

Operator: United Producing Company, Inc.
Farm: Yukon Pocahontas Coal Company
Well No.: 1-1454
Location: Buchanan County
5000' S. of 37°15'
9100' E. of 82°05'
Elevation: 1206' Ground
Total Depth: 6271'
Drilling Commenced: 6/20/47
Well Completed: 3/19/48
Result: Dry hole

VDMR Well No. 7

VANSANT 2-1

Geologic Log
Samples studied and
described by:
John M. Wilson
March , 1963
Virginia Division of
Mineral Resources

GEOLOGIC LOG

<u>Depth</u>	<u>Interval</u>	<u>Description</u>
0-90	90	Siltstone, locally shaly, light gray, medium gray, moderately hard, flaky, no apparent bedding, slightly calcareous, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
90-95	5	Coal, pure, vitreous, conchoidal fracture, blocky fracture.
95-110	15	Interbedded; Siltstone, locally shaly, light gray, medium gray, moderately hard, flaky, no apparent bedding, poorly fissile, slightly calcareous, argillaceous, with: rare biotite, rare muscovite and rare carbonaceous material. Sandstone, white, clear, poorly cemented, very fine to medium-grained, medium sorted, rounded to subangular, silty, siliceous, calcareous, with: rare biotite, common muscovite, and rare fragments of coal. Slightly porous.
110-115	5	Conglomeratic Sandstone, white, clear, milky white, well cemented, medium-to very coarse-grained, common granules, medium sorted, subrounded, subangular, silty, siliceous, with: abundant biotite, abundant muscovite, rare chlorite, and abundant fragments of coal. Slightly porous.

115-125	10	Sandstone, white, clear, well cemented, fine-to coarse-grained, medium sorted, subrounded to subangular, siliceous, with: rare biotite, rare muscovite, and abundant carbonaceous material. Slightly porous.
125-132	7	No sample
132-141	9	Interbedded; Sandstone, white, light gray, moderately cemented, very fine-to medium-grained, well sorted, subrounded to subangular, siliceous, calcareous, with: abundant biotite, abundant muscovite, and coal (common fragments), common iron oxide stains. Slightly porous. Siltstone, locally finely sandy, locally shaly, light gray, medium gray, moderately soft, flaky, no apparent bedding to poorly fissile, argillaceous, and coal (laminae and partings).
141-157	16	Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, siliceous, calcareous, with: abundant biotite, abundant muscovite, and coal (common fragments), common iron oxide stains. Slightly porous. With: stringers of Siltstone, as in 132 to 135.
157-170	13	Shale, locally finely sandy, medium gray, dark gray, moderately hard, tough, poor to fair fissility, ferruginous, with: rare biotite, rare muscovite, rare pyrite, rare carbonaceous material, and rare carbonaceous laminae.
170-200	30	Siltstone, locally shaly, medium gray, hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
200-209	9	Siltstone, locally finely sandy, locally shaly, medium gray, dark gray, moderately hard, flaky, no apparent bedding to poorly fissile, argillaceous, with: rare muscovite, and coal (rare fragments).
209-228	17	Siltstone, locally finely sandy, locally shaly, medium gray, dark gray, red-brown, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare muscovite and coal (rare fragments).

- 226-237 11 Interbedded; Siltstone, locally finely sandy, locally shaly, medium gray, dark gray, red-brown, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare muscovite, and coal (rare fragments). With: Sandstone, white, light gray, moderately cemented, very fine-to medium-grained, medium sorted, subrounded to subangular, interstitially silty, siliceous, with: abundant biotite, abundant muscovite, and rare carbonaceous material. Slightly porous.
- 237-249 12 Siltstone, locally shaly, light gray, medium gray, dark gray, moderately hard, brittle, no apparent bedding to poorly fissile, argillaceous, with: rare muscovite, and rare carbonaceous material.
- 249-256 7 Siltstone, locally finely sandy, light gray, medium gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: abundant biotite, and abundant muscovite.
- 256-262 6 Siltstone, locally shaly, light gray, medium gray, dark gray, moderately hard, flaky, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite, and rare carbonaceous material.
- 262-268 6 Siltstone, as in 256-262, with: stringers of Sandstone, clear to white, well cemented, very fine-to fine-grained, well sorted, subangular to subrounded, interstitially silty, siliceous, with: abundant biotite, abundant muscovite, and rare chlorite. Nonporous to slightly porous.
- 268-274 6 Sandstone, white, clear, light brown, well cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: abundant biotite, abundant muscovite, rare chlorite, common carbonaceous material and abundant iron oxide stains. Nonporous.

274-286	12	Sandstone, white, clear, light brown, well cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, calcareous, with: abundant biotite, abundant muscovite, rare chlorite, Nonporous . With stringers of Siltstone, locally shaly dark gray, moderately hard, flaky, no apparent bedding to poorly fissile, argillaceous, with: rare muscovite, and rare carbonaceous material.
286-298	12	Lithologies as in 274-286, with common coal fragments (possible 6" to 1' coal bed in through interval).
298-306	8	Siltstone, locally finely sandy, locally shaly, light gray, medium gray, dark gray, brownish gray, hard, tough, no apparent bedding to poorly fissile, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
306-315	9	Siltstone, carbonaceous, medium gray, dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: rare biotite, rare muscovite, carbonaceous material, carbonaceous laminae, and coal (rare fragments).
315-330	15	Siltstone, locally finely sandy, locally shaly, light gray, medium gray, dark gray, moderately hard, brittle, no apparent bedding to poorly fissile, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
330-336	6	No sample
336-343	7	Sandstone, white, clear, well cemented, very fine-to medium-grained, medium sorted, rounded to subangular, siliceous, calcareous, with: rare biotite, rare muscovite, common iron oxide stains. Slightly porous.
343-345	2	Sandstone, white, clear, well cemented, very fine-to medium-grained, medium-sorted, rounded to subangular, siliceous, calcareous, with: rare biotite, abundant muscovite, common iron oxide stains. Nonporous. With stringers of Siltstone, locally shaly, medium gray, dark gray, moderately soft, flaky, poorly fissile, siliceous, argillaceous, with: rare muscovite.

