TOWN OF SUNSET BEACH NAVIGATION PROJECT

MAINTENANCE DREDGING OF SOUTH JINKS CREEK, THE BAY AREA, & THE FEEDER CHANNEL

SEDIMENT ANALYSIS

PAGE INDEX

PG 1 – COVER PAGE
PG 2 – ANALYSIS SUMMARY TABLE
PG 3 – SEDIMENT SAMPLING MAP
PG 4 - CHEMICAL ANALYSIS SUMMARY
APPENDIX A – SOUTH JINKS CREEK SEDIMENT ANALYSIS
APPENDIX B - BAY AREA SEDIMENT ANALYSIS
APPENDIX C – FEEDER CHANNEL SEDIMENT ANALYSIS
APPENDIX D – RECIPIENT BEACH SEDIMENT ANALYSIS
APPENDIX E - CHEMICAL ANALYSIS

PREPARED FOR:
TOWN OF SUNSET BEACH, NC
700 SUNSET BOULEVARD NORTH
SUNSET BEACH, NC 28468

PREPARED BY:
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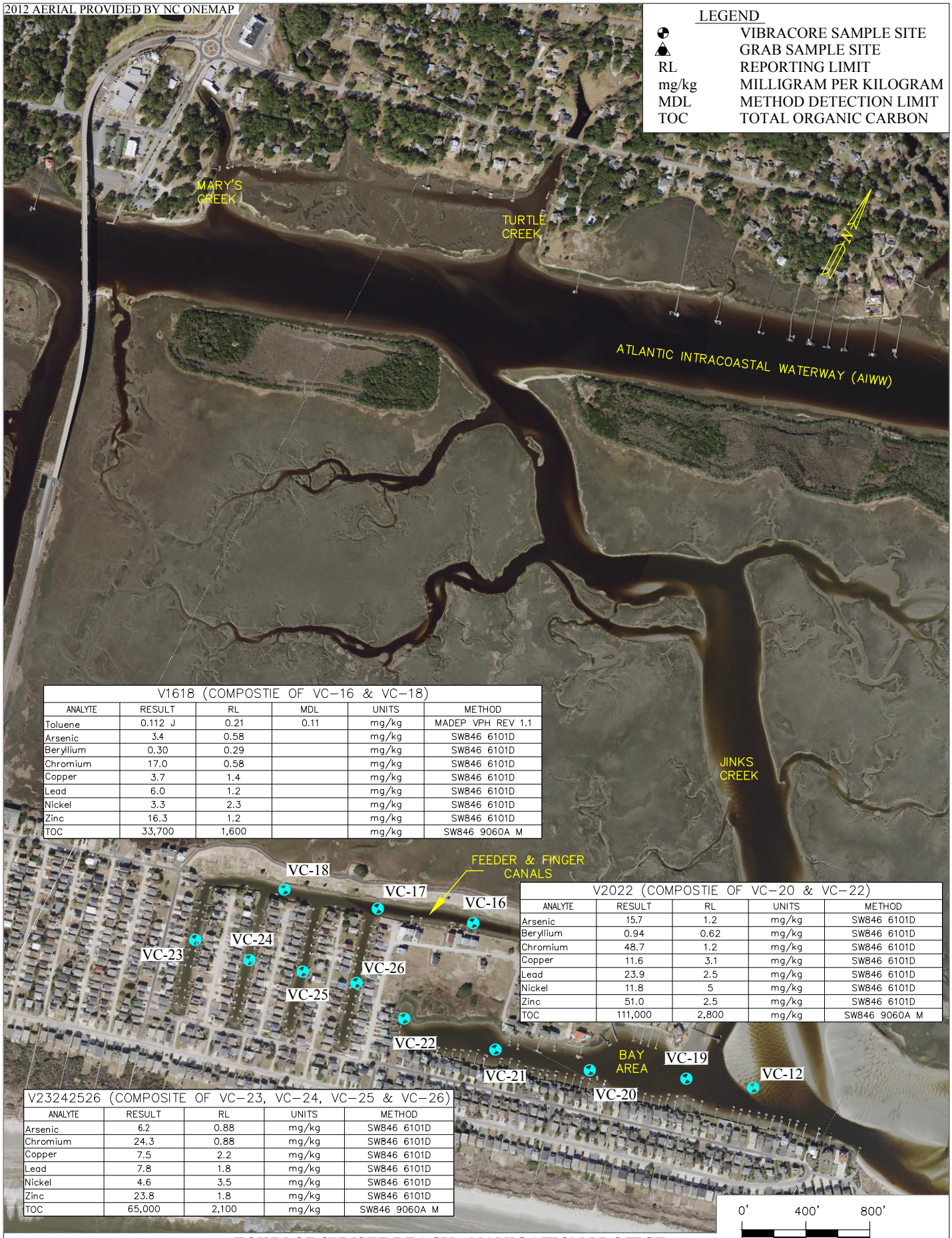
Town of Sunset Beach Navigation Project
Maintenance Dredging of South Jinks Creek, the Bay Area & the Feeder Channel
Sediment Analysis Summary Table

Work Area	Vibracores	Stations		Volume (CY)		Composite Summary (% By Wt. Passing)					Mean	Sorting	Skewness	Kurtosis	Calcium Content (%)
		Start	Stop	Compatible	Non-Compatible	% Fines	% Sand	% Granular	% Gravel	Total	(mm)	(σ)	(α)	(β)	
South Jinks Creek															
	SJ-01	51+00	52+50	4,311	-	1.42	98.56	0.02	0.00	100.00	0.16	0.41	-0.16	0.99	4%
	SJ-02	52+50	54+25	5,096	-	2.66	97.33	0.01	0.00	100.00	0.15	0.43	-0.01	0.84	6%
	SJ-03	54+25	56+75	7,985	-	2.05	97.94	0.01	0.00	100.00	0.17	0.41	-0.14	0.99	5%
	SJ-04	56+75	60+00	10,293	-	1.70	98.30	0.01	0.00	100.00	0.17	0.40	-0.11	0.88	5%
	SJ-05	60+00	62+50	5,720	-	0.57	99.40	0.02	0.00	100.00	0.17	0.42	-0.16	0.94	4%
	SJ-06	62+50	68+50	7,045	-	1.14	98.85	0.01	0.00	100.00	0.17	0.45	-0.14	0.89	4%
SubTotal		**51+00**	**68+50**	**40,450**	**0**	**1.60**	**98.38**	**0.01**	**0.00**	**100.00**	**0.17**	**0.42**	**-0.12**	**0.92**	**5%**
Feeder Canal															
	VC-23	Finger Canal A		-	2,600	40.44	59.48	0.09	0.00	100.00	0.10	1.31	0.31	0.24	-
	VC-24	Finger Canal B		-	2,800	66.80	33.10	0.10	0.00	100.00	0.03	2.38	-0.05	0.24	-
	VC-25	Finger Canal C		-	2,500	74.90	24.50	0.10	0.50	100.00	0.02	3.27	-0.05	0.24	-
	VC-26	Finger Canal D		-	2,800	78.20	21.80	0.00	0.00	100.00	0.01	3.75	-0.05	0.23	-
	VC-18	8+00	15+50	-	3,600	24.16	75.78	0.05	0.00	100.00	0.12	1.03	0.33	0.23	-
	VC-17	15+50	21+50	-	3,000	81.50	18.50	0.00	0.00	100.00	0.01	4.25	-0.04	0.27	-
	VC-16	21+50	27+50	-	3,600	54.10	45.60	0.20	0.10	100.00	0.06	1.69	-0.05	0.24	-
	VC-15	27+50	34+50	-	5,200	6.88	93.12	0.00	0.00	100.00	0.17	0.43	0.00	1.63	-
	VC-14	34+50	40+00	-	4,800	47.60	52.10	0.10	0.20	100.00	0.06	1.73	0.18	0.28	-
	VC-11	40+00	43+00	-	1,800	4.40	95.60	0.00	0.00	100.00	0.15	0.57	0.12	0.51	-
SubTotal		**0+00**	**43+00**	**0**	**32,700**	**45.77**	**54.08**	**0.07**	**0.08**	**100.00**	**0.02**	**0.59**	**0.02**	**0.08**	**-**
Bay Area															
	VC-22	-0+50	3+50	-	2,500	70.50	29.30	0.00	0.20	1.00	0.02	2.74	-0.05	0.24	-
	VC-21	3+50	9+50	-	2,100	94.39	5.51	0.10	0.00	1.00	0.00	14.14	0.00	0.34	-
	VC-20	9+50	15+50	-	4,400	93.90	6.00	0.10	0.00	1.00	0.00	14.78	0.00	0.33	-
	VC-19	15+50	20+50	-	6,400	86.40	13.20	0.10	0.30	1.00	0.00	4.18	0.03	0.39	-
	VC-12	20+50	22+00	-	500	2.40	97.60	0.00	0.00	1.00	0.17	0.42	0.00	1.27	-
SubTotal		**-0+50**	**22+00**	**0**	**15,900**	**84.39**	**15.38**	**0.08**	**0.15**	**100.00**	**0.01**	**8.08**	**0.00**	**0.37**	**-**
Total				**40,450**	**48,600**										

Notes:

1 Composite values determined by weighted averages.
2 Fine grained content(X < 0.0625 mm) must be within 10% of recipient beach for compatible material (navigation channel).
3 Granular content (2mm ≤ X < 4.76 mm) must be within 10% of recipient beach for compatible material.
4 Gravel content (4.76 mm ≤ X < 76 mm) must be within 5% of recipient beach for compatible material.
5 Calcium Carbonate of dredge material must be within 15% of recipient beach values.
6 Volumetric quantities are rounded for clarity.

TOWN OF SUNSET BEACH - NAVIGATION PROJECT
MAINTENANCE DREDGING OF SOUTH JINKS CREEK, THE BAY AREA & THE FEEDER CANAL
SEDIMENT SAMPLING MAP



V1618 (COMPOSTIE OF VC-16 & VC-18)

ANALYTE	RESULT	RL	MDL	UNITS	METHOD
Toluene	0.112 J	0.21	0.11	mg/kg	MADEP VPH REV 1.1
Arsenic	3.4	0.58		mg/kg	SW846 6101D
Beryllium	0.30	0.29		mg/kg	SW846 6101D
Chromium	17.0	0.58		mg/kg	SW846 6101D
Copper	3.7	1.4		mg/kg	SW846 6101D
Lead	6.0	1.2		mg/kg	SW846 6101D
Nickel	3.3	2.3		mg/kg	SW846 6101D
Zinc	16.3	1.2		mg/kg	SW846 6101D
TOC	33,700	1,600		mg/kg	SW846 9060A M

V2022 (COMPOSTIE OF VC-20 & VC-22)

ANALYTE	RESULT	RL	UNITS	METHOD
Arsenic	15.7	1.2	mg/kg	SW846 6101D
Beryllium	0.94	0.62	mg/kg	SW846 6101D
Chromium	48.7	1.2	mg/kg	SW846 6101D
Copper	11.6	3.1	mg/kg	SW846 6101D
Lead	23.9	2.5	mg/kg	SW846 6101D
Nickel	11.8	5	mg/kg	SW846 6101D
Zinc	51.0	2.5	mg/kg	SW846 6101D
TOC	111,000	2,800	mg/kg	SW846 9060A M

V23242526 (COMPOSITE OF VC-23, VC-24, VC-25 & VC-26)

ANALYTE	RESULT	RL	UNITS	METHOD
Arsenic	6.2	0.88	mg/kg	SW846 6101D
Chromium	24.3	0.88	mg/kg	SW846 6101D
Copper	7.5	2.2	mg/kg	SW846 6101D
Lead	7.8	1.8	mg/kg	SW846 6101D
Nickel	4.6	3.5	mg/kg	SW846 6101D
Zinc	23.8	1.8	mg/kg	SW846 6101D
TOC	65,000	2,100	mg/kg	SW846 9060A M

TOWN OF SUNSET BEACH - NAVIGATION PROJECT
MAINTENANCE DREDGING OF SOUTH JINKS CREEK, THE BAY AREA & THE FEEDER CHANNEL
CHEMICAL ANALYSIS SUMMARY

APPENDIX A

SOUTH JINKS CREEK SEDIMENT ANALYSIS

PG A1-1 ANALYSIS SUMMARY PLANVIEW
PG A1-2 ANALYSIS SUMMARY TABLE
PG A2-1 THRU A2-6 VIBRACORE COMPOSITES
PG A3-1 THRU PG A3-6 VIBRACORE LOGS
PG A4-1 THRU A4-36 GRADATION CURVES
PG A5-1 THRU A5-6 VIBRACORE PHOTOGRAPHS
PG A6-1 CALCITE COMPOSITE

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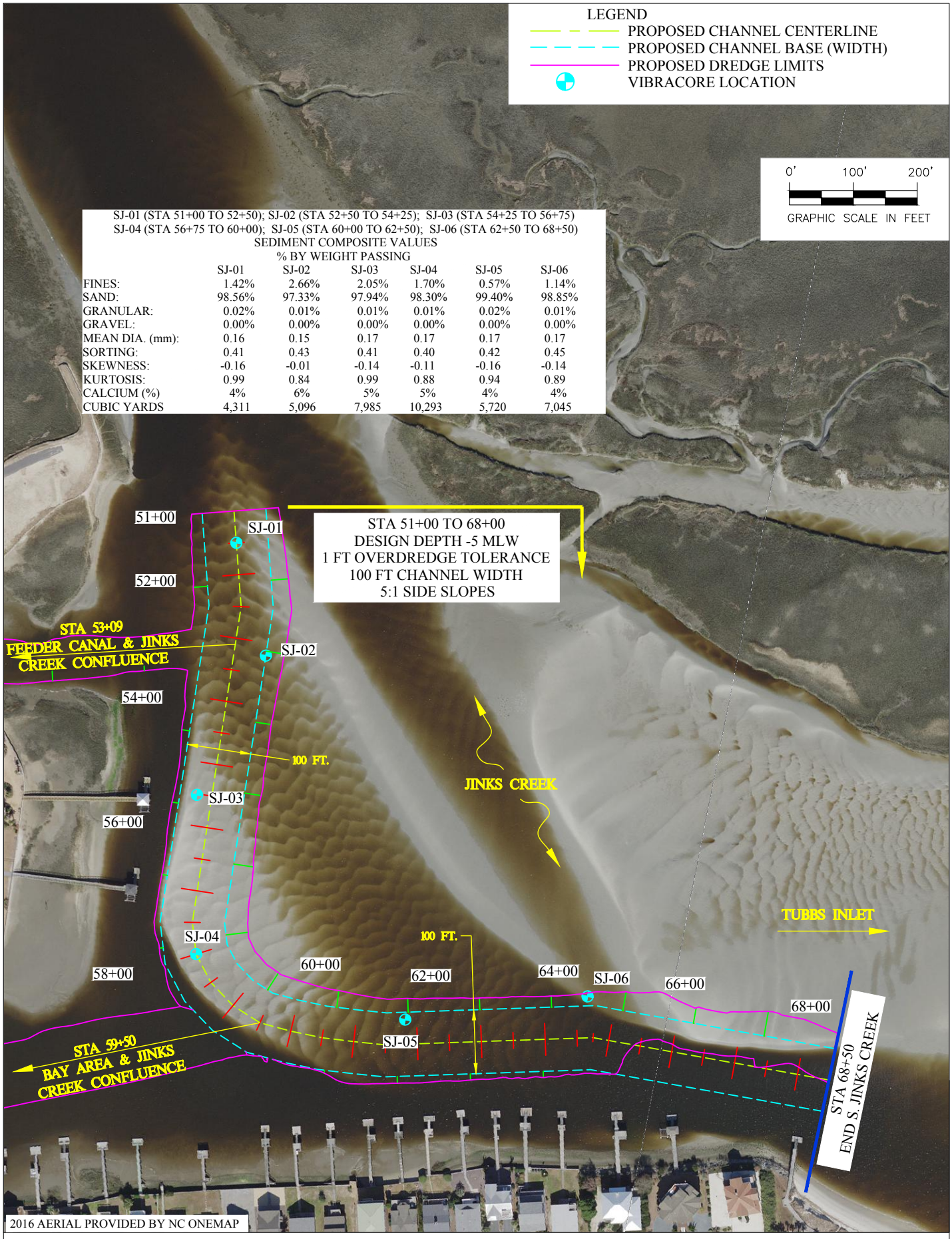

SJ-01 (STA 51+00 TO 52+50); SJ-02 (STA 52+50 TO 54+25); SJ-03 (STA 54+25 TO 56+75)
SJ-04 (STA 56+75 TO 60+00); SJ-05 (STA 60+00 TO 62+50); SJ-06 (STA 62+50 TO 68+50)
SEDIMENT COMPOSITE VALUES
% BY WEIGHT PASSING

	SJ-01	SJ-02	SJ-03	SJ-04	SJ-05	SJ-06
FINES:	1.42%	2.66%	2.05%	1.70%	0.57%	1.14%
SAND:	98.56%	97.33%	97.94%	98.30%	99.40%	98.85%
GRANULAR:	0.02%	0.01%	0.01%	0.01%	0.02%	0.01%
GRAVEL:	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEAN DIA. (mm):	0.16	0.15	0.17	0.17	0.17	0.17
SORTING:	0.41	0.43	0.41	0.40	0.42	0.45
SKEWNESS:	-0.16	-0.01	-0.14	-0.11	-0.16	-0.14
KURTOSIS:	0.99	0.84	0.99	0.88	0.94	0.89
CALCIUM (%)	4%	6%	5%	5%	4%	4%
CUBIC YARDS	4,311	5,096	7,985	10,293	5,720	7,045

TOWN OF SUNSET BEACH NAVIGATION PROJECT
SOUTH JINKS CREEK
SEDIMENT ANALYSIS SUMMARY
PLAN VIEW

A1-1

9269
Town of Sunset Beach
Navigation Project
South Jinks Creek Sediment Analysis Summary Table

Per 15A NCAC 07H.0312
Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

South Jinks Creek Vibracore Composite Summary Table

	Representative Stations		Representative Volume (CY)	Sample Elevation (FT-MLW)		Max. Disturbance (FT-MLW)	% Coverage of Disturbance Depth	Composite Summary (% By Wt. Passing)					Mean	Sorting	Skewness	Kurtosis	Calcium Content
Vibracore	Start	Stop		Top	Bottom			Fines	Sand	Granular	Gravel	Total	(mm)	(σ)	(α)	(β)	(%)
SJ-01	51+00	52+50	4,311	-0.01	-6	-6	100%	1.42	98.56	0.02	0.00	100.00	0.16	0.41	-0.16	0.99	4%
SJ-02	52+50	54+25	5,096	0.2	-6	-6	100%	2.66	97.33	0.01	0.00	100.00	0.15	0.43	-0.01	0.84	6%
SJ-03	54+25	56+75	7,985	0.3	-6	-6	100%	2.05	97.94	0.01	0.00	100.00	0.17	0.41	-0.14	0.99	5%
SJ-04	56+75	60+00	10,293	1.1	-6	-6	100%	1.70	98.30	0.01	0.00	100.00	0.17	0.40	-0.11	0.88	5%
SJ-05	60+00	62+50	5,720	-2.3	-6	-6	100%	0.57	99.40	0.02	0.00	100.00	0.17	0.42	-0.16	0.94	4%
SJ-06	62+50	68+50	7,045	0.5	-6	-6	100%	1.14	98.85	0.01	0.00	100.00	0.17	0.45	-0.14	0.89	4%

Area	Volume (CY)	Stations
Beach Compatible Material	40,450	51+00 - 68+50

1. Max. Disturbance Depth includes overdredge tolerance.
2. Volumetric quantities are rounded for clarity.

Recipient Beach Sediiment Analysis (Reference Only)

DCM Compatibility Summary

Transect	Gravel	Granular	Sand	<#230	Carbonate
0+00	0.07%	0.09%	98.61%	1.22%	2.00%
4+00	0.04%	0.06%	98.67%	1.23%	2.00%
8+00	0.04%	0.09%	98.39%	1.49%	2.00%
12+00	0.10%	2.44%	96.36%	1.11%	2.00%
16+00	0.11%	0.06%	98.70%	1.13%	2.00%
Grand Mean	**0.07%**	**0.55%**	**98.15%**	**1.23%**	**2.00%**

Native Summary

Transect	Median (mm)	Mean (mm)	D5 (mm)	D16 (mm)	D50 (mm)	D84 (mm)	D95 (mm)
0+00	0.18	0.17	0.29	0.22	0.18	0.14	0.11
4+00	0.17	0.17	0.27	0.22	0.17	0.13	0.11
8+00	0.18	0.18	0.29	0.23	0.18	0.14	0.11
12+00	0.17	0.17	0.30	0.23	0.17	0.13	0.11
16+00	0.17	0.17	0.29	0.23	0.17	0.13	0.11
Grand Mean (mm)	**0.17**	**0.17**	**0.29**	**0.23**	**0.17**	**0.13**	**0.11**
Grand Mean (φ)	**2.52**	**2.52**	**1.80**	**2.15**	**2.52**	**2.90**	**3.20**

Mφn	**2.525**
σφn	**0.420**

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VIBRACORE COMPOSITES

Sieve Designation Legend

Sieve #	3/4	5/8	7/16	5/16	3.5	4	5	7	10	14	18	25	35	45	60	80	120	170	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.50	-3.00	-2.50	-2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	3.75	4.00
Sieve Size (mm)	19.0	16	11	8	5.7	4.76	4	2.8	2	1.4	1	0.71	0.5	0.35	0.25	0.18	0.125	0.09	0.0743	0.0625

Town of Sunset Beach Navigation Project
South Jinks Creek Vibracore Composites
Design Depth -5 MLW (+1)

Vibracore SJ-1 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	SJ-1 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00	0.00		
-4.00	0.00	0.00		
-3.50	0.00	0.00		
-3.00	0.00	0.00		
-2.50	0.00	0.00		
-2.25	0.00	0.00		
-2.00	0.00	0.00		
-1.50	0.01	0.02		
-1.00	0.03	0.02		
-0.50	0.05	0.03		
0.00	0.13	0.07		
0.50	0.30	0.16		
1.00	0.77	0.31		
1.50	2.39	0.91		
2.00	12.21	5.34		
2.50	37.29	26.62		
3.00	87.02	84.47		
3.50	98.36	97.64		
3.75	98.83	98.28		
4.00	98.89	98.36		

SJ-1 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.00	100.00		
100.00	100.00		
100.00	100.00		
100.00	100.00		
100.00	100.00		
100.00	100.00		
100.00	100.00		
99.99	99.98		
99.97	99.98		
99.95	99.97		
99.87	99.93		
99.70	99.84		
99.23	99.69		
97.61	99.09		
87.79	94.66		
62.71	73.38		
12.98	15.53		
1.64	2.36		
1.17	1.72		
1.11	1.64		

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.02	99.98
0.02	99.98
0.04	99.96
0.10	99.90
0.22	99.78
0.50	99.50
1.53	98.47
8.22	91.78
31.09	68.91
85.54	14.46
97.94	2.06
98.51	1.49
98.58	1.42

SJ-1	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS	Munsell Color
1	-0.01	-2.1	2.09	41.88%	SP	10Y 6/2
2	-3.1	-6	2.9	58.12%	SP	5Y 6/1
Composite	**-0.01**	**-6**	**4.99**	**100.00%**		

SJ-1	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.63	2.08	2.25	2.63	2.88	2.97	3.35
2	1.96	2.25	2.46	2.70	2.92	3.00	3.40
Composite	**1.76**	**2.17**	**2.37**	**2.67**	**2.90**	**2.99**	**3.38**

SJ-1					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.63	0.16	2.56	0.17	0.45	-0.16	0.92
2	2.70	0.15	2.65	0.16	0.37	-0.14	0.93
Composite	**2.67**	**0.16**	**2.61**	**0.16**	**0.41**	**-0.16**	**0.99**

Calcium Carbonate Content
Composite: 4%

* Twenhofel & Tyler (1941)

SJ-1 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	1.11	98.86	0.03	0.00	100%
2.00	1.64	98.34	0.02	0.00	100%
Composite	**1.42**	**98.56**	**0.02**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Notes:
1. Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
2. Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
3. Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_{\Phi}]$ (Dean & Dalrymple, 2002).
4. Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi}\}$ (Dean & Dalrymple, 2002).
5. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.
6. Moment statistics determined by linear interpretation of composite properties.

