



# BLACK & VEATCH BORING LOG SYMBOLS AND TERMINOLOGY

## GENERAL

SPT	-Split Spoon / Standard Penetration Test
TW	-Thin Wall Sampler
CA	-California Sampler
S	-Grab Sample
PP	-Compressive strength as determined by penetrometer.
TV	-Compressive strength as determined by torvane.
NW	-2.98 inch outer diameter core bit
Gravel	-Fine grained - From 1/4 to 3/4 inches in diameter.
	-Coarse grained - From 3/4 to 3 inches in diameter.
Cobble	-From 3 to 12 inches in diameter.
Boulder	-Greater than 12 inches in diameter.
60	-Represents 60 degrees measured from a plane perpendicular to the longitudinal axis of the sample.
Occasional	-One or less per 6" of thickness.
Trace	-Represents 5 to 10 percent by volume.
Some	-Represents 10 to 20 percent by volume.
N Value	-Indicates the number of blows to drive a standard split spoon sampler 12 inches with a 140-pound weight falling 30 inches.
RQD	-A modified core run recovery in which all pieces of sound core over 4 inches in length are counted as recovery. The modified sum of the core recovery is then expressed as a percentage of the total length of the core run.
-----	-Dashed line in classification column indicates approximate or gradational change.
	-At
w/	-With
&	-And
WOR	-Weight of rods
WOH	-Weight of hammer
ID	-Inside diameter
OD	-Outside diameter

## WEATHERING

Fresh	-The rock shows no dissolution, loss of strength, or other effects due to weathering (unweathered rock).
Slightly Weathered	-Rock is slightly discolored with a slightly lower strength than unweathered rock.
Moderately Weathered	-Rock is considerably discolored with a slightly lower strength than unweathered rock.
Highly Weathered	-Rock is discolored and weakened so intensely that 2-inch diameter rock cores can be broken readily by hand. Wet strength is usually much lower than dry strength

## BEDDING

Laminated	-Less than 0.001 foot to 0.1 foot (0.1 inch).
Thin Bedded	-0.01 foot to 0.1 foot (0.1 to 1.0 inches).
Medium Bedded	-0.1 foot to 1.0 foot (1.2 to 12 inches).
Thick Bedded	-Greater than 1.0 foot.
Massive	-Denotes no discernable internal bedding structure.

## SYMBOLS LEGEND

### Soil Samplers



Rock core



Standard penetration test



**BLACK & VEATCH**

**BORING LOG**

BORING NO. BV-1  
SHEET 1 OF 5

CLIENT										PROJECT										PROJECT NO.	
City of Charlottesville										Ragged Mountain Project										168539	
PROJECT LOCATION					COORDINATES					GROUND ELEVATION (DATUM)					TOTAL DEPTH						
Charlottesville, VA					Not Surveyed					643.5 ft (MSL)					70.7 (feet)						
SURFACE CONDITIONS										COORDINATE SYSTEM					DATE START		DATE FINISHED				
Top of concrete (18" from down slope edge)										Not Surveyed					07/07/2010		07/08/2010				
SOIL SAMPLING										LOGGED BY					CHECKED BY					APPROVED BY	
										B. Gomer					D. Conolly					G. Zamensky	
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS									
ROCK CORING																					
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD															
4"	1	1.3	1.3	1.3	100	100	0		643		CONCRETE; gray; 3/8-3/4" graded aggregate; subangular to angular; evenly distributed; sand in cement	Boring advanced using 4" casing w/ carbide bit & water as drilling fluid (OD 4-1/2"). Below 1.3' continued boring using HQ triple tube core barrel w/ diamond bit & water as drilling fluid (OD 3-3/4"). Frequent mechanical breaks.  Packer test from 6.5-15.0' indicated no significant leakage (0.6 Lugeons).									
			1.3				1		642		Cyclopean CONCRETE; gray; 1/4-20" aggregate & plum stones; subrounded to angular; unevenly distributed; sand in cement										
2.5"	2	4.4	4.4	4.2	100	95	2		641												
							3		640		@ 3.5' 0°; J;N to MW;No;No;PI;SR; mechanical abrasion between concrete & bottom of plum stone										
							4		639												
							5		638		@ 4.7' 30°;J;N;No;No;PI;SR; in plum stone										
							6		637		@ 5.1' FZ;0-45°;J;N;No;No;PI to St;SR to R; @ base of plum stone										
			5.7				7		636		@ 5.8' 0°;J;N;No;No;PI;SR; @ base of plum stone										
							8		635		@ 7.2' 10°;J;N;Fe;Sp;PI;SR; @ top of plum stone										
2.5"	3	5.0	5.0	3.9	100	78	9		634		@ 7.7' 10°;J;N;Fe;Sp;PI;R; joint in plum stone										
							10		633		@ 8.7' 0°;J;MW;No;No;lr;R										
							11		632		@ 8.8' 3/8" pits										
							12		631		@ 9.1' 0-20°;J;N;No;No;lr;R; large aggregate										
							13		630		@ 9.4' 0°;J;N;No;No;St;SR										
							14		629		@ 9.6' 0°;J;N;No;No;lr;R										
							15		629		@ 10.1-10.3' grading brown sand cement										
2.5"	4	5.0	5.0	4.7	100	94	11		632		@ 12.1' 0°;J;MW;Cl;Sp;PI; @ base of plum stone										
							12		631												
							13		630		@ 13.1-13.3' FZ of weak cement w/ no aggregate										
							14		629		@ 13.1-13.7' 90°;J;N;No;No;WA;R; crack in concrete matrix										
							15		629		@ 14.6' 30°;J;T;No;No;PI;SR @ top of plum stone										
							16		629												

