

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 17

Summary of the Benhomer Risser No. 1 Well

McKenzie County, North Dakota

By Sidney B. Anderson

July 1, 1953

Amerada Petroleum Corporation - Benhomer Risser Well No. 1, McKenzie County, North Dakota, SE 1/4 Section 12, T. 149 N., R. 96W. (732 feet north of south line, 2170 feet west of east line, Section 12). Elevation: 2438 K.B. 2418 G.L.

The Amerada Risser No. 1 was spudded August 9, 1951, 13 3/8 inch casing was set at 460 feet, 9 5/8 inch casing was set at 6703 feet and 5 1/2 inch casing was set at 11,700 feet.

- DST No. 1. 8489 feet - 8515 feet open 1 1/4 hours, shut in 15 minutes, light blow for 50 minutes and died, recovered 12 feet drilling mud, HP 4900#.
- DST No. 2. 8490 feet - 8525 feet open 1 1/2, hours, shut in 15 minutes, light blow for 15 minutes and died, recovered 478 feet slightly gas cut mud, HP 5,000#, F.P. 700#, BHP 700#.
- DST No. 3. 9350 feet - 9530 feet, open 3 hours and 59 minutes, air immediately, good blow throughout, packer gave way, recovered 1200 feet water cushion, 330 feet black gas cut mud, 450 feet drilling mud, HP 5450#, IFP 600#, FFP 950#.
- DST No. 4. 9528 feet - 9588 feet, open 4 hours, gas to surface in 40 minutes, est. 110 MCFG, recovered 1200 feet water cushion, 690 feet black sulphur water with show of oil and 270 feet oil and gas cut mud, HP 5550#, IFP 700#, FFP 1100#, BHP 4000#.
- DST No. 5. 9591 feet- 9663 feet, open 2 hours, shut in 15 minutes, light gas blow for 21 minutes and died, recovered 1200 feet water cushion, 95 feet gas cut mud, HP 5500#, FFP 610#, BHP 3530#.
- DST No. 6. 9780 feet - 9875 feet, open 4 hours, shut in 15 minutes, very weak blow for 18 minutes and died, recovered 1700 feet water cushion, 185 feet black sulphurous water and 180 feet black sulphurous mud, slightly gas cut, HP 5750#, IFP 1000#, FFP 1200#, BHP 3750#.
- DST No. 7. 11205 feet - 11290 feet, open 1 hour and 3 minutes, packer failed, light blow for 16 minutes and died, recovered 2900 feet of drilling mud, HP 6500#, IFP 1490#, FFP 1500#.

<u>Holes</u>	<u>Interval</u>	<u>Acid</u>	<u>Recovery</u>
4 per foot	11,654-11,670		20 barrels load and salt water.
4 per foot	11,600-11,630	1,000 gals.	515 barrels of oil and 6 water. Gas. vol. 796,750.
4 per foot	9,585-9,587 9,508-9,510 9,550-9,580	1,000 gals.	F. 200. bbls 39.5° gravity oil and 13 bbls. water. Gas volume 328,000 cubic feet, F. 148 bbls. of 42.2° gravity oil and 4 bbls. water. Gas volume 332, 000 cubic feet.
4 per foot	9,515-9,544	1,000 gals.	Swabbed well in. F. 25 bbls. oil, 41.6° gravity gas volume. 186,000 cubic feet. F. 83 bbls. 40.6° gravity oil and 76 bbls. water. Gas volume 167, 000 cubic feet, F. 58 bbls. oil and 36 bbls. water.
2 shots per foot	9,550-9,570	1,000 gals. thru perf. 9,515-9,570	F. 18 bbls, in 2 hours. Gas volume 13,000 for 2 hours, F. 83 bbls. of oil 42.2° gravity and 3 bbls. water in 24 hours. Gas Volume 176,000 cubic feet.
		6,000 gals. thru perf. 9,515-9,570	F. 186 bbls. of 42.2° gravity and 2 bbls. water in 13 hours. Gas volume 429,000 cubic feet F. 185 bbls. of oil and 1 bbl. of water in 16 1/2 hours gas volume 332,000, F. 138 bbls. of 41.8° gravity oil and 1 bbl. water in 19 hours. Gas volume 308,000 4 hours swab into pits, 1 hour flow into pits, est. 10 bbls. oil, 15 bbls. water.
	PBD 9,540		F. 113 BO and 1 bbl. water in 15 hours. Gas volume 236,000.
4 shots per foot.	9,450-9,445	1,000 gals.	Swabbed 51.25 bbls. of sulphur and salt water in 20 hours.
	Set packer at 9,357		Swabbed well in, F. 38 bbls. oil and 16 bbls. water in 13 hours. Gas volume 210,000
	Set tubing at 9,574		flow and swab 8 hours, recovered 88 bbls. of oil and 22 bbls. of water. Gas volume 264,000. Flowed 10 hours, swabbed 8 hours and recovered 43 bbls. oil, 11 bbls. water, and 22 bbls. mud, well dead 6 hours, swabbed 13 hours, dead 3 hours, recovered 78 bbls. oil 22 bbls. water. Gas volume 258,000, flowed 9 hour, swabbed 1 hour, dead 14 hours, recovered 96 bbls. oil, 20 bbls. water, 11 bbls. mud, gas

volume 261,000. Flowed 10 hours, swabbed 8 hours and recovered 43 bbls. oil, 11 bbls. water, and 22 bbls. mud, well dead 6 hours, gas volume 255,000. Flowed 6 hours, swabbed 13 hours, dead 3 hours. Recovered 78 bbls. oil, 22 bbls. of water. Gas volume 258,000 flowed 9 hours, swabbed 1 hour, dead 14 hours, recovered 96 bbls. mud, gas volume 261,000. Flowed 9 hours, swabbed 1 hour dead 3 hours, recovered 78 bbls. oil, 22 bbls. of water, 7 bbls. of mud, gas 387,000. Flowed 86 bbls. of oil, 15 bbls. of water and mud in 8 hours, gas volume 296,000. Completed IFP 70 bbls. oil, 14 bbls. water and 2 bbls. mud in 6 hours. Gas volume 104,000 for 6 hours.

Drilling was completed March 27, 1952 at 13,773 feet and the well was completed May 20, 1952 for IFP of 70 bbls. oil, 14 bbls. water and 2 bbls. mud in 6 hours. Through 1/2 inch choke, tubing pressure 100#, shut in pressure 550#, gas volume 104,000 for 6 hours.

Formation tops determined from sample, electric and radio activity logs. Not all lithologic formation tops called in following list; colors determined from rock color chart.

