

WS-25

VDMR Well No.: W-4382

Operator: Columbia Gas Transmission Corporation  
Farm: Penn - Virginia Corporation (No. 3)  
Well No.: 20,054-T  
Location: Wise County (Appalachia Quadrangle)  
4900' N. of 36°55' 00"  
2250' E. of 82°47' 30"  
Elevation: 1942.18' Gr.  
Total Depth: 5390' RKB  
Drilling Commences: September 19, 1974  
Drilling Completed: October 7, 1974  
Result: Plugged on January 22, 1975

GEOLOGIC LOG

Depth  
(feet)

- 0 - 20 No samples.
- 20 - 30 Sandstone - light gray (N7) fine to coarse, moderately sorted, subangular quartz grains; siliceous; brittle; moderate porosity seen on some fragments; slight mica-green, muscovite; coal fragments in sandstone, not as laminae; rose-colored fragments.
- 30 - 60 No samples.
- 60 - 70 Sandstone - as 20 - 30'; siderite fragments.
- 70 - 80 No samples.
- 80 - 90 Sandstone - as 20 - 30'.
- 90 - 100 Sandstone - as 20 - 30'.
- 100 - 110 No description.
- 110 - 120 Sandstone - as 20 - 30'; 3% mica.
- 120 - 140 No samples.
- 140 - 150 Sandstone - medium light gray - (N6) - as 20 - 30'; abundant coal fragments, which are micaceous; 3% mica.
- 150 - 160 Sandstone - as 150 - 160'.
- 160 - 170 Siltstone - medium gray (N5) - hard, sandy and finely interlaminated with sandstone (as above); carboniferous; micaceous.
- 170 - 180 No sample.

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(feet)

180 - 190	Siltstone - as 160 - 170'.
190 - 210	No sample.
120 - 220	Siltstone - as 160 - 170'; sparse mica.
220 - 230	Siltstone - as 160 - 170'.
230 - 240	Siltstone - as 160 - 170'.
240 - 250	Siltstone - as 160 - 170'.
250 - 260	Siltstone - as 160 - 170'.
260 - 270	Siltstone - medium gray (N5) - firm, silty with some laminae of medium light gray sandy siltstone; coal, 1-3% grayish red (10R4/2) siltstone.
270 - 280	Siltstone - as 260 - 270'.
280 - 290	Siltstone - as 260 - 270'.
290 - 300	Siltstone/Sandstone - interbedded = medium gray (N5) - siltstone as 200 - 270'; sandstone - fine to medium, moderate sorting, subangular; siliceous; mica-green; fine laminae of coal.
300 - 310	Sandstone - medium gray (N5) - fine to medium, moderate sorting; subangular; siliceous; sparse fine mica; 3% fine particles of coal.
310 - 320	Sandstone - as 300 - 310'; coal, blocky fragments.
320 - 330	Sandstone - as 300 - 310'; coal is scattered in irregular manner throughout interval and as plant fragments.
330 - 340	Sandstone - light gray (N7) - fine to coarse, moderate sorting, subangular; siliceous; brittle; moderately clean; micaceous; 1% coal fragments, some with siltstone.
340 - 350	Sandstone - as 330 - 340'.
350 - 360	Sandstone - 330 - 340'.
360 - 370	Sandstone - as 330 - 340'.
370 - 380	Sandstone - as 330 - 340'; sparse coal.
380 - 390	Sandstone - as 330 - 340'.

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(feet)

390 - 400	Sandstone - as 330 - 340'; very sparse coal, some with sulfur fragments.
400 - 410	Sandstone - 330 - 340'; sparse coal; siderite? fragments.
410 - 420	Sandstone - as 400 - 410; very sparse feldspar.
420 - 430	Sandstone - as 410 - 420'.
430 - 440	Sandstone - as 410 - 420'.
440 - 450 -	Sandstone - as 410 - 420'.
450 - 460	Sandstone/Siltstone - sandstone - as 410 - 420' and siltstone medium gray - (N5) - soft, sparse pyrite masses; coal; 1-3% $\pm$ grayish red (10R 4/2) siltstone - soft.
460 - 470	Sandstone - light gray (N7) - fine to coarse, moderate sorting, sub-angular; siliceous; hard to brittle; moderately clean; sparse mica; and siltstone - 40% $\pm$ - as 450 - 460; sparsely carboniferous.
470 - 480	Sandstone/Siltstone - equal amounts, as 460 - 470'.
480 - 490	Sandstone/Siltstone - as 470 - 480'.
490 - 500	Siltstone - dark gray (N3) - hard, form, with scattered very fine laminae of carboniferous matter.
500 - 510	Siltstone - as 490 - 500'.
510 - 520	Sandstone - light gray - (N7) - fine to medium, moderately sorted quartz; siliceous; micaceous; sparse feldspar; 5% siltstone - as 490 - 500'.
520 - 530	Sandstone - as 470 - 480' and 30% $\pm$ siltstone - as 510 - 520'.
530 - 540	Sandstone/Siltstone - equal amounts each - as 460 - 470'.
540 - 550	Sandstone/Siltstone - as 460 - 470'.
550 - 560	Sandstone - as 510 - 520'; 15% siltstone - as 490 - 500'.
560 - 570	No samples.
570 - 580	Sandstone - as 510 - 520; 10% shell siltstone fragments.
580 - 590	Sandstone/Siltstone - as 460 - 480'; but medium to coarse grained; scattered.
590 - 610	No samples.

