

GEOLOGICAL RECORD

ANR Production Co. #1 VICC  
N 253715 E 853510 WI 215-F  
Wise County, Virginia

Drilling Contractor: Falcon Drilling Co.  
Spud: February 24, 1982  
Drilling Completed: March 18, 1982  
Elevation: Gr 2246.25' RF 2256.25' KB 2257.75'  
Record By: Paul Mescher  
Casing: 9 5/8" @ 987' 7" @ 2472'

FORMATION RECORD

PENNSYLVANIAN

0' - 30'	No samples
30' - 60'	Sand, gray, silty, shaly, mica
60' - 90'	Shale, gray & black, silty, sandy
90' - 100'	Sand, gray, fn gry & silty, very mica. <u>trace coal</u>
100' - 140'	Sand, aa, hard chips (silica cement)
140' - 160'	Shale, gray, silty, sandy
160' - 180'	Missing
180' - 190'	Shale, gray, sandy
190' - 200'	Sand, lt. gray, silty, shaly, mica
200' - 210'	Sand, aa with shale, drk gray, very mica
210' - 220'	Sand, lt. gray, fn grn.
220' - 230'	Shale, gray, silty, mica
230' - 240'	Sand, lt. gray, fn grn, loose and hard clusters, silty
240' - 250'	Shale, dark gray, mica
250' - 300'	Sand, fn grn, silty, shaly, mica
300' - 320'	Shale, drk gray, mica
320' - 330'	Sand, fn grn, very shaly, mica
330' - 350'	Shale, drk gray, silty, mica, sandy
350' - 370'	Sand, lt gray, fn-med grn, clusters with silica cement
370' - 400'	Sand, white, fn grn, loose
400' - 410'	Sand aa <u>trace coal</u>
410' - 480'	Sand, wh, fn-med grn, angular & round, loose
480' - 500'	Sand, aa with shale drk gray, mica
500' - 520'	Shale, dark gray, very sandy
520' - 580'	Shale, gray, hard
580' - 600'	Shale, gray, sandy
600' - 620'	Shale, dark gray, mica, sandy
620' - 650'	Sand, lt gray, fn grn, mica, with shale aa
650' - 670'	Shale, gray, sandy, mica
670' - 680'	Sand, fn & med grn, lt. gray, mica with some shale
680' - 730'	Sand, aa, loose
730' - 740'	Shale, gray, sandy, mica
740' - 780'	Shale, gray, mica
780' - 790'	Shale, gray, mica with <u>coal</u>
790' - 800'	Shale, drk gray to black with <u>coal</u>
800' - 810'	Sand, hard, fn grn, mica, shaly
810' - 910'	Sand, fn & med grn, angular
910' - 920'	Shale, gray-black, mica, sandy, <u>trace coal</u>

GEOLOGICAL RECORD (contd)

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920' - 930' Sahle, gray-black, mica, sandy, with coal  
930' - 940' Shale, gray-black, mica, sandy, trace coal  
940' - 980' Sand, fn grn, gray, shaly, mica  
980' - 1000' Sand, aa, abundant biotite, with blue-green mineral (chlorite?)  
1000' - 1010' Siltstone, mica  
1010' - 1020' Siltstone, mica, shaly and sandy  
1020' - 1030' Sand, very fn grn, silty  
1030' - 1040' Shale, gray, hard  
1040' - 1060' Sand, very fn grn, silty, shaly  
1060' - 1090' Shale, gray, silty, sandy  
1090' - 1110' Sand, lt. gray, fn grn, very mica, with silica cement  
1110' - 1160' Sand, white, very fn grn, silty, loose  
1160' - 1190' Sand, white, fn-med grn, round & angular, loose  
1190' - 1230' Shale, gray & drk gray  
1230' - 1260' Sand, wh, fn-med grn, angular & round, trace shale, black  
1260' - 1270' Sand aa with trace coal  
1270' - 1300' Sand, wh, fn-med grn, angular & round  
1300' - 1310' Sand, aa, very mica, shaly  
1310' - 1330' Sand, aa with silica cement  
1330' - 1340' Sand, aa, shaly  
1340' - 1350' Shale, gray, silty, mica  
1350' - 1370' Sand, fn-med grn, silica cement, trace blk shale  
1370' - 1380' Sand, wh-gray, fn-med grn, sand chips with silica cement  
1380' - 1390' Shale, gray, very sandy, silty  
1390' - 1440' Shale, gray, silty  
1440' - 1450' Sand, fn grn, lt gray, silty  
1450' - 1470' Siltstone, lt gray, with very fn grn sand  
1470' - 1480' Sand, lt gray, fn grn, silty  
1480' - 1490' Siltstone, lt gray with very fn grn sand  
1490' - 1530' Sand, lt gray, fn grn, silty  
1530' - 1570' Siltstone, lt gray, with very fn grn sand  
1570' - 1620' Shale, gray, silty  
1620' - 1630' Sand, lt gray, fn grn, silty, mica  
1630' - 1650' Shale, blk (drilling time 1636' - 1646') = coal  
1650' - 1660' Sand, wh, fn-med grn, round & angular  
1660' - 1680' Shale, gray, sandy  
1680' - 1690' Sand, lt gray, fn grn, with silica cement  
1690' - 1700' Shale, drk gray, platy, with sand aa  
1700' - 1710' Shale, drk gray, platy, mica  
1710' - 1720' Shale, drk gray & black, with coal  
1720' - 1730' Shale, aa, with sand, gray, hard coal  
1730' - 1740' Shale, & sand aa, with trace coal  
1740' - 1770' Sand, lt gray, fn grn, mica, with shale, drk gray  
1770' - 1780' Shale, drk gray, mica, sandy  
1780' - 1800' Shale, drk gray, mica, sandy, trace coal