TOPS

Cretaceous System	<u>Depth</u>
Pierre Shale	1865
Niobrara Formation	4008
Benton Shale	4295
Greenhorn Formation	4495
Base Greenhorn	4680
Dakota	5275
Jurassic System	
Morrison Formation	5705
Sundance Formation.	5905
Piper Formation (Sawtooth)	6430
Triassic System	
Spearfish Formation	6610
Mississippian System	
Amsden Formation	7650
Heath Formation	8020
Otter Formation	8145
Kibbey Formation	8340
Charles Formation	8470

Mission Canyon Formation	9218
Lodgepole Formation	9760
Englewood Formation	10,900
Devonian System	
Lyleton Formation	11,110
Upper Devonian Limestone	11,200
Middle Devonian Salt	12,200
Ashern Formation	12,610
Silurian System	
Stonewall Formation	12,638
Ordovician System	
Stony Mountain	13,050
Stony Mountain Shale	13,120
Red River Formation	13,175
Total Depth	13,773

Benhomer Risser No. 1 Well

450-480	Much lignite, some very light gray N8 shale and medium light gray limestone.
480-600	Missing.
600-660	Light brown gray to buff soft shale.
660-690	Light brown gray to buff soft shale and coal.
700-750	Shale as above, calcareous, some yellow gray shale.
780-810	Yellow gray soft calcareous shale.
810-840	Same as above, little fine grained sandstone.
840-870	Yellow gray soft calcareous shale.
870-900	Shale as above, mostly coal.
900-930	Same as above.
930-960	Lignite.
960-990	Shale as above and little fine grained sand.
990-1020	Shale as above.
1020-1050	Shale as above and little fine grained salt and pepper sandstone, calcareous.
1050-1080	Shale as above.
1080-1110	Shale as above and little lignite.
1110-1200	Shale as above, silty.
1200-1230	Missing.
1230-1260	Shale as above.
1260-1290	Shale, yellow gray to light olive gray. Little salt and pepper sandstone and light olive gray limestone. Little lignite.
1290-1380	Light olive gray 5Y6/1 soft, silty shale.
1380-1470	Shale as above and fine grained sandstone.
1470-1500	Sandstone as above and some shale as above.
1500-1530	Missing.
1530-1560	Fine grained sandstone, slightly calcareous, and little lignite.
1560-1590	Light olive gray, soft shale, and little lignite.
1590-1620	Shale as above, silty.
1620-1650	Lignite.
1650-1710	Sandstone and shale as above, mostly sandstone.
1710-1740	Shale as above, some sand as above, 1 piece of lignite.
1740-1770	Shale as above, some sand as above, and lignite.

1770-1800 Shale and sandstone as above.  
1800-1830 Fine grained, yellow gray to light olive gray sandstone, and  
much lignite.  
1830-1860 Shale as above, little sand and little lignite.

Pierre Shale 1865

1860-1890 Shale as above and little sand.  
1890-1950 Light olive gray, soft shale.  
1950-2010 Green gray, soft shale.  
2010-2280 Green gray shale.  
2280-3090 Green gray shale 5GY6/1.  
3090-3120 Green gray shale 5GY6/1, very lumpy.  
3120-3240 Green gray shale 5GY6/1.  
3240-3270 Green gray shale 5GY6/1, very lumpy.  
3270-3960 Green gray shale 5GY6/1, very lumpy.

Niobrara Formation 4008

3960-4020 Green gray shale 5GY6/1, few pieces of light brown limestone.  
4020-4050 Green gray shale 5GY6/1.  
4050-4110 Medium gray shale N5, white specks.  
4110-4240 Medium gray shale N5, to medium dark gray, white specks.  
4240-4250 Medium gray shale N5.  
4250-4290 Medium gray shale N5, white specks, pyrite inoceramus prisms.

Benton Shale 4295

4290-4300 Medium gray shale N5.  
4300-4310 Medium gray shale N5, white specks.  
4310-4320 Medium gray shale N5, white specks, inoceramus prisms.  
4320-4330 Missing.  
4330-4410 Medium gray shale N5.  
4410-4490 Medium dark gray shale N4.

Greenhorn Formation 4495

4490-4500 Medium dark gray shale N4, inoceramus prisms.  
4500-4510 Medium dark gray shale N4.  
4510-4520 Medium dark gray shale N4, little pyrite, white specks.  
4520-4550 Medium dark gray shale N4, inoceramus prisms, white specks.  
4550-4560 Medium dark gray shale N4, inoceramus prisms, white specks,  
shell fragments, pyrite.  
4560-4570 Medium dark gray shale N4, inoceramus prisms, white specks.  
4570-4590 Medium dark gray shale N4, white specks.  
4590-4670 Medium dark gray shale N4, inoceramus prisms, white specks.

Base Greenhorn 4680

4670-4720 Medium dark gray shale N4.  
4720-4730 Medium dark gray shale N4, inoceramus prisms.  
4730-4740 Medium dark gray shale N4.  
4740-4760 Medium dark gray shale N4.  
4760-4770 Medium dark gray shale N4.  
4770-4780 Medium dark gray shale N4, inoceramus prisms.  
4780-4790 Medium dark gray shale N4.  
4790-4850 Medium dark gray shale N4, and green gray 5GY6/1.  
4850-4860 Medium dark gray shale N4.  
4860-5180 Medium dark gray shale N4.

5180-5190 Medium dark gray shale N4 and little fine grained glauconitic sandstone.  
5190-5210 Medium dark gray shale.  
5210-5220 Medium dark gray shale, piece of light gray glauconitic siltstone.

Dakota 5275

5220-5280 Medium dark gray shale, little piece of light gray glauconitic siltstone.  
5280-5310 Medium dark gray shale, little fine grained light gray sandstone, little glauconite 5300-5310.  
5310-5320 Medium dark gray shale.  
5320-5350 Medium dark gray shale, little fine grained light gray sandstone.  
5350-5370 Medium dark gray shale.  
5370-5380 Medium dark gray shale, piece of glauconitic gray sandstone.  
5380-5390 Medium dark gray shale.  
5390-5400 Medium dark gray shale, N4, piece of medium grained colorless sandstone.  
5400-5410 Medium dark gray shale N4, some medium grained colorless sandstone.  
5410-5420 Medium dark gray shale N4, much medium grained colorless sandstone.  
5420-5440 Medium dark gray shale N4, some medium grained colorless sandstone.  
5440-5480 Medium dark gray shale N4, little medium grained colorless sandstone.  
5480-5490 Medium dark gray shale N4, little colorless to light brown tint sandstone.  
5490-5520 Medium dark gray shale N4, little fine grained colorless sandstone, siliceous cement.  
5520-5530 Medium dark gray shale N4, little fine grained to medium grained colorless sandstone, little fine grained brown sandstone.  
5530-5540 Medium dark gray shale, fine grained, colorless sandstone.  
5540-5550 Medium dark gray shale.  
5550-5570 Medium dark gray shale, little fine to medium grained sandstone.  
5570-5580 Medium dark gray shale, little fine to medium grained sandstone, few rounded brown quartz pellets.  
5580-5590 Medium dark gray shale, little fine grained sandstone.

Morrison Formation 5705

5590-5720 Medium dark gray shale N4.  
5720-5740 Medium dark gray shale N4 and medium light gray N6 siltstone.  
5740-5760 Medium light gray dark gray N3 and medium light gray siltstone, little fine grained sandstone.  
5760-5790 Medium dark gray to dark gray N3 and medium light gray sandstone, very fine grained.  
5790-5800 Missing.  
5800-5820 Medium dark gray to dark gray N3 and medium light gray sandstone, very fine grained, few pieces of green shale 5810-5820.

5820-5840 Medium dark gray to dark gray N3 and medium light gray siltstone and fine sandstone. 5830-5840 few pieces of green shale.

5840-5860 Medium dark gray to dark gray N3 and few pieces of green shale.