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(feet)

610 - 620	Sandstone/Siltstone - as 580 - 590'; poor sorting; coal - blocky, luster, and some as masses on sandstone and siltstone.
620 - 630	Siltstone - medium gray (N5) - hard massive; local disturbed bedding; locally finely sandy; sparse coal.
630 - 640	Sandstone - graywacke - medium dark gray (N4) - very fine grained, moderate to moderately poor sorting, subangular quartz grains, siliceous; dirty; abundant silt/carboniferous/micaceous particles; local pyrite masses; sparse brownish gray (5YR 4/1) siltstone fragments; coal fragments.
<sup>A</sup> 640 - 650	Sandstone - graywacke - as 630 - 630'.
650 - 660	Sandstone - graywacke - as 630 - 640'.
660 - 670	Sandstone - graywacke siltstone - as 630 - 640'; and 620 - 630'.
670 - 680	Siltstone/Sandstone - medium dark gray (N4) - firm, local disturbed bedding and fissility; local carbon; and 35 - 40% <sup>+</sup> sandstone - medium light to light gray (N6-7) - very fine to fine grained, subangular, moderately well sorted; siliceous; moderately clean; 1-3% very fine rock fragments; sparse brownish gray (5YR 4/1) siltstone-fragments.
680 - 690	Siltstone/Sandstone - as 670 - 680'.
690 - 700	No samples.
700 - 710	Siltstone - as 670 - 680; finely micaceous and finely interbedded with sandstone (as above); fine laminae of carboniferous matter.
<sup>710</sup> 710 - 720	Siltstone - as 700 - 710'; sparse sandstone.
720 - 730	Siltstone - as 700 - 710'; no sandstone.
730 - 740	Siltstone - as 720 - 730'.
<sup>740</sup> 740 - 750	Siltstone - as 720 - 730'.
750 - 760	Siltstone - as 730 - 740'.
760 - 770	Siltstone - as 730 - 740'.
770 - 780	Siltstone/Sandstone - siltstone as 730 - 740'; sandstone - grading from a subgraywacke type with abundant grayish red siltstone fragments included - to a fine to medium, subangular mode sorted; siliceous; locally micaceous and carboniferous.
780 - 790	Siltstone/Sandstone - as 770 - 780'; no subgraywacke type.

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790 - 800 Siltstone/Sandstone - as 780 - 790'1 sparse grayish red siltstone.

810 - 820 Siltstone/Sandstone - as 800 - 810'.

820 - 830 Siltstone, sandy - medium dark gray (N4) siltstone - as 770 - 780', interbedded and intergrading with a coarse grained, poorly sorted sub-graywacke type sandstone; local mica carbon and grayish-red siltstone fragments.

830 - 840 Sandstone - very light gray (N8) - fine to coarse, mostly medium-grained, subangular, moderately well sorted; siliceous, clean; sparse feldspar/mica rock fragments; coal.

840 - 850 Sandstone - as 830 - 840'.

850 - 860 Siltstone - as 820 - 830'.

860 - 870 Siltstone - sandy, as 820 - 830'.

870 - 880 Siltstone/Sandstone - as 820 - 830'; sandstone - as 830 - 840'.

880 - 890 Siltstone/Sandstone - as 870 - 880'.

890 - 900 Siltstone - dark gray (N3) - hard; sparse fine mica.

900 - 910 Siltstone - as 980 - 900'; carboniferous, pyrite particles.

910 - 920 Siltstone - as 900 - 910'.

920 - 930 Sandstone - medium-light to light gray (N6-7) fine to medium sub-angular; siliceous; sparse mica, smoky quartz (?); sparse siltstone fragments.

930 - 940 Sandstone - as 920 - 930'.

940 - 950 Sandstone - as 920 - 930'; moderate siltstone fragments - as 890 - 900'.

950 - 960 Sandstone/Siltstone - sandstone as 920 - 930'; siltstone - as 900 - 910'. coal?

960 - 970 Sandstone - light gray (N7) - fine to coarse, moderately sorted, sub-angular; siliceous, rather clean; sparse mica (green/brown); siderite? masses.

970 - 980 Sandstone - as 960 - 970'.

980 - 990 Siltstone - dark gray (N3) - hard micaceous; carboniferous.

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(feet)

990 - 1000 Siltstone - as 980 - 990'.

1000 - 1010 Siltstone - as 990 - 1000'; sparse sandstone fragments.

1010 - 1020 Siltstone/Sandstone - as 990 - 1000' and 960 ÷ 970'.

1020 - 1030 Siltstone, sandy - medium dark gray (4) - hard; finely sandy, micaceous, carboniferous locally.

1030 - 1040 No samples.

1040 - 1050 Siltstone, sandy - as 1020 - 1030'.

1050 - 1060 Siltstone, sandy - as 1020 ÷ 1030'; "Dirty"; coal; local pyrite granular masses.

1060 - 1070 Siltstone, sandy - 1020 - 1030'.

1070 - 1080 Siltstone - as 1020 - 1030'; sparse and localized sandiness.

1080 - 1090 Siltstone - as 1070 - 1080'.

1090 - 1100 Siltstone - as 1070 - 1080'.

1110 - 1120 Siltstone - sandy - as 1020 - 1030'.

1120 - 1130 Siltstone, sandy - as 1020 - 1030'.

1130 - 1140 Siltstone, sandy - as 1020 - 1030'.

1140 - 1150 Siltstone, sandy - as 1020 - 1030'.

1150 - 1160 Sandstone - very light gray (N8) fine to medium, subangular, moderate sorting; siliceous; brittle; clean; sparse rock fragments.

1160 - 1170 Sandstone - as 1150 - 1160'.

1170 - 1180 Sandstone - as 1150 - 1160'.

1180 - 1190 Sandstone - as 1150 - 1160'.

1190 - 1200 Sandstone - as 1150 - 1160'; 20% siltstone fragments.

1200 - 1210 Siltstone - medium dark gray (N4) - hard, micaceous, carboniferous.

1210 - 1220 Siltstone - as 1200 - 1210'.

