

HYDROGEOLOGIC INVESTIGATION AND ESTABLISHMENT
OF A PERMANENT MULTI-OBSERVATIONAL WELL NETWORK
IN AIKEN, ALLENDALE, AND BARNWELL COUNTIES
SOUTH CAROLINA -- PHASE II

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OF
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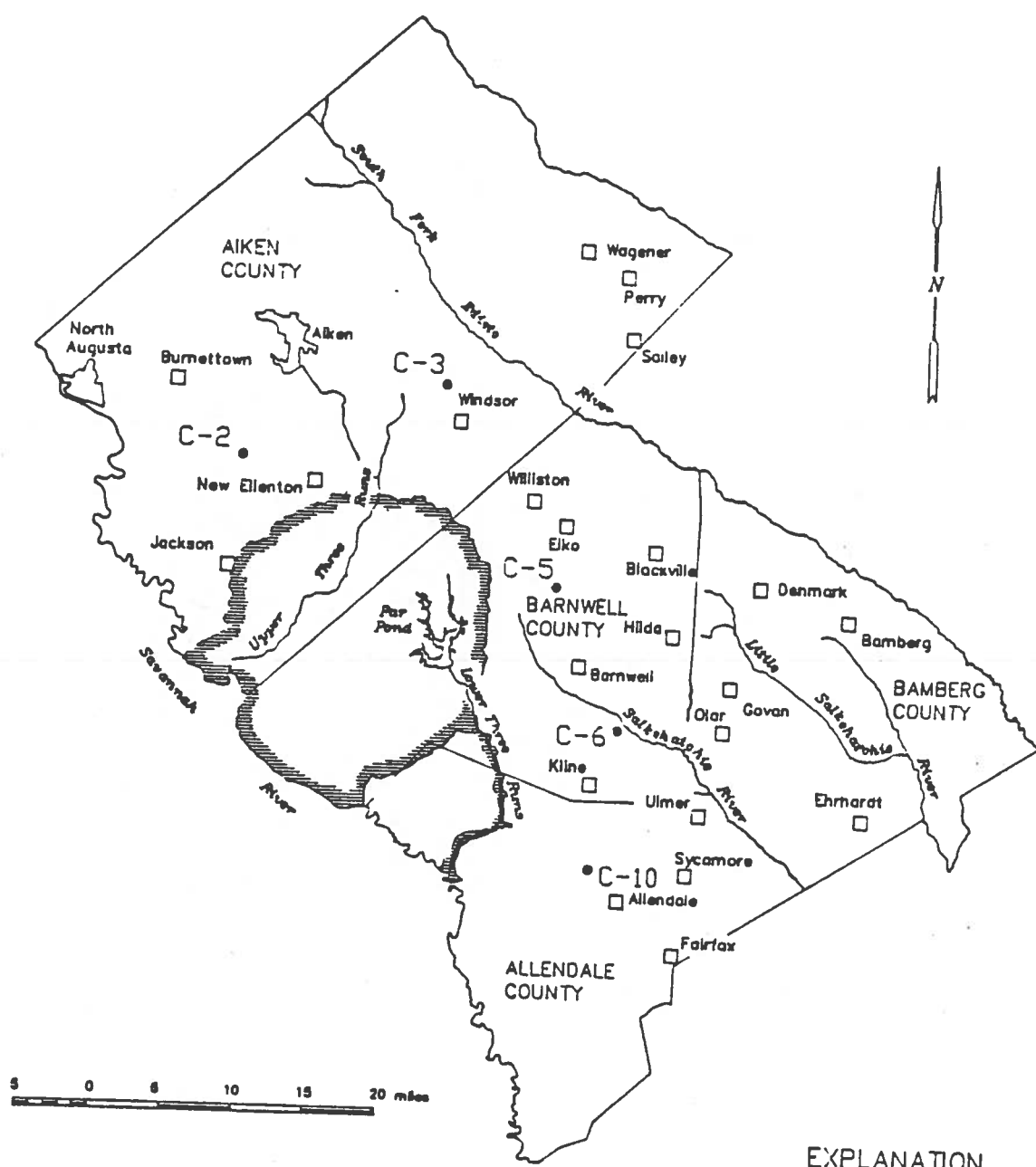
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INTRODUCTION

The South Carolina Water Resources Commission (SCWRC), in its continuing efforts to acquire water-resource information for all parts of the State, and being aware of the deficiency of detailed geologic and hydrologic data for the area surrounding the Savannah River Plant (SRP), began a geohydrologic investigation in part of the Lower Savannah River Project Area in 1986. The area, consisting of Aiken, Allendale, and Barnwell Counties in western South Carolina, lies almost entirely within the Coastal Plain physiographic province. The framework for the investigation is centered on a well cluster system, an extension of the well cluster system being constructed on the plant site as a part of the "SRP Baseline Hydrogeologic Investigation" (Bledsoe, 1984, 1987). The format of the information obtained is compatible with that of the SRP project.

The entire well cluster project, as originally proposed, consists of ten well cluster sites, of five to ten wells each, located peripheral to SRP (Fig. 1). The well cluster sites C-2 and C-6 were selected as part of Phase I activities. Phase II well cluster sites (C-3 and C-5) were selected on the basis of the preliminary data obtained during Phase I. The locations of the remaining sites are tentative and will be based on the data obtained during Phases I and II. Budget constraints necessitated a modification of the original planned activities and expenditures. The Savannah River Operations Office and SCWRC agreed that the available funds could best be used by coring two deep wells and completing two shallow



EXPLANATION

- C-2 • Well cluster, with identifying number

Figure 1. Location of well-cluster network.

wells annually for the first two years of the project. It was decided that Phase I core holes (C-2 and C-6) would provide the most useful data initially. Phase I of the project consisted of continuous coring, geophysical logging, physical testing of sediment samples, and the construction of five permanent observation wells at the two sites. Drilling operations began in October 1986 and were completed in August 1987 (Logan, 1987). Prior to work on Phase II, additional funds were allocated to complete all of the wells at cluster sites C-2 and C-6.

SCOPE OF WORK FOR PHASE II

Phase II of the project consisted of continuous coring, geophysical logging, physical testing of sediment samples, and the construction of four permanent observation wells at sites C-3 and C-5. Three additional wells were completed at C-2 and five more were constructed at C-6, for a total of twelve wells completed during Phase II. Drilling operations began in January 1988 and were completed in June 1988. In addition, automatic digital recorders (ADR's) and a permanent chain-link fence were installed at sites C-2 and C-6.

METHODOLOGY

Geologic data were obtained by continuously coring one exploratory well at each cluster site from land surface through the Coastal Plain sediments and into the crystalline basement. The core samples were described in the field by SCWRC geologists (Appendices A and B). Cores were wrapped in plastic, labeled in 5-foot intervals, and placed on a

polyvinyl chloride (PVC) tray. The tray was then inserted into a 5-foot section of SCH-40 PVC and capped on both ends. The exploratory well at site C-3 (AIK-826) was cored to a depth of 541 ft (feet) and the well at site C-5 (BRN-357) was cored to a depth of 1,084.5 ft. After coring operations were completed, the borings were geophysically logged by SCWRC. The logs obtained include: natural gamma-ray; single-point resistance; long- and short-normal resistivity; lateral resistivity; spontaneous-potential; and caliper. From examination of the geologic samples and geophysical logs and consultation with geologists from SRP, the aquifers were identified and the appropriate zones for screening were determined. In addition, tentative formation contacts were selected. These contacts will be considered tentative until age dates have been determined by paleontological studies. The borings were then reamed to 12 1/4 inches, and 6-inch galvanized steel casing was set and pressure grouted from 10 ft above the top of the screen setting to land surface. After allowing the grout to set, a 5 5/8-inch hole was drilled to a depth of 25 ft below the bottom of the 6-inch casing. A 10-foot section of 4-inch screen equipped with 5 ft of blank-pipe sump and 35 ft of overlap pipe was installed in the bore hole. The top of the overlap pipe was fitted with a neoprene packer to isolate the screened zone. Typical well-construction design is shown in Figure 2. Wells completed in Phase I and Phase II of the project are all natural-filter designed. This means that a screen size is selected so that most of the material smaller than the screen openings will be removed during development, leaving only the coarser particles. A zone of higher hydraulic conductivity and porosity is thereby created around the well screen. Wire-wound 4-inch well screens with 0.010-inch openings were used in all 12 wells. Wells greater than

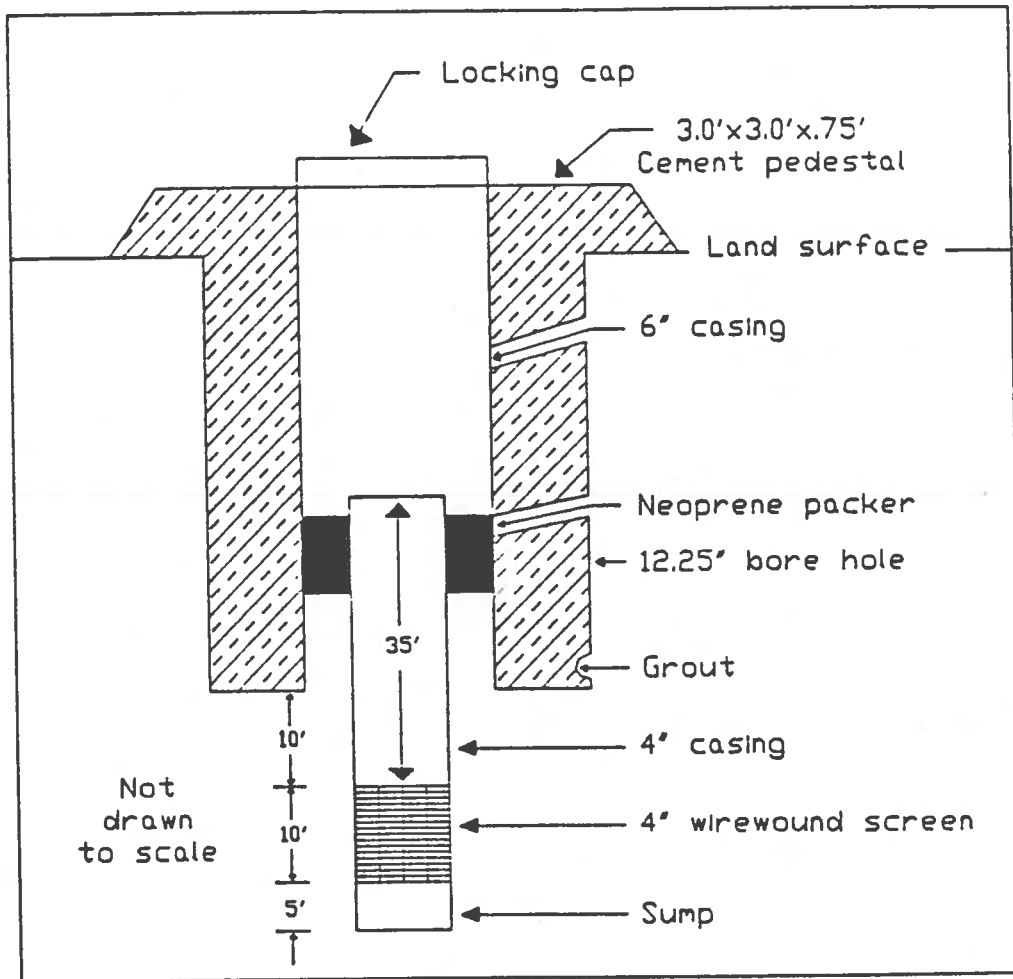


Figure 2. Typical well construction.

300 ft in depth were constructed with standard threaded and coupled Schedule 40 galvanized steel casing and stainless-steel screens. Wells less than 300 ft in depth were constructed with threaded-joint PVC casing and screens. Construction details for each well are given in the Table.

After the screens were installed, the wells were developed by alternately surging and pumping with air. Development continued until a clear, sand-free discharge was obtained.

CLUSTER SITE C-2

Cluster site C-2 is located about 5 miles west northwest of the town of New Ellenton, S.C., and 15 miles northwest of the center of SRP (Fig. 3). The land surface elevation is approximately 420 ft m.s.l. Two wells (AIK-817 and AIK-818) were installed in the cluster as a part of Phase I activities, and three additional wells were added in Phase II. The well layout for cluster C-2 is shown in Figure 4.

The three additional wells drilled in Phase II are wells AIK-823, AIK-824, and AIK-825. AIK-823 was drilled to a total depth of 168 ft (+247 ft m.s.l.) and screened in the Congaree Formation between 153 and 163 ft (+262 to +252 ft m.s.l.). This well did not yield water. AIK-824 was drilled to a total depth of 365 ft (+55 ft m.s.l.) and screened in the Black Creek Formation between 350 and 360 ft (+70 to +60 ft m.s.l.). The last well (AIK-825) was drilled to a total depth of 230 ft (+190 ft m.s.l.) and screened in the Peedee Formation between 216 and 226 ft (+204 to +194 ft m.s.l.). The screened zones and water levels obtained at

Table. Well cluster construction data.

Well Number	Latitude Longitude	¹ Depth Drilled	¹ Screened Interval	Casing Type	Screen Type	Water Level M.S.L. Date	² Elevation of Land Surface	Development Time (Hours)
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Cluster Site C-2

AIK-817	33 26 16 81 46 14	581	520 - 530	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	238.10 10-25-88	420	6
AIK-818	33 26 16 81 46 16	425	410 - 420	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	240.70 10-25-88	420	6
AIK-823	33 26 15 81 46 17	168	153 - 163	6" SCH-40 PVC	4" PVC #10 Slot	Dry 10-25-88	415	0
AIK-824	33 26 16 81 46 17	365	350 - 360	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	239.83 10-25-88	420	4
AIK-825	33 26 16 81 46 16	230	216 - 226	6" SCH-40 PVC	4" PVC #10 Slot	240.33 10-25-88	420	4

Cluster Site C-3

AIK-826	33 32 30 81 29 05	541	485 - 495	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	272.01 10-25-88	295	7
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Cluster Site C-5

BRN-357	33 19 14 81 24 28	L084.5	None	6" SCH-40 Galv. Steel	None	None	265	Abandoned and Cemented
BRN-358	33 19 14 81 24 28	847	832 - 842	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	208.58 10-25-88	265	32
BRN-359	33 19 16 81 24 28	220	199 - 209	6" SCH-40 PVC	4" PVC #10 Slot	212.08 10-25-88	265	30
BRN-360	33 19 15 81 24 28	139	125 - 134	6" SCH-40 PVC	4" PVC #10 Slot	238.06 10-25-88	265	5

Cluster Site C-6

BRN-349	33 10 42 81 18 55	L385	1030 - 1040	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	190.18 10-25-88	205	21
BRN-350	33 10 45 81 18 54	170	155 - 165	6" SCH-40 PVC	4" PVC #10 Slot	171.31 10-25-88	205	8
BRN-351	33 10 43 81 18 53	95	80 - 90	6" SCH-40 PVC	4" PVC #10 Slot	171.97 10-25-88	205	6
BRN-352	33 10 44 81 18 53	295	278 - 288	6" SCH-40 PVC	4" PVC #10 Slot	160.10 10-25-88	205	3
BRN-353	33 10 43 81 18 54	590	573 - 583	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	168.47 10-25-88	205	4
BRN-354	33 10 44 81 18 54	415	396 - 406	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	159.97 10-25-88	205	4
BRN-355	33 10 44 81 18 55	701	686 - 696	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	167.99 10-25-88	205	14
BRN-356	33 10 43 81 18 56	929	914 - 924	6" SCH-40 Galv. Steel	4" Stainless Steel #10 Slot	189.88 10-25-88	205	13

1. All depth measurements in feet below land surface.
2. Elevations estimated from topographic maps until surveyed.

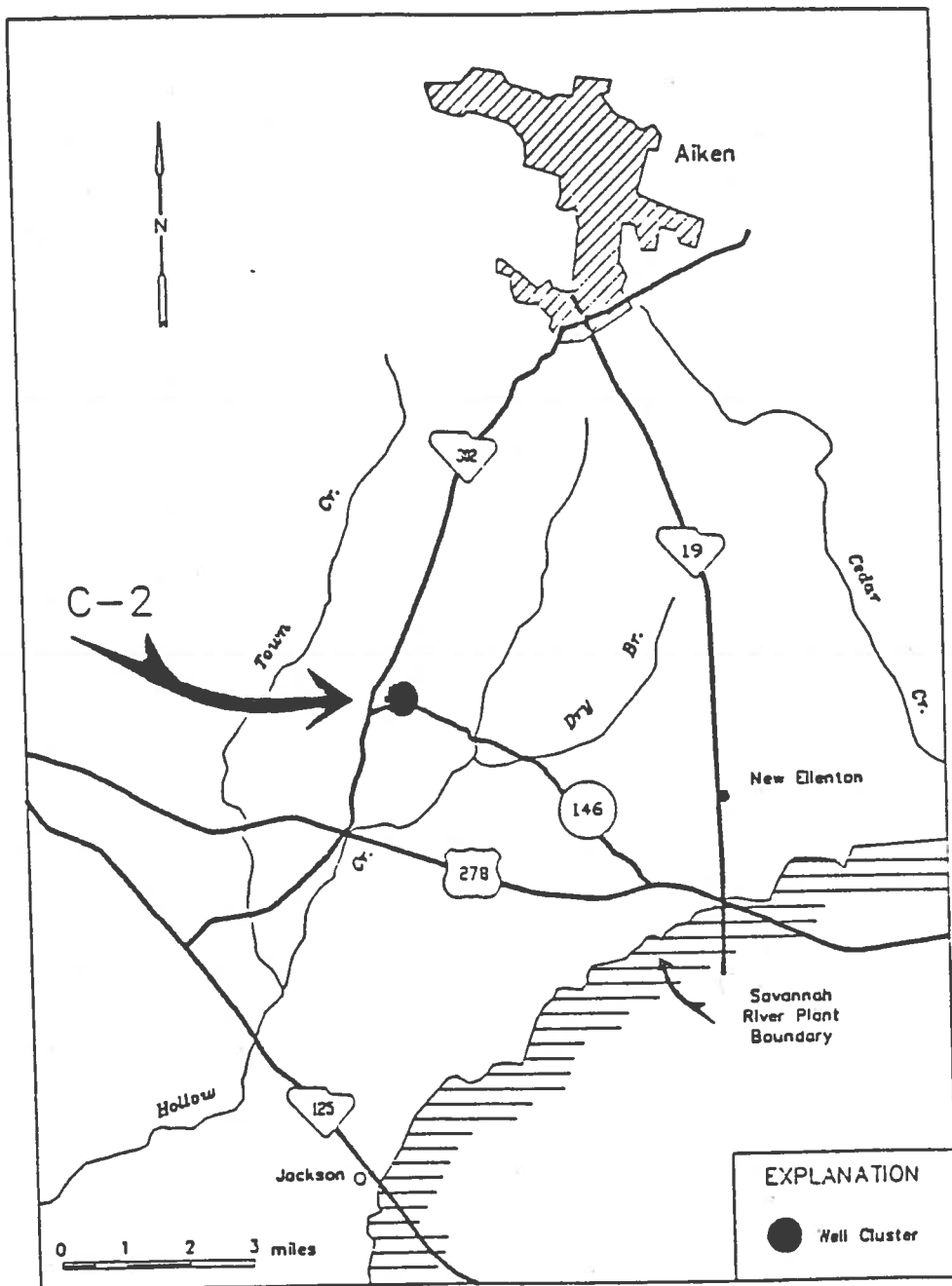


Figure 3. Location of well cluster C-2.