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Sieve Designation Legend

Sieve #	3/4	5/8	7/16	5/16	3.5	4	5	7	10	14	18	25	35	45	60	80	120	170	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.50	-3.00	-2.50	-2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	3.75	4.00
Sieve Size (mm)	19.0	16	11	8	5.7	4.76	4	2.8	2	1.4	1	0.71	0.5	0.35	0.25	0.18	0.125	0.09	0.0743	0.0625

Town of Sunset Beach Navigation Project
South Jinks Creek Vibracore Composites
Design Depth -5 MLW (+1)

Vibracore SJ-2 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	SJ-2 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00	0.00	0.00	
-4.00	0.00	0.00	0.00	
-3.50	0.00	0.00	0.00	
-3.00	0.00	0.00	0.00	
-2.50	0.00	0.00	0.00	
-2.25	0.00	0.00	0.00	
-2.00	0.00	0.00	0.00	
-1.50	0.00	0.00	0.00	
-1.00	0.01	0.00	0.03	
-0.50	0.04	0.00	0.05	
0.00	0.11	0.02	0.17	
0.50	0.27	0.05	0.37	
1.00	0.70	0.12	0.89	
1.50	2.07	0.28	2.05	
2.00	9.20	1.69	5.54	
2.50	27.59	15.74	19.00	
3.00	81.63	77.22	68.06	
3.50	96.47	96.75	91.95	
3.75	97.42	97.96	94.18	
4.00	97.59	98.11	94.61	

SJ-2 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
99.99	100.00	99.97	
99.96	100.00	99.95	
99.89	99.98	99.83	
99.73	99.95	99.63	
99.30	99.88	99.11	
97.93	99.72	97.95	
90.80	98.31	94.46	
72.41	84.26	81.00	
18.37	22.78	31.94	
3.53	3.25	8.05	
2.58	2.04	5.82	
2.41	1.89	5.39	

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.01	99.99
0.03	99.97
0.09	99.91
0.20	99.80
0.51	99.49
1.39	98.61
5.81	94.19
21.82	78.18
77.92	22.08
95.89	4.11
97.13	2.87
97.34	2.66

SJ-2	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS	Munsell Color
1	0.2	-2.3	2.5	47.17%	SP	5Y 6/2
2	-2.8	-4.8	2	37.74%	SP	5Y 5/2
3	-5.2	-6	0.8	15.09%	SP-SM	5Y 4/1
Composite	**0.2**	**-6**	**5.3**	**100.00%**		

SJ-2	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.71	2.18	2.43	2.71	2.94	3.08	3.45
2	2.12	2.50	2.58	2.78	2.98	3.17	3.46
3	1.92	2.39	2.56	2.82	3.15	3.33	4.23
Composite	**1.91**	**2.32**	**2.53**	**2.75**	**2.97**	**3.17**	**3.48**

SJ-2 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.71	0.15	2.66	0.16	0.45	-0.11	0.95
2	2.78	0.15	2.82	0.14	0.34	0.12	0.99
3	2.82	0.14	2.85	0.14	0.47	0.06	1.44
Composite	**2.75**	**0.15**	**2.75**	**0.15**	**0.43**	**-0.01**	**0.84**

Calcium Carbonate Content
Composite: 5.9%

* Twenhofel & Tyler (1941)

SJ-2 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	2.41	97.58	0.01	0.00	100%
2.00	1.89	98.11	0.00	0.00	100%
3.00	5.39	94.58	0.03	0.00	100%
Composite	**2.66**	**97.33**	**0.01**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Notes:
1. Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
2. Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
3. Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_\Phi]$ (Dean & Dalrymple, 2002).
4. Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_\Phi\}$ (Dean & Dalrymple, 2002).
5. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.
6. Moment statistics determined by linear interpretation of composite properties.

moffatt & nichol

Sieve Designation Legend

Sieve #	3/4	5/8	7/16	5/16	3.5	4	5	7	10	14	18	25	35	45	60	80	120	170	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.50	-3.00	-2.50	-2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	3.75	4.00
Sieve Size (mm)	19.0	16	11	8	5.7	4.76	4	2.8	2	1.4	1	0.71	0.5	0.35	0.25	0.18	0.125	0.09	0.0743	0.0625

Town of Sunset Beach Navigation Project
South Jinks Creek Vibracore Composites
Design Depth -5 MLW (+1)

Vibracore SJ-3 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	SJ-3 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00	0.00	0.00	
-4.00	0.00	0.00	0.00	
-3.50	0.00	0.00	0.00	
-3.00	0.00	0.00	0.00	
-2.50	0.00	0.00	0.00	
-2.25	0.00	0.00	0.00	
-2.00	0.00	0.00	0.00	
-1.50	0.00	0.00	0.00	
-1.00	0.01	0.01	0.02	
-0.50	0.03	0.05	0.13	
0.00	0.05	0.12	0.20	
0.50	0.16	0.21	0.61	
1.00	0.46	0.37	1.76	
1.50	1.39	0.88	4.96	
2.00	8.27	5.57	14.59	
2.50	42.47	32.58	37.54	
3.00	93.42	86.44	88.84	
3.50	98.98	96.21	98.05	
3.75	99.19	96.82	98.43	
4.00	99.22	96.92	98.46	

SJ-3 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
99.99	99.99	99.98	
99.97	99.95	99.87	
99.95	99.88	99.80	
99.84	99.79	99.39	
99.54	99.63	98.24	
98.61	99.12	95.04	
91.73	94.43	85.41	
57.53	67.42	62.46	
6.58	13.56	11.16	
1.02	3.79	1.95	
0.81	3.18	1.57	
0.78	3.08	1.54	

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.01	99.99
0.06	99.94
0.12	99.88
0.29	99.71
0.74	99.26
2.03	97.97
8.55	91.45
36.60	63.40
89.00	11.00
97.45	2.55
97.89	2.11
97.95	2.05

SJ-3	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS	Munsell Color
1	0.3	-1.2	1.5	28.30%	SP	5Y 6/1
2	-1.7	-4.2	2.5	47.17%	SP	5Y 6/1
3	-4.7	-6	1.3	24.53%	SP	5Y 7/1
Composite	**0.3**	**-6**	**5.3**	**100.00%**		

SJ-3	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.76	2.11	2.24	2.57	2.82	2.91	3.14
2	1.94	2.19	2.36	2.66	2.89	2.98	3.44
3	1.50	2.03	2.23	2.62	2.87	2.95	3.33
Composite	**1.73**	**2.13**	**2.29**	**2.63**	**2.87**	**2.95**	**3.36**

SJ-3 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.57	0.17	2.53	0.17	0.40	-0.11	0.74
2	2.66	0.16	2.61	0.16	0.39	-0.13	0.91
3	2.62	0.16	2.53	0.17	0.46	-0.19	0.99
Composite	**2.63**	**0.16**	**2.57**	**0.17**	**0.41**	**-0.14**	**0.99**

Calcium Carbonate Content
Composite: 4.5%

* Twenhofel & Tyler (1941)

SJ-3 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	0.78	99.21	0.01	0.00	100%
2.00	3.08	96.91	0.01	0.00	100%
3.00	1.54	98.44	0.02	0.00	100%
Composite	**2.05**	**97.94**	**0.01**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Notes:
1. Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
2. Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
3. Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_\Phi]$ (Dean & Dalrymple, 2002).
4. Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_\Phi\}$ (Dean & Dalrymple, 2002).
5. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.
6. Moment statistics determined by linear interpretation of composite properties.

moffatt & nichol

Sieve Designation Legend

Sieve #	3/4	5/8	7/16	5/16	3.5	4	5	7	10	14	18	25	35	45	60	80	120	170	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.50	-3.00	-2.50	-2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	3.75	4.00
Sieve Size (mm)	19.0	16	11	8	5.7	4.76	4	2.8	2	1.4	1	0.71	0.5	0.35	0.25	0.18	0.125	0.09	0.0743	0.0625

Town of Sunset Beach Navigation Project
South Jinks Creek Vibracore Composites
Design Depth -5 MLW (+1)

Vibracore SJ-4 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	SJ-4 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00	0.00	0.00	
-4.00	0.00	0.00	0.00	
-3.50	0.00	0.00	0.00	
-3.00	0.00	0.00	0.00	
-2.50	0.00	0.00	0.00	
-2.25	0.00	0.00	0.00	
-2.00	0.00	0.00	0.00	
-1.50	0.00	0.00	0.00	
-1.00	0.00	0.02	0.00	
-0.50	0.04	0.06	0.02	
0.00	0.13	0.10	0.02	
0.50	0.37	0.21	0.07	
1.00	0.77	0.44	0.16	
1.50	1.73	1.05	0.48	
2.00	9.13	7.21	4.08	
2.50	39.64	40.38	36.68	
3.00	89.99	87.72	90.87	
3.50	97.75	96.30	98.39	
3.75	98.19	97.75	98.75	
4.00	98.26	97.85	98.78	

SJ-4 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	99.98	100.00	
99.96	99.94	99.98	
99.87	99.90	99.98	
99.63	99.79	99.93	
99.23	99.56	99.84	
98.27	98.95	99.52	
90.87	92.79	95.92	
60.36	59.62	63.32	
10.01	12.28	9.13	
2.25	3.70	1.61	
1.81	2.25	1.25	
1.74	2.15	1.22	

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.01	99.99
0.04	99.96
0.09	99.91
0.23	99.77
0.48	99.52
1.13	98.87
6.94	93.06
38.92	61.08
89.58	10.42
97.51	2.49
98.23	1.77
98.30	1.70

SJ-4	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS	Munsell Color
1	1.1	-1.4	2.5	37.88%	SP	10Y 6/1
2	-1.9	-3.9	2	30.30%	SP	5Y 5/2
3	-3.9	-6	2.1	31.82%	SP	5GY 5/2
Composite	**1.1**	**-6**	**6.6**	**100.00%**		

SJ-4	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.72	2.11	2.26	2.60	2.85	2.94	3.32
2	1.82	2.13	2.27	2.60	2.87	2.96	3.42
3	2.01	2.18	2.32	2.62	2.85	2.94	3.27
Composite	**1.83**	**2.14**	**2.28**	**2.61**	**2.86**	**2.94**	**3.34**

SJ-4 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.60	0.16	2.55	0.17	0.41	-0.12	0.93
2	2.60	0.16	2.56	0.17	0.41	-0.09	0.94
3	2.62	0.16	2.58	0.17	0.38	-0.11	0.67
Composite	**2.61**	**0.16**	**2.57**	**0.17**	**0.40**	**-0.11**	**0.88**

Calcium Carbonate Content
Composite: 4.8%

* Twenhofel & Tyler (1941)

SJ-4 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	1.74	98.26	0.00	0.00	100%
2.00	2.15	97.83	0.02	0.00	100%
3.00	1.22	98.78	0.00	0.00	100%
Composite	**1.70**	**98.30**	**0.01**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Notes:
1. Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
2. Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
3. Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_\Phi]$ (Dean & Dalrymple, 2002).
4. Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_\Phi\}$ (Dean & Dalrymple, 2002).
5. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.
6. Moment statistics determined by linear interpretation of composite properties.

Sieve Designation Legend

Sieve #	3/4	5/8	7/16	5/16	3.5	4	5	7	10	14	18	25	35	45	60	80	120	170	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.50	-3.00	-2.50	-2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	3.75	4.00
Sieve Size (mm)	19.0	16	11	8	5.7	4.76	4	2.8	2	1.4	1	0.71	0.5	0.35	0.25	0.18	0.125	0.09	0.0743	0.0625

Town of Sunset Beach Navigation Project
South Jinks Creek Vibracore Composites
Design Depth -5 MLW (+1)

Vibracore SJ-5 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	SJ-5 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00	0.00	0.00	
-4.00	0.00	0.00	0.00	
-3.50	0.00	0.00	0.00	
-3.00	0.00	0.00	0.00	
-2.50	0.00	0.00	0.00	
-2.25	0.00	0.00	0.00	
-2.00	0.00	0.00	0.00	
-1.50	0.03	0.00	0.00	
-1.00	0.04	0.02	0.00	
-0.50	0.23	0.04	0.00	
0.00	0.48	0.07	0.03	
0.50	0.98	0.18	0.06	
1.00	2.18	1.27	0.13	
1.50	5.45	2.31	0.31	
2.00	19.04	8.75	2.62	
2.50	49.34	34.45	22.23	
3.00	91.36	91.29	85.39	
3.50	97.91	99.56	98.55	
3.75	98.32	99.89	99.00	
4.00	98.39	99.94	99.06	

SJ-5 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
100.00	100.00	100.00	
99.97	100.00	100.00	
99.96	99.98	100.00	
99.77	99.96	100.00	
99.52	99.93	99.97	
99.02	99.82	99.94	
97.82	98.73	99.87	
94.55	97.69	99.69	
80.96	91.25	97.38	
50.66	65.55	77.77	
8.64	8.71	14.61	
2.09	0.44	1.45	
1.68	0.11	1.00	
1.61	0.06	0.94	

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.01	99.99
0.02	99.98
0.09	99.91
0.18	99.82
0.38	99.62
1.39	98.61
2.94	97.06
10.87	89.13
37.15	62.85
90.67	9.33
99.00	1.00
99.37	0.63
99.43	0.57

SJ-5	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS	Munsell Color
1	-2.3	-3.3	1	27.03%	SP	10Y 6/1
2	-3.3	-5.6	2.3	62.16%	SP	10Y 6/1
3	-5.6	-6	0.4	10.81%	SP	5GY 6/1
Composite	**-2.3**	**-6**	**3.7**	**100.00%**		

SJ-5	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.43	1.89	2.10	2.51	2.81	2.91	3.28
2	1.71	2.14	2.32	2.64	2.86	2.94	3.22
3	2.06	2.34	2.52	2.72	2.92	2.99	3.37
Composite	**1.63**	**2.10**	**2.27**	**2.62**	**2.85**	**2.94**	**3.26**

SJ-5 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.51	0.18	2.44	0.18	0.51	-0.14	0.80
2	2.64	0.16	2.57	0.17	0.40	-0.16	0.91
3	2.72	0.15	2.68	0.16	0.32	-0.11	1.01
Composite	**2.62**	**0.16**	**2.55**	**0.17**	**0.42**	**-0.16**	**0.94**

Calcium Carbonate Content
Composite: 4.1%

* Twenhofel & Tyler (1941)

SJ-5 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	1.61	98.35	0.04	0.00	100%
2.00	0.06	99.92	0.02	0.00	100%
3.00	0.94	99.06	0.00	0.00	100%
Composite	**0.57**	**99.40**	**0.02**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Notes:
1. Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
2. Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
3. Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_\Phi]$ (Dean & Dalrymple, 2002).
4. Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_\Phi\}$ (Dean & Dalrymple, 2002).
5. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.
6. Moment statistics determined by linear interpretation of composite properties.

moffatt & nichol

Sieve Designation Legend

Sieve #	3/4	5/8	7/16	5/16	3.5	4	5	7	10	14	18	25	35	45	60	80	120	170	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.50	-3.00	-2.50	-2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	3.75	4.00
Sieve Size (mm)	19.0	16	11	8	5.7	4.76	4	2.8	2	1.4	1	0.71	0.5	0.35	0.25	0.18	0.125	0.09	0.0743	0.0625

Town of Sunset Beach Navigation Project
South Jinks Creek Vibracore Composites
Design Depth -5 MLW (+1)

Vibracore SJ-6 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	SJ-6 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00	0.00	0.00	0.00
-4.00	0.00	0.00	0.00	0.00
-3.50	0.00	0.00	0.00	0.00
-3.00	0.00	0.00	0.00	0.00
-2.50	0.00	0.00	0.00	0.00
-2.25	0.00	0.00	0.00	0.00
-2.00	0.00	0.00	0.00	0.00
-1.50	0.00	0.00	0.00	0.00
-1.00	0.00	0.01	0.03	0.00
-0.50	0.02	0.02	0.08	0.03
0.00	0.03	0.04	0.20	0.09
0.50	0.08	0.14	0.57	0.22
1.00	0.24	0.50	1.95	0.50
1.50	0.93	1.68	7.31	1.44
2.00	7.74	7.92	34.29	5.94
2.50	40.60	29.77	67.27	22.43
3.00	92.05	87.41	93.68	73.20
3.50	98.69	98.38	98.96	95.51
3.75	98.99	98.78	99.20	97.00
4.00	99.00	98.82	99.22	97.20

SJ-6 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	100.00	100.00	100.00
100.00	99.99	99.97	100.00
99.98	99.98	99.92	99.97
99.97	99.96	99.80	99.91
99.92	99.86	99.43	99.78
99.76	99.50	98.05	99.50
99.07	98.32	92.69	98.56
92.26	92.08	65.71	94.06
59.40	70.23	32.73	77.57
7.95	12.59	6.32	26.80
1.31	1.62	1.04	4.49
1.01	1.22	0.80	3.00
1.00	1.18	0.78	2.80

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.01	99.99
0.03	99.97
0.08	99.92
0.22	99.78
0.73	99.27
2.67	97.33
13.78	86.22
42.02	57.98
89.55	10.45
98.41	1.59
98.82	1.18
98.86	1.14

SJ-6	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS	Munsell Color
1	0.5	-2	2.5	38.46%	SP	5GY 6/2
2	-2	-4	2	30.77%	SP	5GY 6/2
3	-4	-5.5	1.5	23.08%	SP	5GY 6/1
4	-5.5	-6	0.5	7.69%	SP	5GY 6/2
Composite	**0.5**	**-6**	**6.5**	**100.00%**		

SJ-6	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.80	2.13	2.26	2.59	2.83	2.92	3.22
2	1.77	2.18	2.39	2.68	2.89	2.97	3.35
3	1.28	1.66	1.83	2.24	2.65	2.82	3.13
4	1.90	2.31	2.53	2.77	3.04	3.24	3.49
Composite	**1.60**	**2.04**	**2.20**	**2.58**	**2.85**	**2.94**	**3.31**

SJ-6 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.59	0.17	2.55	0.17	0.40	-0.11	0.79
2	2.68	0.16	2.61	0.16	0.39	-0.17	1.01
3	2.24	0.21	2.24	0.21	0.58	0.00	0.59
4	2.77	0.15	2.77	0.15	0.47	0.00	0.70
Composite	**2.58**	**0.17**	**2.52**	**0.17**	**0.45**	**-0.14**	**0.89**

Calcium Carbonate Content
Composite: 4.4%

* Twenhofel & Tyler (1941)

SJ-6 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	1.00	99.00	0.00	0.00	100%
2.00	1.18	98.81	0.01	0.00	100%
3.00	0.78	99.19	0.03	0.00	100%
4.00	2.80	97.20	0.00	0.00	100%
Composite	**1.14**	**98.85**	**0.01**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Notes:
1. Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
2. Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
3. Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_\Phi]$ (Dean & Dalrymple, 2002).
4. Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi}\}$ (Dean & Dalrymple, 2002).
5. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.
6. Moment statistics determined by linear interpretation of composite properties.

moffatt & nichol

VIBRACORE LOGS

Boring Designation SJ-01

DRILLING LOG	CLIENT: Moffatt & Nichol	PROJECT OWNER: Town Of Sunset Beach, North Carolina	SHEET 1 OF 1 SHEETS

1. PROJECT	Town of Sunset Beach Navigation Project South Jinks Creek, Brunswick County, North Carolina
2. BORING DESIGNATION	SJ-01
LOCATION COORDINATES	X = 2,154,194 Y = 46,153
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	P. McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	10.5 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	NC State Plane
HORIZONTAL	NAD 1983
VERTICAL	MLW
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 3 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.5 Ft.
15. DATE BORING	STARTED: 01-03-19 08:40 / COMPLETED: 01-03-19
16. ELEVATION TOP OF BORING	-0.1 Ft.
17. TOTAL RECOVERY FOR BORING	10.1 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-0.1	0.0					
			Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in occasional burrows, trace fine sand-sized shell in matrix, loose, subangular, color grades to gray (5Y 5/1) from, olive gray (5Y-5/2), (SP).		S-1	Sample #S-1, Depth = 0.0' - 2.0' Mean (mm): 0.17, Phi Sorting: 0.48 Fines (#200) - 1.17 (SP)
					S-2	Sample #S-2, Depth = 3.0' - 5.9' Mean (mm): 0.16, Phi Sorting: 0.40 Fines (#200) - 1.72 (SP)
-7.0	6.9				C-1	Sample #C-1, Depth = 0.0' - 5.9' Carbonate: 4.0%
			Poorly graded SAND with silt; mostly fine quartz sand, few inorganic silt in burrows and layers, trace fine sand to fine gravel-sized shell in matrix, loose, subangular, bioturbated, dark gray (5Y-4/1), (SP-SM).			
-10.2	10.1					
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS M&N SUNSET BEACH NAVIGATION PROJECT.GPJ FL DEP ROSS.GDT 2/4/19

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
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Boring Designation SJ-02

DRILLING LOG	CLIENT: Moffatt & Nichol	PROJECT OWNER: Town Of Sunset Beach, North Carolina	SHEET 1 OF 1 SHEETS

1. PROJECT	Town of Sunset Beach Navigation Project South Jinks Creek, Brunswick County, North Carolina
2. BORING DESIGNATION	SJ-02
LOCATION COORDINATES	X = 2,154,275 Y = 45,987
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	P. McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	10.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	NC State Plane
HORIZONTAL	NAD 1983
VERTICAL	MLW
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.5 Ft.
15. DATE BORING	STARTED: 01-03-19 08:27 / COMPLETED: 01-03-19
16. ELEVATION TOP OF BORING	0.2 Ft.
17. TOTAL RECOVERY FOR BORING	9.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
0.2	0.0		Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in occasional layers and laminations, trace fine sand-sized shell in matrix, loose, subangular, olive gray (5Y-5/2), (SP).		S-1	Sample #S-1, Depth = 0.0' - 2.5' Mean (mm): 0.16, Phi Sorting: 0.47 Fines (#200) - 2.58 (SP)
					S-2	Sample #S-2, Depth = 3.0' - 5.0' Mean (mm): 0.15, Phi Sorting: 0.35 Fines (#200) - 2.04 (SP)
-5.2	5.4		Poorly graded SAND with silt; mostly fine quartz sand, few inorganic silt in matrix, burrows, layers and laminations, trace fine sand-sized shell in matrix, coarse gravel-sized wood fragment at 7.3', loose, subangular, bioturbated, dark gray (5Y-4/1), (SP-SM).		S-3	Sample #S-3, Depth = 5.4' - 6.2' Mean (mm): 0.15, Phi Sorting: 0.49 Fines (#200) - 5.82 (SP-SM)
-7.2	7.4		Poorly graded SAND; mostly fine to medium quartz sand, trace inorganic silt in occasional burrows, trace fine sand-sized shell in matrix, coarse gravel-sized shell at 8.4', loose, subangular, gray (5Y-6/1), (SP).		C-1	Sample #C-1, Depth = 0.0' - 6.2' Carbonate: 5.9%
-9.3	9.5		End of Boring			

0 5 10 15

FLORIDA DEP ROSS M&N SUNSET BEACH NAVIGATION PROJECT.GPJ FL DEP ROSS.GDT 2/4/19

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
JUN 02 JUN 04

Boring Designation SJ-03

DRILLING LOG	CLIENT: Moffatt & Nichol	PROJECT OWNER: Town Of Sunset Beach, North Carolina	SHEET 1 OF 1 SHEETS

1. PROJECT	Town of Sunset Beach Navigation Project South Jinks Creek, Brunswick County, North Carolina
2. BORING DESIGNATION	SJ-03
LOCATION COORDINATES	X = 2,154,213 Y = 45,751
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	P. McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	10.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	NC State Plane
HORIZONTAL	NAD 1983
VERTICAL	MLW
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.7 Ft.
15. DATE BORING	STARTED: 01-03-19 08:12 / COMPLETED: 01-03-19
16. ELEVATION TOP OF BORING	0.3 Ft.
17. TOTAL RECOVERY FOR BORING	9.7 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
0.3	0.0		Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in occasional laminations, trace fine sand-sized shell in matrix, loose, subangular, color changes to olive gray (5Y 5/2) from, gray (5Y-6/1), (SP).		S-1	Sample #S-1, Depth = 0.0' - 1.5' Mean (mm): 0.18, Phi Sorting: 0.40 Fines (#200) - 0.81 (SP)
					S-2	Sample #S-2, Depth = 2.0' - 4.5' Mean (mm): 0.16, Phi Sorting: 0.41 Fines (#200) - 3.18 (SP)
					S-3	Sample #S-3, Depth = 5.0' - 6.3' Mean (mm): 0.18, Phi Sorting: 0.54 Fines (#200) - 1.57 (SP)
-6.6	6.9				C-1	Sample #C-1, Depth = 0.0' - 6.3' Carbonate: 4.5%
			Poorly graded SAND; mostly fine to medium quartz sand, trace fine to coarse sand-sized shell in matrix, trace inorganic silt in occasional burrows, loose, subangular, light gray (5Y-7/1), (SP).			
-9.4	9.7					
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS M&N SUNSET BEACH NAVIGATION PROJECT.GPJ FL DEP ROSS.GDT 2/4/19

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
JUN 02 JUN 04

Boring Designation SJ-04

DRILLING LOG	CLIENT: Moffatt & Nichol	PROJECT OWNER: Town Of Sunset Beach, North Carolina	SHEET 1 OF 1 SHEETS

1. PROJECT	Town of Sunset Beach Navigation Project South Jinks Creek, Brunswick County, North Carolina
2. BORING DESIGNATION	SJ-04
LOCATION COORDINATES	X = 2,154,296 Y = 45,507
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	P. McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	10.5 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	NC State Plane
HORIZONTAL	NAD 1983
VERTICAL	MLW
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.5 Ft.
15. DATE BORING	STARTED: 01-03-19 07:21 / COMPLETED: 01-03-19
16. ELEVATION TOP OF BORING	1.1 Ft.
17. TOTAL RECOVERY FOR BORING	10 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
1.1	0.0		Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in layers and laminations, trace fine to medium sand-sized shell in matrix, loose, subangular, gray (5Y-5/1), (SP).		S-1	Sample #S-1, Depth = 0.0' - 2.5' Mean (mm): 0.17, Phi Sorting: 0.44 Fines (#200) - 1.81 (SP)
					S-2	Sample #S-2, Depth = 3.0' - 5.0' Mean (mm): 0.17, Phi Sorting: 0.43 Fines (#200) - 2.25 (SP)
					S-3	Sample #S-3, Depth = 5.0' - 7.1' Mean (mm): 0.17, Phi Sorting: 0.36 Fines (#200) - 1.25 (SP)
-6.8	7.9				C-1	Sample #C-1, Depth = 0.0' - 7.1' Carbonate: 4.8%
			Fat inorganic CLAY; mostly inorganic clay, soft, moderate to high plasticity, very dark gray (5Y-3/1), (CH).			
-8.9	10.0					
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS M&N SUNSET BEACH NAVIGATION PROJECT.GPJ FL DEP ROSS.GDT 2/4/19

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
JUN 02 JUN 04

Boring Designation SJ-05

DRILLING LOG	CLIENT: Moffatt & Nichol	PROJECT OWNER: Town Of Sunset Beach, North Carolina	SHEET 1 OF 1 SHEETS

1. PROJECT	Town of Sunset Beach Navigation Project South Jinks Creek, Brunswick County, North Carolina
2. BORING DESIGNATION	SJ-05
LOCATION COORDINATES	X = 2,154,596 Y = 45,464
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
4. NAME OF DRILLER	P. McClellan
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED
DEG. FROM VERTICAL	
BEARING	
6. THICKNESS OF OVERBURDEN	0.0 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
8. TOTAL DEPTH OF BORING	9.0 Ft.
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	NC State Plane
HORIZONTAL	NAD 1983
VERTICAL	MLW
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
12. TOTAL SAMPLES	DISTURBED: 4 / UNDISTURBED (UD):
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	6.6 Ft.
15. DATE BORING	STARTED: 01-03-19 07:50 / COMPLETED: 01-03-19
16. ELEVATION TOP OF BORING	-2.3 Ft.
17. TOTAL RECOVERY FOR BORING	8.3 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Depths and elevations based on measured values)	% REC.	BOX OR SAMPLE	REMARKS
-2.3	0.0					
			Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in layers, laminations and burrows, trace fine to medium sand-sized shell in matrix, loose, subangular, olive gray (5Y-5/2), (SP).		S-1	Sample #S-1, Depth = 0.0' - 1.0' Mean (mm): 0.19, Phi Sorting: 0.56 Fines (#200) - 1.68 (SP)
					S-2	Sample #S-2, Depth = 1.0' - 3.3' Mean (mm): 0.17, Phi Sorting: 0.45 Fines (#200) - 0.11 (SP)
					S-3	Sample #S-3, Depth = 3.3' - 3.7' Mean (mm): 0.15, Phi Sorting: 0.34 Fines (#200) - 1.00 (SP)
					C-1	Sample #C-1, Depth = 0.0' - 3.7' Carbonate: 4.1%
-10.6	8.3					
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS M&N SUNSET BEACH NAVIGATION PROJECT.GPJ FL DEP ROSS.GDT 2/4/19

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
JUN 02 JUN 04

Boring Designation SJ-06

DRILLING LOG

CLIENT	Moffatt & Nichol
PROJECT OWNER	Town Of Sunset Beach, North Carolina
SHEET	1 OF 1 SHEETS
1. PROJECT	Town of Sunset Beach Navigation Project South Jinks Creek, Brunswick County, North Carolina
9. SIZE AND TYPE OF BIT	3.0 In.
10. COORDINATE SYSTEM/DATUM	NC State Plane; HORIZONTAL: NAD 1983; VERTICAL: MLW
2. BORING DESIGNATION	SJ-06
LOCATION COORDINATES	X = 2,154,873 Y = 45,561
11. MANUFACTURER'S DESIGNATION OF DRILL	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY	Athena Technologies, Inc.
CONTRACTOR FILE NO.	
12. TOTAL SAMPLES	DISTURBED: 5; UNDISTURBED (UD):
4. NAME OF DRILLER	P. McClellan
13. TOTAL NUMBER CORE BOXES	
14. WATER DEPTH	3.9 Ft.
5. DIRECTION OF BORING	☒ VERTICAL ☐ INCLINED; DEG. FROM VERTICAL: ; BEARING:
15. DATE BORING	STARTED: 01-03-19 07:34; COMPLETED: 01-03-19
6. THICKNESS OF OVERBURDEN	0.0 Ft.
16. ELEVATION TOP OF BORING	0.5 Ft.
7. DEPTH DRILLED INTO ROCK	0.0 Ft.
17. TOTAL RECOVERY FOR BORING	10.3 Ft.
8. TOTAL DEPTH OF BORING	10.5 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR	A. Freeze

ELEV. (ft)	SCALE (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
0.5	0.0					
			Poorly graded SAND; mostly fine quartz sand, trace inorganic silt in occasional laminations and burrows, trace fine sand-sized shells in matrix, loose, subangular, gray (5Y-6/1), (SP).		S-1	Sample #S-1, Depth = 0.0' - 2.5' Mean (mm): 0.17, Phi Sorting: 0.39 Fines (#200) - 1.01 (SP)
					S-2	Sample #S-2, Depth = 2.5' - 4.5' Mean (mm): 0.16, Phi Sorting: 0.43 Fines (#200) - 1.22 (SP)
					S-3	Sample #S-3, Depth = 4.5' - 6.0' Mean (mm): 0.21, Phi Sorting: 0.55 Fines (#200) - 0.80 (SP)
-5.5	6.0				S-4	Sample #S-4, Depth = 6.0' - 6.5' Mean (mm): 0.15, Phi Sorting: 0.46 Fines (#200) - 3.00 (SP)
			Silty SAND; mostly fine quartz sand, little inorganic silt in matrix, layers, laminations and burrows, trace fine sand-sized shell in matrix, loose, subangular, bioturbated, gray (5Y-5/1), (SM).		C-1	Sample #C-1, Depth = 0.0' - 6.5' Carbonate: 4.4%
-9.8	10.3					
			End of Boring			