5860-5890 Dark gray N3 medium light gray shale and siltstone.

5890-5900 Medium light gray. No shale.

Sundance Formation 5905

5900-5910 Medium light gray shale N6, and little fine grained sandstone N7.

5910-5920 Shale as above, medium dark gray shale N4 and fine grained sandstone N7.

5920-5930 Shale as above, much sandstone as above, slightly glauconitic.

5930-5940 Shale as above, some sandstone as above.

5940-5950 Shale as above.

5950-5960 Shale as above, mostly medium dark gray.

5960-5980 Shale as above, some sandstone as above, fine grained, slightly glauconitic.

5980-5990 Shale as above and much sandstone as above, fine grained, slightly glauconitic.

5990-6000 Missing.

6000-6010 Shale and sandstone as above.

6010-6020 Green gray 5GY6/1 shale, some sandstone as above.

6020-6030 Green gray 5GY6/1 shale, medium light gray shale, some sandstone as above.

6030-6060 Shale as above, and medium dark gray shale N4, little sandstone as above.

6060-6080 Shale as above and little siltstone, green gray 5GY6/1.

6080-6100 Shale as above and little sandy limestone, light gray with slightly green tint.

6100-6110 Shale as above mostly green gray 5GY6/1.

6110-6120 Shale as above, green gray 5GY6/1, and little medium light gray sandy limestone.

6120-6160 Shale as above, green gray, little green gray siltstone.

6160-6190 Shale as above and little medium light gray, siltstone or very fine grained sandstone.

6190-6200 Shale as above and medium light gray siltstone.

6200-6210 Missing.

6210-6230 Shale as above and medium light gray siltstone.

6230-6260 Green gray shale 5GY6/1.

6260-6270 Green gray shale 5GY6/1 and little light gray to white fine grained sandstone.

6270-6300 Shale as above and dark gray shale N3.

6300-6360 Variegated shale.

6360-6370 Missing.

6370-6380 Variegated shale.

6380-6400 Variegated shale, mostly green gray.

6400-6410 Variegated shale.

6410-6430 Variegated shale, mostly green gray.

Piper Formation (Sawtooth) 6430

6430-6440 Shale as above, few pieces of light brown gray limestone.

6440-6450 Variegated shale and yellow gray 5Y8/1 limestone, little pinpoint porosity.

6450-6460 Variegated shale and some limestone as above.  
6460-6470 Variegated shale and little limestone as above.  
6470-6480 Variegated shale and one piece of pale reddish brown, very fine grained sandstone.  
6480-6490 Variegated shale and much limestone as above, dense, fine granular.  
6490-6500 Variegated shale and some limestone as above, few pieces of gray red purple limestone, dense.  
6500-6510 Variegated shale and some yellow gray and gray red purple limestone, dense.  
6510-6520 Variegated shale, little yellow gray limestone and some gray red purple limestone, dense.  
6520-6530 Variegated shale, yellow gray limestone and pale brown limestone, dense.  
6530-6540 Shale same as above, yellow gray limestone and pale brown and gray red pale limestone, dense.  
6540-6550 Variegated shale, limestone as above and pale yellow brown limestone, dense.  
6550-6560 Variegated shale, and little limestone as above.  
6560-6570 Variegated shale, and little limestone as above and some gray orange pink 5YR7/2, fine grained sandstone.  
6570-6580 Variegated shale, very little sandstone as above.  
6580-6590 Variegated shale, and little sandstone as above.  
6590-6610 Variegated shale.

Spearfish Formation 6610

6610-6620 Variegated shale, little pale red brown sandstone as above, and little medium dark gray glauconitic sandstone.  
6620-6630 Variegated shale, little pale red brown siltstone.  
6630-6642 Variegated shale, little pale red brown siltstone, and much gray red 10R4/2 shale.  
6642-6650 Variegated shale, little pale red brown shale, some gray red shale, white anhydrite.  
6650-6680 Shale same as above, much gray red shale, white anhydrite.  
6680-6690 Pale red brown shale 10R5/4 and white anhydrite.  
6690-6708 Pale red brown silty shale, little gray red and gray shale.  
6708-6740 Missing.  
6740-6750 Shale as above and much very light gray limestone, little pinpoint porosity.  
6750-6790 Missing.  
6790-6810 Pale red brown silty shale 10R5/4.  
6810-6840 Missing.  
6840-6850 Pale red brown silty shale, some gray shale, mostly medium dark gray and some white anhydrite.  
6850-7000 Missing.  
7000-7010 Shale as above and much white to colorless anhydrite.  
7010-7020 Salt.  
7020-7090 Missing.  
7090-7100 Salt and some red shale as above.  
7100-7130 White to pink anhydrite and some shale as above.  
7130-7141 Missing.  
7141-7150 Pale red brown 10R5/4 silty calcareous shale.  
7150-7160 Shale as above, some yellow gray limestone, some pinpoint porosity.



7160-7170 Salt and little shale as above.  
 7170-7190 Missing.  
 7190-7210 Salt.  
 7210-7240 Missing.  
 7240-7260 Salt.  
 7260-7300 Missing.  
 7300-7350 Salt and shale as above, 40-50 mostly salt.  
 7350-7380 Missing.  
 7380-7390 Mostly shale as above and some salt.  
 7390-7400 Salt.  
 7400-7480 Missing.  
 7480-7490 Pale red brown shale as above.  
 7490-7500 Missing.  
 7500-7510 Salt and white anhydrite.  
 7510-7520 Shale as above and little salt.  
 7520-7530 Pale red brown shale as above.  
 7530-7540 Shale as above and little fine grained sandstone.  
 7540-7580 Missing.  
 7580-7590 Shale as above, little salt efflorescence.  
 7590-7600 Shale as above, little medium to medium light gray dolomite,  
 dense.

Amsden Formation 7650

7600-7660 Missing.  
 7660-7700 Shale as above, little light gray dolomite, pink tinge,  
 slightly saccharoidal, little white anhydrite.  
 7700-7720 Shale as above and light brown dolomite 5YR6/1.  
 7720-7730 Shale as above and piece of white anhydrite.  
 7730-7740 Shale as above and dolomite as above.  
 7740-7750 Shale as above and little dolomite as above, crystalline dense.  
 7750-7770 Missing.  
 7770-7780 Shale and dolomite as above.  
 7780-7800 Shale as above and little white anhydrite.  
 7800-7810 Missing.  
 7810-7820 Moderate orange pink shale 10R7/4.  
 7820-7840 Very light gray N8 to white dolomite, dense, fine granular.  
 7840-7860 White dolomite, fine granular, dense dolomite.  
 7860-7870 Missing.  
 7870-7880 White to pinkish dolomite, dense.  
 7880-7890 Missing.  
 7890-7900 White dolomite and pinkish shale.  
 7900-7950 Missing.  
 7950-7960 Medium gray to medium dark gray, fine crystalline, dense.  
 7960-8000 Missing.  
 8000-8020 Dolomite as above and reddish shale.

Heath Formation 8020

8020-8090 Dark gray N3, carbonaceous shale.  
 8090-8120 Dark gray N3, carbonaceous, shale, splintery and red shale as  
 above.  
 8120-8140 Shale same as above.