345-360	15	Sandstone, white, clear, well cemented, very fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, rare carbonaceous material, and common iron oxide stains. Nonporous.
360-361	1	Coal, vitreous, conchoidal fracture (interpreted depth and thickness).
361-365	4	Sandstone, white, clear, well cemented, very fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, and rare iron oxide stains. Nonporous.
365-380	15	Sandstone, white, light gray, tan, poorly cemented, fine-to medium-grained, well sorted, subrounded to subangular, siliceous, with: common muscovite, common carbonaceous material, and common iron oxide stains. Slightly porous.
380-387	7	Sandstone, white, light gray, moderately cemented, fine-grained, well sorted, subrounded, subangular, siliceous, with: common muscovite, rare chlorite, common carbonaceous material, and coal. Slightly porous.
387-392	5	Sandstone, white, light gray, moderately cemented, fine-grained, well sorted, rounded to subrounded, siliceous, with: common muscovite, common chlorite, and common carbonaceous material. Slightly porous.
392-402	10	Sandstone, white, light gray, dark gray, moderately cemented, fine-grained, well sorted, subrounded to subangular, siliceous, with: common biotite, common muscovite, chlorite, and common carbonaceous material. Slightly porous.
402-410	8	Interbedded; Sandstone, white, light gray, poorly cemented, fine-grained, well sorted, subrounded, siliceous, with: common biotite, common muscovite, and abundant coal. Slightly porous. Siltstone, locally finely sandy, carbonaceous, dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: abundant coal.

410-415	5	Siltstone, locally finely sandy, medium to dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common muscovite, and common carbonaceous material.
415-420	5	Siltstone, locally finely sandy, medium to dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common muscovite, common carbonaceous material, and common coal.
420-425	5	Interbedded; Sandstone, white, light gray, well cemented, fine-to medium-grained, well sorted, subrounded to subangular, siliceous, with: common muscovite, rare chlorite, and common coal. Slightly porous. Siltstone, locally finely sandy, dark gray, moderately soft, brittle, no apparent bedding, argillaceous.
425-430	5	Interbedded; Sandstone, white, clear, moderately cemented, fine-to medium-grained, well sorted, subrounded to subangular, siliceous, with: common biotite, common muscovite, rare pyrite, common chlorite, common carbonaceous material, and rare coal. Slightly porous. Siltstone, carbonaceous, medium to dark gray, moderately hard, brittle, no apparent bedding, argillaceous, with: rare muscovite, and common carbonaceous material.
430-444	14	Sandstone, white, well cemented, fine-to medium-grained, well sorted, subrounded to subangular, siliceous, with: common biotite, common muscovite, common chlorite, and common carbonaceous material. Slightly porous. With Stringers of Siltstone, locally finely sandy, medium to dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous.
444-450	6	Sandstone, white, moderately cemented, medium-grained, well sorted, subrounded to subangular, siliceous, with: common biotite, common muscovite and common carbonaceous material. Slightly porous.

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| 450-455 | 5 | Sandstone, white, moderately cemented, medium-grained, well sorted, subrounded to subangular, siliceous, with: common biotite, common muscovite, common chlorite, common carbonaceous material. Slightly porous. With stringers of Siltstone, carbonaceous, dark gray, moderately soft, brittle, no apparent bedding, argillaceous, with: common carbonaceous material. |
| 455-457 | 2 | Sandstone, white, moderately cemented, medium-grained, well sorted, subrounded to subangular, siliceous, with: common muscovite, rare chlorite and abundant coal (possible 6 inch coal bed in this interval), Slightly porous. |
| 457-461 | 4 | Sandstone, as in 444-450. |
| 461-474 | 13 | Sandstone, white to clear, poorly cemented, fine-to medium-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, rare chlorite, and common carbonaceous material. Slightly porous. With stringers of Siltstone, locally finely sandy, dark gray, moderately soft, brittle, no apparent bedding, argillaceous, with: common carbonaceous material. |
| 474-485 | 11 | Sandstone, white, clear, well cemented, fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, rare chlorite, and abundant carbonaceous material. Slightly porous. |
| 485-500 | 13 | Sandstone, white, clear, light gray, moderately cemented, fine-to medium-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: abundant biotite, common muscovite, common chlorite, and common coal. Slightly porous. With stringers of Siltstone, locally finely sandy, dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common carbonaceous material. |
| 500-527 | 27 | Sandstone, white, clear, moderately cemented, fine-to medium-grained, well sorted, subrounded to subangular, siliceous, with: common muscovite, rare chlorite, common carbonaceous material, rare coal, abundant iron oxide stains. Slightly porous. |

527-544	17	Sandstone, white, clear, well cemented, fine-to medium grained, well sorted, subrounded to subangular, siliceous, with: common biotite, abundant muscovite, common chlorite, common carbonaceous material, rare coal, abundant iron oxide stains. Slightly porous. With stringers of Siltstone, locally finely sandy, medium to dark gray, moderately soft, brittle, no apparent bedding, siliceous, argillaceous, With: abundant muscovite, and common carbonaceous material.
544-546	2	Siltstone, locally finely sandy, dark gray, moderately soft, brittle, no apparent bedding, siliceous, argillaceous.
546-548	2	No sample
548-566	18	Interbedded; Sandstone, white, clear, poorly cemented, fine-to medium-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, abundant muscovite, and common carbonaceous material. Slightly porous. Siltstone, locally finely sandy, dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common muscovite.
566-572	6	Interbedded; Sandstone, white, clear, light gray, moderately cemented, very fine-to medium grained, medium sorted, rounded to subrounded, siliceous, with: common biotite, common muscovite, rare chlorite, and abundant iron oxide stains. Siltstone, locally finely sandy, light to dark gray, moderately hard, brittle, no apparent bedding, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
572-577	5	No samples
577-579	2	Lithologies as in 566-572.
579-585	6	Siltstone, locally finely sandy, light gray, medium gray, red-brown, (rare), hard, tough, no apparent bedding, siliceous, argillaceous, with: biotite, abundant muscovite, and common iron oxide stains.
585-589	4	No samples