GEOLOGICAL RECORD (contd)

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Formation Record (contd)

1800' - 1810'	Sand, fn grn, shaly	<u>trace coal</u>
1810' - 1820'	Sand, fn-med grn, angular	
1820' - 1830'	Sand, fn-med grn, angular, shaly, trace coal	
1830' - 1840'	Sand, fn-med grn, angular, 25% coal	
1840' - 1850'	Sand, fn-med grn, angular, 20% coal	
1850' - 1860'	Sand, fn-med grn, angular, shaly, trace coal	
1860' - 1910'	Shale, gray, mica, sandy	
1910' - 1940'	Sand, lt gray, fn grn, silica cement, shaly	
1940' - 1970'	Sand, wh., fn grn	
1970' - 1980'	Missing	
1980' - 2000'	Sand, wh., fn grn	
2000' - 2010'	Missing	
2010' - 2060'	Sand, wh, fn grn, loose, at 2030' trace coal	
2060' - 2090'	Sand, wh, fn-med grn, angular & round with silica cement	
2090' - 2100'	Sand, wh, fn grn, loose, silty	
2100' - 2140'	Sand, wh, fn-med grn, angular & round, loose & clusters	
2140' - 2180'	Sand, wh, fn grn, silty	2160-2170 <u>trace coal</u>
2180' - 2190'	Sand, wh, fn & med grn	
2190' - 2200'	Sand, wh, fn & med grn,	<u>trace coal</u>
2200' - 2210'	Sand, lt gray, fn grn	<u>20% coal</u>
2210' - 2220'	Shale, drk gray, sandy	
2220' - 2240'	Sand, lt gray, fn-med grn, shaly	
2240' - 2260'	Sand, fn grn, lt gray, silty	
2260' - 2270'	Sand, fn grn, lt gray, silty, shaly	
2270' - 2280'	Sand, lt gray, fn-med grn, mica, hard chips	
2280' - 2290'	Sand, lt gray, fn-med grn, mica, trace coal	
2290' - 2320'	Sand aa with black carbonaceous shale, trace coal	
2320' - 2400'	Sand, lt gray, fn grn, mica, hard chips	
2400' - 2430'	Shale, gray, sandy	
2430' - 2456'	Shale, gray, sandy, with some red shale	

BASE LEE FORMATION 2456' (-198')

TOP MISSISSIPPIAN - Pennington Formation

2456' - 2470'	Shale, gray & gray-green with red shale
2470' - 2500'	Shale, gray, mica, with red & brown shale
2500' - 2510'	Shale, gray, mica, with red & brown shale, sandy
2510' - 2550'	Shale, red, with some shale aa
2550' - 2560'	Shale, gray, mica
2560' - 2570'	Shale, gray, mica, sandy
2570' - 2590'	Sand, fn grn, with red & gray shale
2590' - 2600'	Shale, gray & red, sandy
2600' - 2630'	Shale, gray, mica
2630' - 2640'	Shale, gray, sandy
2640' - 2670'	Shale, gray & drk gray, sandy
2670' - 2680'	Sand, lt gray, fn grn, angular

GEOLOGICAL RECORD (contd)

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Formation Record (contd)

2680' - 2690'	Sand, lt gray, fn grn, angular, shaly, red & gray
2690' - 2700'	Sand, lt gray, very fn grn
2700' - 2710'	Sand, lt gray, very fn grn, shaly
2710' - 2720'	Shale, gray, sandy
2720' - 2740'	Siltstone
2740' - 2804'	Shale, lt gray & drk gray, silty

Pride Shale 2804' (-546')

2804' - 2850'	Shale, gray, sandy, mica
2850' - 2880'	Shale, drk gray, mica
2880' - 2900'	Shale, drk gray, sandy
2900' - 2970'	Shale, drk gray, mica
2970' - 2980'	Shale, drk gray, mica, sandy
2980' - 3000'	Shale, drk gray, mica, very sandy

Ravencliff Formation 3000' (-742')

3000' - 3010'	Shale, gray, sandy
3010' - 3030'	Sand, lt gray, fn grn, shaly

Show gas 3016' to 3030'. Maximum 400 units at 3016' with gradual decline to 300 units and maintains 200 units gas while drilling to 3281'. Background gas 140 to 200 units while drilling to 3472'. On trip out for NB gas to 350 units with 6" flare.