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# BLACK & VEATCH

# BORING LOG

BORING NO. BV-1  
SHEET 2 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 70.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/07/2010	DATE FINISHED 07/08/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	ROD RECOVERY	PERCENT RECOVERY	RQD						
2.5"	5	5.0	4.9	4.9	98	98	15		628			significant leakage (6.9 Lugeons).
			15.7				16		627		@ 16.1' 35°;J;N to MW;No;No;PI;R; honeycomb, sandy on top of plum stone	
							17		626			
							18		625			
							19		624		@ 19.6' 0°;J;MW;No;No;St;SR	Below 19.0' frequent drill chatter.
							20		623			
			20.7				21		622		@ 20.8' 5°;J;N;No;No;PI;S; @ top of plum stone @ 21.2-21.4' 0°;J;W;Cl;Fi;PI to St;S to R; clay layer	Packer test from 21.5-30.0' indicated no significant leakage (5.6 Lugeons).
							22		621			
2.5"	6	5.0	4.9	4.6	98	92	23		620		@ 23.0' 0°;J;N;Cl;Sp;St;R	
							24		619			
							25		618			@ 25.0' driller lifted rods.
			25.7				26		617		@ 26.0' 0°;J;MW;No;No;lr;R @ 26.0-26.4' grading brown sand cement	
							27		616		@ 27.0' 0°;J;W;Sd;Fi;PI;S; sand is weakly cemented beneath plum stone; laitance on joint surface @ bottom of plum stone	
2.5"	7	5.0	5.0	4.5	100	90	28		615			
							29		614		@ 29.0' 0°;J;MW;No;No;St;SR; in plum stone	
							30		614		@ 29.6' 0°;J;N;Cl;Fi;lr;SR; probable laitance @ top of plum stone	

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# BORING LOG

BORING NO. BV-1  
SHEET 3 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 70.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/07/2010	DATE FINISHED 07/08/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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SOIL SAMPLING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY							
ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
2.5"	8	5.0	5.0	4.3	100	86	30		613				Packer test from 29.0-37.5' indicated no significant leakage (0.7 Lugeons).
			30.7				31		612				
							32		611		@ 32.1' 5°;J;N;No;No;Pl;SR		
							33		610				
							34		609		@ 33.5-33.7' FZ;0-45°;J;N;No;No;lr;SR to R; less aggregate @ 33.9' 0°;J;N;No;No;Pl;SR to R		
							35		608		@ 34.4' 0°;J;MW;No;No;lr;SR to R; @ base of plum stone		
							36		607		@ 36.4' 0°;J;MW;No;No;St;R		
							37		606		@ 37.3' FZ;J;N to MW;No;No;lr;SR to R @ 37.6' 45°;J;N;Ca & Cl;Sp;Pl;SR; honeycombing, @	Packer test from 36.5-45.0' indicated no significant leakage (3.1 Lugeons). @ 38.0' driller lifted up due to change in cutting.	
2.5"	9	5.0	4.8	4.1	96	82	38		605		@ 38.0' 0°;J;MW to W;No;No;Pl;SR; mechanical abrasion of concrete @ edges of joint @ 38.2' vuggy concrete		
							39		604		@ 39.4' 0-60°;J;N to MW;No;No;lr;SR to R; fracture around aggregate		
							40		603				
							41		602				Less rig chatter below 41.5'.
							42		601		@ 42.3' 0°;J;MW;No;No;lr;S to R; @ base of plum stone		
2.5"	10	5.0	5.0	4.1	100	82	43		600		@ 43.3-44.8' grading brown sand in cement @ 43.6' 0°;J;N;No;No;St;SR		
							44		599		@ 44.1' 5°;J;MW;No;No;St;R		
							45				@ 44.4' 0°;J;N;No;No;St;R		

