

APPENDIX A

SOIL BORING LOGS AND  
LABORATORY TEST RESULTS



# TEST BORING LOG

Boring No. B-1  
Page 1 of 1



**PROJECT:** Creamery Road Pump Station

**SITE:** Frederick County, Maryland

**DRILLING CO.:** FSD **RIG/HAMMER:** CME 55 Track/Auto-Hammer

**COMMISSION NO.:** 19082.000

**NORTH:** 740704

**EAST:** 1222390

**ELEVATION:** 387.6 - ft

**START DATE:** 6/6/2019

**END DATE:** 6/6/2019

**DRILLER:** J. Scribellito

**LOGGED BY:** KPR

GROUNDWATER DATA (ft)					EQUIPMENT	CASING	SAMPLER	CORE
Date	Time	Water	Casing	Cave-In	TYPE			
6/6/2019	9:06:00 AM	Dry	--	16	SIZE, ID (in)	HSA	S	
					HAMMER WT. (lb)	3.25	1.375	
					HAMMER FALL (in)		140	-
							30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% ROD)	LABORATORY TEST RESULTS			DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NM/C Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
S-1	X	15	4 4 4					EL 387.4 0.3	3-Inches TOPSOIL	Moist, Medium Stiff, Brown with Gray, CLAY, Little Coarse to Fine Sand, Trace Fine Gravel, Residual (CL) [A-4 (6)]	
S-2	X	6	1 1 2	22%			5		Sample S-2: Soft, Red/Brown		
S-3	X	18	3 5 9						Sample S-3: Stiff, Gray/Red/Orange Mottled		Bulk Sample Obtained from Auger Cuttings from 5 to 10-ft
S-4	X	18	4 7 10	16.9%	28	9	10		Sample S-4: Very Stiff, Red		
S-5	X	2	50/4"	4.7%				EL 376.6 11.0	Completely Weathered ROCK Sampled As: Moist, Red, SILT, Little Coarse to Fine Sand, Trace Rock Fragments	Difficult Drilling	
S-6	X	0	50/3"				15		Sample S-6: No Recovery		
S-7	X	0	50/3.5"				20		Sample S-7: No Recovery		
S-8	X	1	50/1"				25	EL 364.0 23.6	Bottom of Boring @ 23.6 ft		Spoon Refusal at 23.6-ft Boring Backfilled with Auger Cuttings upon Completion.

RKK NORTH/EAST (DEFAULT) 19082 CREAMERY ROAD PUMP STATION.GPJ\_RKK\_CURRENT.GDT 7/16/19

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
- S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
- T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
- SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
- D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
- RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

Boring No. B-1



# TEST BORING LOG

Boring No. B-2  
Page 1 of 2

<b>RK&amp;K</b>	<b>PROJECT:</b> Creamery Road Pump Station				<b>COMMISSION NO.:</b> 19082.000						
	<b>SITE:</b> Frederick County, Maryland				<b>NORTH:</b> 740696						
	<b>DRILLING CO.:</b> FSD				<b>EAST:</b> 1222453						
<b>GROUNDWATER DATA (ft)</b>				<b>EQUIPMENT</b>		<b>CASING</b>		<b>SAMPLER</b>		<b>CORE</b>	
Date	Time	Water	Casing	Cave-In	TYPE	HSA	S	NQ2		<b>START DATE:</b> 6/6/2019	
6/6/2019	12:30:00 PM	8	--	24	SIZE, ID (in)	3.25	1.375	2.03		<b>END DATE:</b> 6/6/2019	
					HAMMER WT. (lb)			140		<b>DRILLER:</b> J. Scribellito	
					HAMMER FALL (in)			30		<b>LOGGED BY:</b> KPR	

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% ROD)	LABORATORY TEST RESULTS			DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NM/C Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
S-1	X	14	3 4 5				EL 385.9 0.7		5.5-Inches Bituminous Concrete 3-Inches Graded Aggregate Base		
S-2	X	5	5 7 5				EL 383.1 3.5		FILL Sampled As: Moist, Red/Brown/Black, Coarse to Fine SAND, Some Coarse to Fine Rock Fragments, Little Silt		
S-3	X	12	1 4 8	23.7% 17.7%	45 33	25 14	EL 380.6 6.0		Moist, Stiff, Gray/Orange Mottled, CLAY, Trace Coarse to Fine Sand, Residual (CL) [A-7-6 (26)]	Bulk Sample Obtained from Auger Cuttings from 5 to 10-ft MDD = 128-pcf OMC = 11.4% CBR = 3.5	
S-4	X	7	3 6 9				EL 375.6 11.0		Sample S-4: Dark Red/Brown, Trace Coarse to Fine Gravel		
S-5	X	4	50/4"				EL 373.1 13.5		Completely Weathered ROCK Sampled As: Wet, Dark Red/Brown, CLAY, Trace Coarse to Fine Sand	Wet Spoon at 11-ft	
S-6	X	5	50/5"	20.5%	35	17	EL 368.1 18.5		Completely Weathered ROCK Sampled As: Moist, Red, Coarse to Fine SAND, Some Silt, Trace Coarse to Fine Rock Fragments	Very Difficult Drilling	
S-7	X	4	50/4"				EL 357.6 29.0		Sample S-9: No Recovery		
S-8	X	3	50/3"	3.7%					Red/Gray SHALE, Fine-Grained, Extremely to Slightly Fractured, Close Bedding, Moderately to Completely Weathered, Medium Strong	Auger and Spoon Refusal Laboratory UCC=3,860-psi at 29.8-ft	
S-9	X	0	50/0"								
R-1	█	31	48%								

RK&K NORTH/EAST (DEFAULT) 19082 CREAMERY ROAD PUMP STATION.GPJ\_RK&K\_CURRENT.GDT 7/16/19

SAMPLE IDENTIFICATION		DRILLING METHOD		BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
X	- S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS		0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
	- T - THIN WALL TUBE	SSA - SOLID STEM AUGERS		5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
	- SS - 3" SPLIT SPOON	DC - DRIVING CASING		11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
/	- D - DENISON	MD - MUD DRILLING		31-50	DENSE	9-15	STIFF	AND	36 TO 50
█	- RC - ROCK CORE	HA - HAND AUGER		OVER 50	VERY DENSE	16-30	VERY STIFF		
						OVER 30	HARD		

Boring No. B-2

# TEST BORING LOG



**PROJECT:** Creamery Road Pump Station

**SITE:** Frederick County, Maryland

**DRILLING CO.:** FSD **RIG/HAMMER:** CME 55 Track/Auto-Hammer

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION  (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
R-2		60	75%							Red/Gray SHALE, Fine-Grained, Extremely to Slightly Fractured, Close Bedding, Moderately to Completely Weathered, Medium Strong	Laboratory UCC=2,480-psi at 36.6-ft
R-3		36	93%								
							40	EL 346.6 40.0		Bottom of Boring @ 40.0 ft	Boring Backfilled with Auger Cuttings and Plugged with Bentonite Chips upon Completion. Cold Patched with Asphalt.
							45				
							50				
							55				
							60				
							65				
							70				

