

APPENDIX C
PHYSICAL LABORATORY TEST DATA

Compaction Test Results

Project No. 3552-08-1210
 Project Name Battle Field Golf Club
 Project Location Chesapeake, Virginia

Tested By JCM
 Test Date Dec. 10 2008
 Reviewed By GBG
 Review Date January 29, 2009

COMPACTION DATA

Sample Location	Sample Depth (ft)	Nuclear Gauge Test			Proctor Compaction Test		Relative Compaction
		Wet Density	Lab Moisture	Dry Density	Maximum Dry	Optimum Moisture	
FTP-1	3.8	92.7	52.1%	60.9	66.2	40.1%	92.1%
FTP-2	2.1	85.7	49.1%	56.1	64.5	41.0%	87.0%
FTP-3	2.5	82.3	52.0%	54.5	64.9	41.1%	83.9%

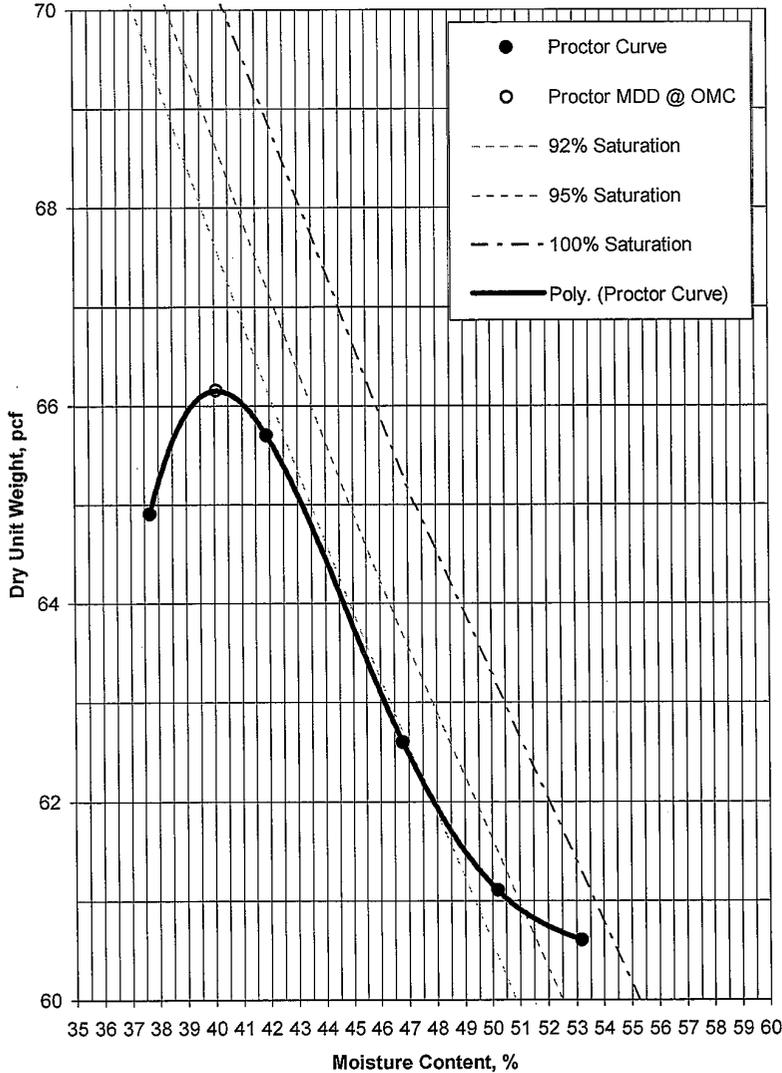
Created By: Jason C. Monk
 Reviewed by: 



MACTEC ENGINEERING AND CONSULTING, INC
 22010 Commerce Drive
 Abingdon, Virginia 24211

Project Name: **Battle Field Golf Club**
 Project Number: **3552-08-1210**
 Report Date: **12/15/2008**
 Sample I.D.: **TP-1 Bulk** Sample Depth: **2.0 - 3.8**
 Test Method: **ASTM D698 A**
 Description: **Black, sandy SILT (ML)**
 Material Source: **Test pit excavation**

Moisture Density Curves



PROCTOR MAX. DRY DENSITY	66.2
PROCTOR OPT. MOISTURE, %	40.1
MATERIAL PASSING SIEVE	No. 4
% MATERIAL RETAINED	N/A
Gs, RETAINED MATERIAL	2.1
CORRECTED MAX. DRY DENSITY	66.2
CORRECTED OPT. MOISTURE, %	40.1

Assumed Zero Air-Voids Curves for Gs=2.05

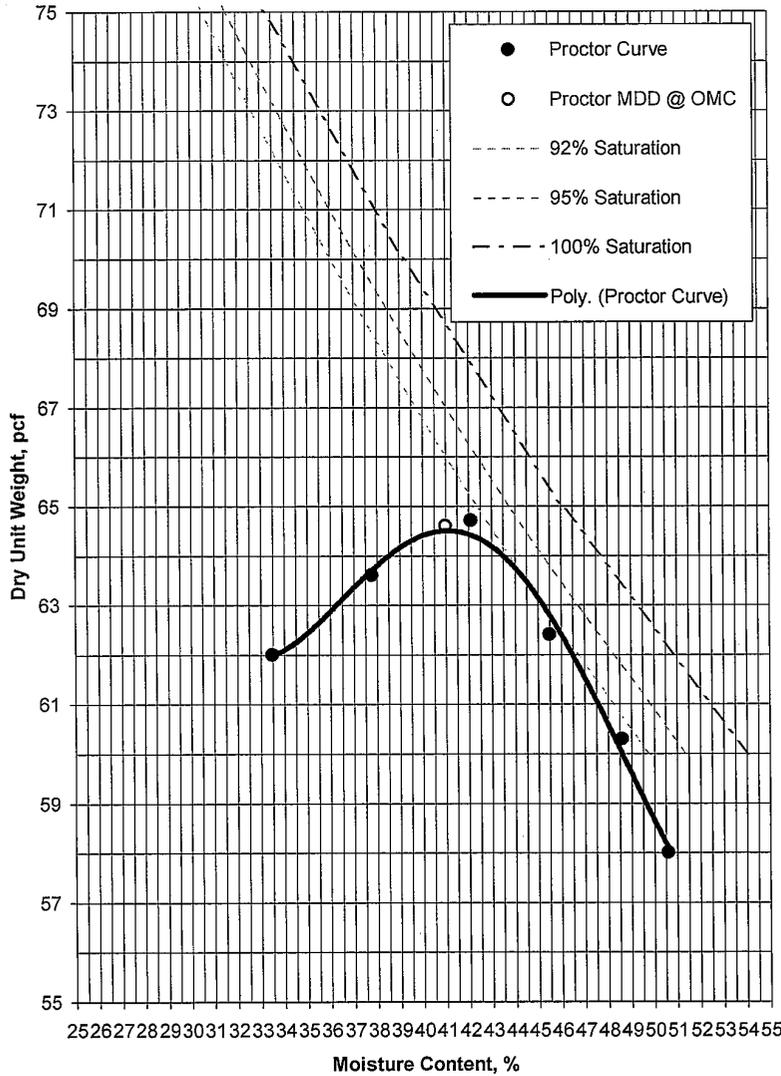
SAMPLE #	SAMPLE DEPTH (ft.)	SAMPLE TYPE	SOIL CLASS.	% FINER NO. 200 SIEVE ASTM D422	NAT. MOIST. (%) ASTM D2216	ATTERBERG LIMITS ASSTHO T90-00(2004)		
						LL	PL	PI
TP-1 Bulk	2.0 - 3.8	Bulk	ML	74.3	52.1	NLL	NPL	NP

Performed by: Bryan C. Williams
 Checked by: ACM



Project Name: **Battle Field Golf Club**
 Project Number: **3552-08-1210**
 Report Date: **12/17/2008**
 Sample I.D.: **TP-2 Bulk** Sample Depth: **1.8 - 2.1**
 Test Method: **ASTM D698 A**
 Description: **Black, SILT (ML) with sand**
 Material Source: **Test pit excavation**

Moisture Density Curves



PROCTOR MAX. DRY DENSITY	64.6
PROCTOR OPT. MOISTURE, %	41.0
MATERIAL PASSING SIEVE	No. 4
% MATERIAL RETAINED	N/A
G _s , RETAINED MATERIAL	2.0
CORRECTED MAX. DRY DENSITY	64.6
CORRECTED OPT. MOISTURE, %	41.0

Assumed Zero Air-Voids Curves for G_s=2.00

SAMPLE #	SAMPLE DEPTH (ft.)	SAMPLE TYPE	SOIL CLASS.	% FINER NO. 200 SIEVE ASTM D422	NAT. MOIST. (%) ASTM D2216	ATTEBERG LIMITS ASSTHO T90-00(2004)		
						LL	PL	PI
TP-2 Bulk	1.8 - 2.1	Bulk	ML	73.3	49.1	NLL	NPL	NP

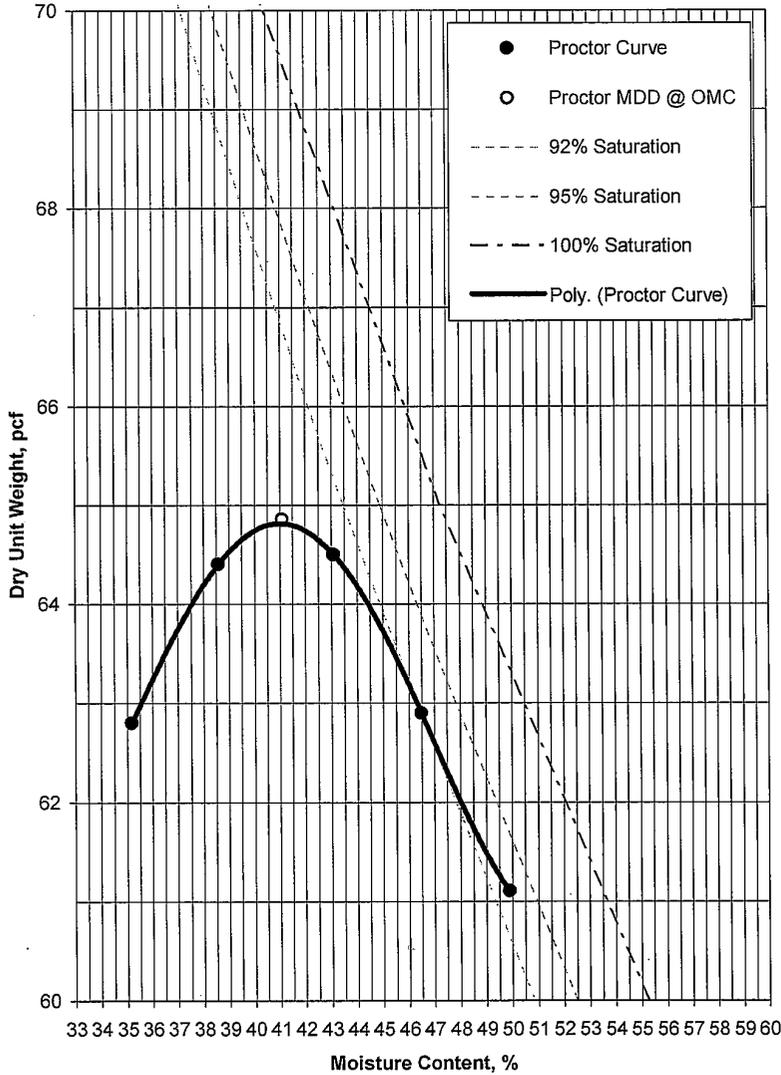
Performed by: Bryan C. Williams
 Checked by: gcm



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Project Name: Battle Field Golf Club
Project Number: 3552-08-1210
Report Date: 12/15/2008
Sample I.D.: TP-3 Bulk **Sample Depth:** 2.5-3.0
Test Method: ASTM D698 A
Description: Black, sandy SILT (ML)
Material Source: Test pit excavation

Moisture Density Curves



PROCTOR MAX. DRY DENSITY	64.9
PROCTOR OPT. MOISTURE, %	41.1
MATERIAL PASSING SIEVE	No. 4
% MATERIAL RETAINED	N/A
Gs, RETAINED MATERIAL	2.1

Assumed Zero Air-Voids Curves for Gs=2.05

SAMPLE #	SAMPLE DEPTH (ft.)	SAMPLE TYPE	SOIL CLASS.	% FINER NO. 200 SIEVE ASTM D422	NAT. MOIST. (%) ASTM D2216	ATTEBERG LIMITS ASSTHO T90-00(2004)		
						LL	PL	PI
TP-3 Bulk	2.5-3.0	Bulk	ML	68.9	52.0	NLL	NPL	NP

Performed by: Bryan C. Williams
 Checked by: ACM



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Project Name: Battle Field Golf Club
 Project Number: 3552-08-1210
 Report Date: 12/16/08

Washed Particle Size/Gradation Test Report
 ASTM D422

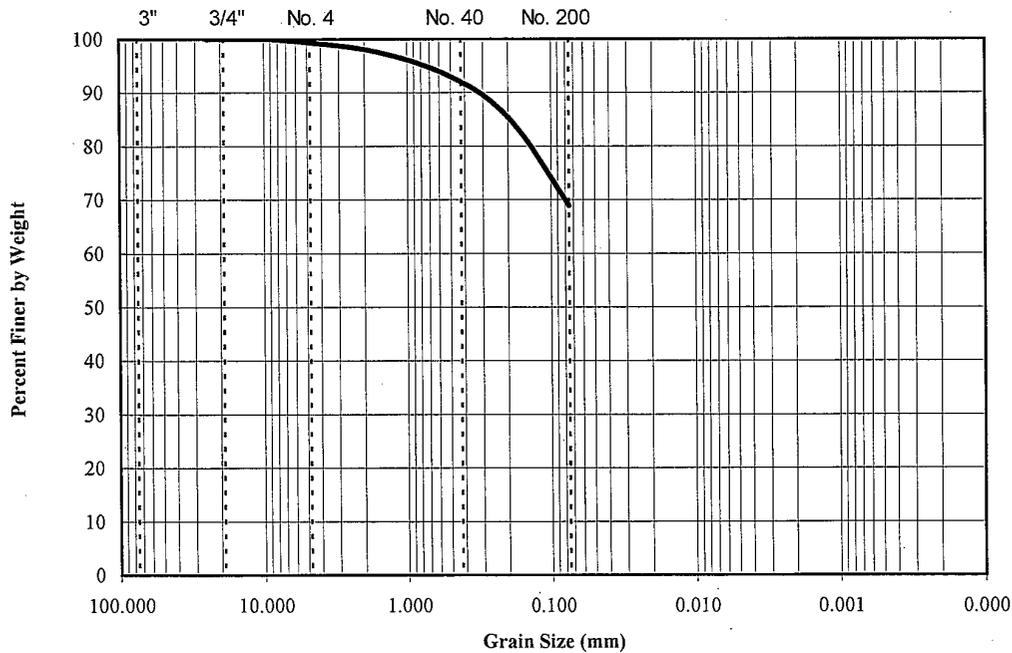
Sample Number: TP-3 Location: 2.5 - 3.0

Description : Black. Sandy SILT (ML)

Percent Finer than No. 200: 68.9% % (from washing)

Sieve Size	Cumulative (g)	Wt. Retained Each Sieve (g)	Cumulative % Passing	Cumulative % Passing w/ Wash 200
1 in.	0.00	0.00	100.0	100.0
3/4 in.	0.00	0.00	100.0	100.0
3/8 in.	0.00	0.00	100.0	100.0
# 4	2.25	2.25	97.7	99.3
# 10	5.82	3.57	94.0	98.1
# 20	14.21	8.39	85.4	95.5
# 40	25.13	10.92	74.2	92.0
# 60	37.72	12.59	61.2	87.9
# 100	58.40	20.68	39.9	81.3
#200	97.24	38.84	0.0	68.9
PAN	97.25	0.01	0.0	
Wt. of Soil, g	312.86			

Particle Size Analysis
 U.S. Standard Sieve Sizes



Performed By: B.C.W.