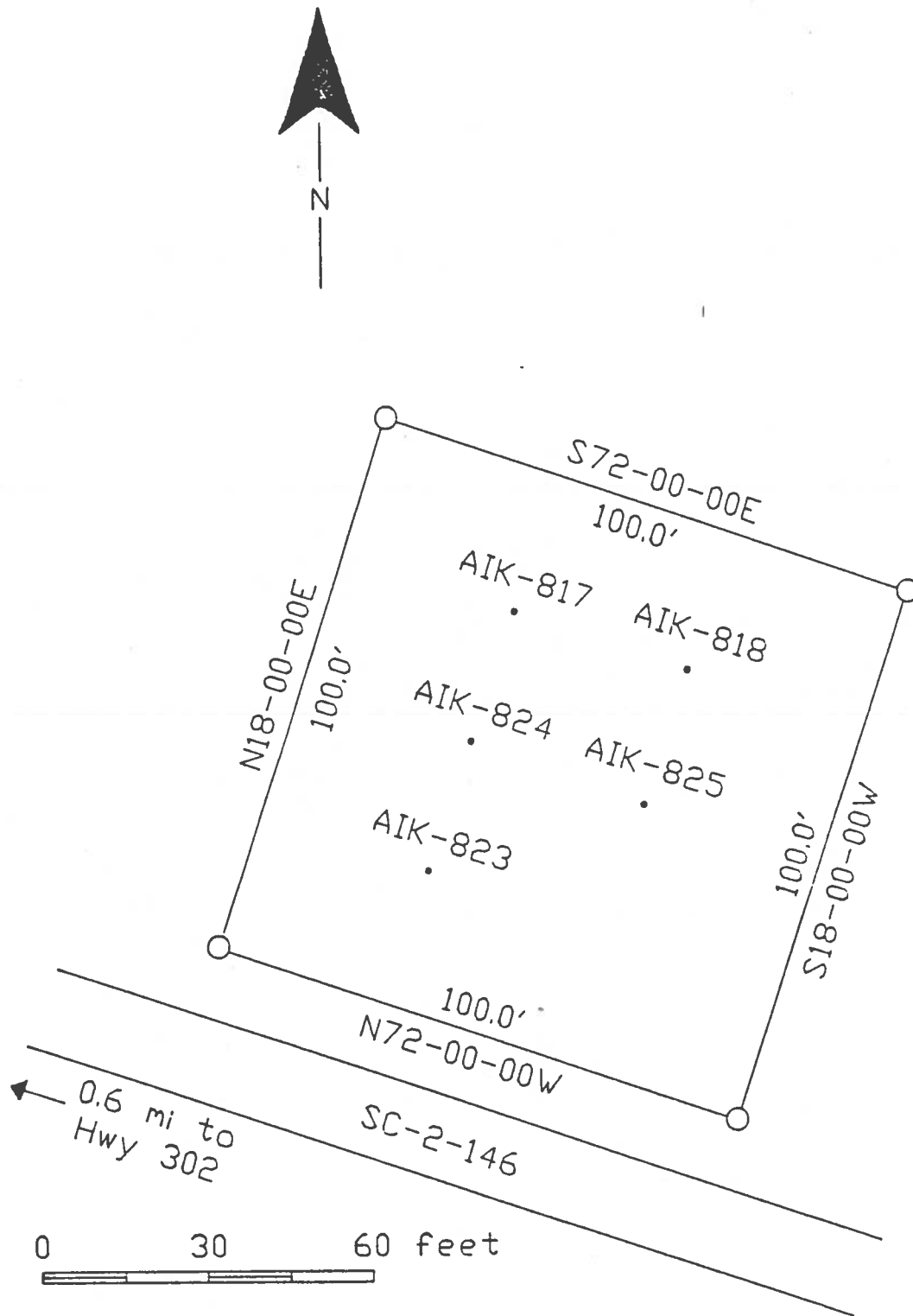


Figure 4. Well cluster C-2 layout.

cluster site C-2 are presented in Figure 5 and again in the Table. In addition, ADR's have been installed on the two Phase I wells, and the entire site has been fenced with 6-ft high industrial 9-gage chain-link fence with a 20-foot gate. For additional information, including a detailed lithologic log and geophysical logs for cluster site C-2, refer to Logan's 1987 Phase I report.

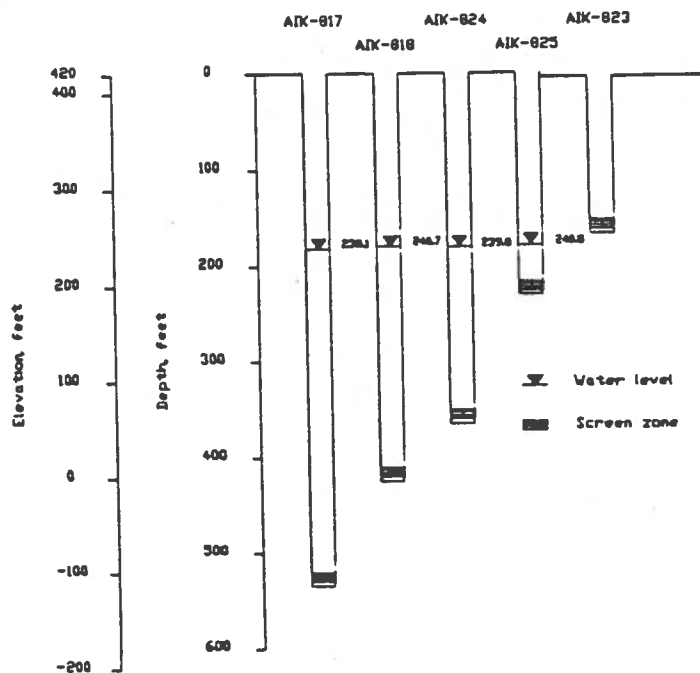


Figure 5. Vertical head relationship for wells at cluster C-2.

CLUSTER SITE C-3

Cluster site C-3 is located about 15 miles east of the city of Aiken, S.C., and within Aiken State Park (Fig. 6). The land elevation is approximately 295 ft m.s.l. Well AIK-826 was installed in the cluster as a part of Phase II activities. The well layout for cluster C-3 is shown in Figure 7.

The exploratory boring (AIK-826) was continuously cored to a depth of 541 ft below land surface (-246 ft m.s.l.). The lithologic column is shown in Figure 8. A detailed lithologic log for AIK-826 is presented in Appendix A. Geophysical logs are presented in Pocket A. Saprolite was encountered at a depth of 520 ft below land surface (-225 ft m.s.l.) and unweathered crystalline rock at a depth of 530 ft (-235 ft m.s.l.). On the basis of data from the deep boring, the screen zone was selected between depths of 485 and 495 ft below land surface (-188 to -198 ft m.s.l.) to best correlate with the deep (Middendorf) monitoring wells at SRP. Complete construction details and the water level measurement are given in the Table and Figure 9.

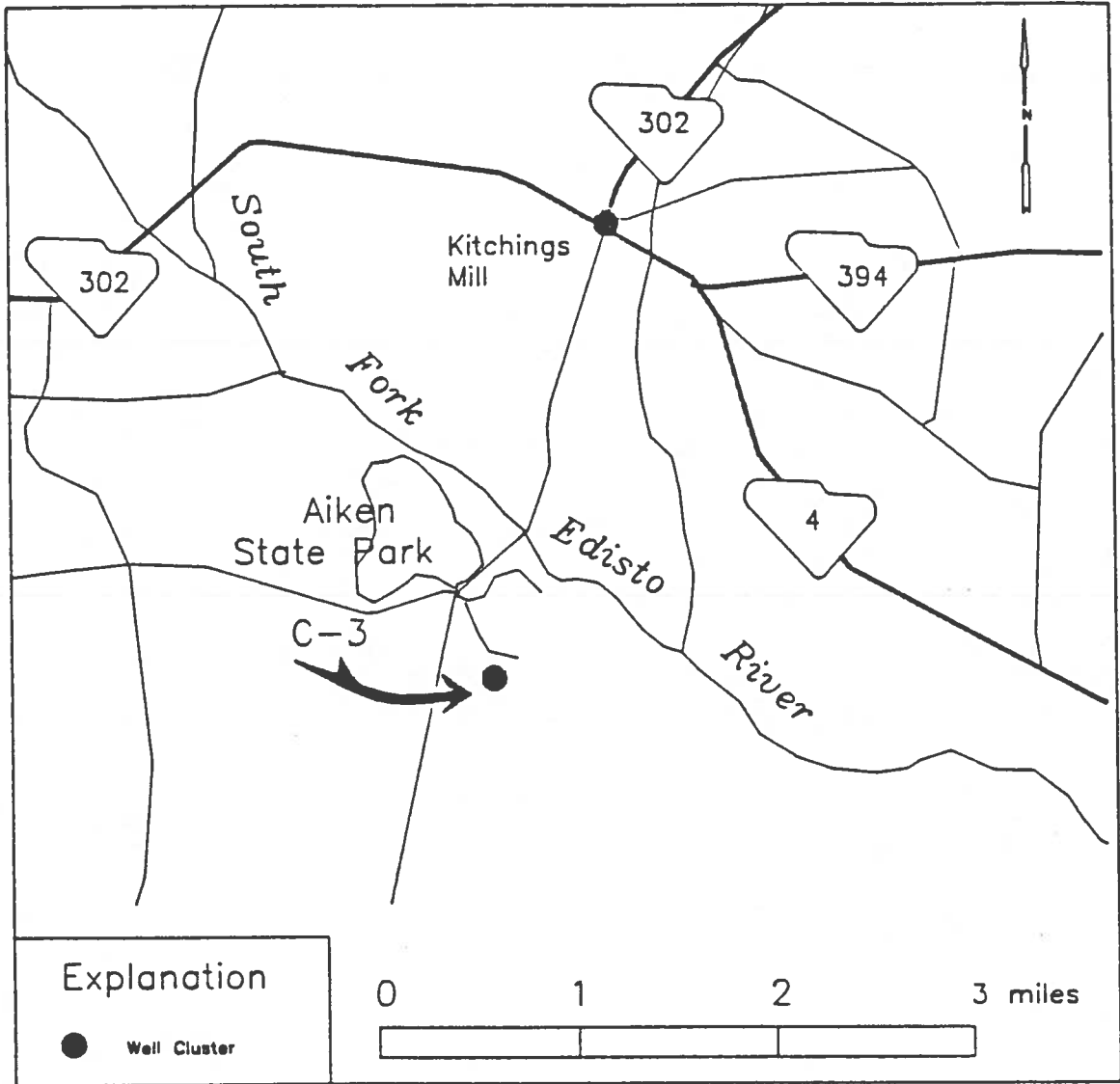


Figure 6. Location of well cluster C-3.

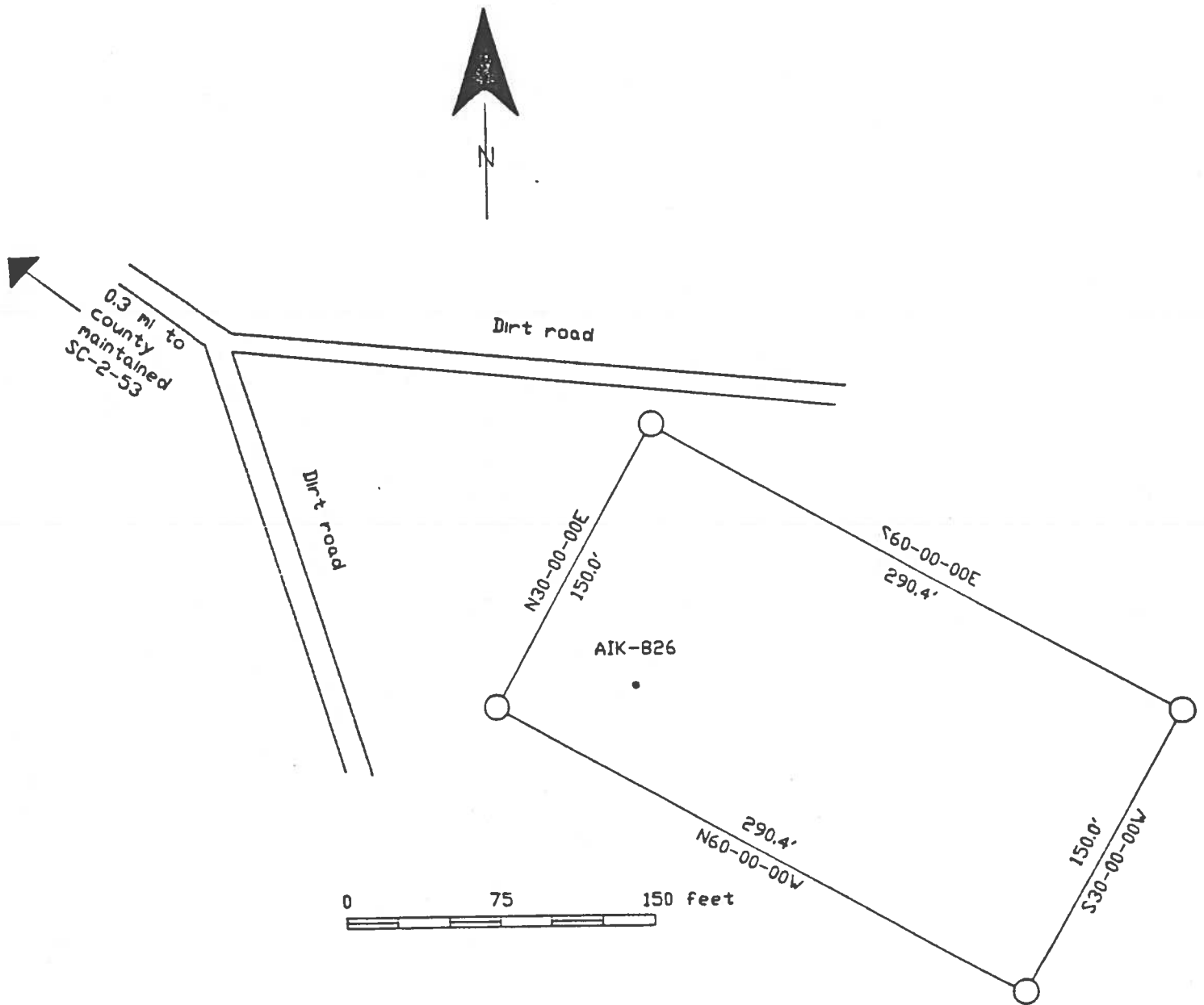


Figure 7. Well cluster C-3 layout.

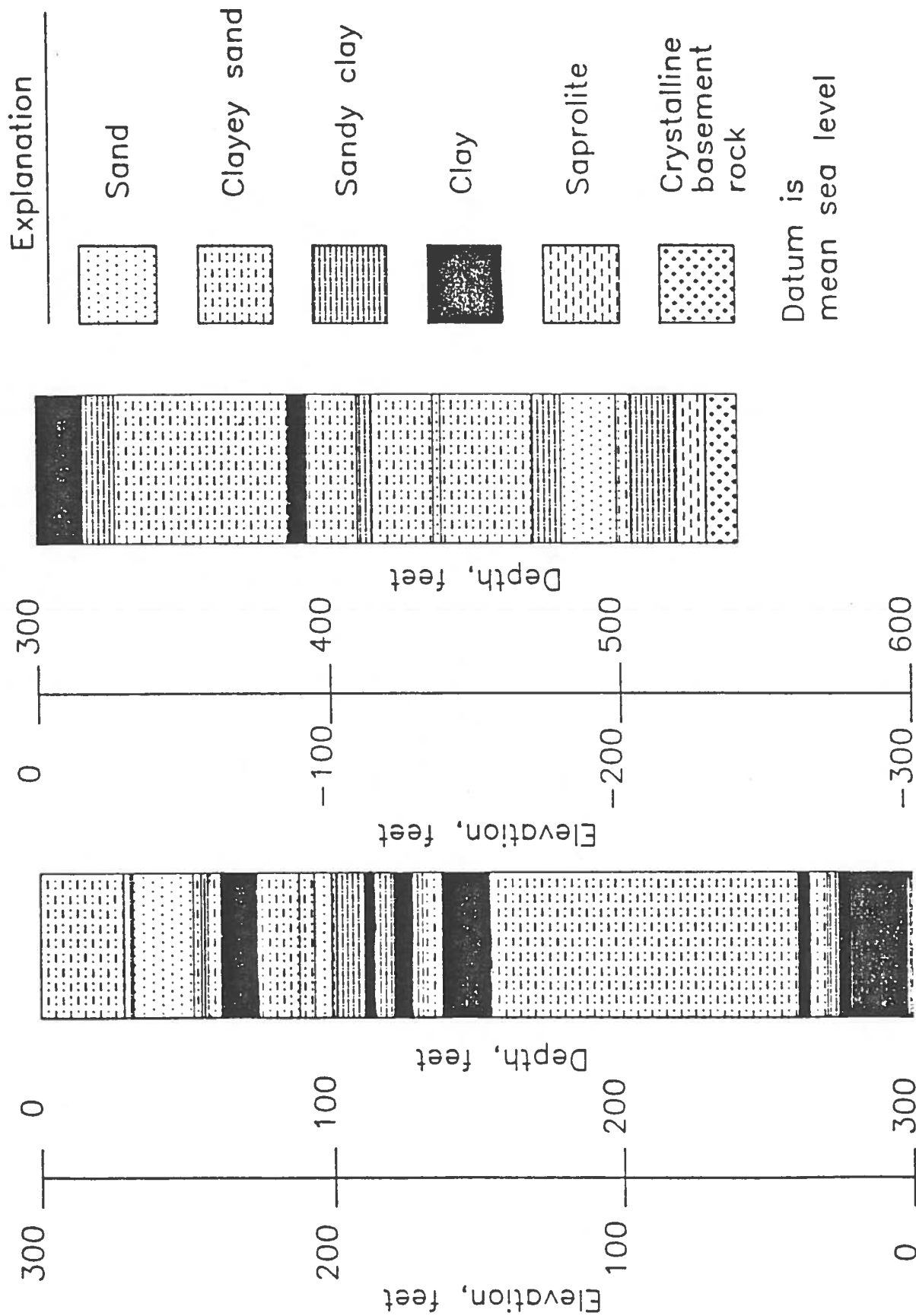


Figure 8. Lithologic column for AIK-826.

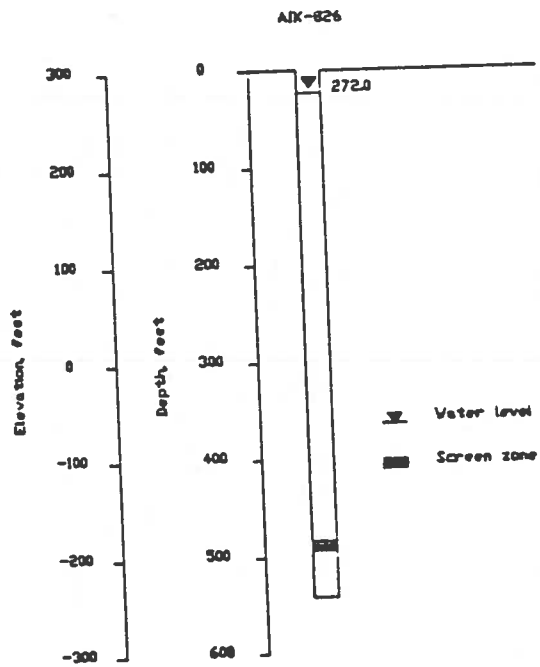


Figure 9. Vertical head relationship for wells at cluster C-3.

