

UNITED FUEL GAS COMPANY

Number: 6431

Location: 9200' East of 82° 00'; and 3900' South of 37° 10'.

Buchanan County, Virginia.

Total Depth: 4800'.

Interval

275-283	Graywacke, very light gray (N8), fine-grained, subangular to angular, very poorly sorted (several medium-grained quartz grains), about 80% quartzose, dark inclusions, muscovite, chlorite, glauconite (?), some rose quartz, little pink chert, silt cement, moderately well cemented, predominantly loose grains; trace pyrite.
283-288	Ditto.
288-295	Ditto.
295-303	Ditto.
202-210	Shale, medium dark gray (N4), slightly fissile, very finely micaceous.
310-317	Ditto.
317-325	Ditto, trace very finely micaceous material.
325-330	Shale, slightly silty to silty, medium dark gray (N4), very finely micaceous.
330-335	Shale, silty to very silty, part sandy, medium dark gray (N4), slightly micaceous (part with large flakes of muscovite).
335-340	Shale, silty to slightly silty, medium dark gray (N4), very finely micaceous.
340-345	Shale, very slightly silty, medium dark gray (N4), slightly fissile, very finely micaceous.

Interval

- 345-350 Shale, sandy, medium dark gray (N4), slightly micaceous.
- 350-355 Shale, as above, to slightly silty, some large flakes of muscovite.
- 355-360 Siltstone, shaly, very slightly to slightly calcareous, medium light gray (N6), medium-grained, subangular to rounded, poorly sorted, slightly micaceous, dark inclusions, well cemented.
- 360-364 Shale, silty, slightly calcareous, medium dark gray (N4), finely micaceous.
- 364-368 Siltstone, shaly, medium light gray (N6), medium-grained, subrounded, moderately poorly sorted, very slightly calcareous, slightly micaceous, well cemented.
- 368-374 Shale, very silty, slightly calcareous, medium gray (N5), micaceous.
- 374-379 Shale, as above, silty, very slightly calcareous.
- 379-384 Shale, very silty (approaching siltstone), medium light gray (N6), part slightly sandy, grading to fine-grained siltstone with dark inclusions, micaceous.
- 384-388 Shale, silty, slightly calcareous, medium gray (N5), micaceous.
- 388-389 No sample.
- 389-394 Shale, medium dark gray (N4), slightly fissile, very finely micaceous.
- 394-400 Shale, silty, medium gray (N5), very micaceous.
- 400-407 Shale, carbonaceous, dark gray (N3); about 1/2 shale, silty, medium dark gray (N4), very slightly micaceous.
- 407-414 Shale, silty, medium dark gray (N4), finely micaceous.
- 414-420 No samples.
- 420-425 Graywacke, light gray (N7.3), very fine-grained, subangular to angular, very poorly sorted, about 75% quartzose, dark inclusions, muscovite, much silt cement, moderately friable. moderately well cemented.
- 425-429 Ditto.
- 429-435 Graywacke, brownish gray (5YR 4/1), as above, considerable muscovite.
- 435-444 Shale, medium dark gray (N4), slightly fissile, very finely micaceous.

Interval

- 444-453 Shale, as above.
- 453-460 Ditto.
- 460-467 Ditto, slightly fissile to chunky.
- 467-473 Ditto, very slightly micaceous.
- 473-476 Shale, very silty, light gray (N6.8), slightly micaceous.
- 476-479 No samples.
- 479-489 Graywacke, light gray (N7), very fine-grained, subangular, very poorly sorted, about 50% quartzose, considerable black very fine-grained inclusions, some green (glauconite?), muscovite, considerable silt cement, moderately well cemented.
- 482-488 Graywacke, as above, about 45% quartzose, many loose grains; trace coal, conchoidal high luster; shale, carbonaceous, dark gray (N3), 10%.
- 488-494 Graywacke, as above 50% quartzose, black inclusions to fine-grained.
- 494-500 Graywacke, as above, fine-grained, very slightly calcareous.
- 500-508 Ditto, trace calcareous material; trace coal; (sample needs washing).
- 508-515 Shale, very silty, medium light gray (N6) very micaceous to slightly micaceous.
- 515-520 Graywacke, as 500-508, about 60% quartzose.
- 520-525 Shale, very silty, light gray (N7), finely micaceous.
- 525-531 Graywacke, as 515-520.
- 531-537 Shale, slightly silty, medium gray (N5), finely micaceous, 40%; shale, very carbonaceous to carbonaceous, dark gray (N3); 10% coal, shaly.
- 537-545 Shale, silty, medium light gray (N6), very finely micaceous.
- 545-549 Siltstone, shaly, medium light gray (N6), coarse-grained, subrounded, poorly sorted, slightly micaceous, dark inclusions, moderately well cemented.
- 549-554 Shale, silty, medium gray (N5), micaceous.
- 554-561 Graywacke, very light gray (N8), very fine-grained, sub-rounded, very poorly sorted, about 65% quartzose, black and brown very fine-grained inclusions, muscovite, silt cement, moderately well cemented.

Interval

- 561-568 Graywacke, as above, very micaceous, about 55% quartzose, more brown inclusions, few green (glaucinite ?) inclusions; and 1/3 graywacke calcareous, light brownish gray (5YR 6/1), as very light gray graywacke.
- 568-575 Ditto, light gray (N7), as very light gray above.
- 575-581 Ditto, (sample needs washing).
- 581-589 Ditto, slightly calcareous.
- 589-596 Shale, silty, medium dark gray (N4), to shaly siltstone, (sample needs washing).
- 596-603 Ditto.
- 603-609 No sample.
- 609-610 Coal, very high luster.
- 610-618 Coal, shaly, some non-shaly, high luster, and carbonaceous shale, 75%; graywacke, light gray (N7), very-fine-grained, subangular, very poorly sorted, about 65% quartzose, dark and brown inclusion, considerable muscovite, trace chlorite, silt cement, moderately well cemented.
- 618-623 Graywacke, trace pyrite, as above.
- 623-630 Graywacke, as above, fine-grained, glauconite? little rose quartz, mostly very small clusters to loose grains.
- 630-635 Ditto, some medium-grained quartz, little yellowish chert, more glauconite?
- 635-641 Ditto.
- 641-648 Ditto.
- 648-653 Ditto, (sample dirty).
- 653-660 Ditto, medium-grained, angular to subangular, predominantly loose grains.
- 660-666 Shale, silty to very silty, medium light gray (N6), dark inclusions, very micaceous.
- 666-671 Shale, slightly silty, medium gray (N5), micaceous.
- 671-676 Shale, as above, to very silty, medium light gray (N6), (approaching siltstone).
- 676-684 Shale, carbonaceous, dark gray (N3), part very finely micaceous; some coal, high luster.

Interval

- 684-692 Shale, medium gray (N5), slightly fissile, finely micaceous, (sample needs washing).
- 692-699 Siltstone, medium light gray (N6), medium-grained, rounded, moderately well sorted, few green and black inclusions, very finely micaceous, moderately well-to well cemented.
- 699-707 Shale, medium dark gray (N4), slightly fissile, very finely micaceous; some shale, carbonaceous, dark gray (N3); trace coal, very high luster.
- 707-715 Shale, medium dark gray (N4), slightly fissile, micaceous.
- 715-723 Shale, as above.
- 723-731 Ditto, some medium light gray (N6), silty shale grading to shaly siltstone.
- 731-741 Shale, medium dark gray (N4), very finely micaceous (sample needs washing).
- 741-749 Ditto.
- 749-757 Ditto, about 1/3 shaly siltstone, medium light gray (N6), considerable brown and dark inclusions, micaceous.
- 757-763 Shale, medium dark gray (N4), very finely micaceous.
- 763-769 Shale, as above, slightly fissile, few large flakes of muscovite.
- 769-775 Graywacke, very light gray (N8), very fine-grained, subangular to angular, very poorly sorted, about 75% quartzose, dark and black inclusions, muscovite, moderately well cemented.
- 775-780 Graywacke, fine-grained, some glauconite? mostly loose grains, considerable coal with high luster.
- 780-786 No sample.
- 786-792 Graywacke, as above; shale, medium gray (N5), fissile, resinous luster, very finely micaceous, 25%.
- 792-798 Graywacke, as above, some fibrous coal, little pyritized.
- 798-805 Shale, very slightly silty to silty, medium gray (N5), finely micaceous to micaceous.
- 805-812 Siltstone, shaly, medium light gray (N6), brown and black inclusions, very micaceous, moderately well- to well cemented.