0 5 10 15

FLORIDA DEP ROSS M&N SUNSET BEACH NAVIGATION PROJECT.GPJ FL DEP ROSS.GDT 2/4/19

SAJ FORM 1836 **MODIFIED FOR THE FLORIDA DEP**
JUN 02 JUN 04

GRADATION CURVES

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

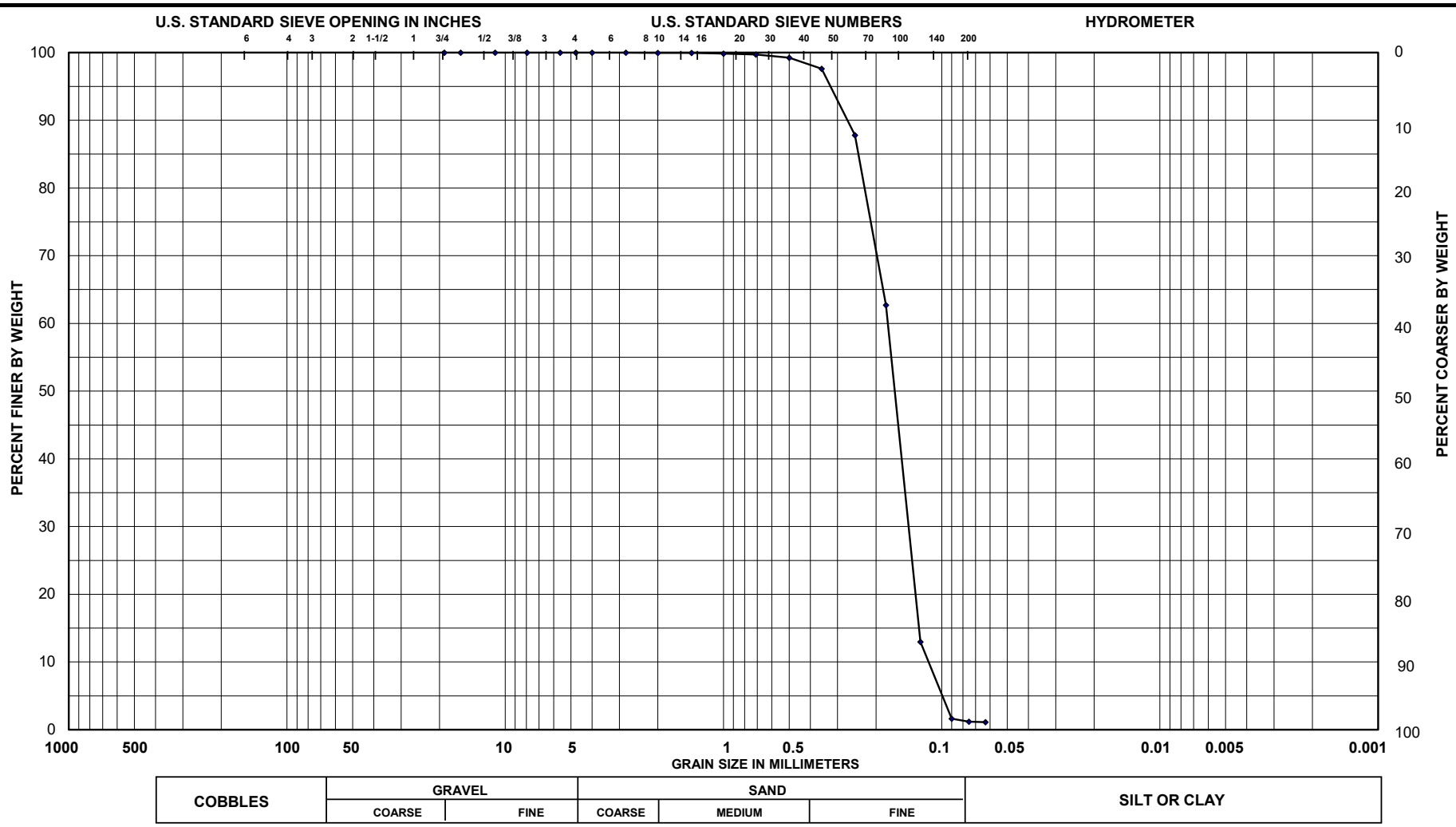
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**0/2**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-01**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/2**		

Tare Weight, (g):	51.28	
	185.22	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.02	99.99	100	0.02
#10	2.000	0.02	99.97	100	0.02
#14	1.400	0.03	99.95	100	0.03
#18	1.000	0.11	99.87	100	0.11
#25	0.710	0.22	99.70	95	0.21
#35	0.500	0.63	99.23	40	0.25
#45	0.355	2.17	97.61	25	0.54
#60	0.250	13.16	87.79	15	1.97
#80	0.180	33.59	62.71	5	1.68
#120	0.125	66.60	12.98	1	0.67
#170	0.090	15.20	1.64	0	0.00
#200	0.075	0.62	1.17	0	0.00
#230	0.063	0.08	1.11	0	0.00
Total Shell Content:		**4**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-1	0/2	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/2			4			

Project M&N Sunset Beach NC

Area

Boring No. SJ-01

Date 1/18/2019

GRADATION CURVES

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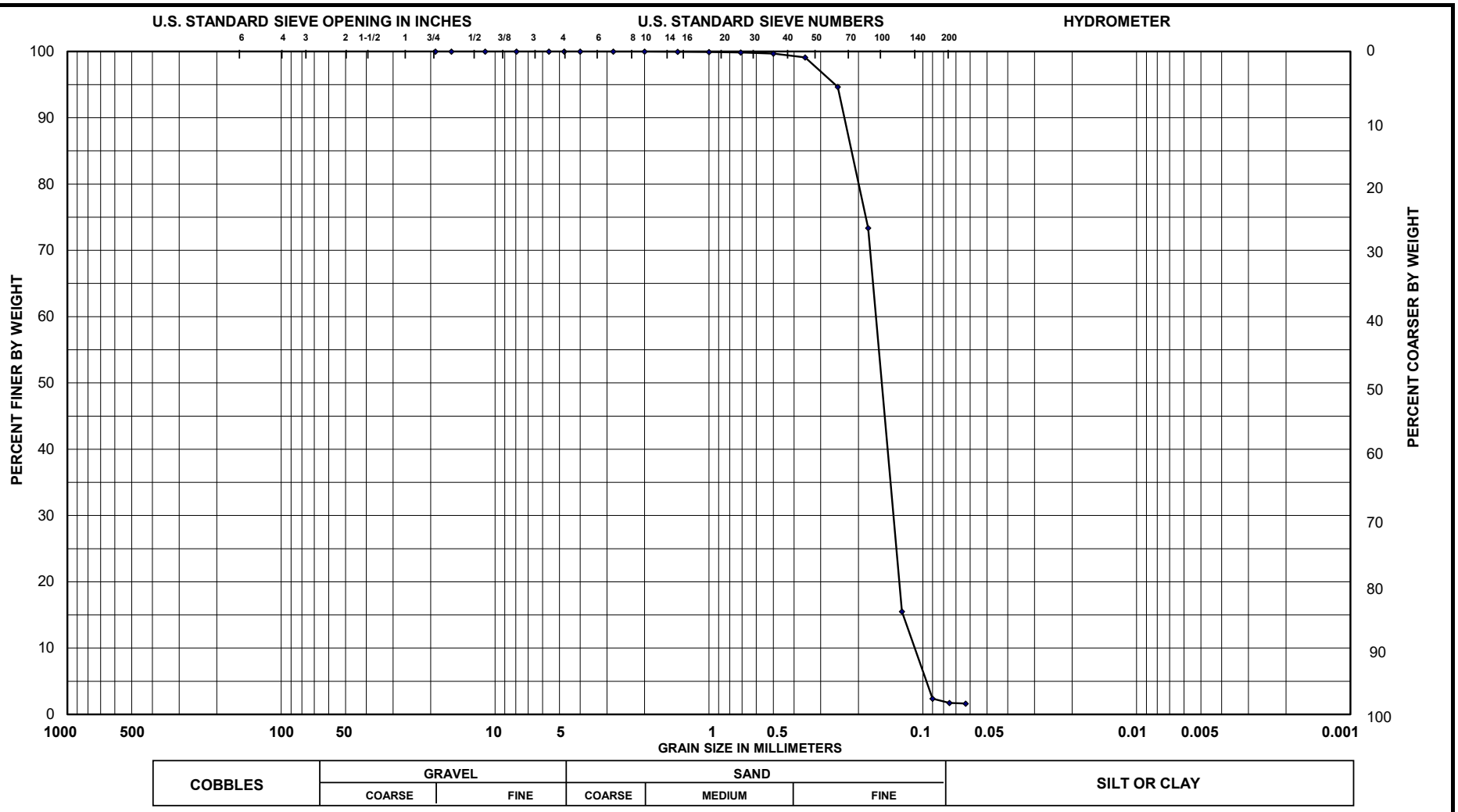
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**3/5.9**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-01**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 6/1**		

Tare Weight, (g):	51.04	
	172.31	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.02	99.98	100	0.02
#10	2.000	0.00	99.98	0	0.00
#14	1.400	0.02	99.97	100	0.02
#18	1.000	0.05	99.93	100	0.05
#25	0.710	0.11	99.84	95	0.10
#35	0.500	0.17	99.69	30	0.05
#45	0.355	0.73	99.09	20	0.15
#60	0.250	5.37	94.66	5	0.27
#80	0.180	25.81	73.38	1	0.26
#120	0.125	70.16	15.53	0	0.00
#170	0.090	15.97	2.36	0	0.00
#200	0.075	0.77	1.72	0	0.00
#230	0.063	0.10	1.64	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-2	3/5.9	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 6/1			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-01

Date 1/18/2019

GRADATION CURVES

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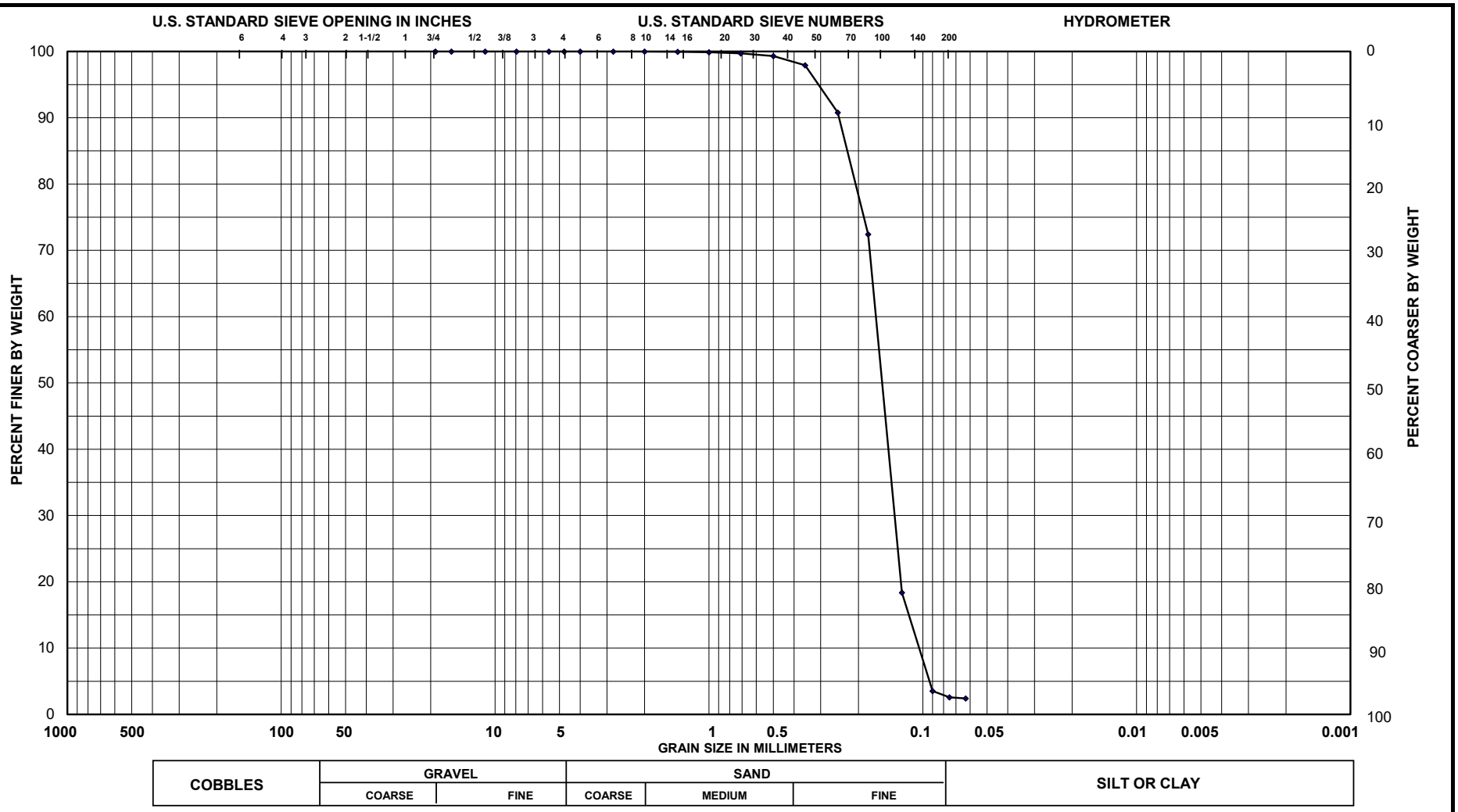
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**0/2.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-02**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 6/2**		

Tare Weight, (g):	49.62	
	177.62	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.01	99.99	100	0.01
#14	1.400	0.04	99.96	100	0.04
#18	1.000	0.09	99.89	100	0.09
#25	0.710	0.21	99.73	95	0.20
#35	0.500	0.55	99.30	40	0.22
#45	0.355	1.75	97.93	30	0.53
#60	0.250	9.13	90.80	10	0.91
#80	0.180	23.54	72.41	1	0.24
#120	0.125	69.17	18.37	0	0.00
#170	0.090	18.99	3.53	0	0.00
#200	0.075	1.22	2.58	0	0.00
#230	0.063	0.22	2.41	0	0.00
Total Shell Content:		**2**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-1	0/2.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 6/2			2			

Project M&N Sunset Beach NC

Area

Boring No. SJ-02

Date 1/18/2019

GRADATION CURVES

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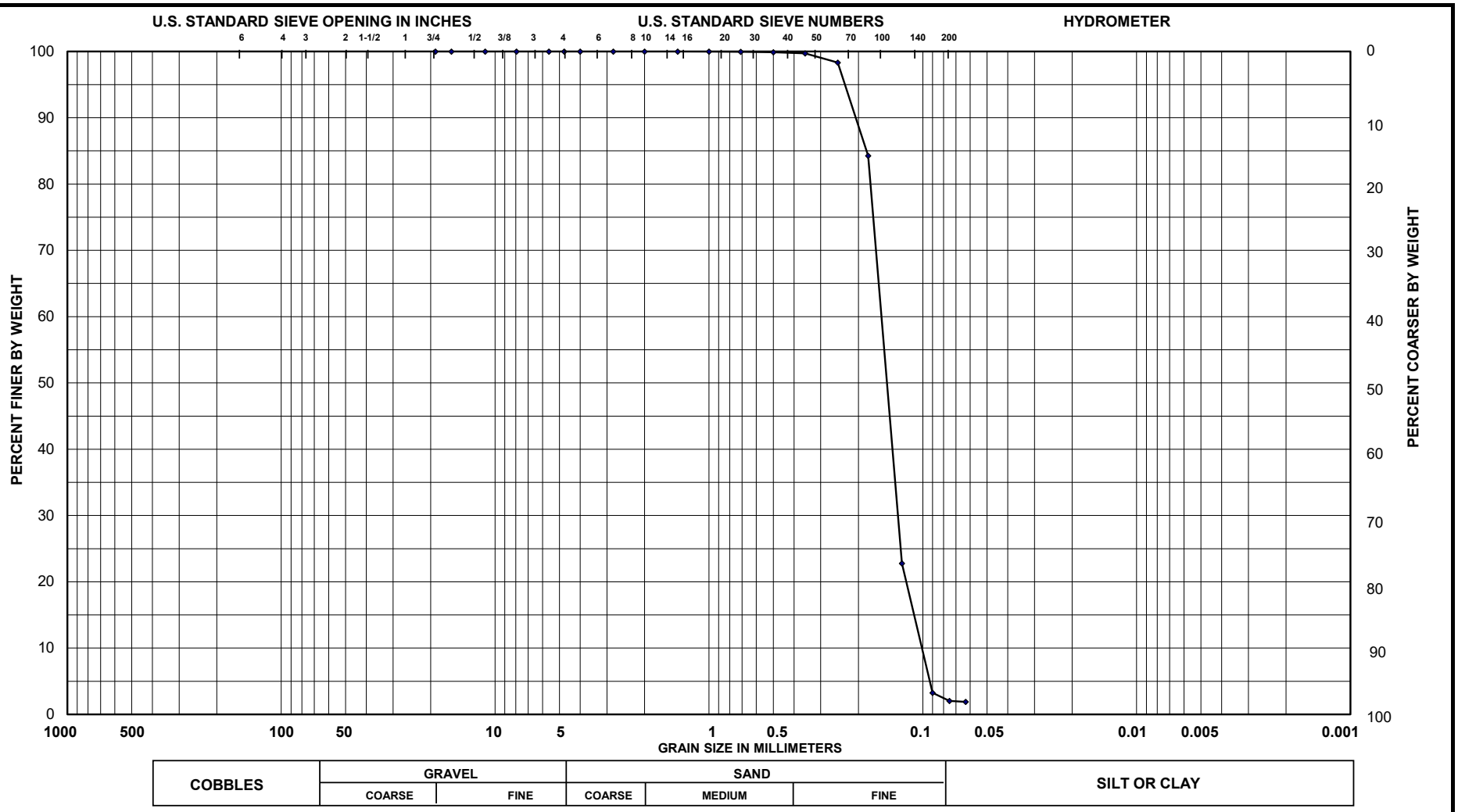
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**3/5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-02**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 5/2**		

Tare Weight, (g):	49.83	
	179.54	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.00	100.00	0	0.00
#18	1.000	0.03	99.98	100	0.03
#25	0.710	0.04	99.95	100	0.04
#35	0.500	0.08	99.88	95	0.08
#45	0.355	0.21	99.72	50	0.11
#60	0.250	1.83	98.31	15	0.27
#80	0.180	18.22	84.26	1	0.18
#120	0.125	79.75	22.78	0	0.00
#170	0.090	25.34	3.25	0	0.00
#200	0.075	1.57	2.04	0	0.00
#230	0.063	0.19	1.89	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-2	3/5	SAND, poorly-graded, mostly fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 5/2			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-02

Date 1/18/2019

GRADATION CURVES

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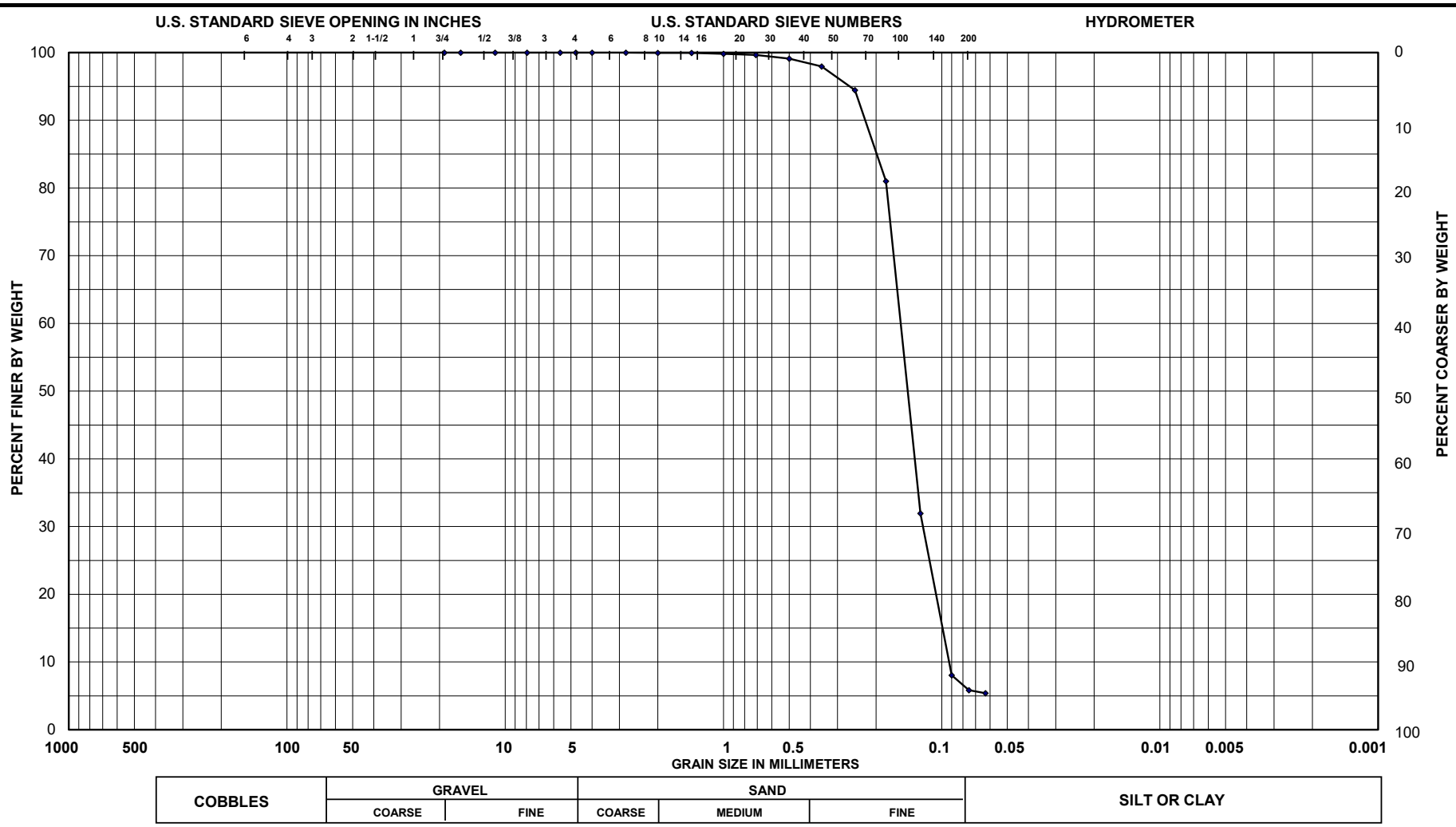
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**5.4/6.2**
Project No.:	**EQ181220**	**Date:**	**1/18/2019**
Boring No.:	**SJ-02**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded with silt, mostly medium to fine-grained quartz, few silt, trace medium to fine sand-sized shell fragments (SP-SM) 5Y 5/2**		

Tare Weight, (g):	52.03	
	153.18	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.03	99.97	50	0.02
#14	1.400	0.02	99.95	50	0.01
#18	1.000	0.12	99.83	50	0.06
#25	0.710	0.20	99.63	30	0.06
#35	0.500	0.53	99.11	20	0.11
#45	0.355	1.17	97.95	15	0.18
#60	0.250	3.53	94.46	5	0.18
#80	0.180	13.62	81.00	1	0.14
#120	0.125	49.62	31.94	0	0.00
#170	0.090	24.17	8.05	0	0.00
#200	0.075	2.25	5.82	0	0.00
#230	0.063	0.44	5.39	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-3	5.4/6.2	SAND, poorly-graded with silt, mostly medium to fine-grained quartz, few silt, trace medium to fine sand-sized shell fragments (SP-SM) 5Y 5/2			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-02

Date 1/18/2019

GRADATION CURVES

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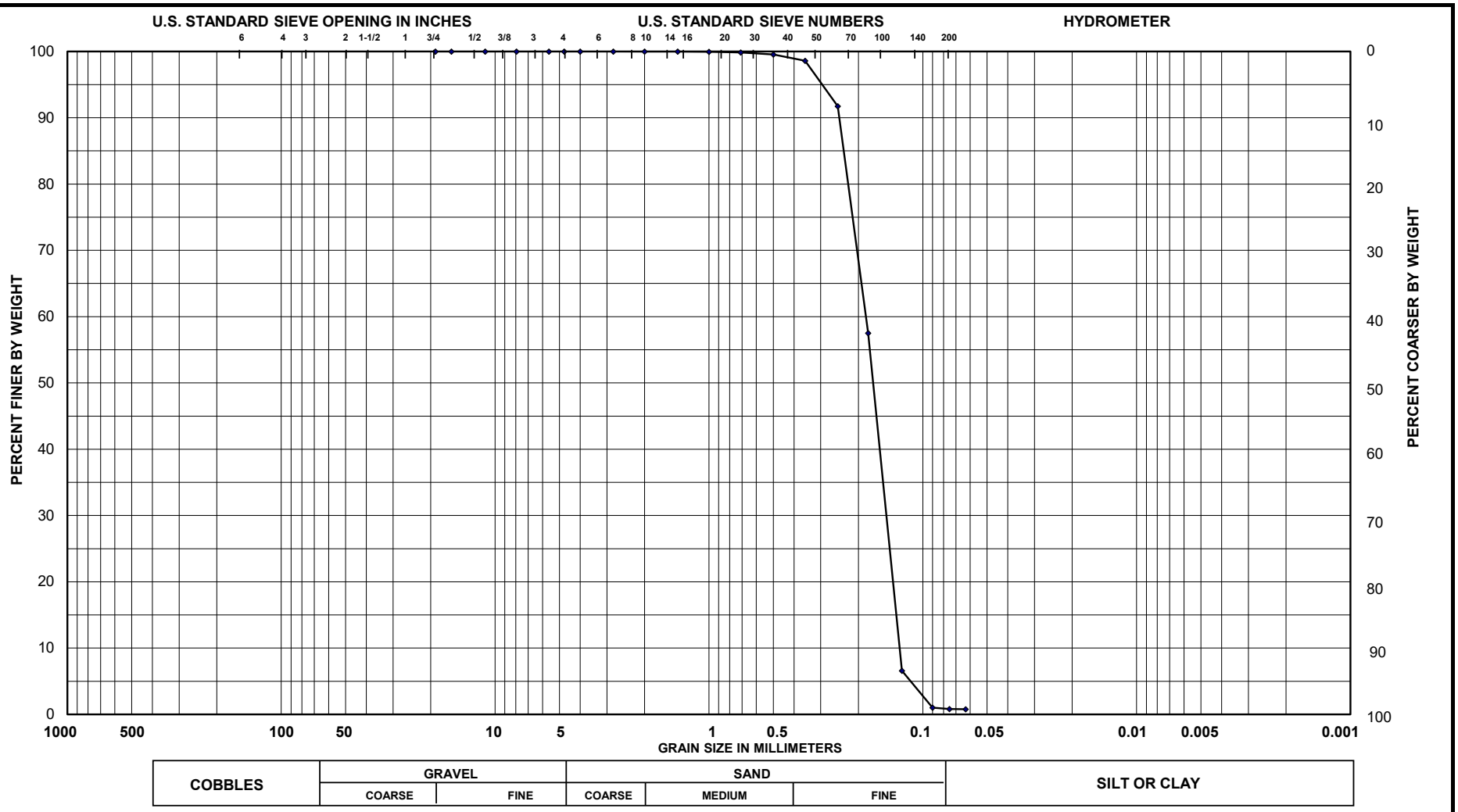
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**0/1.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-03**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1**		