CLUSTER SITE C-5

The C-5 cluster site is located about 6 miles northwest of the town of Barnwell, S.C., and 15 miles east of the center of SRP (Fig. 10). The land surface elevation is approximately 265 ft m.s.l. A total of three wells were installed in the cluster as part of Phase II activities. The well layout for cluster C-5 is shown in Figure 11.

The exploratory boring (BRN-357) was continuously cored to a total depth of 1,084.5 ft below land surface (-819.5 ft m.s.l.). Saprolite was encountered at a depth of 1,031 ft (-776 ft m.s.l.) and unweathered crystalline rock at a depth of 1,064 ft (-799 ft m.s.l.). The lithologic column is presented in Figure 12. A detailed lithologic log for BRN-357 is presented in Appendix B and the geophysical logs in Pocket B. Because of difficulties encountered in the removal of temporary casing the exploratory boring (BRN-357) had to be abandoned and plugged with cement. As a result, an offset well (BRN-358) was installed to a depth of 847 ft below the land surface (-582 ft m.s.l.). After examining the lithologic and geophysical logs and consulting with geologists at SRP, the screen zone was chosen between 832 and 842 ft below land surface (-567 and -577 ft m.s.l.). This zone correlates with the "bottom lower Tuscaloosa" of SRP (Middendorf), the deepest zone of the monitoring wells in the cluster-well program. The sediments below the Tuscaloosa are too impermeable at SRP for the installation of a monitoring well. This zone is probably the Cape Fear Formation. Because of the presence of a high permeability zone within the Cape Fear Formation downdip from SRP, it will be screened as a part of Phase III. After examining the data from

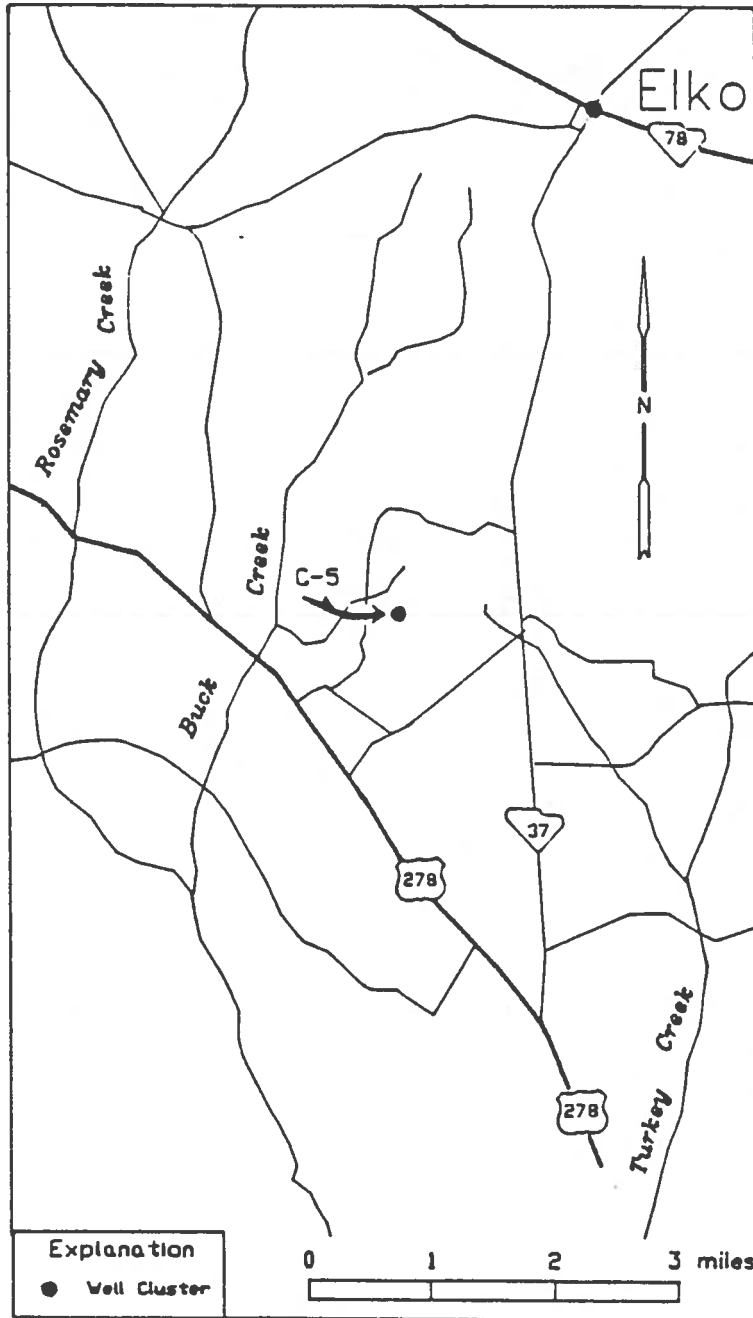


Figure 10. Location of well cluster C-5.

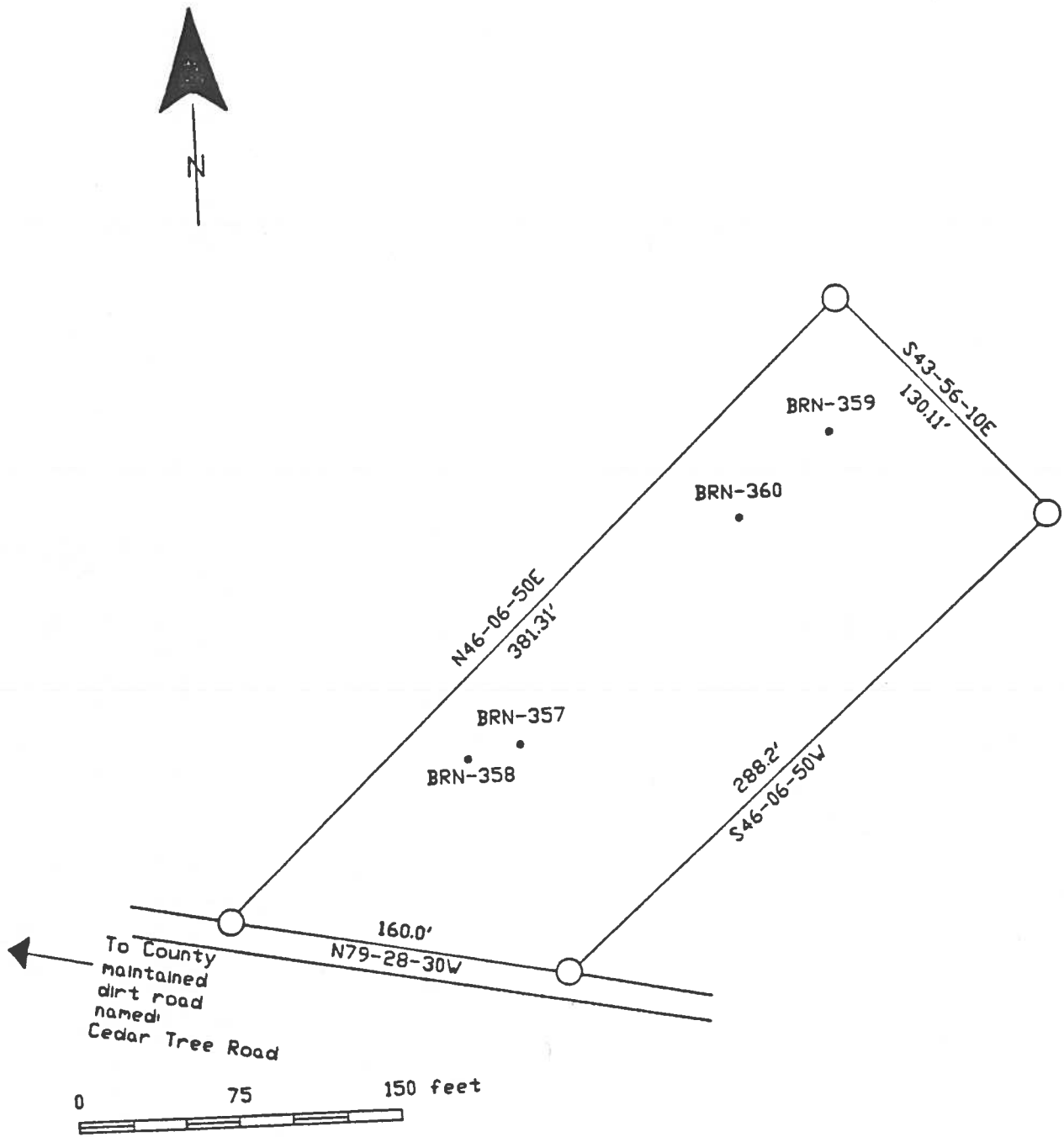


Figure 11. Well cluster C-5 layout.

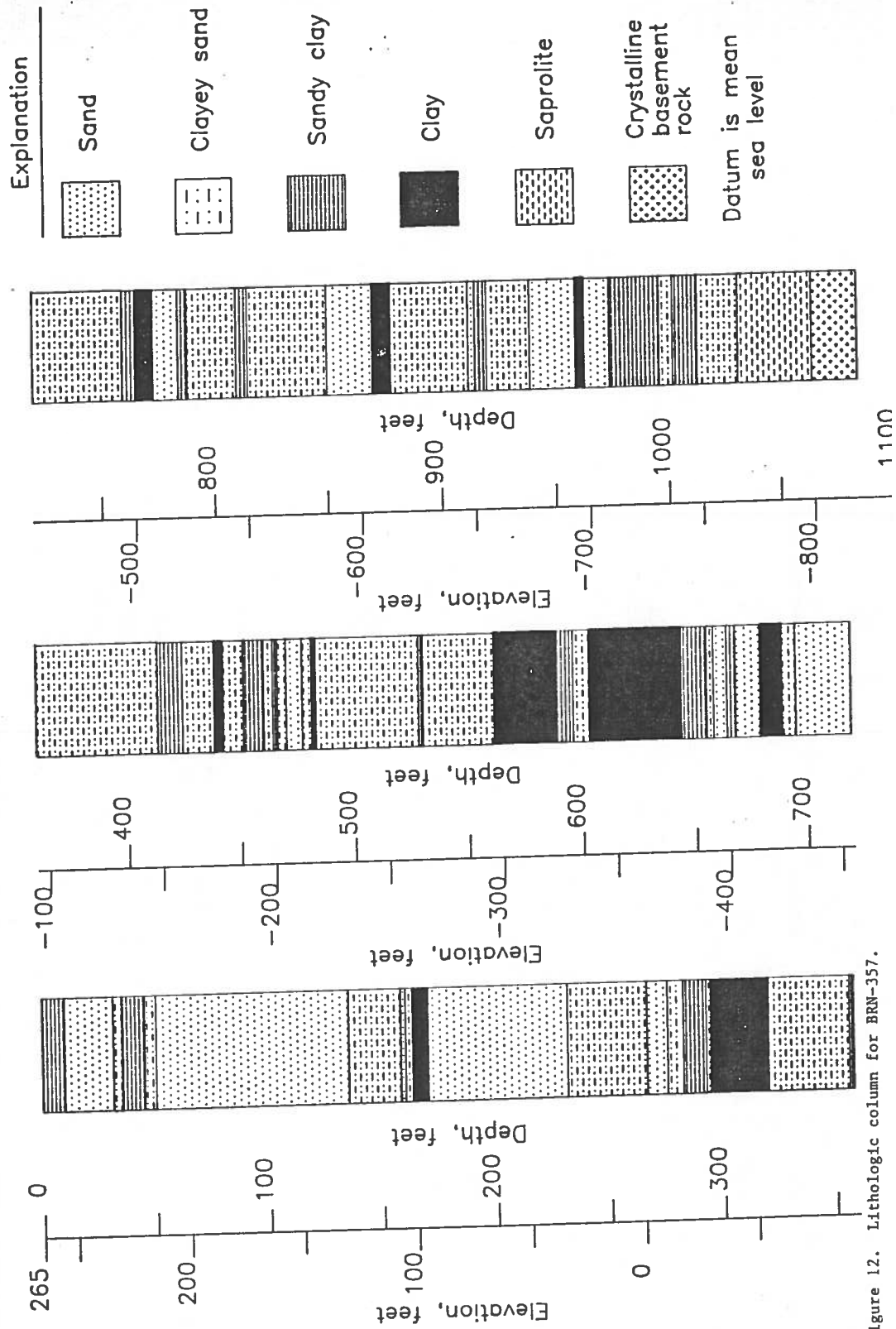


Figure 12. Lithologic column for BRN-357.

BRN-357, the screen zones for the two shallowest wells in the cluster were chosen. Well construction data for these wells are given in the Table. The screen zones for wells BRN-359 and BRN-360 were chosen to be 199 to 209 ft and 125 to 135 ft below land surface, respectively (+76 to +66 ft and +140 to +130 ft m.s.l.). Water levels in the three wells are shown in Figure 13.

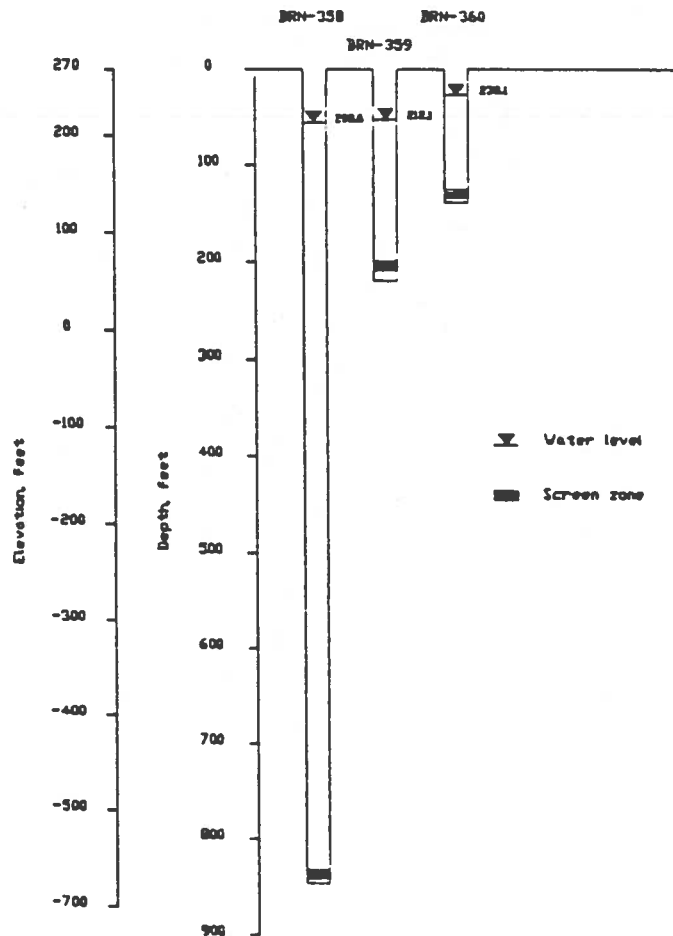


Figure 13. Vertical head relationship for wells at cluster C-5.

CLUSTER SITE C-6

The C-6 cluster site is located about 5 miles southeast of the town of Barnwell, S.C., and 19 miles east-southeast of the center of SRP (Fig. 14). The land surface elevation is approximately 205 ft m.s.l. A total of three wells (BRN-349, BRN-350, AND BRN-351) were installed in the cluster as part of Phase I activities, and five additional wells were installed in Phase II. The well layout for cluster C-6 is shown in Figure 15.

The five additional wells drilled in Phase II are BRN-352, BRN-353, BRN-354, BRN-355, and BRN-356. The first Phase II well (BRN-352) was drilled to a total depth of 295 ft (-90 ft m.s.l.) and screened in the Congaree Formation between 278 and 288 ft (-73 to -83 ft m.s.l.). BRN-353 was drilled to a total depth of 590 ft (-385 ft m.s.l.) and screened in the Peedee Formation between 573 and 583 ft (-368 to -378 ft m.s.l.). BRN-524 was drilled to a total depth of 415 ft (-210 ft m.s.l.) and screened in the Black Mingo Formation between 396 and 406 ft (-191 to -201 ft m.s.l.). BRN-355 was drilled to a total depth of 701 ft (-495 m.s.l.) and screened in the Black Creek Formation between 686 and 696 ft (-481 to -491 ft m.s.l.). The last Phase II well (BRN-356) was drilled to a total depth of 929 ft (-724 ft m.s.l.) and screened in the Middendorf Formation between 914 and 924 ft (-709 to -719 ft m.s.l.). Well construction data and water level measurements are presented in the Table and Figure 16. In addition, a detailed lithologic log and the geophysical logs for cluster site C-6 are presented in Logan's 1987 Phase I report. ADR's have been installed on the three Phase I wells, and the entire site has been fenced

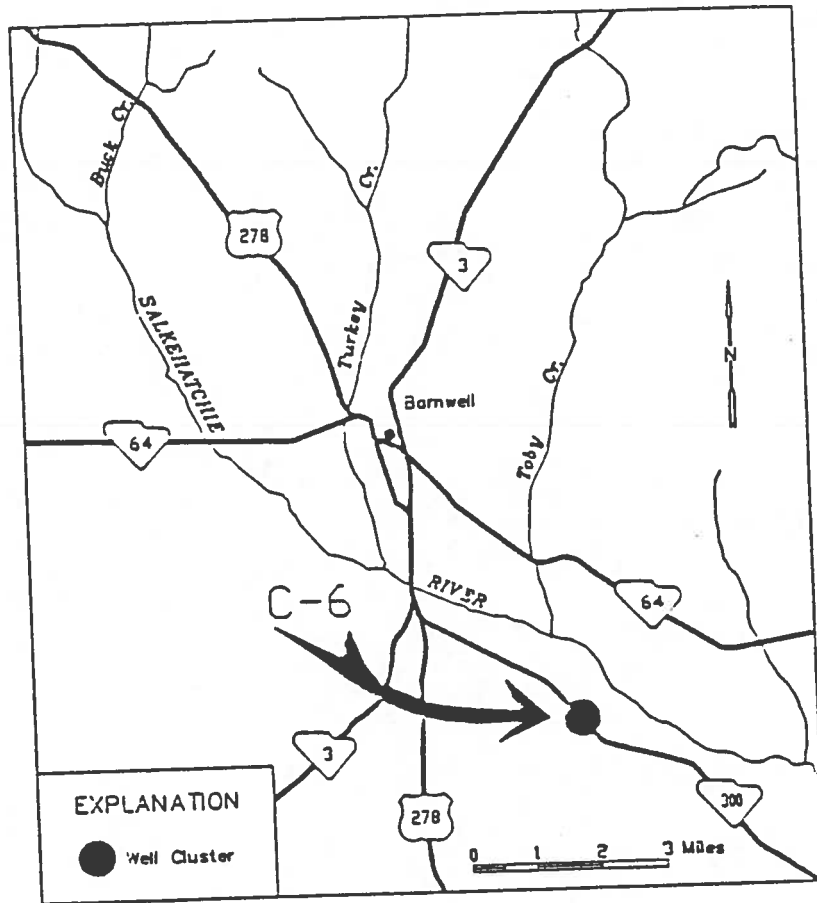


Figure 14. Location of well cluster C-6.