Interval

- 812-820 Graywacke, very light gray (N8), very fine-grained, sub-angular, very poorly sorted, about 65% quartzose, considerable brown and black inclusions, trace red inclusions, some chlorite and glauconite (?), considerable muscovite, silt cement, moderately well cemented.
- 820-828 Ditto, trace calcareous material.
- 828-839 Ditto, fine-grained, angular to subangular, more glauconite than above.
- 839-850 Ditto, very few clusters to loose grains.
- 850-861 Ditto, part slightly calcareous.
- 861-868 Ditto, none calcareous some light bluish gray chert and phlogopite noted.
- 868-878 Shale, dark gray (N3), part carbonaceous and little sandstone, trace very finely micaceous material; little slightly silty to very slightly silty dark gray shale; about 10% coal, part shaly.
- 878-886 Graywacke, very light gray (N8), very fine-grained (approaching siltstone), subangular to subrounded, moderately poorly sorted, about 85% quartzose, considerable brown inclusions, some black inclusions, trace glauconite (?), micaceous, silt cement, moderately well cemented.
- 886-896 Ditto.
- 896-906 Ditto, about 80% quartzose, moderately well cemented to well cemented.
- 906-916 Ditto, very slightly calcareous.
- 916-922 Ditto, non-calcareous, moderately well cemented.
- 922-925 No sample.
- 925-933 Ditto, very small dust to loose grains.
- 933-941 Shale, medium gray (N5), very slightly fissile, very micaceous; coal, high luster, conchoidal fractured, about 15%.
- 941-950 Shale, as above, very slightly silty to silty.
- 950-956 Shale, medium dark gray (N4), very slightly silty, slightly fissile, very finely micaceous to very micaceous.
- 956-962 Shale, medium dark gray (N4), slightly fissile, very finely micaceous; shale, very carbonaceous, dark gray (N3); some coal, blocky.

Interval

- 962-967 Graywacke, light brownish gray (5YR 6/1) to light gray (N7), fine-grained, subangular to angular, very poorly sorted, about 65% quartzose, dark and brown inclusions, some glauconite? trace red inclusions, considerable muscovite, considerable silt cement, moderately well cemented.
- 967-976 Graywacke, very light gray (N8), fine-grained to very fine-grained, as above, very small clusters to loose grains.
- 976-986 Ditto.
- 986-998 Ditto, fine-grained, loose grains.

Samples run by Eloise T. Jacobsen
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Lexington, Kentucky
February, 1950

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Location: 9200 feet E. of 82° longitude, 3900 feet S. of 37° 10' latitude.
On Walker Branch of Garden Creek, Buchanan County, Virginia.

<u>Interval</u>	<u>Description</u>
998-1006	Sandstone, light gray (N7)*, fine-grained, some medium-grained, subrounded, poorly sorted, micaceous (large flakes of muscovite?), friable to few clusters, slightly, peppered with black and little green (glauconite?) minerals.
1006-1016	Sandstone, as above, 80%; shale, medium dark gray (N4), silty, 20%.
1016-1024	Sandstone, as above, 80%; shale, medium dark gray (N4), as above 5%; trace of grayish red (5 R 4/2), silty shale.
1024-1034	Sandstone, as in 998-1024, less than one-half quartz, larger black inclusions, very slightly calcareous cement.
1034-1048	Shale, medium gray (N5), silty to some very silty (some approaching shaly siltstone), slightly micaceous, 85%; sandstone, as above, 15%.
1048-1060	Shale, as above.
1060-1070	Shale, as above, 70%; sandstone, very light gray (N8), very fine-grained, subrounded, moderately well sorted, slightly peppered with dark minerals, slightly calcareous cement.
1070-1080	Shale, as above, 80%; sandstone, as above, 10%; siltstone, as sandstone, 10%.
1080-1087	Sandstone, as above, 70%; shale, as above, 30%.
1087-1095	Siltstone, very light gray (N8), coarse-grained, subrounded, moderately well sorted, clusters with slightly calcareous cement and peppered with black and brown minerals, micaceous (larger flakes of muscovite?), 60%; shale, as above, silty, 40%.

*Color descriptions and numbers taken from National Research Council Rock-Color Chart.

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- 1095-1100 Siltstone, as above, 60%; siltstone, medium gray (N5), very fine-grained, some shaly, 20%; shale, as above, 20%.
- 1100-1103 Sandstone, very light gray (N8), very fine- to fine-grained, subrounded, some dark mineral inclusions, moderately well sorted, slightly calcareous cement, 90%; siltstone, medium gray, and shale, medium gray, 10%.
- 1103-1108 Sandstone, as above, slightly micaceous (larger flakes of muscovite?), 90%; siltstone, and shale, 10%.
- 1108-1113 Ditto.
- 1113-1117 Sandstone, very light gray (N8), very fine-grained, subrounded to rounded, moderately well sorted, friable, half with iron staining.
- 1117-1123 Ditto.
- 1123-1130 Ditto.
- 1130-1136 Sandstone, as above, subrounded, clusters with some peppered with black and few green (glauconite?) minerals, some white and clear quartz grains and fragments to 1.5 mm, 60%; shale, dark gray (N3), micaceous, 30%; shale, dark gray (N3), very hard, slightly calcareous, 10%.
- 1136-1140 Sandstone, as above, friable to few clusters, 70%; shale, as above, 30%.
- 1140-1145 Sandstone, as above, friable, 95%; shale, as above, 5%.
- 1145-1152 Sandstone, as above, friable to clustered.
- 1152-1162 Sandstone, as above, friable, 50%; siltstone, very light gray (N8), medium-grained, subrounded, moderately well sorted, friable, 50%.
- 1162-1164 Sample missing.
- 1164-1168 Sandstone, white (N9), fine-grained, subrounded, to some rounded, moderate sorting, friable to few clusters with black and few green (glauconite?) mineral inclusions.
- 1168-1172 Ditto.
- 1172-1184 Ditto.
- 1184-1191 Shale, dark gray (N3), some very slightly micaceous.
- 1191-1199 Ditto.

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- 1099-1204 Shale, as above, 50%; sandstone, medium dark gray (N4), very fine-grained, subrounded, poorly sorted, shaly, very slightly calcareous cement, some with larger flakes of mica (some muscovite?), 50%.
- 1204-1210 Shale, as above, 75%; sandstone, as above, 25%.
- 1210-1220 Sandstone, very light gray (N8), fine-grained, subangular, very poorly sorted, considerable brown and black and little green mineral inclusions, slightly micaceous (muscovite? in flakes).
- 1220-1231 Ditto.
- 1231-1239 Sandstone, as above, 95%; shale, dark gray (N3), some brownish gray (5 YR 4/1), 5%.
- 1239-1249 Sandstone, as above, 55%, coal, 15%; shale, dark gray (N3), carbonaceous, 10%; shale, medium dark brownish gray (5 NYR 4/1), very hard, 10%; shale, medium gray (N5), slightly silty, 10%.
- 1249-1263 Shale, medium gray (N5), micaceous, 70%; shale, dark gray, as above, 10%; shale, medium dark brownish gray, as above, 10%. siltstone, brownish gray (5 YR 4/1), coarse-grained, 10%.
- 1263-1273 Sandstone, light gray (N7), fine-grained, subrounded, moderately poorly sorted, considerable dark mineral grains included, micaceous, large pieces of coal (cavings?).
- 1273-1285 Sandstone, as above, 90%; shale, dark gray (N3) and brownish gray, 10%.
- 1285-1291 Sandstone, as above, larger flakes of mica (muscovite?).
- 1291-1298 Sandstone, as above, and some fine-grained green mineral (glauconite?) inclusions.
- 1298-1310 Sandstone, as above, some medium-grained, micaceous, 60%; sandstone, medium gray (N5), very fine-grained, subrounded, moderately well sorted, micaceous, 40%.
- 1310-1323 Ditto.
- 1323-1332 Sandstone, as above, 70%; sandstone, medium gray, as above, 30%.
- 1332-1340 Ditto.
- 1340-1354 Sandstone, as above, friable, 50%; coal, 40; shale, medium dark gray (N4), finely micaceous. 10%.