589-600	11	Siltstone, locally finely sandy, light gray, medium gray, red-brown (rare), hard, tough, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite, and common iron oxide stains.
600-606	6	Siltstone, locally finely sandy, locally shaly, light gray, medium gray, dark gray, hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, rare calcite, magnetite (?), and rare carbonaceous material.
606-625	19	Siltstone, locally finely sandy, light gray, medium gray, dark gray, hard, tough, no apparent bedding, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
625-629	4	Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, sub-rounded to subangular, interstitially silty, siliceous, with: abundant biotite, abundant muscovite, rare iron oxide stains. Nonporous to slightly porous. With stringers of Siltstone, locally finely sandy, medium gray, dark gray, moderately hard, tough, no apparent bedding, argillaceous, with: biotite, rare muscovite, and common carbonaceous material.
629-631	2	Coal, vitreous, conchoidal fracture, block fracture, impure and silty in part (Interpreted depth and thickness).
631-640	9	Lithologies as in 625-629.
640-648	8	Siltstone, locally finely sandy, locally shaly, light to dark gray, red-brown, hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, rare iron oxide stains and fragments of Sandstone (contamination ?).
648-659	11	Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite, and abundant coal (possible 1' coal bed in this interval)

- 659-665 6 Siltstone, locally shaly, locally carbonaceous, medium to dark gray, black, with: rare biotite, rare muscovite, common pyrite, common carbonaceous material, abundant carbonaceous laminae, rare coal fragments, and rare fossils (plant).
- 665-678 13 Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, with: siliceous, abundant biotite, abundant muscovite, abundant carbonaceous streaks, common coal fragments. Nonporous. With stringers of Siltstone, locally finely sandy, medium to dark gray, moderately soft, flaky, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite, common carbonaceous material, and rare iron oxide stains.
- 678-700 22 Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, calcareous, with: common biotite, common muscovite, rare chlorite, common carbonaceous material, and common iron oxide stains. Slightly porous.
- 700-715 15 Interbedded; Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, common carbonaceous material, and rare iron oxide stains. Slightly porous. Siltstone, locally finely sandy, medium to dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite, and abundant carbonaceous material
- 715-723 8 Sandstone, white, light gray, poorly cemented, very fine to medium grained, medium sorted, subrounded to subangular, interstitially silty, siliceous, abundant biotite, abundant muscovite, rare chlorite, rare carbonaceous material, and rare iron oxide stains. Nonporous to slightly porous.

- 723-730 7 Sandstone, white, light gray, moderately cemented, fine-to coarse-grained, medium sorted, rounded to subangular, siliceous, with: rare biotite, rare muscovite, abundant iron oxide stains. Slightly porous. With stringers of Siltstone, locally finely sandy, light to medium gray, moderately soft, flaky, no apparent bedding, siliceous, argillaceous, with: rare biotite, and rare carbonaceous material.
- 730-744 14 Sandstone, milky white, light gray, moderately cemented, fine-to medium-grained, well sorted, rounded to subrounded, siliceous, with: abundant biotite, abundant muscovite, common carbonaceous material, and abundant iron oxide stains. Nonporous to slightly porous. With stringers of Siltstone, locally finely sandy, light to medium gray, moderately soft, flaky, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite, and common carbonaceous material.
- 744-752 8 Lithologies as in 730-744, slightly calcareous.
- 752-758 6 Siltstone, locally shaly, medium gray, dark gray, moderately hard, brittle, no apparent bedding to poorly fissile, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material, with stringers of Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well-sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite and rare carbonaceous material. Nonporous to slightly porous.
- 758-768 10 Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, sub-rounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite, rare carbonaceous material. Non porous to slightly porous. With stringers of Siltstone, locally finely sandy, light to medium gray, moderately hard, flaky, no apparent bedding, argillaceous, with: rare biotite, rare muscovite,

768-778	10	Siltstone, locally finely sandy, light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, and rare muscovite.
778-804	26	Siltstone, locally shaly, light gray, moderately hard, brittle, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite and rare carbonaceous material.
804-814	10	Shale, medium to dark gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare muscovite, common carbonaceous material, and plant fossils (calamites), common movement striations.
814-861	47	Siltstone, locally finely sandy, locally shaly, light to dark gray, moderately soft, flaky, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, common carbonaceous material, common carbonaceous laminae and stringers of Sandstone, white, light gray, well cemented, very fine-to medium-grained, medium sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite, and rare iron oxide stains. Nonporous.
861-880	19	Sandstone, white, clear, milky white, moderately cemented, fine-to coarse-grained, medium sorted, well-rounded to subangular, siliceous, with: rare biotite, rare muscovite, and silty-micaceous partings. Slightly porous.
880-900	20	Conglomeratic Sandstone, white, clear, milky white, moderately cemented, medium to coarse and very coarse-grained, with: abundant granules, rare pebbles, poorly sorted, subrounded to angular, siliceous, with: rare biotite, rare muscovite, abundant iron oxide stains. Nonporous to slightly porous. Acid wets rock with difficulty, abundant bit particles.
900-911	11	Sandstone, white, orange, moderately cemented, fine-to coarse-grained, medium sorted, subrounded to angular, siliceous, with: rare biotite, rare muscovite, and abundant iron oxide stains. Nonporous.