Otter Formation 8145

8140-8150 Dark gray N3, carbonaceous shale, and little medium gray dense dolomite.  
8150-8160 Missing.  
8150-8170 Dark gray N3, little green gray 5G6/1 and reddish shale.  
8170-8200 Missing.  
8200-8210 Dark gray N3 and little red shale as above.  
8210-8220 Dark gray N3 and few pieces of green gray and red shale.  
8220-8230 Shale as above.  
8230-8240 Dark gray N3 and few pieces of green gray and red shale.  
8240-8250 Missing.  
8250-8260 Dark gray N3 shale.  
8260-8270 Dark gray N3 and few pieces of green gray and red shale.  
8270-8280 Dark gray N3 and red shale as above.  
8280-8290 Dark gray N3 shale, and little red shale and few pieces of green gray shale.  
8290-8310 Missing.  
8310-8320 Dark gray shale, little red shale and few pieces of green gray shale, dense.  
8320-8330 Shale as above and few pieces of very light gray to light gray, dense dolomite.  
8330-8340 Shale as above.

Kibbey Formation 8340

8340-8342 Shale as above, few pieces of medium gray dolomite, little colorless fine granular sandstone.  
8342-8350 Shale as above, little light brown gray 5YR6/1 to white fine grained sandstone.  
8350-8360 Missing.  
8360-8370 Shale as above, piece of pale red 10R7/2 fine grained sandstone.  
8370-8440 Shale as above, little sandstone as above, piece of white anhydrite 8430-8448.  
8440-8450 Shale as above, little fine to medium grained sandstone.  
8450-8460 Shale as above.  
8460-8470 Shale as above, little fine grained sandstone.

Charles Formation 8470

8470-8480 Shale as above, few pieces of light brown gray, dolomite, dense.  
8480-8490 Shale as above, few pieces of light brown gray dolomite, limestone, dense.  
8490-8500 Shale as above and much brown gray 5YR4/1 fine grained limestone, fair pinpoint porosity.  
8500-8509 Shale as above and some brown gray 5YR4/1 limestone, fine grained, little pinpoint porosity.  
8509-8517 Missing.  
8517-8520 Shale as above and little limestone as above, some pinpoint porosity.  
8520-8530 Shale as above and little limestone as above, and little very light gray sandstone, fine grained.  
8530-8570 Variegated shale.  
8570-8590 Variegated shale, little white anhydrite.  
8590-8600 Dark gray and reddish shale.

8600-8610 Variegated shale, little white anhydrite.  
 8610-8620 Dark gray and reddish shale.  
 8620-8650 Variegated shale, little white anhydrite.  
 8650-8670 Dark gray and red shale, white anhydrite, yellow gray 5Y7/2  
 fine grained sandstone.  
 8670-8700 Variegated shale, white anhydrite.  
 8700-8740 Dark gray and red shale, white anhydrite.  
 8740-8780 Dark gray moderate red orange 10R6/6, some gray red shale and  
 white anhydrite; little pyrite 60-80.  
 8780-8800 Shale as above and salt.  
 8800-8835 Missing.  
 8835-8840 Shale as above and little white anhydrite.  
 8840-8870 Shale as above and salt.  
 8870-8880 Salt.  
 8880-8890 Salt and little anhydrite.  
 8890-8910 Salt.  
 8910-8920 Missing.  
 8920-8930 Shale as above, little anhydrite and salt efflorescence.  
 8930-8940 Dark gray N3 and pale red brown shale, some white anhydrite.  
 8940-8950 Shale as above and some white anhydrite and salt efflorescence.  
 8950-8980 Salt.  
 8980-9000 Shale and anhydrite as above.  
 9000-9010 Shale and anhydrite and little pale yellow brown dolomitic  
 limestone.  
 9010-9020 Shale and anhydrite, some pale yellow brown dolomitic  
 limestone, fair pinpoint porosity.  
 9020-9040 Shale as above and pale yellow brown limestone, some pinpoint  
 porosity.  
 9040-9050 Shale as above, some white anhydrite, and limestone as above.  
 9050-9060 Shale as above and some white anhydrite, and limestone as  
 above to very light gray limestone.  
 9060-9070 Shale as above and some white anhydrite, and limestone as  
 above.  
 9070-9080 Variegated shale, anhydrite, and brown gray dense limestone.  
 9080-9100 Dark gray and pale red brown shale, little white anhydrite,  
 and limestone as above.  
 9100-9110 Dark gray and pale red brown shale, and salt.  
 9110-9120 Dark gray and pale red shale, some white anhydrite, few pieces  
 brown gray dolomitic limestone.  
 9120-9130 Dark gray and pale red shade some white anhydrite.  
 9130-9140 Dark gray and pale red shale, some white anhydrite, little  
 brown gray dense limestone.  
 9140-9150 Dark gray and pale red shale, little white anhydrite and light  
 gray to brown gray dense limestone.  
 9150-9170 Shale as above and much limestone as above.  
 9170-9190 Light gray to brown gray dense limestone, little shale as  
 above, little white anhydrite 80-90.  
 9190-9200 Limestone, shale and anhydrite as above.  
 9200-9210 Same as above, mostly shale.  
  
 Mission Canyon Formation 9218  
 9210-9220 As above, limestone mostly, light brown gray, fair pinpoint  
 porosity in limestone.  
 9220-9250 Missing.

9250-9260 As above, limestone, dense.  
 9260-9270 Shale and anhydrite as above.  
 9270-9280 Shale and limestone as above and light gray dense dolomite.  
 9280-9290 Missing.  
 9290-9300 Shale, limestone, and dolomite as above.  
 9300-9310 Shale, limestone, dolomite, and white anhydrite as above.  
 9310-9320 Missing.  
 9320-9347 Shale, limestone, and anhydrite as above.  
 9347-9350 Little limestone as above, some white anhydrite.  
 9350-9360 Little limestone and shale as above, some white anhydrite.  
 9360-9366 White to brown gray dense limestone.  
 9366-9400 Brown gray dense limestone and some white to light gray anhydrite.  
 9400-9410 Brown gray dense limestone and very light gray dense dolomite.  
 9410-9420 Brown gray dense limestone to light gray limestone, little pinpoint porosity.  
 9420-9450 Very light gray to brown gray limestone, little pinpoint porosity.  
 9450-9460 Very light gray to brown gray crystalline dense limestone, little red and gray shale.  
 9460-9470 Very light gray, medium gray and brown gray, dense limestone; 60-64 little red and gray shale.  
 9470-9480 Missing.  
 9480-9490 Limestone as above.  
 9490-9500 limestone as above, little pinpoint porosity.  
 9500-9530 Limestone as above, dense, little white anhydrite.  
 9533-9538 Core #1. Brown gray, dense.  
 9538-9543 Medium gray N5 crystalline, dense limestone.  
 9543-9548 Brown gray crystalline dense limestone.  
 9548-9552 Light gray limestone N7 crystalline dense, and white anhydrite.  
 9552-9553 Brown gray, good porosity, dark staining around vugs.  
 9553-9556 Pale yellow brown dense.  
 9556-9561 Pale yellow brown dense, good pinpoint porosity.  
 9561-9564 1/2 Medium gray with pale brown tinge, dense.  
 9564 1/2-9567 Light gray N7 oolitic limestone, little pinpoint porosity.  
 9567-9573 Pale yellow brown 10YR6/2 dense crystalline limestone.  
 9573-9582 Light gray oolitic limestone, little pinpoint porosity.  
 9582-9588 End of core. Pale yellow brown dense limestone, and dusky yellow brown oolitic limestone, some pinpoint porosity.  
 9588-9590 As above, little pinpoint porosity.  
 9590-9600 As above, dense.  
 9600-9612 Very light gray, pale yellow brown and brown gray crystalline to oolitic, dense.  
 9612-9620 Brown gray as above and pale yellow brown.  
 9620-9640 As above, oolitic.  
 9640-9670 As above, crystalline to oolitic, dense; little white anhydrite 60-63.