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**BORING LOG**

**BORING NO. BV-1**  
SHEET 4 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 70.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/07/2010	DATE FINISHED 07/08/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
2.5"	11	5.0	4.8	4.2	96	84	45		598		@ 45.3' 10°;J;MW;No;No;St;R; 1/2-3/4" vugs	significant leakage (0.0 Lugeons).	
			45.7				46		597		@ 46.5-46.8' FZ;0-60°;J;N to MW;PI;lr;SR to R; concentrated aggregate without cement; 1/2" vugs & laitance @ base of fracture zone	@ 47.0' occasional rig chatter.	
							47		596				
							48		595				
							49		594		@ 49.2' 25°;MW to W;No;No;lr;SR; @ base of plum stone; laitance @ bottom of plum stone	Packer test from 49.1-57.6' indicated no significant leakage (0.0 Lugeons).	
							50		593				
			50.7				51		592			@ 51.0' driller lifted rods.	
							52		591				
2.5"	12	5.0	2.0	0.4	40	8	53		590			@ 53.0' greenish gray wash water. Bind in core barrel prevented recovery of core in Run 12.	
							54		589		GNEISS; dark gray; massive to slightly foliated; medium to coarse grained; slightly weathered; strong; moderately hard; near vertical (~ 80°) joints & lineations [Lovingson Fm]	@ 53.6' bottom of dam.	
							55		588				
			55.7				56		587		@ 56.2' 10°;N;Fe;Su to Sp;PI;S		
							57		586		@ 56.5' 50°;N;Fe;Su to Sp;PI;S to SR		
							58		585		@ 56.8-58.8' FZ;10-90°;N to MW;Fe;Su to Sp;PI-St-Ir; S to R	Frequent rig chatter below 57.0'. Packer test from 57.0-70.7' indicated no significant leakage (3.9 Lugeons). Frequent	
2.5"	13	5.0	5.0	0.5	100	10	59		584				
							60						

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**BORING LOG**

BORING NO. BV-1  
SHEET 5 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 70.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/07/2010	DATE FINISHED 07/08/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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SOIL SAMPLING							DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY						
ROCK CORING							DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	ROD RECOVERY	PERCENT RECOVERY	ROD						
			60.7				60		583			horizontal (0° to 30°) mechanical breaks from 59.0- 69.5'.
							61		582			
							62		581			@ 62.0' driller lifted rods due to chatter.
2.5"	14	5.0	5.0	0.5	100	10	63		580			
							64		579			
							65		578		@ 65.0' 45°;J;N;Fe;Su;PI;S	
			65.7				66		577		@ 65.6' 60°;Fo;N;No;No;WA;S to SR grading gray to dark gray; foliated; medium grained; very strong; hard	
							67		576		SCHIST; dark gray; foliated; fine to medium grained; moderately to highly weathered; very weak; low hardness	Drill chatter from 67.0-69.5'.
2.5"	15	5.0	4.8	2.7	96	54	68		575		@ 66.8-67.7' FZ;0-45°;Fo;N;No;No;WA;S	
							69		574		Granitic GNEISS; light gray & black; foliated; moedium to very coarse grained; slightly weathered; very strong; hard [Lovington Fm]	
							70		573		@ 68.5-69.0' 85-90°;J;N;Fe;Su;PI;SR;healed @ 69.1' 60°;J;N;Fe;Su;PI;SR;healed @ 69.4-69.6' FZ;0-45°;J;N to MW;Fe;Su;PI to Ir;S to SR	
							71		572		@ 69.9' 40°;Fo;N;No;No;WA;S	No recovery below 70.5'. Bottom of boring @ 70.7'. Boring backfilled w/ cement-bentonite grout on 07/20/2010. Water level @ 10.8' on 07/20/2010.
							72		571			
							73		570			
							74		569			
							75					