RKK NORTH/EAST (DEFAULT) 19082 CREAMERY ROAD PUMP STATION.GPJ\_RKK\_CURRENT.GDT 7/16/19

# FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

## COHESIONLESS SOILS (Silt, Sand, Gravel, and Combinations)

<u>Density</u>		<u>Particle Size Identification</u>	
Very Loose	4 blows/ft or less	Boulders	12 inches diameter or more
Loose	5 to 10 blows/ft		
Medium Dense	11 to 30 blows/ft	Cobbles	3 to 12 inch diameter
Dense	31 to 50 blows/ft		
Very Dense	51 blows/ft or more	Gravel	Coarse: 3/4 to 3 inch diameter Fine: 1/4 to 3/4 inch diameter
		Sand	Coarse: 2 mm to 1/4 inch (diameter of pencil lead)
			Medium: 0.425 to 2 mm (diameter of broom straw)
			Fine: 0.075 to 0.425 mm (diameter of human hair)
		Silt	0.005 to 0.075 mm (Cannot see particles)

<u>Relative Proportions</u>	
<u>Descriptive Term</u>	<u>Percent</u>
Trace	1 to 10
Little	11 to 20
Some	21 to 35
And	36 to 50

## COHESIVE SOILS (Clay, Silt, and Combinations)

<u>Consistency</u>		<u>Plasticity</u>	
		<u>Degree of Plasticity</u>	<u>Plasticity Index</u>
Very Soft	2 blows/ft or less	No to Slight	0 - 4
Soft	3 to 4 blows/ft	Slight	5 - 7
Medium Stiff	5 to 8 blows/ft	Medium	8 - 22
Stiff	9 to 15 blows/ft	High to Very High	over 22
Very Stiff	16 to 30 blows/ft		
Hard	31 blows/ft or more		

Soil Classifications on Test Boring Logs are made by visual-manual inspection of samples. Soil classification symbols using lower case letters are based on a visual-manual classification. Soil classification symbols using upper case letters are based on laboratory testing.

### Standard Penetration Test

Driving a 2.0-inch OD, 1 3/8-inch ID sampler a distance of 1.0-foot into undisturbed soil with a 140-lb hammer free falling a distance of 30.0-inches. It is required to drive the spoon 6.0-inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating and making the test are recorded each 6.0-inches of penetration on the Test boring Log (Example 6-8-9, 8+9=17 blows/ft). (ASTM D-1586)

### Strata Changes

In the column "Soil Descriptions" on the Test Boring Logs, the horizontal lines represent strata changes. A solid line represents an actually observed change, a dashed line represents an estimated change.

### Ground Water

Observations were made at the time indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the Test Boring Log.



700 East Pratt Street, Suite 500  
Baltimore, Maryland 21202  
(410) 728-2900

<b>Title:</b> FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION		<b>Figure No:</b> B-1	
<b>Drawn:</b> KPR	<b>Approved:</b> JLT	<b>Date:</b> July 2019	<b>Comm No:</b> General





## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
<b>COARSE GRAINED SOILS</b>  MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	<b>GRAVEL AND GRAVELLY SOILS</b>  MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS  (LITTLE OR NO FINES)		<b>GW</b>	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GP</b>	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GM</b>	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>GC</b>	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
	<b>SAND AND SANDY SOILS</b>  MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS  (LITTLE OR NO FINES)		<b>SW</b>	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		SANDS WITH FINES  (LITTLE OR NO FINES)		<b>SP</b>	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SM</b>	SILTY SANDS, SAND - SILT MIXTURES	
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		<b>SC</b>	CLAYEY SANDS, SAND - CLAY MIXTURES	
		<b>SILTS AND CLAYS</b>  LIQUID LIMIT LESS THAN 50	SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50		<b>ML</b>	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50		<b>CL</b>	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50			<b>OL</b>	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
<b>SILTS AND CLAYS</b>  LIQUID LIMIT GREATER THAN 50	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50		<b>MH</b>	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS		
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50		<b>CH</b>	INORGANIC CLAYS OF HIGH PLASTICITY		
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50		<b>OH</b>	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
<b>HIGHLY ORGANIC SOILS</b>				<b>PT</b>	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



700 East Pratt Street, Suite 500  
 Baltimore, Maryland 21202  
 (410) 728-2900

Title:

**UNIFIED SOIL CLASSIFICATION SYSTEM**

Figure No:

**B-2a**

Drawn:

KPR

Approved:

JLT

Date:

July 2019

Comm No:

General



## AASHTO SOIL CLASSIFICATION CHART

GENERAL CLASSIFICATION	SOIL TYPE	SYMBOLS		GRADING REQUIREMENTS	PHYSICAL CHARACTERISTICS
		GRAPH	LETTER		
GRANULAR MATERIALS  (35 percent or less of total sample passing No. 200)	GRAVEL & SAND		A-1-a	Sieve analysis % passing No. 10 = 50 max No. 40 = 30 max No. 200 = 15 max	P.I. = 6 max
			A-1-b	Sieve analysis % passing No. 40 = 50 max No. 200 = 25 max	P.I. = 6 max
	FINE SAND		A-3	Sieve analysis % passing No. 40 = 51 max No. 200 = 10 max	Non-plastic
SILT-CLAY MATERIALS  (More than 35 percent of total sample passing No. 200)	SILTY OR CLAYEY GRAVEL & SAND		A-2-4	Sieve analysis % passing No. 200 = 35 max	L.L. = 40 max P.I. = 10 max
			A-2-5	Sieve analysis % passing No. 200 = 35 max	L.L. = 41 min P.I. = 10 max
			A-2-6	Sieve analysis % passing No. 200 = 35 max	L.L. = 40 max P.I. = 11 min
			A-2-7	Sieve analysis % passing No. 200 = 35 max	L.L. = 41 min P.I. = 11 min
	SILTY SOILS		A-4	Sieve analysis % passing No. 200 = 36 min	L.L. = 40 max P.I. = 10 max
			A-5	Sieve analysis % passing No. 200 = 36 min	L.L. = 41 min P.I. = 10 max
			A-6	Sieve analysis % passing No. 200 = 36 min	L.L. = 40 max P.I. = 11 min
	CLAYEY SOILS		A-7-5	Sieve analysis % passing No. 200 = 36 min	L.L. = 41 min P.I. = 11 min
			A-7-6	Sieve analysis % passing No. 200 = 36 min	L.L. = 41 min P.I. = 11 min
	PEAT OR MUCK		A-8	Based on Visual Classification	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



Title:

**AASHTO SOIL CLASSIFICATION SYSTEM**

Figure No:

**B-2b**

Drawn:

KPR

Approved:

JLT

Date:

July 2019

Comm No:

General



# FIELD CLASSIFICATION SYSTEM FOR ROCK EXPLORATION

**Rock Penetrated by Split Spoon** A transitional material between soil and rock retains the relic structure of the parent rock and exhibits penetration resistance between 60 blows/ft and 100 blows/ 2-inches of penetration

**Sampler:**

**RQD:**

Rock Quality Designation: Ratio of the core lengths greater than 4-inches to the total length of the run. Applies only to sound, fresh, unweathered rock.