911-983	72	Conglomeratic Sandstone, white, orange, moderately cemented, medium-to very coarse-grained, abundant granules, poorly sorted, subrounded to subangular, siliceous, with: rare biotite, rare muscovite, and abundant iron oxide stains. Slightly porous.
983-985	2	Shale, carbonaceous, silty, dark gray, moderately soft, flaky, poor to fair fissility, argillaceous, with: rare muscovite, and carbonaceous laminae.
985-1008	23	Interbedded; Siltstone, locally finely sandy, light to medium gray, moderately soft, brittle, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite, common carbonaceous material, and rare iron oxide stains. Sandstone, white, light gray, moderately cemented, very fine to fine grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite and rare carbonaceous material. Nonporous to slightly porous.
1008-1020	12	Sandstone, white, light gray, moderately cemented, very fine-to medium-grained, medium sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, and abundant carbonaceous material. Nonporous to slightly porous.
1020-1035	15	Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, abundant carbonaceous material, and abundant coal fragments. Nonporous to slightly porous.
1035-1041	6	Siltstone, locally finely sandy, medium gray to dark gray, brown, moderately hard, tough, no apparent bedding to poorly fissile, calcareous, argillaceous, with: rare carbonaceous material.
1041-1050	9	Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite, and common carbonaceous material.

1050-1064	14	Interbedded; Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common biotite, abundant muscovite, and abundant carbonaceous material. With: Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, and common iron oxide stains. Nonporous to slightly porous.
1064-1090	26	Sandstone, white, light gray, moderately cemented, very fine-to medium-grained, medium-sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, rare chlorite, and common iron oxide stains. Nonporous to slightly porous. With; stringers of Siltstone, locally finely sandy, locally shaly, light to dark gray, moderately hard, flaky, no apparent bedding, argillaceous, with: rare muscovite.
1090-1099	9	Sandstone, white, clear, moderately cemented, very fine-grained, well sorted, subangular to angular, siliceous, with: rare muscovite, rare carbonaceous material and rare iron oxide stains. Nonporous to slightly porous.
1099-1105	6	Sandstone, white to clear, moderately cemented, very fine-grained, well sorted, subangular to angular, siliceous, with: rare biotite, rare muscovite, and rare iron oxide stains. Nonporous to slightly porous. With; stringers of Siltstone, locally finely sandy, light to medium gray, moderately hard, flaky, no apparent bedding, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
1105-1124	19	Interbedded; Shale, carbonaceous, locally silty, dark gray, black, moderately soft, flaky, good fissility, argillaceous, with: rare pyrite, rare calcite, abundant carbonaceous material, and abundant carbonaceous laminae. Coal, black, vitreous, blocky and conchoidal fracture, common plant fossils (calamites).

- 1124-1151 27 Siltstone, locally shaly, light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
- 1151-1156 5 Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, abundant carbonaceous material, and rare iron oxide stains. Nonporous to slightly porous.
- 1156-1197 41 Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, abundant carbonaceous material, and rare iron oxide stains. Nonporous to slightly porous. With stringers of Siltstone, locally shaly, light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, siliceous, argillaceous, with: common biotite, common muscovite and rare carbonaceous material.
- 1197-1227 30 Sandstone, white, clear, orange, moderately cemented, very fine-to medium-grained, medium sorted, subrounded to subangular, interstitially silty, siliceous, calcareous, with: rare biotite, rare muscovite, and rare chlorite, rare carbonaceous material, abundant iron oxide stains. Non porous to slightly porous.
- 1227-1236 9 Interbedded; Sandstone, white, clear, milky white, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite, rare chlorite, and rare iron oxide stains. Nonporous to slightly porous. Siltstone, locally shaly, light to medium gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, common muscovite, and rare carbonaceous material.

1236-1252	16	Sandstone, white, clear, milky white, moderately cemented, fine-to medium-grained, well sorted, rounded to subangular, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material. Nonporous to slightly porous.
1252-1255	3	Sandstone, white, clear, milky white, poorly cemented, fine-to coarse-grained, medium sorted, rounded to subrounded, siliceous, calcareous, with: rare biotite, rare muscovite, common chlorite, rare carbonaceous material, and abundant iron oxide stains. Slightly porous.
1255-1280	25	Siltstone, locally finely sandy, light to medium gray, brown, moderately soft, brittle, no apparent bedding, siliceous, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
1280-1282	2	No samples
1282-1290	8	Siltstone, locally shaly, carbonaceous, medium to dark gray, moderately hard, tough, no apparent bedding, argillaceous, with: rare biotite, rare muscovite, and abundant carbonaceous material.
1290-1334	44	Interbedded; Siltstone, locally shaly, medium to dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: rare biotite, rare muscovite, and abundant carbonaceous material. With; Sandstone, white, light gray, poorly cemented, fine-to medium-grained, well sorted, subangular to angular, siliceous, with: common muscovite and rare carbonaceous material. Nonporous to slightly porous.
1334-1355	21	Siltstone, locally finely sandy, dark gray, green (light to medium), moderately soft, brittle, no apparent bedding, argillaceous, with: rare biotite, rare muscovite and chert (abundant brown, round nodules).

- 1355-1359 4 Siltstone, locally finely sandy, light gray, green, cream, moderately soft, flaky, no apparent bedding, calcareous, siliceous, with: abundant biotite, rare muscovite, and rare carbonaceous material.
- 1359-1372 13 Interbedded; Siltstone, locally finely sandy, light gray, green moderately soft, flaky, no apparent bedding, siliceous, with: abundant biotite, rare muscovite, and rare carbonaceous material. Sandstone, white, clear, poorly cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, common muscovite, common chlorite, and rare carbonaceous material. Slightly porous.
- 1372-1384 12 Siltstone, variegated, locally finely sandy, light gray, red, green, cream, moderately soft, flaky, no apparent bedding, siliceous, argillaceous, ferruginous, with: common biotite, common muscovite, and rare iron oxide stains.
- 1384-1408 24 Siltstone, locally finely sandy, red, green, moderately soft, flaky, no apparent bedding, calcareous, siliceous, ferruginous, with: rare biotite, rare muscovite, and rare carbonaceous material.
- 1408-1414 6 Siltstone, locally finely sandy, locally shaly, light to dark gray, green, moderately hard, brittle, no apparent bedding, calcareous, argillaceous, with: abundant biotite, common muscovite.
- 1414-1420 6 Interbedded; Limestone, silty, light gray, tan, moderately hard, no apparent fossil content, no apparent bedding, cryptocrystalline. With Siltstone, locally finely sandy, light to medium gray, green, moderately hard, brittle, no apparent bedding calcareous, argillaceous, with: common biotite, common muscovite.
- 1420-1462 42 Siltstone, variegated, locally finely sandy, light gray, red, green, cream, moderately hard, tough, no apparent bedding, calcareous, argillaceous, with: rare biotite, rare muscovite.