1220 - 1230 Siltstone - as 1200 - 1210'; local coarse sandy areas.

1230 - 1240	Siltstone - as 1220 - 1230'.
1240 - 1250	Siltstone - as 1220 - 1230'.
1250 - 1260	Siltstone/Sandstone - 1220 - 1230' and 1150 - 1160'; not a "clean" Sandstone, but only sparse fine rock fragments.
1260 - 1270	Siltstone/ Sandstone - 1250 - 1260'.
1270 - 1280	Siltstone/Sandstone - as 1250 - 1260'.
1280 - 1290	Siltstone/Sandstone - as 1250 - 1260'.
1290 - 1300	Siltstone/Sandstone - as 1250 - 1260'.
1300 - 1310	Sandstone - 1150 - 1160'.
1310 - 1320	Sandstone - as 1150 - 1160'.
1320 - 1330	Sandstone - 1150 - 1160'; very fine to coarse, with some very coarse subrounded grains.
1330 - 1340	Sandstone - as 1320 - 1330'.
1340 - 1350	Sandstone - as 1320 - 1330'; to coarse
1350 - 1360	Sandstone - as 1340 - 1350'.
1360 - 1370	Sandstone - as 1340 - 1350'; 10% $\pm$ fine siltstone fragments.
1370 - 1380	Sandstone - as 1340 - 1350'.
1380 - 1390	Sandstone - as 1340 - 1350'.
1390 - 1400	Sandstone - as 1340 - 1350'; coarse grains are subrounded, sample clean - very sparse rock fragments.
1400 - 1410	Sandstone - as above, all grains are subrounded.
1410 - 1420	Sandstone - as above.
1420 - 1430	Sandstone - as above.
1430 - 1440	Sandstone - as above.
1440 - 1450	Sandstone - as above.
1450 - 1460	Sandstone - as above.
1460 - 1470	Sandstone - as above.

- 1470 - 1480 Sandstone - as above.
- 1480 - 1490 Sandstone - as above.
- 1490 - 1500 Sandstone - as above.
- 1500 - 1510 Sandstone - as above.
- 1510 - 1520 Sandstone - as above; mica; feldspar.
- 1520 - 1530 Sandstone - as above; coal.
- 1530 - 1540 Sandstone - as above; coal.
- 1540 - 1550 Sandstone - as above; coal.
- 1550 - 1560 Sandstone - as above; coal, some sandy.
- 1560 - 1570 Siltstone/Sandstone-medium gray (N5) moderately soft, locally sandy, Sandstone is medium gray (N5) - very fine to fine, subangular, poorly sorted, siliceous; silty! - mottled coal laminae and sandy masses of coal.
- 1570 - 1580 Sandstone - medium gray (N5); as 1560 - 1570!; sparse siltstone; coal fragments and laminae.
- 1580 - 1590 Sandstone, silty - as above but abundantly silty and carboniferous- "graywacke" in appearance.
- 1590 - 1600 As above.
- 1600 - 1610 Sandstone, silty - as above, mica.
- 1610 - 1620 Sandstone, silty, - as above.
- 1620 - 1630 Siltstone - medium dark gray (N4); moderately soft; carboniferous, local sparse fine mica; some sandstone fragments.
- 1630 - 1640 Siltstone - as 1620 - 1630!.
- 1640 - 1650 Sandstone - medium gray (N6); fine to medium, subangular, moderately poor sorting; siliceous; moderately hard; mica; carboniferous masses; 15 - 20% siltstone fragments.
- 1650 - 1660 Sandstone - as 1640 - 1650'.
- 1660 - 1670 Sandstone - as 1640 - 1650'.
- 1670 - 1680 Sandstone - light olive gray (5Y 6/1); very fine and medium sized grains, subrounded, well sorted, siliceous; brittle; clean.
- 1680 - 1690 Sandstone - as above.
- 1690 - 1700 Sandstone - as above.



- 1700 - 1710 Sandstone - as above; fine to medium, sparse fragments.
- 1710 - 1720 Sandstone - as 1700 - 1710'.
- 1720 - 1730 Sandstone - as 1700 - 1710'.
- 1730 - 1740 Sandstone - as 1700 - 1710'.
- 1740 - 1750 Sandstone - as 1700 - 1710'.
- 1750 - 1760 Sandstone - as 1700 - 1710'.
- 1760 - 1770 Sandstone - as 1700 - 1710'.
- 1770 - 1780 Sandstone - light olive gray (5Y 6/1) - very fine to medium, sub-angular, moderate sorting; siliceous; brittle; 20% <sup>±</sup> fine rock fragments; mica.
- 1780 - 1790 Sandstone - as 1770 - 1780'.
- 1790 - 1800 Sandstone - as 1770 - 1780'; 5% rock fragments.
- 1800 - 1810 Sandstone - as 1790 - 1800'.
- 1810 - 1820 Sandstone - as 1790 - 1800'.
- 1820 - 1830 Sandstone - as 1790 - 1800'; mica.
- 1830 - 1840 Sandstone - as 1790 - 1800'; mica.
- 1840 - 1850 Siltstone - medium dark gray (N4); moderately soft, sparse coal, sparse mixed sand grains.
- 1850 - 1860 Siltstone - as 1840 - 1850'.
- 1860 - 1870 Siltstone - as 1840 - 1850'.
- 1870 - 1880 Siltstone - as 1840 - 1850'.
- ~~1880 - 1890 Siltstone - as 1840 - 1850'; sparsely carboniferous.~~
- ~~1890 - 1900 Sandstone - light olive gray (5Y 6/1); fine to medium grained, subangular to subrounded, moderate sorting; siliceous; brittle; 15-20% rock (siltstone) fragments.~~
- 1900 - 1910 Sandstone - yellowish gray (5Y 7/2); as 1890 - 1900; silty and sparse rock fragments.
- 1910 - 1920 Sandstone - as 1900 - 1910'.
- 1920 - 1930 Sandstone - as 1900 - 1910'.
- 1930 - 1940 Sandstone - as 1900 - 1910'.