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**BORING LOG**

BORING NO. BV-2P  
SHEET 1 OF 6

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 83.6 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/08/2010	DATE FINISHED 07/13/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
4"	1	1.2	1.1	1.0	92	83	0	643		CONCRETE; gray; 3/8-3/4" graded aggregate; subangular to angular; evenly distributed @ 0.4' 0°;J;MW;No;No;PI;SR; likely cold joint Cyclopean CONCRETE; gray; 1/4" to 25" aggregate & plum stone; subrounded to angular; unevenly distributed; sand-sized grains in cement @ 1.4' 0°;J;MW;No;No;lr;SR	Boring advanced using 4" casing w/ carbide bit & water as drilling fluid (OD 4-1/2"). Below 1.2' continued boring using HQ triple tube core barrel w/ diamond bit & water as drilling fluid (OD 3-3/4"). Frequent mechanical breaks.		
			1.2				1	642			@ 0.4' 0°;J;MW;No;No;PI;SR; likely cold joint		
2.5"	2	4.3	4.2	4.0	98	93	3	640					
			5.5				6	638					
2.5"	3	5.0	5.0	4.9	100	98	8	635			@ 8.1' 0-10°;J;N;No;No;lr;SR; @ base of plum stone		
			10.5				11	633					
2.5"	4	5.0	5.0	4.0	100	80	13	630			@ 11.3' 0-15°;J;N to W;No;No;lr;SR; @ base of plum stone @ 11.4' 0°;J;N;No;No;St;R @ 12.2' 0°;J;W;Fe & Sd;Su to Sp;PI;SR; minor mechanical abrasion of concrete	Packer test from 9.5-18.0' indicated no significant leakage (3.5 Lugeons). @ 11.2' 100% loss of circulation to 11.6'. @ 13.0' white wash water for approximately 6".	

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project



# BLACK & VEATCH

# BORING LOG

BORING NO. BV-2P  
SHEET 2 OF 6

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 83.6 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/08/2010	DATE FINISHED 07/13/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
2.5"	5	5.0	5.0	4.5	100	90	15.5		628		@ 15.0' 10°;J;MW;Fe;Su;PI;SR; large aggregate		
							15.7		627		@ 15.7' 40°;J;N to MW;No;No;St;R; @ top of plum stone; slight honeycomb	Packer test from 15.5-24.0' indicated no significant leakage (0.0 Lugeons).	
							16.0		626				
							16.5		625				
							17.0		624				
							17.5		623		@ 19.8' 0-10°;J;N to MW;Fe;Su;PI to Ir;SR @ 20.0' 45°;J;N to MW;UK;Sp;St;SR		
							18.0		622				
							18.5		621				
2.5"	6	5.1	5.0	4.5	98	88	20.5		620		@ 23.3-23.5' FZ;0-45°;N to MW;Sd & Cl;Sp to Pa;Ir;S to R @ 23.7' 0°;J;MW;Cl;Sp to Su;Ir;R	Drill chatter from 21.5-23.5'.  Packer test from 22.9-31.4' indicated slight leakage (15 Lugeons).	
							21.0		619				
							21.5		618		@ 24.9' 10°;J;N to MW;No;No;St;SR		
							22.0		617				
							22.5		616		@ 26.8' 1/2" vugs		
							23.0		615				
2.5"	7	5.0	5.0	4.7	100	94	25.6		614		@ 28.9' 0-30°;J;N to MW;construction debris;Pa;St;SR; @ top of plum stone	Frequent drill chatter from 27.5-30.6'.	
							26.0						
							26.5						
							27.0						
							27.5						
							28.0						
							28.5						
							29.0						
							29.5						
							30.0						

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project





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**BORING LOG**

BORING NO. BV-2P  
SHEET 3 OF 6

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 83.6 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/08/2010	DATE FINISHED 07/13/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	ROD RECOVERY	PERCENT RECOVERY	RQD							
			30.6				30		613				
							31		612				
							32		611				
2.5"	8	5.0	5.0	4.2	100	84	33		610	@ 32.5' 0°;J;N;Cl;Fi;PI;S; laitance			
							34		609	@ 33.2' 5°;J;N to MW;No;No;St;SR; @ top of plum stone		@ 33.0' drill chatter, occasional drill chatter to 38.0'.	
							35		608	@ 34.0' 5°;J;N to MW;No;No;St;SR; @ base of plum stone			
			35.6				36		607	@ 34.6-37.2' grading brown sand cement			
							37		606	@ 34.7' 0°;J;MW;Sd;Sp;lr;R			
2.5"	9	5.0	4.9	4.0	98	80	38		605	@ 34.9' 10°;J;N;Sd;Su;PI;SR			
							39		604	@ 35.2' 0-45°;J;N;No;No;St;SR			
							40		603	@ 35.7' 0°;J;N;Cl;Sp;PI;SR; laitance			
							41		602	@ 36.8' 0°;J;MW;Sd;Sp;lr;R			
							42		601	@ 37.2' 20°;J;N to MW;Sd;Pa;PI;SR; @ top of plum stone			
							43		600	@ 37.2-37.7' 90°;J;N;Fe;Su;lr;R			
							44		599	@ 37.6-37.8' FZ;J;N to MW;Sd;Pa;PI to lr;S to SR; apparent precipitate in joints			
							45			@ 38.0-38.2' sandy weak cement @ bottom of plum stone			
			40.6				41		602	@ 41.3' 0°;J;N;No;No;lr;R; joint through vein in plum stone			
2.5"	10	5.0	5.0	4.5	100	90	43		600				
							44						
							45						