Lodgepole Formation 9760  
 9670-9780 Limestone as above, crystalline dense; little white anhydrite 9710-9723.  
 9780-9784 Very light gray to brown gray, dense limestone.  
 9784-9790 Limestone as above and white to light gray dolomite.  
 9790-9800 Limestone as above, and white to light gray dolomitic limestone.

9800-9803 Light gray dolomitic limestone and brown gray limestone dense.  
 9803-9830 Limestone as above, finely granular.  
 9830-9840 Limestone as above, dense, and little colorless anhydrite.  
 9840-9850 Pale brown to brown gray limestone, dense.  
 9850-9857 Pale brown 5YR5/2, dense, crystalline.  
 9857-9860 Light gray pale to brown gray crystalline to fine granular, dense.  
  
 9860-9870 Limestone as above, little white anhydrite.  
 9870-9875 Limestone as above, little white anhydrite, little pinpoint porosity.  
  
 9875-9880 Missing.  
 9880-9890 Pale brown to brown gray, crystalline, little pinpoint porosity and white anhydrite.  
  
 9890-9900 Missing.  
 9900-9910 Limestone as above.  
 9910-9920 Limestone as above, dense.  
 9920-9930 Limestone as above, little pinpoint porosity.  
 9930-9940 Limestone as above, crystalline to finely granular dense, little white anhydrite.  
 9940-9950 Limestone as above, little pinpoint porosity, and white anhydrite.  
 9950-9970 Limestone as above, mostly pale brown dense.  
 9970-9980 Limestone, brown gray and pale brown, dense, little dark gray shale.  
  
 9980-9990 Brown gray and pale brown dense limestone.  
 9990-10,000 Brown gray and pale brown dense limestone, little white anhydrite and shell fragments.  
 10,000-10,010 Brown gray and pale brown dense limestone.  
 10,010-10,020 Brown gray and pale brown dense limestone, little white anhydrite and shell fragments.  
 10,020-10,040 Brown gray and pale brown, dense limestone.  
 10,040-10,050 Missing.  
 10,050-10,060 Limestone as above and little white anhydrite.  
 10,060-10,090 Light gray and dusky yellow brown, finely granular to crystalline, dense, limestone.  
  
 10,090-10,100 Missing.  
 10,100-10,120 Limestone as above.  
 10,120-10,160 Light gray to dusky yellow brown crystalline dense, shell fragments 50-60.  
  
 10,160-10,170 Missing.  
 10,170-10,180 Dusky yellow brown and light gray dense limestone.  
 10,180-10,190 Missing.  
 10,190-10,200 Limestone as above.  
 10,200-10,210 Missing.  
 10,210-10,230 Limestone as above.  
 10,230-10,240 Missing.  
 10,240-10,260 Limestone as above.  
 10,260-10,270 Missing.  
 10,270-10,290 Limestone as above.  
 10,290-10,300 Missing.  
 10,300-10,320 Limestone as above.  
 10,320-10,470 Brown gray, medium gray, and light gray, dense limestone.  
 10,470-10,550 Medium gray, light gray, and some brown gray dense limestone.  
 10,550-10,555 Missing.

10,555-10,560 Limestone as above.  
 10,560-10,695 Medium gray, light gray, and brown gray limestone, dense; little white anhydrite 10,595-10,600.  
 10,695-10,710 Medium gray and light gray, dense limestone.  
 10,710-10,715 Medium gray and light gray, dense limestone, and little brown gray limestone, dense.  
 10,715-10,720 Missing.  
 10,720-10,740 Limestone as above.  
 10,740-10,750 Missing.  
 10,750-10,805 Limestone as above.  
 10,805-10,815 Missing.  
 10,810-10,830 Limestone as above.  
 10,830-10,835 Medium gray, and light gray, dense limestone, mostly light gray.  
 10,835-10,855 Medium gray and light gray limestone.  
 10,855-10,860 Missing.  
 10,860-10,880 Medium gray and light gray limestone.  
 10,880-10,890 Missing.  
 10,890-10,895 Limestone as above.  
 10,895-10,900 Limestone as above and some gray black carbonaceous shale.  
 10,900-10,920 Dark gray N3 carbonaceous shale.  
 10,920-10,930 Shale as above and light gray to medium gray limestone, dense.  
 10,930-10,965 Shale as above and light gray to medium gray and brown gray limestone, 50-55 mostly limestone, 55-60 mostly shale.  
 10,965-10,975 Shale as above.  
 10,975-10,980 Shale as above and little pale red brown shale 10R5/4.  
 10,980-10,985 Dark gray N3 carbonaceous shale.  
 10,985-11,000 Dark gray N3 carbonaceous shale and little pale red brown shale.  
 11,000-11,010 Shale as above and green gray shale 5G6/1, and limestone as above.  
 11,010-11,015 Shale as above, and limestone as above, sandy.  
 11,015-11,020 Shale as above and some pale red 10R6/2, very fine grained sandstone.  
 11,020-11,027 Core #2. Medium light gray N6 shale.  
 11,027-11,032 Light brown gray 5YR6/1.  
 11,032-11,037 Medium gray shale, and pale yellow brown dolomite, dense intercalated shale.  
 11,037-11,042 As above, mostly dolomite, shale partings.  
 11,042-11,047 Dolomite as above, dense, finely crystalline.  
 11,047-11,053 Medium gray shale.  
 11,053-11,057 Medium light gray N6 dense dolomite.  
 11,057-11,070 Cuttings. Very light gray dolomite, dark gray shale N3, little red gray shale.  
 11,062-11,072 Medium light gray N6 dolomite, dense.  
 11,072-11,077 Medium light gray N6 dolomite, dense, platy or shaley appearance.  
 11,077-11,082 Core #3. Medium light gray N6 dolomite, dense, some light gray.  
 11,082-11,092 Medium light gray N6 dolomite, dense.  
 11,092-11,097 Medium gray N5, green shale partings, dense, hard.  
 11,097-11,107 Green gray 5G6/1 dolomite, limey green shale partings, dense.