Tare Weight, (g):	49.52	
	154.46	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.01	99.99	100	0.01
#14	1.400	0.02	99.97	100	0.02
#18	1.000	0.02	99.95	100	0.02
#25	0.710	0.12	99.84	95	0.11
#35	0.500	0.31	99.54	75	0.23
#45	0.355	0.98	98.61	50	0.49
#60	0.250	7.22	91.73	10	0.72
#80	0.180	35.89	57.53	1	0.36
#120	0.125	53.46	6.58	0	0.00
#170	0.090	5.84	1.02	0	0.00
#200	0.075	0.22	0.81	0	0.00
#230	0.063	0.03	0.78	0	0.00
Total Shell Content:		**2**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-1	0/1.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1			2			

Project M&N Sunset Beach NC

Area

Boring No. SJ-03

Date 1/18/2019

GRADATION CURVES

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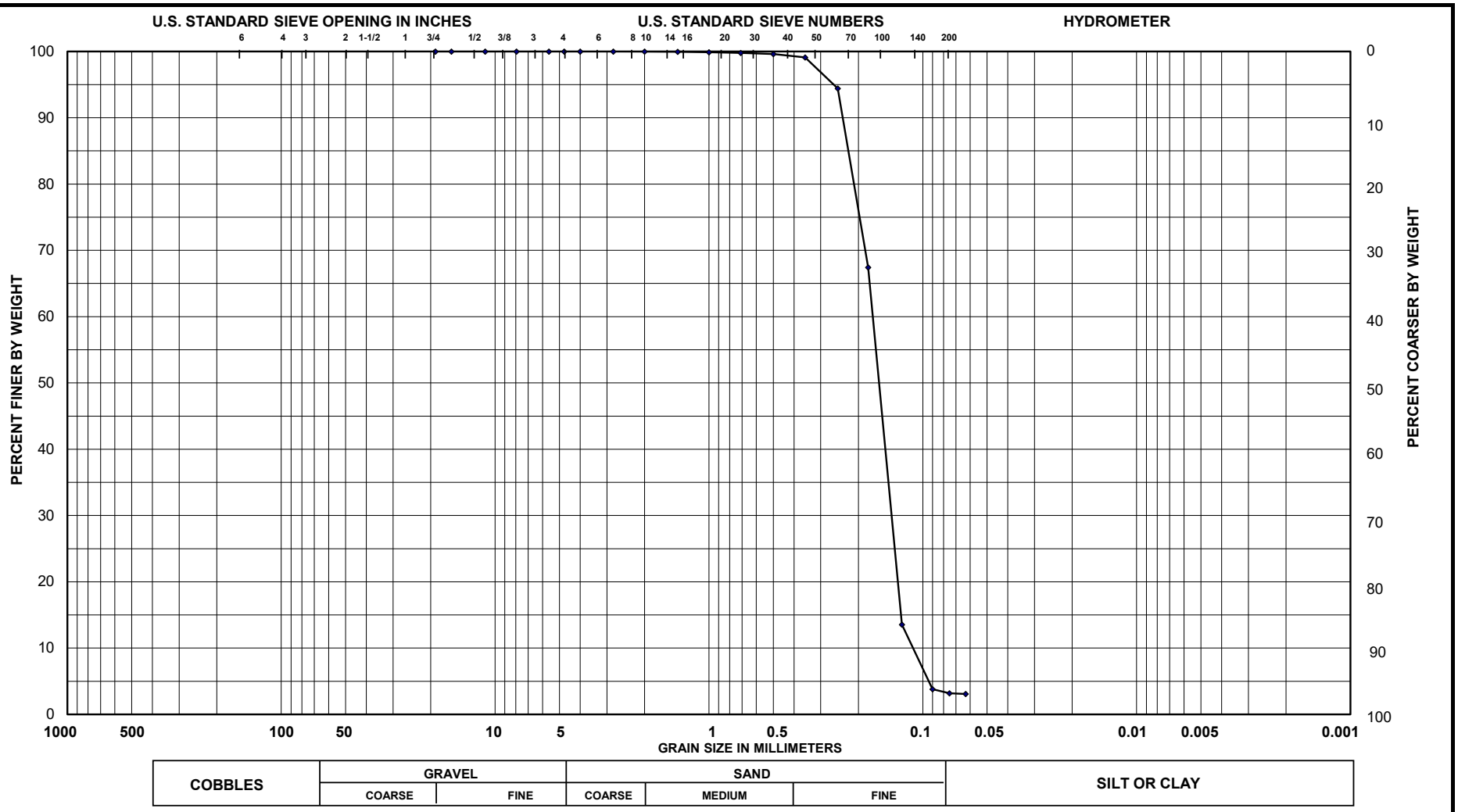
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**2/4.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-03**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 5/2**		

Tare Weight, (g):	51.42	
	150.46	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.01	99.99	100	0.01
#14	1.400	0.04	99.95	60	0.02
#18	1.000	0.07	99.88	20	0.01
#25	0.710	0.09	99.79	60	0.05
#35	0.500	0.16	99.63	80	0.13
#45	0.355	0.50	99.12	70	0.35
#60	0.250	4.65	94.43	15	0.70
#80	0.180	26.75	67.42	1	0.27
#120	0.125	53.34	13.56	0	0.00
#170	0.090	9.68	3.79	0	0.00
#200	0.075	0.60	3.18	0	0.00
#230	0.063	0.10	3.08	0	0.00
Total Shell Content:		**2**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-2	2/4.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 5/2			2			

Project M&N Sunset Beach NC

Area

Boring No. SJ-03

Date 1/18/2019

GRADATION CURVES

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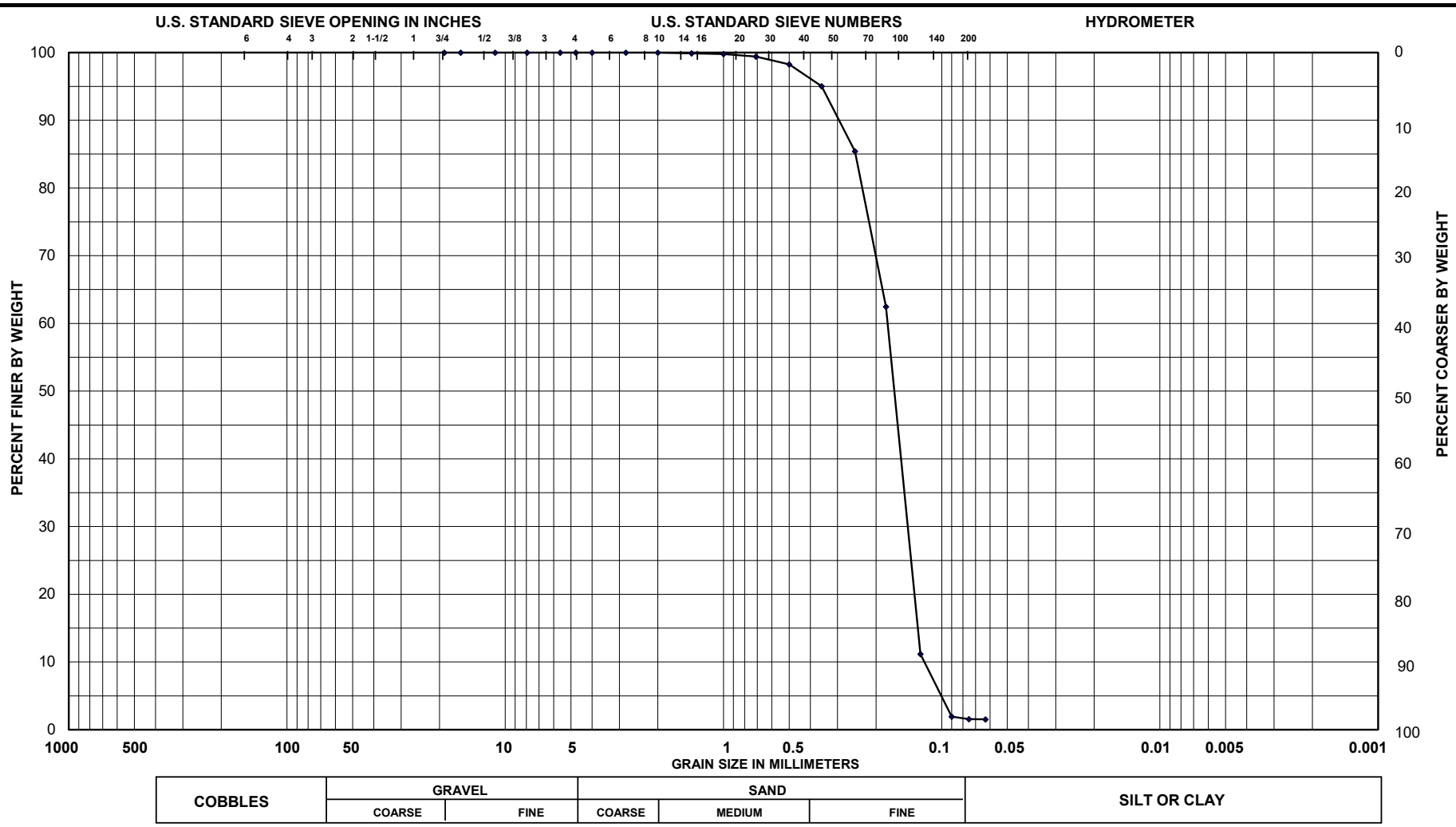
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**5/6.3**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-03**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 5/2**		

Tare Weight, (g):	50.48	
	167.63	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.02	99.98	100	0.02
#14	1.400	0.13	99.87	100	0.13
#18	1.000	0.09	99.80	100	0.09
#25	0.710	0.47	99.39	60	0.28
#35	0.500	1.35	98.24	25	0.34
#45	0.355	3.75	95.04	10	0.38
#60	0.250	11.28	85.41	1	0.11
#80	0.180	26.89	62.46	0	0.00
#120	0.125	60.10	11.16	0	0.00
#170	0.090	10.79	1.95	0	0.00
#200	0.075	0.44	1.57	0	0.00
#230	0.063	0.04	1.54	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-3	5/6.3	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 5/2			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-03

Date 1/18/2019

GRADATION CURVES

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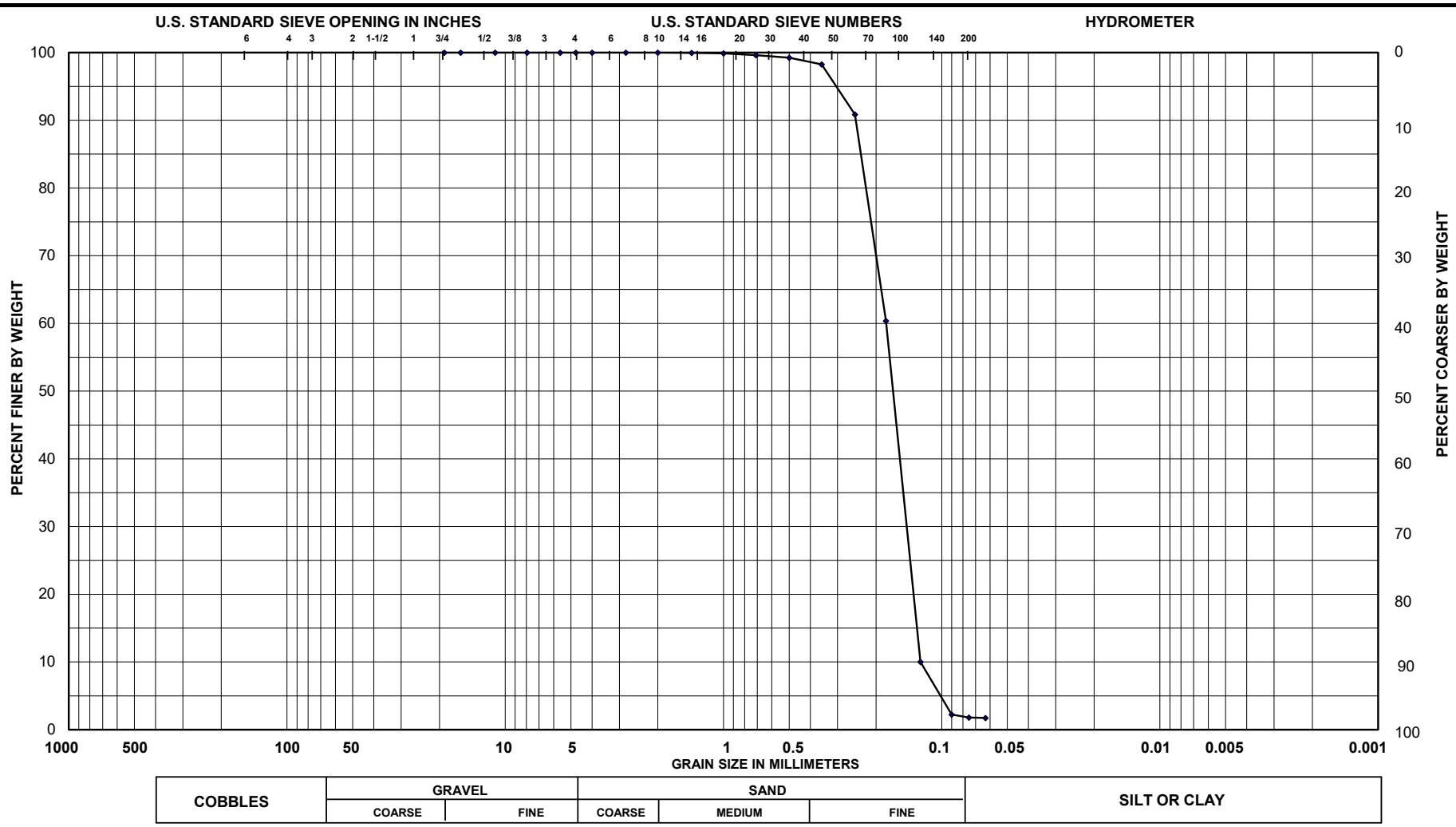
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**0/2.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-04**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1**		

Tare Weight, (g):	52.19	
	159.83	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.04	99.96	10	0.00
#18	1.000	0.10	99.87	95	0.10
#25	0.710	0.26	99.63	50	0.13
#35	0.500	0.43	99.23	35	0.15
#45	0.355	1.03	98.27	25	0.26
#60	0.250	7.97	90.87	5	0.40
#80	0.180	32.84	60.36	1	0.33
#120	0.125	54.19	10.01	0	0.00
#170	0.090	8.36	2.25	0	0.00
#200	0.075	0.47	1.81	0	0.00
#230	0.063	0.08	1.74	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-1	0/2.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-04

Date 1/18/2019

GRADATION CURVES

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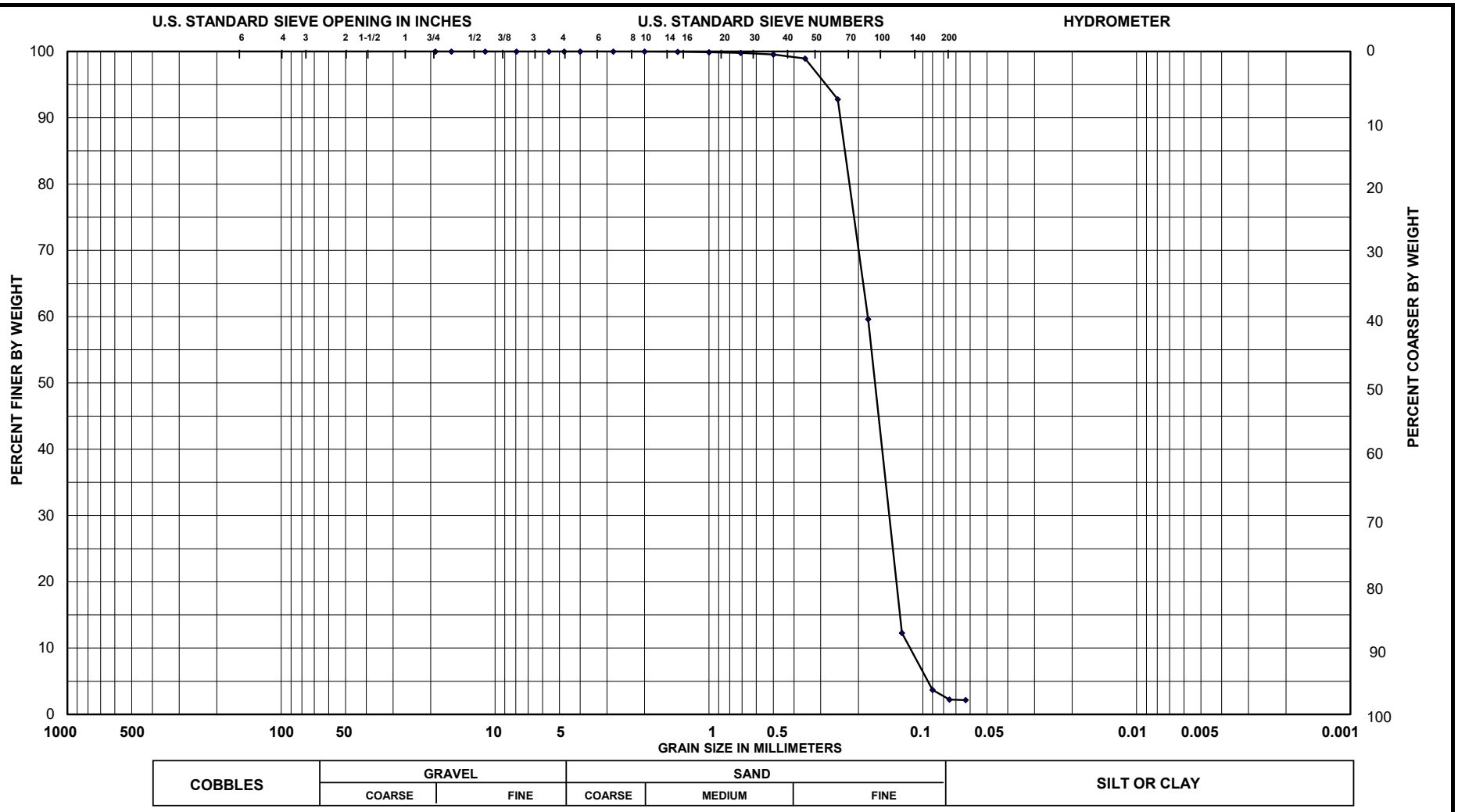
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**3/5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-04**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 5/2**		

Tare Weight, (g):	51.60	
	166.72	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.02	99.98	0	0.00
#14	1.400	0.05	99.94	10	0.01
#18	1.000	0.05	99.90	20	0.01
#25	0.710	0.12	99.79	50	0.06
#35	0.500	0.27	99.56	50	0.14
#45	0.355	0.70	98.95	50	0.35
#60	0.250	7.09	92.79	10	0.71
#80	0.180	38.18	59.62	1	0.38
#120	0.125	54.50	12.28	0	0.00
#170	0.090	9.88	3.70	0	0.00
#200	0.075	1.67	2.25	0	0.00
#230	0.063	0.11	2.15	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-2	3/5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5Y 5/2			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-04

Date 1/18/2019

GRADATION CURVES

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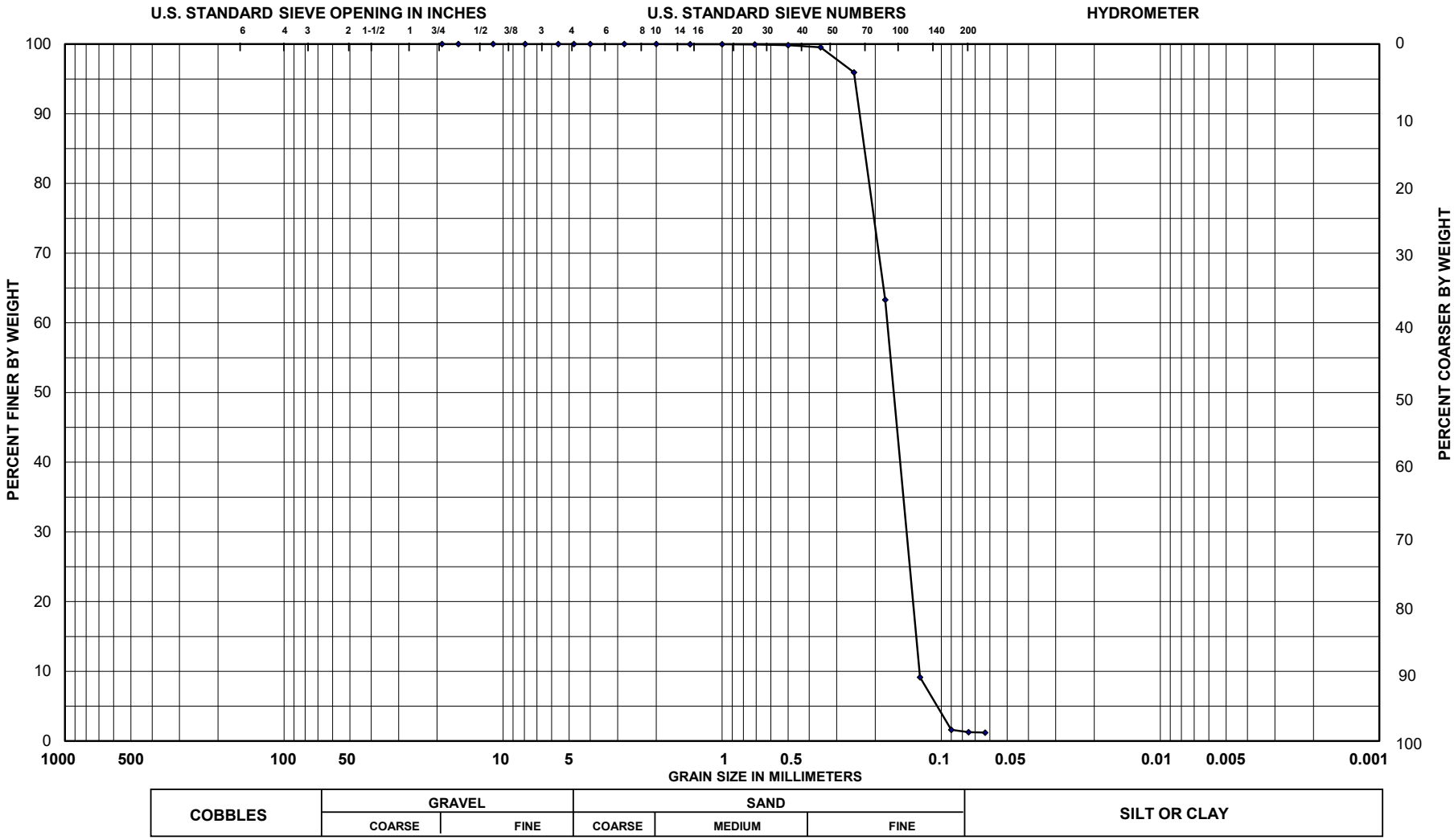
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**5/7.1**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-04**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 5/2**		

Tare Weight, (g):	52.09	
	184.60	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.02	99.98	25	0.01
#18	1.000	0.01	99.98	100	0.01
#25	0.710	0.06	99.93	90	0.05
#35	0.500	0.12	99.84	80	0.10
#45	0.355	0.42	99.52	80	0.34
#60	0.250	4.77	95.92	30	1.43
#80	0.180	43.21	63.32	1	0.43
#120	0.125	71.80	9.13	0	0.00
#170	0.090	9.96	1.61	0	0.00
#200	0.075	0.48	1.25	0	0.00
#230	0.063	0.05	1.22	0	0.00
Total Shell Content:		**2**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-3	5/7.1	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 5/2			2			

Project M&N Sunset Beach NC

Area

Boring No. SJ-04

Date 1/18/2019

GRADATION CURVES

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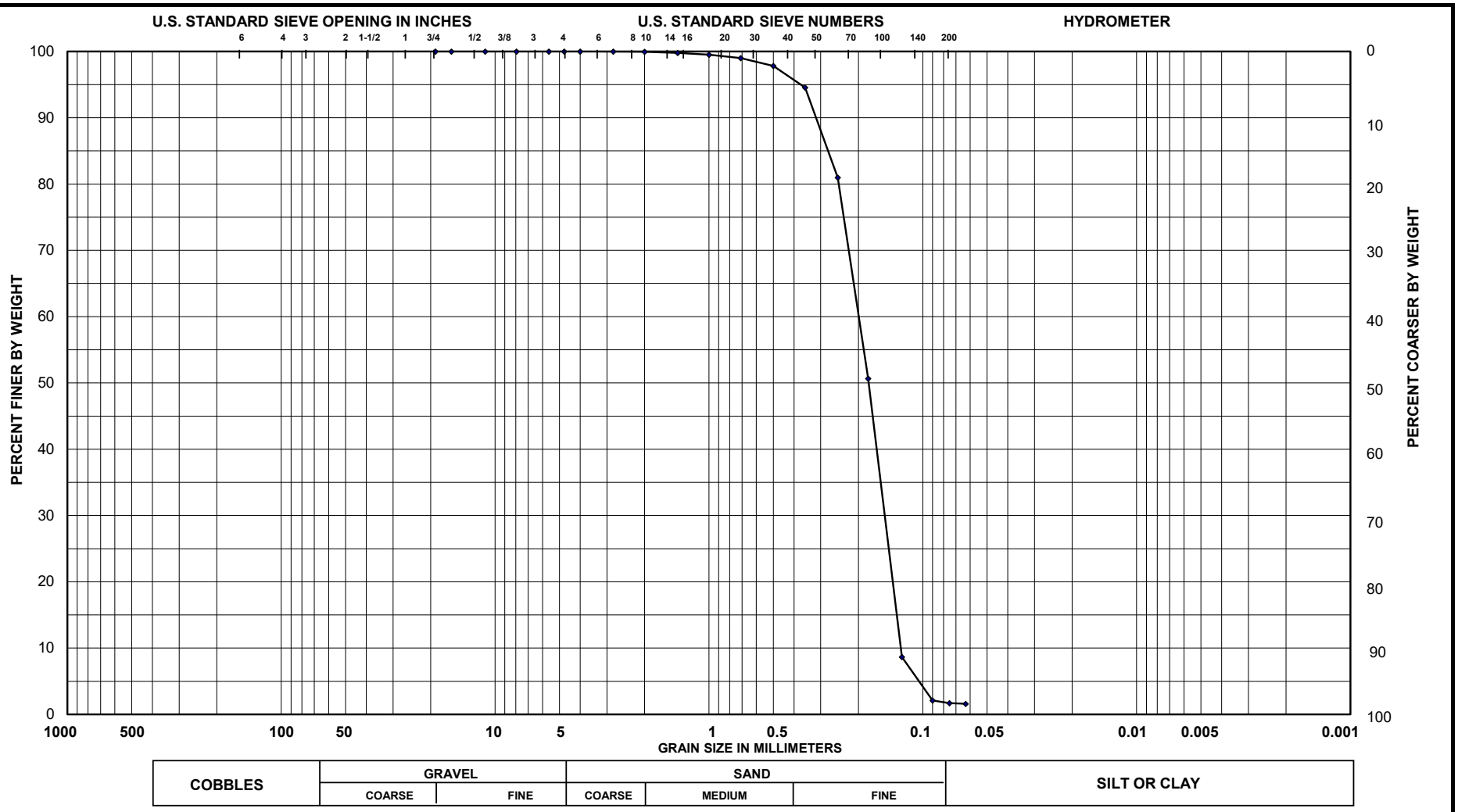
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**0/1**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-05**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1**		

Tare Weight, (g):	50.17	
	162.03	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.03	99.97	100	0.03
#10	2.000	0.02	99.96	100	0.02
#14	1.400	0.21	99.77	70	0.15
#18	1.000	0.28	99.52	70	0.20
#25	0.710	0.56	99.02	70	0.39
#35	0.500	1.34	97.82	40	0.54
#45	0.355	3.66	94.55	20	0.73
#60	0.250	15.20	80.96	5	0.76
#80	0.180	33.89	50.66	0	0.00
#120	0.125	47.00	8.64	0	0.00
#170	0.090	7.33	2.09	0	0.00
#200	0.075	0.46	1.68	0	0.00
#230	0.063	0.08	1.61	0	0.00
Total Shell Content:		**3**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-1	0/1	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1			3			