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- 1354-1367 Shale, medium dark gray (N4), 85%; shale, medium light gray (N6.5), silty finely micaceous, 10%; sandstone, as above, with trace of coal and carbonaceous shale, 5%.
- 1367-1374 Shale, medium light gray, as above.
- 1374-1384 Ditto.
- 1384-1390 Siltstone, very light gray (N8), medium-grained, subrounded, shaly, micaceous, peppered with black minerals.
- 1390-1399 Shale, medium light gray (N6), slightly finely micaceous, 90%; siltstone, as above, 10%.
- 1399-1408 Shale, as above.
- 1408-1418 Coal. 85%; shale, grayish black (N2), and as above, 15%.
- 1418-1430 Sandstone, very light gray (N8), very fine-grained, subangular, rather poorly sorted, with considerable dark mineral inclusions, about one-half quartzose, slightly calcareous cement, 90%; shale and coal, as above, 10%.
- 1430-1445 Sandstone, as above.
- 1445-1457 Sandstone, as above, friable to very small clusters.
- 1457-1472 Shale, medium gray (N5), slightly finely micaceous, some rather silty, 85%; sandstone, as above, 15%.
- 1472-1479 Shale, as above, some very slightly silty.
- 1479-1487 Sandstone, very light gray (N8), very fine-grained, subangular, poorly sorted, considerable fine-grained black mineral, one-half quartzose, very small clusters to some friable, 80%; shale, as above, 20%.
- 1487-1500 Sandstone, as above, more included minerals, some green, some micaceous (larger flakes of muscovite?), 80%; sandstone, light brownish gray (5 YR 6/1), and as above, very calcareous cement, 20%.
- 1500-1510 Sandstone, very light gray, as above, 90%; sandstone, light brownish gray, 10%.
- 1510-1521 Ditto.
- 1521-1535 Ditto.

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1535-1545	Shale, medium gray (N5), slightly and very finely micaceous.
1545-1552	Ditto.
1552-1562	Ditto.
1562-1570	Shale, as above, very finely micaceous, some slightly silty.
1570-1580	Ditto.
1580-1590	Shale, as above, some slightly silty to silty, some slightly fissile.
1590-1600	Sandstone, very light gray (N8), fine-grained, subrounded, moderately well sorted, friable to few clusters with few dark minerals and mica, 80%; shale, medium brownish gray and light brownish gray (5 YR 5/1 and 5 YR 6/1), 10%; shale, medium gray, as above, 5%; shale, dark gray, carbonaceous, and coal, 5%.
1600-1607	Sandstone, as above, 90%; shale, brownish gray and medium gray, 10%.
1607-1614	Sandstone, as above, 90%; shale, brownish gray and medium light gray, 10%.
1614-1627	Shale, medium light gray (N6), non-silty to some silty, 60%; sandstone, as above, slightly calcareous cement, 40%.
1627-1638	Sandstone, as above, more dark mineral inclusions, 80%; shale, as above, 20%.
1638-1648	Ditto.
1648-1656	Sandstone, light gray (N7), very fine-grained, subrounded, moderately well sorted, about one-half quartzose, numerous black mineral grains, micaceous, small clusters.
1656-1665	Sandstone, very light gray (N8), as above, friable to few very small clusters.
1665-1674	Sandstone, very light gray (N8), subrounded, fine-grained (very fine-grained to few medium grains), poorly sorted, friable to few cluster with considerable dark mineral grains, about one-half quartzose, very slightly calcareous cement, micaceous.
1674-1683	Sandstone, as above, subangular to subrounded.
1683-1693	Ditto.

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- 1693-1703 Sandstone, as above. Noted some coarse grains and one piece of white quartz, 1 mm., rather angular.
- 1703-1712 Sandstone, as above, 85%; shale, medium gray (N5), very silty to shaly siltstone, micaceous, 10%; shale, dark brownish gray (5 YR 3/1) and medium gray (N5), very finely micaceous, 5%.
- 1712-1723 Ditto.
- 1723-1733 Sandstone, as above, more included larger quartz fragments, 80%; shale, medium gray (N5), micaceous.
- 1733-1742 Ditto.
- 1742-1752 Ditto.
- 1752-1763 Shale, medium gray and medium light gray (N5 and N6), 40%; shale, dark grayish red (5 R 3/2), 20%; shale, medium light gray (N6), silty and finely micaceous, 5%; sandstone, as above, 35%.
- 1763-1772 Ditto.
- 1772-1778 Shale, grayish red (5 R 4/2), very finely micaceous, 60%; shale, medium gray (N5), 40%.
- 1776- ? Shale, grayish red (5 R 3/2) and grayish red purple (5 RP 4/2), 70%; siltstone, medium greenish gray (5 GY 7/1), coarse-grained, subrounded, rather poorly sorted, some green, red, orange and black mineral inclusions, very slightly calcareous cement, 30%.
- 1778-1784 Shale, grayish red and purple, as above, 30%; shale, medium gray (N5), and some greenish gray (5 GY 6/1), 30%; siltstone, as above, 40%.
- 1784-1793 Shale, red and purple, as above, 40%; shale, gray and greenish gray, 20%; siltstone, as above, 40%.
- 1793-1803 Shale, red and purple, some gray, 40%; sandstone, very fine-grained, as siltstone above, 60%.
- 1803-1814 Sandstone, as above, 60%; shale, red, and some purple and gray, 40%.
- 1814-1823 Sandstone, as above 70%; shale, as above, 30%.

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- 1823-1827 Shale, grayish red (5 R 4/2), 80%; shale, medium gray (N5), silty, micaceous, 10%; sandstone, as above, friable, 10%.
- 1827-1835 Shale, red, as above, 50%; shale, medium light gray (N6), silty, somewhat micaceous, 50%.
- 1835-1846 Shale, medium light gray (N6), slightly silty, very slightly micaceous, 90%; shale, red, as above, 10%.
- 1846-1857 Shale, medium light gray, very silty, 95%; shale, red, 5%.
- 1857-1866 Shale, as above, silty; trace of red shale.
- 1866-1872 Ditto.
- 1872-1877 Sandstone, very light gray (N8), very fine-grained, friable to few clusters, subrounded, rather well sorted, 35%; shale, medium light gray and medium gray (N6 and N5), some very slightly calcareous, some silty, most moderately micaceous, 35%; siltstone, medium light gray (N6), medium-grained, subrounded, moderately poorly sorted, 15%; shale, grayish red (5 R 4/2), 15%.
- 1877-1887 Shale, medium dark gray to medium gray (N4 and N5), some silty and micaceous, 50%; siltstone, as above, siliceous cement, 25%; shale, red, as above, 25%.
- 1887-1889 Shale, grayish red, as above, 80%; shale, gray, as above, 10%; sandstone, medium pinkish gray (5 Y 7/1), very fine-grained, subrounded, rather poorly sorted, finely peppered with black and red minerals, about one-half quartzose, 10%.
- 1889-1893 Sandstone, as above, 70%; shale, red, as above, 20%; shale, gray, as above, 10%.
- 1893-1900 Sandstone, as above, 50%; shale, medium dark gray (N4), some micaceous and silty, 30%; shale, red, as above, 20%.
- 1900-1909 Shale, medium dark gray, as above, 80%; siltstone, as sandstone, above, 15%; sandstone, as above, 5%; trace of red shale.
- 1909-1920 Shale, medium dark gray, very silty, very slightly micaceous, 60%; siltstone, medium dark gray, very slightly micaceous, somewhat shaly, 20%; siltstone, medium gray (N5), siliceous cement, 10%; sandstone, as above, calcareous cement, 10%; trace of red shale.

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1920-1929 Ditto: red shale, 2%.

1929-1937 Siltstone, medium dark gray, as above, 50%; shale, medium dark gray, as above, 25%; sandstone, as above, 15%; red shale, 10%. Sample dirty.

1937-1946 Siltstone, medium dark gray, as above, 70%; sandstone, as above, calcareous cement, 30%. Sample dirty.

1946-1954 Sandstone, as above, 70%; siltstone, as above, 20%; shale, dark gray (5 R 3/2), 10%.

1954-1964 Sandstone, as above, shaly, micaceous, 65%; siltstone, medium dark gray (N5), as above, 10%; shale, red, as above, 25%.

1964-1974 Sandstone, as above, 70%; shale, red, as above, 25%; siltstone, as above, 5%.

1974-1986 Siltstone, medium dark gray, 90%; shale, red, 5%; sandstone, as above, 5%.

1986-2002 Shale, medium dark gray (N4), very silty, 70%; siltstone, as sandstone above, 15%; shale, red, 15%.

2002-2012 Shale, medium light gray (N6), very finely micaceous.

2012-2020 Ditto: slightly silty.

2020-2030 Ditto: more micaceous, very slightly calcareous.

2030-2043 Ditto: some very silty, some calcareous.

2043-2052 Shale, as above, 70%; sandstone, very light gray (N8), subrounded, moderately well sorted, peppered with green and dark minerals, about one-half quartzose, clustered, slightly calcareous cement, 30%.