Lyleton Formation 11,110

- 11,107-11,112 Light brown and green gray dolomite, dense.
- 11,112-11,117 Green gray dolomite, dense, finely crystalline.
- 11,117-11,122 Dolomite as above and white anhydrite.
- 11,122-11,127 Dolomite as above and some white anhydrite.
- 11,127-11,132 Green gray dolomite as above, and gray red 10R4/2 dolomite, dense.
- 11,132-11,137 White anhydrite and some green gray dolomite, dense.
- 11,137-11,142 End of core. White anhydrite and green gray dolomite with red dolomite inclusions.
- 11,142-11,160 Dolomite as above, variegated shale, and little white anhydrite.
- 11,160-11,170 Variegated shale, little brown dolomite and white anhydrite.
- 11,170-11,175 Variegated shale and little white anhydrite.
- 11,175-11,180 Missing.
- 11,180-11,185 Shale as above and little white anhydrite.
- 11,185-11,195 Shale and anhydrite as above, very little brown limestone.
- 11,195-11,200 Variegated shale.

Upper Devonian Limestone 11,200

- 11,200-11,205 Variegated shale and some dusky yellow brown dense, limestone.
- 11,205-11,210 Variegated shale and little dusky yellow brown dense, limestone.
- 11,210-11,215 Variegated shale and some dusky yellow brown dense, limestone.
- 11,215-11,225 Dusky yellow brown - buff and very light gray limestone, dense.
- 11,225-11,230 Dusky yellow brown - buff, sublithographic and light gray dense.
- 11,230-11,235 As above, little shale and white anhydrite.
- 11,235-11,265 Dusky yellow brown, little brown gray, light gray and little white anhydrite, dense.
- 11,265-11,290 As above and few pieces of red shale.
- 11,290-11,300 Limestone as above, some red shale and few pieces of gray shale.
- 11,300-11,305 Same as above and little white anhydrite.
- 11,305-11,310 Same as above and little red gray and green shale.
- 11,310-11,325 Limestone as above, little white anhydrite, red and green shale.
- 11,325-11,335 Dusky yellow brown and light brown gray limestone, dense; little white anhydrite, red green and gray shale.
- 11,335-11,345 Limestone as above and little shale as above.
- 11,345-11,365 Limestone as above, and little shale and white anhydrite as above.
- 11,365-11,390 Dusky yellow brown, pale yellow brown and light gray, dense limestone, red and gray shale.
- 11,390-11,395 Limestone as above, mostly dusky yellow brown, sublithographic, very little red shale.
- 11,395-11,400 Limestone as above, little red shale and some white anhydrite.
- 11,400-11,410 Limestone as above, little red shale.
- 11,410-11,415 Limestone as above, little red shale and little white anhydrite.
- 11,415-11,430 Light gray and brown gray, dense limestone, and little red shale.
- 11,430-11,435 Missing.
- 11,435-11,475 Limestone as above, little white anhydrite and red shale as above.

11,475-11,480 Light brown gray and dusky yellow brown, dense limestone, little shale as above.  
 11,480-11,485 Limestone as above, little red shale and white anhydrite.  
 11,485-11,490 Limestone as above, little red shale.  
 11,490-11,505 Limestone as above, little red shale and white anhydrite.  
 11,505-11,525 Limestone as above, little red shale.  
 11,525-11,535 Limestone as above, and light brown gray, finely granular and little red shale.  
 11,535-11,575 Limestone as above and few pieces of red shale.  
 11,575-11,580 Limestone as above and few pieces of white anhydrite and red shale.  
 11,580-11,600 Limestone as above, few pieces of red shale, anhydrite.  
 11,600-11,605 Limestone as above, light brown to brown gray, fine crystalline, dense.  
 11,605-11,610 Limestone as above and light brown gray, fine crystalline to slightly saccharoidal, little red shale.  
 11,610-11,620 Brown gray, limestone, dense, little brown gray, fine crystalline to slightly saccharoidal, little red shale.  
 11,620-11,625 Limestone as above, little white anhydrite.  
 11,625-11,630 Limestone as above.  
 11,630-11,675 Limestone as above and light brown gray, sandy.  
 11,675-11,690 Limestone as above and some light brown gray slightly saccharoidal, dense.  
 11,690-11,715 Medium dark gray N4 dense, and limestone as above, dense.  
 11,715-11,725 Limestone as above, and little red shale.  
 11,725-11,745 Limestone as above.  
 11,745-11,750 Limestone as above and little red shale.  
 11,750-11,755 Medium dark gray and light brown limestone, dense.  
 11,755-11,760 As above and little dark gray shale.  
 11,760-11,765 Light gray and brown gray limestone, dense.  
 11,765-11,770 Brown gray limestone and light gray dolomite, dense.  
 11,770-11,775 Missing.  
 11,775-11,780 Brown gray, light gray, and medium gray, dense limestone.  
 11,780-11,785 Missing.  
 11,785-11,790 Limestone as above, little white anhydrite and red shale.  
 11,790-11,805 Limestone as above and little red shale.  
 11,805-11,810 Limestone as above, mostly light gray, little red shale.  
 11,810-11,845 Light gray, brown gray, and medium dark gray, dense.  
 11,845-11,855 Limestone as above, dense, and brown gray limestone sublithographic.  
 11,855-11,860 Missing.  
 11,860-11,885 Same as above, 70-75 little white anhydrite.  
 11,885-11,930 Light gray, medium gray, and medium dark gray, dense limestone.  
 11,930-11,940 Same as above, some pinpoint porosity in light gray limestone.  
 11,940-11,945 Limestone as above.  
 11,945-11,950 Limestone as above, some pinpoint porosity in light gray dolomitic limestone.  
 11,950-11,955 Limestone as above.  
 11,955-11,965 Limestone as above and little red shale.  
 11,965-11,970 Limestone as above, light gray dolomite, some white anhydrite.  
 11,970-11,975 Missing.  
 11,975-11,980 Limestone as above, light gray dolomite, some white anhydrite.  
 11,980-11,995 Limestone as above, light gray limestone, some red shale, little white anhydrite.



11,995-12,000 Same as above, little red shale.  
 12,000-12,005 Limestone as above.  
 12,005-12,010 Limestone as above, little white anhydrite.  
 12,010-12,015 Missing.  
 12,015-12,025 Same as above, little pinpoint porosity in light gray limestone, little red shale.  
 12,025-12,030 Limestone as above, little pinpoint porosity.  
 12,030-12,045 Brown gray and light gray dense limestone, little white anhydrite 40-45.  
 12,045-12,065 Brown gray and light gray dense limestone, little pinpoint porosity very little pinpoint porosity 60-65.  
 12,065-12,070 Limestone as above, little red shale.  
 12,070-12,085 Limestone as above.  
 12,085-12,090 Limestone as above, little red shale.  
 12,090-12,120 Limestone as above, little red shale and white anhydrite.  
 12,120-12,145 Limestone as above, dense, little red and dark gray shale, and white anhydrite.  
 12,145-12,160 Missing.  
 12,160-12,175 Limestone same as above.  
 12,175-12,180 Limestone as above, much white anhydrite, some red and dark gray shale.  
 12,180-12,185 Limestone as above, much white anhydrite, much red shale and some dark gray shale.