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# BORING LOG

BORING NO. BV-2P

SHEET 4 OF 6

CLIENT City of Charlottesville										PROJECT Ragged Mountain Project										PROJECT NO. 168539									
PROJECT LOCATION Charlottesville, VA										COORDINATES Not Surveyed										GROUND ELEVATION (DATUM) 643.5 ft (MSL)					TOTAL DEPTH 83.6 (feet)				
SURFACE CONDITIONS Top of concrete (18" from down slope edge)										COORDINATE SYSTEM Not Surveyed										DATE START 07/08/2010					DATE FINISHED 07/13/2010				
SOIL SAMPLING										LOGGED BY B. Gomer										CHECKED BY D. Conolly					APPROVED BY G. Zamensky				
SAMPLE TYPE		SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	ROCK CORING		DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS														
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD																							
2.5"	11	5.0	5.0	4.5	100	90			45		598		@ 45.2' 30°;J;N;Cl;Fi;PI;SR; laitance at bottom of plum stone	indicated no significant leakage (3.4 Lugeons).															
									46		597																		
									47		596			Drill chatter from 47.0-48.0'.															
									48		595																		
									49		594		@ 48.6' 0°;J;N;No;No;PI;SR; @ base of plum stone																
									50		593			Drill chatter from 50.0-53.5'.															
									51		592		@ 50.8' 3/8" pits																
									52		591		@ 51.6' 20°;J;N to MW;No;No;PI to Ir;S to SR; @ top of plum stone	Packer test from 52.0-60.5' indicated no significant leakage (0.0 Lugeons).															
2.5"	12	5.0	5.0	4.2	100	84			53		590		@ 53.0' 0°;J;MW;No;No;Ir;R; joint in plum stone	@ 53.2' driller lifted rods.															
									54		589		@ 53.5' 0°;J;MW;Fe;Su;PI;R; @ base of plum stone																
									55		588		@ 54.6' 10°;J;N;Fe;Su;PI;SR; joint in plum stone	Occasional drill chatter from 54.5-55.6'.															
									56		587			@ 56.0' dark gray wash water for 6".															
									57		586		@ 56.5' 0°;J;MW;No;No;Ir;R; @ base of plum stone	Below 57.0' frequent chatter.															
2.5"	13	5.0	4.9	4.1	98	82			58		585		@ 58.2-58.5' FZ;0°-45°;J;N to MW;No;No;Ir;SR; gravel																
									59		584		@ 58.8' 0°;J;N;No;No;St;SR																
									60					Packer test from 59.3-67.8'															

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project





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**BORING LOG**

BORING NO. BV-2P  
SHEET 6 OF 6

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 83.6 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/08/2010	DATE FINISHED 07/13/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
2.5"	17	5.0	5.0	5.0	100	100	75						
				78.6			76						
							77					@ 77.1' 0°;J;N;No;No;lr;R	
							78						
							79					@ 78.9' grading medium grained	
							80					@ 80.1' grading medium to coarse grained	
2.5"	18	5.0	5.0	4.9	100	98	81					Frequent drill chatter from 81.5-83.6'. @ 81.8' driller lifted rods.	
							82						
							83					@ 83.0' driller lifted rods.	
							84					Bottom of boring @ 83.6'. Piezometer installed in boring on 07/19/2010. Water level @ 8.6' on 07/21/2010.	
							85						
							86						
							87						
							88						
							89						
							90						