Checked By: JCM

Sieve Analysis, TP-3.xls



Project Name: Battle Field Golf Club
Project Number: 3552-08-1210
Report Date: 12/16/08

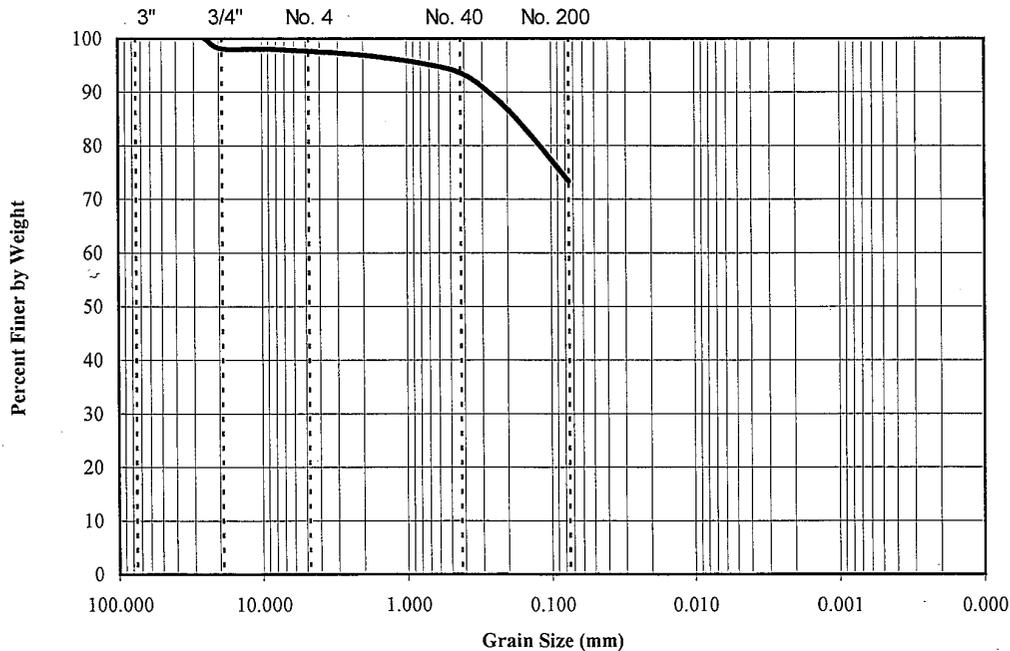
Washed Particle Size/Gradation Test Report
ASTM D422

Sample Number: TP-2 Location: 1.8-2.1
Description : Black, SILT (ML) with sand

Percent Finer than No. 200: 73.3% % (from washing)

Sieve Size	Cumulative (g)	Wt. Retained Each Sieve (g)	Cumulative % Passing	Cumulative % Passing w/ Wash 200
1 in.	0.00	0.00	100.0	100.0
3/4 in.	5.36	5.36	93.0	98.1
3/8 in.	5.86	0.50	92.4	98.0
# 4	6.84	0.98	91.1	97.6
# 10	9.03	2.19	88.2	96.9
# 20	12.89	3.86	83.2	95.5
# 40	18.55	5.66	75.8	93.6
# 60	30.66	12.11	60.0	89.3
# 100	48.70	18.04	36.5	83.1
#200	76.71	28.01	0.0	73.3
PAN	76.71	0.00	0.0	
Wt. of Soil, g	287.61			

Particle Size Analysis
U.S. Standard Sieve Sizes



Performed By: B.C.W.

Checked By: ACM

Sieve Analysis, TP-2.xls



Project Name: Battle Field Golf Club

Project Number: 3552-08-1210

Report Date: 12/16/08

Washed Particle Size/Gradation Test Report

ASTM D422

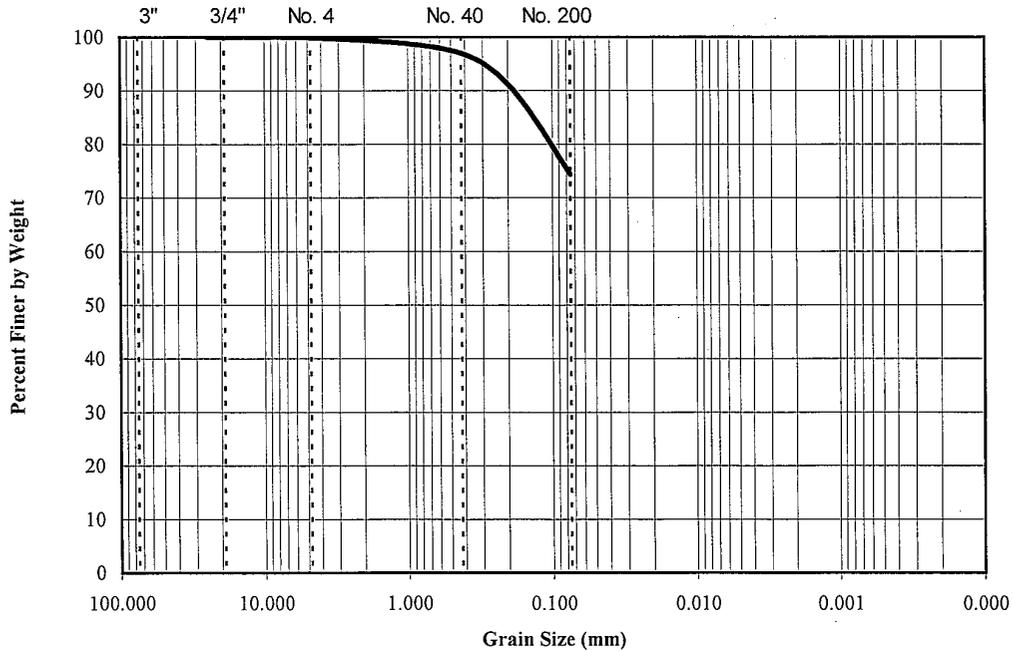
Sample Number: TP-1 Location: 2.0 - 3.8

Description : Black, SILT (ML) with sand

Percent Finer than No. 200: 74.3% % (from washing)

Sieve Size	Cumulative (g)	Wt. Retained Each Sieve (g)	Cumulative % Passing	Cumulative % Passing w/ Wash 200
1 in.	0.00	0.00	100.0	100.0
3/4 in.	0.00	0.00	100.0	100.0
3/8 in.	0.00	0.00	100.0	100.0
# 4	0.26	0.26	99.7	99.9
# 10	1.68	1.42	97.8	99.4
# 20	4.25	2.57	94.3	98.5
# 40	8.77	4.52	88.3	97.0
# 60	18.25	9.48	75.7	93.7
# 100	37.83	19.58	49.6	87.0
#200	75.13	37.30	0.0	74.3
PAN	75.13	0.00	0.0	
Wt. of Soil, g	291.87			

Particle Size Analysis
U.S. Standard Sieve Sizes



Performed By: B.C.W.

Checked By: JCM

Sieve Analysis, TP-1.xls



Project Name: Battle Field Golf Club

Project Number: 3552-08-1210

Report Date: 12/16/08

Washed Particle Size/Gradation Test Report

ASTM D422

Sample Number: SB-3 Location: 16.0-18.0

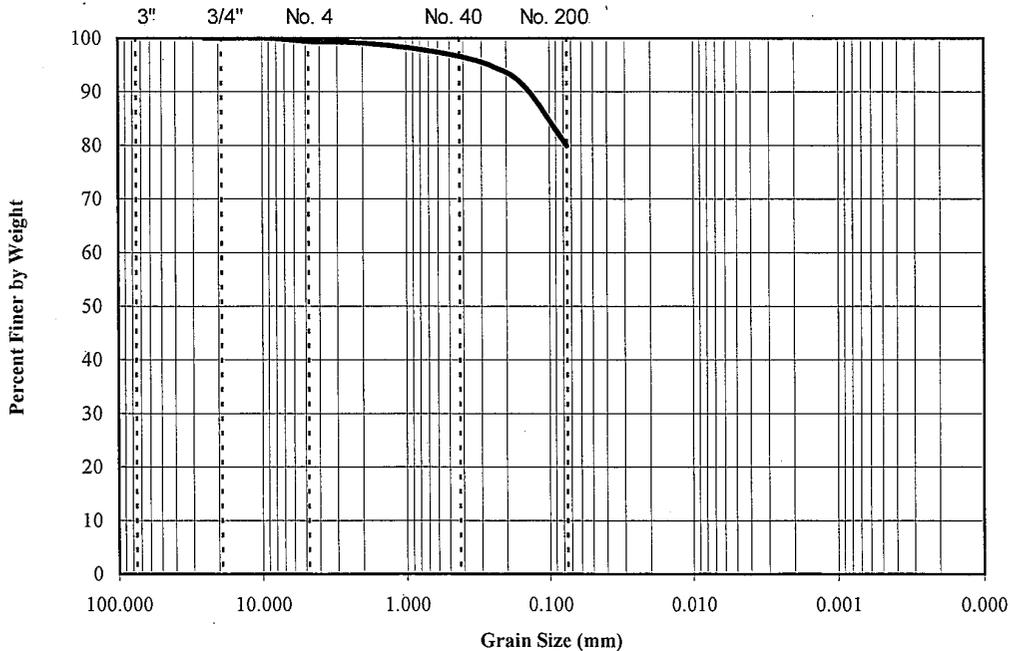
Description : Very dark greenish gray, SILT (ML) with sand

Percent Finer than No. 200: 79.9% (from washing)

Sieve Size	Cumulative (g)	Wt. Retained Each Sieve (g)	Cumulative % Passing	Cumulative % Passing w/ Wash 200
1 in.	0.00	0.00	100.0	100.0
3/4 in.	0.00	0.00	100.0	100.0
3/8 in.	0.00	0.00	100.0	100.0
# 4	0.18	0.18	96.9	99.4
# 10	0.26	0.08	95.6	99.1
# 20	0.59	0.33	89.9	98.0
# 40	1.00	0.41	83.0	96.6
# 60	1.53	0.53	73.9	94.8
# 100	2.60	1.07	55.7	91.1
#200	5.87	3.27	0.0	79.9
PAN	5.87	0.00	0.0	
Wt. of Soil, g	29.25			

Particle Size Analysis

U.S. Standard Sieve Sizes



Performed By: B.C.W.

Checked By: JCM

Sieve Analysis, SB-3.xls



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Project Name: Battle Field Golf Club
 Project Number: 3552-08-1210
 Report Date: 12/16/08

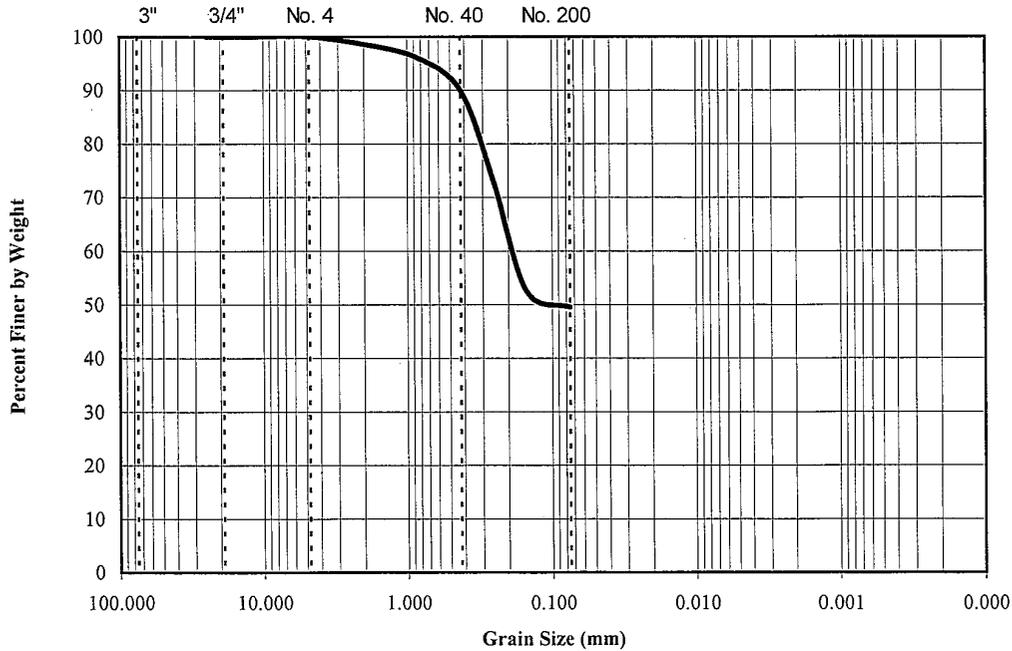
Washed Particle Size/Gradation Test Report
ASTM D422

Sample Number: SB-2 Location: 17.0-18.0
 Description: *Very dark gray, silty SAND (SM)*

Percent Finer than No. 200: 49.5% % (from washing)

Sieve Size	Cumulative (g)	Wt. Retained Each Sieve (g)	Cumulative % Passing	Cumulative % Passing w/ Wash 200
1 in.	0.00	0.00	100.0	100.0
3/4 in.	0.00	0.00	100.0	100.0
3/8 in.	0.00	0.00	100.0	100.0
# 4	0.00	0.00	100.0	100.0
# 10	0.84	0.84	97.3	98.6
# 20	2.39	1.55	92.3	96.1
# 40	6.18	3.79	80.1	90.0
# 60	16.80	10.62	46.0	72.7
# 100	29.23	12.43	6.0	52.5
#200	31.07	1.84	0.1	49.5
PAN	31.09	0.02	0.0	
Wt. of Soil, g	61.52			

Particle Size Analysis
U.S. Standard Sieve Sizes



Performed By: B.C.W.

Checked By: ACM

Sieve Analysis, SB-2.xls



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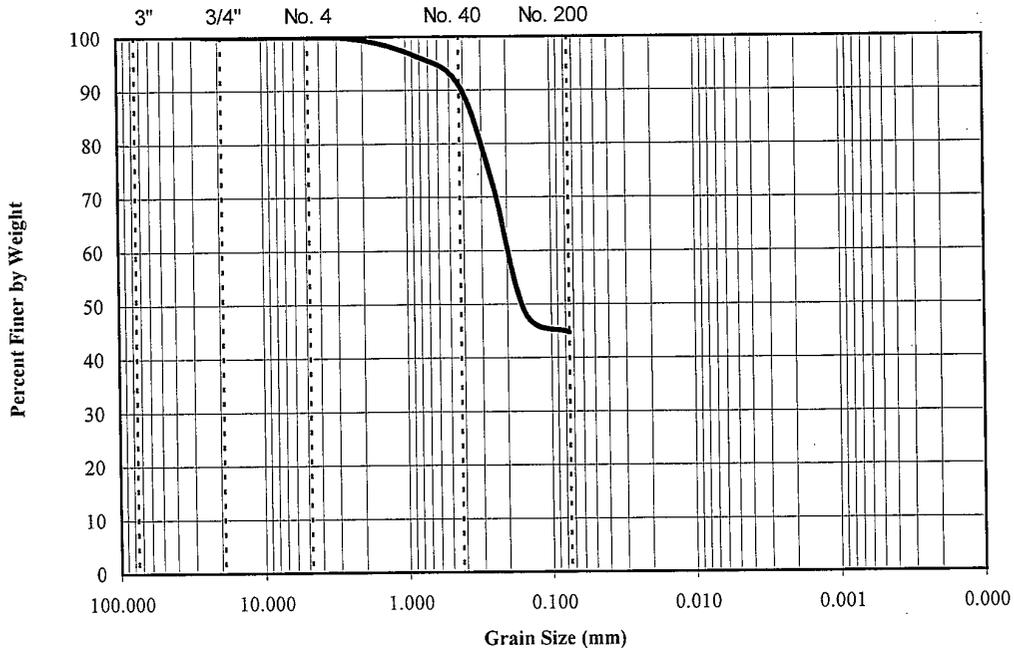
Project Name: Battle Field Golf Club
 Project Number: 3552-08-1210
 Report Date: 12/16/08

Washed Particle Size/Gradation Test Report
ASTM D422

Sample Number: SB-1 Location: 18.5 - 19.0
 Description : *Very dark greenish gray, silty SAND (SM)*
 Percent Finer than No. 200: 44.7% % (from washing)

Sieve Size	Cumulative (g)	Wt. Retained Each Sieve (g)	Cumulative % Passing	Cumulative % Passing w/ Wash 200
1 in.	0.00	0.00	100.0	100.0
3/4 in.	0.00	0.00	100.0	100.0
3/8 in.	0.00	0.00	100.0	100.0
# 4	0.00	0.00	100.0	100.0
# 10	0.45	0.45	98.9	99.4
# 20	2.52	2.07	93.6	96.4
# 40	6.44	3.92	83.6	90.9
# 60	19.59	13.15	50.0	72.4
# 100	36.63	17.04	6.6	48.3
#200	39.20	2.57	0.0	44.7
PAN	39.20	0.00	0.0	
Wt. of Soil, g	70.88			

Particle Size Analysis
U.S. Standard Sieve Sizes



Performed By: B.C.W.