Middle Devonian Salt 12,200

12,185-12,205 Limestone as above, much white anhydrite, much red shale.  
 12,205-12,210 Same as above and much salt efflorescence.  
 12,210-12,215 Limestone same as above, no salt.  
 12,215-12,220 Limestone as above, some anhydrite and shale, much salt efflorescence.  
 12,220-12,225 Medium gray, light gray, and brown gray limestone, some red and dark gray shale, brachiopod cast.  
 12,225-12,235 Limestone as above, and salt.  
 12,235-12,240 Limestone as above, salt, and some red shale.  
 12,240-12,250 Limestone as above, some red shale and salt efflorescence.  
 12,250-12,255 Salt.  
 12,255-12,260 Missing.  
 12,260-12,280 Salt.  
 12,280-12,285 Limestone, gray, salt.  
 12,285-12,290 Gray limestone, red shale and salt.  
 12,295-12,320 Salt.  
 12,320-12,325 Brown gray to light brown, dense limestone and salt efflorescence.  
 12,325-12,355 Limestone as above and salt.  
 12,355-12,365 Brown gray, light brown gray, and medium gray dense limestone.  
 12,365-12,420 Limestone as above and salt efflorescence. Brachiopod fragments 12,380-12,385.  
 12,420-12,460 Dark gray, brown gray, and light brown gray dense limestone. Salt efflorescence 12,450-12,455.  
 12,460-12,465 As above and some light gray dolomitic limestone.  
 12,465-12,505 As above and some light gray dolomitic limestone and salt efflorescence.  
 12,505-12,510 Missing.  
 12,510-12,515 Limestone as above and some light gray dolomite.

12,515-12,520 Missing.  
 12,520-12,525 Limestone as above and little light gray dolomite.  
 12,525-12,530 Missing.  
 12,530-12,535 Limestone as above and some light gray dolomite, dense.  
 12,535-12,540 Limestone as above and little dolomite as above.  
 12,540-12,545 Limestone as above.  
 12,545-12,550 Limestone as above and some dolomite as above.  
 12,550-12,555 Limestone as above and some dolomite as above, salt efflorescence.  
 12,555-12,565 Limestone and dolomite as above, brown gray, medium gray limestone; light gray, and brown gray dolomite.  
 12,565-12,575 Salt and little limestone and dolomite as above.  
 12,575-12,580 Limestone and dolomite as above, salt efflorescence.  
 12,580-12,585 Salt.  
 12,585-12,590 Limestone and dolomite as above, salt efflorescence.  
 12,590-12,600 Light to medium gray dense limestone, salt efflorescence.  
 12,600-12,605 Missing.  
 12,605-12,615 Limestone as above, very pale orange, sublithographic to dense dolomite, pale red dolomite, dense, some red and dark gray shale.

Ashern Formation 12,610

12,615-12,620 As above to yellow gray dolomite, little red shale.  
 12,620-12,625 Dolomite as above, little pinpoint porosity.  
 12,628-12,633 Core #4. White to very light gray dolomite dense, some fair pinpoint, porosity, fragmental to oolitic dolomite.  
 12,633-12,638 Light gray N7 slightly saccharoidal dolomite, some pinpoint porosity and green gray, to gray red shale.

Stonewall Formation 12,638

12,638-12,643 Pinkish gray 5YR8/1 dolomite, good pinpoint porosity and pale red 5R6/2 very finely crystalline dolomite.  
 12,643-12,648 Pale red 10R6/2 fair pinpoint porosity, gray red 5Y4/2 and medium dark gray dense to finely crystalline dolomite.  
 12,648-12,653 White to very light gray fragmental to slightly oolitic dolomite, some fair pinpoint porosity. Salt inclusions. Finely crystalline.  
 12,653-12,658 White fragmental and oolitic.  
 12,658-12,663 Yellow gray, finely crystalline dolomite, and very light gray fragmental to oolitic dolomite.  
 12,663-12,668 Yellow gray, to light gray, finely crystalline dolomite, few vugs.  
 12,668-12,673 Pale red 10R6/2 finely crystalline, dense dolomite and white fragments, dense dolomite.  
 12,673-12,678 White and medium light gray mottled dolomite, fine crystalline, white fine crystalline limestone with salt inclusions.  
 12,678-12,678 Very light brown gray oolitic dolomite with anhydrite and yellow gray dolomite, fine crystalline.  
 12,678-12,680 Yellow gray, fine crystalline, pinpoint porosity and, pale red fine crystalline dolomite.  
 12,680-12,685 Dolomite as above, crystalline to oolitic.  
 12,685-12,690 As above, mostly yellow gray, little pinpoint porosity.  
 12,690-12,700 Yellow gray, pink, gray, yellow gray, little brown gray and gray limestone; little gray and red shale.

12,700-12,710 Limestone as above and pinkish gray dolomitic limestone.  
 12,710-12,725 White limestone, fine crystalline and some fine crystalline pink gray dolomite.  
 12,725-12,730 White fine crystalline, some oolitic little red dolomite.  
 12,730-12,765 White fine crystalline to light gray and light brown gray limestone, little pinpoint porosity.  
 12,765-12,770 White to light gray fine crystalline limestone, some oolitic.  
 12,770-12,775 As above, dolomitic limestone.  
 12,775-12,800 White to light gray fine crystalline, mostly white, little pinpoint porosity 80-90, some oolitic at 12,800.  
 12,800-12,805 White to light gray dense limestone, very little pinpoint porosity.  
 12,805-12,810 As above and some light brown gray lithographic limestone.  
 12,810-12,820 Yellow gray to light gray dense limestone, mostly yellow gray, little porosity.  
 12,820-12,825 Yellow gray to light gray, fine crystalline to fragmental, dense.  
 12,825-12,835 Yellow gray to light gray, some oolitic, little pinpoint porosity.  
 12,835-12,840 Yellow gray as above and little brown gray limestone, fair pinpoint porosity.  
 12,840-12,845 As above, dolomitic.  
 12,845-12,860 Yellow gray and little very light olive gray limestone, little pinpoint porosity.  
 12,860-12,865 White to yellow gray, fine crystalline to oolitic, little porosity.  
 12,865-12,875 As above, fine crystalline, fragmental to oolitic, little porosity.  
 12,875-12,910 Same as above, dolomitic, little porosity.  
 12,910-12,915 Limestone as above but dolomitic, pink coating on cuttings, little pinpoint porosity.  
 12,915-12,925 Limestone as above, not dolomitic, little pinpoint porosity.  
 12,925-12,930 Limestone as above, dolomitic, some pale yellow brown limestone, little porosity.  
 12,930-12,935 Limestone as above, dolomitic.  
 12,935-12,945 Limestone as above, dolomitic and brown gray to pale yellow brown, little porosity.  
 12,945-12,950 White to yellow gray and brown gray fair pinpoint porosity.  
 12,950-12,960 As above little pinpoint porosity.  
 12,960-12,970 As above, some pinpoint porosity.  
 12,970-12,975 As above, and some light brown slightly saccharoidal dolomite, some pinpoint porosity.  
 12,975-12,990 Same as above and little pinpoint porosity.  
 12,990-12,995 Limestone as above.  
 12,995-13,000 Yellow gray, light gray, pale yellow brown to brown gray, little pinpoint porosity.  
 13,000-13,005 Yellow gray to light gray, fine crystalline, little oolitic.  
 13,005-13,010 Yellow gray to light gray dolomitic limestone, fine crystalline, dense; little pinpoint porosity 15-20.  
 13,010-13,025 Yellow gray, light gray, to light brown gray, little pinpoint porosity.  
 13,025-13,045 As above and some brown gray limestone, little red and dark gray shale, very little porosity. Some dolomitic limestone 40-45.