2052-2060 Shale, medium gray (N5), slightly silty, micaceous, 75%; sandstone, as above, some friable, 25%.

2060-2069 Shale, as above, some very silty, 50%; sandstone, as above, calcareous cement, 50%.

2069-2078 Shale, as above, 75%; sandstone, as above, 20%; shale, red, 5%.

2078-2086 Shale, as above, very silty, 80%; sandstone, as above, 15%; shale, red, 5%.

2086-2095 Ditto.

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- 2095-2113 Shale, medium gray (N5), micaceous, some slightly silty.
- 2113-2123 Ditto.
- 2123-2132 Ditto: some slightly calcareous.
- 2132-2143 Ditto: less silty.
- 2143-2153 Ditto: more calcareous.
- 2153-2161 Ditto: calcareous.
- 2161-2170 Shale, medium dark gray (N4), slightly finely micaceous.
- 2170-2180 Shale, medium light gray (N6), silty, peppered with small dark rounded minerals, finely micaceous, 60%; shale, medium dark gray, as above, 20%; shale, grayish red purple (5 RP 4/2), 20%.
- 2180-2189 Ditto.
- 2189-2195 Shale, medium light gray, 70%; shale, medium dark gray, 20%; shale, red, 10%.
- 2195-2200 Sandstone, very light gray (N8), very fine-grained, subrounded to subangular, friable to few clusters with few black mineral inclusions, 70%; shales, as above, 30%.
- 2200-2205 Ditto.
- 2205-2212 Shale, grayish red (5 R 4/2), 80%; sandstone, as above, clustered, 10%; shale, gray, 10%.
- 2212-2216 Sandstone, grayish white (N8:5), very fine-grained, subangular to subrounded, rather well sorted, 80%; shale, red, as above, 10%; shale, gray, 10%.
- 2216-2220 Ditto.
- 2220-2225 Ditto.
- 2225-2230 Sandstone, as above, 95%; shale, medium gray and some red, 5%.
- 2230-2236 Ditto.
- 2236-2242 Sandstone, as above, 85%; shale, grayish red (5RR 4/2), rather mottled, small pieces, 10%; shale, gray, 5%.
- 2242-2250 Sandstone, as above, 85%; shale, red, as above, 7%; shale, gray, 8%.

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- 2250-2254 Sandstone, as above, some clusters, considerably iron-stained, 93%; shale, red and gray, 7%.
- 2254-2266 Sandstone, white (N9), as above, slightly micaceous, 90%; shale, red, 7%; shale, gray, 3%.
- 2266-2272 Sandstone, as above, considerable iron staining, 90%; shale, gray, 7%; shale, red, 3%.
- 2273-2277 Sandstone, very light gray (N8), as above, more clusters with more mineral inclusions, 95%; shale, gray and little red, 5%.
- 2277-2283 Ditto.
- 2283-2288 Ditto: much iron staining.
- 2288-2291 Sample missing.
- 2291-2293 Same as 2283-2288.
- 2293-2296 Ditto: considerable iron staining.
- 2296-2298 Ditto: some iron staining.
- 2298-2300 Sandstone, white (N9), as above, 95%; shale, red, 3%; shale, gray, 2%.
- 2300-2305 Sandstone, as above, 99%; shales, as above, 1%.
- 2305-2310 Ditto.
- 2310-2312 Ditto: subrounded to some subangular.
- 2312-2318 Sandstone, as above, 90%; shale, red, 8%; shale, gray, 2%.
- 2318-2321 Sandstone, as above, 99%; shale, as above, 1%.
- 2321-2323 Ditto.
- 2323-2326 Sandstone, white, fine-grained, subrounded to some subangular, friable to few small clusters, calcareous cement, 75%; shale, grayish black (N2), mostly carbonaceous to very carbonaceous, 15%; sandstone, medium light gray, same as white above, 10%; considerable pyrite.
- 2326-2328 Sandstone, white (N9), very fine-grained, to some fine-grained, as above, 90%; shale, blackish gray, as above, 10%.
- 2328-2335 Sandstone, as above, 95%; shale, as above, 5%.

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2335-2339 Ditto.

2339-2342 Ditto.

2342-2345 Ditto.

2345-2348 Ditto: friable to some clusters, very slightly calcareous, very slightly peppered with dark minerals.

2348-2355 Ditto.

2355-2358 Ditto: calcareous cement.

2358-2361 Ditto.

2361-2366 Ditto.

2366-2375 Limestone, medium dark gray (N4), shaly, medium clastic, fossiliferous (fenestellid bryozoans, brachiopods?), 75%; shale, medium dark gray (N4), calcareous, slightly silty, 25%.

2375-2384 Limestone, medium light gray (N6), finely clastic, very shaly.

2384-2392 Limestone, as above, slightly fossiliferous (crinoids?), 75%; shale, medium light gray (N6), calcareous, 25%.

2392-2400 Limestone, as above, very shaly to slightly silty, some medium clastic, slightly fossiliferous, approximately one-half calcareous shale.

2400-2408 Limestone, medium dark gray (N4), finely clastic, shaly, fossiliferous (crinoids, brachiopods?); trace of shaly limestone, very light gray (N8), finely clastic.

2408-2415 Ditto.

2415-2420 Limestone, medium light gray (N6), finely clastic, shaly, trace of very light gray limestone, as above.

2420-2429 Limestone, as above, 40%; limestone, medium gray (N5), medium to coarsely clastic, fossiliferous (brachiopods?), 40%; limestone, very light gray (N8), medium clastic, fossiliferous, silty, 20%; trace of sandstone, very light gray (N8 to N5), very fine-grained, with calcareous cement.

2429-2437 Ditto.

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- 2437-2448 Shale, red (5 R 5/2), very slightly micaceous, some slightly silty, 80%; limestone, medium gray (N5), finely clastic, shaly, slightly fossiliferous, 20%.
- 2448-2457 Shale, red, as above, 70%; limestone, medium gray, as above, and medium gray, medium clastic, fossiliferous (crinoid fragments, 1.5 to 2 mm.), 30%; trace of shale, greenish gray, some pebbly.
- 2457-2467 Shale, red, as above, some slightly calcareous.
- 2467-2484 Shale, red, as above, 70%; shale, medium gray (N5), 10%; limestone, medium gray, finely to medium clastic, shaly, 20%.
- 2484-2492 Ditto.
- 2492-2500 Sample missing.
- 2500-2505 Shale, medium gray (N5), approaching fissile, 80%; shale, medium light gray (N6), very silty, 10%; shale, light grayish red (55R 4.5/2), 10%.
- 2505-2510 Sandstone, very light gray (N8), very fine- to fine-grained, subangular, rather poorly sorted, more to less in alignment, considerable fine-grained green mineral grains, about one-half quartzose, micaceous, clustered, 70%; shale, medium gray (N5), very finely micaceous, few speckled with dark very fine-grained mineral, 15%; shale, very dusky red (10 R 2/2), 15%; trace of pyrite.
- 2510-2516 Sandstone, as above, more fine-grained than very fine-grained, clustered, 50%; shale, red, as above, 40%; shale, gray, as above, 10%.
- 2516-2525 Sample missing.
- 2525-2533 Sandstone, light pinkish gray (55YR 8.5/1), fine-grained, subangular to subrounded, rather poorly sorted, friable to very few clusters; few green mineral grains, very slightly to calcareous cement.
- 2533-2540 Ditto.
- 2540-2545 Sandstone, medium light greenish gray (5 GY 7/1), very fine-grained to some fine-grained, very poorly sorted, subangular to subrounded, abundant green mineral, about one-half quartzose, small clusters to clusters, very slightly micaceous, 50%; sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, friable to very few small clusters, some iron staining, 50%.