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**BORING LOG**

BORING NO. BV-3  
SHEET 1 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 58.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/13/2010	DATE FINISHED 07/14/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
4"	1	1.4	1.4	0.9	100	64	0	643		CONCRETE; gray; 3/8-3/4" graded aggregate; evenly spaced; entrained air pockets; subangular to angular @ 0.3' 0°; J; MW; No; No; PI; SR to R; cold joint w/ construction debris	Boring advanced using 4" casing w/ carbide bit & water as drilling fluid (OD 4-1/2"). Below 1.4', continued boring using HQ triple tube core barrel w/ diamond bit & water as drilling fluid (OD 3-3/4"). Frequent mechanical breaks. @ 2.6' driller lifted rods.		
			1.4				1	642					
2.5"	2	2.3	2.3	2.2	100	96	2	641		Cyclopean CONCRETE; gray; 1/4" to 28" aggregate & plum stone; unevenly distributed; subrounded to subangular; sand cement			
			3.7				3	640					
							4	639					
							5	638					
2.5"	3	5.0	4.9	4.9	98	98	6	637		@ 5.7' 0°; J; N; No; No; PI; SR; @ top of plum stone	Packer test from 6.0-14.5' indicated no significant leakage (5.9 Lugeons).		
							7	636		@ 7.0' 5°; J; N; Sd; Su; PI; R; @ top of plum stone			
							8	635		@ 7.4-8.3' cement grading to light yellowish brown sand			
							9	634		@ 9.2' FZ; 0-45°; J; N to MW; No; No; Ir; SR to R; fractured plum stone			
							10	633					
2.5"	4	5.0	5.0	4.7	100	94	11	632		@ 12.1' 45°; J; N to MW; Sd; Pa; Ir; S to SR; slight honeycomb, @ top of plum stone	Packer test from 10.5-19.0' indicated no significant leakage (1.4 Lugeons).		
							12	631		@ 12.6' 25°; J; N; Fe; Su; St; SR; 1/4" vugs, @ base of plum stone			
							13	630					
							14	629					
							15	628					

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project



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# BORING LOG

BORING NO. BV-3

SHEET 2 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 58.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/13/2010	DATE FINISHED 07/14/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
2.5"	5	5.0	5.0	4.9	100	98	15		628				
							16		627		@ 16.1' 0°;J;MW to W;No;No;PI to St;R; weak cement w/ little aggregate @ 16.1-16.4' honeycomb, 3/4" vugs	@ 16.0' driller reports change in resistance. Frequent drill chatter from 16.9' to 17.5'.	
							17		626		@ 17.6' 25°;J;N;No;No;PI;SR; joint in plum stone		
							18		625			Packer test from 18.0-26.5' indicated no significant leakage (0.0 Lugeons).	
			18.7				19		624				
2.5"	6	5.0	5.0	4.8	100	96	20		623		@ 19.8' 0-20°;J;N to MW;Cl;Sp;PI to Ir;SR; @ top of plum stone; laitance @ 20.2' 5°;J;N;UK;Sp;Ir;SR to R; @ base of plum stone		
							21		622				
							22		621		@ 22.4' 0°;J;N to W;No;No;PI to Ir;SR; @ base of weathered plum stone; laitance @ 22.9' 0°;J;N to MW;No;No;PI;SR	Packer test from 21.5-30.0' indicated no significant leakage (0.0 Lugeons).	
							23		620				
			23.7				24		619				
2.5"	7	5.0	5.0	4.9	100	98	25		618				
							26		617		@ 26.3-26.5' 1-1/2" vug & honeycomb @ 26.5' 5°;J;N;No;No;Ir;R; fracture around aggregate	Frequent drill chatter from 24.0' to 25.0'.	
							27		616				
							28		615				
			28.7				29		614				
							30					Packer test from 28.8-37.3' indicated no significant	