Project M&N Sunset Beach NC

Area

Boring No. SJ-05

Date 1/18/2019

GRADATION CURVES

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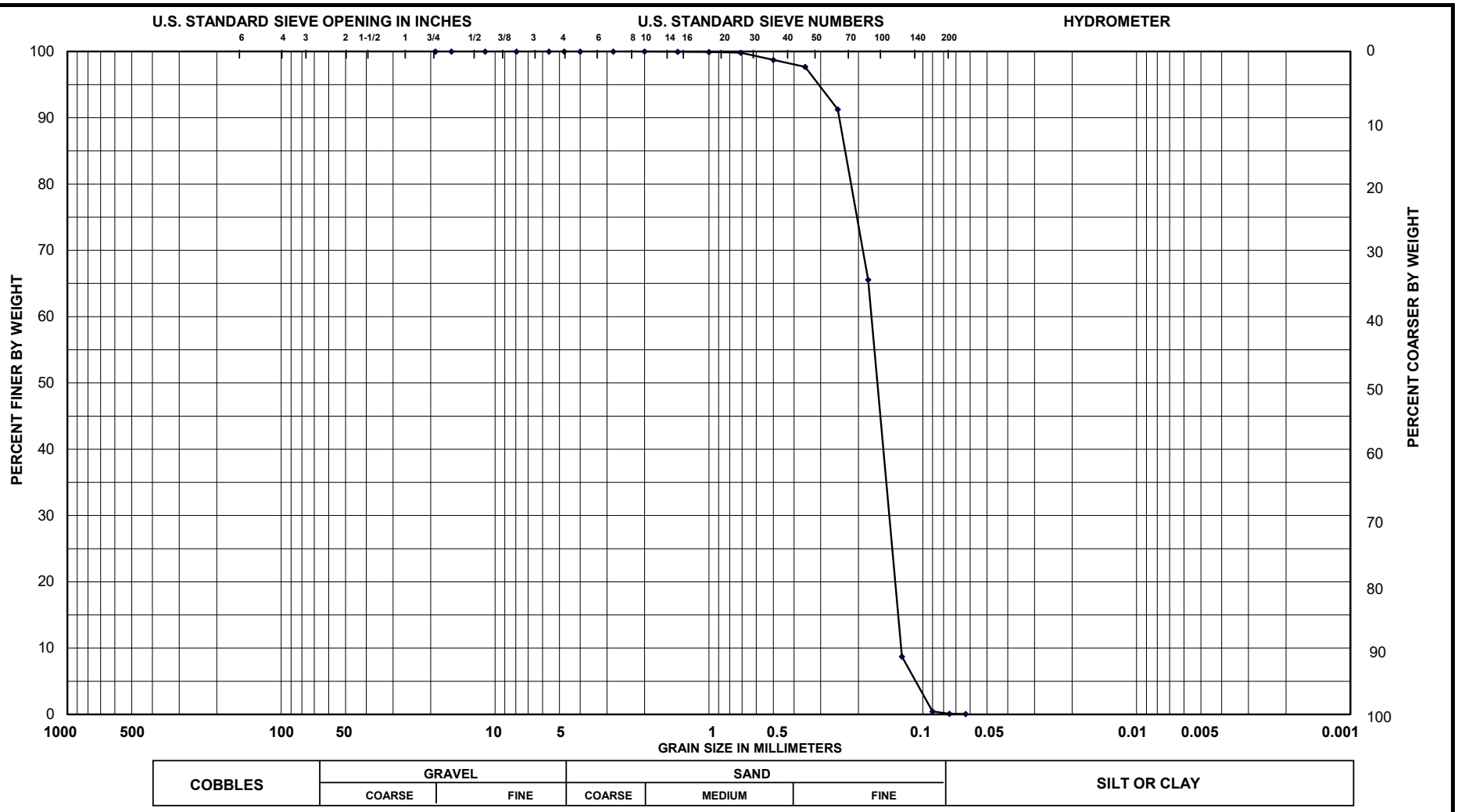
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**1/3.3**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-05**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1**		

Tare Weight, (g):	51.70	
	177.83	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.02	99.98	100	0.02
#14	1.400	0.03	99.96	100	0.03
#18	1.000	0.04	99.93	90	0.04
#25	0.710	0.14	99.82	60	0.08
#35	0.500	1.37	98.73	50	0.69
#45	0.355	1.31	97.69	20	0.26
#60	0.250	8.13	91.25	5	0.41
#80	0.180	32.41	65.55	1	0.32
#120	0.125	71.69	8.71	0	0.00
#170	0.090	10.44	0.44	0	0.00
#200	0.075	0.41	0.11	0	0.00
#230	0.063	0.06	0.06	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-2	1/3.3	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 10Y 6/1			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-05

Date 1/18/2019

GRADATION CURVES

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VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**3.3/3.7**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-05**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/1**		

Tare Weight, (g):	51.90	
	167.47	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.00	100.00	0	0.00
#18	1.000	0.03	99.97	100	0.03
#25	0.710	0.04	99.94	60	0.02
#35	0.500	0.08	99.87	50	0.04
#45	0.355	0.21	99.69	50	0.11
#60	0.250	2.67	97.38	15	0.40
#80	0.180	22.66	77.77	1	0.23
#120	0.125	73.00	14.61	0	0.00
#170	0.090	15.20	1.45	0	0.00
#200	0.075	0.53	1.00	0	0.00
#230	0.063	0.06	0.94	0	0.00
Total Shell Content:		**1**			

Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-3	3.3/3.7	SAND, poorly-graded, mostly fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/1			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-05

Date 1/18/2019

GRADATION CURVES

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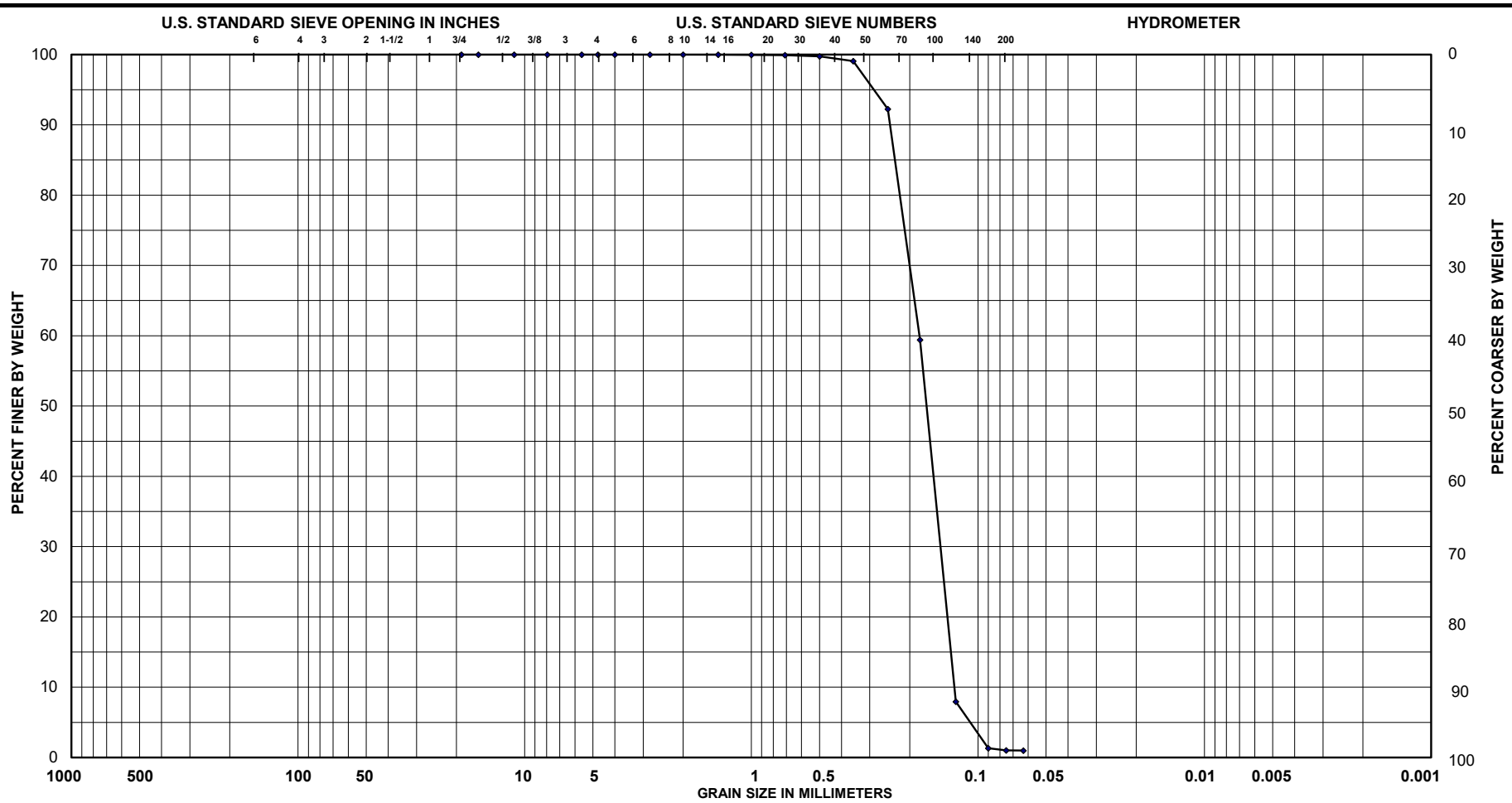
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**0/2.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-06**		
Sample No.:	**S-1**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2**		

Tare Weight, (g):	49.80	
	172.26	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.02	99.98	100	0.02
#18	1.000	0.02	99.97	100	0.02
#25	0.710	0.06	99.92	100	0.06
#35	0.500	0.20	99.76	60	0.12
#45	0.355	0.84	99.07	40	0.34
#60	0.250	8.34	92.26	15	1.25
#80	0.180	40.24	59.40	1	0.40
#120	0.125	63.00	7.95	0	0.00
#170	0.090	8.14	1.31	0	0.00
#200	0.075	0.36	1.01	0	0.00
#230	0.063	0.02	1.00	0	0.00
Total Shell Content:		**2**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-1	0/2.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2			2			

Project M&N Sunset Beach NC

Area

Boring No. SJ-06

Date 1/18/2019

GRADATION CURVES

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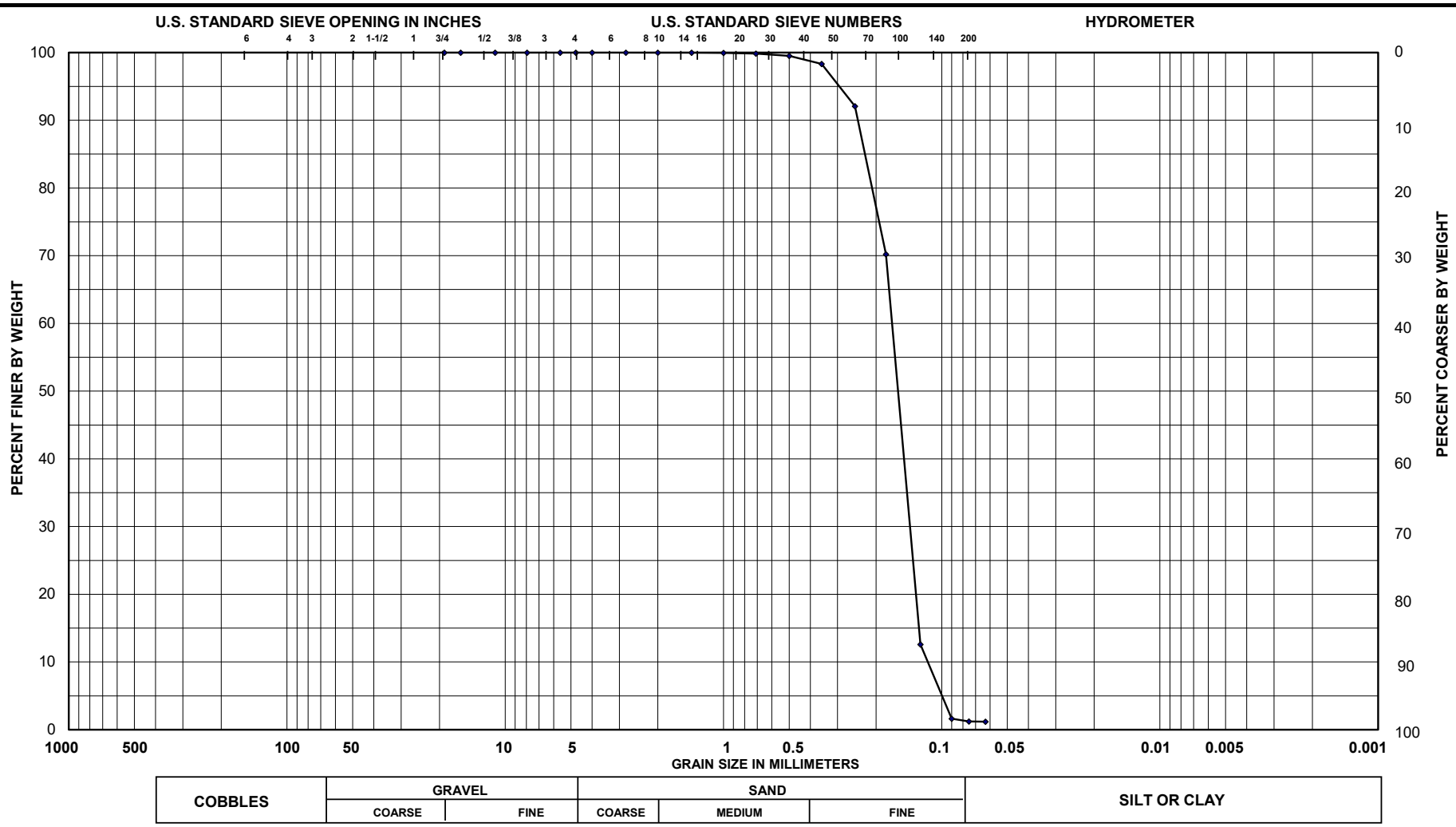
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**2.5/4.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-06**		
Sample No.:	**S-2**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2**		

Tare Weight, (g):	51.57	
	192.03	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.01	99.99	100	0.01
#14	1.400	0.02	99.98	100	0.02
#18	1.000	0.03	99.96	80	0.02
#25	0.710	0.13	99.86	60	0.08
#35	0.500	0.51	99.50	50	0.26
#45	0.355	1.66	98.32	50	0.83
#60	0.250	8.77	92.08	20	1.75
#80	0.180	30.69	70.23	1	0.31
#120	0.125	80.95	12.59	0	0.00
#170	0.090	15.42	1.62	0	0.00
#200	0.075	0.55	1.22	0	0.00
#230	0.063	0.06	1.18	0	0.00
Total Shell Content:		**2**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-2	2.5/4.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2			2			

Project M&N Sunset Beach NC

Area

Boring No. SJ-06

Date 1/18/2019

GRADATION CURVES

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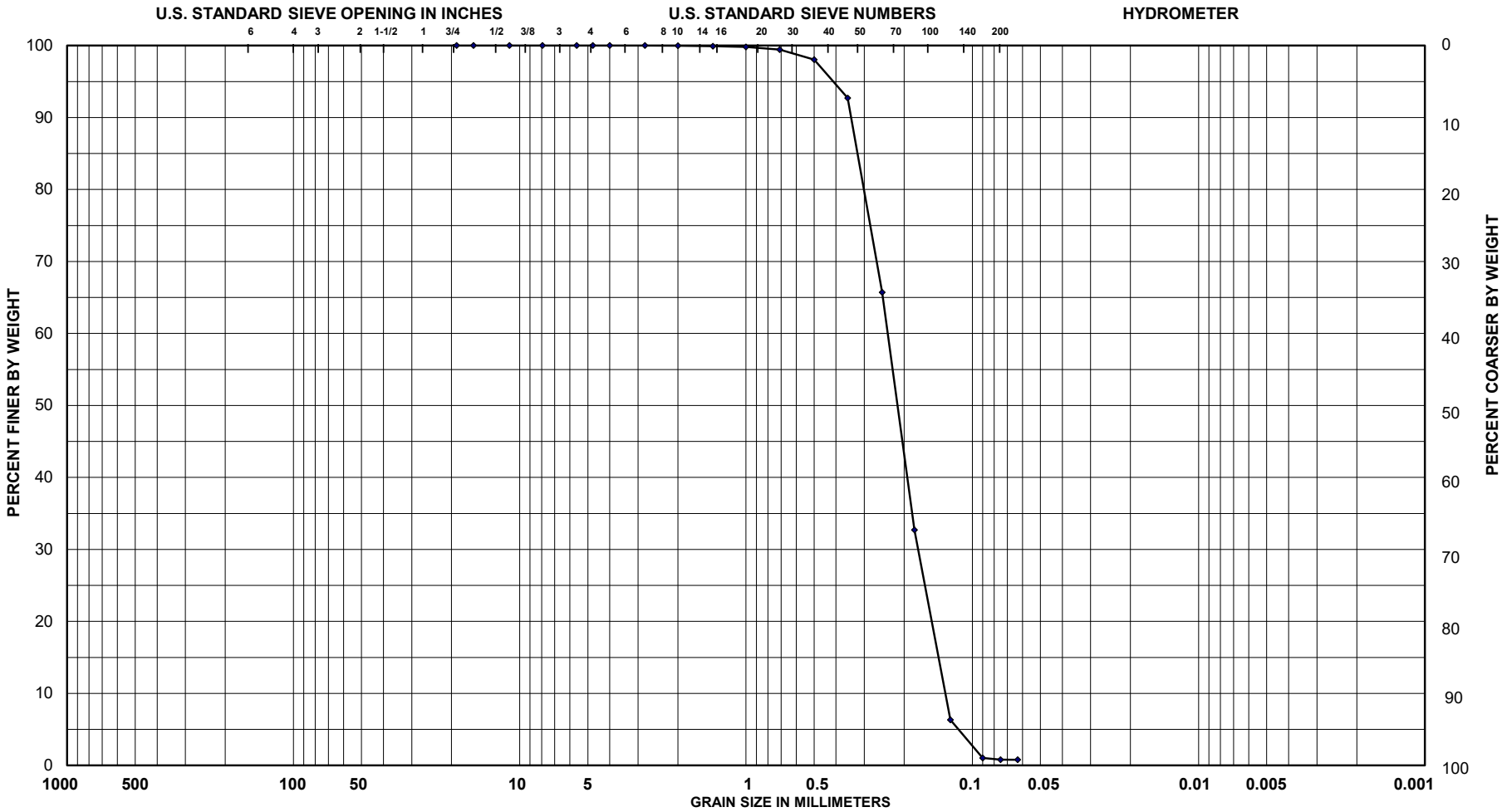
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**4.5/6**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-06**		
Sample No.:	**S-3**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2**		

Tare Weight, (g):	51.64	
	166.07	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.03	99.97	100	0.03
#14	1.400	0.06	99.92	100	0.06
#18	1.000	0.14	99.80	95	0.13
#25	0.710	0.42	99.43	65	0.27
#35	0.500	1.58	98.05	40	0.63
#45	0.355	6.13	92.69	25	1.53
#60	0.250	30.88	65.71	5	1.54
#80	0.180	37.74	32.73	1	0.38
#120	0.125	30.22	6.32	0	0.00
#170	0.090	6.04	1.04	0	0.00
#200	0.075	0.28	0.80	0	0.00
#230	0.063	0.02	0.78	0	0.00
Total Shell Content:		**4**			



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-3	4.5/6	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2			4			

Project M&N Sunset Beach NC

Area

Boring No. SJ-06

Date 1/18/2019

GRADATION CURVES

** The USC classification is based on laboratory grain size distribution and visual classification*

ENG FORM 2087
MAY 63

Terracon
9655 Florida Mining Boulevard West
Jacksonville, Florida 32257
(904) 900-6494 (Tel) · (904) 268-5255 (Fax)

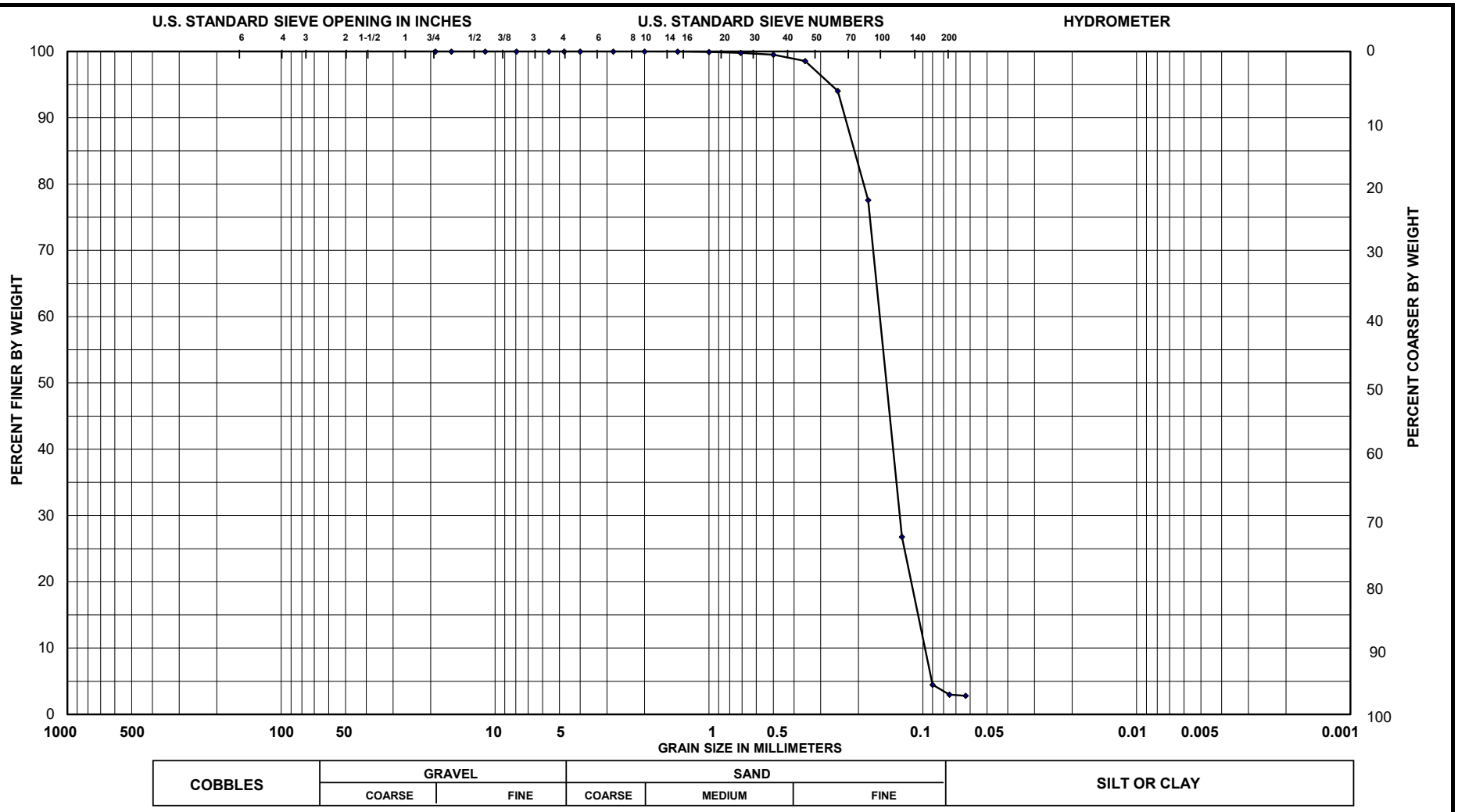
VISUAL SHELL CONTENT

GRAIN SIZE AND VISUAL SHELL CONTENT

Project:	**M&N Sunset Beach NC**	**Depth:**	**6/6.5**
Project No.:	**EQ191008**	**Date:**	**1/18/2019**
Boring No.:	**SJ-06**		
Sample No.:	**S-4**		
Description:	**SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2**		

Tare Weight, (g):	49.69	
	161.15	(with tare)
Dry Weight After Washing (g):		(with tare)

Sieve Size (Name)	Sieve Size (mm)	Weight Retained (g)	% Passing	Approx. Visual Shell %	Approx. Visual Shell Wt. (g)
3/4"	19.000	0.00	100.00	0	0.00
5/8"	16.000	0.00	100.00	0	0.00
7/16	11.112	0.00	100.00	0	0.00
5/16	7.938	0.00	100.00	0	0.00
#3.5	5.600	0.00	100.00	0	0.00
#4	4.750	0.00	100.00	0	0.00
#5	4.000	0.00	100.00	0	0.00
#7	2.800	0.00	100.00	0	0.00
#10	2.000	0.00	100.00	0	0.00
#14	1.400	0.03	99.97	25	0.01
#18	1.000	0.07	99.91	20	0.01
#25	0.710	0.14	99.78	20	0.03
#35	0.500	0.32	99.50	15	0.05
#45	0.355	1.04	98.56	15	0.16
#60	0.250	5.02	94.06	10	0.50
#80	0.180	18.38	77.57	1	0.18
#120	0.125	56.59	26.80	0	0.00
#170	0.090	24.87	4.49	0	0.00
#200	0.075	1.66	3.00	0	0.00
#230	0.063	0.22	2.80	0	0.00
Total Shell Content:		**1**			



Sample No.	Elev. Or Depth	Classification	% CO_3	G_s	Shell	LL	PL	PI
◆ S-4	6/6.5	SAND, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace medium to fine sand-sized shell fragments (SP) 5GY 6/2			1			