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- 2545-2550 Sandstone, white, as above, 75%; sandstone, greenish gray, 25%.
- 2550-2556 Sandstone, white, as above, 60%; sandstone, greenish gray, as above, 40%.
- 2556-2560 Sandstone, white, as above, 90%; limestone, brownish gray (5 YR 4/1), finely clastic, 10%; trace of gray shale.
- 2560-2567 Shale, medium dark gray (N4), some very calcareous, finely micaceous, 40%; siltstone, light gray (N7), very fine-grained, subrounded, rather poorly sorted, micaceous, very slightly calcareous cement, some dark mineral inclusions, 30%; limestone, brownish gray (5 YR 4/1), finely clastic, 10%; sandstone, as above, 20%.
- 2567-2574 Shale, medium dark gray, some fissile, very finely micaceous, 90%; shale, and siltstone, as above, 10%.
- 2574-2582 Limestone, medium dark gray (N4), very finely clastic, shaly, 60%; shale, medium dark gray (N4), calcareous, some very finely micaceous, 35%; sandstone, as above, 5%; trace of shale, grayish red (10 R 4/2).
- 2582-2591 Shale, medium dark gray (N4), finely micaceous, 35%; shale, very dusky red (10 R 2/2), finely micaceous, 25%; siltstone, very light gray (N8), medium-grained, subrounded, poorly sorted, very calcareous cement, shaly, 10%; limestone, as above, 25%; All small pieces.
- 2591-2600 Shale, grayish red (5 R 4/2), finely micaceous, somewhat fissile, 35%; shale, medium light gray (N6), very slightly calcareous, slightly silty, and micaceous, 25%; shale, medium gray (N5), slightly to very calcareous, fossiliferous (pelecypods?), 25%; limestone, medium gray (N5), finely clastic, shaly, 15%.
- 2600-2606 Shale, dusky red (10 R 3/2), finely micaceous, 75%; shale, olive gray (5 Y 3/2), very finely micaceous, 20%; limestone, as above, 5%.
- 2606-2612 Shale, grayish red (10 R 4/2), micaceous, silty.
- 2612-2620 Siltstone, grayish red (10 R 4/2), very fine-grained, micaceous, very slightly calcareous, 30%; siltstone, pale red (10 R 6/2), medium-grained, subrounded, very poorly sorted, considerable dark minerals, extremely calcareous cement, micaceous, 20%; siltstone, medium gray (N5), medium-grained, poorly sorted, shaly, micaceous, 20%; shale, red, as above, 30%.

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- 2620-2633 Shale, grayish red (5 R 4/2), calcareous, finely micaceous, 50%; shale, medium dark gray (N4), slightly calcareous, very finely micaceous, 50%.
- 2633-2643 Shale, medium gray (N5), slightly calcareous, finely micaceous, 80%; shale, red, as above, 20%.
- 2643-2653 Shale, medium gray, as above,
- 2653-2657 Ditto: very slightly calcareous.
- 2657-2663 Siltstone, light gray (N7), medium-grained, subrounded, poorly sorted, shaly, very slightly calcareous, dark mineral inclusions, 70%; shale, medium gray (N5), slightly fossiliferous, very slightly micaceous, 30%.
- 2663-2675 Ditto.
- 2675-2678 Siltstone, light gray (N7), coarse-grained, subrounded, moderately well sorted, friable, 90%; shale, as above, 10%.
- 2678-2682 Siltstone, light gray to pinkish gray (5 YR 8/1), as above.
- 2682-2689 Ditto.
- 2689-2695 Siltstone, as above, 80%; shale, medium gray (N5), finely micaceous, some silty, 20%; trace of pyrite.
- 2695-2709 Siltstone, very light gray (N8), very fine-grained, subrounded to rounded, moderately poorly sorted, slightly peppered with dark minerals, medium micaceous, slightly calcareous to calcareous, 90%; siltstone, medium light gray (N6), same as very light gray, non-calcareous, 10%.
- 2709-2715 Siltstone, grayish red (10 R 4/2), same as very light gray siltstone above, very calcareous, 50%; light pale red (10 R 7/2), very slightly calcareous, 20%; limestone, medium light brownish gray (5 YR 5/1), medium clastic, very sandy (approaching very calcareous fine-grained sandstone), 20%; shale, medium gray (N5), very micaceous to some slightly micaceous, 10%; considerable pyrite.
- 2715-2721 Siltstone, light gray (N7), medium-grained, rounded, moderately well sorted, few dark mineral grains, slightly micaceous, very slightly calcareous cement, to some coarse-grained, poorly sorted, 90%; siltstone, medium gray (N5), fine- to medium-grained, noncalcareous to little very calcareous, considerable very fine-grained black mineral inclusions, micaceous, 10%; trace of sandstone, white (N9), very fine-grained.

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- 2721-2728 Limestone, medium gray (N5), finely clastic, silty, 50%; siltstone, light gray, as above, friable to very small clusters, 40%; siltstone, medium gray (N5), as above, friable, 10%.
- 2728-2737 Shale, medium gray (N5), silty, very calcareous to slightly calcareous, 60%; siltstone, light gray, as above, very calcareous cement, clustered, 40%.
- 2737-2746 Shale, medium light gray (N6), some slightly silty, 98%; shale, dark grayish red (5 R 3/2), very calcareous (approaching shaly limestone), 2%.
- 2746-2756 Ditto.
- 2756-2758 Sandstone, very light gray (N8), very fine-grained, subrounded to rounded, moderately well sorted, very small clusters to friable, 50%; shale, medium dark gray (N4), very calcareous, some finely micaceous, 25%; limestone, medium dark gray (N4), shaly, 25%. (All very small pieces).
- 2758-2765 Sandstone, light gray (N7), very fine-grained, poorly sorted, slightly peppered with dark minerals, slightly micaceous, about one-half quartzose, 85%; siltstone, medium gray (N5), coarse-grained, subrounded, moderately well sorted, 15%.
- 2765-2770 Siltstone, very light gray (N8), medium-grained, subrounded, moderately well sorted, slightly peppered with dark minerals, about one-half quartzose, very slightly calcareous cement, 90%; siltstone, medium gray (N5), as above, 10%.
- 2770-2773 Siltstone, very light gray, as above, very small clusters to friable, some iron staining, 90%; shale, medium dark gray (N4), slightly fissile, very small pieces, 10%.
- 2773-2780 Siltstone, white (N9), as above, 95%; shale, as above, 5%.
- 2780-2784 Siltstone, very light gray (N8), clustered, 98% shale, as above, and grayish red (5 R 4/2), 2%.
- 2784-2787 Siltstone, very light gray, as above, friable, considerable iron staining, 98%; shale, medium dark gray (N4), 2%.
- 2787-2795 Siltstone, as above, to some clustered, 98%; shale, as above, and trace of grayish red (5 R 4/2), very silty, 2%.
- 2795-2808 Shale, medium light gray (N6).
- 2808-2821 Shale, as above, slightly calcareous.
- 2821-2833 Shale, as above, 75%; limestone, medium light gray (N6), shaly, 25%.

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- 2833-2837 Shale, medium dark gray (N4.3), very slightly calcareous to very calcareous, somewhat fissile, 70%; limestone, medium dark gray (N4.3), finely clastic to some medium clastic, shaly, 30%.
- 2837-2842 Shale, as above, 50%; limestone, as above, 10%; siltstone, very light gray (N8), coarse-grained, subrounded, moderately well sorted, friable to small clusters, slightly peppered with dark minerals, about one-half quartzose, 40%; considerable pyrite.
- 2842-2847 Shale, as above, 60%; limestone, as above, 10%; siltstone, as above, 30%; trace of red shale and siltstone and pyrite.
- 2847-2850 Sandstone, very light gray (N8), very fine-grained, subrounded to some subangular, moderately well sorted, friable, 85%; shale, medium dark gray (N4), as above, 15%.
- 2850-2855 Sandstone, as above, 90%; shale, as above, 10%.
- 2855-2858 Sandstone, as above, grain size little coarser, 85%; shale, as above, 15%; considerable iron staining.
- 2858-2860 Ditto.
- 2860-2866 Sandstone, as above, friable to small clusters, some with considerable black mineral inclusions, 85%; shale, dark gray (N3), slightly fissile, 15%.
- 2866-2871 Sandstone, very fine- to fine-grained, as above, 60%; shale, dark gray (N3), slightly fissile to fissile, 40%.
- 2871-2876 Sandstone, as above, 90%; shale, as above, very small pieces, 10%.
- 2876-2881 Sandstone, as above, friable to few clusters, with very little dark mineral inclusions.
- 2881-2885 Ditto: some iron staining.
- 2885-2890 Ditto: considerable iron staining.
- 2890-2894 Sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, friable, few clusters with trace of dark minerals, some iron staining.
- 2894-2896 Ditto.
- 2896-2898 Ditto.
- 2898-2905 Sandstone, yellowish gray (5 Y 8/1), very fine- to fine-grained, as above, very few clusters; slight trace of mica.

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2905-2909	Sandstone, white, as above, considerable iron staining.
2909-2915	Ditto: friable to few clusters.
2915-2918	Ditto.
2918-2924	Ditto.
2924-2934	Ditto.
2934-2937	Ditto: friable, some iron staining.
2937-2939	Ditto.
2939-2944	Ditto.
2944-2950	Ditto.