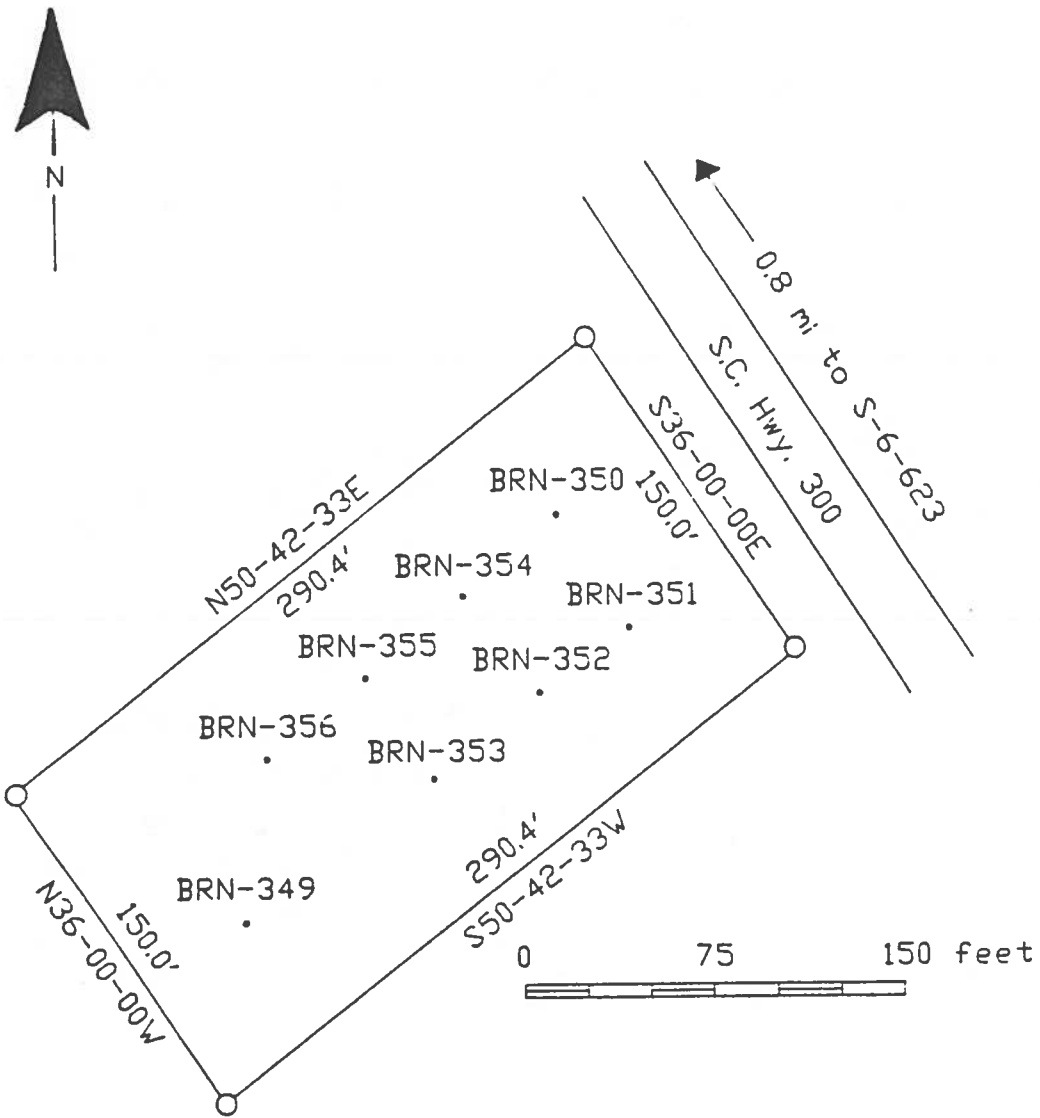


Figure 15. Well cluster C-6 layout.

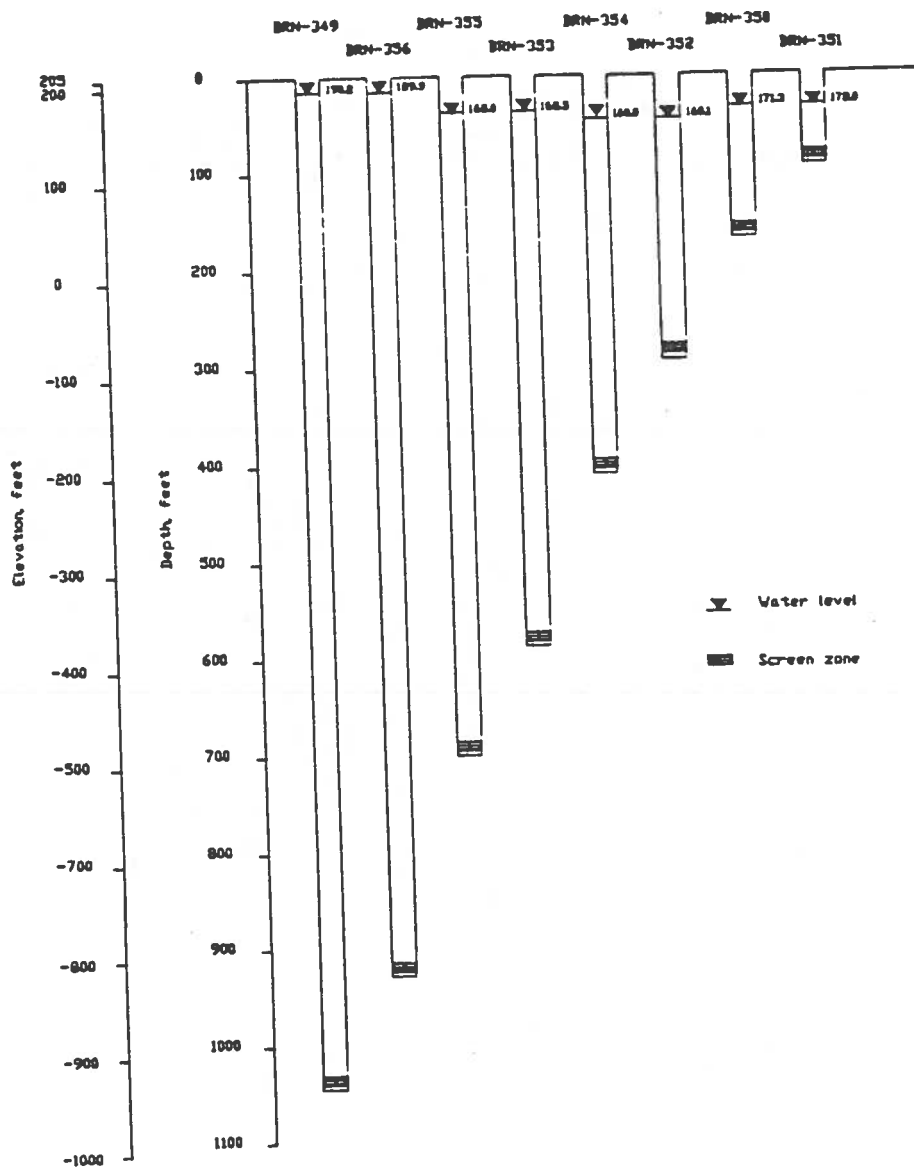


Figure 16. Vertical head relationship for wells at cluster C-6.

with 6-ft high industrial 9-gage chain-link fence with a 20-foot gate. Finally, red cedar seedlings were planted along the perimeter of the compound.

SUMMARY

Phase II of the "Geohydrologic Investigation and Establishment of a Permanent Multi-Observational Well Network in Aiken, Allendale, and Barnwell Counties, South Carolina" project saw the completion of cluster sites C-2 and C-6 as well as the initial coring phase of sites C-3 and C-5. The first well at site C-5 was continuously cored to a depth of 1084.5 feet with a total recovery of 72 percent. Additional coring in an offset well brought recovery up to 78 percent, reasonably good recovery in unconsolidated deposits. Following completion of the core hole, three additional observation wells were completed at the site.

The first well at site C-3 was continuously cored to a depth of 541 feet with a total recovery of 72 percent. Here again, recovery was somewhat low but is reasonable in the unconsolidated sediments. No additional observation wells have been drilled at site C-3 to date. The analytical program for Phase II began in the field with detailed lithologic descriptions of the cores by SCWRC geologists. Further analyses of the cores in the SCWRC geology laboratory will include detailed megascopic and microscopic descriptions, core photography, sieve analyses and insoluble-residue analyses. In addition, the clay fractions from selected intervals will be analyzed by X-ray diffraction.

A team of outside consultants has been selected to provide additional analytical expertise. These consultants were selected on the basis of their experience and their performance with the Savannah River Laboratories so that quality and consistency in the interpretation of the data are assured. The analyses provided by these consultants will include marine macrofossil and microfossil age dating as well as nonmarine age dating by pollen and spores. Further isotopic age dating will be done on pore water and authigenic glauconite grains. Petrographic analyses of thin sections from selected units will be made, and the clay fraction from various aquifers and confining units will be X-rayed to determine the clay constituents. Finally, chemical analyses of water samples from the various aquifers will be made by both the SCWRC water laboratory and outside analysts to determine water type and quality.

The culmination of this in-depth analytical program, coupled with data compiled on SRP by Savannah River Laboratory geologists and hydrologists, will be the most comprehensive and detailed regional subsurface database in the State. This database will in turn give us the necessary tools to further define the complex regional stratigraphy and allow for a full assessment of the water quality, movement, and availability in the region.

Phase III of the project is a cooperative effort between the SCWRC and the microbiologists of the Savannah River Laboratories' "Deep Probe" project. This phase is already under way with the coring of two deep wells at site C-10 near Allendale, S.C., (Fig. 1). During the coring of these wells the microbiologists from the Savannah River Laboratories worked jointly with the SCWRC geologists in developing and applying techniques to collect uncontaminated subsurface samples for

microbiological analyses. Preliminary detection analyses of tracers added to the drilling fluids have yielded very encouraging results, making this project an extremely important step forward in the newly developing field of subsurface microbiology. The second hole on the site is currently being completed in the Cape Fear Formation, making it the first well in the State to be completed in that formation, and thus yielding useful water data for that aquifer. The first well at the site is projected to be screened in either the lower Middendorf aquifer or the Black Creek aquifer. Thus, the two Phase III wells at site C-10 are another crucial step toward reaching the overall objective of gathering high-quality subsurface data so that the hydrogeology of the region can be more fully evaluated.

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APPENDIX A

LITHOLOGIC LOG FOR WELL AIK-826

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
0 - 14'	No recovery				
14' - 15'2"	Clayey sand	Light brown	Fine	Good	Wood chips.
15'2" - 15'6"	Clayey sand	Grayish orange	Fine	Good	
15'6" - 20'	No recovery				
20' - 20'9"	Clayey sand	Light brown	Fine	Good	
20'9" - 21'	No recovery				
21' - 22'3"	Clayey sand	Light brown	Fine	Moderate	Coarse sand upwards.
22'3" - 23'	No recovery				
23' - 24'	Clayey sand	Light brown	Fine - medium	Moderate	
24' - 24'10"	Clayey sand	Pale Yellow orange	Fine	Good	Color change; More clayey upwards.
24'10" - 26'6"	No recovery				
26'6" - 27'8"	Clayey sand	Light brown	Fine - medium	Good	Orange clay matrix.
27'8" - 28'	Clayey sand	Pinkish gray	Fine	Good	White clay matrix.
28' - 28'5"	Clay	Very light gray	Clay	Moderate	Grades into a sandy clay @ 28'4".
28'5" - 30'	No recovery				
30' - 30'9"	Sandy clay	Grayish orange	Fine - coarse	Poor	Mottled.

DEPTH	TYPE	COLOR	GRAIN SIZE	SORTING	REMARKS
Cluster-3 Well # AIX-826 360-01					
30'9" - 31'	Sand	Light gray	Medium - small pebbles	Poor	Very clean sand.
31' - 32'6"	No recovery				
32'6" - 33'6"	Sand	Light gray	Fine granular	Poor	Coarsening upwards; Very clean sand.
33'6" - 34'11"	No recovery				
34'11" - 37'10"	Sand	Light gray	Fine - small pebbles	Poor	Heavies; More clayey @ 35'9" - 36'2"
37'10" - 42'	No recovery				
42' - 43'4"	Sand	Light gray	Fine - medium	Good	clean sand.
43'4" - 44'	No recovery				
44' - 45'	Clayey sand	Grayish orange	Fine - small pebbles	Poor	
45' - 49'	No recovery				
49' - 49'10'	Sand	Grayish orange pink	Very fine - fine	Moderate	Tan - brown stratified clay lamination at 49'1"; Heavies.
49'10" - 50'	Sand	Very pale orange	Very fine - medium	Moderate	Orange with dark orange laminations.
50' - 51'	No recovery				
51' - 52'5"	Clayey sand	Shades of orange	Clay - very fine	Moderate	Like laminations color from very pale orange to dark yellowish orange; Very large pebble @ 51'3".
52'5" - 53'	No recovery				
53' - 53'10"	Clayey sand	Lamination l. orange	Clay - very fine	Moderate	Color from v. pale orange to dark yellowish orange; Heavies.

Cluster-3	Well #	AIK-826	36U-01						REMARKS
DEPTH	TYPE	COLOR	GRAINSIZE	SORTING					
53'10" - 54'4"	Clay	Dark brown - d. vel. brown	Clay - silt	Good					Finely laminated gray clay & orange silt; Micaceous.
54'4" - 55'5"	Sandy clay	Lt. brown - d. yellow. brown	Clay - very fine	Moderate					Mottled; Micaceous; Slightly laminated; Iron rich laminations at 55'2" - 55'5".
55'5" - 57'	No recovery								Very indurated; Micaceous.
57' - 57'2"	Clayey sand	P. yellow brown - d. vel. orange	Clay - fine	Moderate - good					Micaceous; Indurated; possibly silicified; Mottled; Iron staining in a few places.
57'2" - 57'7"	Clayey sand	P. brown - d. yellow orange	Clay - fine	Good					Mottled; Iron staining in a few places.
57'7" - 58'	No recovery								Laminated; Micaceous;
58' - 59'4"	Clayey sand	P. brown - d. yellow orange	clay - fine	Good					
59'4" - 60'	No recovery								Massive fissile black shale; Micaceous; From 65' to 66'4" shale is more friable.
60' - 66'4"	Shale	Dark gray	Clay	Very good					
66'4" - 68'	No recovery								
68' - 69'4"	Shale								
69'4" - 73'11"	No recovery								Orange tan.
73'11" - 74'1"	Clay	Pale brown	Clay	Good					Laminae; Upper 5" is laminated with iron staining; Muscovite in sand.
74'1" - 75'	Clayey sand	Pale yellow orange	Clay - very coarse	Poor					
75' - 75'10"	No recovery								Orange tan; Lignite @ 75'5"; slightly laminated with Fe stains.
75'10" - 77'	Clayey sand	Pale yellow orange	Clay - coarse	Poor					

Cluster-3 Well # AIK-826 360-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
77' -	Clayey sand	Very pale orange	Clay - coarse	Poor	Laminated with iron stains & clay lenses; Muscovite; L. pebbles @ 77'9"; Coarsens downward.
78'					
79' -	No recovery				
81' -					
81' -	Clayey sand	Very pale orange	Clay - granular	Very poor	Laminated with orange iron staining; Muscovite; Heavies.
82'11"					
82'11" -	No recovery				
85'					
85' -	Sand	Very pale orange	Fine - medium	Good	Laminations of orange Fe stains; Muscovite; Heavies.
87'					
87' -	No recovery				
88'					
88' -	Clayey sand	Grayish orange	Clay - small pebbles	Very poor	Scattered pebbles @ base; Fe stained laminated; Scarce heavies.
91'					
91' -	Clayey sand	Very pale orange	Clay - small pebbles	Poor	Kaolinitic; Muscovite; Heavies; Clay intraclasts from 92' to 92'6"; Iron stained laminations.
93'6"					
93'6" -	Sand	D. yellowish orange	Clay - large pebbles	Very poor	Less than 10% clay; Heavies; Specks of kaolinitic clay.
94'10"					
94'10" -	No recovery				
95'					
95' -	Sand	Dark yellow orange	Clay - coarse	Poor	Muscovite; Fe stains in lenses; Grading @ bottom to more clay in matrix.
95'5"					
95'5" -	Sand & clay less than 10%	Grayish orange	Clay - medium	Moderate	Muscovite; Gradational @ top & base.
96'8"					
96'8" -	Sand	Mod. yellow brown	Clay - granules	Very poor	Heavies slight laminated @ base; Clay interclasts @ 97'4"; smoky quartz; Conc.heavies lower 2".
98'3"					
99'6" -	Silty clay	White - Dark yellow orange	Clay - silt	Good	Mottled; Kaolinitic.
99'7"					
99'7" -	Clayey sand	White - dark yellow orange	Clay - granules	Very poor	Gradually changing to sandy clay towards base; Clay laminae; Muscovite; Concentr. heavies;
100'					
100' -	No recovery				
101'					

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
101' - 102'3"	Clay	Gray orange- p. red purple	Clay - silt	Good	Mottled; Micaceous; Kaolinitic.
102'3" - 103'	Sandy clay	Very light gray	Clay - fine	Moderate	Less than 10% sand; Kaolinitic.
103' - 106'4"	Sandy/silty clay	Very light gray	Clay - sand	Good	Very hard clay.
106'4" - 108'	No recovery				
108' - 108'4"	Clay	Very light gray	Clay	Good	
108'4" - 111"	No recovery				
111' - 113'11"	Clay	Very light gray	Clay	Good	
113'11" - 114'10"	Silty clay	Pale red purple	Clay - silt	Good	
114'10" - 115'	No recovery				
115' - 117'1"	Silty clay	Pale red purple	Clay- silt	Good	
117'1" - 120'	No recovery				
120' - 120'9"	Silty clay	Pale red purple	Clay - silt	Good	
120'9" - 122'8"	Clay	Very light gray	Clay	Good	
122'8" - 124'	No recovery				
124' - 127'	Clay	Very light gray	Clay - silt	Good	Silty in spots; Purple in spots.
127' - 127'11"	Silty clay	Very light gray	Clay- silt	Good	Very fine sand in spots.

Cluster-3 Well # AIK-826 360-01

DEPTH	TYPE	COLOR	GRAIN SIZE	SORTING	REMARKS
127'11" - 131'	No recovery				
131' - 137'2"	Clayey sand	Very light gray	Clay -fine	Good	Recovered 5" more than cored.
137'2" - 138'	No recovery				
138' - 140'	Clay	Pale pink	Clay	Good	Extremely tight clay; Some sand upper 2".
140' - 140'11"	Clay	Very light gray	Clay	Good	
140'11" - 145'	Clay	Medium light gray	Clay	Good	
145' - 150'	Clay	Medium gray- pale orange	Clay	Good	Color change med. gray - light gray - pink - pale orange.
150' - 154'6"	Clay	Purple white	Clay	Good	Variegated silty in spots.
154'6" - 155'	No recovery				
155' - 157'1"	Clayey sand	Pale pink	Fine - medium	Moderate	More clayey & micaceous towards top; clay balls; Kaolin.
157'1" - 159'	No recovery				
159' - 162'4"	Clayey sand	Pale pink	Fine - medium	Moderate	More clayey & micaceous towards top; Iron cemented clasts.
162'4" - 163'	No recovery				
163' - 167'4"	Clayey sand	Very light gray	Fine - coarse	Poor	Coarse-small pebbles @ 165' -166'; More mica & clay towards top.
167'4" - 168'	No recovery				
168' - 172'8"	Clayey sand	Very light gray	Fine - coarse	Poor	More kaolin & mica towards top.