Project M&N Sunset Beach NC

Area

Boring No. SJ-06

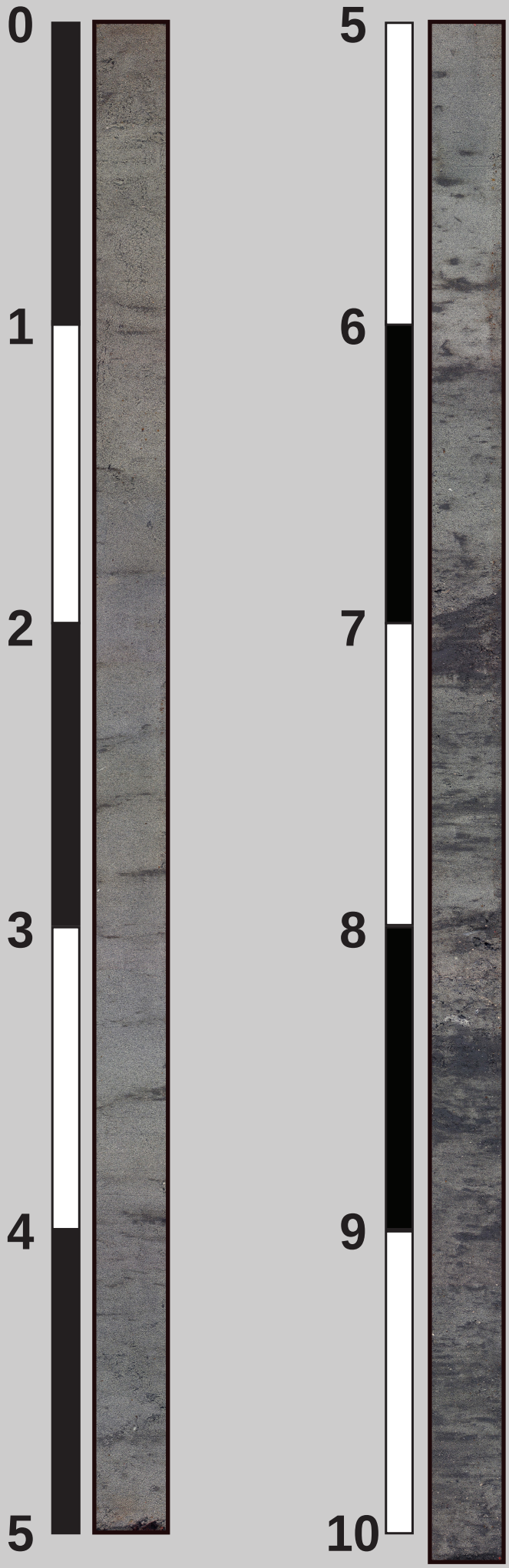
Date 1/18/2019

GRADATION CURVES

** The USC classification is based on laboratory grain size distribution and visual classification*

ENG FORM 2087
MAY 63

VIBRACORE PHOTOGRAPHS



SJ-01

Moffatt & Nichol

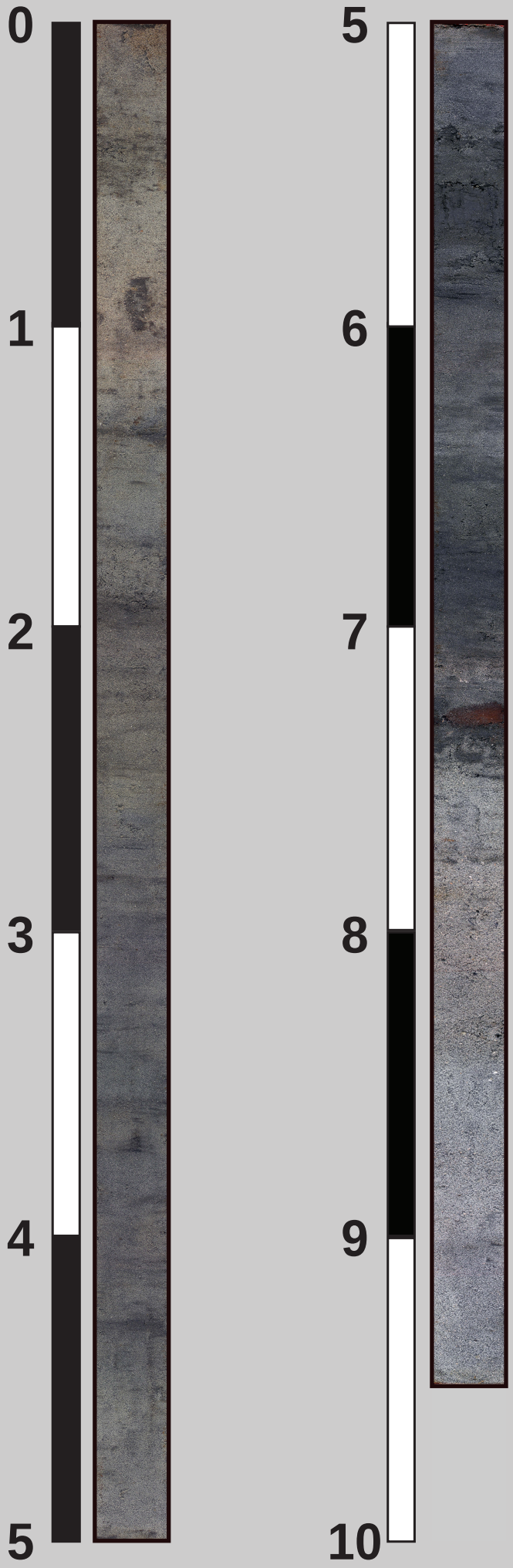
Town of Sunset Beach
Navigation Project
South Jinks Creek
Brunswick County,
North Carolina

Top Elev. (ft MLW): -0.1
Bottom Elev. (ft MLW): -10.2

Notes:
- Photo Mosaic Image
- Photo Scale in Feet

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



SJ-02

Moffatt & Nichol

Town of Sunset Beach
Navigation Project
South Jinks Creek
Brunswick County,
North Carolina

Top Elev. (ft MLW): 0.2
Bottom Elev. (ft MLW): -9.3

Notes:
- Photo Mosaic Image
- Photo Scale in Feet

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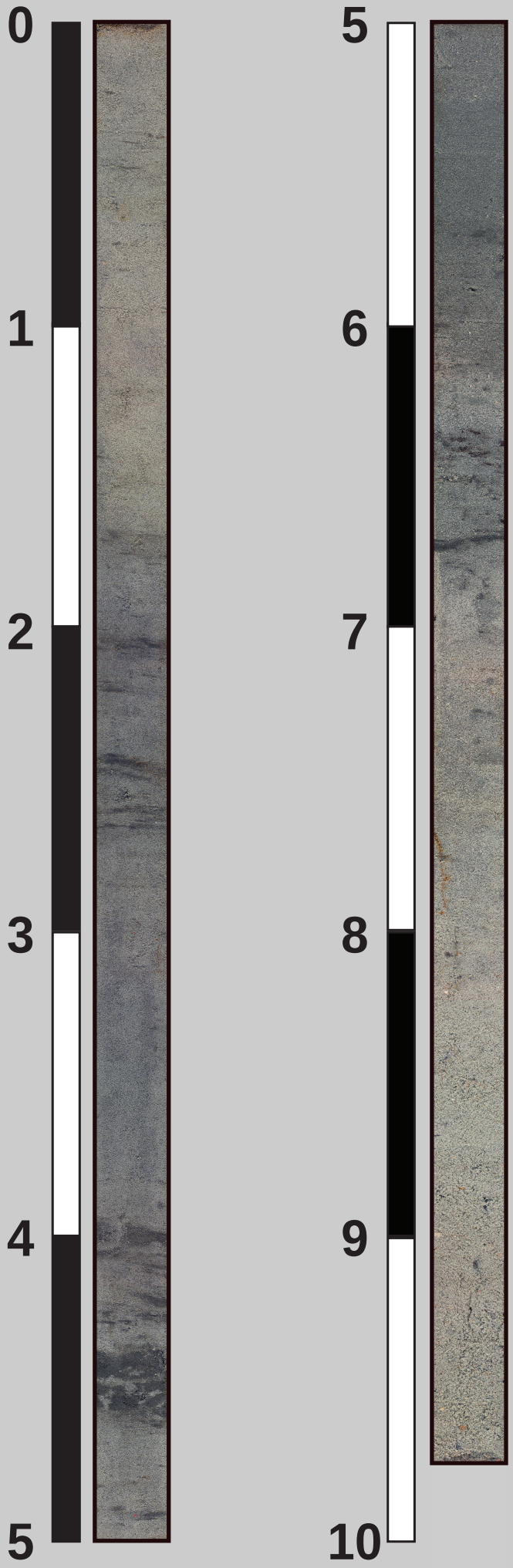
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



SJ-03

Moffatt & Nichol

Town of Sunset Beach
Navigation Project
South Jinks Creek
Brunswick County,
North Carolina

Top Elev. (ft MLW): 0.3
Bottom Elev. (ft MLW): -9.4

Notes:
- Photo Mosaic Image
- Photo Scale in Feet

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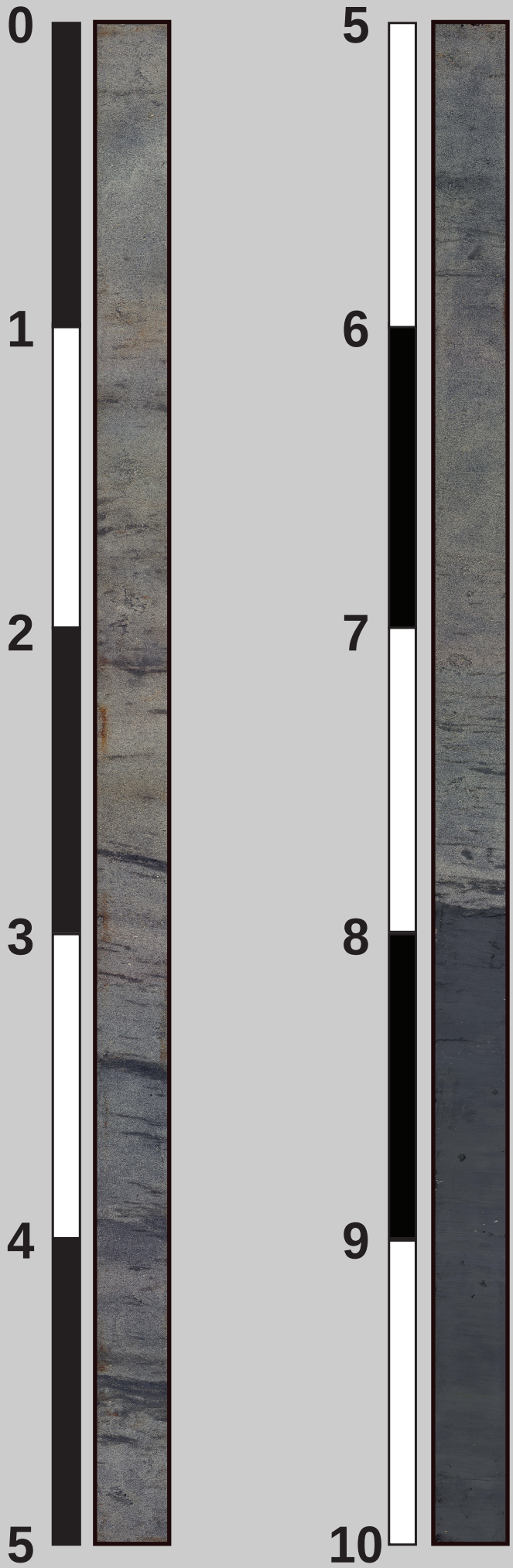
Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



SJ-04

Moffatt & Nichol

Town of Sunset Beach
Navigation Project
South Jinks Creek
Brunswick County,
North Carolina

Top Elev. (ft MLW): 1.1
Bottom Elev. (ft MLW): -8.9

Notes:
- Photo Mosaic Image
- Photo Scale in Feet

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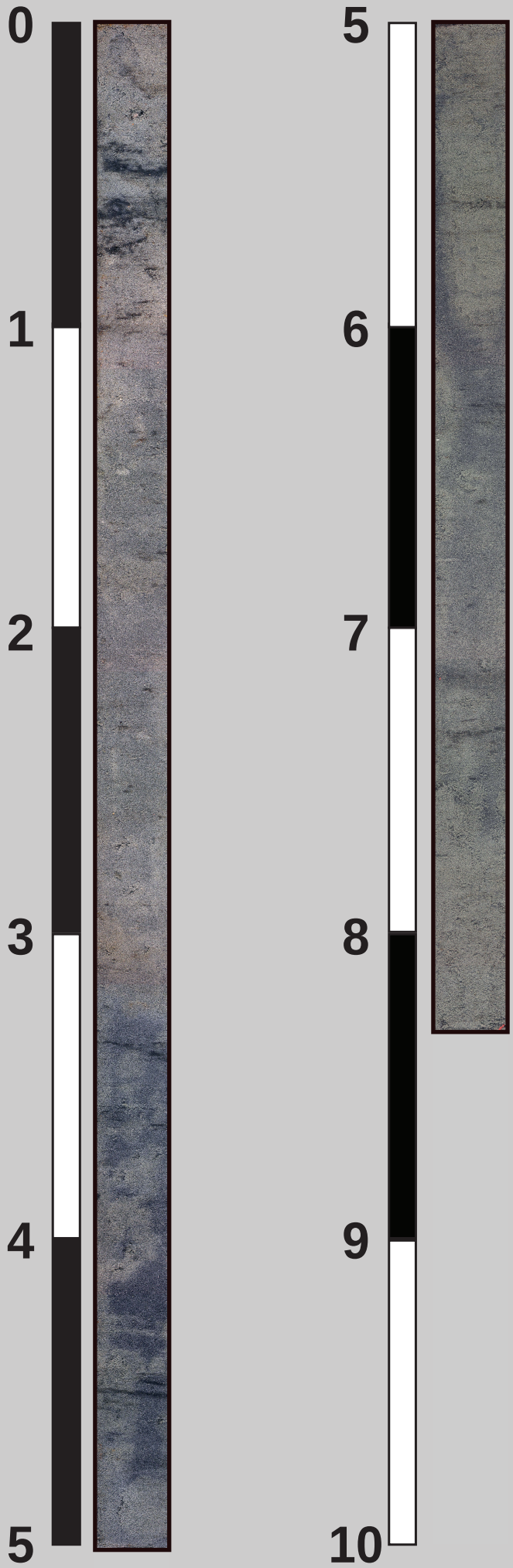
Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



SJ-05

Moffatt & Nichol

Town of Sunset Beach
Navigation Project
South Jinks Creek
Brunswick County,
North Carolina

Top Elev. (ft MLW): -2.3
Bottom Elev. (ft MLW): -10.6

Notes:
- Photo Mosaic Image
- Photo Scale in Feet

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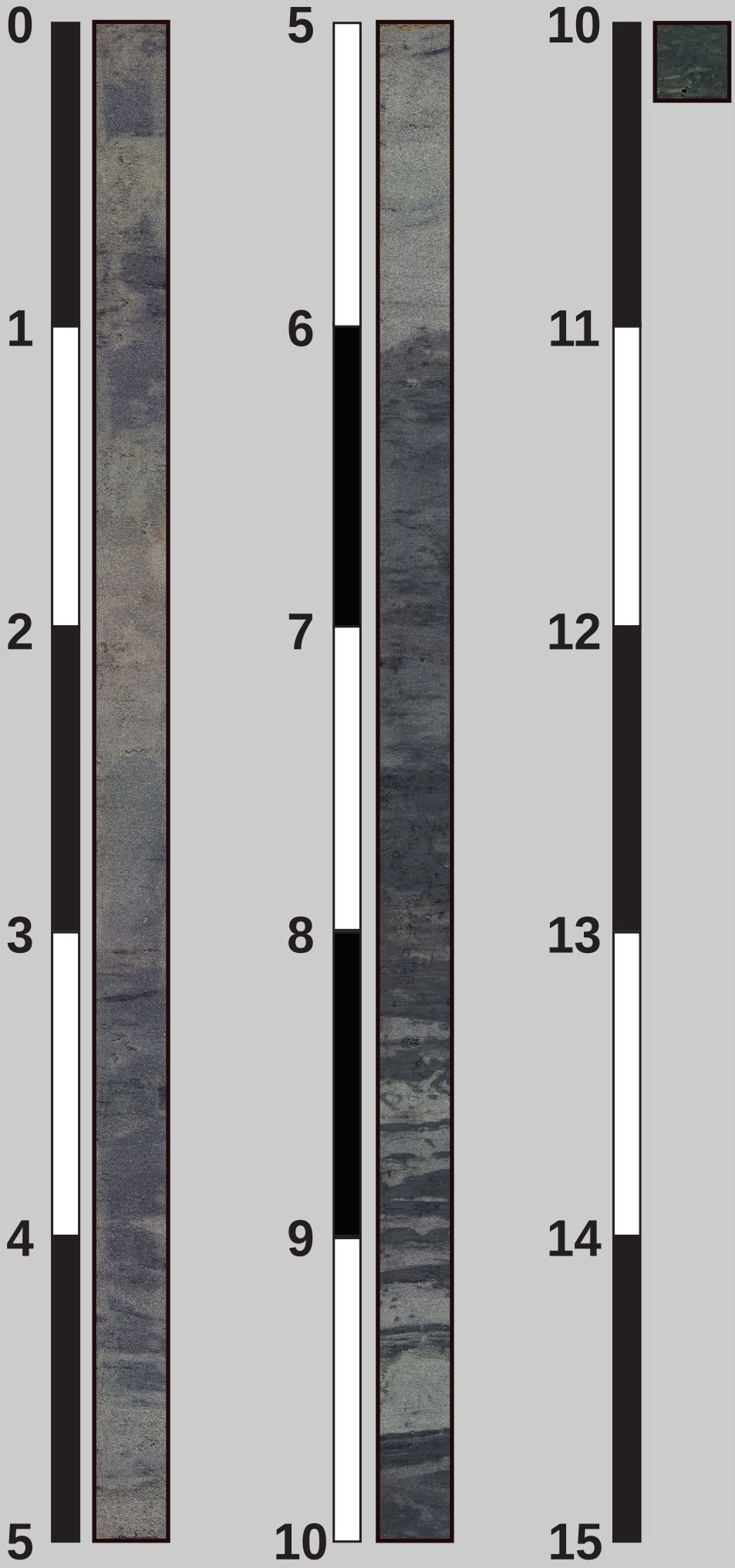
Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800



SJ-06

Moffatt & Nichol

Town of Sunset Beach
Navigation Project
South Jinks Creek
Brunswick County,
North Carolina

Top Elev. (ft MLW): 0.5
Bottom Elev. (ft MLW): -9.8

Notes:
- Photo Mosaic Image
- Photo Scale in Feet

ATHENA TECHNOLOGIES, INC.

Athena Technologies, Inc.
1293 Graham Farm Road
McClellanville, SC 29458
www.athenatechnologies.com
(843) 887-3800

CALCITE COMPOSITE

Terracon
Consulting Engineers & Scientists

Carbonate Content Data

Project Name: M&N Sunset Beach
Project Number: EQ191008
Date: 1/29/2019

Boring No.	Sample No.	Depth Range, Feet	Tare No.	Beaker No.	Dry Sample Wt.		Percent Carbonate
					Before	After	
SJ-01	C-1	0-5.9	797	1	80.09	76.90	4.0
SJ-02	C-1	0-6.2	415	2	70.17	66.05	5.9
SJ-03	C-1	0-6.3	228	3	79.86	76.30	4.5
SJ-04	C-1	0-7.1	441	4	77.54	73.84	4.8
SJ-05	C-1	0-3.7	198	5	87.16	83.60	4.1
SJ-06	C-1	0-6.5	66	6	84.43	80.74	4.4

Tested By: CRM Sr.

Reviewed By: TES

APPENDIX B

BAY AREA SEDIMENT ANALYSIS

PG B1-1 & B1-2 ANALYSIS SUMMARY PLANVIEW
PG B1-3 ANALYSIS SUMMARY TABLE
PG B2-1 THRU B2-3 VIBRACORE COMPOSITES
PG B3-1 THRU PG B3-5 VIBRACORE LOGS
PG B4-1 THRU B4-6 GRADATION CURVES
PG B5-1 THRU B5-4 VIBRACORE PHOTOGRAPHS

moffatt & nichol

2016 AERIAL PROVIDED BY NC ONEMAP

VC-21 (STA 3+50 TO 9+50)
VC-22 (STA -0+50 TO 3+50)
SEDIMENT COMPOSITE VALUES
% BY WEIGHT PASSING

	VC-21	VC-22
FINES:	94.39 %	70.50%
SAND:	5.51%	29.30%
GRANULAR:	0.10%	0.00%
GRAVEL:	0.00%	0.20%
MEAN DIA. (mm):	0.00	0.02
SORTING:	14.1	2.74
SKEWNESS:	0.00	-0.05
KURTOSIS:	0.34	0.24
CUBIC YARDS	2,200	2,500

TOWN OF SUNSET BEACH
NAVIGATION PROJECT
BAY AREA SEDIMENT ANALYSIS
PLAN VIEW

B1-1

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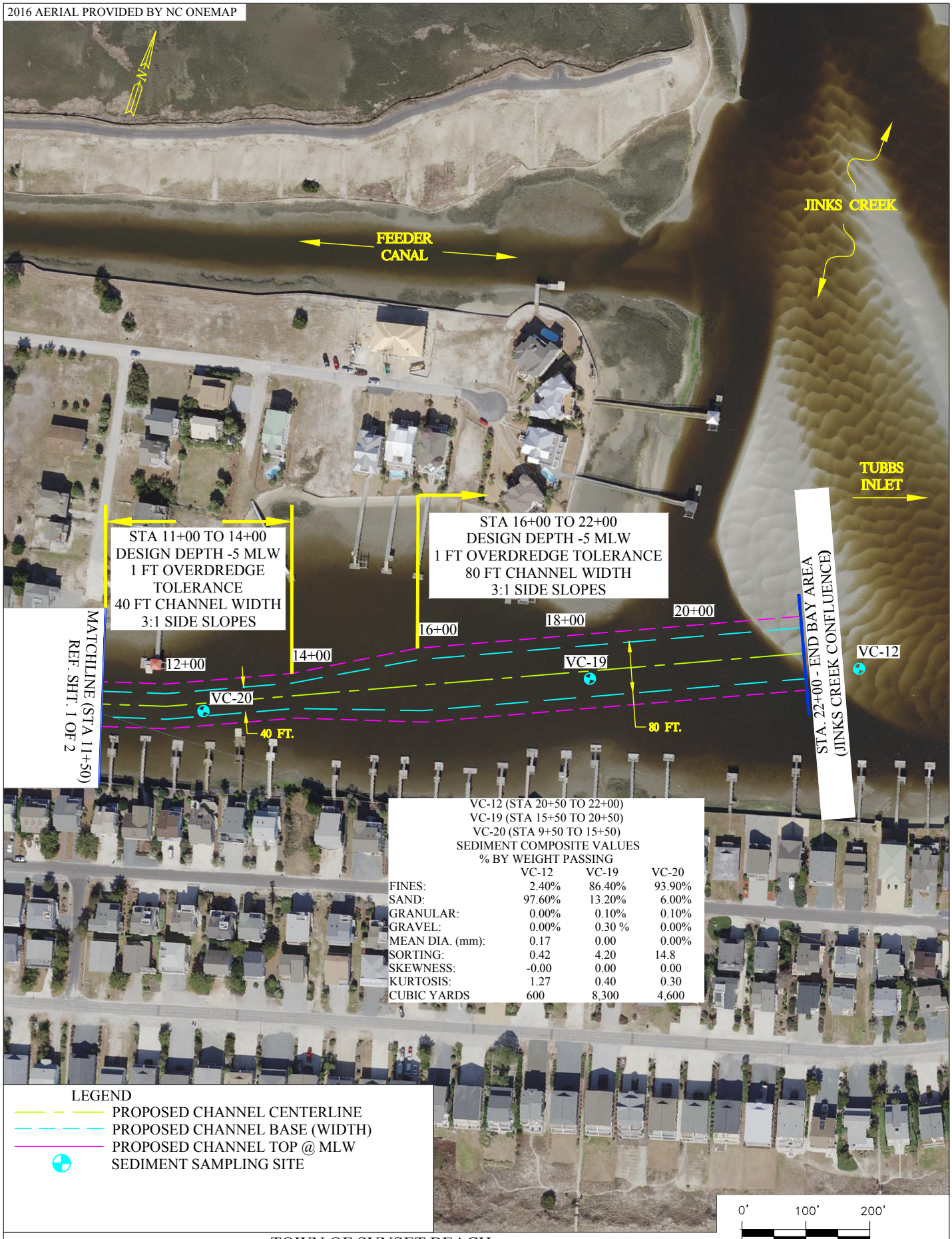
2016 AERIAL PROVIDED BY NC ONEMAP



VC-12 (STA 20+50 TO 22+00)
VC-19 (STA 15+50 TO 20+50)
VC-20 (STA 9+50 TO 15+50)
SEDIMENT COMPOSITE VALUES
% BY WEIGHT PASSING

	VC-12	VC-19	VC-20
FINES:	2.40%	86.40%	93.90%
SAND:	97.60%	13.20%	6.00%
GRANULAR:	0.00%	0.10%	0.10%
GRAVEL:	0.00%	0.30 %	0.00%
MEAN DIA. (mm):	0.17	0.00	0.00%
SORTING:	0.42	4.20	14.8
SKEWNESS:	-0.00	0.00	0.00
KURTOSIS:	1.27	0.40	0.30
CUBIC YARDS	600	8,300	4,600

LEGEND
- PROPOSED CHANNEL CENTERLINE
- PROPOSED CHANNEL BASE (WIDTH)
- PROPOSED CHANNEL TOP @ MLW
- SEDIMENT SAMPLING SITE

0' 100' 200'
GRAPHIC SCALE IN FEET

TOWN OF SUNSET BEACH
NAVIGATION PROJECT
BAY AREA SEDIMENT ANALYSIS
PLAN VIEW

B1-2

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9269
Town of Sunset Beach
Navigation Project
Bay Area Sediment Analysis Table

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Bay Area Vibracore Composite Summary Table

	Representative Stations		Representative Volume (CY)	Sample Elevation (FT-MLW)		Max. Disturbance (FT-MLW)	% Coverage of Disturbance Depth	Composite Summary (% By Wt. Passing)					Mean	Sorting	Skewness	Kurtosis
Vibracore	Start	Stop		Top	Bottom			Fines	Sand	Granular	Gravel	Total	(mm)	(σ)	(α)	(β)
VC-22	-0+50	3+50	2,500	-0.4	-6	-6	100%	70.5	29.3	0.00	0.20	100%	0.02	2.74	-0.05	0.24
VC-21	3+50	9+50	2,100	-3.5	-6	-6	100%	94.39	5.51	0.10	0.00	100%	1.7E-07	14.1	2.5E-16	0.34
VC-20	9+50	15+50	4,400	-2.2	-6	-6	100%	93.90	6.00	0.10	0.00	100%	1.1E-07	14.8	0.0E+00	0.33
VC-19	15+50	20+50	6,400	-2.2	-6	-6	100%	86.40	13.20	0.10	0.30	100%	2.3E-03	4.2	2.9E-02	0.4
VC-12	20+50	22+00	500	-0.2	-6	-6	100%	2.40	97.60	0.00	0.00	100%	0.17	0.42	0.00	1.27

Area	Volume (CY)	Stations
Beach Compatible Material	-	20+50 to 22+00
Non-Compatible Material	15,900	-0+50 to 20+50
Total	15,900	-0+50 to 22+00

1. Sediment represented by VC-12 is classified as non-compatible for planning purposes. The material (600 CY) will be placed in an upland spoil area if dredged as part of the Bay Area work.
2. Max. Disturbance Depth includes overdredge tolerance.
3. Volumetric quantities rounded for clarity.

VIBRACORE COMPOSITES

9269
Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_{\Phi}]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi}\}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Bay Area Vibracore Composites
Design Depth -5 MLW +1 FT OD

Vibracore VC-12 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	VC-12 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.00			
0.00	0.10			
1.00	0.70			
2.00	7.50			
3.00	89.00			
3.75	97.50			
4.00	97.60			

VC-12 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.0			
100.0			
100.0			
100.0			
100.0			
99.9			
99.3			
92.5			
11.0			
2.5			
2.4			

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.70	99.30
7.50	92.50
89.00	11.00
97.50	2.50
97.60	2.40

VC-12	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS
1	-0.2	-6	5.8	100.00%	SP
Composite	**-0.2**	**-6**	**5.8**	**100.00%**	**SP**

VC-12	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.63	2.10	2.21	2.52	2.83	2.94	3.53
Composite	**1.63**	**2.10**	**2.21**	**2.52**	**2.83**	**2.94**	**3.53**

VC-12	Parameters in Phi Units Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.52	0.17	2.52	0.17	0.42	0.00	1.27
Composite	**2.52**	**0.17**	**2.52**	**0.17**	**0.42**	**0.00**	**1.27**

VC-12 Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
1.00	2.40	97.60	0.00	0.00	100%
Composite	**2.40**	**97.60**	**0.00**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Note: 1. Analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 φ) sieve.
2. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.