Recovery	Description	RQD	Description of Rock Quality	Approximate General Tunneler's Description
< 40%	Incompetent	0 - 25	Very Poor	Crushed
40-70	Competent	25 - 50	Poor	Shattered, very blocky and seamy
70-90	Fairly Continuous	50 - 75	Fair	Blocky and seamy
90-100	Continuous	75 - 90	Good	Massive, moderately jointed
		90 - 100	Excellent	Intact Rock

## FIELD HARDNESS

(A measure of resistance to scratching or abrasion.)

### Very Hard

Cannot be scratched with knife or geologist's pick. Breaking of hand specimens requires hard blows of geologist's pick. Typical UCC > 28- ksi

### Hard

Can be scratched with knife or geologist's pick only with difficulty. Hard blow of a hammer required to detach hand specimen. Typical UCC: 14 to 28- ksi

### Medium Hard

Can be scratched with knife or geologist's pick. Gouges or grooves of 1/4-inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow. Typical UCC: 10.5 to 14- ksi

### Medium

Can be grooved or gouged 1/16-inch deep by firm pressure on knife or geologist's pick point. Can be excavated in small chips to pieces about 1-inch maximum size by hard blows of the point of a geologist's pick. Typical UCC: 7 to 10.5- ksi

### Soft

Can be gouged or grooved readily with knife or pick point. Can be excavated in chips and pieces several inches in size by moderate blows of a geologist's pick point. Small thin pieces can be broken by finger pressure. Typical UCC: 3.5 to 7- ksi

### Very Soft

Can be carved with knife. Can be excavated with point of pick. Pieces 1-inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail. Typical UCC: 140 to 3,500- psi

## ROCK FRACTURE FREQUENCY

Description	Spacing Between Fractures
Extremely Fractured	< 1-in
Moderately Fractured	1 to 4-in
Slightly Fractured	4 to 8-in
Sound	> 8-in

NOTE: Fracture frequency terms are generalized to describe the average condition of the rock obtained from the core run. Portions of the rock within the run described may vary from the generalized descriptions. Where a core break appears to be due to drilling and not to natural causes, it has not been considered as a break for accessing fracture frequency. Frequency shown on the Test Boring Logs represents conditions of core as removed from the core barrel.

## WEATHERING

(The action of the elements in altering the color, texture, and composition of the

### Very Slightly

Rock generally fresh, joints stained, some joints may contain thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.

### Slightly

Rock generally fresh, joints stained, and discoloration extends into rock up to 1-inch. Joints may contain clay. In granitoid rocks, some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.

### Moderately

Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some may be decomposed to clay. Rock has dull sound under hammer and has a significant loss of strength compared with fresh rock.

### Severely

All rock except quartz discolored or stained. Rock "fabric" clear and evident but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.

### Very Severely

All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.

### Completely

All rock completely altered to soil-like material.

## JOINTS, BEDDING AND FOLIATION

Joints	Bedding and Foliation	Spacing
Very Close	Fissile	< 0.25-in
Close	Very Thin	< 2-in
Moderately Close	Thin	2-in to 1-ft
Wide	Medium	1 to 3-ft
Very Wide	Thick	3 to 10-ft
	Very Thick	> 10-ft

NOTE: Refers to perpendicular distance between discontinuities.

### Attitude

Vertical  
Steep or High Angle  
Moderately Dipping  
Shallow to Low Angle  
Horizontal

### Angle (Degrees)

0 to 5  
5 to 35  
35 to 55  
55 to 85  
85 to 90



700 East Pratt Street, Suite 500  
Baltimore, Maryland 21202  
(410) 728-2900

Title:

**FIELD CLASSIFICATION SYSTEM FOR ROCK EXPLORATION**

Figure No:

**B-3**

Drawn:

KPR

Approved:

JLT

Date:

July 2019

Comm No:

General



**ROCK CLASSIFICATION CHART**

ROCK TYPE	SYMBOLS	ROCK TYPE	SYMBOLS
Bedrock		Breccia	
Decomposed Rock		Chert	
Boulders		Conglomerate	
Claystone		Diorite	
Coal		Gabbro	
Dolomite		Gneiss	
Limestone		Granite	
Mudstone		Marble	
Sandstone		Phyllite	
Siltstone		Quartz/Quartzite	
Basalt/Metabasalt		Schist	
Diabase/Granofels		Shale	



700 East Pratt Street, Suite 500  
 Baltimore, Maryland 21202  
 (410) 728-2900

Title:

**ROCK CLASSIFICATION SYSTEM**

Figure No:

**B-4**

Drawn:

KPR

Approved:

JLT

Date:

July 2019

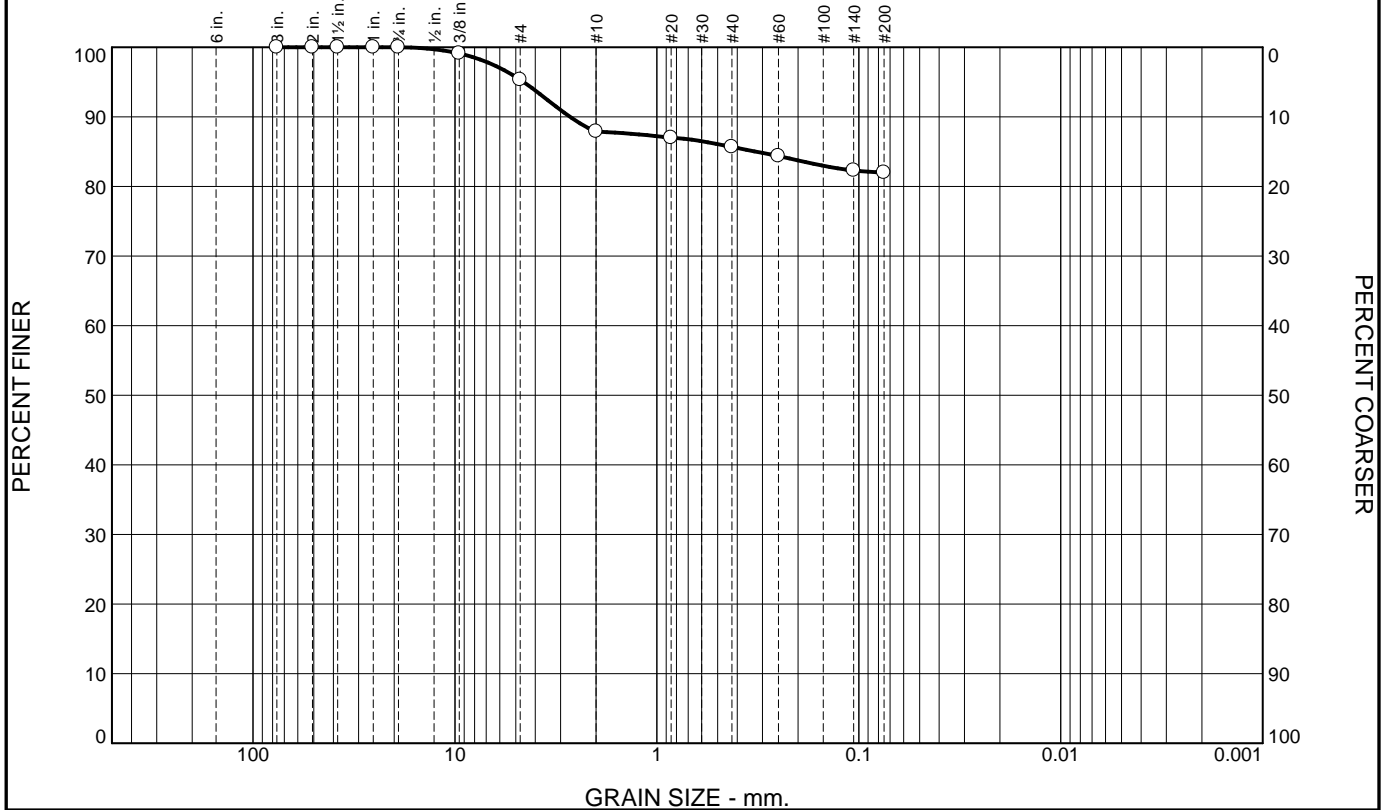
Comm No:

General





# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.7	7.4	2.2	3.7	82.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
3/8	99.1		
#4	95.3		
#10	87.9		
#20	87.0		
#40	85.7		
#60	84.4		
#140	82.3		
#200	82.0		

**Soil Description**  
Red, brown, Lean CLAY with Sand

PL= 19      **Atterberg Limits**      LL= 28      PI= 9

**Coefficients**

D<sub>90</sub>= 2.6921      D<sub>85</sub>= 0.3226      D<sub>60</sub>=  
D<sub>50</sub>=                      D<sub>30</sub>=                      D<sub>15</sub>=  
D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= CL                      AASHTO= A-4(6)

**Remarks**

Natural Moisture: 16.9%

\* (no specification provided)

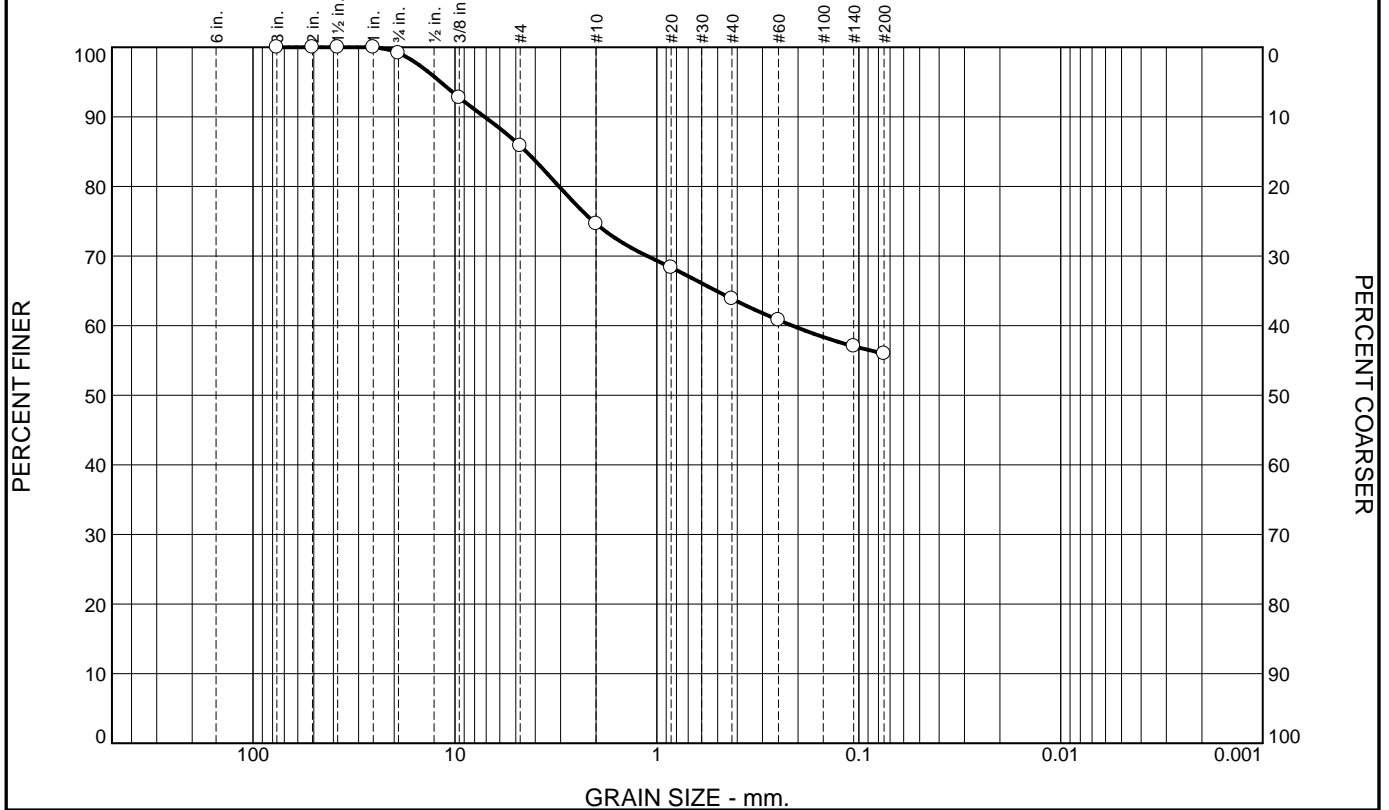
Source of Sample: B-1      Depth: 8.5'-10.0'  
Sample Number: S-4

Date: 6/21/19

<b>E2CR, Inc.</b>  <b>Baltimore, MD</b>	<b>Client:</b> RK&K <b>Project:</b> Creamery Road PS  <b>Project No:</b> 19517-03
<b>Figure</b>	



# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.8	13.4	11.2	10.7	7.9	56.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	99.2		
3/8	92.8		
#4	85.8		
#10	74.6		
#20	68.4		
#40	63.9		
#60	60.8		
#140	57.0		
#200	56.0		

**Soil Description**

Purple, brown, Sandy Lean CLAY

**Atterberg Limits**

PL= 19      LL= 33      PI= 14

**Coefficients**

D<sub>90</sub>= 7.1317      D<sub>85</sub>= 4.4290      D<sub>60</sub>= 0.2135  
D<sub>50</sub>=              D<sub>30</sub>=              D<sub>15</sub>=  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL      AASHTO= A-6(5)

**Remarks**

Natural Moisture: 17.7%

\* (no specification provided)

Source of Sample: B-2  
Sample Number: Bulk

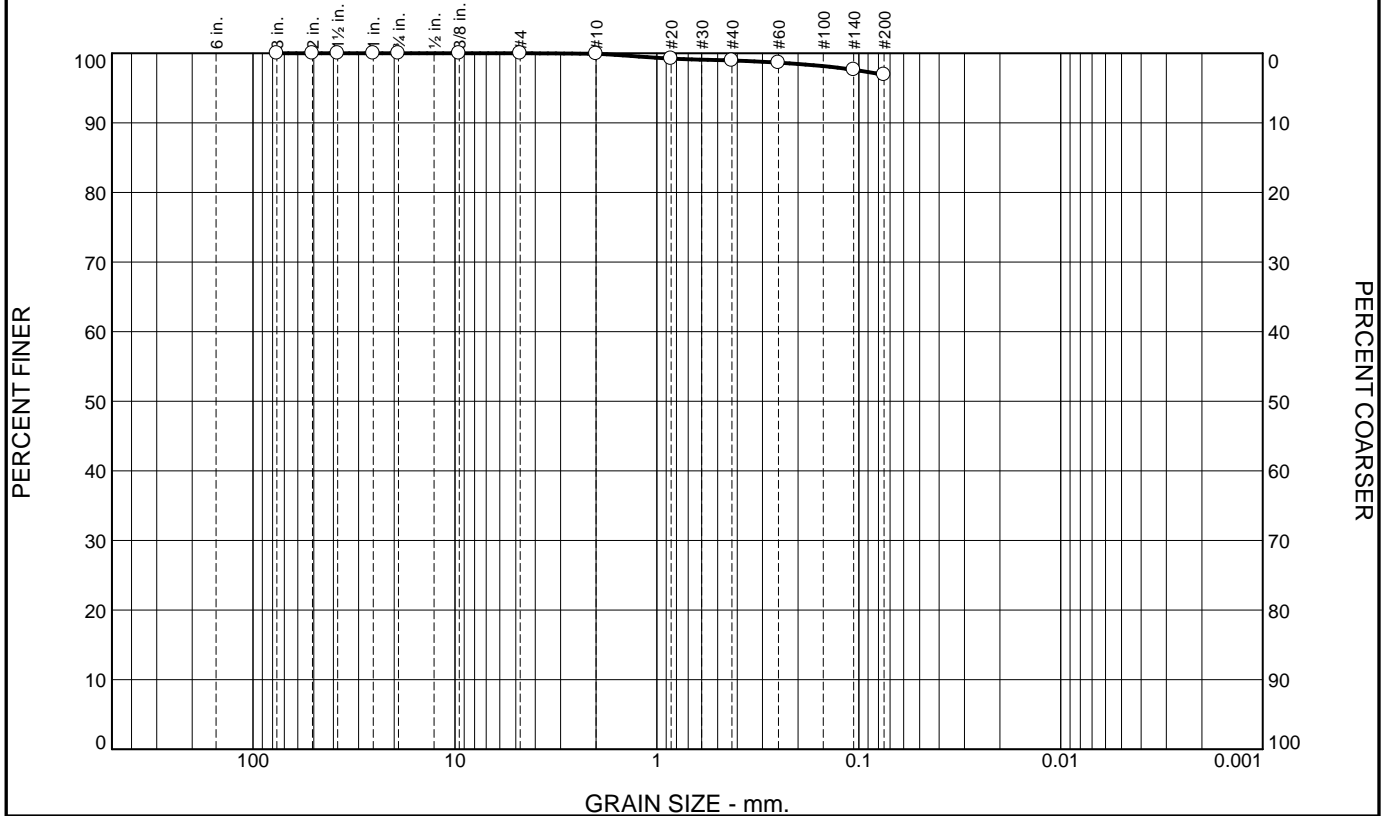
Depth: 5.0'-10.0'

Date: 6/21/19

<b>E2CR, Inc.</b>  <b>Baltimore, MD</b>	<b>Client:</b> RK&K <b>Project:</b> Creamery Road PS  <b>Project No:</b> 19517-03
<b>Figure</b>	



# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.9	2.1	96.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X-NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
3/8	100.0		
#4	100.0		
#10	99.9		
#20	99.2		
#40	99.0		
#60	98.6		
#140	97.6		
#200	96.9		

**Soil Description**

Gray, brown, Lean CLAY

**Atterberg Limits**

PL= 20      LL= 45      PI= 25

**Coefficients**

D<sub>90</sub>=      D<sub>85</sub>=      D<sub>60</sub>=  
D<sub>50</sub>=      D<sub>30</sub>=      D<sub>15</sub>=  
D<sub>10</sub>=      C<sub>u</sub>=      C<sub>c</sub>=

**Classification**

USCS= CL      AASHTO= A-7-6(26)

**Remarks**

Natural Moisture: 23.7%

\* (no specification provided)