Checked By: ACM

Sieve Analysis, SB-1.xls



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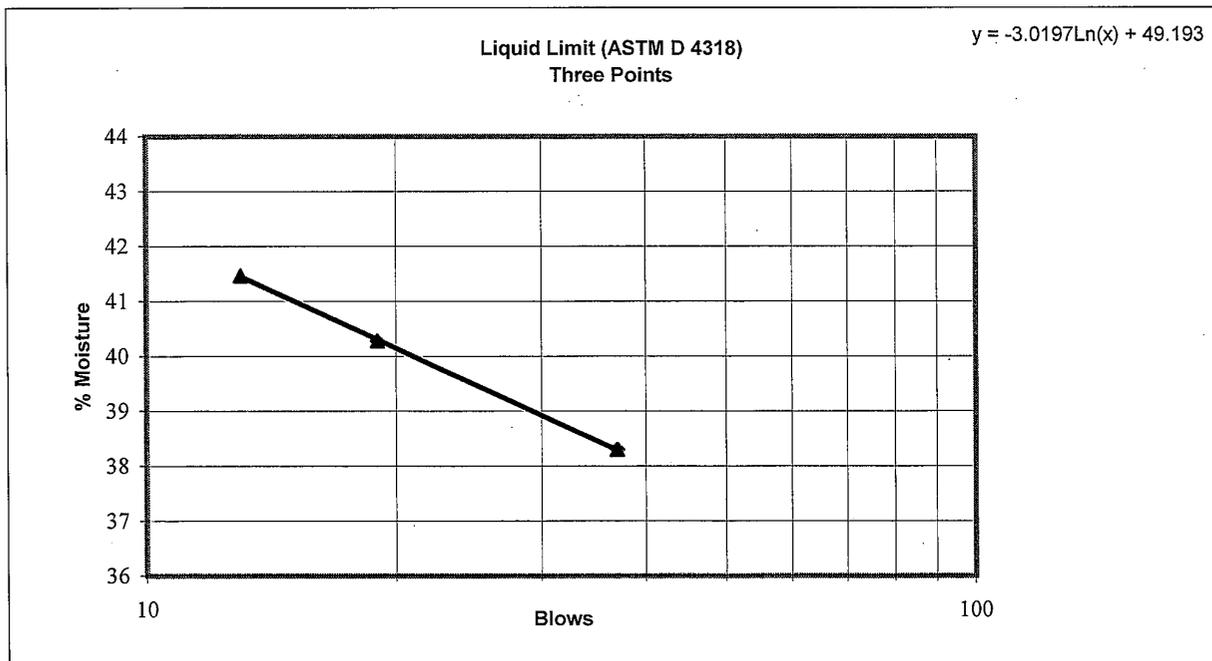
Project Name: Battle Field Golf Club
Project Number: 3552-08-1210
Report Date: 12/15/08
Soil Description: *Very dark greenish gray, SILT (ML) with sand*

**Atterberg Limits ASTM D 4318
(Three Points)**

Sample Location: SB-3 Sample Number: SS-9
Depth (ft): 16.0-18.0

Blows	% Moisture
37	38.3
19	40.3
13	41.5

Liquid Limit	Plastic Limit	Plasticity Index
40	31	9



Performed by: B C W

Checked by: JCM



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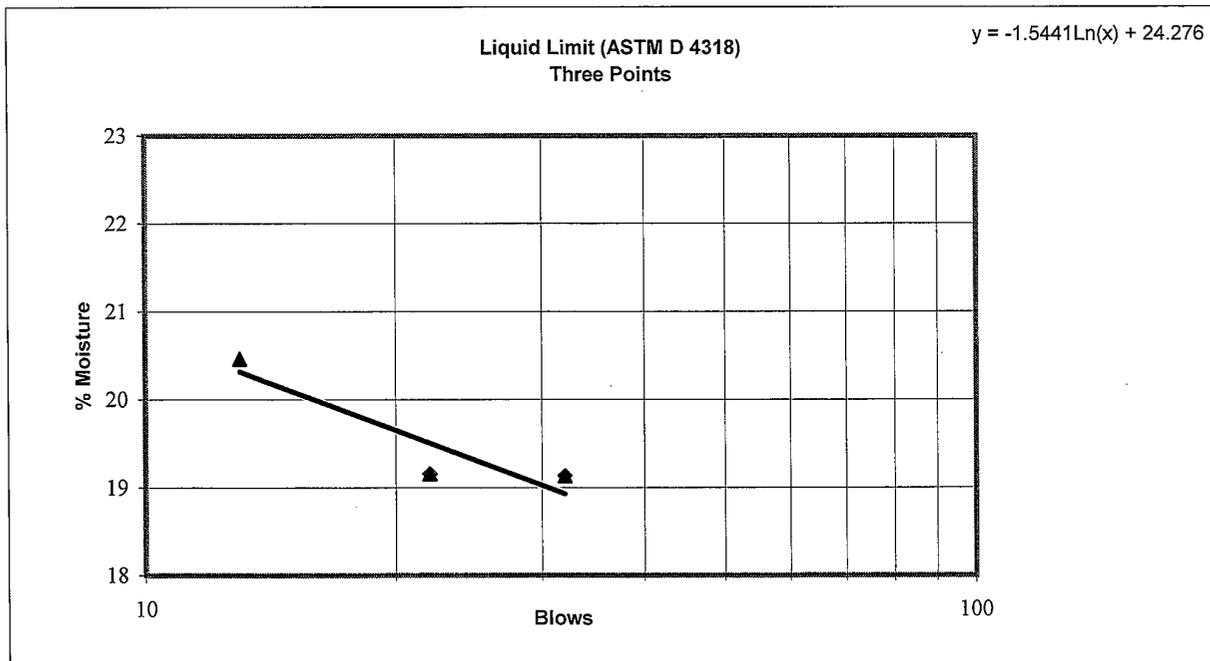
Project Name: Battle Field Golf Club
Project Number: 3552-08-1210
Report Date: 12/15/08 Soil Description: *Very dark gray, silty SAND (SM)*

**Atterberg Limits ASTM D 4318
(Three Points)**

Sample Location: SB-2 Sample Number: SS-10
Depth (ft): 17.0-18.0

Blows	% Moisture
32	19.1
22	19.2
13	20.5

Liquid Limit	Plastic Limit	Plasticity Index
19	16	3



Performed by: BCW

Checked by: JCM



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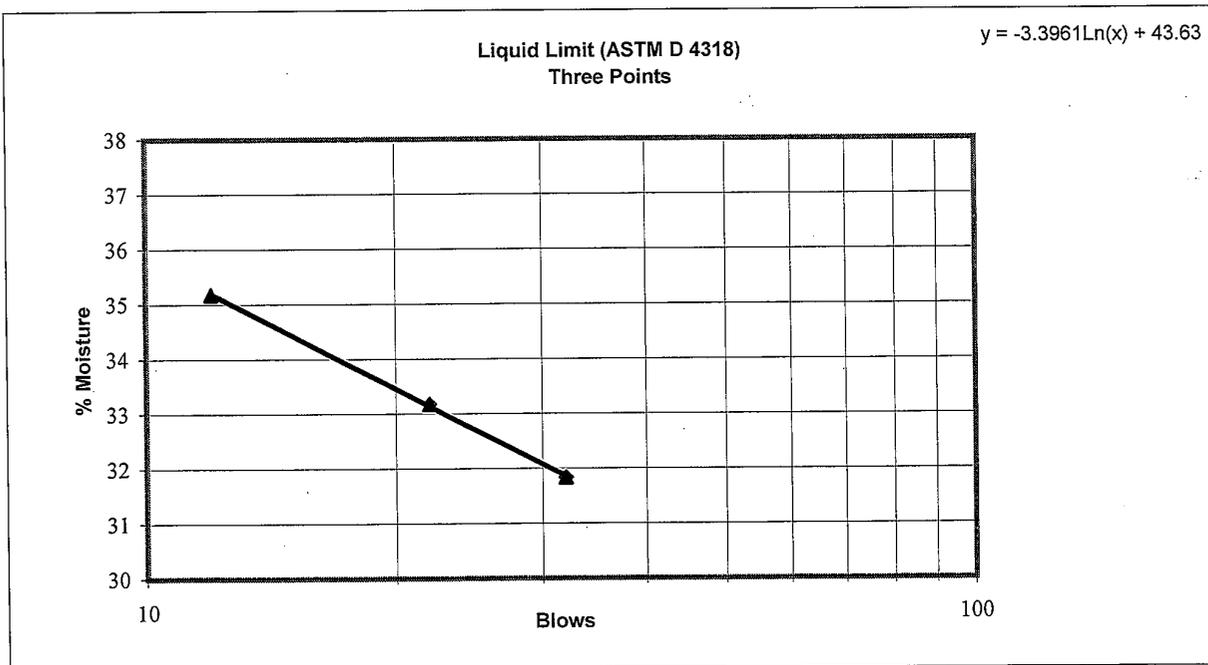
Project Name: Battle Field Golf Club
 Project Number: 3552-08-1210
 Report Date: 12/15/08
 Soil Description: *Very dark greenish gray, silty SAND (SM)*

**Atterberg Limits ASTM D 4318
 (Three Points)**

Sample Location: SB-1 Sample Number: SS-10
 Depth (ft): 18.5 - 19.0

Blows	% Moisture
32	31.8
22	33.2
12	35.2

Liquid Limit	Plastic Limit	Plasticity Index
33	27	6



Performed by: B C W

Checked by: JCM

Moisture Content, %

Project Name: Battle Field Golf Club
 Project Number: 3552-08-1210
 Date: 12/15/2008

Boring	TP-1	TP-2	TP-3					
Depth	3.8	2.1	2.5					
Tare + Wet	222.23	275.17	215.35					
Tare + Dry	148.87	187.39	144.42					
Tare	8.04	8.47	8.02					
Moisture, %	52.1	49.1	52.0					

Boring	SB-1	SB-1	SB-1	SB-1	SB-1	SB-1		
Depth	2.0-4.0	6.0-8.0	10.0-12.0	14.0-16.0	16.0-18.0	18.5-19.0		
Tare + Wet	113.67	134.54	99.59	137.62	125.32	94.89		
Tare + Dry	87.83	101.28	72.26	99.11	91.46	76.11		
Tare	8.50	8.26	8.35	9.15	8.23	8.40		
Moisture, %	32.6	35.8	42.8	42.8	40.7	27.7		

Boring	SB-2	SB-2	SB-2	SB-2	SB-2	SB-2		
Depth	2.0-4.0	6.0-8.0	10.0-12.0	12.0-14.0	14.0-16.0	17.0-18.0		
Tare + Wet	126.89	108.45	131.99	120.09	133.01	100.97		
Tare + Dry	94.67	80.15	89.36	73.14	85.38	84.40		
Tare	9.17	8.47	8.47	8.30	9.01	8.29		
Moisture, %	37.7	39.5	52.7	72.4	62.4	21.8		

Boring	SB-3	SB-3	SB-3	SB-3	SB-3			
Depth	2.0-4.0	6.0-8.0	12.0-14.0	14.0-16.0	16.0-18.0			
Tare + Wet	112.40	115.44	116.92	112.85	92.87			
Tare + Dry	82.15	85.53	78.33	68.55	58.69			
Tare	8.04	9.09	7.99	8.46	8.05			
Moisture, %	40.8	39.1	54.9	73.7	67.5			

Performed by: Bryan C. Williams

Checked by: ACM

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 5A
Elev. or Depth: Sample Length (in./cm.):
Location:
Description:
Date: 12-11-08 PL: LL: PI:
USCS Classification: AASHTO Classification:
Testing Remarks:

Mechanical Analysis Data

Initial After wash
Dry sample and tare= 404.16 382.83
Tare = 0.00 0.00
Dry sample weight = 404.16 382.83
Minus #200 from wash= 5.3 %
Tare for cumulative weight retained= .00

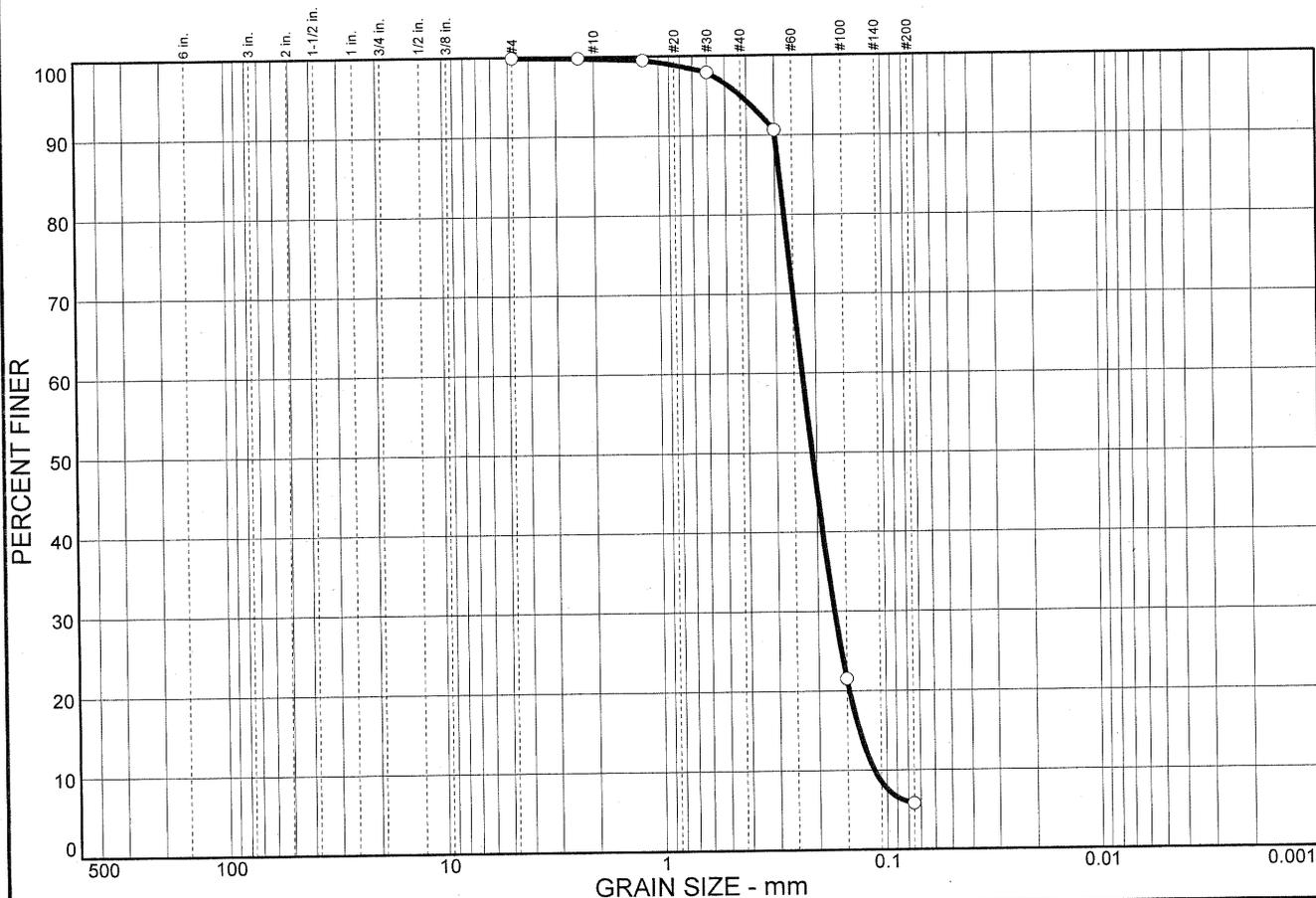
Sieve	Cumul. Wt. retained	Percent finer
# 4	0.42	99.9
# 8	0.95	99.8
# 16	2.02	99.5
# 30	8.34	97.9
# 50	37.95	90.6
# 100	317.35	21.5
# 200	380.64	5.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 94.1
% FINES = 5.9

D85= 0.29 D60= 0.23 D50= 0.21
D30= 0.17 D15= 0.13 D10= 0.11
Cc= 1.0925 Cu= 2.0228

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		94.1	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.9		
#8	99.8		
#16	99.5		
#30	97.9		
#50	90.6		
#100	21.5		
#200	5.8		

Soil Description

PL= **Atterberg Limits** PI=

LL=

Coefficients

D₈₅= 0.286 D₆₀= 0.230 D₅₀= 0.209

D₃₀= 0.169 D₁₅= 0.132 D₁₀= 0.114

C_u= 2.02 C_c= 1.09

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

Sample No.: 5A
Location:

Source of Sample:

Date: 12-11-08
Elev./Depth:

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AND ENVIRONMENTAL
SERVICES, INC.**

Client:
Project: Battlefield Golf Club

Project No: 3552081210 task 05

Plate

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 5B
Elev. or Depth: **Sample Length (in./cm.):**
Location:
Description:
Date: 12-11-08 **PL:** **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