- 1462-1488 26 Siltstone, locally finely sandy, dark gray, red, green, moderately soft, brittle, no apparent bedding, calcareous, siliceous, argillaceous, with: common muscovite and rare carbonaceous material.
- 1488-1503 15 Siltstone, variegated, locally finely sandy, light gray, medium gray, red, green, tan, brown, cream, moderately soft, flaky, no apparent bedding, calcareous, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
- 1503-1540 37 Siltstone, variegated, locally finely sandy, light gray, red, green, brown, moderately soft, flaky, no apparent bedding, calcareous, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material. Sandstone, white, clear, moderately cemented, very fine grained, well sorted, subrounded to subangular, siliceous, with: rare biotite, and rare carbonaceous material. Nonporous.
- 1540-1547 7 Sandstone, grades locally to Siltstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite, and rare iron oxide stains. Nonporous.
- 1547-1580 33 Interbedded; Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite and rare iron oxide stains. Nonporous. Siltstone, medium to dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: abundant biotite, abundant muscovite, rare pyrite, and rare iron oxide stains.
- 1580-1582 2 Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, calcareous, with: rare biotite, and rare iron oxide stains. Nonporous. With stringers of Siltstone, light to dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: rare biotite, rare muscovite, rare carbonaceous material and rare carbonaceous laminae,

1582-1586	4	No sample
1586-1593	7	Lithologies as in 1580-1582.
1593-1597	4	Interbedded; Shale, silty, medium to dark gray, moderately hard, flaky, fair fissility, argillaceous, with: rare muscovite, and common carbonaceous laminae. Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: common biotite, and common muscovite, rare iron oxide stains. Nonporous.
1597-1644	47	Shale, silty, medium to dark gray, moderately hard, tough, poorly fissile to fair fissility, argillaceous, with: rare muscovite, and rare iron oxide stains.
1644-1695	51	Shale, medium to dark gray, moderately hard, tough, fair to good fissility, argillaceous, with: rare muscovite.
1695-1705	10	Interbedded; Siltstone, carbonaceous (locally), light to dark gray, black, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, and common carbonaceous material. Sandstone, white, light gray, light green, well cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material. Nonporous.
1705-1719	14	Siltstone, locally finely sandy, green, moderately hard, brittle, no apparent bedding, siliceous, with: chert (abundant round, brown nodules), and rare carbonaceous material.
1719-1749	30	Siltstone, locally shaly, light gray, black, moderately soft, flaky, no apparent bedding to poorly fissile, argillaceous, with: abundant biotite, abundant muscovite, and rare pyrite, and rare carbonaceous material.

1749-1758	9	Sandstone, white, light gray, light green, well cêmented, very fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, calcareous, with: abundant biotite, abundant muscovite and abundant iron oxide stains. Nonporous. With; stringers of Siltstone, locally finely sandy, light gray, green, hard, tough, no apparent bedding, siliceous, with: common iron oxide stains.
1758-1765	7	Siltstone, locally finely sandy, light gray, green, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite, and common carbonaceous material, rare iron oxide stains.
1765-1822	57	Siltstone, locally finely sandy, light to medium gray, moderately hard, flaky, no apparent bedding, calcareous, argillaceous, with: abundant biotite, common muscovite, and rare carbonaceous material.
1822-1846	24	Interbedded; Siltstone, locally finely sandy, light to medium gray and dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: common biotite, common muscovite, and abundant iron oxide stains. Sandstone, white, clear, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, siliceous calcareous, with: rare biotite, and rare muscovite. Nonporous to slightly porous.
1846-1901	55	Sandstone, white, clear, poorly cemented, very fine-to fine-grained, well sorted, subrounded to subangular, siliceous, calcareous, with: common biotite, common muscovite, and abundant iron oxide stains. Nonporous.
1901-1912	11	Limestone, silty, light gray, greenish-gray, moderately hard, with: rare fossil fragments, no apparent bedding, microcrystalline, with: rare calcite and rare iron oxide staining.
1912-1987	75	Limestone, dolomitic (slightly), silty, light to dark gray, moderately hard, fossils (crinoid stems, brachiopods), no apparent bedding, microcrystalline, with: common mica, rare pyrite, common calcite, and rare iron oxide staining.

1987-2010	23	Siltstone, locally finely sandy, red, green, moderately soft, flaky, no apparent bedding, argillaceous, ferruginous, with: common muscovite, rare pyrite.
2010-2015	5	Interbedded; Siltstone, locally finely sandy, red, green, moderately soft, flaky, no apparent bedding argillaceous, ferruginous, with: common muscovite. Sandstone, white, light gray, moderately cemented, very fine-to medium-grained, medium sorted, sub-rounded to subangular, interstitially silty, siliceous, with: abundant biotite, abundant muscovite, rare pyrite, and rare carbonaceous material. Nonporous to slightly porous.
2015-2055	40	Sandstone, white, light gray, poorly cemented, very fine-to fine-grained, medium sorted, subrounded to subangular, interstitially silty, siliceous, calcareous, with: abundant biotite, abundant muscovite, and rare carbonaceous material. Nonporous to slightly porous.
2055-2076	21	Interbedded; Sandstone, white, milky white, poorly cemented, very fine-to fine-grained, well sorted, subrounded to angular, interstitially silty, siliceous, with: common biotite, common muscovite, and rare iron oxide stains. Nonporous to slightly porous. Siltstone, locally finely sandy, medium to dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: common muscovite.
2076-2100	24	Siltstone, light to medium gray, green-gray, moderately hard, brittle, no apparent bedding, calcareous, argillaceous, with: rare biotite, rare muscovite, and common pyrite. With: stringers of Limestone, shaly, light gray, tan, moderately hard, fossil fragmental, no apparent bedding, cryptocrystalline.
2100-2182	82	Shale, locally finely sandy, light gray, red, rare green, moderately soft, flaky, no apparent bedding, argillaceous, ferruginous, with: rare biotite, rare muscovite.
2182-2215	33	Siltstone, variegated, locally finely sandy, light gray to medium gray, red, green tan, moderately soft, flaky, no apparent bedding, calcareous, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.