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project



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**BORING LOG**

**BORING NO. BV-3**  
**SHEET 3 OF 5**

CLIENT City of Charlottesville				PROJECT Ragged Mountain Project				PROJECT NO. 168539	
PROJECT LOCATION Charlottesville, VA			COORDINATES Not Surveyed			GROUND ELEVATION (DATUM) 643.5 ft (MSL)		TOTAL DEPTH 58.7 (feet)	
SURFACE CONDITIONS Top of concrete (18" from down slope edge)					COORDINATE SYSTEM Not Surveyed		DATE START 07/13/2010	DATE FINISHED 07/14/2010	
SOIL SAMPLING				LOGGED BY B. Gomer			CHECKED BY D. Conolly		APPROVED BY G. Zamensky
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY			
ROCK CORING									
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD	DEPTH (FEET)	SAMPLE TYPE	
							ELEVATION (FEET)	GRAPHIC LOG	
								CLASSIFICATION OF MATERIALS	
								REMARKS	
2.5"	8	5.0	5.0	5.0	100	100	30 613	@ 30.2' 0-30°;J;N;No;No;lr;SR; joint in plum stone	leakage (8.3 Lugeons).
							31 612	@ 30.9-31.5' grading brown sand cement @ 30.9' 30°;J;N to MW;Cl;Sp;Pl to lr;SR; @ base of plum stone @ 31.6' pits; 1/8-1/4"	
							32 611		
							33 610	@ 32.7-34.0' grading brown sand cement @ 32.7' 30°;J;N;No;No;Pl;SR; @ base of plum stone w/ irregular contact	
			33.7				34 609		
							35 608	@ 34.5' 10-45°;J;N to MW;No;No;lr;R; honeycomb; weak cement @ 35.0' 20-30°;J;N to MW;No;No;lr;R; honeycomb & 1/2" vugs	Frequent drill chatter from 34.0' to 38.0'.
2.5"	9	5.0	5.0	4.5	100	90	36 607	@ 35.8' 40°;J;N;No;No;Pl;SR; joint in plum stone	
							37 606		
							38 605		
			38.7				39 604		
							40 603		
2.5"	10	5.0	4.9	4.9	98	98	41 602	Granitic GNEISS; black to light gray; massive to foliated; medium to very coarse grained; fresh; very strong; hard [Lovingson Fm]	@ 40.5' bottom of dam. @ 41.0' white/gray wash. Frequent drill chatter from 41.0-46.5'.
							42 601		
							43 600		
			43.7				44 599		
							45		Packer test from 44.0-58.7' indicated no

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project



CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 58.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/13/2010	DATE FINISHED 07/14/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
2.5"	11	5.0	5.0	5.0	100	100	45		598	<p>@ 50.4' 5-30°;J;N;No;No;PI to St; S to SR</p>	significant leakage (0.0 Lugeons).		
							46		597		Smooth drilling below 46.5'.		
							47		596				
							48		595				
							49		594				
							50		593				
							51		592				
							52		591				
							53		590				
							54		589				
							55		588				
							56		587				
							57		586				
							58		585				
							59		584				
							60					Bottom of boring @ 58.7'. Boring backfilled w/ cement-	

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project





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# BORING LOG

BORING NO. BV-3  
SHEET 5 OF 5

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) 643.5 ft (MSL)	TOTAL DEPTH 58.7 (feet)
SURFACE CONDITIONS Top of concrete (18" from down slope edge)		COORDINATE SYSTEM Not Surveyed	DATE START 07/13/2010	DATE FINISHED 07/14/2010

SOIL SAMPLING			LOGGED BY B. Gomer		CHECKED BY D. Conolly		APPROVED BY G. Zamensky	
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SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	ROCK CORING			DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
							CORE SIZE	RUN NUMBER	RUN LENGTH						
										60					bentonite grout on 07/19/2010. Water level @ 6.2' on 07/19/2010.
											583				
										61					
											582				
										62					
											581				
										63					
											580				
										64					
											579				
										65					
											578				
										66					
											577				
										67					
											576				
										68					
											575				
										69					
											574				
										70					
											573				
										71					
											572				
										72					
											571				
										73					
											570				
										74					
											569				
										75					



CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) Not Surveyed	TOTAL DEPTH 50.0 (feet)
SURFACE CONDITIONS Grass covered slope on buttress embankment		COORDINATE SYSTEM Not Surveyed	DATE START 07/15/2010	DATE FINISHED 07/18/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
SPT	1	2	2	2	4	0.4	0						Boring advanced using HQ rotary casing w/ water as drilling fluid (OD 3-3/4"). SPT sampler driven using 140 lb hammer w/ 30" drop; 1-3/4 turns on cathead; baskets in SPT samplers.
							1						
SPT	2	2	1	3	4	0.6	2						
							3						
SPT	3	4	2	3	5	0.5	4						
							5						
							6						
SPT	4	3	2	3	5	0.3	6						
							7						
							8						
SPT	5	2	3	4	7	0.5	9						
							10						
							11						
SPT	6	5	5	5	10	0.4	12						
							13						
							14						
							15						