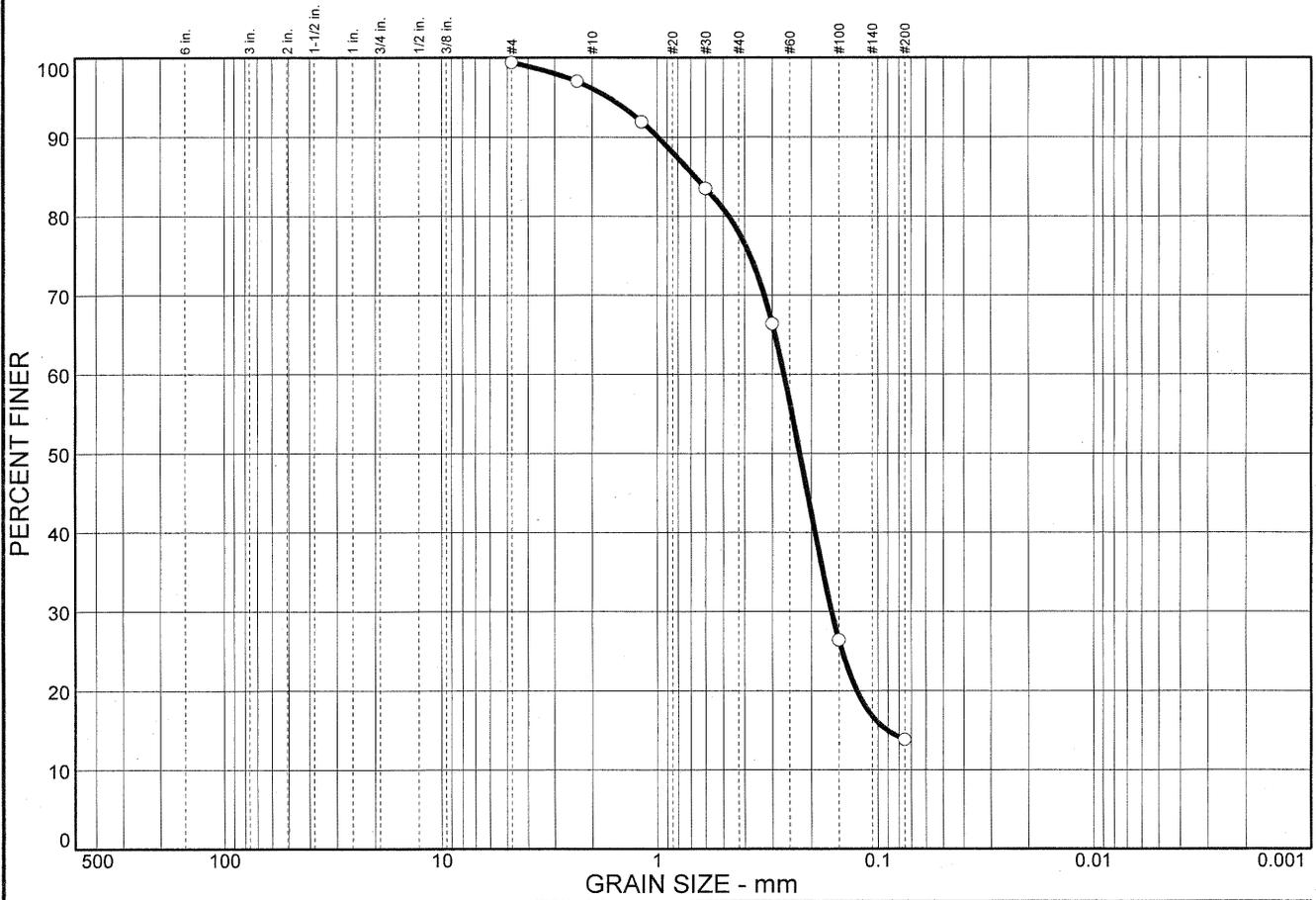
	Initial	After wash
Dry sample and tare=	400.16	345.65
Tare =	0.00	0.00
Dry sample weight =	400.16	345.65
Minus #200 from wash=	13.6 %	
Tare for cumulative weight retained=	.00	
Sieve	Cumul. Wt. retained	Percent finer
# 4	2.46	99.4
# 8	12.00	97.0
# 16	32.50	91.9
# 30	65.97	83.5
# 50	134.51	66.4
# 100	294.66	26.4
# 200	344.90	13.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND = 85.6**
% FINES = 13.8

D85= 0.67 D60= 0.27 D50= 0.23
D30= 0.16 D15= 0.09

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		85.6		13.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.4		
#8	97.0		
#16	91.9		
#30	83.5		
#50	66.4		
#100	26.4		
#200	13.8		

Soil Description

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₈₅= 0.671 D₆₀= 0.266 D₅₀= 0.226
 D₃₀= 0.162 D₁₅= 0.0905 D₁₀=
 C_u= C_c=

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

Sample No.: 5B
Location:

Source of Sample:

Date: 12-11-08
Elev./Depth:

LAW ENGINEERING
AND ENVIRONMENTAL
SERVICES, INC.

Client:
Project: Battlefield Golf Club
Project No: 3552081210 task 05

Plate

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 6A
Elev. or Depth:
Location:
Description:
Date: 12-11-08 PL:
USCS Classification:
Testing Remarks:
Sample Length (in./cm.):
LL:
PI:
AASHTO Classification:

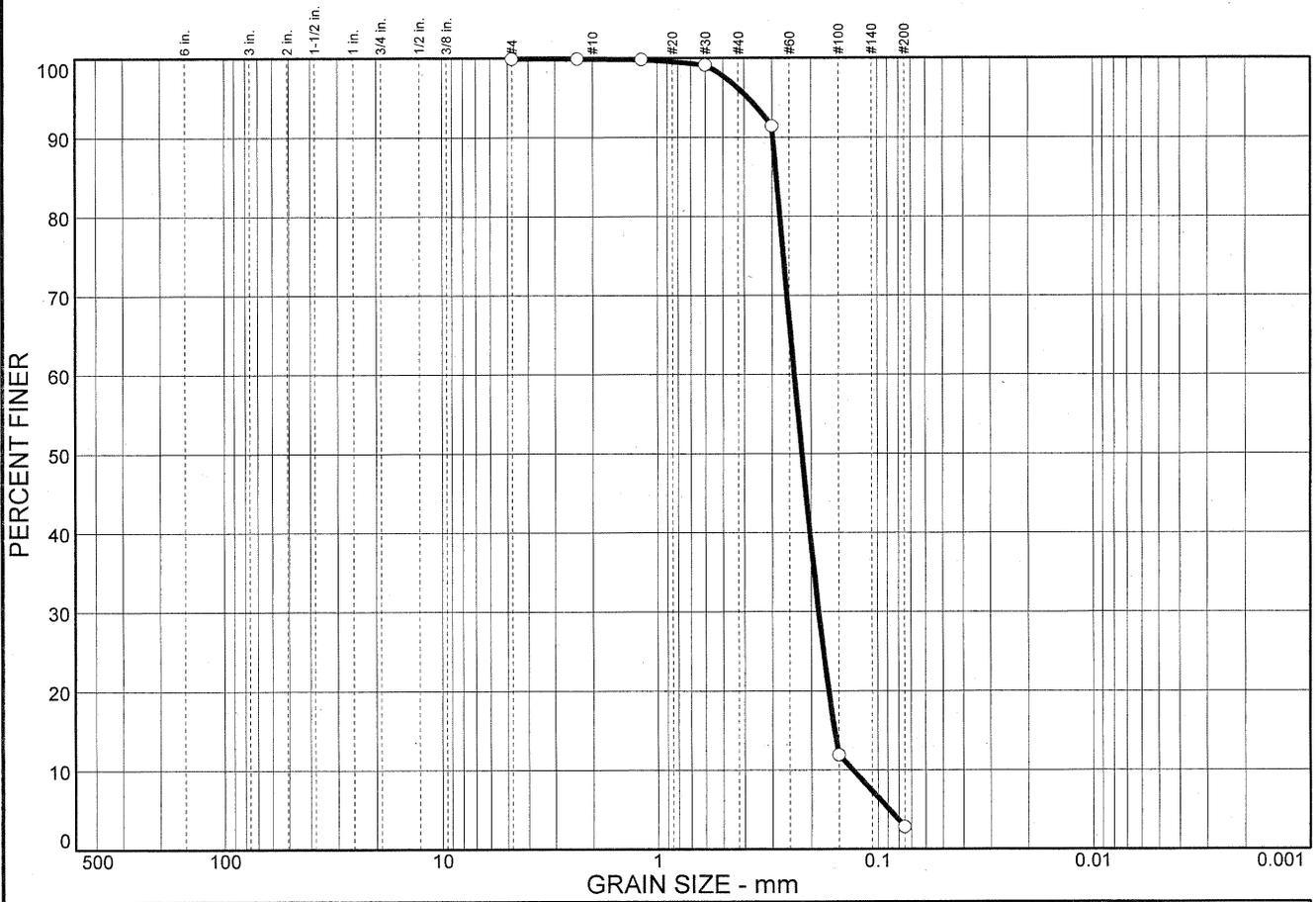
Mechanical Analysis Data

Table with 3 columns: Sieve, Cumul. Wt. retained, Percent finer. Rows include initial and after wash weights for various sieves (#4, #8, #16, #30, #50, #100, #200).

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES =
% FINES = 2.9
% GRAVEL =
% SAND = 97.1
D85= 0.29 D60= 0.24 D50= 0.22
D30= 0.19 D15= 0.16 D10= 0.13
Cc= 1.1106 Cu= 1.8341

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		97.1	2.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.9		
#8	99.9		
#16	99.8		
#30	99.1		
#50	91.4		
#100	11.9		
#200	2.8		

Soil Description

PL=	Atterberg Limits	LL=	PI=
	Coefficients		
D ₈₅ = 0.286	D ₆₀ = 0.238	D ₅₀ = 0.220	
D ₃₀ = 0.185	D ₁₅ = 0.157	D ₁₀ = 0.130	
C _u = 1.83	C _c = 1.11		
USCS=	Classification	AASHTO=	
	Remarks		

* (no specification provided)

Sample No.: 6A
Location:

Source of Sample:

Date: 12-11-08
Elev./Depth:

**LAW ENGINEERING
AND ENVIRONMENTAL
SERVICES, INC.**

Client:
Project: Battlefield Golf Club
Project No: 3552081210 task 05

Plate

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 6B
Elev. or Depth: **Sample Length (in./cm.):**
Location:
Description:
Date: 12-11-08 **PL:** **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	414.87	395.68
Tare =	0.00	0.00
Dry sample weight =	414.87	395.68
Minus #200 from wash=	4.6 %	
Tare for cumulative weight retained=	.00	

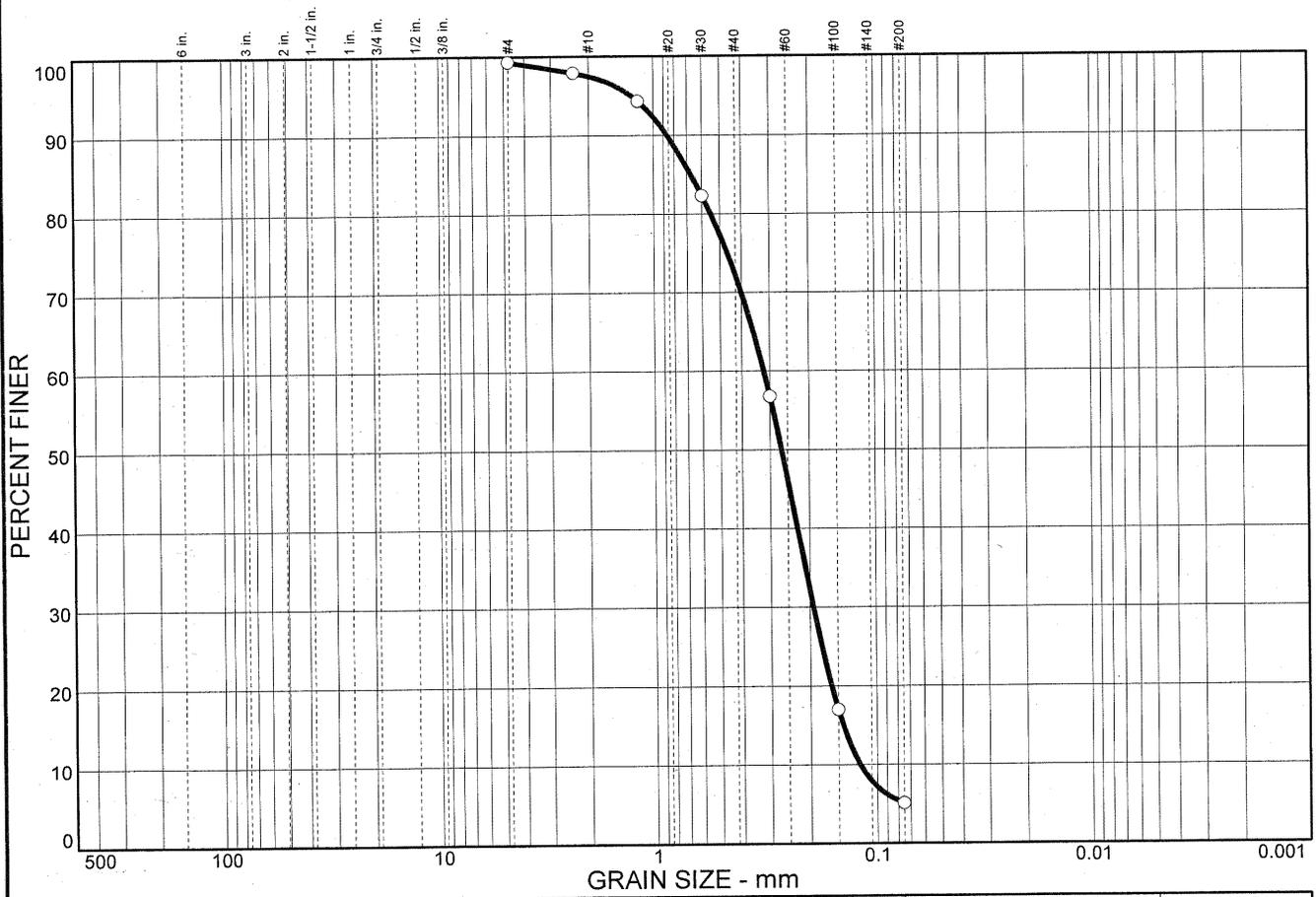
Sieve	Cumul. Wt. retained	Percent finer
# 4	2.92	99.3
# 8	8.82	97.9
# 16	23.82	94.3
# 30	73.34	82.3
# 50	179.27	56.8
# 100	344.32	17.0
# 200	393.55	5.1

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 94.2
% FINES = 5.1

D85= 0.67 D60= 0.32 D50= 0.27
D30= 0.19 D15= 0.14 D10= 0.12
Cc= 0.9795 Cu= 2.6744

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		94.2		5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.3		
#8	97.9		
#16	94.3		
#30	82.3		
#50	56.8		
#100	17.0		
#200	5.1		

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.673 D₆₀= 0.319 D₅₀= 0.267
D₃₀= 0.193 D₁₅= 0.142 D₁₀= 0.119
C_u= 2.67 C_c= 0.98

Classification

USCS= AASHTO=

Remarks

* (no specification provided)

Sample No.: 6B
 Location:

Source of Sample:

Date: 12-11-08
 Elev./Depth:

**LAW ENGINEERING
 AND ENVIRONMENTAL
 SERVICES, INC.**

Client:
 Project: Battlefield Golf Club

Project No: 3552081210 task 05

Plate

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 8A
Elev. or Depth:
Location:
Description:
Date: 12-11-08 PL:
USCS Classification:
Testing Remarks:
Sample Length (in./cm.):
LL:
PI:
AASHTO Classification:

Mechanical Analysis Data

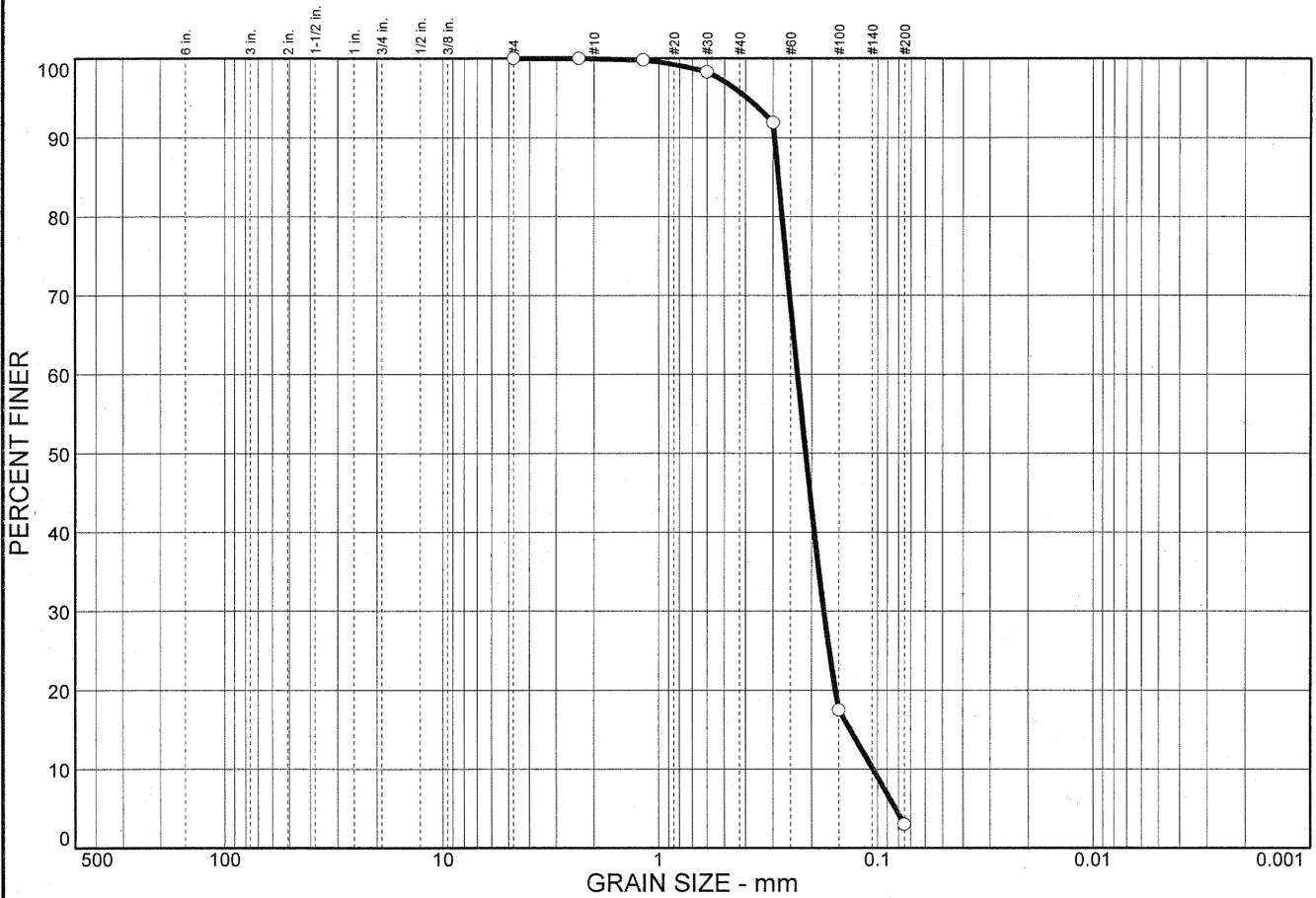
Table with 3 columns: Sieve, Cumul. Wt. retained, Percent finer. Rows include initial and after wash weights for dry sample and tare, and sieve analysis results for sieves #4, #8, #16, #30, #50, #100, and #200.