Source of Sample: B-2  
Sample Number: S-3

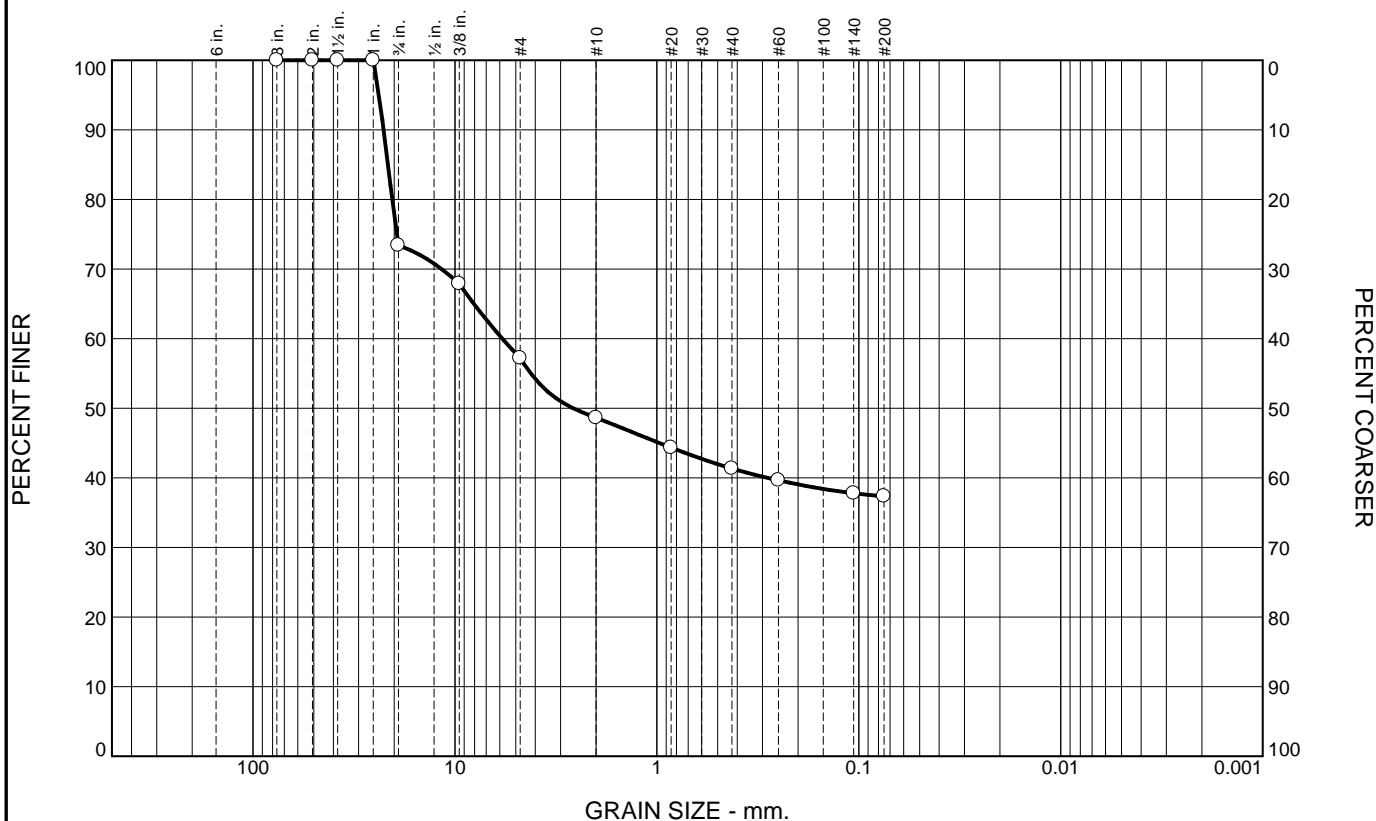
Depth: 6.0'-7.5'

Date: 6/21/19

<b>E2CR, Inc.</b>  <b>Baltimore, MD</b>	<b>Client:</b> RK&K <b>Project:</b> Creamery Road PS  <b>Project No:</b> 19517-03
<b>Figure</b>	



# Particle Size Distribution Report



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.6	16.2	8.6	7.3	3.9	37.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X-NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	73.4		
3/8	67.9		
#4	57.2		
#10	48.6		
#20	44.4		
#40	41.3		
#60	39.7		
#140	37.8		
#200	37.4		

**Soil Description**

Gray, red, brown, Clayey GRAVEL with Sand

**Atterberg Limits**

PL= 18      LL= 35      PI= 17

**Coefficients**

D<sub>90</sub>= 22.5502      D<sub>85</sub>= 21.4810      D<sub>60</sub>= 5.8275  
D<sub>50</sub>= 2.5959      D<sub>30</sub>=                      D<sub>15</sub>=  
D<sub>10</sub>=                      C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= GC      AASHTO= A-6(2)

**Remarks**

Natural Moisture: 20.5%

\* (no specification provided)