C-1 = 4%, C-2 = trace, C-3 = trace

3030' - 3086'	Sand, lt gray, very fn grn, loose, silty
3086' - 3110'	Shale, drk gray, mica, silty
3110' - 3120'	Shale, drk gray, mica, silty, sandy
3120' - 3150'	Shale, drk gray, mica
3150' - 3167'	Shale, lt gray, sandy, with some red shale

Base Ravencliff Formation 3167' (-909')

3167' - 3190'	Shale, red
3190' - 3200'	Shale, red with shale, gray, sandy
3200' - 3230'	Sand, gray, hard, very shaly, mica, trace red shale
3230' - 3250'	Shale, gray, sandy
3250' - 3280'	Sand, fn-med grn, angular & round, loose, trace red shale
3280' - 3300'	Shale, gray & red
3300' - 3310'	Shale, red to brown, very mica
3310' - 3330'	Shale, red to brown, very mica, with shale, gray-green

GEOLOGICAL RECORD (contd)

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Formation Record (contd)

3330' - 3360' Shale, red and gray, mica  
3360' - 3390' Shale, gray  
3390' - 3400' Shale, gray, with silica chips and sandy  
3400' - 3410' Sand, fn-med grn, hard chips, some pyrite, shaly  
3410' - 3450' Sand, aa with blk shale, some pyrite  
3450' - 3460' Shale, gray, silty, sandy  
3460' - 3540' Sand, wh-gray, fn grn, clusters of sand with silica cement,  
with traces pyrite, red and gray shale  
3540' - 3610' Shale, drk gray with sand aa  
3610' - 3630' Shale, gray, mica, some sand aa and pyrite  
3630' - 3660' Shale, gray, mica, sandy  
3660' - 3690' Sand, wh, fn & med. grn, loose & hard clusters, shaly  
3690' - 3780' Shale, drk gray, mica, sandy  
3780' - 3810' Shale, drk gray, mica  
3810' - 3860' Shale, drk gray, mica, sandy  
3860' - 3870' Shale, gray & drk gray, mica, some ls. nodules and trace red shale  
3870' - 3880' Shale, gray & drk gray, mica, some ls. dark brn dense, trace red shal  
3880' - 3900' Shale, gray & drk gray, mica, some red & maroon shale  
3900' - 3960' Shale, gray & drk gray, mica, with 15% ls. drk brn dense  
3960' - 3980' Shale, gray, mica, sandy, some ls. drk brn dense  
3980' - 4000' Shale, drk gray, mica, sandy, pyrite, trace ls. nodules  
4000' - 4010' Shale, drk gray, mica, silty  
4010' - 4030' Shale, drk gray, mica, with 10% ls., lt & drk, mottled, some  
cse xln and chalky  
4030' - 4060' Shale aa with 20% ls. aa  
4060' - 4090' Shale aa with 15% ls. aa, some shaly foss. ls.  
4090' - 4100' Ls. drk brn, dense, with ls. aa, 20% shale, drk gray  
4100' - 4120' Ls. drk brn, dense, some crinoid stems, some oolites  
4120' - 4140' Ls. drk brn, dense, some oolites  
4140' - 4150' Ls. drk brn, dense, 30% drk gray shale  
4150' - 4160' Ls. drk brn, dense, 50% drk gray shale  
4160' - 4200' Shale, gray, mica

Little Lime 4200' (-1942')

4200' - 4210' Shale, gray, mica with 30% Ls., brn, dense  
4210' - 4240' Ls. lt gray & gray, cse xln, dense with 10% red shaly ls.  
4240' - 4280' Ls. lt. gray & gray, cse xln, dense, 20% red shale, 10% red shaly ls.

