	Limestone, brown gray to pale yellow brown, fine grained, dense, crystalline, mostly brown gray limestone.
12,225	12,235	Limestone, dark yellow brown, fine grained, dense, some limestone as above.
12,235	12,245	Limestone, brown gray, fine grained, dense, crystalline, little pale yellow brown, dense crystalline limestone.
12,245	12,260	Limestone, dark brown gray, fine grained, dense crystalline limestone.
12,260	12,275	Limestone, dark yellow brown, finely saccharoidal.
12,275	12,300	Limestone, dark brown gray, fine grained, crystalline.
12,300	12,308½	Core #5. Limestone, brownish black, fine grained, dense, crystalline.
12,308½	12,310	Dolomite, brownish black, fine grained, dense, crystalline.
12,310	12,318	Anhydrite, brown, fine grained, dense crystalline, anhydritic dolomite.
12,386	12,387	Core #6. Shale, light brownish gray, hard, slightly calcareous shale.
12,387	12,388¼	Limestone, brownish gray, fine grained, dense.
12,389	12,393½	Dolomite, brownish gray, fine granular.
12,393	12,397	Limestone, dusky brown 5YR2/2, fine grained, dense crystalline.
12,397	12,398	Limestone, dark yellowish brown, fine granular to dusky yellowish brown, fine grained dense.
12,398	12,399½	Limestone, dark yellow brown 10YR4/2, fine granular limestone.
12,399	12,405	Limestone, dusky yellowish brown 5YR2/2, fine grained, dense crystalline.
12,405	12,411	Limestone, dark yellowish brown 10YR4/2, fine granular limestone, dusky brown 5YR2/2, fine grained, dense, crystalline.
12,411	12,414	Limestone as above and little gypsum.
12,414	12,424	Core #1. Dusky brown 5YR2/2, fine grained, dense crystalline dolomite, with some dark yellowish brown fine granular limestone.
12,424	12,434	Limestone, dark brownish gray, fine grained, dense limestone.

<u>From</u>	<u>To</u>	<u>Formation</u>
12,434	12,440	Limestone, dusky yellowish brown, fine grained, dense limestone.
12,440	12,440	End Core #6. Limestone, dusky yellowish brown, fine grained, dense. Some brachiopod fragments.
12,440	12,500	Limestone, dusky brown, fine grain dense, and little dark gray, fine grain limestone.
12,500	12,560	Limestone, dusky brown, fine grain dense, crystalline and little brownish fine granular limestone.
12,560	12,745	Limestone, dusky brown, fine grain, dense, crystalline, and brownish to tan, fine granular.
12,745	12,805	Limestone, dusky brown, fine grain, dense.
Winnipeg	12,808	
12,805	12,810	Limestone, shale, as above and some dark green gray shale.
12,810	12,830	Shale, dark green gray, waxey shale.
12,830	12,835	Shale, as above and few pieces, fine grain, light gray sandstone.
12,835	12,870	Shale, dark green gray, waxey shale.
12,870	12,920	Shale, dark gray to dark green gray, waxey.
Winnipeg Sandstone	12,925	
12,920	12,929	Core. Shale, as above, and few pieces fine grain, light gray, sandstone.
12,929	12,934	Core. Sandstone, white fine grain, slightly calcareous.
12,934	12,935	Sandstone, shale, white fine grain sandstone and dark gray shale.
12,935	12,936	Sandstone, white fine grain, not calcareous, slightly fluorescence, and stain in fragments.
12,946	12,951	Shale, medium to dark gray.
12,951	12,956	Limestone, brownish fine grain, dense.
12,956	12,961	Limestone, as above.
12,961	12,966	Limestone, brownish, fine grain, dense, glauconite.
12,966	12,971	Limestone, brownish, fine grain, dense with some pyrite.
12,971	12,976	Core. Limestone, light brown gray, fine grain, dense, with little glauconite.
12,976	12,981	Limestone, dusky brown fine grain, dense.
12,981	12,986	Limestone, shale, limestone as above and some gray shale.
12,986	12,991	Limestone, brown gray, fine grain, dense, crystalline.
12,991	12,996	Limestone, light gray to light brown gray, fine grain, dense.
12,996	13,000	Sandstone, whitish fine grain, calcareous, some brown staining, no fluorescence.
13,000	13,004	Sandstone, medium to coarse grain.
13,004	13,009	Sandstone, whitish fine grain, slightly fluorescence and carbon-tetrachloride cut with.