Samples run by Eloise Jacobsen, May 1949.

- 2950-2954 Sandstone, white (N9), very fine-grained, subrounded to subangular, moderately well sorted (slightly silty), friable, considerable iron staining.
- 2954-2959 Ditto, friable with few clusters.
- 2959-2961 Ditto.
- 2961-2964 Ditto.
- 2964-2967 Ditto, less iron staining.
- 2967-2972 Ditto.
- 2972-2977 Sandstone, as above, some fine-grained, slightly micaceous, 80%; shale, medium dark gray (N5), finely micaceous, 20%.
- 2977-2987 Shale, as above, 40%; shale, medium light gray (N6), silty to slightly silty, slightly micaceous, 40%; siltstone, medium light gray (N6), coarse-grained, poorly sorted, very shaly, slightly micaceous, 20%.
- 2987-2997 Shale, medium light gray (N6), silty to non-silty, finely micaceous.
- 2997-3003 Ditto.
- 3003-3008 Shale, medium dark gray (N4), non-silty to some very silty, finely micaceous, 60%; shale, as above, to very silty (approaching siltstone), 40%.
- 3008-3014 Shale, medium gray (N5), silty, finely micaceous, 60%; siltstone, light gray (N8), medium-grained, poorly sorted, shaly, slightly peppered with black mineral, 40%.
- 3013-3018 Siltstone, very light gray (N8), medium-grained, subrounded, moderately well sorted, shaly, slightly peppered with black mineral, slightly iron-stained, very small clusters, 95%; shale, as above, 5%.
- 3018-3023 Ditto.
- 3023-3026 Ditto.
- 3023-3029 Ditto, slightly sandy.
- 3029-3034 Sandstone, very light gray to white (N8.7), very fine-grained, subrounded to subangular, moderately well sorted, slightly silty, very slightly peppered with dark mineral, clustered, little iron staining.
- 3034-3036 Sandstone, as above, 80%; shale, medium gray (N5), finely micaceous, 20%.

- 3036-3044 Sandstone, white (N9), fine-grained, subrounded to sub-angular, moderately poorly sorted (some medium-grained), slightly silty, very slightly peppered with black mineral, clustered, 60%; shale, as above, 40%. Driller's note: "Show of oil."
- 3044-2047 Sandstone, white (N9), fine-grained, subrounded to some sub-angular, moderately well sorted (some very fine-grained), friable, 95%; shale, as above, 5%.
- 3047=3050 Sandstone, as above, 80%; shale, medium gray (N5), finely micaceous, 10%; shale, medium light gray (N6), very silty, 10%.
- 3050-3055 Shale, medium gray (N5), as above, 50%; sandstone, as above, 50%.
- 3055-3063 Sandstone, white (N9), very fine-grained, subrounded to sub-angular, moderately poorly sorted, silty, slightly micaceous, friable, some iron staining.
- 3063-3073 Shale, medium gray (N5); trace medium dark gray shale (N4).
- 3073@3079 Shale, as above, 70%; shale, medium light gray, very silty, 30%.
- 3079-3081 Sandstone, light gray (N7), very fine-grained, subrounded to subangular, moderately well sorted, slightly silty, few dark minerals, friable with few clusters, considerable iron staining, 90%; shale, as above, 10%.
- 3081-3091 Shale, medium gray (N5), slightly calcareous, 90%; siltstone, light gray (N7), very shaly, 10%.
- 3091-3101 Shale, as above, calcareous to very calcareous, 90%; siltstone, as above, very shaly to silty shale, 10%; interbedding noted on some fragments.
- 3101-3111 Shale, as above, non-calcareous to calcareous, 95%; siltstone, as above, 5%.
- 3111-3117 Shale, as above, non-calcareous, 80%; sandstone, very light gray (N8), very fine-grained, subangular, moderately well sorted, some very shaly, clustered, 20%; trace pyrite.
- 3117-3121 Sandstone, very light gray (N8.3), very fine-grained, subrounded to subangular, moderately well sorted, friable, 95%; shale, as above, 5%.
- 3121-3127 Shale, medium dark gray (N4), 60%; siltstone, medium light gray (N6), medium-grained, subrounded, moderately well sorted, peppered with black mineral, 25%; sandstone, as above, 15%.
- 3127-3131 Shale, medium gray (N5), 50%; shale, medium light gray (N6), silty, 20%; sandstone, as above, clustered, 30%.
- 3131-3136 Sandstone, as above, friable with few clusters, 60%; shale, medium gray (N5), 40%.

- 3136-3141 Ditto.
- 3141-3147 Ditto: sandstone, 70%; shale, 30%.
- 3147-3157 Ditto.
- 3157-3163 Shale, medium dark gray (N4), slightly finely micaceous, 85%; siltstone, medium light gray (N6), subrounded, moderately well sorted, very slightly calcareous, slightly micaceous, 15%.
- 3163-3170 Shale, medium dark gray to medium gray (N4-5), 90%; siltstone, as above, 10%.
- 3170-3174 Shale, medium gray (N5), slightly finely micaceous.
- 3174-3180 Shale, as above, 90%; shale, medium dark gray (N4), 10%.
- 3180-3190 Shale, medium gray, as above, 60%; siltstone, light gray (N7), medium-grained, subrounded, finely peppered with dark mineral, some very calcareous cement, 40%.
- 3190-3199 Shale, medium gray (N5), slightly silty to very silty, 95%; siltstone, as above, non-calcareous, 5%.
- 3199-3208 Shale, medium gray (N5), non-silty to slightly silty, very finely micaceous, 80%; siltstone, as above, 10%; shale, light gray (N7), very silty, 10%.
- 3208-3214 Shale, medium gray (N5), some very finely micaceous, somewhat fissile, 95%; siltstone, as above, 5%.
- 3214-3230 Shale, medium light gray (N5.8), some very finely micaceous.
- 3230-3236 Limestone, medium dark gray to dark gray (N4-3), very finely clastic, very shaly, 60%; shale, medium dark gray (N4), calcareous to non-calcareous, 40%.
- 3236-3242 Shale, dark gray (N3), as above, 70%; limestone, dark gray (N3), some medium dark gray (N4), as above, 30%.
- 3242-3250 Shale, as above, 60%; limestone, as above, some medium clastic, 40%.
- 3250-3255 Ditto; trace pyrite.
- 3255-3261 Limestone, medium dark gray (N4.3), some medium light gray (N6), finely clastic to some medium clastic, very shaly, 60%; shale, medium dark gray, as above, non-calcareous to calcareous, 40%.
- 3261-3267 Ditto.
- 3267-3277 Shale, as above, slightly micaceous, 75%; limestone, as above, silty, 25%.
- 3277-3285 Ditto.

- 3285-3295 Shale, medium gray (N5), micaceous, 60%; shale, medium dark gray, (N4), slightly calcareous, 20%; limestone, as above, very silty, 20%.
- 3295-3301 Shale, medium gray, as above, 80%; siltstone, light gray (N7), finely micaceous, peppered with black mineral, very shaly, 20%.
- 3301-3314 Siltstone, light gray (N7), medium-grained, subrounded, moderately well sorted, well cemented, 60%; shale, medium gray (N5), some slightly silty, trace mica, 40%.
- 3314-3323 Ditto.
- 3323-3331 Shale, as above, 60%; siltstone, 40%.
- 3331-3338 Ditto.
- 3338-3345 Shale, medium gray (N5), 70%; siltstone, as above, 30%.
- 3345-3353 Ditto.
- 3353-3360 Shale, medium gray (N5), 95%; chert, very pale orange (10YR 8/2), 5%.
- 3360-3370 Ditto.
- 3370-3381 Ditto.
- 3381-3395 Shale, medium gray (N5).
- 3395-3405 Shale, medium gray and medium dark gray (N4-5), 80%; limestone, medium gray (N5), medium clastic, slightly shaly, 20%.
- 3405-3413 Shale, medium gray (N5), calcareous.
- 3413-3420 Ditto.
- 3420-3430 Ditto, fragments, of macro-fossils.
- 3430-3442 Ditto.
- 3443-3448g Shale, as above, no fossils noted, 80%; limestone, medium light gray to light gray (N6-7), medium clastic, slightly shaly, 20%.
- 3448-3456 Ditto.
- 3456-3464 Shale, medium dark gray (N4), slightly to very calcareous, 80%, limestone, medium gray to medium dark gray (N5-4), 20%.
- 3464-3472 Ditto; trace coarsely crystalline limestone.