Big Lime 4280' (-2022')

4280' - 4350' Ls., lt gray & gray, cse xln, dense, with trace oolites  
4350' - 4470' Ls. lt gray & gray, cse xln, dense, with increase in oolites  
4470' - 4510' Ls. lt gray, fn xln, very dense  
4510' - 4520' Ls. lt gray, fn xln, very dense, very oolitic  
4520' - 4540' Ls. lt gray, fn xln, chalky, some oolites  
4540' - 4590' Ls. lt gray, fn xln, chalky, and ls, fn xln, gray, tan, dense

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GEOLOGICAL RECORD (contd)

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Formation Record (contd)

- 4590' - 4600' Ls. gray tan, fn xln, dense  
4600' - 4620' Ls. gray tan, fn xln, dense, some oolites  
4620' - 4640' Ls. lt gray, very fn xln, dense  
4640' - 4650' Ls. lt gray, very fn xln, dense, some red tint in ls.  
4650' - 4690' Ls. lt gray, very fn xln, dense, some cse xln ls., dense  
4690' - 4710' Ls. lt. gray, very fn xln, dense, with oolites  
4710' - 4730' Ls. lt. gray, very fn xln, dense, 5% shale, red, gray & green  
4730' - 4750' Shale, gray, mica, sandy, with ls aa and 5% red shale  
4750' - 4770' Limestone, dolomitic, gray, dense with 5% chert, amber with some shale, gray, sandy  
4770' - 4779' Ls. aa with dolomite, buff, fn xln, cherty. Some shale aa

Base Big Lime 4779' (-2521')

- 4779' - 4790' Dolomite, buff, fn xln, cherty  
4790' - 4800' Dolomite, buff, fn xln, cherty and shale, gray sandy, some black carbonaceous material in sandy shale  
4800' - 4830' Shale, gray and shale drk gray, mica, sandy aa  
4830' - 4850' Shale, lt. gray, very sandy  
4850' - 4870' Dolomite, buff, fn xln, dense, cherty, with some shale aa  
4870' - 4920' Shale, gray and shale, lt gray, mica, very sandy, w/pyrite  
4920' - 4972' Sand, fn grn to silty, lt gray, shaly, some red sandy shale  
4920' - 4930'

Weir 4972' (-2714')

- 4972' - 4990' Shale, lt gray, sandy  
4990' - 5010' Shale, gray, mica, silty, slightly sandy  
5010' - 5040' Shale, gray, mica, silty, slightly sandy, some shale, brown, red & maroon  
5040' - 5290' Shale, lt gray, mica  
5290' - 5300' Shale, lt gray & drk gray, mica, silty  
5300' - 5310' Shale, drk gray to blk, mica, silty and shale aa  
5310' - 5330' Shale, aa with some sand, hard (silica cement)

Berea 5330' (-3072')

Show gas 5330' to 5460'. 160 units background gas to 5330'. Gas increase to 360 units while drilling with maximum 400 units at 5493'. NB 5334'. Trip gas 1100 units

- 5330' - 5350' Sand, wh gray, fn grn, very hard chips  
5350' - 5390' Sand, lt gray, fn grn, very hard chips, some soft chips  
5390' - 5400' Sand, gray & drk gray, fn grn hard; sand, shaly & shaly gray & blk  
5400' - 5410' Sand, & shale aa, with fn grn, gray sand, some porosity in soft shaly sand chips, a few vugs with (dolomite?) crystals

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5410' - 5430' Shale, gray, with some blk carbonaceous material in shale,  
some red shale 20%, some sand aa 20%. A few ls. nodules  
5430' - 5456' Shale, gray & drk gray, 10% sand aa, 5% red shale

Base Berea - Top Devonian Shale 5456' (-3198')

5456' - 5480' Shale, blk, very mica, gritty  
5480' - 5490' Shale, drk gray & blk, hard  
5490' - 5520' Shale, blk, mica  
5520' - 5680' Shale, gray, mica, silty  
5680' - 6130' Shale, gray, drk gray and black, mica, some silty  
lt gray shales. 5910' to 5930' trace coal.  
Pyrite 6120'.  
6130' - 6140' Shale, gray, mica, silty  
6140' - 6250' Shale, gray, mica, silty and shale, blk, mica, pyrite  
6250' - 6410' Shale, gray, mica, silty  
6410' - 6420' Shale, gray, mica, silty, with trace coal  
6420' - 6469' Shale, gray and black, mica with increase in black shale at 6460'

Onondaga 6469' (-4211')

6469' - 6480' Ls. gray-tan, fn to med xln, mottled, cherty  
6480' - 6490' Ls. gray-buff, fn xln, very cherty, chert, gray-buff  
6490' - 6510' Ls. aa with trace sand, clear quartz  
6510' - 6520' Ls. buff, fn xln dense, cherty, trace sand  
6520' - 6540' Ls. lt gray, fn-med xln chalky, glauconite, trace sand  
6540' - 6559' Dolomite, fn-med xln, buff-gray, sparkly, some inter-  
crystalline porosity

Driller TD: 6559'  
Electric Log TD: 6472' (tool did not reach TD)  
FORMATION TOPS CORRECTED TO ELECTRIC LOG MEASUREMENTS.