Vibracore VC-19 Max Dredge Depth -6 MLW

Sieve (Phi)	VC-19 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.20			
-2.00	0.30			
-1.00	0.40			
0.00	0.50			
1.00	0.60			
2.00	1.20			
3.00	5.80			
3.75	12.70			
4.00	13.60			

VC-19 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.0			
100.0			
99.8			
99.7			
99.6			
99.5			
99.4			
98.8			
94.2			
87.3			
86.4			

Composite VC-19 Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.20	99.80
0.30	99.70
0.40	99.60
0.50	99.50
0.60	99.40
1.20	98.80
5.80	94.20
12.70	87.30
13.60	86.40

VC-19	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS
1	-2.2	-6	3.8	100.00%	OL/OH
2					
3					
4					
Composite	**-2.2**	**-6**	**3.8**	**100.00%**	**OL/OH**

VC-19	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.83	4.67	5.46	8.67	11.87	13.03	14.44
2							
3							
4							
Composite	**2.83**	**4.67**	**5.46**	**8.67**	**11.87**	**13.03**	**14.44**

VC-19	Parameters in Phi Units Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	8.67	0.00	8.79	0.00	4.18	0.03	0.39
2							
3							
4							
Composite	**8.67**	**0.00**	**8.79**	**0.00**	**4.18**	**0.03**	**0.39**

VC-19 Composite Grain Size Distribution (% by Weight Passing) SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	86.40	13.20	0.10	0.30	100%
2.00					
3.00					
4.00					
Composite	**86.40**	**13.20**	**0.10**	**0.30**	**100%**

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

moffatt & nichol

9269
Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{d\Phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{d\Phi}-\Phi_{50})/\sigma_{\Phi}]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi}\}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Bay Area Vibracore Composites
Design Depth -5 MLW +1 Ft OD

Vibracore VC-20 Max Dredge Depth -6 MLW

	VC-20			
	Sample Cumulative % by Weight Retained			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.10			
0.00	0.20			
1.00	0.50			
2.00	1.50			
3.00	4.40			
3.75	5.80			
4.00	6.10			

VC-20			
Sample Cumulative % by Weight Passing			
#1	#2	#3	#4
100.0			
100.0			
100.0			
100.0			
99.9			
99.8			
99.5			
98.5			
95.6			
94.2			
93.9			

Composite VC-20	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.20	99.80
0.50	99.50
1.50	98.50
4.40	95.60
5.80	94.20
6.10	93.90

VC-20	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-2.2	-6	3.8	100.00%	OL/OH
2					
3					
4					
Composite	**-2.2**	**-6**	**3.8**	**100.00%**	**OL/OH**

VC-20	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	3.32	8.30	12.22	23.09	33.96	37.87	42.65
2							
3							
4							
Composite	**3.32**	**8.30**	**12.22**	**23.09**	**33.96**	**37.87**	**42.65**

VC-20							
					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	23.09	0.00	23.09	0.00	14.78	0.00	0.33
2							
3							
4							
Composite	**23.09**	**0.00**	**23.09**	**0.00**	**14.78**	**0.00**	**0.33**

VC-20	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	93.90	6.00	0.10	0.00	100%
2.00					
3.00					
4.00					
Composite	**93.90**	**6.00**	**0.10**	**0.00**	**100%**

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Vibracore VC-21 Max Dredge Depth -6 MLW

	VC-21			
	Sample Cumulative % by Weight Retained			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.10			
0.00	0.20			
1.00	0.20			
2.00	0.80			
3.00	4.80			
3.75	5.60			
4.00	5.61			

VC-21			
Sample Cumulative % by Weight Passing			
#1	#2	#3	#4
100.0			
100.0			
100.0			
100.0			
99.9			
99.8			
99.8			
99.2			
95.2			
94.4			
94.4			

Composite VC-21	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.20	99.80
0.20	99.80
0.80	99.20
4.80	95.20
5.60	94.40
5.61	94.39

VC-21	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-3.5	-6	2.5	100.00%	OL/OH
2					
3					
4					
Composite	**-3.5**	**-6**	**2.5**	**100.00%**	**OL/OH**

VC-21	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	3.19	8.32	12.06	22.46	32.85	36.59	41.17
2							
3							
4							
Composite	**3.19**	**8.32**	**12.06**	**22.46**	**32.85**	**36.59**	**41.17**

VC-21							
					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	22.46	0.00	22.46	0.00	14.14	0.00	0.34
2							
3							
4							
Composite	**22.46**	**0.00**	**22.46**	**0.00**	**14.14**	**0.00**	**0.34**

VC-21	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	94.4	5.51	0.10	0.00	100%
2.00					
3.00					
4.00					
Composite	**94.4**	**5.51**	**0.10**	**0.00**	**100%**

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

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9269
Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{d\phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{d\phi}-\Phi_{50})/\sigma_\phi]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_\phi\}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Bay Area Vibracore Composites
Design Depth -5 MLW +1 Ft OD

Vibracore VC-22 Max Dredge Depth -6 MLW

	VC-22			
	Sample Cumulative % by Weight Retained			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.20			
-2.00	0.20			
-1.00	0.20			
0.00	0.30			
1.00	0.40			
2.00	2.60			
3.00	25.80			
3.75	29.40			
4.00	29.50			

VC-22			
Sample Cumulative % by Weight Passing			
#1	#2	#3	#4
100.0			
100.0			
99.8			
99.8			
99.8			
99.7			
99.6			
97.4			
74.2			
70.6			
70.5			

Composite VC-22	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.20	99.80
0.20	99.80
0.20	99.80
0.30	99.70
0.40	99.60
2.60	97.40
25.80	74.20
29.40	70.60
29.50	70.50

VC-22	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-0.4	-6	5.6	100.00%	OL/OH
2					
3					
4					
Composite	**-0.4**	**-6**	**5.6**	**100.00%**	**OL/OH**

VC-22	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.10	2.58	2.97	5.52	7.38	8.05	8.87
2							
3							
4							
Composite	**2.10**	**2.58**	**2.97**	**5.52**	**7.38**	**8.05**	**8.87**

VC-22	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	70.5	29.30	0.00	0.20	100%
2.00					
3.00					
4.00					
Composite	**70.5**	**29.30**	**0.00**	**0.20**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-22					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	5.52	0.02	5.38	0.02	2.74	-0.05	0.24
2							
3							
4							
Composite	**5.52**	**0.02**	**5.38**	**0.02**	**2.74**	**-0.05**	**0.24**

VIBRACORE LOGS

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-22**
NORTHING: 44806	**EASTING:** 2152329	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -0.4 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 4.4 ft.	**DEPTH IN SEDS.:** 7.2 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -10.0 ft.
START DATE: 08/18/16	**FINISH DATE:** 08/18/16	**BORING LOCATION:** Canal Drive Bay Area	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-0.4
0.0	-0.4	-0.4	V2022	V22-S01	OL/OH			Gray, ORGANIC SOIL	
6.7	-7.1	-7.6		V22-S02	SP		6.7		-7.1
7.2	-7.6						7.2	Gray, poorly graded SAND	-7.6

BORING TERMINATED WITH VIBRACORE REFUSAL AT ELEVATION -7.6 ft (MLW)

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-20 & VC-22

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-21
NORTHING: 44896	**EASTING:** 2152926	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -3.5 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 5.4 ft.	**DEPTH IN SEDS.:** 6.5 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -10.0 ft.
START DATE: 08/18/16	**FINISH DATE:** 08/18/16	**BORING LOCATION:** Canal Drive Bay Area	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-3.5
0.0	-3.5			V21-S01	OL/OH			Gray to dark gray, ORGANIC SOIL	
							6.0		-9.5
6	-9.5						6.5	No Recovery	-10.0
								BORING TERMINATED AT ELEVATION -10.0 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-20**
NORTHING: 45052	**EASTING:** 2153509	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -2.2 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 7.5 ft.	**DEPTH IN SEDS.:** 7.9 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -10.0 ft.
START DATE: 08/19/16	**FINISH DATE:** 08/19/16	**BORING LOCATION:** Canal Drive Bay Area	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-2.2
0.0	-2.2	-2.2	V2022	V20-S01	OL/OH			Gray to dark gray, ORGANIC SOIL	
6.8	-9.0	-9.0					6.8		-9.0
							7.9	No Recovery	-10.1
								BORING TERMINATED AT ELEVATION -10.1 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-20 & VC-22

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-19
NORTHING: 45283	**EASTING:** 2154070	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -2.2 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 6.9 ft.	**DEPTH IN SEDS.:** 7.8 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -10.0 ft.
START DATE: 08/19/16	**FINISH DATE:** 08/19/16	**BORING LOCATION:** Canal Drive Bay Area	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-2.2
0.0	-2.2			V19-S01	OL/OH			Gray, ORGANIC SOIL	
							6.0		-8.2
6	-8.2							No Recovery	
							7.8		-10.0
								BORING TERMINATED AT ELEVATION -10.0 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-12
NORTHING: 45425	**EASTING:** 2154467	**FIELD GEO.:** Steven Hudson	**MUDLINE ELEV.:** -0.2 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 5.3 ft.	**DEPTH IN SEDS.:** 8.9 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -10.0 ft.
START DATE: 08/23/16	**FINISH DATE:** 08/23/16	**BORING LOCATION:** Jinks Creek	

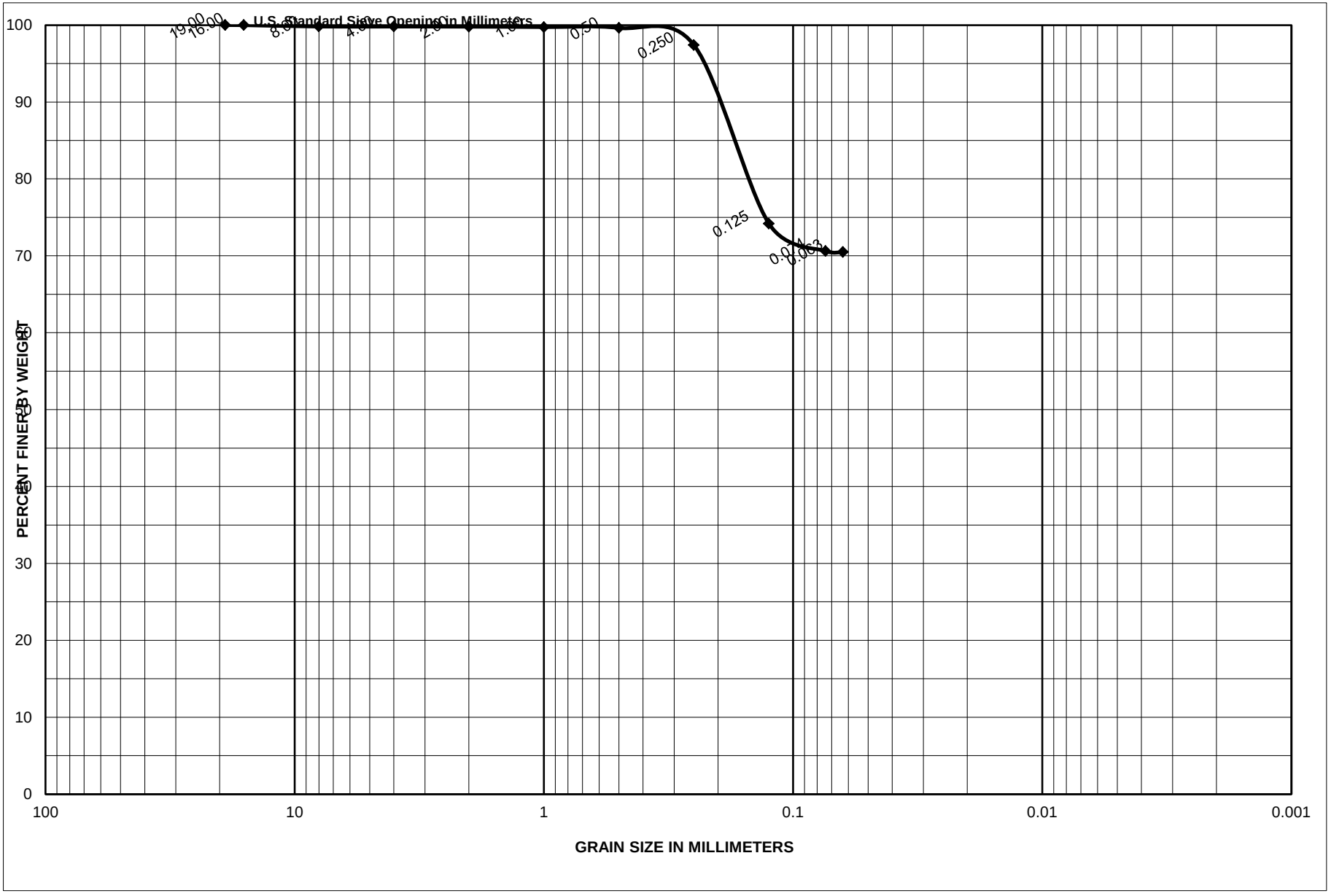
DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-0.2
0.0	-0.2			V12-S01	SP			Tan to gray, poorly graded SAND	
8.9	-9.1						8.9		-9.1
								BORING TERMINATED WITH VIBRACORE REFUSAL AT ELEVATION -9.1 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

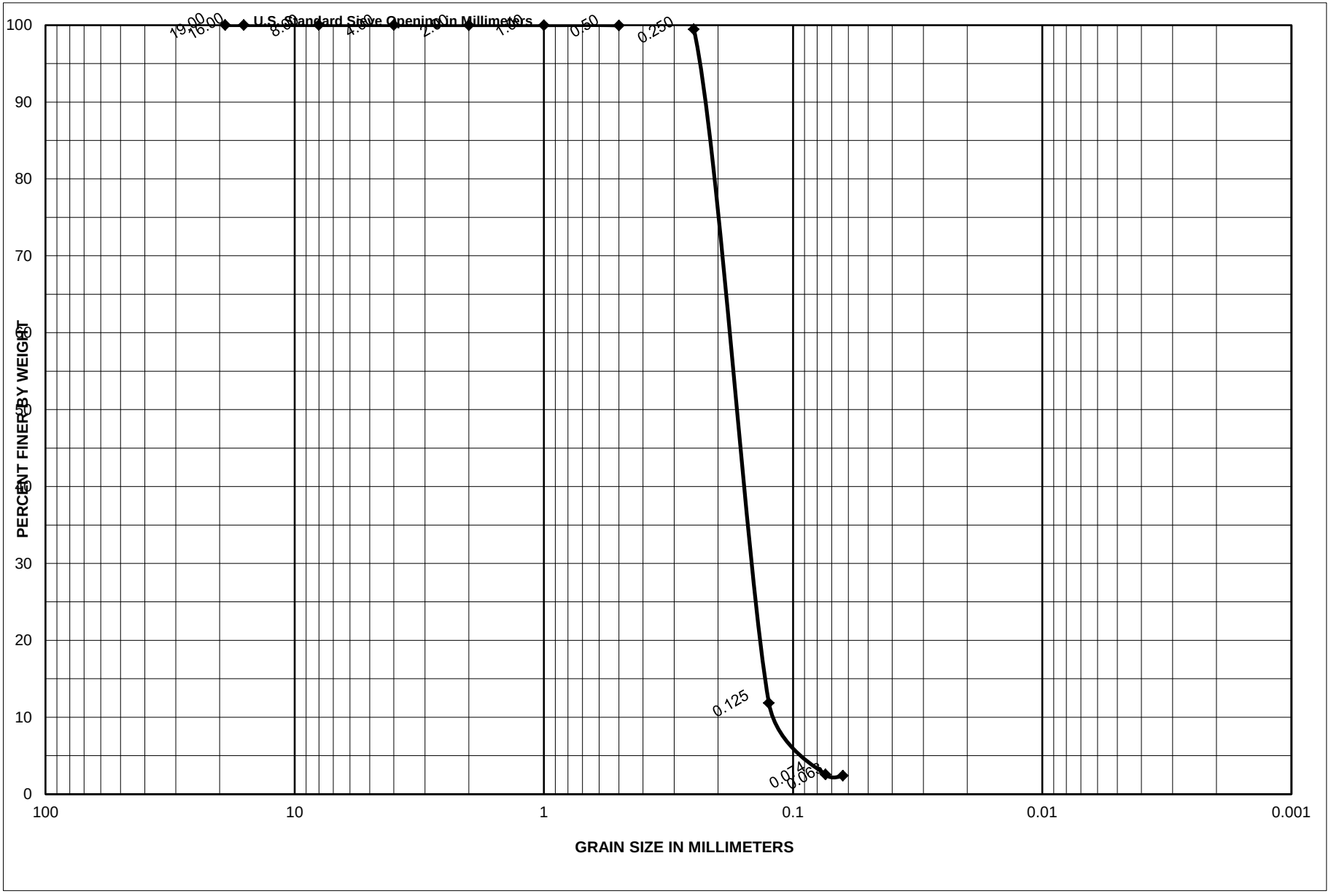
NOTES:

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

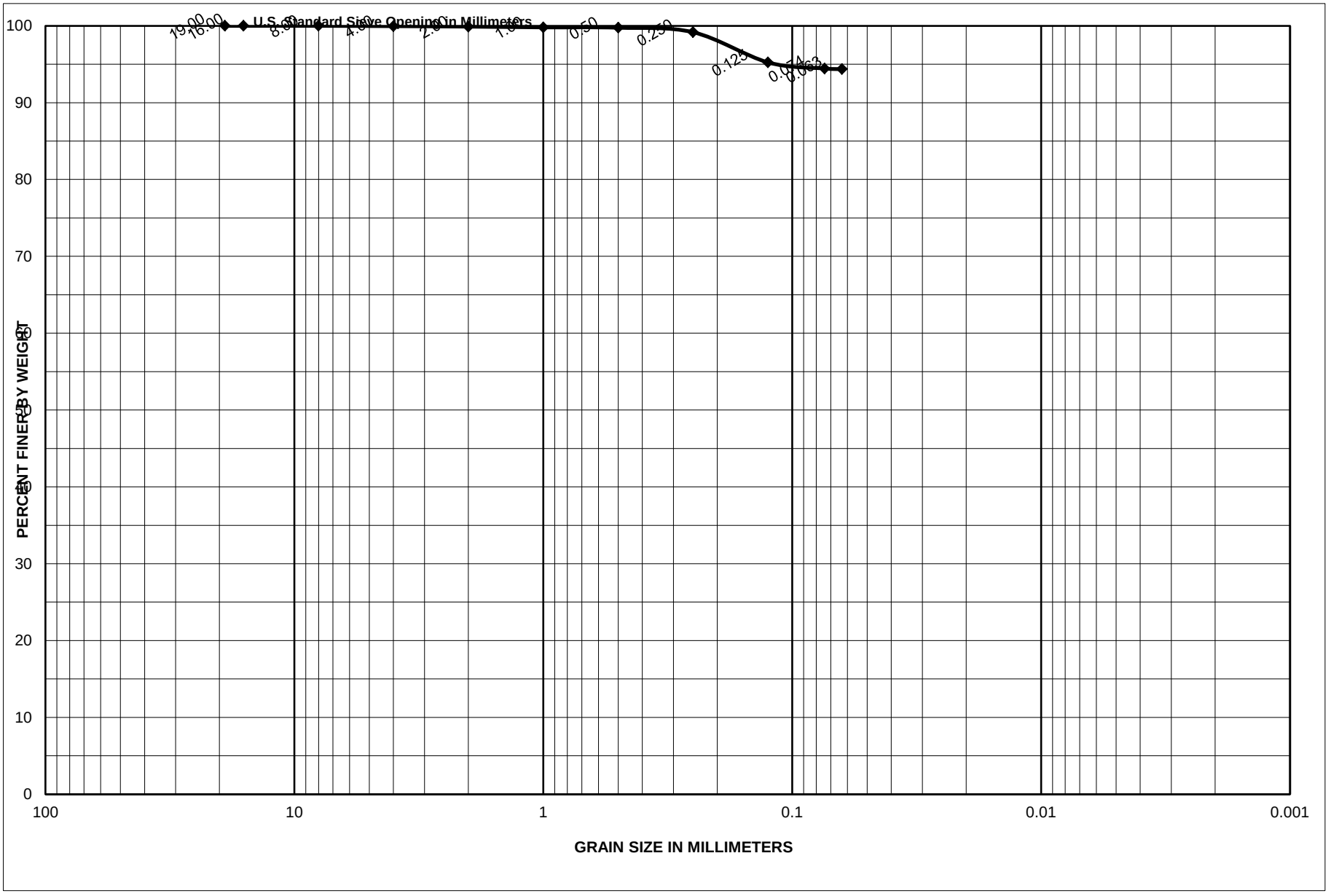
GRADATION CURVES



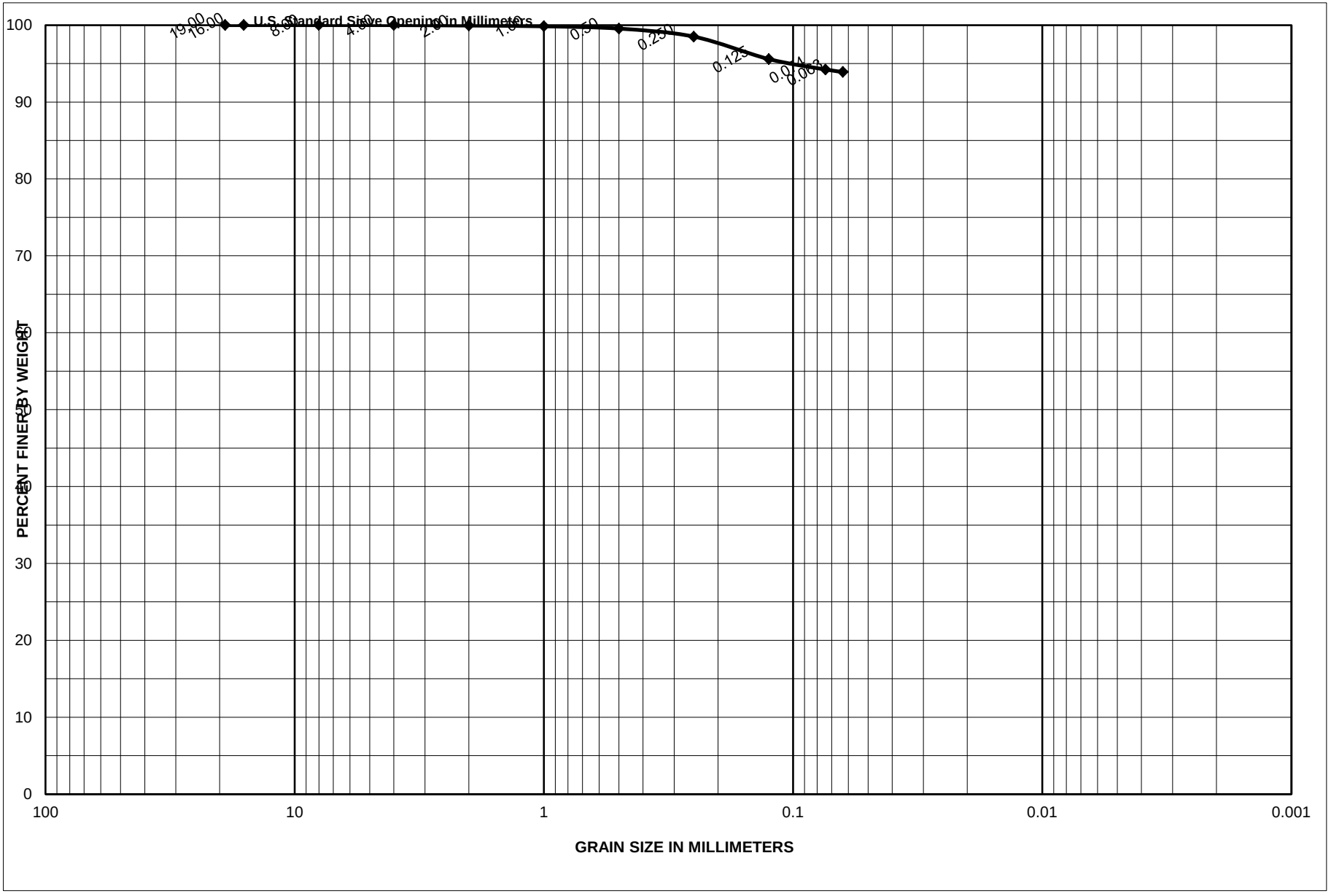
Sample No.	Depth (ft)	Classification		
V22-S01	0-6.7	Gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-22
			Date	9/14/2016



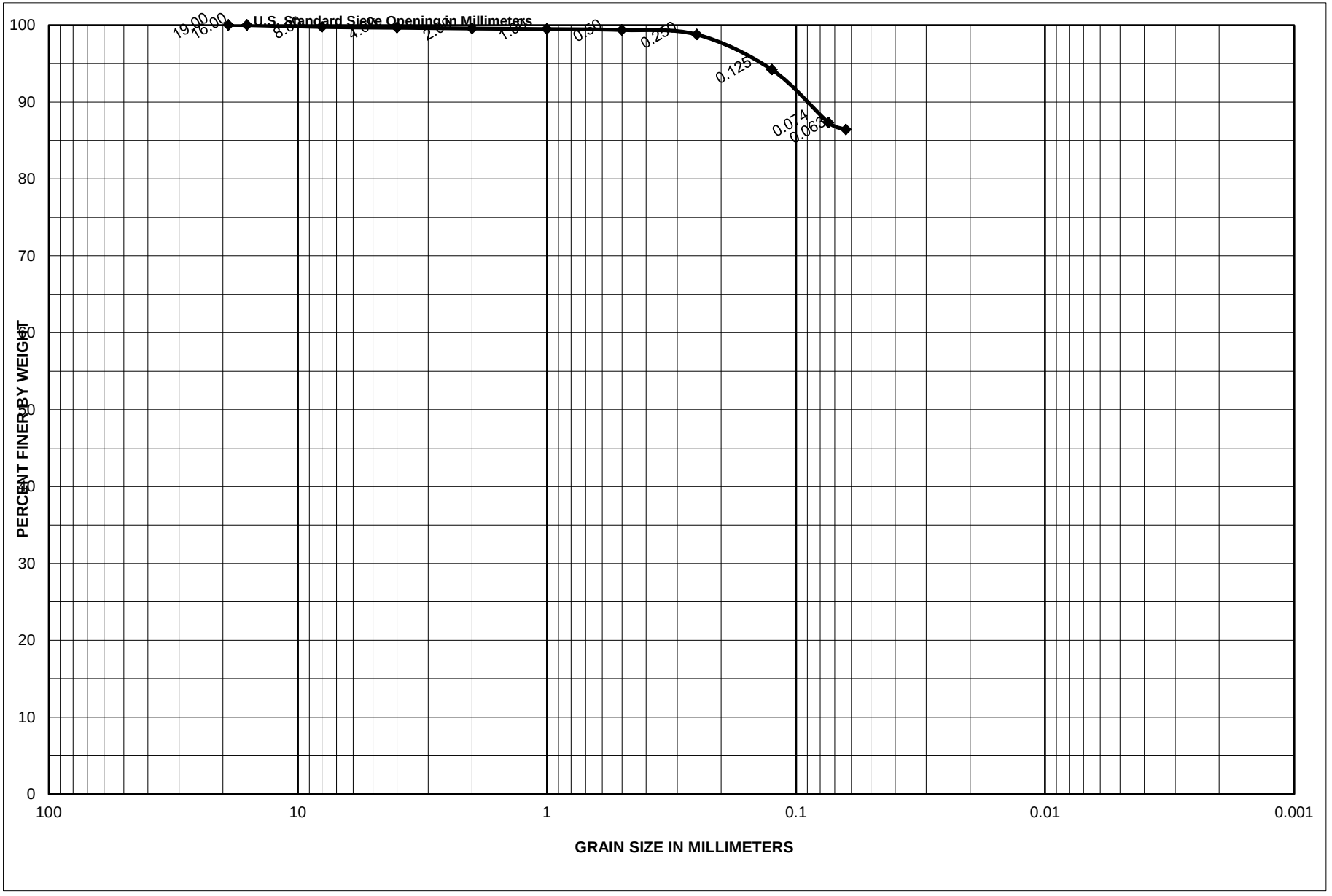
Sample No.	Depth (ft)	Classification		
V22-S02	6.7-7.2	Gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-22
			Date	9/14/2016