1940 - 1950	Sandstone - as 1900 - 1910'. some subrounded coarse grains.
1950 - 1960	Sandstone - as 1890 - 1900'; sparse rock fragments.
1960 - 1970	Sandstone - 1900 - 1910'.
1970 - 1980	Sandstone - as 1900 - 1910'; some subrounded coarse grains.
1980 - 1990	Sandstone - as 1970 - 1980'.
1990 - 2000	Sandstone - light gray (N7); fine to medium grained, subangular to subrounded, moderate sorting; siliceous; brittle; 25% rock (siltstone) fragments.
2000 - 2010	Sandstone - as 1990 - 1200'.
2010 - 2020	Sandstone - as 1990 - 1200'.
2020 - 2030	Sandstone - as 1900 - 1910'.
2030 - 2040	Sandstone - as 1900 - 1910'.
2040 - 2050	Sandstone - as 1900 - 1910'.
2050 - 2060	Sandstone - as 1900 - 1910'.
2060 - 2070	Sandstone - as 1900 - 1910'.
2070 - 2080	Sandstone - as 1900 - 1910'.
2080 - 2090	Sandstone - as 1900 - 1910'; 10% rock fragments.
2090 - 2100	Sandstone - 1900 - 1910'; 5% rock fragments.
2100 - 2110	Sandstone - as 2090 - 2100'.
2110 - 2120	Sandstone - as 2090 - 2100'; fine to coarse grained.
2120 - 2130	Sandstone - as 2110 - 2120'.
2130 - 2140	Sandstone - as 2110 - 2120'.
2140 - 2150	Sandstone - as 2110 - 2120'.
2150 - 2160	Sandstone - as 2110 - 2120'.
2160 - 2170	Sandstone - as 2110 - 2120'.
2170 - 2180	Sandstone - as 2110 - 2120'.
2180 - 2190	Sandstone - as 2110 - 2120'.
2190 - 2200	Sandstone - as 2110 - 2120'.
2200 - 2210	Siltstone - medium gray (N5); firm; moderate amount crushed sandstone.

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(feet)

2210 - 2220	Siltstone/Sandstone - siltstone as 2200 - 2210' and sandstone yellowish gray (5Y 6/1) fine to medium, some coarse, subangular to subrounded, moderate sorting; siliceous; brittle; silty; mica.
2220 - 2230	Siltstone/Sandstone - as 2210 - 2220'.
2230 - 2240	Siltstone/Sandstone - as 2210 - 2220'.
2240 - 2250	Sandstone/Siltstone - as 2210 - 2220'; about 45% $\pm$ siltstone.
2250 - 2260	Sandstone/Siltstone - as 2210 - 2220'; about 35% $\pm$ siltstone.
2260 - 2270	Sandstone - as 2210 - 2220'; fine to medium; 10% siltstone.
2270 - 2280	No sample.
2270 - 2280	Sandstone - as 2210 - 2220'.
2280 - 2290	Sandstone - as 2270 - 2280'.
2290 - 2300	Sandstone - as 2270 - 2280'; 20% siltstone.
2300 - 2400	No sample.
2400 - 2410	Sandstone - as 2270 - 2280'; 10% siltstone fragments.
2410 - 2420	Siltstone - grayish black (N2); hard; carboniferous; coal fragments.
2420 - 2430	Sandstone - very light olive gray (5Y 7/1); fine to coarse, subangular and subrounded, moderately sorted; siliceous; brittle, 19% fine siltstone fragments.
2430 - 2440	Sandstone - as 2420 - 2430'; 5% rock fragments; iron oxide staining.
2440 - 2450	Sandstone - as 2430 - 2440'.
2450 - 2460	Sandstone - as 2430 - 2440'.
2460 - 2470	Sandstone - as 2430 - 2440'.
2470 - 2480	Sandstone - as 2430 - 2440'.
2480 - 2490	Sandstone - as 2430 - 2440'.
2490 - 2500	Sandstone - as 2430 - 2440'; 3% rock fragments.
2500 - 2520	No samples.
2520 - 2530	Sandstone - pale yellowish brown (10YR 6/2); very fine to medium, subangular, and subrounded, moderately sorted; siliceous; brittle; silty; sparse mica; coal.

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(feet)

2530 - 2540	Sandstone - as 2520 - 2530'.
2540 - 2550	Sandstone - as 2520 - 2530'.
2550 - 2560	Sandstone - light olive gray (5Y 6/1); as 2520 - 2530; becoming more subangular.
2560 - 2570	Sandstone - pale yellowish brown - (10 YR 7/2); as 2520 - 2530; coal and carboniferous siltstone fragments.
2570 - 2580	Sandstone - as 2560 - 2570'.
2580 - 2590	Sandstone - as 2560 - 2570'; sparse angular coarse sized grains.
2590 - 2600	Sandstone - as 2560 - 2570'; angular, subangular and sparse sub-rounded; siltstone with very fine rare coal fragments.
2600 - 2610	Sandstone - as 2590 - 2600'.
2610 - 2620	Sandstone - as 2590 - 2600'; very fine fragments of magnetite (not contamination).
2620 - 2630	Sandstone - pale yellowish brown (10 YR 7/2); fine to coarse with some very coarse, subangular with some angular, moderate sorting; siliceous; 10% siltstone fragments; mica.
2630 - 2640	Sandstone - as 2620 - 2630'.
2640 - 2650	Sandstone - very light gray (N8); fine to medium, subangular, moderate sorting; siliceous; clean; feldspar; 1-3% siltstone fragments.
2650 - 2660	As 2640 - 2650'.
2660 - 2670	Sandstone - as 2640 - 2650'.
2670 - 2680	Sandstone - as 2640 - 2650'.
2680 - 2690	Sandstone - as 2640 - 2650; 3% rock fragments - carboniferous with thin laminae of coal.
2690 - 2700	Sandstone - as 2640 - 2650'; mica.
2700 - 2710	No sample.
2710 - 2720	Sandstone - as 2640 - 2650'.
2720 - 2730	Sandstone - light olive gray ( 5Y 6/1); fine to medium, subangular, moderate sorting; siliceous; hard; some fragments clean with some up to 20% <sup>±</sup> siltstone fragments; sparse feldspar; sparse mica.