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES =
% FINES = 3.0
% GRAVEL =
% SAND = 97.0

D85= 0.28 D60= 0.23 D50= 0.21
D30= 0.18 D15= 0.13 D10= 0.10
Cc= 1.2695 Cu= 2.2179

Particle Size Distribution Report



GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 8B
Elev. or Depth: **Sample Length (in./cm.):**
Location:
Description:
Date: 12-11-08 **PL:** **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

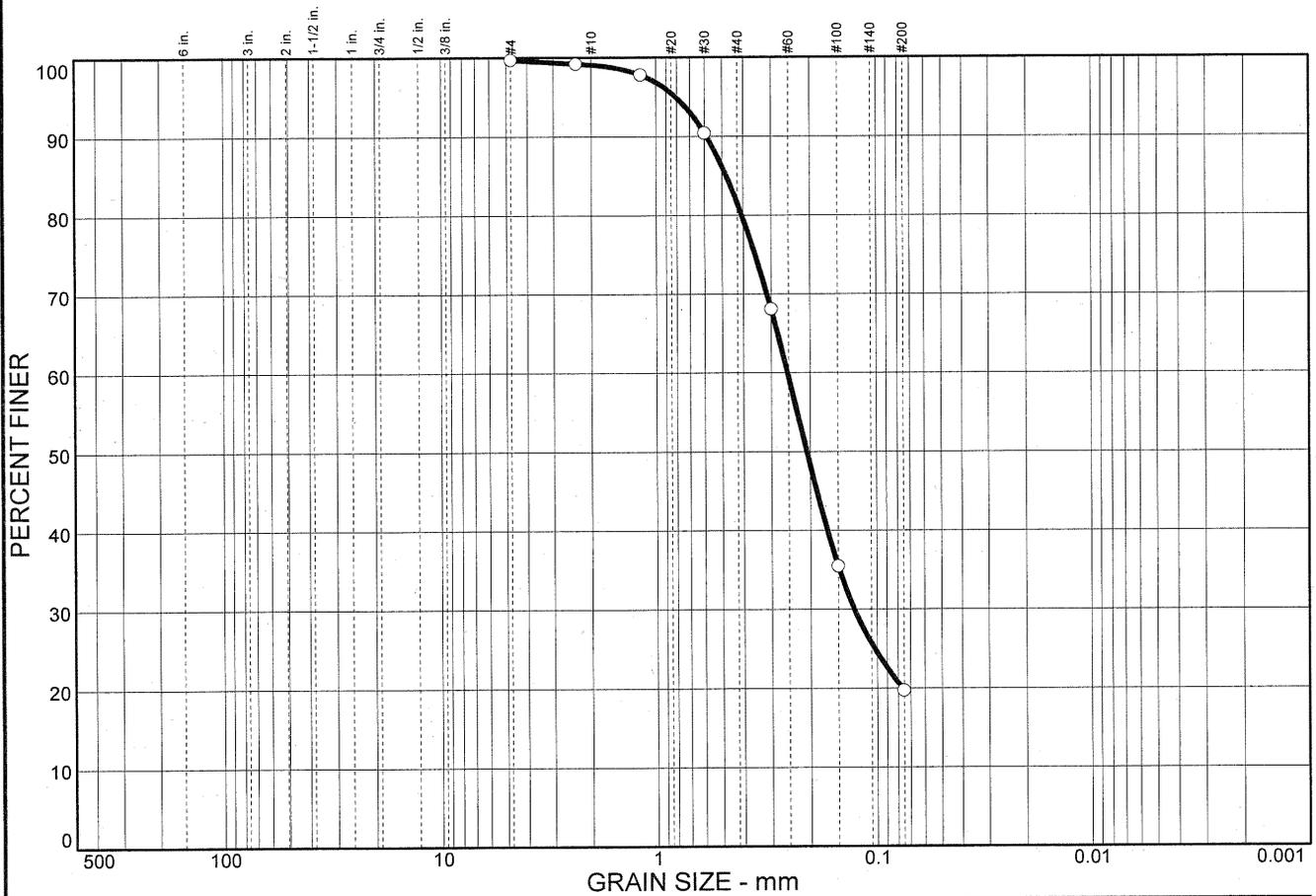
	Initial	After wash
Dry sample and tare=	410.63	332.88
Tare =	0.00	0.00
Dry sample weight =	410.63	332.88
Minus #200 from wash=	18.9 %	
Tare for cumulative weight retained=	.00	
Sieve	Cumul. Wt. retained	Percent finer
# 4	1.28	99.7
# 8	3.27	99.2
# 16	8.84	97.8
# 30	39.49	90.4
# 50	131.06	68.1
# 100	264.90	35.5
# 200	329.65	19.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 80.0
% FINES = 19.7

D85= 0.48 D60= 0.25 D50= 0.21
D30= 0.13

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		80.0		19.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.7		
#8	99.2		
#16	97.8		
#30	90.4		
#50	68.1		
#100	35.5		
#200	19.7		

Soil Description

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₈₅= 0.478 D₆₀= 0.253 D₅₀= 0.207
 D₃₀= 0.127 D₁₅= D₁₀=
 C_u= C_c=

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

Sample No.: 8B
 Location:

Source of Sample:

Date: 12-11-08
 Elev./Depth:

**LAW ENGINEERING
 AND ENVIRONMENTAL
 SERVICES, INC.**

Client:
 Project: Battlefield Golf Club
 Project No: 3552081210 task 05

Plate

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 11A
Elev. or Depth: **Sample Length (in./cm.):**
Location:
Description:
Date: 12-11-08 **PL:** **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	407.83	381.54
Tare =	0.00	0.00
Dry sample weight =	407.83	381.54
Minus #200 from wash=	6.4 %	
Tare for cumulative weight retained=	.00	

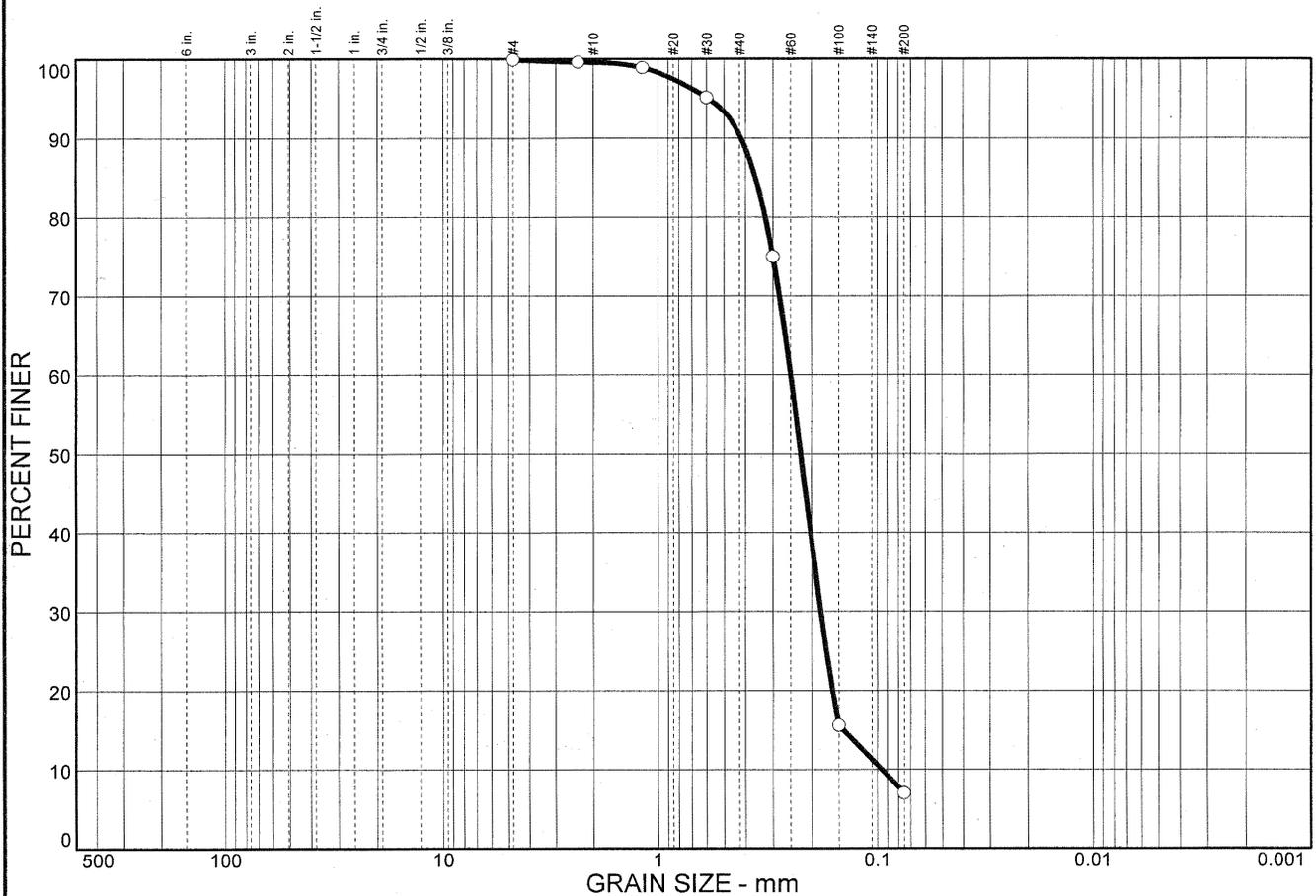
Sieve	Cumul. Wt. retained	Percent finer
# 4	0.30	99.9
# 8	1.44	99.6
# 16	4.33	98.9
# 30	19.91	95.1
# 50	101.83	75.0
# 100	344.32	15.6
# 200	379.28	7.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 92.9
% FINES = 7.1

D₈₅= 0.36 D₆₀= 0.25 D₅₀= 0.22
D₃₀= 0.18 D₁₅= 0.14 D₁₀= 0.10
C_c= 1.3841 C_u= 2.6158

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		92.9	7.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.9		
#8	99.6		
#16	98.9		
#30	95.1		
#50	75.0		
#100	15.6		
#200	7.0		

Soil Description

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₈₅= 0.360 D₆₀= 0.250 D₅₀= 0.225
 D₃₀= 0.182 D₁₅= 0.143 D₁₀= 0.0955
 C_u= 2.62 C_c= 1.38

Classification
 USCS= AASHTO=

Remarks

* (no specification provided)

Sample No.: 11A
 Location:

Source of Sample:

Date: 12-11-08
 Elev./Depth:

**LAW ENGINEERING
 AND ENVIRONMENTAL
 SERVICES, INC.**

Client:
 Project: Battlefield Golf Club
 Project No: 3552081210 task 05

Plate

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: Battlefield Golf Club
Project Number: 3552081210 task 05

Sample Data

Source:
Sample No.: 11B
Elev. or Depth: Sample Length (in./cm.):
Location:
Description:
Date: 12-11-08 PL: LL: PI:
USCS Classification: AASHTO Classification:
Testing Remarks:

Mechanical Analysis Data

Initial After wash
Dry sample and tare= 406.67 369.14
Tare = 0.00 0.00
Dry sample weight = 406.67 369.14
Minus #200 from wash= 9.2 %
Tare for cumulative weight retained= .00

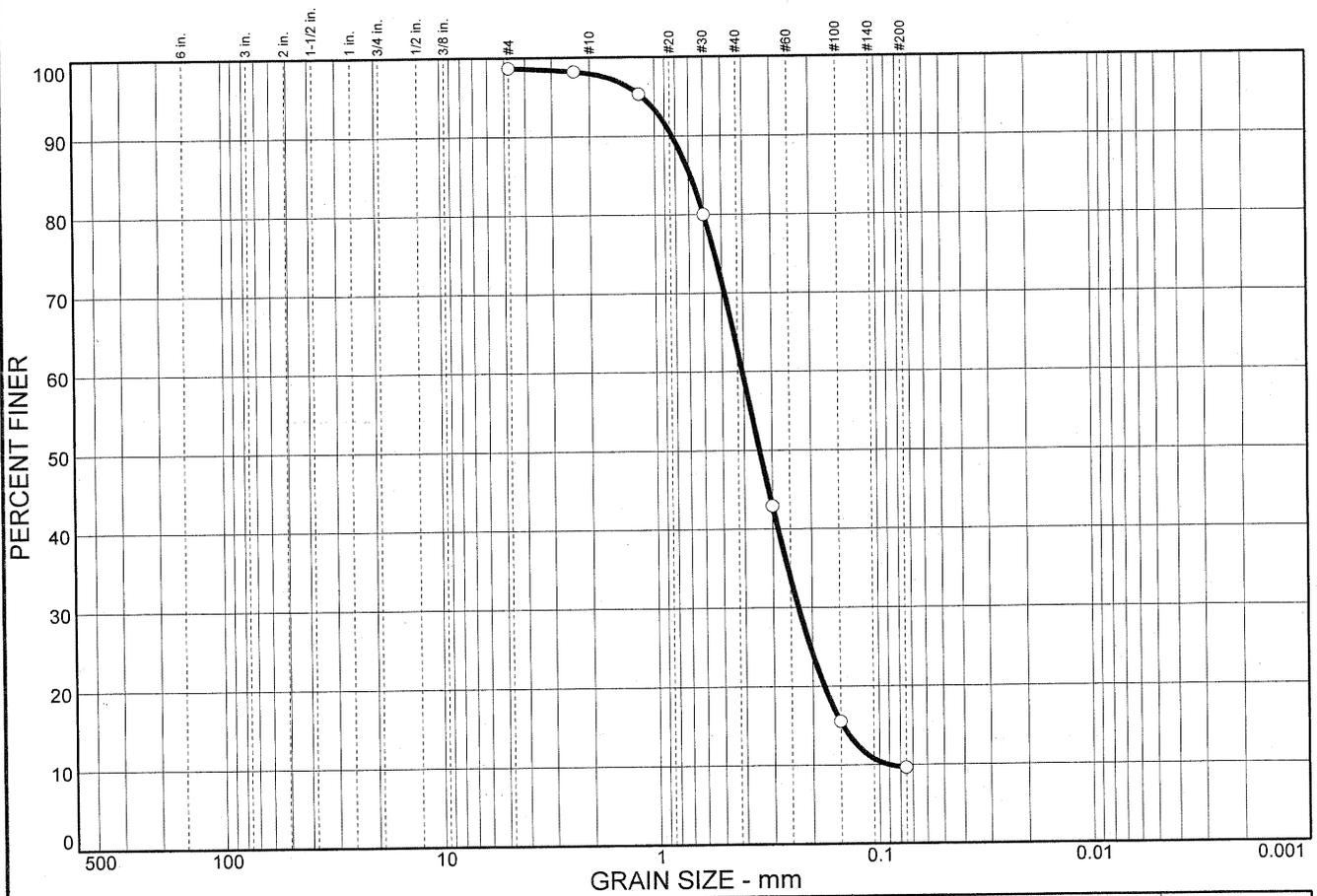
Sieve	Cumul. Wt. retained	Percent finer
# 4	5.23	98.7
# 8	7.32	98.2
# 16	19.00	95.3
# 30	81.27	80.0
# 50	232.02	42.9
# 100	343.80	15.5
# 200	367.46	9.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 89.1
% FINES = 9.6

D85= 0.69 D60= 0.41 D50= 0.34
D30= 0.23 D15= 0.15 D10= 0.09
Cc= 1.4594 Cu= 4.5039

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		89.1	9.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	98.7		
#8	98.2		
#16	95.3		
#30	80.0		
#50	42.9		
#100	15.5		
#200	9.6		