Cluster-3 Well # AIK-826 360-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
172'8" - 173'	No recovery				
173' - 178'	Clayey sand	Very light gray	Fine - coarse	Poor	More mica & kaolin towards top.
178' - 183'	No recovery				
183' - 184'2"	Clayey sand	Very light gray	Fine - coarse	Poor	More mica & kaolin towards top.
184'2" - 185'	No recovery				
185' - 188'	Clayey sand	Very light gray	Fine - very coarse	Poor	Heavies; Mica; Kaolin.
188' - 189'	No recovery				
189' - 197'3"	Clayey sand	Very light gray	Silt - fine	Good	More kaolin, clay %, & Mica towards top.
197'3" - 198'	No recovery				
198' - 202'5"	Clayey sand	Very light gray	Silt - medium	Moderate	More clayey & micaceous towards top.
202'5" - 203'	No recovery				
203' - 206'9'	Clayey sand	Very light gray	Fine - very coarse	Poor	More kaolinitic towards top.; Heavies.
206'9" - 208'	No recovery				
208' - 210'1"	Clayey sand	Very light gray	Fine - granules	Very poor	Kaolinitic; Clay lenses 208'2' - 209'4'; Micaceous; Heavies.
210'1" - 212'	No recovery				
212' - 212'4"	Clay	White	Clay	Good	Micaceous; Kaolinitic; V. darky red purple sand laminations at 212'3" - 212'4'.

Cluster-3 Well # AIK-826 360-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
212'4" - 214'9"	Clayey sand	White	Clay - fine	Good	Micaceous; Heavies; Slight laminations.
214'9" - 215'	No recovery				
215' - 217'4"	Clayey sand	White	Clay - medium	Moderate	Kaolinitic; Mica; Heavies;
217'4" - 218'	No recovery				
218' - 219'7"	Clayey sand	White	Clay - medium	Good	Kaolinitic; Micaceous; Heavies.
219'7" - 220'	Sand	Moderate brown	Medium	Good	Micaceous.
220' - 222'4"	Clayey sand	White	Clay - medium	Good	Micaceous; Medium pebble rich zone at 221'5" - 221'4", 221'7" - 221'8"; Mottled purple zone.
222'4" - 223'	No recovery				
223' - 232'6"	Clayey sand	White	Clay - medium	Good	Mica; Kaolin; Heavies; Purple zone at 226'10" - 227'; Indurated purple clay clasts.
232'6" - 233'	No recovery				
233' - 237'7"	Clayey sand	White	Clay - medium	Good	Mica; kaolin; Heavies; Purple zones; Purple hard sandy clay clasts; Increase in grain size.
237'7" - 238'	No recovery				
238' - 243'	Clayey sand	White	Clay granules	Poor	Mica; Heavies; Kaolin; Grain size increase towards bottom.
243' - 246'5"	Clayey sand	White	Clay - small pebbles	Poor	Mica; Heavies; Kaolinitic; Grain size increases towards base.
246'5" - 246'7"	Clay	Pinkish gray	Clay	Good	Indurated.
246'7" - 247'3"	Clayey sand	White	Clay - small pebbles	Poor	Grain size increases towards base; Mica; Heavies; Kaolinitic granules cover.

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
247'3" - 247'10"	No recovery				
247'10" - 257'6"	Clayey sand	White	Clay - coarse	Good	Micaceous; kaolinitic; Heavies.
257'6" - 258'	No recovery				
258' - 260'4"	Clayey sand	White	Clay - coarse	Good	Micaceous; Kaolinitic; Heavies.
260'4" - 261'	Clayey sand	Grayish red purple	Clay - coarse	Moderate	
261' - 262'	No recovery				
262' - 262'4"	Clayey sand	The whole spectrum	Clay - very coarse	Poor	Colors white, tan, purple, brown, gray, in laminations.
262'4" - 262'7"	Sand	Very dusky red purple			Indurated cement sand.
262'7" - 264'7"	Clay	D. yellowish orange	Clay	very good	Color lamination thruout.
264'7" - 266'	Clayey sand	M. yellowish brown	Clay	Good	Muscovite; Heavies; Mottled - highly colored.
266' - 267'9"	Clayey sand	Very pale orange	Clay - fine	Good	Muscovite; Kaolinite; Heavies; Color lamination toward base; v. dusky red purple zone 267'6"-267'7"
267'9" - 271'	Clayey sand	Dark yellow orange	Clay - fine	Good	Fine clay laminations - mottled with tan orange; Muscovite.
271' - 272'10"	Silty clay	Pale yellow brown	Clay - silt	Good	Muscovite; Orange lamination at bottom 2"; Heavies.
272'10" - 273'1"	Clay	D. v. orange/pale y. brown	Clay	Good	Alternating 1" thick color zones.
273'1" - 283'10"	Sandy clay	The whole spectrum	Clay - very fine	Good	Purple, orange, white, tan, brown colors; Muscovite; Specks of kaolinite; Lignite at 273'10".
283'10" - 298'	Clay	L. brown gray m. red brown	Clay	Good	Mottled between red & gray.

Cluster-3 Well # AIK-826 360-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
298'	Sandy clay	Very light gray	Clay - granules	Poor	Grain size increases to 300' and than decreases to 302'.
302'	Clay	V. light gray - m. red brown	Clay	Good	Mottled.
307'	Clay	Very light gray	Clay	Good	Micaceous;
314'9"	Sandy clay	Gr. red purple - gra. ora. pink	Clay	Moderate	Mica; purple & tan laminations; 1/2' indurated zone at 315'2".
315'6"	Sandy clay	Grayish orange pink	Clay - very coarse	Poor	Muscovite.
315'8"	No recovery				
318'	Sand	Grayish orange pink	Fine - coarse	Poor	Heavies.
318'8"	Sandy clay	Pinkish gray	Clay - medium	Moderate	Muscovite; Sand lenses at 319' - 319'1" & 319'4" - 319'5".
319'9"	No recovery				
321'	Sandy clay	Very light gray	Fine - very coarse	Poor	Heavies.
322'9"	No recovery				
324'	Sandy clay	Very light gray	Fine - very coarse	Poor	Mica.
326'3"	No recovery				
327'	Clayey sand	Very light gray	Fine - very coarse	Poor	Mica; Heavies.
329'8"	No recovery				
331'	Clayey sand	Very light gray	Fine - coarse	Poor	6" clay lenses @ 332'6" & 3" @ 33'11".

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
334'2" - 336'3"	No recovery				
336'3" - 339'	Clayey sand	Very light gray	Fine - coarse	Poor	Heavies; Mica; Clay 3" at bottom.
339' - 341'2"	Clayey sand	Very light gray	Fine- very coarse	Poor	Mica.
341'2" - 343'	No recovery				
343' - 346'7"	Clayey sand	Very light gray	Fine - coarse	Poor	Mica.
346'7" - 347'	No recovery				
347' - 349'2"	Clayey sand	Very light Gray	Fine- coarse	Poor	Mica; kaolin.
349'2" - 351'	No recovery				
351' - 356'	Clayey sand	Very light gray	Fine - coarse	Poor	Kaolin; Mica.
356' - 357'	Clay	Light gray	Clay		
357' - 357'6"	Clayey sand	Very light gray	Fine - coarse	Poor	Kaolin.
357'6" - 359'	No recovery				
359' - 361'	Clayey sand	Very light gray	Fine - coarse	Poor	Kaolin.
361' - 363'	No recovery				
363' - 367'1"	Clayey sand	Very light - light gray	Fine - very coarse	Poor	Mica.
367'1" - 368'	No recovery				

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
368' -	Clayey sand	Medium light gray	Fine - very coarse	Poor	
371'11" -	No recovery				
373'					
373' -	Clayey sand	Medium light gray	Medium - coarse	Moderate	
374'7" -	No recovery				
374'7" -	No recovery				
377'					
377' -	Clayey sand	Medium light gray	Fine - coarse	Poor	Heavies.
379'5" -	Sandy clay	Medium gray	Fine	Good	
379'10" -	Clayey sand	Medium light gray	Fine - coarse	Poor	Heavies.
380'6" -	No recovery				
380'6" -	No recovery				
384'					
384' -	Clayey sand	Medium light gray	Fine - coarse	Poor	
386'6" -	Clay	Medium light gray			
386'6" -	Clay	Medium light gray			
387'					
387' -	No recovery				
391'7" -	Clayey sand	Light gray	Fine - coarse	Poor	Grades into clay @ 394'; Heavies; Micac.
392' -	Clayey sand	Light gray	Fine - coarse	Poor	
396'					
396' -	No recovery				
397'					
397' -	Sandy clay	Light gray	Clay - coarse	Poor	Grading into clayey sand; Heavies.
401'4" -	No recovery				
401'4" -	No recovery				
402'					
402' -	Clayey sand	Medium light gray	Clay - coarse	Poor	
403'9" -					

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
403'9" - 404'1"	Wood	Black			Green metallics.
404'1" - 404'3"	Clayey sand	Medium light gray	Clay - coarse	Poor	
404'3" - 407'	No recovery				
407' - 407'10"	Clayey sand	Medium light gray	Clay - coarse	Poor	Wood chips
407'10" - 412'	No recovery				
412' - 415'3"	Sandy clay	Light gray			
415'3" - 415'7"	Clayey sand	Very pale orange			
415'7" - 417'	No recovery				
417' - 419'9"	Clayey sand	Very pale orange	Clay - coarse	Poor	Slightly mottled; Metallics @ 417'4".
419'9" - 422'	No recovery				
422' - 425'9"	Clayey sand	Very pale orange	Clay - coarse	Poor	Mottled in spots.
425'9" - 427'	No recovery				
427' - 430'9"	Clayey sand	Very pale orange	Clay - Coarse	Poor	2" clay layer @ 430'7".
430'9" - 431'	No recovery				
431' - 435'8"	Clayey sand	Moderate orange pink	Clay - coarse	Poor	Clay itraclasts; Heavies mottled with pink, tan, orange iron stained cemented sand grains @ 435'4".
435'8" - 436'	No recovery				

Cluster-3 Well # AIK-826 36U-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
436' -	Sand	Moderate orange pink	Fine - very coarse	Poor	Clay intraclasts; Heavies.
437'11" -					
437'11" -	Clayey sand	Very light gray	Clay - medium	Moderate	Muscovite; Laminations of heavies; Iron staining.
439'1" -					
439'1" -	Clayey sand	Very pale orange	Clay - fine	Moderate	Heavies fine laminations.
440'10" -					
440'10' -	No recovery				
441' -					
441' -	Clayey sand	Very pale orange	Clay - large pebbles	Poor	Heavies; iron stained cemented sand garin clast
445'10" -					
446' -	Clayey sand	Very pale orange	Clay - medium pebbles	Poor	Iron stained cemented sand grain clast @ 446'6"; 1" pebbles rich zones @ 446'2" & 448'2'; Heavies.
450' -					
450' -	No recovery				
451' -					
451' -	Clayey sand	White & dusky red purple	Clay - fine	Moderate	Kaolinite mottled clay clast.
452'3" -					
452'3" -	Clayey sand	Very pale orange	Clay - medium pebbles	Poor	1" pebble rich zone @ 454'6"; 1" iron stained zone @ 453'11"; kaolinite mottled; Heavies.
455'6" -					
455'6" -	Clayey sand	display memory white	Clay - fine	Moderate	Heavies; 4" thick purple zone at 468'; Kaolinite.
458'1" -					
458'1" -	Clayey sand	Very pale orange	Clay - coarse	Poor	Heavies; slightly mottled purple with orange tan; 1" clay zone at 460'4" - 460'5".
460'5" -					
460'5" -	No recovery				
461'4" -					
461'4" -	Clayey sand	White	Clay - large pebbles	Poor	Kaolinite; Mottled purple- white.
465'4" -					
465'4" -	No recovery				
466' -					
466' -	Clayey sand	Very pale orange	Clay - medium	Moderate	Heavies; Mottled.
467' -					
467' -	Clayey sand	White	Clay - coarse	Poor	
468'10" -					
468'10" -	Clayey sand	White	Clay - coarse	Poor	

Cluster-3 Well # AIK-826 360-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
468'10" - 470'3"	Clayey sand	Very pale orange	Clay - smallpebbles	Poor	Heavies; Mottled clay in clasts.
470'3" - 472'	No recovery				
472' - 476'4"	Silty clay	Pinkish gray	Clay - silt	Good	
476'4" - 480'4"	No recovery				
480'4" - 480'10'	Sand/ sandstone	Grayish orange	Very fine	Good	Very indurated just like sandstone.
480'10" - 481'	No recovery				
481' - 482'5"	Sandstone	Grayish orange	Very fine	Good	Sample for Thoyer @ 480' & 481'.
482'5" - 486'	No recovery				
486' - 489'	Sand	Grayish orange	Fine - coarse	Moderate	Ironstone 2" at the base.
489' - 491'6"	Sand	Yellowish gray	Fine - granular	Poor	Cemented at some spots.
491'6" - 493'6"	Sandstone	Yellowish gray			Iron stained @ 492'4".
493'6" - 496'	Sand	Yellowish ray	Fine - very coarse	Poor	
496' - 496'5"	Mudstone	Brownish gray			Indurated; Large pebbles.
496'5" - 496'8"	Sand	Dusky yellow	Fine - medium	Good	
496'8" - 497'6"	No recovery				
497'6" - 497'8"	Sandstone	Dusky yellow	Fine- medium	Good	Very hard; First inch is clay.

Cluster-3 Well # AJK-826 360-01

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
497'8" - 498'	Sandstone	Very pale orange			
498' - 498'4"	Clayey sand	Very light gray	Fine - pebbly	Poor	Mottled in spots.
498'4" - 498'8"	Sandstone	Very light gray	Fine- pebbly	Poor	Mottled in spots.
498'8" - 499'11"	Silty clay - clayey silt	Grayish orange			
499'11" - 504'	No recovery				
504' - 504'4"	Clayey sand	Light brown	Fine - pebbles	Poor	Large - very large pebbles.
504'4" - 506'	Silty clay	Very light gray			
506' - 516'	Sandy silty clay	Very light gray			Mottled @ 511'; Larger quartz pebbles @ 513'6".
516' - 518'9"	Silty clay	Grayish green	Clay - silt	Good	Muscovite rich; mottled shades of green, white, & red patches; Indurated patches pyrite & heavies.
518'9" - 519'6"	No recovery				
519'6" - 519'10"	Saprolite	Dusky yellow green	rock		1" quartz vein.
519'10" - 520'	No recovery				
520' - 523'	Saprolite				
523' - 525'	No recovery				
525' - 527'5"	Saprolite				
527'5" - 528'	No recovery				

Cluster-3 Well # AIK-826 36U-01					
DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
528' -	Saprolite				
530' 4"					
530' 4" -	Basement	Dusky			Pyrite; Heavies; Small quartz veins with pyrite
540' 9"	rock	yellowish green			crystals well developed.

APPENDIX B

LITHOLOGIC LOG FOR BRN-357

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
0 -	No recovery				
1'3"					
3'	Clayey sand	Yellowish brown	Fine		
3' -					
6'	Sandy clay	Light gray	Medium - coarse		Mottled red.
6' -					
8'6"	Sandy clay	Light gray	Medium		Mottled.
8'6" -					
9'2	No recovery				
9'2" -					
11'	Silty clay	Light gray			Mottled purple red.
11' -					
12'	Clayey sand	Purple	Medium		Mottled.
12' -					
13'6"	Sand	Light brown	Fine - medium		
13'6" -					
13'11"	No recovery				
13'11" -					
17'	Sand	Yellowish brown	Fine - medium		Mottled.
17' -					
18'6"	Clayey sand	Purple	Fine		
18'6" -					
20'	Sand	Purple	Medium		Mottled red yellow.
20' -					
22'	Sand	Purple	Coarse		
22' -					
23'6"	Clayey sand	Orange orange	Coarse		
23'6" -					
25'	Clayey sand	Light purple	Medium - coarse		Trace kaolin; Sub-angular.
25' -					
26'11"	Clayey sand	Light purple	Medium - coarse		Trace kaolin; Sub-angular.

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
26'11" -	Clayey sand	Yellow orange	Fine		
29'7" -	No recovery				
30'					
30' -	Sand	Yellow orange	Fine		
30'8"					
30'8" -	Clayey sand	Purple	Coarse		Pebbles.
32'4"					
32'4" -	Clayey sand	Purple	Fine - medium		Kaolin.
35'					
35' -	Silty clay	Purple			
39'5"					
39'5" -	No recovery				
40'					
40' -	Silty clay	Purple			
41'6"					
41'6" -	Clayey sand	Purple			Mottled white.
41'10"					
41'10" -	Silty clay	Purple	Medium - coarse		Mottled white.
44'6"					
44'6" -	Clayey sand	Purple	Medium		Mica.
45'					
45' -	No recovery				
45'2"					
45'2" -	Clayey sand	Purple	Very coarse		Mottled white red.
45'4"					
45'4" -	Clayey sand	Purple	Medium - pebble		Mottled white & red; Traces of Muscovite.
50'					
50' -	Sand	Purple	Medium - pebble		Sub-angular.
53'8"					
53'8" -	No recovery				
55'					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAIN SIZE	SORTING	REMARKS
55' -	Gravel	Purple	Medium - large Pebbles		Sub-angular.
59'1" -	No recovery				
60'					
60' -	Clayey sandy gravel	Purple			Pebbles.
61'7"					
61'7" -	Sand	Yellow brown	Medium - very coarse		Very loose.
62'6"					
62'6" -	No recovery				
66'10"					
66'10" -	Sand	Yellow brown	Medium		
70'					
70' -	No recovery				
74'					
74' -	Sand	Yellow brown	Medium		very loose
75'					
75' -	Sand	Purple	Medium		
75'4"					
75'4" -	Sand	Yellow brown	Medium		
76'10"					
76'10" -	No recovery				
77'10"					
77'10" -	Sand	Yellow brown	Fine - medium		Very loose.
77'11"					
77'11" -	No recovery				
80'					
80' -	Sand	Yellow brown	Medium		Very loose.
80'7"					
80'7" -	Sand	Brown	Medium		Trace lignite.
80'8"					
80'8" -	No recovery				
83'					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
83' - 83'2"	Sand	Yellow	Fine		
83'2" - 83'6"	No recovery				
83'6" - 85'	Sand	Yellow brown	Fine - very fine		Quartz pebbles 0.4" diameter; Lignite.
85' - 85'10"	No recovery				
85'10" - 90'	Clayey sand	Yellow brown	Very fine		
90' - 93'3"	Sand	White yellow	Fine		
93'3" - 93'6"	Sand	White yellow			
93'6" - 94'1"	Silt	White yellow			
94'1" - 95'	No recovery				
95' - 99'6"	Silt	White yellow			
99'6" - 100'	No recovery				
100' - 104'9"	Silty sand	Yellowish gray	Very fine		
104'9" - 105'	No recovery				
105' - 109'8"	Silty sand	Yellowish gray	Very fine - medium	Poor	Lignite @ 4" from base.
109'8" - 110'	No recovery				
110' - 112'9"	Silty sand	Yellowish gray	Silt - medium	Poor	Scatted lignite laminae.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-el