- 3472-3480 Ditto; part limestone medium clastic and slightly oolitic, part coarsely crystalline.
- 3480-3488 Ditto; no oolites; trace fossil fragment.
- 3488-3493 Shale, as above, slightly to very calcareous, 80%; limestone, as above, some mottled with light gray, fossiliferous (macro), 20%.
- 3493-3503 Shale, 70%; limestone, more light gray mottling numerous macro-fossil fragments, 30%.
- 3503-3508 Shale, as above, fossil fragments (macro), 85%; limestone, as above, crinoid fragments, 15%.
- 3508-3515 Shale, as above, 60%; limestone, considerable light gray and very light gray (N7-8), fragments, as above, no fossils noted, 40%.
- 3515-3528 Shale, medium dark gray (N4), very calcareous, 90%; limestone, as above, 10%.
- 3528-3536 Shale, as above, slightly calcareous to calcareous, 90%; limestone, 10%.
- 3536-3545 Shale, medium gray (N5.3), slightly calcareous; trace coarsely crystalline limestone.
- 3545-3556 Ditto.
- 3556-3564 Shale, as above, 90%; shale medium gray (N5), very calcareous, and some shaly limestone, 10%.
- 3564-3574 Shale, as above, 85%; limestone, medium gray (N5), medium clastic, very shaly, 15%.
- 3574-3586 Shale, medium gray (N4.8), calcareous, 90%; limestone, 10%, as above.
- 3586-3598 Shale, as above, 97%; chert, very pale orange (10YR 8/2), 3%.
- 3598-3601 Limestone, medium gray (N5), some mottled with light gray, finely clastic, 50%; shale, medium gray (N5), non-calcareous to some slightly calcareous, 50%.
- 3601-3608 Shale, light grayish red (5R 5/2), very slightly calcareous, finely micaceous, 30%; shale, as above, 60%; limestone, as above, medium clastic, 10%; trace pyrite.
- 3608-3614 Shale, medium gray to medium light gray (N5-6), some calcareous, finely micaceous 65%; shale, red, as above, 10%; limestone, light gray (N7), some medium gray and very light gray (N5-8), finely clastic, to some medium clastic, 25%.
- 3614-3620 Ditto.

- 3620-3630 Shale, medium light gray (N7), calcareous, 90%; limestone, very light gray (N8), coarsely crystalline, little medium gray crystalline, 10%.
- 3630-3640 Shale, as above, calcareous to very calcareous, 85%; limestone, medium gray (N5), crystalline to finely clastic, 10%; limestone, very light gray, as above, 5%.
- 3640-3654 Limestone, medium gray (N5), mottled with light gray, finely to medium clastic, slightly shaly, 75%; shale, as above, 25%; trace white coarsely crystalline limestone.
- 3654-3663 Ditto: few scattered oolitics, 85%; white limestone, coarsely crystalline to finely clastic, 5%; shale, 10%; trace fossil fragment.
- 3663-3672 Shale, medium gray (N5), non-calcareous to calcareous, very finely micaceous, 50%; limestone, as above, 50%.
- 3672-3679 Shale, as above, calcareous 75%; limestone, as above, 25%.
- 3679-3691 Shale, medium dark gray (N4), calcareous, 70%; limestone, as above, 30%.
- 3691-3700 Limestone, medium dark gray (N4), finely clastic to medium clastic, some oolitic, 30%; limestone, as above, 20%; shale, as above, 50%.
- 3700-3712 Ditto; fossil fragment.
- 3712-3719 Limestone, light brownish gray (5YR 6/1), finely clastic, 40%; limestone, medium dark gray, as above, 10%; limestone, very light gray to white (N8-9), coarsely crystalline to finely clastic, some oolitic, 25%; shale, as above 25%.
- 3719-3726 Limestone, light brownish gray, as above, 65%; limestone, very light gray to white, as above, 25%; shale, as above, 10%.
- 3726-3732 Ditto: limestone, light brownish gray, 75%; limestone, very light gray to white, 25%.
- 3732-3742 Ditto.
- 3742-3756 Limestone, light brownish gray, medium clastic to some finely clastic, as above, 75%; limestone, very light gray, as above, 20%; shale, as above, 5%.
- 3756-3774 Ditto: scattered oolites.
- 3774-3779 Ditto; some crinoid fragments, trace white calcite.
- 3779-3786 Limestone, medium dark gray (N4), finely to medium clastic, some coarsely crystalline, scattered oolites (up to 1 1/3mm.), 80%; limestone, very light gray, scattered oolites (to 1 mm.), some coarsely crystalline, 20%; slightly fossiliferous.

- 3786-3795 Limestone, medium dark gray, as above, 70%; limestone, very light gray, as above, 30%; slightly fossiliferous.
- 3795-3800 Limestone, medium dark gray, no oolites noted, as above, 70%; limestone, very light gray, as above, 30%; slightly fossiliferous.
- 3800-3808 Ditto: limestone, medium dark gray, 60%; limestone, very light gray, 40%.
- 3808-3817 Limestone, medium dark gray, finely clastic, little medium clastic, trace oolites, 80%; limestone, very light gray, as above, trace oolites, 20%; crinoid fragments.
- 3817-3826 Shale, medium dark gray (N3.5), very calcareous, slightly micaceous, 80%; limestone, medium dark gray, 20%.
- 3826-3831 Shale, as above, 65%; limestone, as above, mottled with light gray, 35%.
- 3831-3841 Shale, as above, crinoidal, 65%; limestone, moderately mottled with light gray, crinoidal, 35%.
- 3841-3852 Shale, as above, 50%; limestone, as above, 50%.
- 3852-3862- Limestone, medium gray (N5), finely clastic, shaly, 93%; limestone, very light gray (N8), finely clastic, 7%.
- 3962-3872 Ditto.
- 3872-3882 Ditto, some oolites, 90%; limestone, very light gray, as above, some oolitic, 10%.
- 3882-3893 Ditto, finely clastic to medium clastic, very few oolites, 90%; very light gray limestone, 10%.
- 3893-3903 Limestone, light brownish gray (5YR 6/1), finely clastic, some mottled with very light gray, 60%; limestone, medium gray, as above, 20%; limestone, very light gray (N8.5), finely clastic to coarsely crystalline, some slightly oolitic (to 1/3 mm.), 20%.
- 3903-3913 Ditto.
- 3913-3922 Limestone, light brownish gray to medium gray, as above, same oolitic (1/3 mm.), 70%; limestone, very light gray, as above, 30%.
- 3922-3936 Limestone, light brownish gray and medium gray, finely clastic, 85%; limestone, very light gray, finely clastic, shaly, 15%.
- 3936-3945 Limestone, light brownish gray mottled with very light gray, moderately oolitic (to 2/3 mm.).
- 3945-3954 Ditto; few oolites, very finely clastic.

- 3954-3964 Ditto, trace oolites, 90%; limestone, very light gray (N8.5), finely clastic, shaley, 10%.
- 3964-3968 Limestone, medium light gray (N6), very finely clastic, 60%; limestone, light brownish gray, very finely clastic, 25%; limestone, very light gray, as above, 15%.
- 3968-3978 Limestone, medium gray (N5), very finely clastic, to some very finely crystalline, some slightly mottled with very light gray, 90%; limestone, very light gray, as above, 10%.
- 3978-3986 Limestone, medium gray and light brownish gray, as above, 80%; limestone, very light gray, as above, 20%.
- 3986-3994 Ditto; trace oolites.
- 3994-4005 Ditto.
- 4005-4014 Limestone, light brownish gray (5YR 6/1), very finely clastic, 80%; limestone, very light gray (N8), finely clastic soft, 15%; limestone, medium gray (N5), some oolites, finely clastic, 5%.
- 4014-4024 Limestone, light brownish gray, as above, 85%; limestone, very light gray, as above, 15%.
- 4025-4034 Limestone, light brownish gray, 90%; very light gray, 10%.
- 4034-4044 " " 80%; " 20%.
- 4004-4053 " trace oolites, 85; "trace oolites, 15%.
- 4053-4065 Limestone, medium gray (N5), finely clastic, trace fossil, 34%; limestone, light brownish gray, as above, 34%; limestone, very light gray as above, to medium clastic, 30%; limestone, grayish red (5R 4/2), finely clastic, 2%.
- 4065-4073 Limestone, medium gray, as above, trace oolites, 70%; limestone, light brownish gray, as above, 15%; limestone, very light gray, as above, 15%.
- 4073-4087 Ditto: medium gray, 60%; light brownish gray, 20%; very light gray, 20%; trace red limestone.
- 4087-4096 Ditto: medium gray, trace oolites, 75%; light brownish gray, 10%; very light gray, 15%; trace red shale.
- 4096-4105 Limestone, medium dark gray (N4), very finely clastic with oil residue, 90%; limestone, very light gray, as above, trace oolites and trace finely crystalline, 10%.
- 4105-4112 Ditto (no oil noted).