Source of Sample: B-2      Depth: 13.5'-15.0'  
Sample Number: S-6

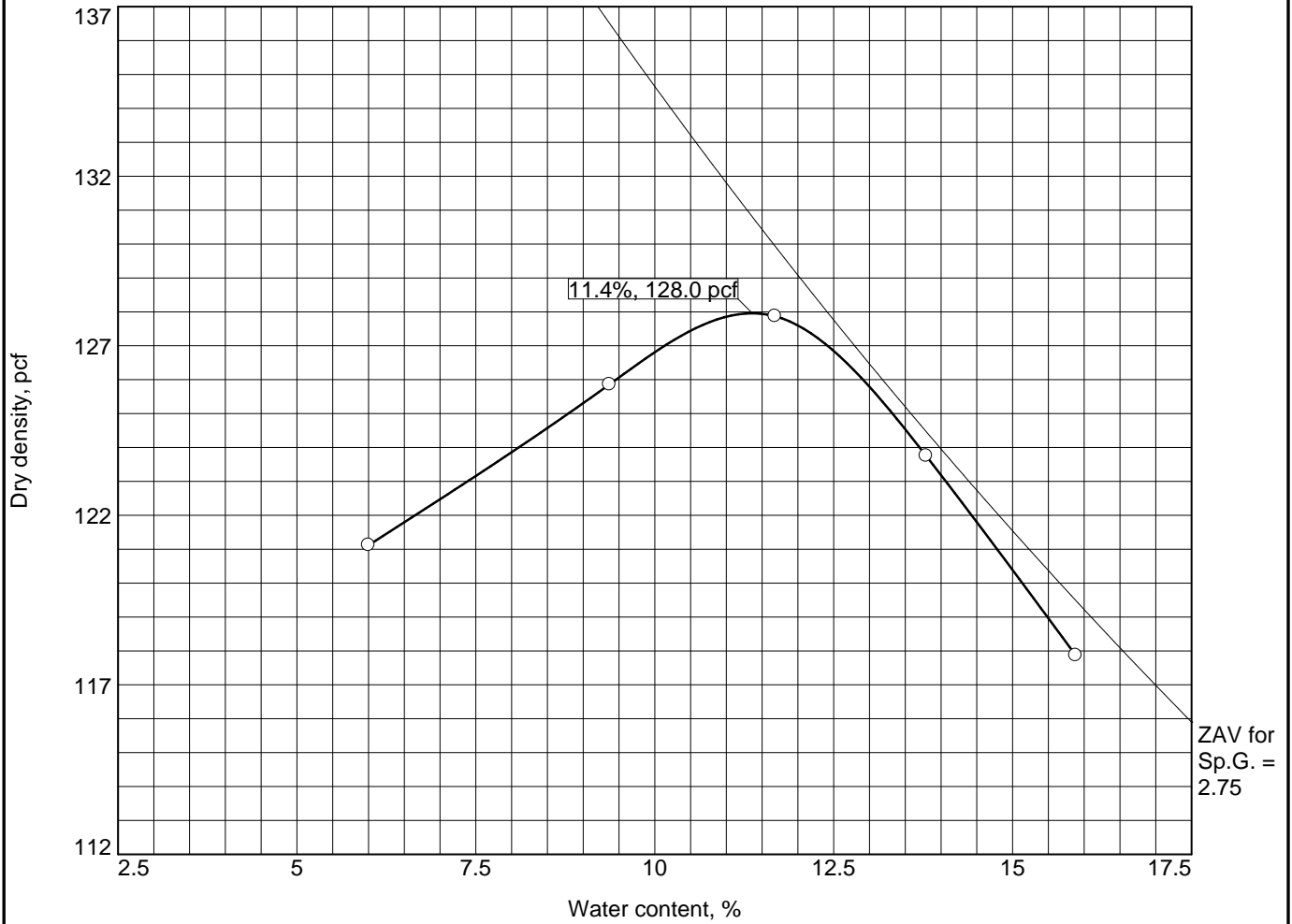
Date: 6/21/19

<b>E2CR, Inc.</b>  <b>Baltimore, MD</b>	<b>Client:</b> RK&K <b>Project:</b> Creamery Road PS  <b>Project No:</b> 19517-03
<b>Figure</b>	





# COMPACTION TEST REPORT



Test specification: AASHTO T 180-01 Method C Modified using Mechanical Circular Rammer

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
5.0'-10.0'	CL	A-6(5)	17.7		33	14	0.8	56.0

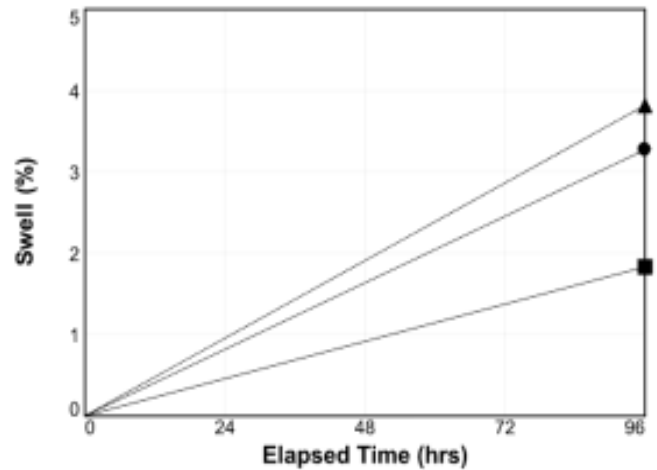
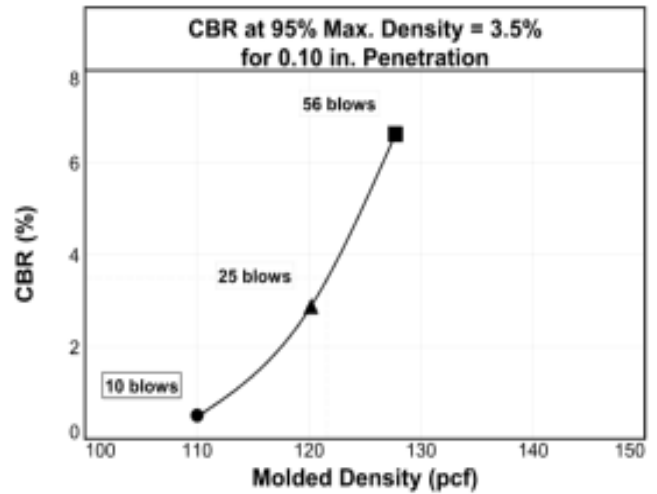
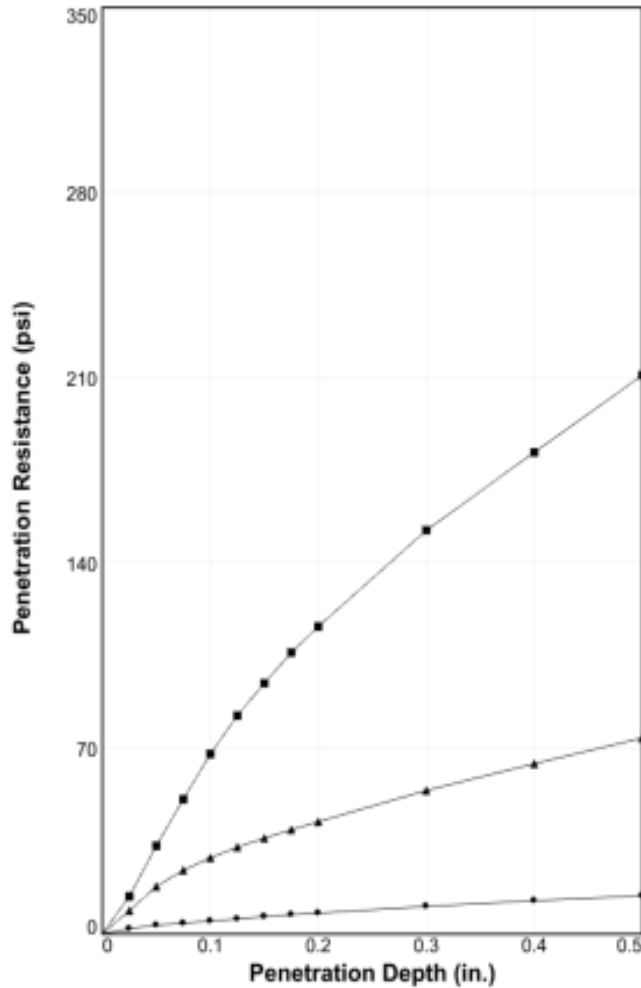
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 128.0 pcf Optimum moisture = 11.4 %	Purple, brown, Sandy Lean CLAY
<b>Project No.</b> 19517-03 <b>Client:</b> RK&K <b>Project:</b> Creamery Road PS  ○ <b>Source of Sample:</b> B-2 <b>Sample Number:</b> Bulk E2CR, Inc.  Baltimore, MD	<b>Remarks:</b>

Figure



# BEARING RATIO TEST REPORT

## ASTM D1883-16



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1	110.1	86	11.4	106.6	83.3	23.6	0.5	0.5	0.000	10	3.3
2	120.2	93.9	11.4	115.8	90.4	17.9	2.9	2.8	0.000	10	3.8
3	127.7	99.8	11.4	125.4	98	15.0	6.6	7.7	-0.003	10	1.8

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
	Purple, brown, Sandy Lean CLAY	CL	128.0	11.4	33

**Project No:** 19517-03  
**Project:** Creamery Road PS  
**Source of Sample:** B-2      **Depth:** 5.0'-10.0'  
**Sample Number:** Bulk  
**Date:** 6/21/19