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
112'9" - 113'10"	Silty sand	Dark yellow orange	Silt - fine	Poor	
113'10" - 115'	No recovery				
115' - 115'9"	Clay	Dark yellow orange	Clay - silt	Moderate	Clay lenses.
115'9" - 119'	Silty sand	Moderate Yellow brown	Very fine	Moderate - poor	
119' - 120'	No recovery				
120' - 124'3"	Silty sand	Grayish orange	Very fine - fine	Moderate - poor	Grades from very fine @ top to fine @ base; Scattered lignite.
124'3" - 125'	No recovery				
125' - 129'4"	Sand	Grayish orange	Medium	Moderate	Massive.
129'4" - 130'	No recovery				
130' - 133'10"	Sand	Dark yellow orange	Medium	Moderate	Massive.
133'10" - 135'	No recovery				
135' - 135'3"	Sand	Dark yellow orange	Medium	Moderate	Clay lenses @ base.
135'3" - 135'9"	Sandy clay	Dark yellow brown	Silty - very fine	Moderate	
135'9" - 136'8"	Clayey sand	Moderate yellow brown	Fine	Moderate	
136'8" - 137'8"	Sandy clay	Dark yellow brown	Very fine	Moderate	Mottled; Lignite; Kaolin.
137'8" - 140'	No recovery				

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
140' - 142'4"	Clayey sand	Dark yellow brown	Clay - very fine	Moderate	Mottled; Clay clasts.
142'4" - 143'5"	Clayey sand	Dark yellow brown	Very fine - medium	Moderate - poor	Mottled; Oxides (bulk flecks).
143'5" - 145'	No recovery				
145' - 146'5"	Clayey sand	Dark yellow brown	Very fine	Moderate	Mottled; Oxides.
146'5" - 148'1"	Clayey sand	Yellowish orange	silt - v. fine	Moderate	Mottled; Oxides; Slightly silicified 147'-148'1".
148'1" - 150'	No recovery				
150' - 151'7"	Clayey sand	Mod. dark yellow brown	Very fine	Moderate	Mottled; Lignite & oxides.
151'7" - 155'	No recovery				
155' - 158'3"	Clayey sand	Dark yellow orange	Very fine	Moderate	Very pale orange clay laminations; Base is gradational to coarse sand.
158'3" - 159'	Sand	Light brown orange brown	Fine - coarse	Moderate - poor	Lignite & base.
159' - 160'	No recovery				
160' - 162'8"	Clayey sand	Light brown - orange brown	Very fine - coarse	Poor	Lower 10" more sandy; Clay lamination; Oxides & lignite.
162'8" - 163'2"	Clay	Dusky yellow	Clay	Good	Lenses of grayish yellow & pale olive clay; Oxides.
163'2" - 164'3"	Clay	Grayish yellow	Clay	Good	White granules, very indurated clay; Iron stained; Mottled; Indurated.
164'3" - 164'8"	Clay	Yellow gray - olive brown	Clay	Good	Mottled.
164'8" - 165'	Clay	Yellow gray - olive brown	Clay	Good	Mottled; Indurated.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
165'- 166'1"	Silty clay	Dark yellow orange	Clay - silt	Good	Grades to clay @ base.
166'1" - 169'6"	Clay	Mod. yellow brown	Clay	Good	Grades to silt @ top to clay @ base; Iron stained lens @ 168'4".
169'6" - 170'	Clayey sand	Grayish orange	Very fine	Good - moderate	Very indurated; Oxide rich lower 1"; Yellow brown at top.
170' - 170'7"	Sandy clay	Gray orange	Very fine	Good - moderate	
170'7" - 175'	No recovery				
175' - 176'7"	Sand	Dark yellow orange	Fine - coarse	Poor	Sorting increase towards base.
176'7" - 180'	Sand */	Dark yellow orange	Fine	Good	Heavies.
180' - 181'7"	Sand	Dark yellow orange	Silt - granules	Poor	Clayey @ base; Intraclast near base.
181'7" - 182'6"	Clayey sand */	Dark yellow orange	Fine - clay	Good	Heavies.
182'6" - 184'10"	Clayey sand	Light brown	Clay - coarse	Poor	Massive.
184'10" - 185'	Clayey sand	Dark yellow orange	Clay - fine	Good	Heavies.
185' - 188'9"	Sand	Dark yellow orange	Clay - granules	Poor	Massive.
188'9" - 190'	No recovery				
190' - 194'7"	Sand	Dark yellow orange	Clay - granules	Poor	Massive.
194'7" - 195'	Sand */	Pale yellow orange	Very fine	Good	Heavies.
195' - 196'3"	Sand	Mod. yellow brown	Clay - small pebbles		Massive; @ 196'3" two shark tooth shaped objects - noncalcareous.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAIN SIZE	SORTING	REMARKS
196'3" -	Clayey sand */	Mod. yellow brown	Clay - medium	Good	Heavies.
196'5" -	No recovery				
200'					
200' -	Sand	Pale yellow brown	Fine - coarse	Moderate	Oxides.
200'3" -	No recovery				
205'					
205' -	Sand	Light olive gray	Fine - coarse	Moderate - poor	Massive.
206'3" -	No recovery				
207'6" -	No recovery				
207'6" -	Sand	Light olive gray	Fine - coarse	Moderate - poor	Massive.
208'2" -	No recovery				
209'					
209' -	Clayey sand */	Light gray	Clay - moderate	Good	Heavies.
211'5" -	No recovery				
212'4" -	No recovery				
212'4" -	Sand	Light olive gray	Coarse	Good	Trace of heavy minerals (garnets).
214'1" -	No recovery				
214'4" -	No recovery				
214'4" -	Clayey sand	Olive gray	Fine - medium	Good	Green clay; Traces of heavy minerals.
215'2" -	No recovery				
215'2" -	No recovery				
216'4" -	Clayey sand	Dark green gray	Fine - very coarse	Very poor	
216'5" -	No recovery				
216'5" -	No recovery				
220'					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
Cluster-5 Well # BRN-357 35X-e1					
220' -	Small pebbles	Light green	Very Coarse - pebbles	Good	
220'1" -	No recovery				
224'					
224' -	Sand */	Grayish orange	Fine - granules	Poor	Heavies; Shark tooth.
225'					
225' -	Clayey sand	Olive gray	Clay - granules	Poor	Heavies.
225'4" -	No recovery				
227'					
227' -	Clayey sand */	Olive gray	Clay - granules	Poor	
227'6" -	Sand	Olive gray	Fine	Good	
228'5" -	No recovery				
228'6"					
228'6" -	Sand	Olive gray	Fine	Good	
229'3" -	Clayey sand */	Olive gray	Clay - fine	Good	Clay increase toward base.
231'					
231' -	Clayey sand	Olive gray	Clay - granules	Poor	Fine-grained indurated lenses.
231'6" -	Clayey sand	Olive gray	Clay - medium	Moderate	Indurated; Heavy minerals (Mn).
235'					
235' -	Clayey sand	Olive gray	Clay - granules	Poor	Indurate; Heavy minerals (Mn).
235'10" -	No recovery				
236'					
236' -	Clayey sand */	Olive gray	Clay - medium	Moderate	Indurated.
236'4" -	No recovery				
238'					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
238' -	Clayey sand */	Olive gray	Clay - medium	Moderate	Indurated.
241' -	Clayey sand	Olive gray	Clay - medium	Moderate	Heavy minerals (Mn).
241'4" -	Clayey sand */	Olive gray	Clay - medium	Moderate	Less clay toward base.
245' -	Sand	Olive gray	Fine - medium	Good	Heavy minerals.
246'10" -	No recovery				
247' -	Clayey sand	Olive gray	Clay - medium	Moderate	Heavy minerals; Indurated fine grained lenses at 247'4".
247'4" -	Clayey sand */	Olive gray	Clay - fine	Moderate	Less clay.
248' -	Clayey sand	Olive gray	Clay - very coarse	Moderate	Grain size increases toward base; Clay lenses.
249'9" -	No recovery				
250' -	Clayey sand	Olive gray	Clay - Small pebbles	Poor	Heavy minerals; Clay lenses.
250'8" -	No recovery				
251' -	Clayey sand	Olive gray	Clay - Small pebbles	Poor	
251'11" -	No recovery				
253' -	Sand */	Medium gray	Fine - very coarse	Moderate	
255'2" -	No recovery				
257' -	Clayey sand */	Medium gray	Clay - medium	Poor	

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
257'9"	Sand */	Yellowish gray	Fine - coarse	Poor	Heavies.
258'8"					
258'8" -	No recovery				
258'11"					
258'11" -	Sand	Light gray	Clay - small pebbles	Poor	
259'10"					
259'10" -	Clayey sand	Light olive gray	Clay - coarse	Moderate	Heavy minerals; Patches of drilling mud caved in.
260'4"					
260'4" -	Sand	Light olive gray	Fine - very coarse	Mod. good	Heavy minerals.
260'10"					
260'10" -	Clayey sand	Medium gray	Clay - very coarse	Mod. poor	Manganese oxide.
261'					
261' -	Sand	Medium gray	Fine - very coarse	Moderately good	Heavy minerals.
261'9"					
261'9" -	No recovery				
264'					
264' -	Clayey sand	Medium gray	Clay - Small pebbles	Very poor	Heavy minerals.
264'8"					
264'8" -	No recovery				
265'					
265' -	Clayey sand	Medium gray	Clay - small pebbles	Very poor	Heavies.
265'11"					
265'11" -	No recovery				
266'					
266' -	Clayey sand */	Medium dark gray	Clay - small pebbles	Poor	Heavies; Garnet.
266'4"					
266'4" -	No recovery				
267'4"					
267'4" -	Sand	Brownish black	Medium	Moderate	Dark gray slate coated with an iron-carbonate - weakly effervesces.
267'9"					
267'9" -	Sand	Medium gray	Fine - coarse	Poor	Translucent quartz.
268'10"					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
Cluster-5 Well # BRN-357 35X-e1					
268'10" - 272'	No recovery				
272' - 272'8"	Sand */	Olive gray	Coarse - small pebbles	Poor	Heavies; Garnet.
272'8" - 274'4"	No recovery				
274'4" - 274'8"	Sand	Olive gray	Fine - medium	Good	Translucent quartz.
274'8" - 274'10"	Sandy clay	Medium gray	Fine - pebbles	Poor	Large pebble in matrix 1" long.
274'10" - 275	No recovery				
275' - 276'7"	Clayey sand */	Olive black	Clay - granules	Poor	Most sand with clay patches grades downward from pale yellow brown to olive black; top may be fill.
276'7" - 276'8"	No recovery				
276'8" - 276'10"	Clayey sand */	Olive black	Clay - small pebbles	Poor	Clay occurs in patches (introclasts).
276'10" - 278'1"	Clayey sand	Olive gray	Fine - coarse	Moderate	
278'1" - 278'4"	Sand */	Pale yellow brown	Medium - large pebbles	Poor	It is most probably fill.
278'4" - 279'	No recovery				
279' - 280'	Clayey sand	Medium gray	Clay - fine	Good	
280' - 280'2"	Clayey sand	Olive gray	Fine - pebbles	Very poor	Large pebbles.
280'2" - 281'	Clay	Olive gray			
281' - 281'10"	Pebbly sand		Fine - granular		Translucent quartz.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
281'10" -	Clayey sand	Medium gray	Clay - fine	Good	
282'1" -	Clay	Medium dark gray	Clay	Good	
283' -	Clayey sand	Medium dark gray	clay - very large pebbles	Poor	Muscovite.
284'3" -	Sand */	Light brown gray	fine - granules	Poor	Most probably fill.
284'7" -	Sandy clay & sand & clay	white			Muscovite (sercitic) ; White clay.
286' -	Clay, sandy clay, & sand	White			
287'7" -	No recovery				
288' -	Sandy clay	White	Fine		Coarse sand at top & sides of core is probably sand left from previous cores.
289'6" -	No recovery				
290' -	Sandy clay	White	Fine		
291'6" -	No recovery				
292' -	Clayey sand	Light gray	Very fine - Fine		
292'4" -	Clayey sand	Light gray	Fine - very coarse	Poor	
292'4" -	Clay	Medium gray			
293'7" -	No recovery				
293'9" -	No recovery				
294' -	Sandy clay */	Very light gray	Clay - fine	Good	Kaolinitic; Muscovite; Heavies; 1/4" sand lense @ 295'.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
Cluster-5 Well # BRN-357 35X-e1					
295'4" -	Clayey sand	Medium gray	Very fine - medium	Moderate	Fine grained muscovite (sericite).
296'					
296' -	Clayey sand	Medium gray	Fine - medium	Moderate	
297'3"					
297'3" -	Clay	Dark gray			
301'9"					
301'9" -	No recovery				
302'					
302' -	Clay	Dark gray			
309'8"					
309'8" -	No recovery				
310'					
310' -	Clay, silt, sand	Dark gray - olive green			Material grading from clay to sand.
314'					
314' -	Clayey sand	Dusky Yellow green	Clay - medium	Moderate	
317'8"					
317'8" -	Clayey sand	Dark gray	Clay - medium	Moderate	
317'10"					
317'10" -	No recovery				
318'6"					
318'6" -	Sand	Light olive gray	Medium - coarse	Poor	Heavy minerals.
319'7"					
319'7" -	Sandy clay	Grayish black	Clay - fine	Poor	Coarse grains from overlying material.
320'					
320' -	Clayey sand	Light gray	Clay - fine	Poor	Sand with clay lenses; Lignite; Muscovite; All material on outside of core is washed in sand.
321'1"					
321'1" -	Clay */	Dark gray	Clay	Good	Indurate muscovite.
322'2"					
322'2" -	Sandy clay */	Dark gray	Clay - medium	Good	Lignite; Muscovite.
322'11"					
322'11' -	Silty clay */	Medium dark gray	Clay - fine	Good	Muscovite, clay, silt laminae.
325'10"					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
325'10" - 326'	Clayey sand	Light gray	Clay - fine	Poor	Pyritized rock 1" diameter.
326' - 326'8"	Sandy clay	M. light gray - gray black	Clay - very fine		Fine laminations; Muscovite; Interbedded sand & Ellenton type clay; lignite in clay.
326'8" - 326'10"	No recovery				
326'10" - 328'4"	Clay	Light gray - Dark gray	Clay - silt		Laminations clay/silt; Lignite; Bottom 3" gradational to silt.
328'4" - 329'9"	Clayey sand	Medium gray	Clay - small pebbles	Poor	Sand with 1" clay bed @ 328'9" - 328'10"; Clay laminations; Muscovite; Lignite.
329'9" - 330'	No recovery				
330' - 331'5"	Clayey sand	M. light gray - gray black	Clay - medium	Poor	Coarse material not part of core; Muscovite; Interbedded sand & clay lenses; Kaolinitic.
331'5" - 332'	No recovery				
332' - 332'8"	Clayey sand	Medium gray	Clay - small pebbles	Poor	Lignite; Muscovite.
332'8" - 333'8"	Sand	Light gray	Fine - small pebbles	Poor	Heavy minerals; Muscovite; Kaolinite.
333'8" - 334'3"	Clayey sand	Medium gray	Clay - small pebbles	Poor	Lignite; Muscovite; Clay lenses.
334'3" - 334'8"	Clayey sand */	Medium gray	Clay - fine	Good	Muscovite; Lignite layers;
334'8" - 336'	Clayey sand */	Light brown gray	Clay - coarse	Poor	Very little clay; Muscovite & lignite layers.
336' - 336'2"	Sand	Brownish gray	Fine - medium	Moderate	Heavy minerals; Muscovite; Kaolinite.
336'2" - 336'9"	Sandy clay	Medium gray	Clay - very fine	Moderate	Lignite; Muscovite.
336'9" - 338'	Clayey sand */	Light brown gray	Fine - granules	Poor	Very little clay; Muscovite & lignite layers.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
338' -	Clayey sand */	Medium gray	Clay - fine	Good	Heavies; Muscovite.
340' -	Sand	Light olive gray	Fine	Moderate - good	Muscovite; Heavies.
340'5" -	Clayey sand */	Medium gray	Clay - fine	Good	Heavies; Muscovite; Lignite; Clay laminations.
342' -	Sand	Light olive gray	Fine	Moderate - good	Muscovite; Heavies.
342'11" -	Sandy clay	Medium gray	Clay - very fine	Moderate	Heavies; Muscovite.
342'11" -	Sandy clay	Medium gray	Clay - very fine	Moderate	Heavies; Muscovite.
343' -	Sandy clay	Medium gray	Clay - granules	Poor	Lignite.
343'7" -	Clayey sand */	Light brown gray	Clay - coarse	Poor	Muscovite; Heavies; Less clay.
344'10" -	No recovery				
345' -	Clayey sand	Medium gray	Clay - coarse	Poor	Lignite.
345'1" -	No recovery				
345'6" -	Clayey sand	Light gray	Clay - medium	Poor	Lignite & kaolinite laminae (white).
345'8" -	Sand	Light olive gray	Fine - granules	Poor	
345'10" -	Sandy clay	Med. dark gray	Clay - very fine	Poor	Lignite; Oxide? ; Kaolinite laminae.
346'1" -	No recovery				
347' -	Clayey sand	Yellowish gray	Clay - Small pebbles	Poor	Clay lense pinkish gray 1" @ 347'6"; Heavies.
348'3" -	No recovery				
349' -					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
Cluster-5 Well # BRN-357 35X-e1					
349' -	Sand	Yellowish	Clay -	Poor	Increase in clay bottom 3"; Muscovite;
350'1"		gray	small pebbles		Heavies.
350'1" -	No recovery				
351'					
351' -	Clayey sand	Pinkish gray	Clay - very coarse	Moderate	Clay lense 1" at 351'8"; Top 8" very coarse grained grading to fine; Muscovite; Heavies.
353'3"					
353'3" -	Sand	Pale yellow	Fine - coarse	Poor	Heavies; Muscovite.
353'7"		brown			
353'7" -	Sandy clay *	Light gray	Clay - fine	Good	Clay layer @ 353'10" - 354'; Heavies; Muscovite.
354'6"					
354'6" -	Lignite */				
355'					
355' -	Sand	Light olive	Fine -	Moderate	
356'		gray	very coarse		
356' -	Sandy clay	Light olive	Clay -	Poor	Muscovite; Heavies; Dark clay lamination.
356'6"		gray	small pebbles		
356'6" -	Clayey sand */	Yellowish	Fine -	Moderate	Muscovite; Heavies; Kaolinite.
357'		gray	coarse		
357' -	Sandy clay	Pale yellow	Clay -	Poor	Coarse to small pebble material on outer coating (washed in ?); Mottled clay lense @ 357'7"; Oxides
358'1"		brown	fine		
358'1" -	Clayey sand */	Pinkish	Clay -	Poor	Heavies; Muscovite; Kaolinite.
359'		gray	small pebbles		
359' -	Clayey sand */	Pinkish	Clay -	Poor	Heavies; Muscovite; Kaolinite;
360'4"		gray	small pebbles		Lignite layer 4" at base.
360'4" -	No recovery				
365'					
365' -	Clayey sand	Pale yellow	Clay -	Poor	Lignite; Heavies; Clay lenses at 365'7" and 366'3"
367'6"		brown	very coarse		to 366'8" pale olive.
367'6" -	Clayey sand */	Light brown	Clay -	Poor	Mostly sand; Clay lense @ 367'2".
369'		gray	small pebbles		
369' -	Sand	Pale	Fine -	Moderate	Heavies.
369'4"		brown	coarse	Good	