13,009	13,014	Sandstone, whitish fine to medium grain, calcareous.
13,014	13,019	Sandstone, whitish to light gray fine to medium grain, little carbon material, dead oil?
13,019	13,020 ^¼	Sandstone, whitish fine grain (some carbon material in fractures, (dead oil).)
13,020 ^¼	13,020 ^¾	Sandstone, white to brown, medium grain slightly fluorescence with carbon-tetrachloride in brown sandstone.

<u>From</u>	<u>To</u>	<u>Formation</u>
13,020 ³ / ₄	13,024	Sandstone, white fine to medium grain slightly calcareous, (some dark brown carbon? stain) no fluorescence.
13,024	13,028 ³ / ₄	Sandstone, whitish medium grain, some staining, no fluorescence.
13,028 ³ / ₄	13,030 ¹ / ₂	Sandstone, whitish medium grain, some staining, no fluorescence.
13,030 ¹ / ₂	13,032 ¹ / ₄	Core #9. Sandstone, whitish, fine grain, some staining, (dead oil, no fluorescence) and bitumen.
13,032 ¹ / ₄	13,032	Sandstone, whitish, medium grain, much staining, no fluorescence.
13,033	13,035	Sandstone, whitish fine to medium grain, some staining no fluorescence.
13,035	13,038	Sandstone, whitish fine to medium grain, some carbon material.
13,045	13,047 ³ / ₄	Core #10. Sandstone, light gray, fine to medium grain.
13,045	13,050	Sandstone, whitish, fine to medium grain, some carbon material in fragments.
13,051	13,053	Sandstone, whitish fine grain, much carbon residue, no fluorescence.
13,053	13,057	Sandstone, whitish medium grain, little carbon residue.
13,057	13,061	Core. Sandstone, light gray to whitish, fine to medium grain.
13,061	13,066	Sandstone, whitish fine to medium grain, little carbon residue.
13,066	13,070	Sandstone, whitish fine to medium grain, little carbon residue.
13,073	13,078 ¹ / ₂	Sandstone, whitish, medium green.
13,078 ¹ / ₂	13,085	Sandstone, whitish, medium to fine grain.
13,085	13,094	Sandstone, whitish, medium to fine grain.
13,094	13,098	Core #12. Sandstone, whitish, medium to fine grain.
13,098	13,103 ¹ / ₂	Sandstone, whitish, medium grain.
13,103 ¹ / ₂	13,108	Sandstone, whitish, fine, to medium grain.
13,108	13,111 ³ / ₄	Sandstone, whitish, fine to medium grain.
13,111 ³ / ₄	13,115 ¹ / ₂	Sandstone, whitish, fine grain.
13,115 ¹ / ₂	13,117	Sandstone, light gray to whitish fine grain, little carbon residue.
13,137	13,120	Sandstone, whitish, fine grain, with some brown carbon residue.
13,120	13,127	Sandstone, whitish to light gray, fine grain with some brown carbon residue and dark gray shale.
13,127	13,129	Sandstone, light gray, fine grain, with brown staining, no fluorescence (carbon residue).
13,129	13,130	Core #13. Sandstone, whitish, fine grain, with brown staining.
13,130	13,133	Sandstone, light gray, fine gain, with brown banding.
13,133	13,136	Sandstone, light gray, fine grain, with brown banding, and little intergranular dark gray shale.
13,136	13,139	Sandstone, light gray, fine grain.
13,139	13,141	Sandstone, shale, interbedded light gray, and dark gray shale.
13,141	13,142	Shale, sandstone, as above.
13,142	13,143	Sandstone, light gray, fine to medium grain with small amount of glauconite.

<u>From</u>	<u>To</u>	<u>Formation</u>
13,143	13,146	Sandstone, light gray, fine grain with some brown staining no fluorescence.
13,146	13,150	Core. Sandstone, light gray, fine grain, small amount of glauconite and some brown stain, carbon residue, no fluorescence.
13,150	13,152	Sandstone, light gray, fine grain banded with brown carbon material? no fluorescence, little grayish.
13,152	13,154	Sandstone, light gray, fine grain with interbedded gray shale.
13,154	13,155	Limestone, brownish very glauconitic.
13,155	13,156	Limestone, brownish, very hard, slightly sandy.
13,156	13,157	Shale, dark gray.
13,157	13,158	Sandstone, fine grain, salt and pepper with glauconite.
13,158	13,161	Sandstone, light gray, very fine grain, slightly calcareous tight.