- 4112-4126 Limestone, light brownish gray (5YR 6/1), very finely clastic, slight trace oolites, 80%; limestone, very light gray (N8), as above, trace oolites, 20%.
- 4126-4136 Limestone, medium dark gray (N4), very finely clastic, 35%; limestone, light brownish gray, as above, 35%; limestone, very light gray, trace oolitic pieces, 30%.
- 4136-4144 Limestone, medium dark gray (N4), as above, 70%; limestone, light gray to very light gray (N7-8), 20%; chert, grayish brown (5YR 3/2), angular, 10%.
- 4144-4150 Limestone, medium gray (N5), finely clastic with trace oolitic pieces, 90%; limestone, very light gray (N8), some slightly oolitic, 10%; trace chert, as above.
- 4150-4164 Ditto.
- 4164-4173 Limestone, medium gray (N5), very finely clastic, 83%; limestone, very light gray, fine to medium clastic, trace oolites, 15%; chert, as above, 2%.
- 4173-4179 Limestone, medium gray (N5), part with scattered oolites (1/3 mm.), 80%; limestone, very light gray, as above, 20%.
- 4179-4187 Limestone, medium dark gray (N4), finely clastic, few oolites, 80%; very light gray limestone, as above, 20%.
- 4187-4198 Ditto: medium dark gray limestone, slightly shaly, 85%; very light gray limestone, 15%.
- 4198-4207 Ditto.
- 4207-4215 Limestone, medium gray (N5), finely clastic, 50%; limestone, medium dark gray (N4), as above, 25%; very light gray limestone, as above (no oolites), 25%.
- 4215-4229 Shale, grayish red (5R 4/2), calcareous, slightly silty, part finely micaceous, 40%; shale, light gray (N7), calcareous, 40%; limestone, medium dark gray (N4), as above, 10%; anhydrite, white (N9), medium crystalline, 10%.
- 4229-4239 Shale, pale red to red (5R 6/2-5/2), calcareous, 75%; shale, light gray, as above, 15%; anhydrite, as above, part very coarsely crystalline, 10%.
- 4239-4248 Shale, medium light gray (N6), slightly to very calcareous, silty, 60%; shale, light gray, as above, 20%; shale, red, as above, 15%; anhydrite, as above, 5%; trace sandstone.
- 4248-4257 Shale, greenish gray (5GY 6/1), calcareous to very calcareous, silty, considerable green mineral grains, slightly micaceous, 70%; shale, pale red (5R 6/2), very calcareous (approaching limestone), 20%; limestone, pale red to very pale red, coarsely crystalline, 10%; trace white calcite.

- 4257-4269 Shale, medium light gray (N6), silty, very slightly calcareous, 95%; shale, medium light gray (N6), finely micaceous, 5%; trace red shale and calcite.
- 4269-4279 Shale, medium light gray, very silty, as above, 70%; shale, medium light gray, finely micaceous, 20%; limestone, white (N9) and medium gray (N5), finely to medium clastic, 10%; trace brown chert and red shale.
- 4279-4292 Ditto.
- 4292-4300 Ditto.
- 4300-4310 Shale, medium gray (N5), slightly silty to silty, trace finely micaceous material, 75%; shale, medium dark gray (N4), finely micaceous 25%.
- 4310-4323 Shale, medium light gray (N6), part with abundant green mineral grains, silty, part calcareous, 70%; shale, medium dark gray (N4), finely micaceous, as above, 10%; limestone, medium gray (N5), fossiliferous, finely to some medium clastic, 20%.
- 4322-4329 Siltstone, light gray (N7), fine- to medium-grained, sub-rounded, moderate sorting, shaly, slightly calcareous, 40%; shale, light gray (N7), silty to very silty, slightly calcareous, 40%; shale, medium gray (N5), 20%; trace shale with green mineral, as above.
- 4329-4340 Siltstone, as above, 65%; shale, medium gray, as above 25%; limestone, light brownish gray, finely clastic, fossiliferous, 10%.
- 4340-4355 Shale, medium light gray (N6.5), silty, slightly calcareous, 90%; shale, medium light gray (N6), trace mica, 10%.
- 4355-4364 Shale, as above, very silty (some shaly siltstone), 80%; shale, medium dark gray (N4), 15%; limestone, light brownish gray (5YR 6/1), medium clastic, 5%.
- 4364-4373 Siltstone, light gray (N7), fine-grained, subrounded, shaly, slightly calcareous, 80%; shale, medium dark gray, as above, 20%; trace limestone, as above.
- 4373-4380 Shale, light gray (N7), silty, slightly micaceous, very slightly calcareous, 90%; shale, medium dark gray, as above, 10%.
- 4380-4386 Shale, light gray, as above, 85%; shale, medium dark gray, as above, 15%.
- 4386-4399 Shale, medium light gray (N6), trace mica.

Samples described by Eloise Tittle Jacobsen
U.S. Geological Survey, Lexington, Kentucky,
June 1949.

UNITED FUEL GAS COMPANY

Number 6431

Location: 9200' East of 82° 00'; 3900' South of 37° 10'.

Buchanan County, Virginia.

Total Depth: 4800'.

Interval

4399-4414	Siltstone, medium light gray (N6), fine-grained, moderately well sorted, slightly micaceous, moderately friable.
4414-4425	Ditto.
4425-4442	Shale, medium dark gray (N4), small part sandy, trace finely micaceous; numerous loose medium-grained rounded to subrounded quartz grains.
4442-4454	Shale, as above, silty, slightly to very slightly calcareous.
4454-4467	Shale, silty, medium dark gray (N4), slightly micaceous; and siltstone, medium gray (N5), medium-grained, subrounded, moderately well sorted, moderately well cemented.
4467-4480	Shale, as above, non-silty to silty; siltstone, shaly, very slightly calcareous, slightly micaceous, as above; trace pyrite.
4480-4490	Ditto.
4490-4501	Siltstone, calcareous, as above.
4501-4510	Shale, medium dark gray (N4), trace calcareous material, trace very finely micaceous material; trace pyrite.
4510-4523	Shale, as above, to non-calcareous.
4523-4533	Shale, as above, with some siltstone, medium light gray (N6), trace calcareous material, medium-grained, subrounded, moderately well sorted, moderately well cemented (probably thin interbed).
4533-4543	Shale, slightly silty, medium dark gray (N4), slightly micaceous, very slightly fissile, and some siltstone, light brownish gray (5YR 6/1), fine-grained, subrounded, moderately well sorted, dark dust particles, well cemented (lense?).

Interval

- 4543-4557 Shale, medium gray (N5), very slightly fissile, part with trace of micaceous material.
- 4557-4564 Shale, as above, part slightly silty.
- 4564-4575 Shale, medium dark gray (N4), slightly fissile to some fissile, very slight trace of finely micaceous material; trace pyrite.
- 4575-4587 Ditto.
- 4587-4600 Ditto.
- 4600-4608 Ditto.
- 4608-4620 Shale, medium gray (N5), slightly fissile to fissile.
- 4620-4629 Shale, medium dark gray (N4), slightly fissile, slight trace of micaceous material.
- 4629-4640 Shale, as above.
- 4640-4649 Shale, medium gray (N5), slightly fissile.
- 4649-4662 Shale, as above, very slight trace of finely micaceous material.
- 4662-4674 Shale, medium dark gray (N4), slightly fissile, very slight trace of micaceous material.
- 4674-4685 Shale, as above.
- 4685-4695 Shale, as above, fissile to slightly fissile.
- 4695-4707 Shale, medium gray (N5), slightly fissile, part very slightly silty.
- 4707-4722 Shale, as above, trace very finely micaceous material.
- 4722-4732 Ditto.
- 4732-4748 Ditto, slight trace of very finely micaceous material.
- 4784-4760 Ditto.
- 4760-4773 Ditto, slight trace micaceous material.
- 4773-4778 Ditto.
- 4778-4787 Shale, slightly silty to silty, dark medium gray (N4.5), slightly fissile, slightly micaceous.

U.F. 6431

Interval

4787-4800 Shale, slightly silty, medium dark gray (N4), slightly
 fissile, trace micaceous material.

Total Depth: 4800'.

Samples examined by Elosie T. Jacobsen
Geologist, U.S. Geological Survey
Lexington, Kentucky
January 17-18, 1950.