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
369'4" - 370'10"	Clayey sand	Light olive gray	Clay - very coarse	Poor	Clay lense 1" yellowish gray @ 369'5".
370'10" 372'	No recovery				
372' - 373'3"	Clayey sand	Light olive gray	Fine - coarse	Poor	Muscovite; Sericite.
373'3" - 374	Clayey sand */	Light brown gray	Fine - coarse	Poor	Muscovite; Kaolinite; Heavies;
374' - 374'8"	Clayey sand */	Light brown gray	Fine - coarse	Poor	Heavies; Kaolinite.
374'8" - 375'1"	Sandy clay */	Light brown gray	Clay - silt	Good	Heavies; Muscovite; Kaolinite.
375'1" - 375'6"	Clayey sand */	Light brown gray	Clay - small pebble	Poor	Heavies; Muscovite; Kaolinite.
375'6" - 376'	Sandy clay	Light gray	Clay - medium	Poor	Heavies; Muscovite; Kaolinite.
376' - 377'9"	Clayey sand	Light olive gray	Fine - medium	Moderate	Sericite.
377'9" - 378'	No recovery				
378' - 379'9"	Clayey sand	Light olive gray	Fine - medium	Moderate	Sericite.
379'9" - 380	No recovery				
380' - 381'5"	Clayey sand	Light olive gray	Fine - medium	Moderate	Sericite; Pebbles washed on the outside walls of the core.
381'5" - 382'	No recovery				
382' - 384'	Clayey sand	Light olive gray	Fine - medium	Moderate	Possibly wall material (core was longer than cut); More sandy toward bottom; Muscovite.
384' - 385'11"	Clayey sand	Light olive gray	Fine - coarse	Moderate	More sandy at top with large pebbles.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
385'11" - 386'	No recovery				
386' - 388'4"	Clayey sand	Light olive gray	Fine - very coarse	Poor	Sericite.
388'4" - 388'8"	Clayey sand	Light olive gray	Fine - coarse	Moderate	4" clay lense medium gray on one side.
388'8" - 388'10"	Clayey sand	Light olive gray	Fine - coarse	Moderate	
388'10" - 389'	Clay	Light olive gray	Clay	Good	
389' - 389'4"	Clayey sand	Light olive gray	Clay - granules	Poor	Muscovite.
389'4" - 390'	No recovery				
390' - 392'4"	Clayey sand	Light olive gray	Fine - pebbles	Poor	Heavy minerals; muscovite.
392'4" - 394'	Clayey sand */	Pinkish gray	Clay - small pebbles	Poor	
394' - 395'5"	Clayey sand	Light olive gray	Fine - very coarse	Very poor	Heavies; Muscovite; 1" clay layer @ 395'2" - 395'3".
395'5" - 397'	Clayey sand */	Pinkish gray	Clay - small pebbles	Poor	
397' - 398'	Sandy clay	Light olive gray	Fine - coarse	Very poor	Pebbles.
398' - 399'7"	Clayey sand	Light olive gray	Clay - coarse	Poor	Muscovite.
399'7" - 400'	No recovery				
400' - 401'3"	Clayey sand	Light olive gray	clay - coarse	Very poor	Muscovite; Heavy minerals.
401'3" - 402'	No recovery				

*/ indicates no recovery from well C-5. Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
402' -	Clayey sand	Light olive gray	Clay - coarse	Poor	Muscovite; Heavy minerals.
403'8" -	No recovery				
404'					
404'8" -	Clayey sand	Light olive gray	Clay - coarse	Poor	Muscovite; Loose sand.
404'11" -	No recovery				
408'					
408' -	Sand	Yellowish gray	Coarse - very coarse	Moderate	Some clay material @ base.
409'1" -					
409'1" -	Clayey sand	Yellowish gray	Clay - very coarse	Poor	2" clay lens at 409'2" - 409'4". Lens contains heavies, muscovite, kaolinite & smokey quartz pebbles
409'5" -	No recovery				
409'5" -					
411'3" -					
411'3" -	Clayey sand	Pinkish gray	Clay - small pebbles	Very poor	Muscovite; Heavies; Traces MnO.
412'					
412' -	Clayey sand	Pinkish gray	Clay - small pebbles	Very poor	Grades to clay @ bottom; Muscovite; Heavies.
412'8" -					
412'8" -	Sandy clay	Pinkish gray	Clay - fine	Moderate	MnO laminae @ 412'10"-413'1"; Muscovite & heavies.
413'8" -					
413'8" -	Sandy clay	Pinkish gray	Clay - fine	Moderate	0.3" thick MnO laminae @ 413'8".
413'10" -					
413'10" -	Clay	Yellowish gray	Clay - silt	Good	Muscovite & traces MnO.
414'					
414' -	Sandy clay	Yellowish gray	Clay - very coarse	Poor	Muscovite; Traces heavies; MnO.
417'10" -	No recovery				
418'					
418' -	Sandy clay	Yellowish gray	Clay - very fine	Good	1" bed MnO @ 418'10" - 418'11".
419'6" -	No recovery				
419'6" -					
421'					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-el

DEPTH	TYPE	COLOR	GRAIN SIZE	SORTING	REMARKS
421' -	Clayey sand	Yellowish gray	Clay - medium	Moderate	Mn; Muscovite.
422'9" -	Sandy clay	Light brown gray	Clay - fine	Moderate good	Mn; Oxides; Muscovite.
423'1" -	Silty clay	Brownish gray	Clay - silt	Moderate good	Muscovite; Lignite.
423'7" -	No recovery				
424' -	Silty clay	Brownish gray	Clay - silt	Moderate good	Muscovite; Lignite.
424'1" -	Clayey sand	Light brown gray	Clay - fine	Good	Muscovite; Mn oxides.
426' -	No recovery				
427' -	Clayey sand	Light gray	Very fine - medium	Good	Muscovite.
427'10" -	Clayey sand	Light gray	Fine - granules	Poor	Heavy minerals; Muscovite.
428'9" -	No recovery				
429' -	Clayey sand	Light gray	Fine - granules	Poor	Thin laminates of coarse sand; Top 1" has high % of clay.
431'8" -	No recovery				
432' -	Clayey sand	Light gray	Fine - coarse	Poor	Muscovite; Heavy minerals.
433'6" -	No recovery				
437' -	Sand (split spoon)	Light gray	Fine - granular	Poor	slate chips iron-carbonate coated (10% HCl = effervescent).
437'2" -	Clay (split spoon)	Light gray	Fine - granules	Poor	slate chips iron carbonate coated (HCl reaction = effervescent).

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1				
DEPTH	TYPE	COLOR	GRAINSIZE	REMARKS
437'8"	Sandy clay	Light gray	Fine - granular	Extremely tight.
438'3"				
438'3"	Clay	Olive gray	Clay	Extremely tight.
441'7"				
441'7"	No recovery			
442'8"				
442'8"	Sandy clay	Medium gray	Very fine - medium	Micas.
443'				
443'	Clayey sand	Light olive gray	Fine - coarse	Micas.
444'4"				
444'4"	No recovery			
444'8"				
444'8"	Clayey sand	Light olive gray	Fine - coarse	Micas.
446'5"				
446'5"	No recovery			
446'8"				
446'8"	Clayey sand	Light olive gray	Fine - coarse	Micas.
450'4"				
450'4"	Clayey sand	Light olive gray	Fine - granules	Finer upward; Micas.
450'4"				
450'4"	No recovery			
451'				
451'	Clayey sand	Medium light gray	Fine - granules	Micas; Heavies.
452'				
452'	Sandy clay	Medium light gray	Very fine - fine	Color change @ 452'6".
452'6"				
452'6"	Sandy clay	Very light gray	Clay - medium	Fines upward; Micas; Heavies; Sand size silt - medium.
458'6"				
458'6"	No recovery			
459'				
459'	Sandy clay	Light brown gray	Clay - medium	Muscovite; Heavies.
459'9"				
459'9"	Silty clay	Brownish gray	Clay - silt	Muscovite; Mottled.
460'6"				

* / indicates no recovery from well C-5.; Description is from well C-5A.

DEPTH	TYPE	COLOR	GRAIN SIZE	SORTING	REMARKS
Cluster-5 Well # BRN-357 35X-e1					
460'6"	Clayey sand	Light brown gray	Clay - very coarse	Poor	Muscovite; Heavies; Fines upward.
463'	Sand	Light olive gray	Clay - medium	Poor	Muscovite; Heavies.
463'11"	Sandy clay	Light gray	Clay - fine	Moderate	Muscovite.
464'1"	Sandy clay	Light gray	Clay - coarse	Poor	Heavies; Muscovite; Medium gray clay laminae.
466'1"	No recovery				
466'6"	Clayey sand	Light gray	Clay - medium	Moderate	Muscovite; Heavies; 1" light gray clay laminae @ 466'7".
467'1"	Sand	Pale yellow brown	Fine - coarse	Poor	Heavies; Muscovite.
467'7"	Clayey sand	Pale yellow brown	Clay - coarse	Poor	Heavies; Muscovite.
468'1"	No recovery				
469'	Clayey sand	Yellowish gray	Fine - medium	Moderate	Heavies; Muscovite.
470'1"	Sand	Medium light gray	Fine - very coarse	Poor	At 470'1" - 470'2" indurated (silicified) heavies.
470'6"	No recovery				
471'	Sand	Yellowish gray	Silt - very coarse	Poor	Mud laminae @ 471'4"; Silicified & indurated @ base.
471'7"	No recovery				
473'	Sand	Yellowish gray	Silt - very coarse	Poor	Clay increases @ base.
473'9"	No recovery				
475'	No recovery				

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
475' -	Sand	Light - med. gray	Very fine - small pebbles	Poor	Lignite; color change from light gray to medium gray toward base; Heavies & muscovite.
476'4" -	No recovery				
477'					
477' -	Clayey sand	Medium gray	Clay - medium	Moderate	Clay lenses (0.3" thick); Heavies.
477'4" -					
477'4" -	Sand	Yellowish gray	very fine - very coarse	Poor	Heavies.
477'9" -					
477'9" -	Clayey sand	Light olive gray	Clay - granules	Poor	Heavies; Clay laminae (0.1").
478'5" -					
478'5" -	No recovery				
479'					
479' -	Clayey sand	Light gray	Clay - very coarse	Moderate	Grain size fines upwards; Heavies; Muscovite.
480'7" -					
480'7" -	No recovery				
481'					
481' -	Silty clay	Medium dark gray	Clay -silt	Good	Muscovite.
481'7" -					
481'7" -	Clay	Grayish black	Clay	Good	Muscovite; 1/4" thick indurated black shale @ 482'9".
482'10" -					
482'10" -	Clayey sand	Light brown gray	Clay - very coarse	Poor	Heavies; Muscovite; Fines upward.
484'11" -					
484'11" -	No recovery				
485'					
485' -	Clayey sand	Light brown gray	Clay - granules	Poor	Muscovite; Heavies; Homogenous.
488'8" -					
488'8" -	No recovery				
489'					
489' -	Clayey sand	Light brown gray	Clay - coarse	Moderate	Muscovite; Heavies; Homogenous; Few clay laminations (less than 0.1").
492'5" -					
492'5" -	No recovery				
493'					

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1					
DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
493' -	Clayey sand	Light brown gray	Fine - medium	Good	Heavy minerals; Muscovite.
494'					
494' -	Clayey sand	Light brown gray	Fine - coarse	Moderate	Heavy minerals; Muscovite.
495'10" -	No recovery				
496'					
496' -	Clayey sand	Yellowish gray	Clay - medium	Moderate	Small (0.1") clay clasts; MnO; Heavies; Muscovite.
496'8" -					
496'8" -	Clayey sand	Light olive gray	Clay - coarse	Poor	Muscovite; Heavies; 0.3" clay lens @ 496'10".
498'7" -	No recovery				
500'					
500' -	Sandy clay	Light olive gray	Clay - granules	Poor	Muscovite.
500'3" -					
500'3" -	Clayey sand	Pinkish gray	Clay - granules	Poor	Heavies; Fines upward.
501'8" -	No recovery				
501'8" -					
502'9" -	Clayey sand	Yellowish gray	Clay - coarse	Poor	1" clay rich zones @ 502'10", 503'9", & 504'5"; Muscovite concentrated in clays; Heavies.
504'8" -	No recovery				
507'8" -	Clayey sand	Pinkish gray	Clay - Granules	Very poor	0.5" clay layer @ top contains blackish granules (phosphate?).
508'					
508' -	Clayey sand	Pinkish gray	Clay - Pebbles	Very poor	Heavies; 1/4" thick pyritized rock near base.
508'6" -	No recovery				
509'					
509' -	Clayey sand	Pinkish gray	Clay - small pebbles	Very poor	Pyritized granules; Heavies.
511'3" -	No recovery				
511'3" -					
513'					

* / indicates no recovery from well C-5.; Description is from well C-5A.

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
Cluster-5 Well # BRN-357 35X-e1					
513'	Clayey sand	Pinkish gray	Clay - coarse	Moderate	Muscovite; Heavies.
516'4"	No recovery				
517'	No recovery				
517'	Clayey sand	Pinkish gray	Clay - granules	Very poor	Clay rich laminae in dense light olive gray clay @ 520'3" - 529'4"; Cemented quartz clamps; muscov.
520'6"	Clayey sand	Pinkish gray	Clay - small pebble	Poor	Muscovite; Heavies; Clay rich zones; @ 522'8"
523'5"	No recovery				
524'	No recovery				
524'	Clayey sand	Pinkish gray	Clay - coarse	Very poor	Muscovite; Heavies.
525'2"	Clayey silt	Light brown gray	Clay - silt	Good	Muscovite; Dark clay laminae;
525'8"	Clayey silt	Light gray	Clay - silt	good	Muscovite; Dark clay laminae.
526'5"	Silt	Light gray	Clay - silt	Good	Indurated; Muscovite.
528'1"	silty clay	Medium gray	Clay -silt	Good	Muscovite; lignite.
528'9"	No recovery				
529'	No recovery				
529'3"	Sandy clay	Medium light gray	Clay - fine	Good	Laminae of dark clay & lignite; Muscovite.
530'	Clayey sand	Light gray	Clay - fine	Good	Heavies; Muscovite.
532'2"	Clayey sand	Pinkish gray	Clay - Coarse	Poor	Dark clay bed & lignite laminae 532'2" - 532'4"; Muscovite.
532'7"	Silty clay	Light gray	Clay - silt	Good	Muscovite.
533'	No recovery				

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1					
DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
533' -	Clayey sand	Light gray	Clay - medium	Moderate	Lignite layers at 533'2" - 533'4", & 534'-534'1", & 534'6"; Muscovite.
535'6" -	Silty clay	Light gray	Clay - silt	Good	Lignite layers @ 535'6" & 536'2"; Muscovite.
536'9" -	No recovery				
537' -	Clayey sand	Light gray	Clay - fine	Moderate	0.4" thick silt layer; Muscovite.
539' -	Clayey silt	Light gray	Clay - silt	Moderate good	Dark gray clay laminae & lignite; Muscovite.
539'7" -	Clayey sand	Light gray	clay - fine	Moderate	Laminations of gray clay & lignite; Muscovite; Wood fragments @ base.
540'10" -	No recovery				
541' -	Silty clay	Light gray	Clay - silt	Moderate	Muscovite.
541'3" -	Clayey sand	Light gray	Clay - medium	Moderate - poor	Muscovite; Lamination of gray clay & lignite; .4" layer of lignite at 541'8".
544'5" -	No recovery				
545' -	Clayey sand	Light gray	Clay - coarse	Poor	Lignite laminae @ top; 3" dark gray clay lens @ 546'8" - 546'11"; Muscovite.
547'2" -	Silt	Olive black	Clay - silt	Good	Muscovite; several (pyrite cemented, pebble-sized clumps of quartz on outer surface.
548'11" -	No recovery				
549' -	Clayey silt	Medium dark gray	Clay - silt	Good	Muscovite.
552'11" -	No recovery				
553' -	Clayey silt	Medium dark gray	Clay - silt	Good	Muscovite.

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
556'5" - 557'	No recovery				
557' - 558'10"	Clayey silt	Olive gray	Clay - silt	Good	
558'10" - 558'11"	Lignite	Black	wood		
558'11" - 559'	Clayey silt	Olive gray	Clay -silt	Good	
559' - 559'3"	Clay	Olive gray	Clay	V. good	
559'3" - 559'5" -	Clayey silt	Olive gray	Clay -silt	Good	Lignite.
559'5" - 559'10"	Clay	Olive gray	Clay	Very good	
559'10" - 561'	No recovery				
561' - 562'3"	Clay	Olive gray	Clay	Very good	
562'3" - 563'1"	No recovery				
563'1" - 565'4"	Clay	Olive gray	Clay	Very good	
565'4" - 567'	No recovery				
567' - 573'	Clay	Dark green gray	Clay	Good	
573' - 577'	Clay	Dark green gray	Clay	Very good	Part at the bottom 2.5" is recovered in second run of the barrel.
577' - 578'	Clay	Dark green gray	Clay	Very good	
578' - 588'	Clay	Dark green gray	Clay	Very good	

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1					
DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
588' -	Sandy clay	Olive black	Clay - very fine	Moderate	Muscovite; Heavies.
591'10" -	No recovery				
592'					
592' -	Sandy clay	Olive black	Clay - fine	Moderate	Muscovite; Heavies; Lignite layer 1" thick at 593'11".
594'					
594' -	Clay	Dark gray	Clay	Good	Fissile.
594'2" -	No recovery				
596'					
596' -	Clayey sand	Light olive gray	Clay - medium	Poor	Lignite layer less than .5" @ 596'11"; Muscovite.
597'7" -	No recovery				
598'					
598' -	Clayey sand	Olive gray	Clay - medium	Poor	Lignite; Muscovite.
599'6" -	No recovery				
600'					
600' -	Clayey sand	Medium dark gray	Clay - coarse	Poor	Muscovite.
602'7" -					
602'7" -	Silty clay	Medium dark gray	Clay - silt	Good	Muscovite; Dark clay laminae; Slightly fissile.
608'					
608' -	Silty clay	Medium dark gray	Clay - silt	Good	Abundant muscovite; Dark clay laminae; Slightly fissile.
619'6" -	No recovery				
622'					
622' -	Clay	Olive black	Clay	Good	Slightly fissile; Muscovite.
622'3" -	No recovery				
624'					
624' -	Clay	gray	Clay	Good	Slightly fissile; Muscovite.
625'10" -	Medium dark				

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
625'10" - 626'	No recovery				
626' - 635'	Clay	Medium dark gray	Clay	Good	Slightly fissile; Muscovite.
635' - 639'9"	Silty clay	Medium dark gray	Clay - silt	Good	Muscovite; 1/4" lignite layer @ 637'2".
639'9" - 640'	No recovery				
640' - 643'8"	Silty clay	Medium dark gray	Clay -silt	Good	Muscovite.
643'8" - 644'9"	Sandy clay	Medium light gray	Clay - very fine	Good	Muscovite.
644'9" - 645'	No recovery				
645' - 649'7"	Sandy clay	Medium light gray	Clay - fine	Good	Muscovite.
649'7" - 650'	No recovery				
650' - 651'10"	Sandy clay	Medium light gray	Clay - fine	Good	Muscovite.
651'10" - 655'	Silty clay	Medium dark gray	Clay - very fine	Good	Muscovite; Grain size increase frm silt to very fine toward base.
655' - 658'2"	Clayey sand	Light olive gray	Fine - coarse	Moderate	Lignite sillicated in some places as .5" diameter angular pieces.
658'2" - 660'	No recovery				
660' - 660'3"	Loose sand	Olive gray	Coarse	Good	Lignite; Muscovite.
660'3" - 662'	No recovery				
662' - 663'10"	Sand	Medium dark gray	Silt - medium	Moderate	More clayey at bottom; Muscovite; Lignite.