13,161	13,162	Sandstone, light brown, gray, very fine grain, slightly calcareous, tight and dark gray shale.
Deadwood	13,165	
13,165	13,167	Sandstone, light brown, gray, banded, very fine grain, slightly calcareous, tight, and dark gray shale.
13,167	13,169	Limestone, light brown gray, fragmental limestone and light gray, fine grain, dense.
13,169	13,170	Limestone, light brown gray, fine grain, dense.
13,170	13,175	Limestone, light gray, slightly brininge, fine grain, dense, with interbedded dark grayish.
13,175	13,179	Limestone, light gray, slightly brown tinge.
13,179	13,182	Limestone, very light brown, gray fragmental, glauconitic, with interbedded dark gray shale.
13,182	13,186	Limestone, light brown gray, fine grain, dense.
13,186	13,191	Limestone, as above, and dark gray shale.
13,191	13,196	Limestone, as above, and dark gray shale partings.
13,196	13,201	Shale, dark gray, hard shale.
13,201	13,206	Limestone, shale, light brown gray, fine grain, dense, and dark gray shale.
13,206	13,211	Limestone, as above and some calcite, shale.
13,211	13,216	Limestone, as above shale.
13,216	13,221	Limestone, shale, as above and interbedded dark green gray shale.
13,221	13,226	Core #14. Shale, dark gray with small amounts of limestone.
13,226	13,231	Shale, dark green gray with small amounts of limestone.
13,231	13,236	Limestone, shale, dark green gray to medium gray shale and light gray to light brown gray, very fine grain, dense, with glauconite.
13,236	13,237	Shale, limestone, dark gray to dark green gray shale and little light brown fragments.
13,237	13,239	Limestone, shale, light brown gray, fragments and interbedded green shale.
13,239	13,240	Limestone, shale, as above little interbedded gray and gray shale.
13,240½	13,242½	Limestone, dark gray, shaly.
13,242½	13,244	Limestone, shale, very light brown gray, fragmental and gray to green gray shale.

<u>From</u>	<u>To</u>	<u>Formation</u>
13,244	13,246	Limestone, shale, as above and gray shale, little green shale and glauconite.
13,246	13,249	Limestone, medium gray, with glauconite.
13,249	13,252½	Limestone, shale, very light brown gray, fragmental with interbedded gray shale.
13,252½	13,254	Core #15. Light gray, very fine grain, dense with little glauconite.
13,254	13,259	Limestone, very light brown gray, fine granular to fragmental, dense.
13,259	13,262	Limestone, light brown gray, fragmental, and light gray, fine grain, interbedded.
13,262	13,264	Limestone, light green gray, fine grain, shaly.
13,264	13,265½	Limestone, light brown gray, fragmental.
13,265½	13,269	Limestone, medium gray, fine grain, shaly.
13,269	13,270	Limestone, light brown gray, fragmental with calcite, crystals.
13,270	13,271	Limestone, shale, medium gray, fine grain, dense and green to medium gray.
13,271	13,272½	Limestone, very light olive gray, fine grain, dense and little dark gray shale.
13,272½	13,273½	Limestone, medium gray, shaly.
13,273½	13,274½	Limestone, light gray to light brown gray, fine grain, dense.
13,274½	13,276	Shale, dark gray, limey.
13,276	13,280	Limestone, medium gray (with slightly brown tinge) fine grain, dense.
13,280	13,282¾	Shale, dark gray, limey.
13,282¾	13,285	Core #16. Shale, limestone, dark gray, limey and medium gray fine granular, dense, limestone interbedded.
13,285	13,287½	Limestone, medium gray, lithographic tight limestone.
13,287½	13,288½	Shale, medium gray, limey, with limestone inclusions.
13,288½	13,292½	Limestone, very light brown gray or light olive gray, fragmental.
13,292½	13,295	Limestone, as above with glauconite.
13,295	13,297	Limestone, medium gray, fine grain, dense with dark gray shale, inclusions.
13,297	13,301	Limestone, light brown gray, fragments with glauconite.
13,301	13,307	Sandstone, light gray, fine grain with gray and glauconite shale partings.
13,307	13,310	Limestone, light brown gray, fragments with glauconite and medium gray, fine grain, dense.
13,310	13,315	Sandstone, limestone, shale, very light brown gray, fine grain, calcareous, light brown, very fine grain, dense and medium dark gray to green gray shale.
13,315	13,320	Limestone, medium gray, fine granular limestone with dark gray shale partings.
13,320	13,325	Limestone, as above, dense tight limestone.