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2730 - 2740	Siltstone - greenish gray - (5YG 6/1); grayish red (10R 4/2); pale reddish brown (10R 5/4) and light to dark grays (N7-N3); siltstones vary in sandiness with some becoming sandy siltstones and sandstones, silty; hard carboniferous grains in gray siltstones with generously increasing sandiness; greenish gray has increasing sandiness with no dark grains; reddish brown is soft to firm.
2740 - 2750	Siltstones/Sandstones - 50% each; siltstones as 2730 - 2740'; sandstones as 2720 - 2730'.
2750 - 2760	Sandstone, silty - medium light gray (N6); very fine grained to fine, subangular well sorted; siliceous; silty, grading into siltstone, sandy locally; very sparse dark rock fragments and mica.
2760 - 2770	Sandstone, silty - as 2750 - 2760; becoming lighter locally; greenish gray silty areas.
2770 - 2780	Sandstone, silty - as 2760 - 2770'.
2780 - 2790	Sandstone - light gray (N7.5); very fine to fine, subangular, well sorted to moderately well sorted; siliceous; locally silty; local thin dark gray siltstone laminae; carboniferous laminae.
2790 - 2800	Sandstone - 2780 - 2790; local disturbed bedding on siltstone laminae.
2800 - 2810	Siltstone/Sandstone - medium gray to medium dark gray and light gray - siltstone - (darker colors); hard; massive to thin laminae interbedded with lighter colored sandstone as 2780- 2790'; 60 - 40%.
2810 - 2820	Siltstone/Sandstone - as 2800 - 2810'.
2820 - 2830	Siltstone - as 2800 - 2810'; carboniferous; micaceous; interbedded with sandstone laminae.
2830 - 2840	Siltstone - as 2820 - 2830'.
2840 - 2850	Siltstone - as 2820 - 2830'; massive.
2850 - 2860	Siltstone - as 2820 - 2830'; becoming softer; still massive.
2860 - 2870	Siltstone - medium dark gray (N3) - massive; soft carboniferous.
2870 - 2880	Siltstone - as 2860 - 2870'.
2880 - 2890	Siltstone - as 2860 - 2870'.
2890 - 2900	Siltstone - as 2860 - 2870'.
2900 - 2910	Siltstone - as 2860 - 2870'.

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(feet)

2910 - 2920	Siltstone - as 2860 - 2870'.
2920 - 2930	Siltstone - as 2860 - 2870'.
2930 - 2940	Siltstone - as 2860 - 2870'.
2940 - 2950	Siltstone - as 2860 - 2870'.
2950 - 2960	Siltstone - as 2860 - 2870'.
2960 - 2970	Siltstone - as 2860 - 2870'.
2970 - 2980	Siltstone - as 2860 - 2870'.
2980 - 2990	Sandstone - light olive gray (5Y 6/2); very fine to fine, subangular moderately well sorted; siliceous; brittle; 20% <sup>±</sup> fine dark gray siltstone fragments; sparse mica.
2990 - 3000	Sandstone - as 2980 - 2990'; 50% each.
3000 - 3010	Sandstone - as 2980 - 2990'; siltstone fragments.
3010 - 3020	Sandstone - 2980 - 2990'; 10% rock fragments.
3020 - 3030	Sandstone - as 3010 - 3020'.
3030 - 3040	Sandstone - 2880 - 2890'; rock fragments.
3040 - 3050	Sandstone - as 3030 - 3040'; subrounded
3050 - 3060	Siltstone - medium dark gray (N4).
3060 - 3070	Siltstone - as 3050 - 3060'.
3070 - 3080	Siltstone - as 3050 - 3060'.
3080 - 3090	Siltstone - as 3050 - 3060'.
3090 - 3100	Siltstone - sandy - as 3050 - 3060'; very finely sandy.
3100 - 3110	Siltstone - sandy - as 3090 - 3100'.
3110 - 3120	Siltstone/Sandstone - as 3090 - 3100'; fossil/plant fragments and sandstone - as 2980 - 2990'; about 35-40%.
3120 - 3130	Sandstone - pale yellow brown (10YR 6/2); very fine to slightly coarse; subangular with some subrounded grains, moderately sorted; siliceous; brittle; 15% siltstone fragments.
3130 - 3140	Sandstone - as 3120 - 3130'; 1-3% rock fragments.
3140 - 3150	Sandstone - as 3120 - 3130'.