Soil Description

PL= **Atterberg Limits** LL= PI=

Coefficients

D₈₅= 0.688 D₆₀= 0.406 D₅₀= 0.341

D₃₀= 0.231 D₁₅= 0.147 D₁₀= 0.0900

C_u= 4.50 C_c= 1.46

USCS= **Classification** AASHTO=

Remarks

* (no specification provided)

Sample No.: 11B
Location:

Source of Sample:

Date: 12-11-08
Elev./Depth:

**LAW ENGINEERING
AND ENVIRONMENTAL
SERVICES, INC.**

Client:
Project: Battlefield Golf Club

Project No: 3552081210 task 05

Plate

12-9-08 6 GRAIN SILE / 200 WASH
 FLS CHESEPEAKE VA ~~BOFF~~ ~~COURSE~~
 BATTLEFIELD GOLF ~~COURSE~~ CLUB

12-10-08
 PMW

SAMP	DRY WT BEFORE	DRY WT AFTER WASH	
5B = 400.16 g		375.65	4-2.46 8-12.00 14-32.50 30-65.97 50-134.51 100-294.66 200-344.90 Pan-345.61
5A = 404.16 g		382.83	4-0.42 8-0.95 16-2.02 30-8.34 50-37.95 100-317.35 200-360.64 Pan-362.83
11B = 406.67		369.14	4-5.23 8-7.32 16-19.00 30-81.27 50-232.02 100-343.80 200-367.46 Pan-368.92
8B = 410.63		332.88	4-1.20 8-3.27 16-8.84 30-39.49 50-131.06 100-264.90 200-329.65 Pan-332.67
11A = 407.83		381.54	4-0.30 8-1.44 16-4.33 30-19.91 50-101.83 100-288.34 200-379.28 Pan-381.82
10B = 414.87		395.68	4-2.92 8-6.82 16-23.82 30-73.34 50-179.27 100-344.32 200-393.55 Pan-394.98
8A = 413.46		402.35	4-0.08 8-0.15 16-0.81 30-7.01 50-33.30 100-341.14 200-400.91 Pan-402.31
6A = 411.98		401.94	4-0.40 8-0.46 16-0.65 30-2.01 50-35.60 100-362.00 200-400.39 Pan-401.94 50471



MACTEC ENGINEERING AND CONSULTING, INC.
 21740 Beaunreade Circle, Suite 150
 Ashburn, VA 20147

SATURATED HYDRAULIC CONDUCTIVITY

ASTM D 5084

PROJECT NAME: Battlefield Golf Club
 PROJECT NUMBER: 3552-08-1210.03
 DATE: 03/06/09

Sample ID.	Sample Depth (ft)	Dry Density (pcf)	Initial Moisture (%)	Length (cm)	Diameter (cm)	Assumed Gs Solids	Head (cm)	β Coefficient	Consolidation Δ Volume (cu. cm)	After Test Moisture (%)	Quantity (cu. cm)	Elapsed Time (sec)	Temperature (C)
SB-1/COV-1	0.1-2.0	57.2	34.3	6.41	7.20	2.650	70.30	1.0	4.9	61.6	47.8	14,400	22.4
SB-1/ASH-1	17.0-19.0	101.9	19.5	6.44	7.14	2.650	70.34	1.0	5.6	21.7	44.3	18,000	22.3
SB-2/COV-2	0.0-2.0	62.6	38.4	6.39	7.16	2.650	70.34	1.0	5.4	53.2	49.3	12,600	22.2
SB-2/ASH-2	17.0-19.0	108.0	20.5	6.40	7.16	2.650	140.68	1.0	7.3	23.3	13.8	21,600	22.2
SB-3/ASH-3	16.5-18.5	57.2	46.6	6.41	7.19	2.650	70.34	1.0	6.7	62.0	48.0	10,800	22.3
TP-3/COV-3	0.0-2.0	109.7	16.6	6.43	7.34	2.650	175.85	1.0	8.1	17.9	15.3	28,800	23.3

Sample Number	Sample Depth (in.)	Area (sq. cm)	Hydraulic Gradient	Porosity (n)	Void Ratio (e)	Initial Saturation (%)	Final Saturation (%)	Correction Factor	Coefficient of Permeability K cm/sec	Visual Soil Description (manual Procedure)
SB-1/COV-1	0.1-2.0	40.7	11.0	65.4	1.891	48.1	86.3	0.946	7.0E-06	Very dark gray to black, sandy Silt (ML)
SB-1/ASH-1	17.0-19.0	40.0	10.9	38.3	0.623	82.9	92.3	0.948	5.3E-06	Very dark gray, sandy Silt (ML)
SB-2/COV-2	0.0-2.0	40.3	11.0	62.1	1.642	62.0	85.9	0.951	8.4E-06	Very dark gray, sandy Silt to silty Sand, contains organics (ML-SM)
SB-2/ASH-2	17.0-19.0	40.3	22.0	34.7	0.531	102.3	116.3	0.951	6.9E-07	Dark gray Clayey Sand, contains organics (SC)
SB-3/ASH-3	16.5-18.5	40.6	11.0	65.4	1.891	65.3	86.9	0.948	9.5E-06	Very dark gray to black, sandy Silt to silty Sand (ML-SM)
TP-3/COV-3	0.0-2.0	42.3	27.3	33.6	0.507	86.8	93.6	0.924	4.2E-07	Dark brown, sandy Clay, contains organics (CL)

NOTES: Permeability Test in Accordance with ASTM D 5084

MC, % by ASTM D 2216
 N/A = Not Available

Prepared by: PMF

Reviewed by: WBH



Materials Science Division

Attn.: Gregory B. Grose
MACTEC Engineering
21740 Beaumeade Circle, Suite 150
Ashburn, VA 20147

Phone: 571-252-2566 Fax: 703-858-1858

EMSL Case No.: 360801777rev020409
Sample(s) Received: 12/11/2008
Date of Analysis: 12/30/2008
Date Printed: 2/4/2009
Reported By: D. D'Ulisse

- Laboratory Report -
-Revised-

Material analysis with Reference Comparison

For

Project: Battlefield Golf Club 3552-08-1210

Analyzed by:



Dana D'Ulisse
Materials Scientist

February 4, 2009

Date

QA/QC :



Eugenia Mirica, Ph.D.
Senior Materials Scientist

February 4, 2009

Date



Attn.: Gregory B. Grose

MACTEC Engineering

21740 Beaumeade Circle, Suite 150

Ashburn, VA 20147

Phone: 571-252-2566 Fax: 703-858-1858

EMSL Case No.: 360801777rev020409

Sample(s) Received: 12/11/2008

Date of Analysis: 12/30/2008

Date Printed: 2/4/2009

Reported By: D. D'Ulisse

Conclusions:

- Samples "ASH-BGC-TP1" through "ASH-BGC-TP3" are primarily composed of ash.
- The samples display similar chemical composition and morphology with reference sample "ASH-CEC-STD". Material similar with reference sample "KILNDUST-GC-STD" was not identified in the samples within the limit of detection in samples "ASH-BGC-TP2" and "ASH-BGC-TP3". . Using a chemical finger print identified by XRF material similar to "KILNDUST-GC-STD" was detected in sample "ASH-BGC-TP1".

Procurement of Samples and Analytical Overview:

The samples for analysis (bulk) arrived at EMSL Analytical's corporate laboratory in Westmont, NJ on December 11, 2008. The package arrived in satisfactory condition with no evidence of damage to the contents. The samples reported herein have been analyzed using the following equipment and methodologies.

Methods & Equipment: Stereomicroscopy
 Polarized Light Microscopy (PLM)
 Scanning Electron Microscopy (SEM)
 Energy Dispersive X-Ray (EDX)
 X-Ray Diffraction (XRD)
 X-Ray Fluorescence (XRF)

Sample Preparation and Analysis:

The samples were placed under a heat lamp for several hours until dried. The dried samples were then ground into a powder with a mortar and pestle and placed through a sieve to insure the appropriate particle size for analysis.

For XRD analysis the fine powder was pressed into a sample holder taking care to produce a flat surface for analysis. The conditions for measurement were set to run full scan 2θ from 5 to 90 at 40 rpm. The data was analyzed using *Jade 6.0 XRD Pattern Processing* software.

For XRF analysis approximately 2 grams of the fine powder was placed into a three piece sample cell with a 6.0 micron polypropylene film. The samples were run under helium and analyzed with *Bruker AXS Spectra Plus* Software.



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EMSL Case No.: 360801777rev020409
Sample(s) Received: 12/11/2008
Date of Analysis: 12/30/2008
Date Printed: 2/4/2009
Reported By: D. D’Ulisse

Phone: 571-252-2566 Fax: 703-858-1858

Results and Discussion:

Sample ID	Analyte	Concentration(%)	LOD (%)	Comments
ASH-BGC-TP2	Ash	97	~1	Displays similar chemical composition and morphology with "ASH-CEC-STD"
	Kiln Dust	<LOD	~1	
	Other	3	~1	
ASH-BGC-TP3	Ash	98	~1	Displays similar chemical composition and morphology with "ASH-CEC-STD"
	Kiln Dust	<LOD	~1	
	Other	2	~1	
ASH-BGC-TP1	Ash	94	~1	Displays similar chemical composition and morphology with "ASH-CEC-STD" Small amounts with similar chemical compositions to "KILNDUST-GC-STD" Were detected
	Kiln Dust	2-4	~1	
	Other	1	~1	

- Reference sample "ASH-CEC-STD" is composed of aluminum silicates, quartz and calcite (as determined by XRD and light microscopy).
- Reference sample "KILNDUST-GC-STD" is composed of lime, calcite, portlandite and anhydrite (as determined by XRD and light microscopy).

Since both references have calcite in the elemental composition, the presence of calcite could not be used as fingerprint for identifying the presence of the references in the samples. Therefore, based on the elemental composition as determined by XRF, CuO (present in "KINDUST-GC-STD" but not in "ASH-CEC-STD") was used as a finger print for determining the presence of "KINDUST-GC-STD" in the samples instead. This assessment is based on the assumption that the samples and the references have uniform composition.

The ratio of the elements was used in determining the concentration of "KILNDUST-GC-STD" in the samples. Copper oxide is not detected in samples "ASH-BGC-TP2" and "ASH-BGC-TP3"; therefore, it is assumed that "KILNDUST-GC-STD" is not present in these samples.



107 Haddon Avenue, Westmont, NJ 08108
 Phone: (856) 858-4800

Attn.: Gregory B. Grose
MACTEC Engineering
 21740 Beaumeade Circle, Suite 150
 Ashburn, VA 20147

EMSL Case No.: 360801777rev020409
 Sample(s) Received: 12/11/2008
 Date of Analysis: 12/30/2008
 Date Printed: 2/4/2009
 Reported By: D. D'Ulisse

Phone: 571-252-2566 Fax: 703-858-1858

Elemental composition of the samples and the reference samples as determined by XRF (the concentrations were measured as elements and reported as oxides by stoichimetric calculation)

Sample ID	ASH-CEC-STD	KILNDUST-GC-STD	ASH-BGC-TP1	ASH-BGC-TP2	ASH-BGC-TP3
Oxide	Conc. (wt%)	Conc. (wt%)	Conc. (wt%)	Conc. (wt%)	Conc. (wt%)
SiO ₂	54.3	2.48	51.4	49.5	49.6
Al ₂ O ₃	27.4	1.34	26.9	26.9	26.4
Fe ₂ O ₃	7.67	0.729	9.14	9.36	7.99
K ₂ O	3.60	0.774	3.72	3.34	3.37
CaO	2.37	90.1	3.45	5.06	5.75
TiO ₂	1.59	0.119	1.72	1.67	1.77
MgO	1.20	0.823	1.29	1.25	1.16
SO ₃	0.521	3.22	0.885	1.39	1.66
Na ₂ O	0.501	--	0.492	0.573	0.969
P ₂ O ₅	0.194	--	0.241	0.229	0.338
BaO	0.180	--	0.217	0.244	--
SrO	0.110	0.0510	0.154	0.215	0.139
Cl	0.0820	0.412	0.0322	--	0.612
V ₂ O ₅	0.0561	--	0.0518	0.0595	0.0658
ZrO ₂	0.0459	--	0.0495	0.0475	0.0507
MnO	0.0353	--	0.0414	0.0409	0.0420
Cr ₂ O ₃	0.0289	--	0.0409	0.0398	0.0444
ZnO	0.0212	--	0.0247	0.0298	0.0295
Y ₂ O ₃	0.0185	--	0.0230	0.0258	0.0195
Rb ₂ O	0.0176	--	0.0204	0.0180	0.0188
Ga ₂ O ₃	0.00772	--	0.0110	0.0116	0.0112
CuO	--	0.289	0.0508	--	--
NiO	--	--	0.0135	--	--
Br	--	--	--	--	0.00538
C	Balance	Balance	Balance	Balance	Balance



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EMSL Case No.: 360801777rev020409
Sample(s) Received: 12/11/2008
Date of Analysis: 12/30/2008
Date Printed: 2/4/2009
Reported By: D. D'Ulisse

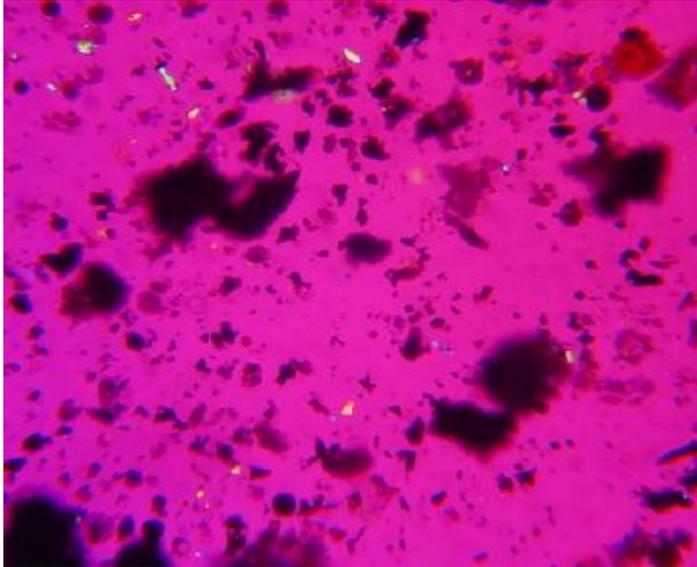
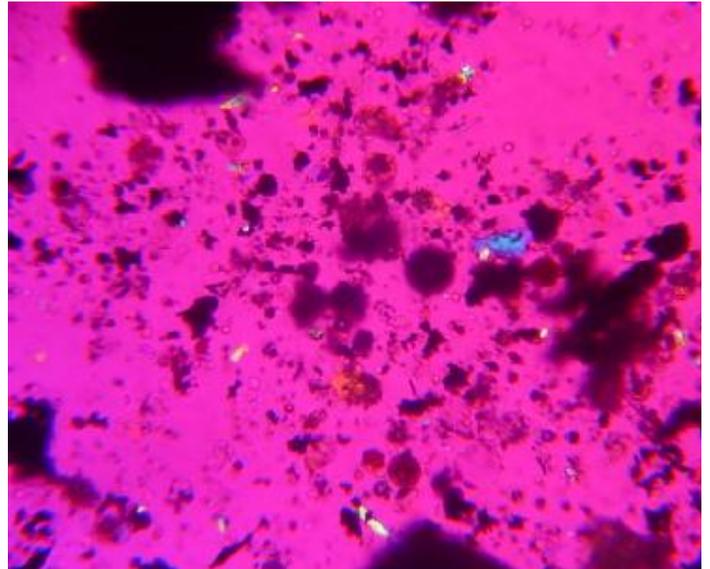
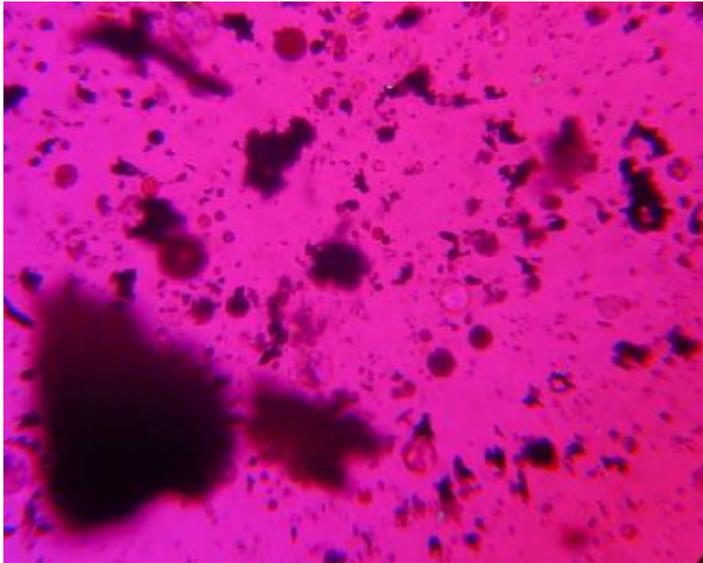


Figure 1: PLM images of samples “ASH-BGC-TP2” (top), “ASH-BGC-TP3” (bottom left) and “ASH-BGC-TP1” (bottom right) showing the samples to be similar with reference “ASH-CEC-STD” (see figure 2)