2215-2220	5	Interbedded; Siltstone, medium to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare muscovite. Limestone, dolomitic, shaly, olive-green, hard, no apparent fossil content, no apparent bedding, cryptocrystalline.
2220-2250	30	Siltstone, light gray, red, green, moderately soft, flaky, no apparent bedding, argillaceous, ferruginous, with: rare biotite, abundant muscovite, and rare carbonaceous material.
2250-2260	10	Interbedded; Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to sub-angular, interstitially silty, siliceous, calcareous, with: rare biotite, rare muscovite, and abundant iron oxide stains. Nonporous. With; Siltstone, as in 2220-2250.
2260-2286	26	Sandstone, white, clear, moderately cemented, very fine-to fine-grained, well sorted, rounded to subangular, interstitially silty, siliceous, with: rare biotite, common iron oxide stains. Nonporous to slightly porous. With stringers of Siltstone, carbonaceous (locally), dark gray, moderately soft, flaky, no apparent bedding, argillaceous, with: rare biotite, and rare muscovite.
2286-2296	10	Siltstone, locally shaly, light to medium gray, moderately hard, brittle, no apparent bedding, argillaceous, with: common muscovite, and common carbonaceous material.
2296-2317	21	Siltstone, locally finely sandy, light gray, red, green, moderately hard, brittle, no apparent bedding, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
2317-2331	14	Siltstone, rare red, black, moderately hard, brittle, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, common pyrite, and abundant carbonaceous material.

- 2331-2341 10 Limestone, shaly, light to dark gray, moderately hard, fossil fragmental, no apparent bedding, microcrystalline, with: common pyrite, and rare calcite.
- 2341-2350 9 Siltstone, locally shaly, light to dark gray, moderately soft, brittle, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, common muscovite, common pyrite, and rare carbonaceous material.
- 2350-2364 14 Siltstone, locally shaly, light to medium gray, moderately hard, brittle, no apparent bedding to poorly fissile, calcareous, argillaceous, with: rare biotite, rare muscovite, abundant pyrite, rare carbonaceous material, and rare carbonaceous laminae.
- 2364-2411 47 Siltstone, variegated, locally finely sandy, locally shaly, light gray to medium gray, red, green, tan, brown, black, moderately hard, tough, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite, rare pyrite, rare chert nodules, and rare carbonaceous material.
- 2411-2435 24 Interbedded; Shale, silty, dark gray, moderately soft, flaky, fair to good fissility, calcareous, argillaceous, with: rare muscovite, abundant pyrite, calcite veinlets, and common carbonaceous laminae, With: siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent, bedding, siliceous, argillaceous, with: rare biotite, rare muscovite, and rare iron oxide stains.
- 2435-2445 10 No samples
- ~~2445-2455~~ 10 *Maxon*
Siltstone, variegated, locally finely sandy, light gray, medium gray, red, green, tan, moderately hard, brittle, no apparent bedding, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
- 2455-2484 29 Siltstone, locally finely sandy, locally shaly, dark gray, red (rare), green, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: rare biotite, rare muscovite, and common carbonaceous material.

2484-2495	11	Interbedded; Sandstone, white, clear, moderately cemented, very fine-grained, well sorted, subrounded to subangular, interstitially silty, calcareous, with: rare muscovite and common iron oxide stains. Nonporous to slightly porous. Siltstone, locally finely sandy, light gray, dark gray, red (rare), green, moderately hard, brittle, no apparent bedding, argillaceous, with: common biotite, common muscovite, and common carbonaceous material.
2495-2501	6	No samples
2501-2505	4	Lithologies as in 2484-2495.
2505-2511	6	Siltstone, locally shaly, light gray, red, green, moderately hard, brittle, no apparent bedding to poorly fissile, <u>siliceous</u> , argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
2511-2585	74	Siltstone, locally finely sandy, light gray, dark gray, red (rare), green (light), moderately hard, tough, no apparent bedding, <u>argillaceous</u> , with: common biotite, common muscovite, and rare carbonaceous material.
2585-2595	10	Interbedded; Sandstone, white, light gray, moderately cemented, very fine- to fine-grained, well sorted, subrounded to subangular, interstitially silty, <u>siliceous</u> , with: common biotite, common muscovite, and common carbonaceous material. Nonporous to slightly porous. Siltstone, locally finely sandy, light to medium gray, moderately hard, flaky, no apparent bedding, argillaceous, with: abundant biotite, abundant muscovite, and abundant carbonaceous material.
2595-2615	20	Siltstone, locally shaly, light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, and rare pyrite, rare carbonaceous material.
2615-2642	27	Limestone, shaly, light to dark gray, light to dark brown, moderately hard, fossils, (brachiopods crinoid stems), no apparent bedding, micro-crystalline, With: rare pyrite, common calcite, and common carbonaceous material.

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2642-2658	16	Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, slightly calcareous, argillaceous, with: common muscovite, common biotite, and rare carbonaceous material.
2658-2685	27	Limestone, shaly, light gray, dark gray, moderately hard, fossil fragmental, platy, cryptocrystalline, with: rare mica, and rare calcite.
2685-2746	61	Interbedded; Siltstone, locally finely sandy, medium to dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: rare biotite, rare muscovite, common pyrite, and rare carbonaceous material. With: Sandstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite. Nonporous to slightly porous.
2746-2790	44	Siltstone, locally finely sandy, light to medium gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, abundant muscovite, and common pyrite.
2790-2868	78	Limestone, shaly (rare), dark gray, moderately hard, abundant fossil fragments, no apparent bedding, microcrystalline, with: rare mica, common pyrite, and common calcite.
2868-2911	43	Limestone, light gray, dark gray, moderately hard, oolitic, abundant fossil fragments, no apparent bedding, microcrystalline, with: abundant calcite.
2899-2925	26	Limestone, shaly, silty, light to dark gray, moderately hard, with: common fossil fragments, no apparent bedding, microcrystalline, with: common mica and common calcite.
2925-2929	4	No samples
2929-2970	41	Limestone, shaly, silty, light to dark gray, moderately soft, rare fossil fragments, no apparent bedding, microcrystalline, with: rare mica, rare pyrite, and rare calcite.