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(feet)

3150 - 3160	Sandstone - 3130 - 3140'.
3160 - 3170	Sandstone - as 3130 - 3140'.
3170 - 3180	Sandstone - pale yellow brown (10YR 6/2); very fine to very coarse, angular with some subrounded, poorly sorted; siliceous; crushed; rose quartz, reddish brown siltstone fragments; 15% siltstone fragments.
3180 - 3190	Sandstone - as 3170 - 3180'; fine to medium; micaceous and foliated siltstone fragments; calcite crystal.
3190 - 3200	Sandstone - as 3130 - 3140'.
3200 - 3210	Sandstone - as 3130 - 3140'.
3210 - 3220	Sandstone - as 3130 - 3140'; mica.
3220 - 3230	Sandstone - as 3180 - 3190'; 15% siltstone fragments; no calcite.
3230 - 3240	Sandstone - as 3220 - 3230'.
3240 - 3250	Sandstone - as 3220 - 3230'; siltstone, with some reddish brown.
3250 - 3260	Siltstone - medium dark gray (N4); firm to moderately soft; very finely micaceous and locally finely sandy; locally carboniferous.
3260 - 3270	Siltstone - as 3250 - 3260'; 30% light gray siltstone grading into a silty sandstone.
3270 - 3280	Siltstone - as 3260 - 3270'.
3280 - 3290	Siltstone - as 3260 - 3270'.
3290 - 3300	Siltstone - as 3260 - 3270'.
3300 - 3310	No sample.
3310 - 3320	Siltstone/Sandstone - 50% each; siltstone - as 3260 - 3270'; sandstone - light gray (N7); very fine to medium, subangular, moderate sorting; siliceous; hard; relatively clean.
3320 - 3330	Sandstone/Siltstone - as above.
3330 - 3340	Sandstone/Siltstone - as above.
3340 - 3350	Sandstone/Siltstone - as above; with 1% $\pm$ grayish siltstone fragments.
3350 - 3360	Sandstone/Siltstone - as above; local coaly laminae.
3360 - 3370	Sandstone - as 3310 - 3320'; moderately well sorted; 30% siltstone.
3370 - 3380	Sandstone - as 3310 - 3320'; 10% $\pm$ siltstone.

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- 3380 - 3390 Sandstone - as 3310 - 3320'; siltstone.
- 3390 - 3400 Sandstone - as 3310 - 3320'; 1 - 3% siltstone sparse grayish red siltstone fragments also.
- 3400 - 3410 Sandstone - as 3310 - 3320'; moderately well sorted; contaminant iron stained.
- 3140 - 3420 Sandstone - as 3400 - 3410'.
- 3420 - 3430 Sandstone - as 3310 - 3320'.
- 3430 - 3440 Sandstone - as 3310 - 3320'.
- 3340 - 3450 Sandstone - as 3310 - 3320'.
- 3450 - 3460 Sandstone - as 3310 - 3320'.
- 3460 - 3470 Sandstone - as 3310 - 3320'.
- 3470 - 3480 Sandstone - as 3310 - 3320'.
- 3480 - 3490 Siltstone - medium dark gray - (N4); firm to soft; very fine, sparse mica; slightly calcareous; intergrading with sandstone as above.
- 3490 - 3500 Siltstone - as 3480 - 3490'; slightly sandy.
- 3500 - 3510 Siltstone - as 3490 - 3500'.
- 3520 - 3530 Sandstone - pale yellowish brown (10 YR 6/2); very fine to medium, subangular with some subrounded, moderate sorting; siliceous; silty; some siltstone fragments.
- 3530 - 3540 Sandstone - as 3520 - 3530'.
- 3540 - 3550 Sandstone - as 3520 - 3530'.
- 3530 - 3540 Sandstone - as 3520 - 3530'.
- 3550 - 3560 Siltstone - calcareous and sandy - dark gray (N3); hard grains of quartz sand are subrounded, fine. (possible limestone, arenaceous?)
- 3560 - 3570 Siltstone - calcareous and sandy as above; fossils.
- 3570 - 3580 Siltstone - calcareous - as above; sparsely sandy; thin (?) laminae of limestone interbedded with and grading into siltstones; fossils- Auiculopecten; Ostracod; fine calcite fragments.
- 3580 - 3590 Siltstone, calcareous - as above; sparse fossil fragments; very thin laminae of limestone.



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(feet)

3590 - 3600	Siltstone - dark gray (N3); hard; sandy locally; sparse fine Mica fragments of limestone.
3600 - 3610	Siltstone - calcareous - dark brownish gray (5 YR 3/1); hard; calcareous to limestone, silty; interclasts in both siltstones and limestones; some medium gray, sandy siltstone fragments.
3610 - 3620	Siltstone - some medium gray, sandy siltstone calcareous fragments, as 3600 - 3610'.
3620 - 3630	Siltstone calcareous - as 3600 - 3610'.
3630 - 3640	Siltstone, sandy - medium dark gray (N4), hard; sandiness varies locally, with much of it is finely layered together with siltstone and together with siltstone and carboniferous material; not oily.
3640 - 3650	Siltstone - as 3630 - 3640; local calcite fragments; pyrite.
3650 - 3660	Siltstone - as 3640 - 3650'.
3660 - 3670	Siltstone - as 3640 - 3650'.
3670 - 3680	Siltstone/calcareous - as 3600 - 3610'; fragments of light brownish gray limestone (5YR 6/1).
3680 - 3690	Siltstone - as 3670 - 3680'.
3690 - 3700	Siltstone - as 3670 - 3680'.
3700 - 3710	Siltstone - dark gray (N3) hard to firm; oily film on all fragments; sparsely calcareous and in very thin laminae of limestone and calcite.
3710 - 3720	Siltstone - as 3700 - 3710'.
3720 - 3730	Siltstone - as 3700 - 3710'; 20% ± limestone fragments.
3730 - 3740	Siltstone - as 3700 - 3710'.
3740 - 3750	Siltstone - as 3200 - 3710'; very sparse limestone.
3750 - 3760	Siltstone - as 3700 - 3710'.
3760 - 3770	Siltstone, calcareous - dark gray (N3); hard; sparsely very finely and locally sandy; local pyrite.
3770 - 3780	Siltstone, calcareous - as 3760 - 3770'.
3780 - 3790	Siltstone, calcareous - as 3760 - 3770'.
3790 - 3800	Siltstone, calcareous as 3760 - 3770'. becoming less sandy; calcite (brown,white) fragments.