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-el

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
663'10" - 666'	Silty clay	Brownish black	Clay -silt	Good	Light brownish clay lenses; Muscovite; Lignite.
666' - 668'1/2"	Silty clay	Olive black	Clay - silt	Good	Lignite; Muscovite.
668'1/2" - 670'6"	No recovery				
670'6" - 671'10"	Clayey sand	Medium gray	Clay - granules	Very poor	Scattered clay laminae & clay balls weathered.
671'10" - 672'5"	Sand	Brownish gray	Clay - very coarse	Very poor	Pebbles; Lignite laminae @ 671'6".
672'5" - 673'	No recovery				
673' - 673'5"	Sand	Brownish gray	Clay - very coarse	Very poor	
673'5" - 674'10"	Clayey sand	Medium gray	Clay - very coarse	Very poor	Grades to sandier from 574'5" - 574'10".
674'10" - 675'	Sand	Light olive gray	Fine - small pebbles	Very poor	Likely mixed with coarse fill; Very unconsolidated.
675' - 676'5"	Clayey sand	Light gray	Clay - coarse	Poor	Heavies; 2" dark gray clay layer @ 675'3" - 575'5".
676'5" - 677'5"	No recovery				
677'5" - 677'6"	Clayey sand	Medium light gray	Clay - medium	Poor	
677'6" - 678'5"	Sand	Light brown gray	Medium	Good	MnO & heavies.
678'5" - 679'	No recovery				
679' - 679'6"	Clayey sand	Dark gray	Clay - pebbles	Very poor	Cobble size (1.6"); Lignite; Wood fragments; Contact appears to be @ 680'.
679'6" - 679'10"	No recovery				

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
679'10" - 684'4"	Clay	Light gray	Clay	Very good	Dense; Massive; Micaceous.
684'4" - 686'5"	Silty clay	Brownish gray	Clay - silt	Good	Abundant lignite & mica.
686'5" - 688'	No recovery				
688' - 689'5"	Silty clay	Brownish gray	Clay - silt	Good	Abundant lignite & mica; Lignite chunk @ 688'; Lignite laminae @ 689'4".
689'5" - 691'	No recovery				
691' - 691'11"	Clayey sand	Light brown gray	Clay - coarse	Poor	Micaceous; Clay rich 1" layer @ 691'4" - 691'5".
691'11" - 692'9"	No recovery				
692'9" - 694'9"	Clayey sand	Light brown gray	Clay - coarse	Poor	Micaceous; Lignite laminae @ 694'3"; Mottled with dark gray clay.
694'9" - 695'	Sand	Light gray	Clay - very coarse	Very poor	
695' - 697'10"	No recovery				
697'10" - 698'4"	Sand	Light brown gray	Clay - coarse	Poor	
698'4" - 699'5"	Clayey sand	Light brown gray	Clay - very coarse	Poor	Slightly mottled; Micaceous; Clay clasts & lignite laminae.
699'5" - 705'10"	No recovery				
705'10" - 706'1"	Sand		Fine - very coarse	Poor	
706'1" - 706'4"	Clayey sand				
706'4" - 707'1"	No recovery				

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
707'1" -	Clayey sand	Light olive gray	Fine granules	Poor	Muscovite & heavy minerals;
708'7" -	No recovery				Sandy clay @ 708'2" - 708'4".
708'7" -	No recovery				
711'1" -	Sandy clay	Light olive gray	Very fine - fine	Very good	Muscovite.
711'1" -	Clayey sand	Light brown gray	Clay - very coarse	Poor	Micaceous.
713'1" -	No recovery				
713'8" -	No recovery				
715'1" -	Clay	Brownish black	Clay	Very good	
715'2" -	No recovery				
716' -	Sand	Light brown gray	Clay - granules	Very poor	Micaceous; Lignite @ 717'9".
716'10" -	No recovery				
717' -	Sand	Light brown gray	Clay - granules	Very poor	2/3" lignite bed @ 718'8".
718'3" -	No recovery				
719' -	Sand	Light olive gray	Clay - granules	Very poor	Gray clay-rich laminae.
719'2" -	Clayey sand	Light brown gray	Clay - coarse	Very poor	Gray (MnO ?) laminae.
719'11" -	No recovery				
720'1" -	Clayey sand	Light brown gray	Clay - granules	Very poor	Scattered clay rich zones.
721'3" -	No recovery				
722' -	No recovery				

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
722'	Clayey sand	Light brown gray	Clay - granules	Very poor	Clay rich laminae upper 8"; MnO rich lamination @ 723'7"; Micaceous.
724'	No recovery				
724'11"					
724'11" - 727'9"	Clayey sand	Pinkish gray	Clay - very coarse	Very poor	Lens of gray clay concentrations; mica; Heavies.
727'9" - 727'11"	Silty clay	Light brown gray	Clay - silt	Moderate	Micaceous; Grades darker @ base.
727'11" - 728'	Sandy clay	Light brown gray	Clay - very fine	Moderate	Clay lens.
728' - 731'2"	Clayey sand	Light brown gray	Clay - very fine	Moderate	Micaceous; MnO laminae; slightly more clayey at 730'4" - 730'10".
731'2" - 732'	No recovery				
732' - 735'	Clayey sand	Light brown gray	Clay - granules	Very poor	Micaceous; Small pebbles @ base.
735' - 736'	No recovery				
736' - 739'6"	Clayey sand/sandy clay	Pinkish gray	Clay - fine	Moderate	MnO laminae; Micaceous; Grades to more clay @ base.
739'6" - 740'	No recovery				
740' - 743'6"	Clayey sand	Pinkish gray	Clay - fine	Moderate	Micaceous.
743'6" - 744'	No recovery				
744' - 745'9"	Sand	Pinkish gray	Clay - very coarse	Very poor	MnO staining in interstitial clays.
745'9" - 746'	No recovery				
746' - 748'10"	Clayey sand	Light brown gray	Clay - coarse	Poor	Heavies; Lignite; MnO staining; Small pebble size clay balls.

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
748'10" - 749'8"	Clayey sand	Pinkish gray	Clay - fine	Poor	Large (1.3") clay ball; Heavies; Micaceous; Lamination of gray clay.
749'8" - 750'	Silty clay	Light brown gray	Clay - silt	Good	Micaceous.
750' - 750'10"	Silty clay	Light brown gray	Clay - silt	poor	Large pebbles.
750'10" - 754'	No recovery				
754' - 755'5"	Clayey sand	Light brown gray	Clay - coarse	Poor	Micaceous; Lignite; Pebbles; Bottom part more clayey.
755'5" - 756'	No recovery				
756' - 758'2"	Clayey sand	Light olive gray	Fine - medium	Moderate	Pebbles.
758'2" - 759'6"	Sand	Light olive gray	Coarse	Moderate	Pebbles.
759'6" - 759'7"	Clay	Light olive gray	clay	very good	Tight.
759'7" - 760'1"	No recovery				
760'1" - 760'6"	Silty clay	Medium light gray	Clay - silt	Poor	Sand; Mica; Lignite.
760'6" - 760'7"	No recovery				
760'7" - 765'	Silty clay	Medium light gray	Clay - silt	Poor	Sand; Mica; Lignite.
765' - 770'	Clay	Medium light gray	Clay	Good	
770' - 770'10"	Sand	Medium light gray	Fine - coarse	Poor	
770'10" - 771'4"	Clay	Medium light gray	Clay	Good	

* / indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-el

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
771'4" - 771'9"	Sand	Medium light gray	Fine	Good	
771'9" - 772'10"	Clay	Medium light gray	Clay	Good	
772'10' - 778'8"	No recovery				
778'8" - 779'2"	Silty sand	Pale yellow brown	Fine-medium	Poor	Lignite; Pebbles.
779'2" - 779'4"	Clay	Dark gray	Clay	Poor	Lignite; Mica; Sand.
779'4" - 780'	Sand	Light brown gray	Coarse	Good	
780' - 781'5"	Sand	Medium light gray	Fine - coarse	Moderate	Mica.
781'5" - 781'8"	Clay	Medium light gray	Clay	Good	
781'8" - 783'9"	No recovery				
783'9" - 785'	Sandy clay	Light brown gray	Clay - medium	Poor	Lignite; Coarse sand on top - washed in?
785' - 786'3"	Silty clay	Brownish gray	Clay - silt	Moderate	Grades to v.fine sand; Clay @ base; Lignite v.large chunk pebble size @ 785'8"; clay clasts.
786'3" - 787'6"	Sandy clay	Light gray	Clay - very coarse	Very poor	Slightly micaceous & lignitic.
787'6" - 788'4"	No recovery				
788'4" - 789'	Clayey sand	Light brown gray	Clay - granules	Very poor	Mottled clay & clayey sand; Lignitic & slightly micaceous; Clump of pyrite; Cemented quartz @ 789'
789' - 792'6"	Clayey sand	Light brown gray	Clay - very coarse	Very poor	Lignitic; slightly micaceous; clay intrabets; Mottled; pyrite cemented chunk quartz grains.
792'6" - 793'5"	Clayey sand	Pinkish gray	Clay - fine	Moderate	Heavies; slightly micaceous; Thin clay laminae.

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
793'5" - 795'	No recovery				
795' - 796'4"	Sandy clay	Light brown gray	Clay - medium	Poor	Traces heavies & mica.
796'4" - 797'10"	Clay sand	Pinkish gray	Clay - coarse	Poor	Lignite; MnO laminae; Micaceous; Traces heavies & mica.
797'10" - 798'	Silt	Brownish black	Silt	Good	Micaceous.
798' - 799'6"	Clayey sand	Brownish black	Clay - coarse	Poor	Traces lignite & mica; Some MnO staining.
799'6" - 800'9"	Clayey sand	Yellowish gray	Clay - medium	Poor	Micaceous.
800'9" - 802'	No recovery				
802' - 805'5"	Clayey sand	Yellowish gray	Clay - medium	Poor	Traces mica.
805'5" - 806'	No recovery				
806' - 809'2"	Clayey sand	Yellowish gray	Clay - medium	Moderate poor	Heavies; Mica.
809'2" - 810'	No recovery				
810' - 814'1"	Silty clay	Light brown gray	Clay - silt	Good	Lignite; micaceous laminae; 2" lignite bed @ 810'5".
814'1" - 815'	No recovery				
815' - 818'8"	Clayey sand	Pinkish gray	Clay - fine	Moderate poor	Traces of Heavies; Scattered lignitic laminae.
818'8" - 820'	No recovery				
820' - 820'8"	Sandy clay	Light brown gray	Clay - fine	Moderate	Heavies; Lignite.

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Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
820'8" - 821'	Clay	Brownish gray	Clay	Good	Lignite laminae.
821' - 823'	Sand	Pale yellow brown	Fine - small pebbles	Poor	Heavies; Lignite laminae; chunk of wood at 822'3" - 822'7"; Pyritized sand grains; kaoline laminae.
823' - 824'9"	No recovery				
824'9" - 825'	Clayey sand	Pale yellow brown	Clay - very coarse	Poor	Lignite; Heavies; Muscovite.
825' - 830'	No recovery				
830' - 830'9"	Clayey sand	Pale yellow brown	Clay - granules	Poor	Muscovite; Clay towards top.
830'9" - 832'6"	No recovery				
832'6" - 832'8"	Clay	Dusky yellow brown	Clay	Very good	Micaceous;
832'8" - 833'2"	Wood	Black			Solid lignitized wood chunk.
833'2" - 833'5"	Silty clay	Dusky yellow brown	Clay - silt	Good	Lignitic & micaceous.
833'5" - 834'	Sandy clay	Light brown gray	Clay - very fine	Moderate	Micaceous; Bits of lignite.
834' - 834'5"	Wood	Black			Lignitized whole chunk.
834'5" - 835'	No recovery				
835' - 835'10"	Silty clay	Brownish gray	Clay - silt	Good	Muscovite; Lignite.
835'10" - 836'2"	Clayey sand	Pinkish gray	Clay - granules	Poor	Muscovite.
836'2" - 836'5"	Clay	Brownish gray	Clay	Good	Muscovite; Lignite.

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Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
836'5" -	Clayey sand	Pinkish gray	Clay - granules	Poor	Muscovite; Lignite.
836'9" -	No recovery				
836'9" -	No recovery				
838' -	Silty sand	Light brown gray	Clay - medium	Moderate poor	Muscovite; Lignite.
838'10" -	No recovery				
838'10" -	No recovery				
840' -	Clayey sand	Pale yellow brown	Clay - medium	good	Muscovite; Lignite.
841'8" -	No recovery				
841'8" -	No recovery				
842'6" -	Clayey sand	Pale yellow brown	Clay - very coarse	Poor	Muscovite; lignite.
845' -	Clayey sand	Pale yellow brown	Clay - medium	Good	Muscovite; Chunks of lignite.
849'5" -	No recovery				
850' -	Sand	Light gray	Coarse	Good	Muscovite.
853'8" -	No recovery				
854'3" -	Sand	Light brown gray	Medium	Good	Laminae of clay, muscovite, lignite.
856'7" -	No recovery				
856'7" -	No recovery				
856'9" -	Sand	Light brown gray	Medium	Good	Muscovite; disperse kaolin.
859'5" -	Silt	Olive black	Silt - medium	Poor	Muscovite; Disperse kaolin.
860' -	Sand	Olive gray	Silt - coarse	Poor	Muscovite; Disperse kaolin.
864'4" -					

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Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
864'4" - 865'	No recovery				
865' - 867'7"	Sand	Pinkish gray	Pebbles	Poor	Muscovite; Disperse kaolin.
867'7" - 868'6"	No recovery				
868'6" - 870'2"	Sand	Pinkish gray	Pebbles	Poor	
870'2" - 872'4"	Clay	Light gray	Clay -silt	Good	silt very dry, brittle at the bottom.
872'4" - 874'5"	Sandy clay	Light brown gray	Clay - fine	Moderate	Micaceous.
874'5" - 875'	No recovery				
875' - 877'6"	Clay	Light brown gray	Clay	Good	Muscovite.
877'6" - 878'11"	Clayey sand	Light brown gray	Clay- very coarse	Poor	
878'11" - 879'2"	Sandy clay	Brownish gray	Clay - very fine	Moderate	Muscovite; Thin lignite laminae at top.
879'2" - 880'	No recovery				
880' - 880'9"	Sandy clay	Brownish gray	Clay - fine	Moderate poor	Micaceous; Clay laminae; Grading to coarse @ bottom.
880'9" - 882'10"	Clayey sand	Light brown gray	Clay - fine	Moderate poor	MnO laminae; Micaceous; Lignite.
882'10" - 884'8"	Clayey sand	Pinkish gray	Clay - granules	Very poor	MnO laminations; Micaceous.
884'8" - 885'	No recovery				
885' - 885'7"	Sandy clay	Light brown gray	Clay - very fine	Good	Muscovite.

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Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
885'7" -	Clayey sand	Light brown gray	Clay - small pebbles	Poor	Clay clasts; Heavies; Muscovite.
887'2" -	Sandy clay	Brownish gray	Clay - very fine	Good	Muscovite; Clay intraclasts.
888'4" -	Clayey sand	Light brown gray	Clay - medium	Moderate	Muscovite; Heavies.
889'3" -	No recovery				
890'					
890' -	Clayey sand	Light brown gray	Clay - medium	Moderate	Muscovite; Heavies; Traces of lignite.
892'9" -	No recovery				
895'					
895' -	Silty clay	Light brown gray	Clay - silt	Good	
897'					
897' -	No recovery				
900'					
900' -	Sandy clay	Light brown gray	Clay - fine	Good	Muscovite; Heavies.
900'11" -					
900'11" -	Clayey sand	Light brown gray	Clay - sand	Moderate	Muscovite; Heavies.
902'4" -	No recovery				
902'4" -	No recovery				
905'					
905' -	Clayey sand	Pinkish gray	Clay - coarse	Poor	Heavies (traces); Micaceous.
906'11" -	No recovery				
906'11" -	No recovery				
907'6" -	Clayey sand	Pinkish gray	Clay - medium	Moderate	Heavies; Mica.
907'11" -	Clay	Brownish gray	Clay	Good	Lignite layer 908'1" - 908'2".
907'11" -	No recovery				
908'3" -	No recovery				
908'3" -	No recovery				
910'					

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Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
910' -	Clayey sand	Pinkish gray	Clay - small pebbles	Very poor	Lignite @ top; Micaceous; grades from coarse to small pebbles & granules @ base; Heavies.
911' 11" -	No recovery				
912' 10" -	Sand	Pinkish gray	Fine - med. pebbles	Very poor	Micaceous; Heavies.
915'					
915' -	Sandy clay	Very light gray	Clay - medium	Poor	Micaceous; MnO; Heavies.
916' 10" -	No recovery				
917'					
917' -	Sandy clay	Very light gray	Clay - medium	Poor	Micaceous; Heavies; MnO.
920' -	Clayey sand	Light gray	Clay - medium	Moderate	Muscovite; Heavies; Kaolinite.
924' 6" -	No recovery				
925'					
925' -	Clayey sand	Light gray	Clay - pebbles	Poor	Muscovite; Kaolinite; Lignite; Mudstone.
928' 5" -	Silt	Brownish gray	Clay - silt	Good	Dry; Brittle.
928' 10" -	Clayey silt	Brownish gray	Clay - silt	Good	Dry; Brittle.
929' -	No recovery				
929' 1" -					
929' 1" -	Clayey silt	Brownish gray	clay - silt	Good	Dry; more brittle at the bottom.
938' 5" -	No recovery				
938' 10" -	Sand	Light Brown gray	Silt - fine	Good	Muscovite.
943' 8" -	No recovery				
943' 10" -					

*/ indicates no recovery from well C-5.; Description is from well C-5A.

Cluster-5 Well # BRN-357 35X-e1

DEPTH	TYPE	COLOR	GRAINSIZE	SORTING	REMARKS
943'10" -	Sand	Light	Fine	Good	
948'7" -		brown gray			
948'7" -	No recovery				
948'10" -					
948'10" -	Silty sand	Light brown gray	Fine	Good	Black lignite laminae.
952'10" -					
952'10" -	No recovery				
953'10" -					
953'10" -	Silty sand	Light brownish	gray	Moderate	Black lignite; Quartz pebbles.
956'11" -					
956'11" -	No recovery				
959'7" -					
959'7" -	Clay	brown gray	Clay	Good	On the top 1" cobbles & sand.
960'5" -	Light				
960'5" -	Sand	Light brown gray	Coarse	Good	
962'10" -					
962'10" -	Clay	Light brown gray	Clay	Good	
963'2" -					
963'2" -	Sand	Olive gray	Good		
963'10" -					
963'10" -	Sand	Light brown gray	Coarse	Moderate	Quartz cobbles; Lignite.
964'5" -					
964'5" -	No recovery				
968'10" -					
968'10" -	Sand	Medium light gray	Fine - coarse	Moderate	Kaolinite; Pebbles.
970" -					
970" -	No recovery				
971'7" -					
971'7" -	Sand	Light gray	Fine - pebbles	Poor	Kaolinite.
973'4" -					
973'4" -	Clay	Light gray - d.red brown	clay	Good	Red spotted.
975' -					

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