2970-3034	64	Limestone, shaly, light to dark gray, moderately hard, rare oolitic, common fossil fragments, no apparent bedding to platy, microcrystalline, with: rare pyrite, and common calcite.
3034-3068	34	Limestone, dark gray, moderately soft, rare fossil fragments, no apparent bedding, microcrystalline, with: rare mica common pyrite, and abundant carbonaceous material.
3068-3076	8	Limestone, light gray, dark gray, moderately hard, rare fossil fragments, no apparent bedding, cryptocrystalline, with: rare mica, rare pyrite, and abundant calcite, rare iron oxide staining.
3076-3090	14	Limestone, light gray, dark gray, white, moderately hard, no apparent fossil content, no apparent bedding, cryptocrystalline, with: rare mica, rare calcite, and rare carbonaceous material.
3090-3105	15	Limestone, silty, light gray, dark gray, dark brown, moderately hard, oolitic, fossil fragmental, no apparent bedding, microcrystalline, with: rare calcite.
3105-3108	3	Limestone, light to dark gray, moderately hard, rare fossil fragments, no apparent bedding, microcrystalline, with: rare chert.
3108-3151	43	Limestone, dark gray, dark brown, moderately hard, no apparent fossil content, no apparent bedding, microcrystalline, with: abundant calcite.
3151-3155	4	No samples
3155-3171	16	Limestone, light gray, dark gray, moderately hard, oolitic, common fossil fragments, no apparent bedding, microcrystalline, with: common calcite.
3171-3196	25	Limestone, dark gray, dark brown, moderately hard, rare fossil fragments, no apparent bedding, microcrystalline, with: rare calcite.
3196-3243	47	Limestone, light gray, dark gray, moderately hard, no apparent fossil content, no apparent bedding, cryptocrystalline, with: rare mica, common calcite.

3243-3383	140	Limestone, silty, light gray, dark gray, moderately hard, oolitic, no apparent fossil content, no apparent bedding, microcrystalline, with: common calcite and rare carbonaceous material.
3383-3439	56	Limestone, light brown, tan, white, moderately hard, no apparent fossil content, no apparent bedding, cryptocrystalline, microcrystalline, with: abundant calcite, and rare iron oxide staining.
3439-3485	46	Limestone, dolomitic, dark gray, dark brown, moderately hard, no apparent fossil content, no apparent bedding, microcrystalline, with: common calcite.
3485-3523	38	Siltstone, locally finely sandy, red (rare), green-gray, moderately hard, brittle, no apparent bedding calcareous, argillaceous, with: common biotite, common muscovite, and rare iron oxide stains.
3523-3595	72	Siltstone, locally finely sandy, rare light gray, red, moderately hard, brittle, no apparent bedding, argillaceous, ferruginous, with: common biotite, common muscovite, rare pyrite, and abundant iron oxide stains,
3595-3612	17	Siltstone, locally finely sandy, light to medium gray, moderately hard, tough, no apparent bedding, argillaceous, with: common biotite, common muscovite, and rare iron oxide stains.
3612-3657	45	Siltstone, grades locally to a very fine-grained Sandstone, locally finely sandy, light to dark gray, moderately soft, brittle, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite, and rare iron oxide stains.
3657-3669	12	Siltstone, locally finely sandy, light to medium gray, moderately hard, tough, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite, rare carbonaceous material and rare iron oxide stains.
3669-3707	38	Sandstone, grades locally to Siltstone, white, light gray, moderately cemented, very fine-to fine-grained, well sorted, subrounded to subangular interstitially silty, siliceous, with: abundant biotite, abundant muscovite, rare pyrite, rare carbonaceous material. Nonporous to slightly porous.

3707-3734	27	Siltstone, locally finely sandy, locally shaly, light to dark gray, moderately hard, brittle, no apparent bedding to poorly fissile, siliceous, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
3734-3780	46	Siltstone, locally shaly, light to dark gray, brown, moderately hard, tough, no apparent bedding to fair fissility, argillaceous, with: rare biotite, rare muscovite, rare pyrite, and rare carbonaceous material, rare iron oxide stains.
3780-3812	32	Shale, silty, medium gray, moderately soft, flaky, poorly fissile to fair fissility, argillaceous, with: rare biotite, rare muscovite, abundant pyrite, and rare iron oxide stains.
3812-3912	100	Shale, locally finely sandy, light to medium gray, brown (rare), moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, and common pyrite.
3912-3917	5	No samples
3917-3942	25	Shale, medium to dark gray, brown (rare), moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, rare pyrite.
3942-4028	86	Shale, silty, locally shaly, dark gray, moderately hard, brittle, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite and abundant pyrite.
4028-4038	10	Siltstone, carbonaceous, dark gray, black, moderately hard, flaky, no apparent bedding to poorly fissile, argillaceous, with: common biotite, abundant muscovite, and rare pyrite.
4038-4167	129	Shale, silty, medium to dark gray, moderately hard, tough, poor to fair fissility, argillaceous, with: rare biotite, rare muscovite, common carbonaceous material, and rare iron oxide stains,
4167-4201	34	Interbedded; Shale, silty, medium to dark gray, moderately soft, flaky, poor to fair fissility, argillaceous, with: common biotite, common muscovite, and common carbonaceous material. Siltstone, locally finely sandy, light to medium gray, moderately hard, tough, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite.