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3800 - 3810 Siltstone, calcareous - as 3760 - 3770'.

3810 - 3820 Siltstone, calcareous - as 3760 - 3770'.

3820 - 3830 Siltstone, calcareous - dark brownish gray (5YR 4/1) grading into limestone, argillaceous; fine grained; calcite fragments.

3830 - 3840 Siltstone, calcareous - as 3820 - 3803'.

3840 - 3850 Limestone, calcareous - as 3820 - 3830'.

3850 - 3860 Limestone, argillaceous interbedded with siltstone, calcareous - limestone is light to dark brownish gray (5YR 6/1 - 4/1); fine grained; silty; and siltstone is medium dark gray (N4) - sort; very finely sandy; particles of carboniferous matter.

3860 - 3870 Limestone, argillaceous and siltstone, calcareous - as 3850 - 3860.

3870 - 3880 Limestone, argillaceous - as 3850 - 3860'; decreasing amounts of siltstone.

3880 - 3890 Limestone - light brownish gray (5YR 6/1); fine grained; shading into gray and dark gray locally; calcite crystalline areas.

3890 - 3900 Limestone - as 3880 - 3890'.

3900 - 3910 Limestone - brownish gray (5YR 4/1); fine grained; minor amounts of calcite.

3910 - 3920 Limestone - as 3900 - 3910'.

4930 - 3930 Limestone - as 3900 - 3910'.

3930 - 3950 No samples.

3950 - 3960 Limestone - as 3900 - 3910'; some lighter colored areas.

3960 - 3970 Limestone - 60% light olive gray, 40%  $\pm$  light brownish gray (5Y 6/1).

3970 - 3980 Limestone - as 3960 - 3970'.

3980 - 3990 Limestone - as 3960 - 3970'.

3990 - 4000 No sample.

4000 - 4010 Limestone - light brownish gray (5YR 6/1); fine grained; sparse crystalline areas.

4010 - 4020 Limestone - as 4000 - 4010'.

4020 - 4030 Limestone - as 4000 - 4010'; sparse white fragments.

4030 - 4040 Limestone - as 4020 - 4030'.

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4040 - 4050 Limestone as 4020 - 4030'; also some dark gray silty limestone.

4050 - 4060 Limestone - as 4020 - 4030'; also some dark gray silty limestone.

4060 - 4070 Limestone - as 4050 - 4060'.

4070 - 4080 Limestone - moderate brownish gray - (5YR 4/1); fine grained; occasional lighter fragments and dark gray fragments; no oolites.

4080 - 4090 Limestone - as 4070 - 4080'.

4090 - 4100 Limestone - as 4000 - 4010'.

4100 - 4110 Limestone - as 4000 - 4010'.

4110 - 4120 Limestone - as 4000 - 4010'; oolite zone and limestone fragments as intraclasts.

4120 - 4130 Limestone - as 4110 - 4120'.

4130 - 4140 Limestone - as 4110 - 4120'; some dark gray silty fragments.

4140 - 4150 Limestone as 4130 - 4140'; calcite fragments.

4150 - 4160 Limestone - brownish gray (5YR 4/1); silty; fine grained; some lighter colored fragments; sparse dark gray silty limestone, no oolites.

4160 - 4170 limestone - as 4150 - 4160'.

1470 - 4180 Limestone - as 4150 - 4160'.

4180 - 4190 Shale - light grayish red (10R 4/2); soft; fragments of gray limestone and siltstone - 20%  $\pm$ .

4190 - 4200 Shale - light grayish red to moderate red (5R 4/6); soft to firm; locally sandy with poor sorting of grain sizes - very fine to fine with some medium; finely micaceous.

4200 - 4210 Shale - as 4190 - 4200'.

4210 - 4220 Siltstone/Shale - shale as above; siltstones - light to dark gray, firm to hard, locally sandy; still some limestone fragments.

4220 - 4230 Siltstone - medium gray (N5)' moderately firm, very finely and sparsely micaceous; local very fine sand.

4230 - 4240 Siltstone - as above.

4240 - 4250 Siltstone as above.

4250 - 4260 Siltstone - as above; 35%  $\pm$  very light gray siltstone.

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4260 - 4270 Siltstone - as 4260 - 4270'.

4270 - 4280 Siltstone - as 4260 - 4270'.

4280 - 4290 Siltstone - as 4260 - 4270'.

4290 - 4300 Siltstone - dark brownish gray (5YR 3/1); firm; sandy ; local granular pyrite; milky chert grains; angular and subangular coarse quartz grains.

4300 - 4310 Siltstone - as 4290 - 4300'.

4310 - 4320 Siltstone - as 4090 - 4300'; sparse grains of limestone.

4320 - 4330 Siltstone - as 4310 - 4320'; oily surface on samples - dead oil show.

4330 - 4340 Siltstone - dark gray to light gray; hard sandy with poor sorting; fine particles of carbonaceous matter; some fragments of light gray siltstone are grading into a fine grained, silty sandstone.

4340 - 4350 Siltstone - as 4330 - 4340'.

4350 - 4360 Siltstone - as 4330 - 4340'.

4360 - 4370 Siltstone - as 4330 - 4340'.

4370 - 4380 Siltstone - as 4330 - 4340'.

4380 - 4390 Siltstone - medium light gray (N6)'; hard; sandy; micaceous; some darker colored particles of siltstone.

4390 - 4400 Siltstone - as 4390 - 4400'.

4400 - 4410 Siltstone - medium gray (N5); hard; finely sandy; light gray particles; quartz grains/chert.