Stony Mountain

- 13,045-13,055 Missing.  
13,055-13,065 Yellow gray dolomite and brown gray limestone, fine crystalline, little porosity. Very pale yellow brown at 60.  
13,065-13,070 Pale yellow brown sublithographic dolomite, brown gray limestone, finely crystalline.  
13,070-13,075 As above, some red and dark gray shale.  
13,075-13,080 As above, little porosity.  
13,080-13,090 Dolomite as above, little limestone as above, very little porosity  
13,090-13,100 As above with little brown gray limestone.  
13,100-13,110 Pale yellow brown 10YR6/2 sublithographic, no porosity.  
13,110-13,115 Missing.

Stony Mountain Shale 13,120

- 13,115-13,125 As above, (Phos. Pellet? 15-20).  
13,125-13,130 As above to pale brown 5YR5/2, slightly saccharoidal.  
13,130-13,135 Pale brown, slightly saccharoidal dolomite.  
13,135-13,140 Same as above, little red shale.  
13,140-13,145 As above to gray red purple dense dolomite 5RP4/2.  
13,145-13,150 As above to pale yellow brown sublithographic, and red shale.  
13,150-13,155 Medium light gray to gray red, purple sublithographic to slightly saccharoidal.  
13,155-13,160 Pale yellow brown to gray red purple sublithographic to slightly saccharoidal.  
13,160-13,165 Dolomite as above, very heavy red shale, coating on cuttings.  
13,165-13,170 Pale yellow brown to gray red purple dolomite, finely crystalline sublithographic, and white anhydrite.  
13,170-13,175 Dolomite as above.

Red River Formation 13,175

- 13,175-13,180 Pale yellow brown, finely crystalline to sublithographic, gray red purple, finely crystalline to slightly saccharoidal.  
13,180-13,185 Pale yellow brown to medium light gray, finely crystalline to sublithographic; and white anhydrite.  
13,185-13,215 Colorless, very pale yellow brown to light gray, fine crystalline, dolomite.  
13,215-13,220 White to medium gray, finely crystalline, dolomite.  
13,220-13,225 As above to brown gray saccharoidal, fair pinpoint porosity.  
13,225-13,230 Brown gray, to pale brown, much brown gray crystalline dolomite, little porosity.  
13,230-13,235 White to pale yellow brown, finely crystalline, dense.  
13,235-13,240 Same as above, finely crystalline to slightly saccharoidal.  
13,240-13,245 White to very light gray N8, finely crystalline to slightly saccharoidal, little porosity.  
13,245-13,250 Pale yellow brown sublithographic to saccharoidal, little porosity.  
13,250-13,260 White to pale brown, finely crystalline to slightly saccharoidal, little porosity.  
13,260-13,265 Same as above, but mostly pale brown to brown gray 5YR4/1.  
13,265-13,270 White to very light gray, and brown gray, mostly brown gray, (fine crystalline to slightly saccharoidal, some fair porosity).  
13,270-13,275 Missing.

13,275-13,285 Brown gray, to medium gray N5, finely crystalline to slightly saccharoidal, little porosity.

13,285-13,290 Pale brown to brown gray, finely crystalline to slightly saccharoidal.

13,290-13,295 As above, crystalline to slightly saccharoidal.

13,295-13,300 As above, crystalline to saccharoidal.

13,300-13,305 As above, crystalline. Missing 20-30.

13,305-13,355 As above, crystalline to slightly saccharoidal, very little porosity, 35-40 brachiopod fragments.

13,355-13,360 Light gray to brown gray, crystalline to slightly saccharoidal.

13,360-13,365 Brown gray, crystalline to slightly saccharoidal, little porosity.

13,365-13,370 Pale brown to brown gray, crystalline to slightly saccharoidal, little porosity.

13,370-13,375 As above, some fair porosity.

13,375-13,390 Yellow gray 5Y8/1 to brown gray finely crystalline to slightly saccharoidal. 80-85 slightly limey.

13,390-13,400 Yellow gray 5Y8/1 to brown gray finely crystalline dolomitic limestone, some porosity.

13,400-13,405 As above, slightly limey, little porosity.

13,405-13,410 Missing.

13,410-13,415 As above, slightly limey.

13,415-13,425 As above, mostly brown gray, little porosity.

13,425-13,440 Brown gray, finely crystalline to crystalline, little porosity and few pieces of brown gray limestone 30-35.

13,440-13,450 Brown gray, finely crystalline to saccharoidal 40-45; slightly saccharoidal 45-50.

13,450-13,455 Brown gray finely crystalline to slightly saccharoidal some limestone.

13,455-13,460 As above, poor porosity.

13,460-13,465 Brown gray sublithographic to crystalline, poor porosity, some red calcareous shale.

13,465-13,470 Pale yellow brown to brown gray, limey, fine crystalline, little red shale.

13,470-13,475 Missing.

13,475-13,495 As above, poor porosity, some red shale.

13,495-13,500 Mostly brown gray, crystalline to slightly saccharoidal poor porosity.

13,500-13,505 Mostly brown gray, crystalline to slightly saccharoidal limey, poor porosity.

13,506-13,525 Mostly brown gray, crystalline to slightly saccharoidal little porosity.

13,525-13,530 As above and some red shale.

13,530-13,540 Mostly brown gray, little pale brown, finely crystalline to slightly saccharoidal, little porosity.

13,540-13,550 Same as above, finely crystalline to crystalline, very little porosity.

13,550-13,555 Mostly brown gray, some yellow gray, fine crystalline to crystalline, very little porosity.

13,555-13,565 Limestone and dolomite as above.

13,565-13,570 As above, limey, very little porosity.

13,570-13,575 Same as above.

13,575-13,585 Same as above.

13,585-13,590 As above, some limestone.

13,590-13,620 Dolomite as above, limey, tight.  
 13,620-13,625 As above, little red shale.  
 13,625-13,630 Dolomite as above, little red shale, very little porosity.  
 13,630-13,635 Dolomite as above, little red shale, little limestone tight.  
 13,635-13,685 As above, limey, tight.  
 13,685-13,690 Brown gray to pale brown, finely crystalline, dolomite and  
 dense limestone.  
 13,690-13,695 As above, mostly limestone.  
 13,695-13,700 As above, and some red calcareous shale.  
 13,700-13,710 Brown gray limestone, finely crystalline and pale brown  
 dolomite, fine crystalline, dense.  
 13,710-13,715 As above and little red shale.  
 13,715-13,725 Brown gray, fine crystalline, limey, some pinpoint porosity.  
 13,725-13,730 As above, fair pinpoint porosity.  
 13,730-13,735 As above, dense.  
 13,735-13,745 Brown gray, limestone, pale brown dolomite, fine crystalline,  
 dense.  
 13,745-13,755 Brown gray, limestone, pale brown limestone, fine crystalline,  
 dense.  
 13,755-13,760 Brown gray and pale brown dolomite, fine crystalline to  
 sublithographic.  
 13,760-13,765 As above, and few pieces of white anhydrite.  
 13,765-13,773 Brown gray limestone, pale brown dolomite, fine crystalline  
 dense and few pieces of red shale.

Total Depth 13,773