4201-4207	6	No samples
4207-4337	130	Siltstone, locally finely sandy, locally shaly, light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, with: rare biotite, rare muscovite, and common carbonaceous material.
4337-4425	88	Interbedded, Sandstone, white, light gray, moderately cemented, very fine-grained, well sorted, subrounded to subangular, interstitially silty, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material. Nonporous to slightly porous. Siltstone, locally shaly, light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, siliceous, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
4425-4555	130	Siltstone, grades locally to very fine-grained Sandstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous argillaceous, with: abundant biotite, abundant muscovite, common carbonaceous material, and rare iron oxide stains.
4555-4571	16	Siltstone, locally shaly light to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, siliceous, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
4571-4590	19	Siltstone, locally finely sandy, light gray, medium gray, brittle, no apparent bedding, siliceous, argillaceous, with: abundant biotite, abundant muscovite and rare iron oxide stains.
4590-4634	44	Shale, silty, light to medium gray, moderately soft, flaky, fair to good fissility, argillaceous, with: common biotite, common muscovite, and rare carbonaceous material.
4634-4890	256	Interbedded; Shale, medium to dark gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, With: Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, With: rare biotite, rare muscovite.

4890-4912	32	Shale, locally silty, light to dark gray, moderately soft, flaky, poor to good fissility, argillaceous, with: abundant biotite, common muscovite, and rare carbonaceous material.
4912-4929	17	Interbedded; Shale, medium to dark gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous laminae. Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
492 4929-4940	11	No samples
4940-5040	100	Interbedded; Shale, medium to dark gray, moderately soft, flaky, fair fissility, argillaceous, with: common biotite, and rare muscovite. Siltstone, locally finely sandy, light to medium gray, moderately hard, brittle, no apparent bedding, siliceous, with: rare biotite, rare muscovite, and rare carbonaceous material.
5040-5064	24	Shale, locally silty, light to medium gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, common pyrite, and rare carbonaceous material.
5064-5188	124	Interbedded; Shale, locally silty, medium to dark gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, rare pyrite and rare carbonaceous material. Siltstone, locally finely sandy, light gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: common biotite, common muscovite.
5188-5199	11	Shale, carbonaceous, dark gray, black, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, rare pyrite, abundant carbonaceous material; and abundant carbonaceous laminae.
5199-5236	37	Interbedded; Shale, locally finely sandy, light gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, common pyrite. Siltstone, locally finely sandy, locally shaly, light to dark gray, moderately hard, brittle, no apparent bedding, siliceous, argillaceous, with: rare biotite, rare muscovite, common pyrite and abundant carbonaceous material.

- 5236-5318 82 Interbedded; Shale, carbonaceous, dark gray, black, moderately soft, flaky, poor to fair fissility, argillaceous, with: rare pyrite, abundant carbonaceous material, and abundant carbonaceous laminae. Shale, light to medium gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, and rare pyrite.
- 5318-5334 16 Shale, carbonaceous, dark gray, black, moderately soft, flaky, poor to good fissility, argillaceous, with: rare muscovite, abundant pyrite, and abundant carbonaceous material.
- 5334-5786 452 Interbedded; Shale, carbonaceous, dark gray, black, moderately soft, flaky, poor to fair fissility, argillaceous, with: common pyrite, abundant carbonaceous material, and abundant carbonaceous laminae. Shale, light to medium gray, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite and rare pyrite.
- 5786-5887 101 Shale, carbonaceous, dark gray, black, moderately soft, flaky, fair to good fissility, argillaceous, with: rare biotite, rare muscovite, common pyrite, abundant carbonaceous material, and abundant carbonaceous laminae.
- 5887-5900 13 Interbedded; Shale, carbonaceous, dark gray, moderately soft, flaky, fair to good fissility, argillaceous, with: common pyrite, and abundant carbonaceous material. Siltstone, locally shaly, light to medium gray, moderately soft, flaky, no apparent bedding to poorly fissile, calcareous, argillaceous, with: common biotite, common muscovite, and common carbonaceous material.
- 5900-5927 27 Interbedded, Shale, carbonaceous, dark gray, moderately soft, flaky, fair to good fissility, with: rare pyrite, abundant white silicified calcite, and abundant carbonaceous material. Siltstone, locally shaly, light gray, moderately soft, brittle, no apparent bedding to poorly fissile, calcareous, argillaceous, with: rare biotite, rare muscovite, and rare carbonaceous material.

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| 5927-6073 | 146 | Limestone, silicified, dolomitic, light gray to light brown, moderately hard, no apparent fossil content, no apparent bedding, cryptocrystalline to microcrystalline, with: common, abundant pyrite, common chert and abundant white silicified calcite, rare iron oxide staining. |
| 6073-6089 | 16 | Siltstone, light to dark gray, moderately soft, flaky, no apparent bedding, calcareous, argillaceous, with: rare biotite, rare muscovite, and common calcite. |
| 6089-6096 | 7 | Sandstone, white, clear, moderately cemented, very fine-to fine-grained , well sorted, rounded to subangular, siliceous, with: rare biotite, rare muscovite, rare carbonaceous material, and rare iron oxide stains. Nonporous to slightly porous. |
| 6096-6271-T. D. 175 | | Siltstone, locally shaly, light gray to dark gray, moderately hard, tough, no apparent bedding to poorly fissile, argillaceous, dolomitic (slightly) with: rare biotite, rare muscovite, abundant pyrite, abundant chert, rare calcite, and common carbonaceous material. |

GEOLOGIC SUMMARY

Pennsylvanian System

Norton Formation	in bottom	at surface 268
Lee Formation	top bottom	268 1334

Mississippian System

Bluestone Formation	top bottom	1334 1749
Princeton Princeton Sandstone	top bottom	1749 1901
(L. ST. GRP) Hinton Formation	top bottom	1901 2595

Stony Gap Sandstone (Maxon)	top bottom	2440 2595
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Bluefield Formation	top bottom	2595 2790
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✓ Greenbrier Limestone q	top bottom	2790 3485
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Maccrady-Price Formations	top bottom	3485 3780
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✓ Mississippian-Devonian Systems

Big Stone Gap Shale	top bottom	3780 4167
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Devonian - Pre-Devonian Systems

Devonian - Pre-Devonian undivided	top (deepest sample	4167 6271)
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