4410 - 4420 Siltstone - as 4400 - 4410'.

4420 - 4430 Siltstone - as 4400 - 4410'.

4430 - 4440 Siltstone - medium dark gray to dark gray (N4-N3); firm; very sparse fragments of sandy siltstone.

4440 - 4450 Siltstone - as 4430 - 4440'.

4450 - 4460 Siltstone - as 4430 - 4440'.

4470 - 4470 Siltstone/Shale - dark gray (N3); firm; hard no rock fragments; fissile.

4470 - 4480 Shale/Siltstone - as above.

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(feet)

4480 - 4490 Shale/Siltstone - as above.  
4490 - 4500 Shale/Siltstone - as above.  
4500 - 4510 Shale/Siltstone - as above.  
4510 - 4520 Siltstone - as above.  
4520 - 4530 Siltstone - as above.  
4530 - 4540 Siltstone - as above.  
4540 - 4550 Siltstone - as 4460 - 4470'.  
4550 - 4560 Siltstone - as 4460 - 4470'.  
4560 - 4570 Shale - as 4460 - 4470'; pyrite; local carbonaceous areas.  
4570 - 4580 Shale - as 4460 - 4470'.  
4580 - 4590 Siltstone - medium dark gray to medium gray (N4-N3); hard 5%  $\pm$  loose quartz grains.  
4590 - 4600 Siltstone - as 4580 - 4590'.  
4600 - 4610 Siltstone - as 4580 - 4590'.  
4610 - 4620 Siltstone - as 4580 - 4590'.  
4620 - 4630 Siltstone - as 4580 - 4590'.  
4630 - 4640 Siltstone - as 4580 - 4590'.  
4640 - 4650 Siltstone - dark brownish gray (5Y R 3/1); to dark gray (N3); firm; hard; very coarse sized grains of pyrite.  
4650 - 4660 No sample.  
4660 - 4670 Siltstone - as 4640 - 4650'.  
4670 - 4680 Siltstone - as 4640 - 4650'.  
4680 - 4690 Siltstone - as 4640 - 4650'; local very fine mica.  
4690 - 4700 Siltstone - as 4640 - 4650'.  
4700 - 4710 Siltstone - as 4640 - 4650'.  
4710 - 4720 Siltstone - as 4640 - 4650'.  
4720 - 4730 Siltstone - medium gray (N5), fine even textured; firm; moderately hard.  
4730 - 4740 Siltstone - as 4720 - 4730'.

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4740 - 4750	Siltstone - as 4720 - 4730'.
4750 - 4760	Siltstone - as 4720 - 4730'.
4760 - 4770	Siltstone - as 4720 - 2730'.
4770 - 4780	Siltstone - as 4720 - 4730'.
4780 - 4790	Siltstone - dark brownish gray and dark gray; firm; hard.
4790 - 4800	Siltstone - as 4780 - 4790'.
4800 - 4810	Siltstone - as 4780 - 4790'.
4810 - 4820	Siltstone - medium gray (N5); fine, even texture; firm to moderately hard.
4820 - 4830	Siltstone - as 4810 - 4820'.
4820 - 4840	Siltstone - as 4810 - 4820'.
4840 - 4850	Siltstone - as 4810 - 4820'.
4850 - 4860	Siltstone - <u>as 4810 - 4820'</u> .
4860 - 4870	Siltstone - as 4810 - 4820'.
4870 - 4880	Siltstone - dark brownish gray and dark gray; hard; firm.
4880 - 4890	Siltstone - as 4870 - 4880'.
4890 - 4900	Siltstone - as 4870 - 4880'.
4900 - 4910	Siltstone - as 4810 - 4820'.
4910 - 4920	Siltstone - as 4810 - 4820'.
4920 - 4930	Siltstone - Siltstone as 4810 - 4820'.
4930 - 4940	Siltstone - as 4810 - 4820'.
4940 - 4950	Siltstone - as 4810 - 4820'.
4950 - 4960	Siltstone - as 4870 - 4880'.
4960 - 4970	Siltstone - as 4810 - 4820'.
4970 - 4980	Siltstone - as 4810 - 4820'.
4980 - 4990	Siltstone - as 4810 - 4820'.

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(feet)

4990 - 5000	Siltstone - as 4810 - 4820'.
5000 - 5010	Siltstone - as 4810 - 4820'.
5010 - 5020	Siltstone - as 4810 - 4820'.
5020 - 5030	Siltstone - as 4810 - 4820'.
5030 - 5040	Siltstone - as 4810 - 4820'.
5040 - 5050	Siltstone - as 4870 - 4880'.
5050 - 5060	Siltstone - as 4810 - 4820'.
5060 - 5070	Siltstone - as 4810 - 4820'.
5070 - 5080	Siltstone - as 4810 - 4820'.
5080 - 5090	Siltstone - as 4810 - 4820'.
5090 - 5100	Siltstone - as 4870 - 4880'.
5100 - 5110	Siltstone - <u>as 4870 - 4880'.</u>
5110 - 5120	Siltstone - as 4870 - 4880'.
5120 - 5130	Siltstone - <u>as 4870 - 4880'.</u>
5130 - 5140	Siltstone - as 4870 - 4880'.
5140 - 5150	Siltstone - as 4870 - 4880'.
5150 - 5160	Siltstone - as 4810 - 4820'.
5160 - 5170	Siltstone - as 4810 - 4820'.
5170 - 5180	Siltstone - as 4810 - 4820'.
5180 - 5210	Siltstone - as 4810 - 4820'.
5210 - 5240	Siltstone - <u>as 4810 - 4820'.</u>
5340 - 5270	Siltstone - as 4810 - 4820'.
5270 - 5280	Siltstone - as 4810 - 4820'.