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project



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**BORING LOG**

BORING NO. BV-4P  
SHEET 2 OF 4

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) Not Surveyed	TOTAL DEPTH 50.0 (feet)
SURFACE CONDITIONS Grass covered slope on buttress embankment		COORDINATE SYSTEM Not Surveyed	DATE START 07/15/2010	DATE FINISHED 07/18/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	ROD RECOVERY	PERCENT RECOVERY	RQD							
SPT	7	5	5	5	10	0.3	15				grading reddish brown w/ some gravel	Gravel clast in basket of SPT-7.	
SPT	8	5	6	11	17	0.3	19				@ 19.5' grading light yellowish brown & gray; medium dense; fine to coarse grained; poorly graded; subangular to subrounded; w/ trace gravel		
SPT	9	5	5	6	11	0.6	21				grading reddish brown & light yellowish brown w/ occasional seams of sandy silt	Changed from standard (orange) to soft (green) basket prior to SPT-9.	
SPT	10	6	5	5	10	0.7	24				grading brown; loose; fine to medium grained		
SPT	11	5	4	4	8	0.8	27				grading reddish brown		
SPT	12	4	3	6	9	0.8	29				Sandy SILT; reddish brown; stiff; wet; nonplastic (Fill)		

10/28/2010 12:13 PM City of Charlottesville - Ragged Mountain Project



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# BORING LOG

BORING NO. BV-4P

SHEET 3 OF 4

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) Not Surveyed	TOTAL DEPTH 50.0 (feet)
SURFACE CONDITIONS Grass covered slope on buttress embankment		COORDINATE SYSTEM Not Surveyed	DATE START 07/15/2010	DATE FINISHED 07/18/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY	DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD						
SPT	13	3	9	8	17	0.5	30					Loss of circulation @ 30.0'. Water level maintained in casing below 30.0'.
SPT	14	4	5	7	12	0.4	34				grading grayish brown w/ trace wood	Alternating hard & soft layers, drilling to 33.5'. Overdrilled to 34.0' for SPT-14.
SPT	15	30	20	15	35	0.5	38				grading dense	Dropped SPT sampler ~10' before sampling @ 36.5'. Drilled 1' deeper to avoid disturbances. @ 37.0' hard drilling. ~2" gravel slough in top of SPT-15.
SPT	16	5	13	50/1.5	50+	1.1	40				Sandy SILT; grayish brown; hard; wet; nonplastic; trace wood (Alluvium)	
			41.1				41				SAND; grayish brown; very dense; wet; fine to coarse grained; poorly graded; subangular to subrounded; some silt; trace wood (Alluvium); trace fine subrounded gravel	Below 41.1', continued w/ double tube NX core barrel w/ diamond bit using water as drilling fluid. Rapid rod advance from 42.4-43.0' w/ 100% loss of circulation from 42.4' to 50.0'.
							42				BOULDER; dark gray to light gray; very dense; wet; slightly weathered edges [Colluvium]	
							43				@ 42.4' to 43.0' no recovery.	
1.875	1	5.0	4.4	4.4	88	88	44				Granitic GNEISS; dark gray to light gray; slightly foliated; medium to very coarse grained; slightly weathered; strong; hard [Livingston Fm]	

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**BORING LOG**

BORING NO. BV-4P

SHEET 4 OF 4

CLIENT City of Charlottesville		PROJECT Ragged Mountain Project		PROJECT NO. 168539
PROJECT LOCATION Charlottesville, VA		COORDINATES Not Surveyed	GROUND ELEVATION (DATUM) Not Surveyed	TOTAL DEPTH 50.0 (feet)
SURFACE CONDITIONS Grass covered slope on buttress embankment		COORDINATE SYSTEM Not Surveyed	DATE START 07/15/2010	DATE FINISHED 07/18/2010

SOIL SAMPLING		LOGGED BY B. Gomer		CHECKED BY D. Conolly	APPROVED BY G. Zamensky
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SOIL SAMPLING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY							
ROCK CORING								DEPTH (FEET)	SAMPLE TYPE	ELEVATION (FEET)	GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD							
								45				@ 45.0' 70°;Fo;N;Ca;Sp;PI to St;SR to R	
			46.1					46					
1.875	2	3.9	3.6	3.6	92	92		48					~0.2' gravel & wood slough @ top of Run 2. Apparent slough from washed out zone @ 42.4-43.0'.
								49					
								50					No recovery 49.7-50.0'. Bottom of boring @ 50.0'. Piezometer installed in boring on 07/17/2010. Water level @ 47.7' below top of casing (3.7' stickup) on 07/21/2010.
								51					
								52					
								53					
								54					
								55					
								56					
								57					
								58					
								59					
								60					