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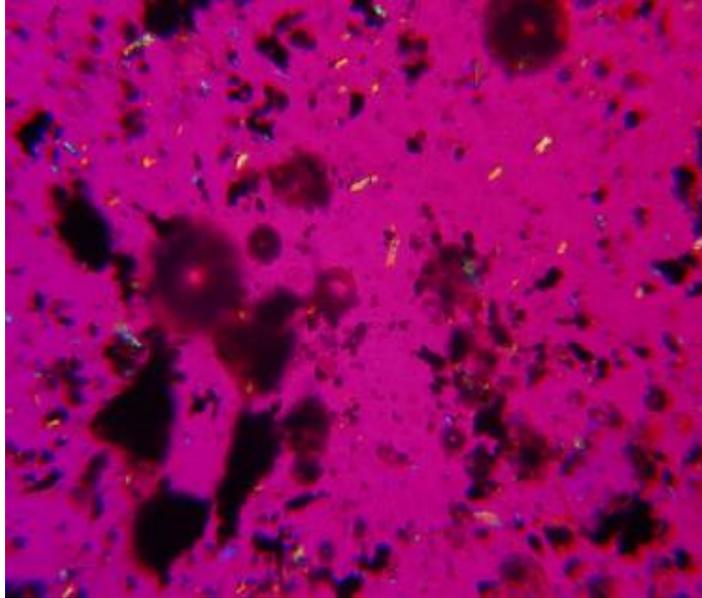
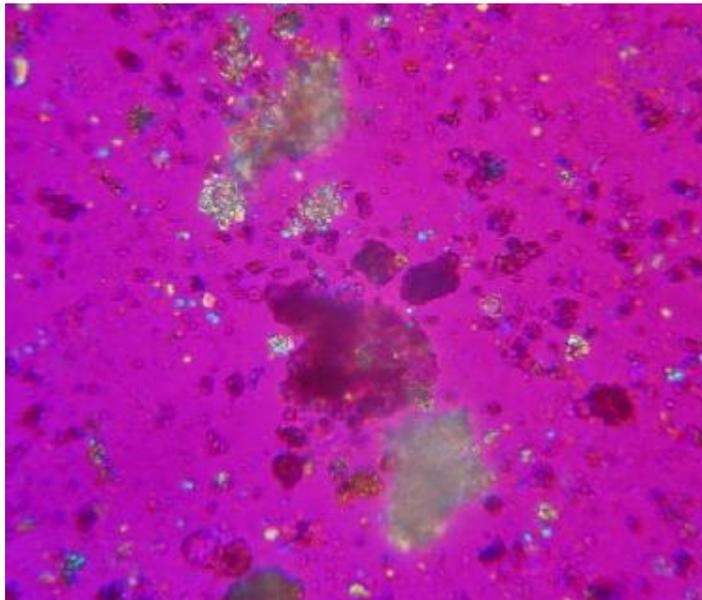


Figure 2: PLM images of the reference samples “ASH-CEC-STD” (top) and “KILNDUST-GC-STD” (bottom)





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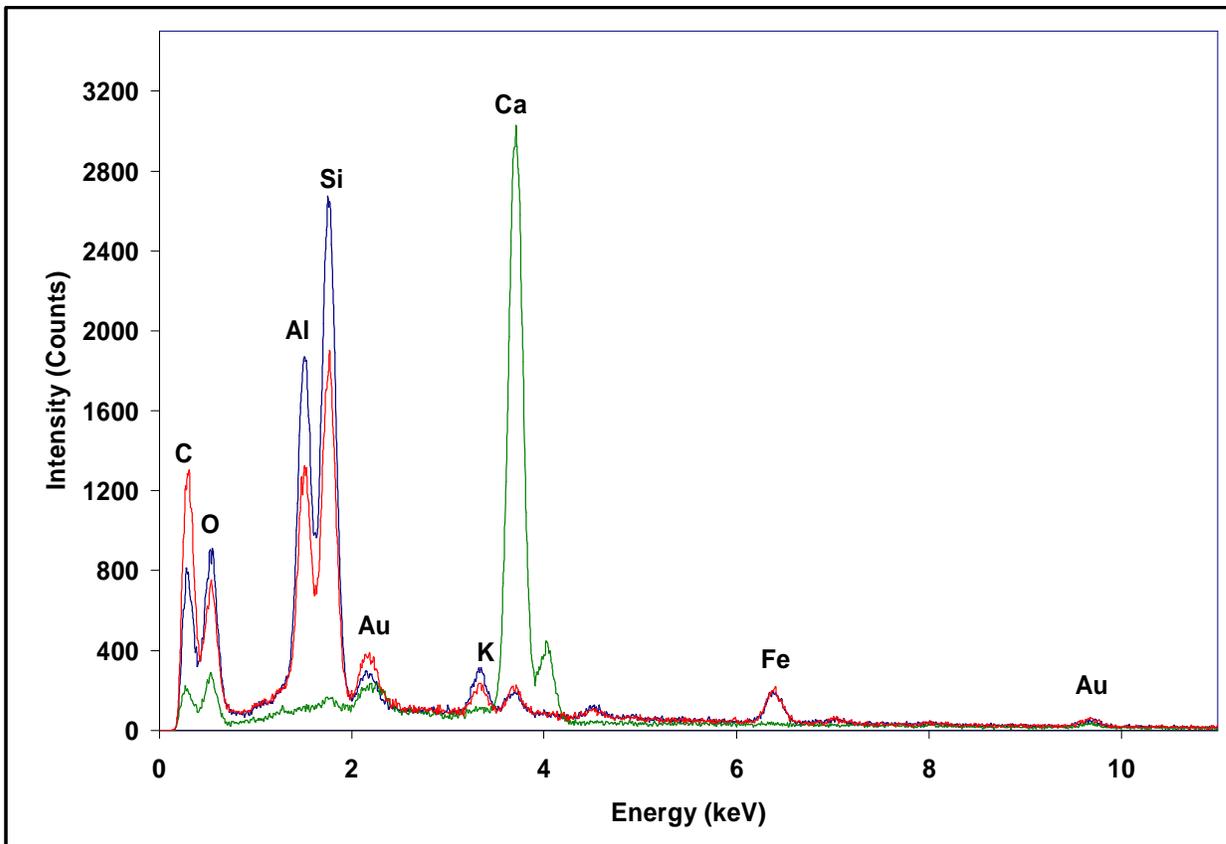


Figure 3: Comparative SEM/ EDX elemental spectra of sample “ASH-BGC-TP1” (red) against “ASH-CEC-STD” (blue) and “KILNDUST-GC-STD” (green). Sample “ASH-BGC-TP1” and “ASH-CEC-STD” display similar compositions.



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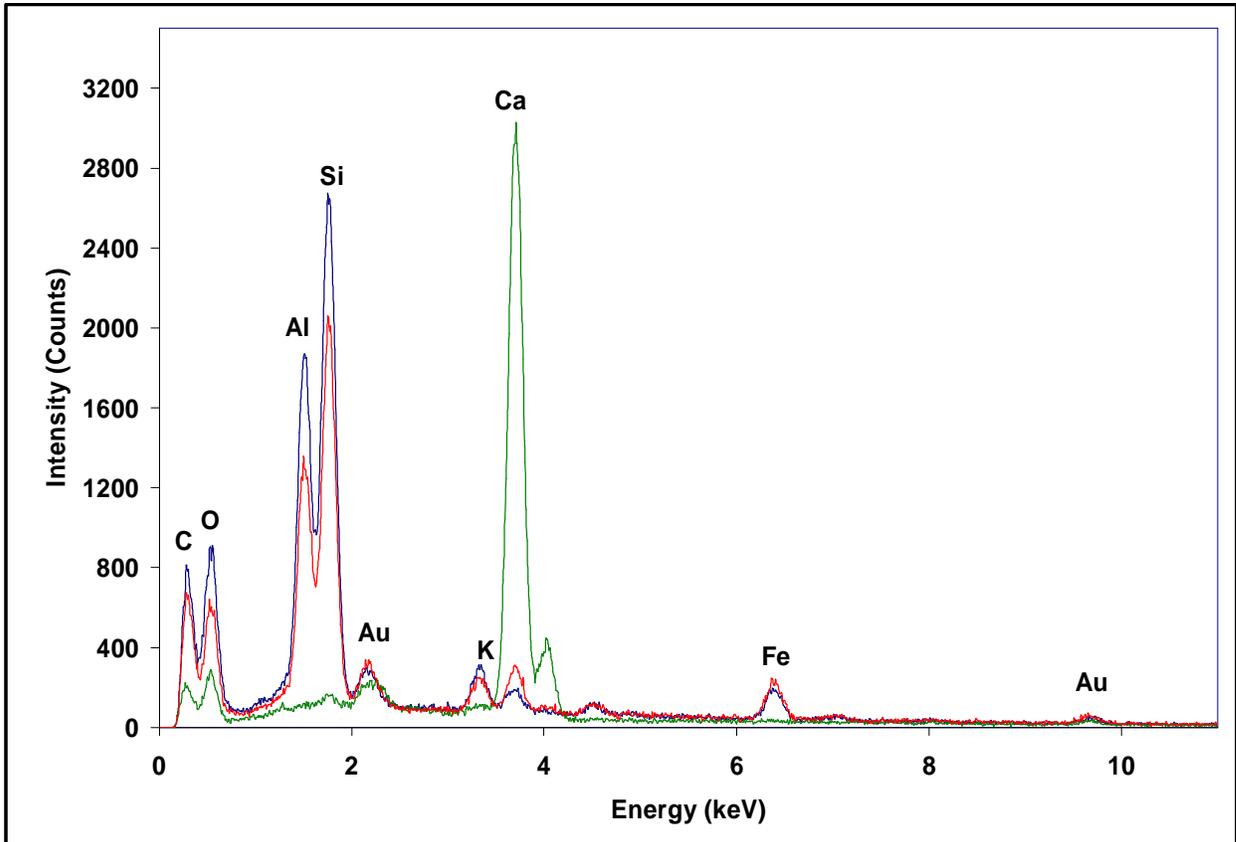


Figure 4: Comparative SEM/ EDX elemental spectra of sample “ASH-BGC-TP2” (red) against “ASH-CEC-STD” (blue) and “KILNDUST-GC-STD” (green). Sample “ASH-BGC-TP2” and “ASH-CEC-STD” display similar compositions.



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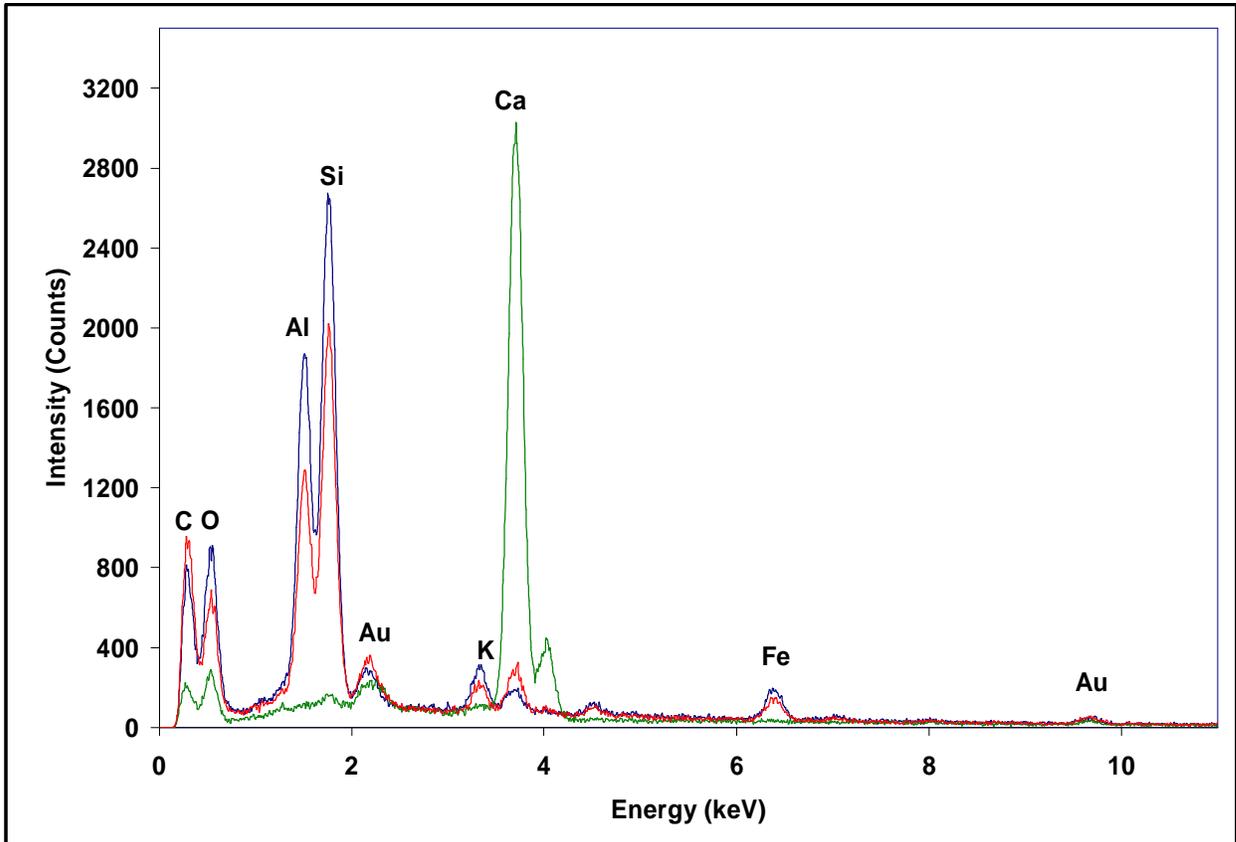


Figure 5: Comparative SEM/ EDX elemental spectra of sample “ASH-BGC-TP3” (red) against “ASH-CEC-STD” (blue) and “KILNDUST-GC-STD” (green). Sample “ASH-BGC-TP3” and “ASH-CEC-STD” display similar compositions.



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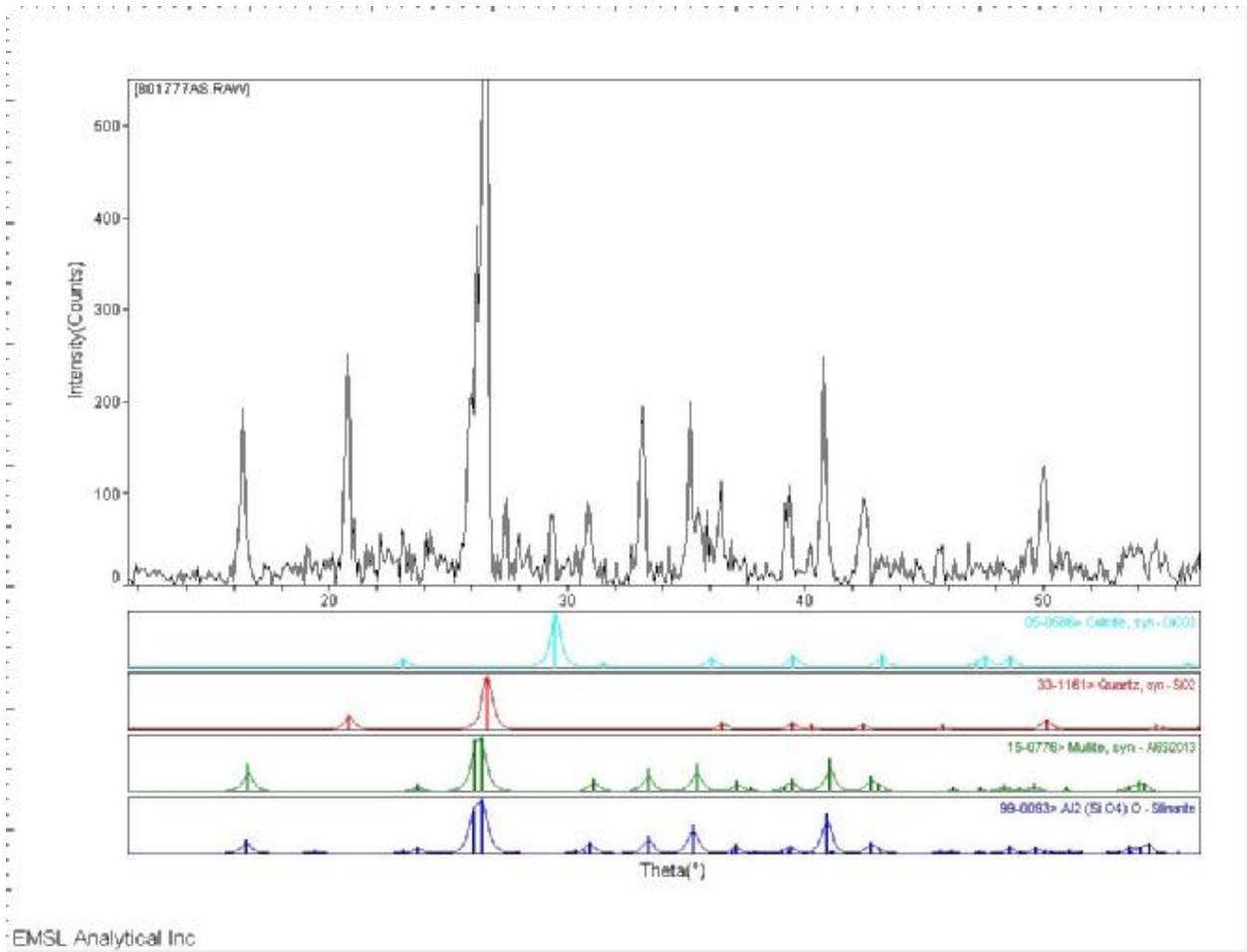