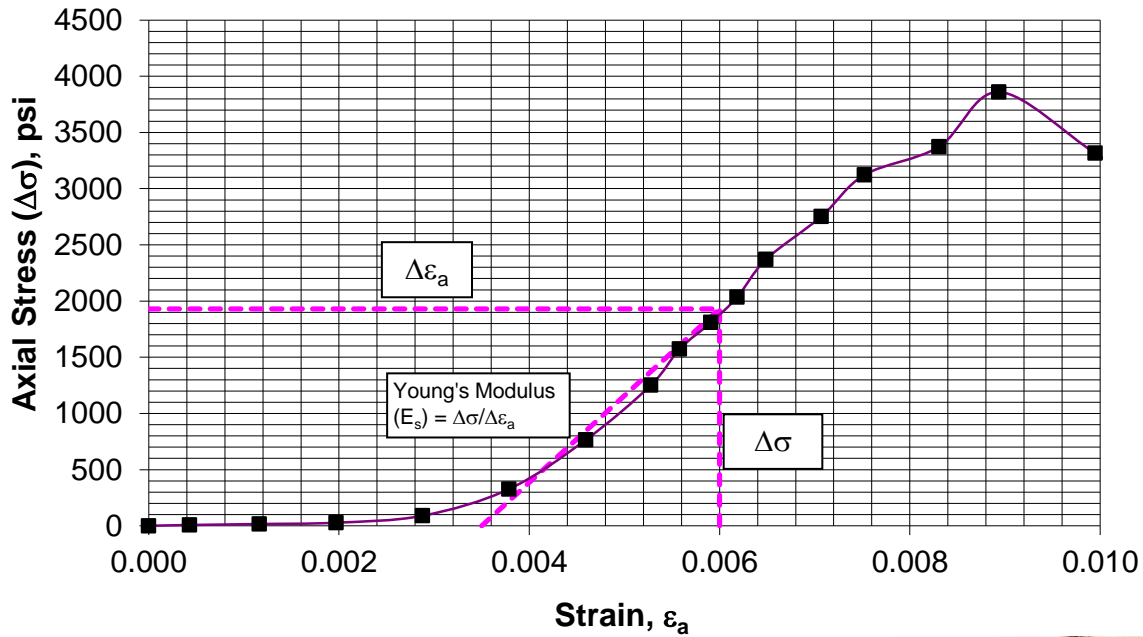
**Test Description/Remarks:**

BEARING RATIO TEST REPORT

**E2CR, Inc.**

Figure \_\_\_\_\_





Boring No.	B-2
Run No	R-1
Depth	29.8'-30.4' FEET
Diameter, D	1.982 INCH
Length, L	3.961 INCH
L/D Ratio	2.0
Area (in <sup>2</sup> )	3.09
Axial Stress at Failure	3,860 PSI
Unit Weight (PCF)	165.99 PCF

<b>Young's Modulus (E<sub>s</sub>) @ 50% of Ultimate Strength (Secant Modulus)</b>	<b>7.72E+05</b>	PSI
--	-----------------	-----



**Description:**

Type of Fracture :

     D



Cone (a)



Cone and Split (b)



Cone and Shear (c)



Shear (d)

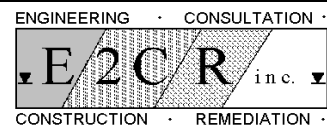


Columnar (e)

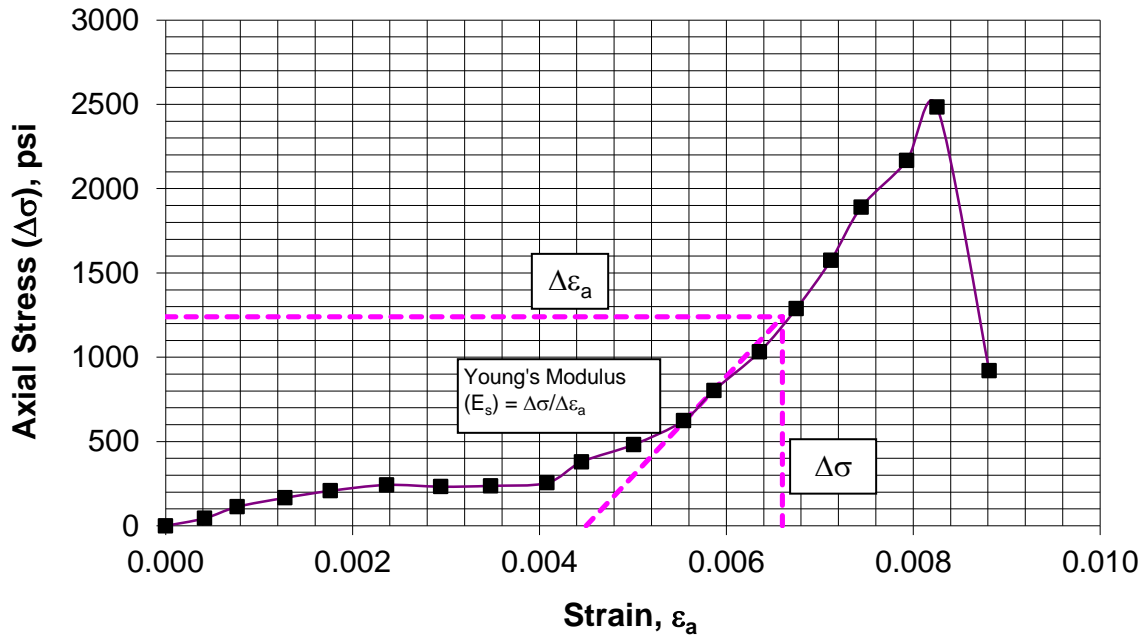
**NOTE: Rock not prepared in accordance with the tolerances of ASTM D4543**

Project Name:	Creamery Road Pump Station	Date:	6/19/19
Project No.:	19517-03	Figure:	

**UNIAXIAL COMPRESSION OF ROCK CORE**  
ASTM-D7012







Boring No.	B-2
Run No	R-2
Depth	36.6'-37.0' FEET
Diameter, D	1.982 INCH
Length, L	4.312 INCH
L/D Ratio	2.2
Area (in <sup>2</sup> )	3.09
Axial Stress at Failure	2,480 PSI
Unit Weight (PCF)	168.17 PCF

<b>Young's Modulus (E<sub>s</sub>) @ 50% of Ultimate Strength (Secant Modulus)</b>	<b>5.90E+05</b>	PSI
--	-----------------	-----



**Description:**

Type of Fracture :

     D



Cone (a)



Cone and Split (b)



Cone and Shear (c)



Shear (d)



Columnar (e)

**NOTE: Rock not prepared in accordance with the tolerances of ASTM D4543**

Project Name:	Creamery Road Pump Station	Date:	6/19/19
Project No.:	19517-03	Figure:	

**UNIAXIAL COMPRESSION OF ROCK CORE**

ASTM-D7012