Figure 6: XRD pattern of “ASH-CEC-STD” showing the primary mineral components



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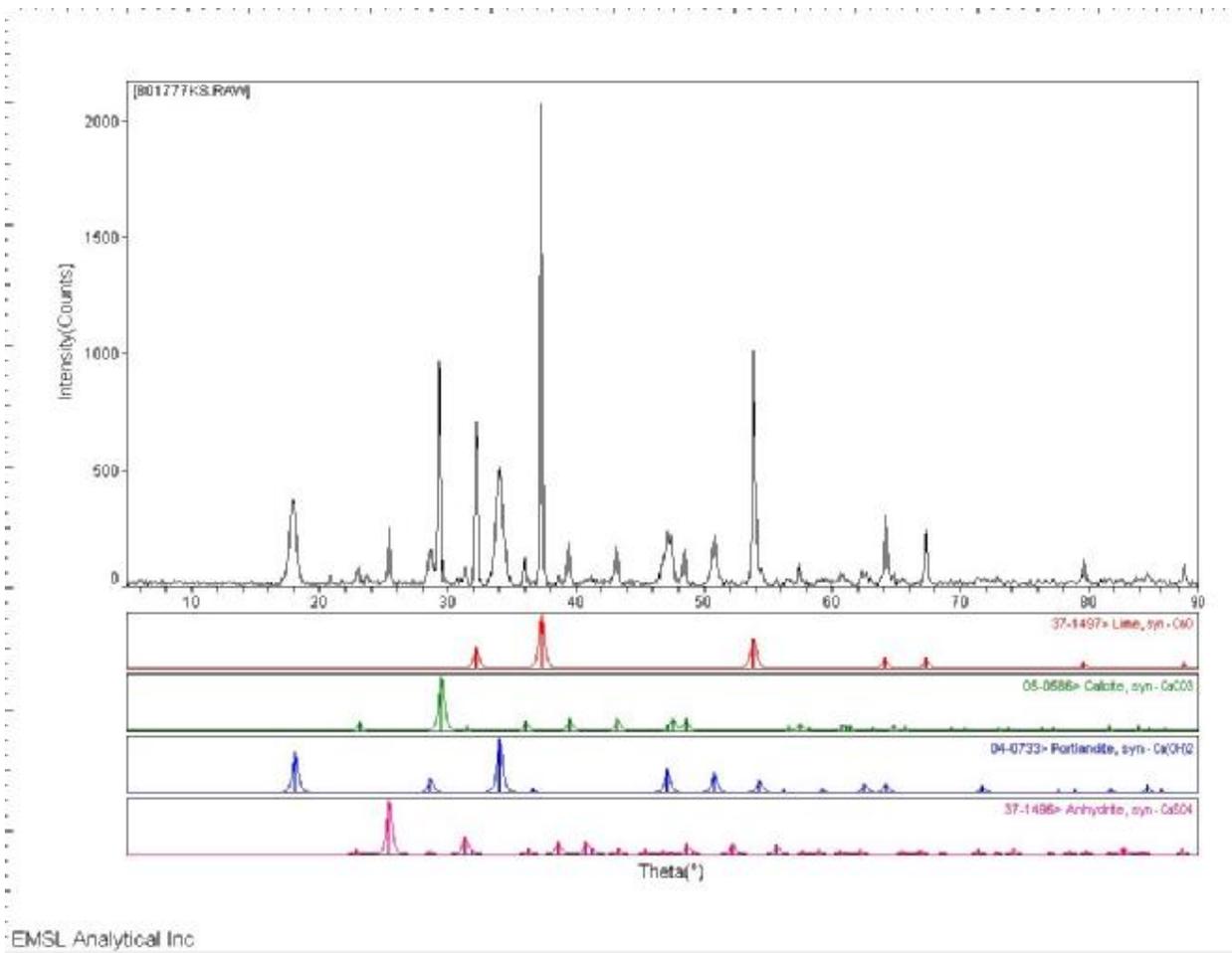


Figure 7: XRD pattern of "KILNDUST-GC-STD" showing the primary mineral components



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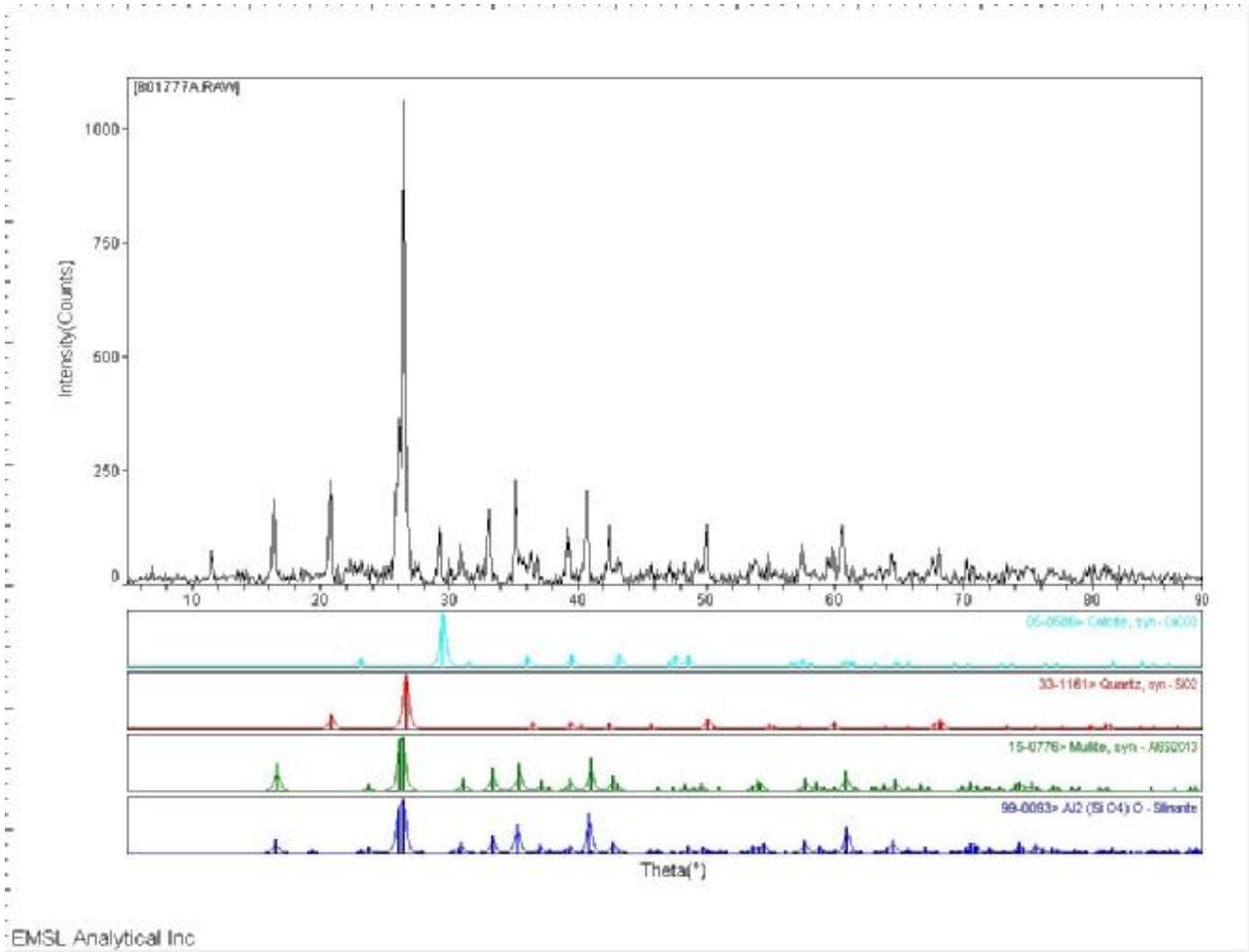


Figure 8: XRD pattern of “ASH-BGC-TP1” showing the primary mineral components



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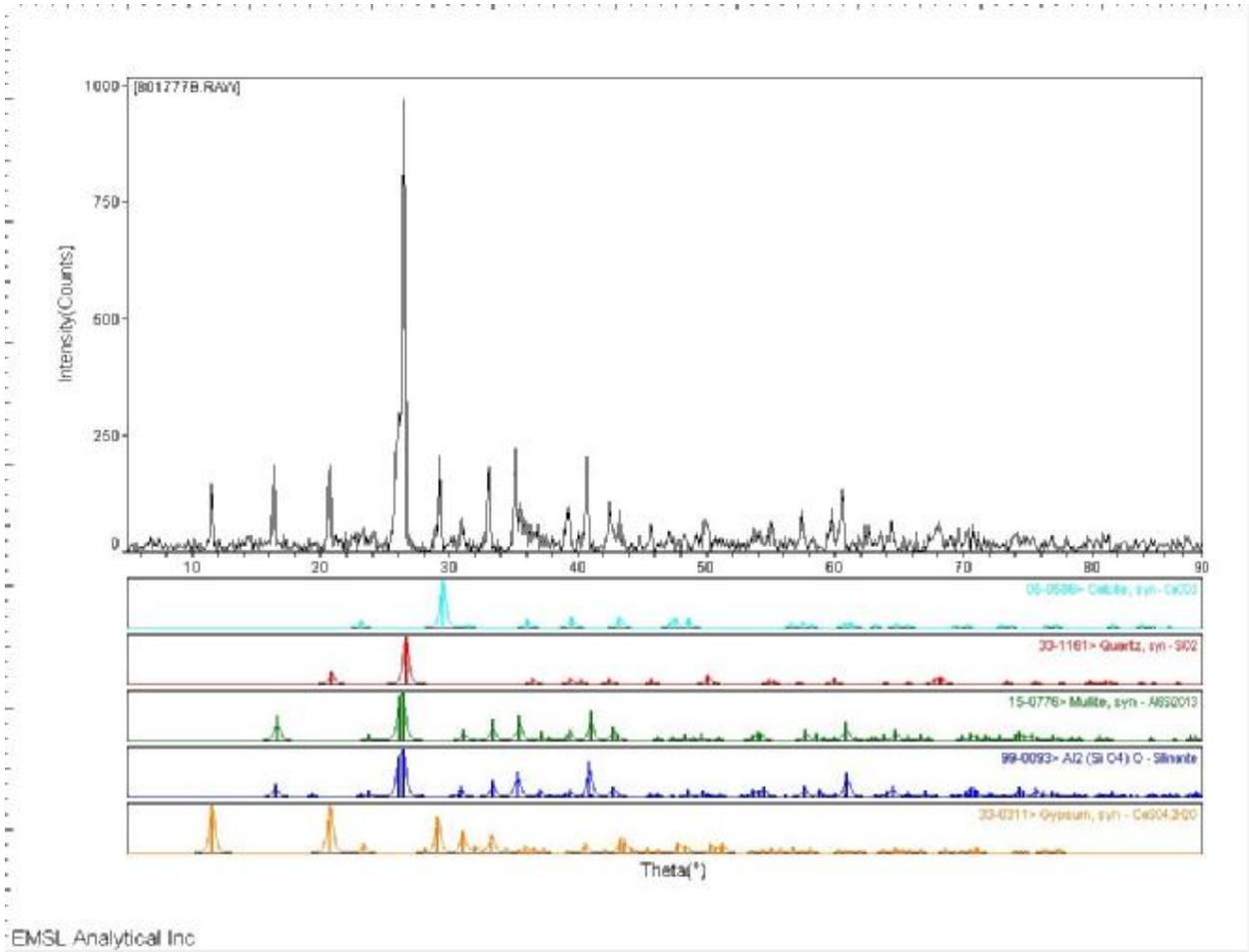


Figure 9: XRD pattern of “ASH-BGC-TP2” showing the primary mineral components



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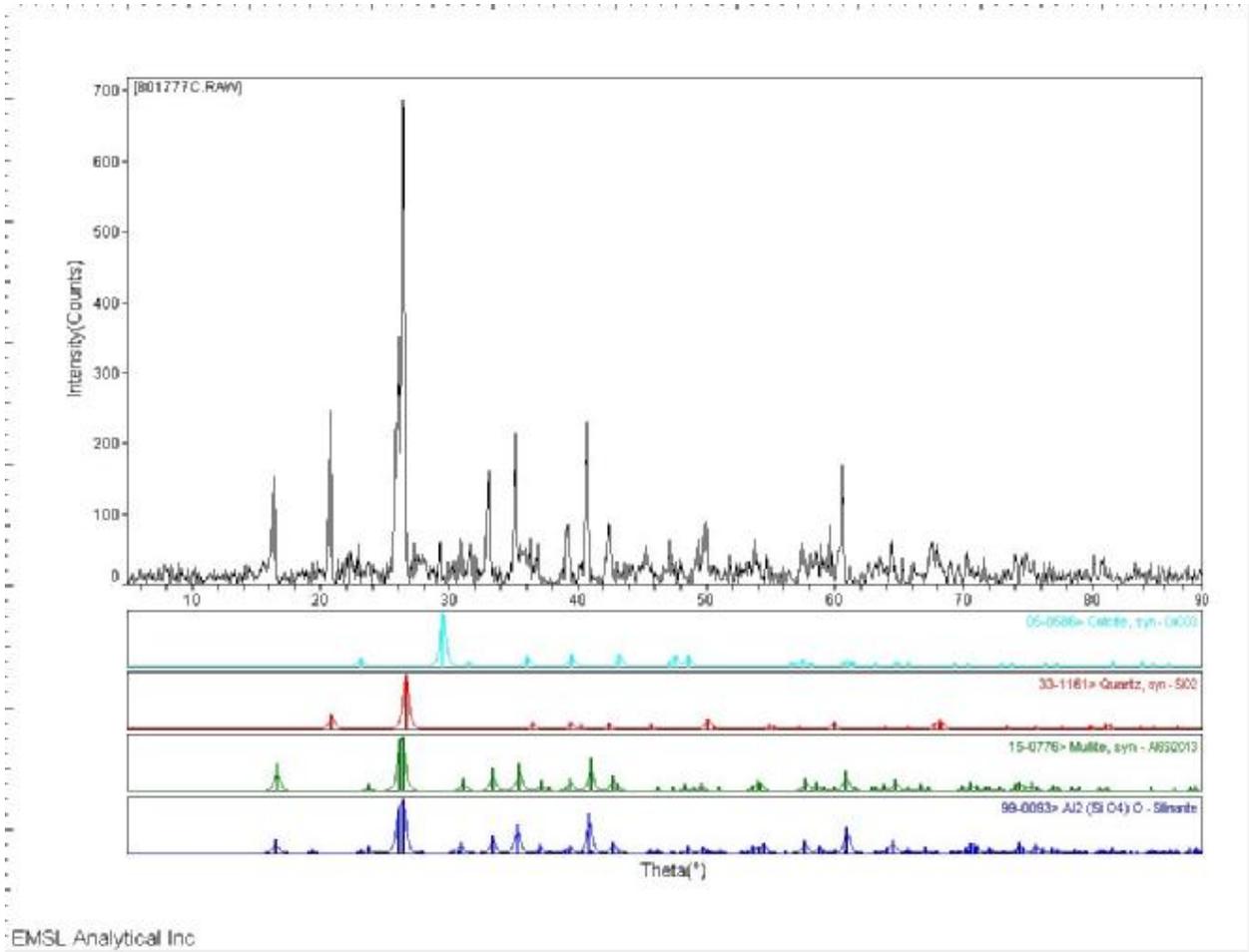


Figure 10: XRD pattern of “ASH-BGC-TP3” showing the primary mineral components



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Descriptions & Definitions:

None Detected (ND) denotes the absence of an analyte in the subsample analyzed. Trace levels of the analyte may be present in the sample below the limit of detection (LOD).

Limit of Detection (LOD): The minimum concentration that can be theoretically achieved for a given analytical procedure in the absence of matrix or sample processing effects. Particle analysis is limited to a single occurrence of an analyte particle in the sub-sample analyzed.

Concentrations for bulk samples are derived from Visual Area Estimation (VAE) unless otherwise noted. Air sample concentrations are calculated to particles per unit volume.

VAE technique estimates the relative projected area of a certain type of particulate from a mixture of particulate by comparison to data derived from analysis of calibration materials having similar texture and particulate content. Due to bi-dimensional nature of the measurements, in some cases the particle thickness could affect the results.

The results are obtained using the methods and sampling procedures as described in the report or as stated in the published standard methods, and are only guaranteed to the accuracy and precision consistent with the used methods and sampling procedures. Any change in methods and sampling procedure may generate substantially different results. EMSL Analytical, Inc. assumes no responsibility or liability for the manner in which the results are used or interpreted.