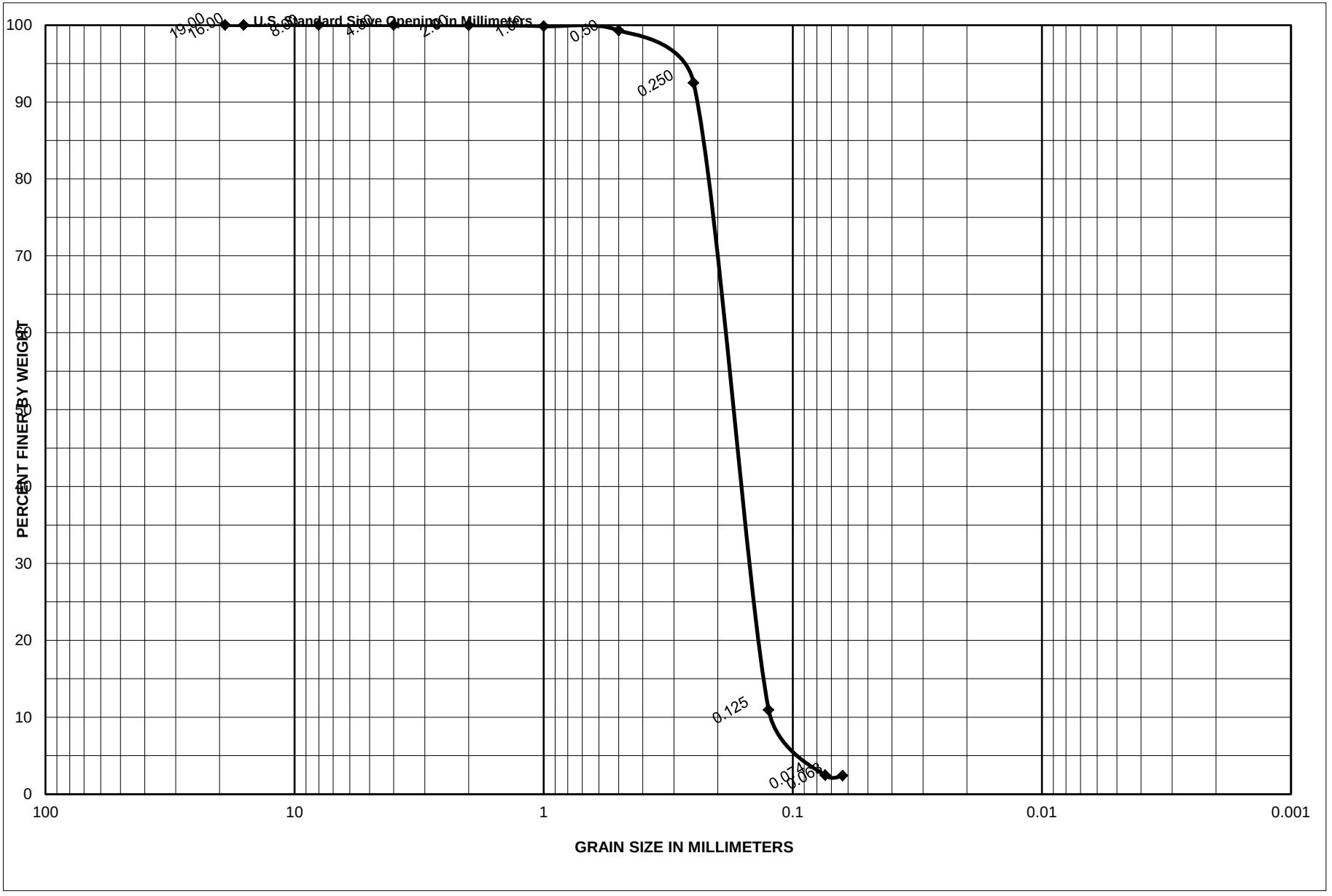
Sample No.	Depth (ft)	Classification		
V21-S01	0-6	Gray to dark gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-21
			Date	9/14/2016



Sample No.	Depth (ft)	Classification		
V20-S01	0-6.8	Gray to dark gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-20
			Date	9/14/2016



Sample No.	Depth (ft)	Classification		
V19-S01	0-6.0	Gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-19
			Date	9/14/2016



Sample No.	Depth (ft)	Classification		
V12-S01	0-8.9	Tan to gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-12
			Date	9/14/2016

VIBRACORE PHOTOGRAPHS

Sample VC-22

Top Elevation: -0.4 MLW

Bottom Elevation: -7.6 MLW

Sample Length: 7.2 ft

Sample VC-20

Top Elevation: -2.2 MLW Bottom Elevation: -9.0 MLW

Sample Length: 6.8 ft

Sample VC-21

Top Elevation: -3.5 MLW Bottom Elevation: -9.5 MLW

Sample Length: 6.0 ft

Sample VC-19

Top Elevation: -2.2 MLW

Bottom Elevation: -8.2 MLW

Sample Length: 6.0 ft

Sample VC-12-1

Top Elevation: -0.2 MLW Bottom Elevation: -5.2 MLW

Sample Length: 5.0 ft

Sample VC-12-2

Top Elevation: -5.2 MLW Bottom Elevation: -9.1 MLW

Sample Length: 3.9 ft

APPENDIX C

FEEDER CHANNEL SEDIMENT ANALYSIS

PG C1-1 THRU C1-3 ANALYSIS SUMMARY PLANVIEW
PG C1-4 ANALYSIS SUMMARY TABLE
PG C2-1 THRU C2-5 VIBRACORE COMPOSITES
PG C3-1 THRU PG C3-10 VIBRACORE LOGS
PG C4-1 THRU B4-22 GRADATION CURVES
PG C5-1 THRU B5-8 VIBRACORE PHOTOGRAPHS

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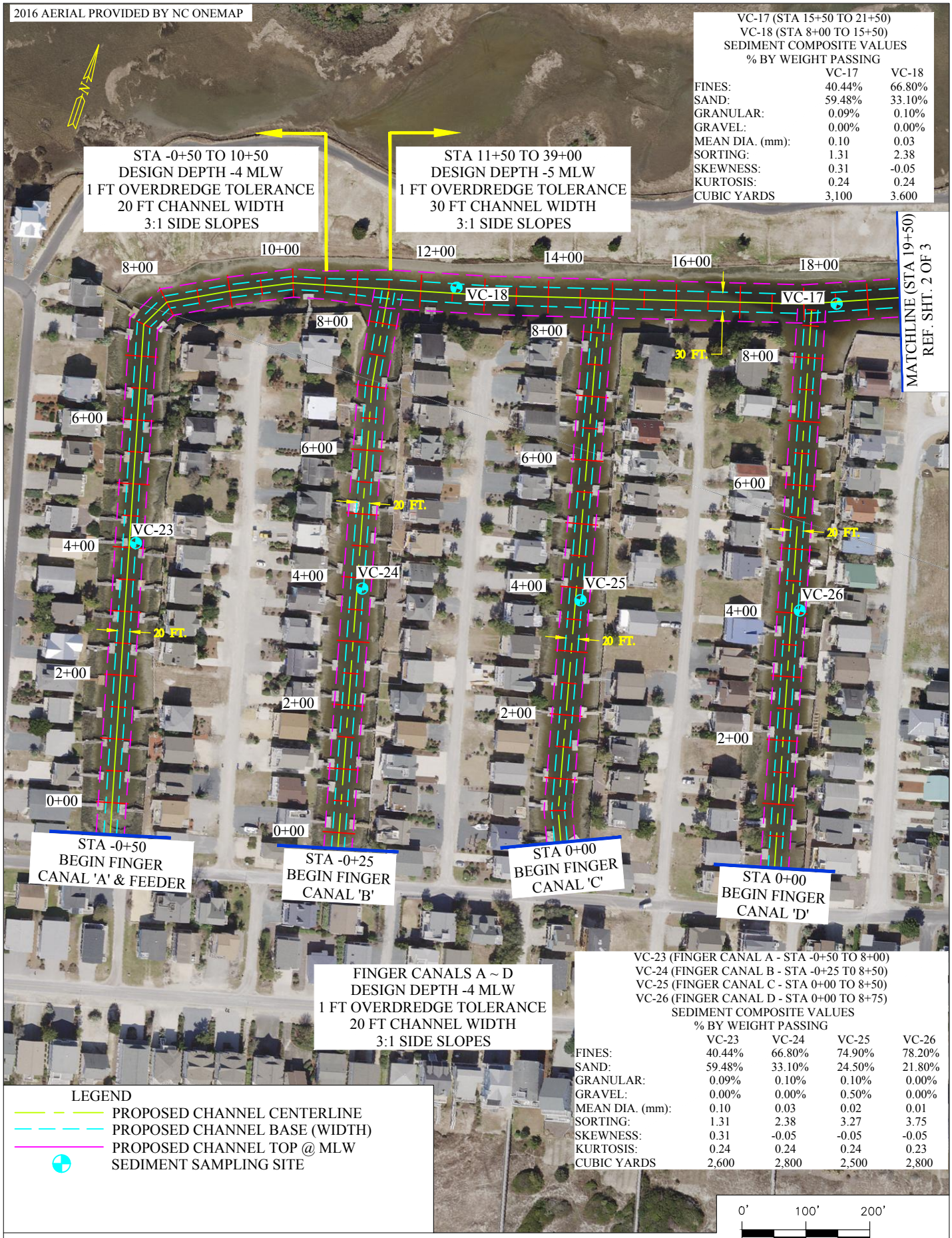

VC-17 (STA 15+50 TO 21+50)
VC-18 (STA 8+00 TO 15+50)
SEDIMENT COMPOSITE VALUES
% BY WEIGHT PASSING

	VC-17	VC-18
FINES:	40.44%	66.80%
SAND:	59.48%	33.10%
GRANULAR:	0.09%	0.10%
GRAVEL:	0.00%	0.00%
MEAN DIA. (mm):	0.10	0.03
SORTING:	1.31	2.38
SKEWNESS:	0.31	-0.05
KURTOSIS:	0.24	0.24
CUBIC YARDS	3,100	3.600

VC-23 (FINGER CANAL A - STA -0+50 TO 8+00)
VC-24 (FINGER CANAL B - STA -0+25 T0 8+50)
VC-25 (FINGER CANAL C - STA 0+00 TO 8+50)
VC-26 (FINGER CANAL D - STA 0+00 TO 8+75)
SEDIMENT COMPOSITE VALUES
% BY WEIGHT PASSING

	VC-23	VC-24	VC-25	VC-26
FINES:	40.44%	66.80%	74.90%	78.20%
SAND:	59.48%	33.10%	24.50%	21.80%
GRANULAR:	0.09%	0.10%	0.10%	0.00%
GRAVEL:	0.00%	0.00%	0.50%	0.00%
MEAN DIA. (mm):	0.10	0.03	0.02	0.01
SORTING:	1.31	2.38	3.27	3.75
SKEWNESS:	0.31	-0.05	-0.05	-0.05
KURTOSIS:	0.24	0.24	0.24	0.23
CUBIC YARDS	2,600	2,800	2,500	2,800

TOWN OF SUNSET BEACH
NAVIGATION PROJECT
FEEDER CHANNEL SEDIMENT ANALYSIS
PLAN VIEW

C1-1

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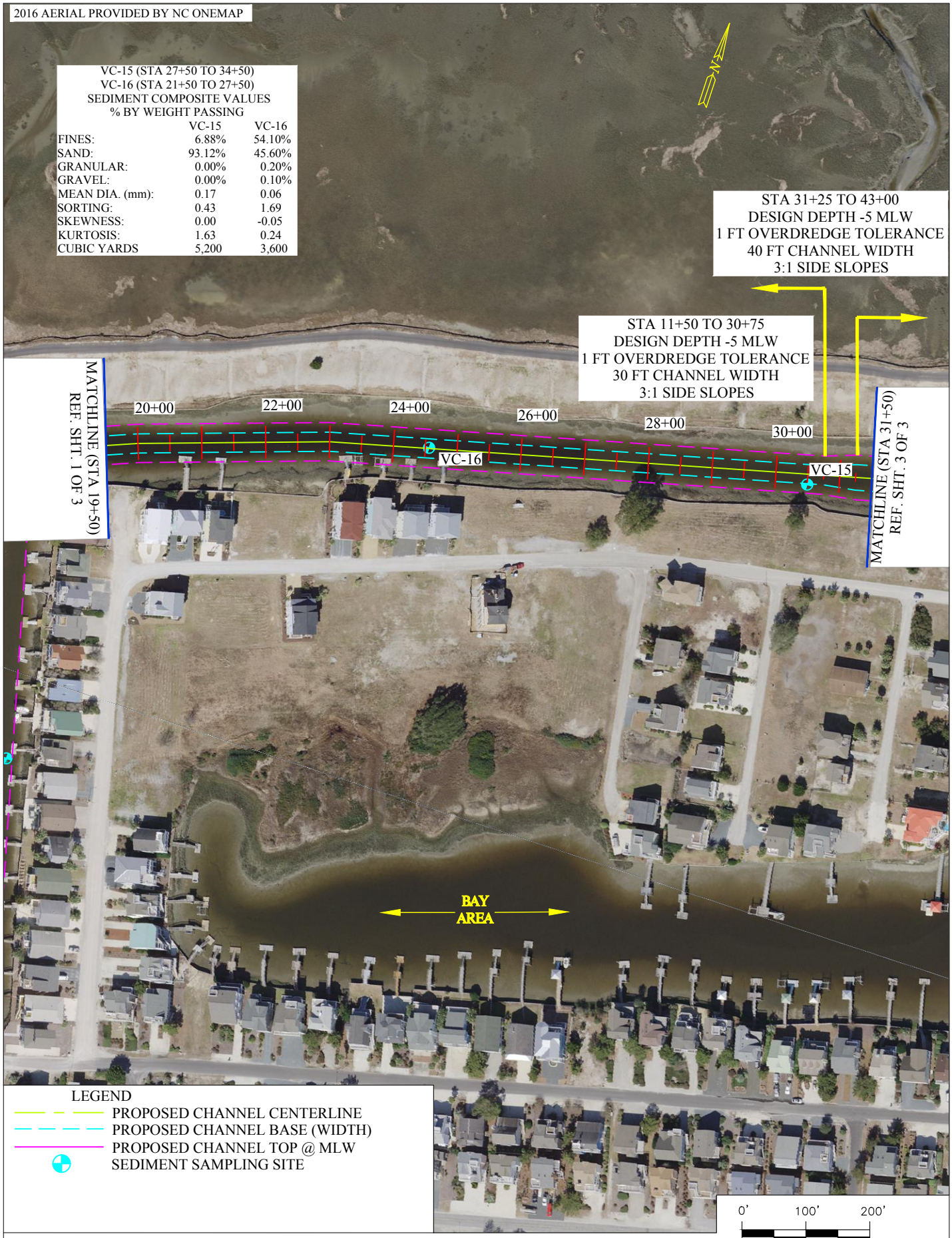

TOWN OF SUNSET BEACH
NAVIGATION PROJECT
FEEDER CHANNEL SEDIMENT ANALYSIS
PLAN VIEW

C1-2

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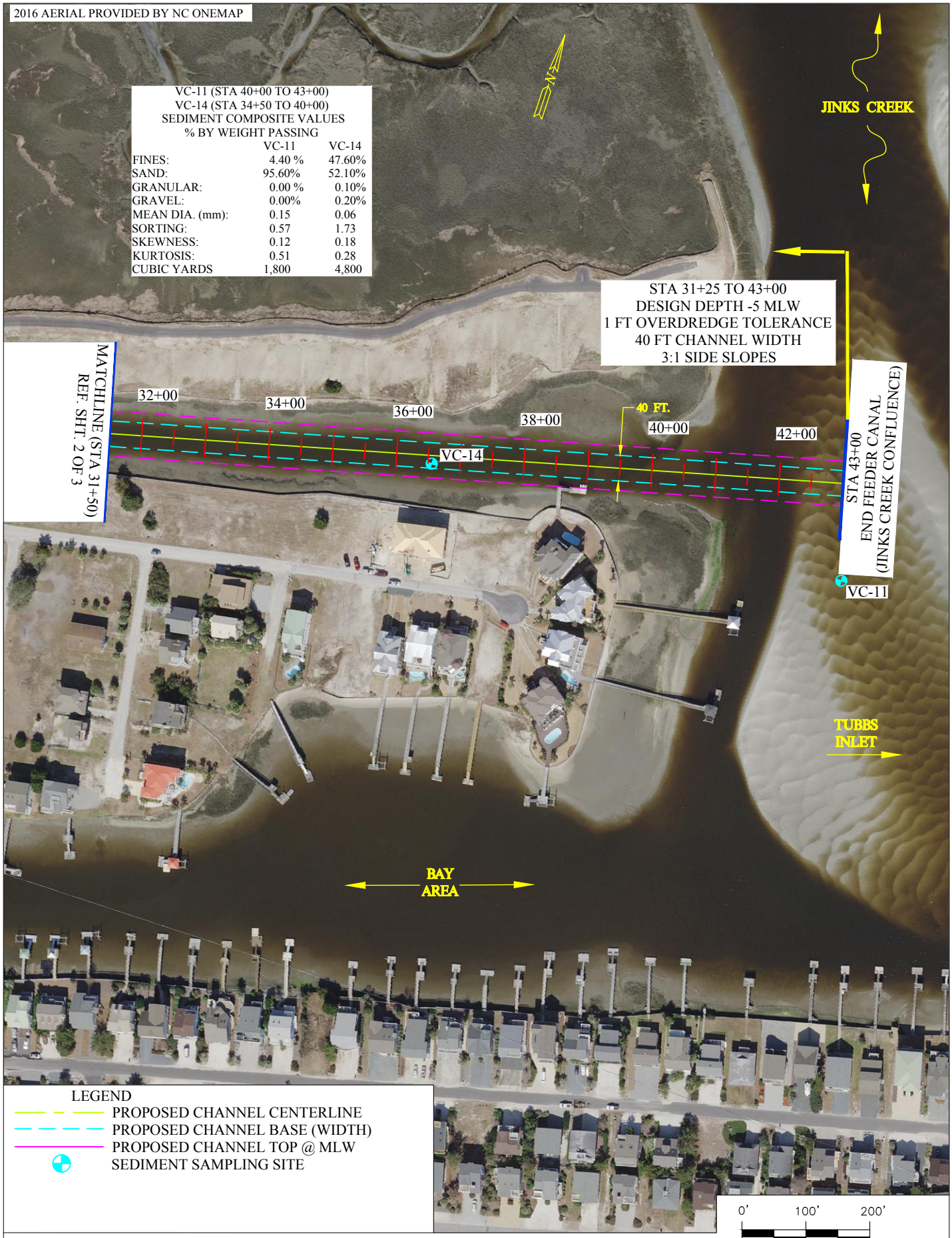

TOWN OF SUNSET BEACH
NAVIGATION PROJECT
FEEDER CHANNEL SEDIMENT ANALYSIS
PLAN VIEW

C1-3

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9269
Town of Sunset Beach
Navigation Project
Feeder Channel Sediment Analysis Summary Table

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Feeder Channel Vibracore Composite Summary Table

	Representative Stations		Representative Volume (CY)	Sample Elevation (FT-MLW)		Max. Disturbance (FT-MLW)	% Coverage of Disturbance Depth	Composite Summary (% By Wt. Passing)					Mean	Sorting	Skewness	Kurtosis
Vibracore	Start	Stop		Top	Bottom			Fines	Sand	Granular	Gravel	Total	(mm)	(σ)	(α)	(β)
VC-26	0+00	8+75	2,800	-2.4	-5	-5	100%	78.20	21.80	0.00	0.00	1.00	0.01	3.75	-0.05	0.23
VC-25	0+00	8+50	2,500	-2.4	-5	-5	100%	74.90	24.50	0.10	0.50	1.00	0.02	3.27	-0.05	0.24
VC-24	-0+25	8+50	2,800	-3.1	-5	-5	100%	66.80	33.10	0.10	0.00	1.00	0.03	2.38	-0.05	0.24
VC-23	-0+50	8+00	2,600	-4.2	-5	-5	100%	40.44	59.48	0.09	0.00	1.00	0.10	1.31	0.31	0.24
VC-18	8+00	15+50	3,600	-2.2	-6	-6	100%	24.16	75.78	0.05	0.00	1.00	0.12	1.03	0.33	0.23
VC-17	15+50	21+50	3,000	-4.6	-6	-6	100%	81.50	18.50	0.00	0.00	1.00	0.01	4.25	-0.04	0.27
VC-16	21+50	27+50	3,600	-4.9	-6	-6	100%	54.10	45.60	0.20	0.10	1.00	0.06	1.69	-0.05	0.24
VC-15	27+50	34+50	5,200	-1	-6	-6	100%	6.88	93.12	0.00	0.00	1.00	0.17	0.43	0.00	1.63
VC-14	34+50	40+00	4,800	-2.1	-6	-6	100%	47.60	52.10	0.10	0.20	1.00	0.06	1.73	0.18	0.28
VC-11	40+00	43+00	1,800	-0.4	-6	-6	100%	4.40	95.60	0.00	0.00	1.00	0.15	0.57	0.12	0.51

Area	Volume (CY)	Stations
Beach Compatible Material	0	-
Non-Compatible Material	32,700	0+00 - 43+00
Total	32,700	0+00 - 43+00

1. The volumetric quantity shown for VC-11 has been reduced from 2,600 CY to 1,800 CY to account for the overlap in dredge areas between the Feeder Channel and S. Jinks Creek.
2. Max. Disturbance depth includes overdredge tolerance.
3. Volumetric quantities are rounded for clarity.

VIBRACORE COMPOSITES

9269
Town of Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{z\phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{z\phi}-\Phi_{50})/\sigma_\phi]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\phi_1}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Feeder Channel Composites
Design Depth -5 MLW +1 Ft OD

Vibracore VC-11 (Max. Dredge Depth -6 MLW)

Sieve (Phi)	VC-11 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.00			
0.00	0.00			
1.00	0.30			
2.00	3.40			
3.00	75.90			
3.75	95.40			
4.00	95.60			

VC-11 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.0			
100.0			
100.0			
100.0			
100.0			
100.0			
99.7			
96.6			
24.1			
4.6			
4.4			

Weighted Composite % Retained	% Passing
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.30	99.70
3.40	96.60
75.90	24.10
95.40	4.60
95.60	4.40

VC-11	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS
1	-0.4	-6	5.6	100.00%	SP
Composite	**-0.4**	**-6**	**5.6**	**100.00%**	**SP**

VC-11 Sample	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.02	2.17	2.30	2.64	2.99	3.31	3.73
Composite	**2.02**	**2.17**	**2.30**	**2.64**	**2.99**	**3.31**	**3.73**

VC-11 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.64	0.16	2.71	0.15	0.57	0.12	0.51
Composite	**2.64**	**0.16**	**2.71**	**0.15**	**0.57**	**0.12**	**0.51**

VC-11	Composite Grain Size Distribution (% by Weight Passing) Sample	Fines	Sand	Granular	Gravel	Total
	1.00	4.40	95.60	0.00	0.00	100%
	Composite	**4.40**	**95.60**	**0.00**	**0.00**	**100%**

Per 15A NCAC 07H.0312

Fines: X < 0.0625 mm
Sand: 0.0625 ≤ X < 2 mm
Granular: 2 mm ≤ X < 4.76 mm
Gravel: 4.76 ≤ X < 76 mm

Note: 1. Analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 φ) sieve.
2. Calcium Carbonate content of dredge material must be within 15% of recipient beach values.

Vibracore VC-14 (Max Dredge Depth -6 MLW)

Sieve (Phi)	VC-14 Sample Cumulative % by Weight Retained #1	#2	#3	#4
-4.25	0.00			
-4.00	0.10			
-3.00	0.10			
-2.00	0.20			
-1.00	0.30			
0.00	0.40			
1.00	0.60			
2.00	1.60			
3.00	35.70			
3.75	51.40			
4.00	52.40			

VC-14 Sample Cumulative % by Weight Passing #1	#2	#3	#4
100.0			
99.9			
99.9			
99.8			
99.7			
99.6			
99.4			
98.4			
64.3			
48.6			
47.6			

Composite VC-14 Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.10	99.90
0.10	99.90
0.20	99.80
0.30	99.70
0.40	99.60
0.60	99.40
1.60	98.40
35.70	64.30
51.40	48.60
52.40	47.60

VC-14	Depth Interval (MLW) Top	Bottom	Representative Values Length (ft)	Percent	USCS
1	-2.1	-6	3.9	100.00%	OL/OH
2					
3					
4					
Composite	**-2.1**	**-6**	**3.9**	**100.00%**	

VC-14 Sample	Moment Statistics and Properties in Phi Units φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.10	2.42	2.69	3.68	5.35	5.89	6.55
2							
3							
4							
Composite	**2.10**	**2.42**	**2.69**	**3.68**	**5.35**	**5.89**	**6.55**

VC-14 Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Parameters in Phi Units Sorting (σ)	Skewness (α)	Kurtosis (β)
1	3.68	0.08	4.00	0.06	1.73	0.18	0.28
2							
3							
4							
Composite	**3.68**	**0.08**	**4.00**	**0.06**	**1.73**	**0.18**	**0.28**

VC-14	Composite Grain Size Distribution (% by Weight Passing) SubSample	% Fines	% Sand	% Granular	% Gravel	Total
	1.00	47.60	52.10	0.10	0.20	100%
	2.00					
	3.00					
	4.00					
	Composite	**47.60**	**52.10**	**0.10**	**0.20**	**100%**

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

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9269
Town of Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{z\phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{z\phi}-\Phi_{50})/\sigma_\phi]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi_1}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Feeder Channel Composites
Design Depth -5 MLW +1 Ft OD

Vibracore VC-15 (Max Dredge Depth -6 MLW)

	VC-15			
	Sample Cumulative % by Retained			Weight
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00	0.00		
-4.00	0.00	0.00		
-3.00	0.00	0.00		
-2.00	0.00	0.00		
-1.00	0.00	0.00		
0.00	0.10	0.00		
1.00	0.20	0.10		
2.00	6.50	6.50		
3.00	85.60	83.70		
3.75	91.80	95.00		
4.00	92.00	95.30		

VC-15			
Sample Cumulative % by Weight Passing			
#1	#2	#3	#4
100.0	100.0		
100.0	100.0		
100.0	100.0		
100.0	100.0		
100.0	100.0		
99.9	100.0		
99.8	99.9		
93.5	93.5		
14.4	16.3		
8.2	5.0		
8.0	4.7		

Composite VC-15	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.07	99.93
0.17	99.83
6.50	93.50
84.95	15.05
92.89	7.11
93.12	6.88

VC-15	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-1	-4.3	3.3	66.00%	SP/SM
2	-4.3	-6	1.7	34.00%	SP
3					
4					
Composite	**-1**	**-6**	**5**	**100.00%**	

VC-15	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	1.76	2.12	2.23	2.55	2.87	2.98	4.07
2	1.77	2.12	2.24	2.56	2.89	3.02	3.75
3							
4							
Composite	**1.76**	**2.12**	**2.24**	**2.55**	**2.87**	**2.99**	**4.04**

VC-15	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	8.00	92.00	0.00	0.00	100%
2.00	4.70	95.30	0.00	0.00	100%
Composite	**6.88**	**93.12**	**0.00**	**0.00**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-15					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.55	0.17	2.55	0.17	0.43	0.00	1.69
2	2.56	0.17	2.57	0.17	0.45	0.01	1.21
Composite	**2.55**	**0.17**	**2.55**	**0.17**	**0.43**	**0.00**	**1.63**

Vibracore VC-16 (Max Dredge Depth -6 MLW)

	VC-16			
	Sample Cumulative % by Retained			Weight
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.10			
-1.00	0.30			
0.00	0.40			
1.00	0.60			
2.00	2.70			
3.00	38.00			
3.75	45.30			
4.00	45.90			

VC-16			
Sample Cumulative % by Weight Passing			
#1	#2	#3	#4
100.0			
100.0			
100.0			
99.9			
99.7			
99.6			
99.4			
97.3			
62.0			
54.7			
54.1			

Composite VC-16	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.30	99.70
0.40	99.60
0.60	99.40
2.70	97.30
38.00	62.00
45.30	54.70
45.90	54.10

VC-16	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-4.9	-6	1.1	100.00%	OL/OH
2					
3					
4					
Composite	**-4.9**	**-6**	**1.1**	**100.00%**	

VC-16	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.07	2.38	2.63	4.19	5.35	5.76	6.27
2							
3							
4							
Composite	**2.07**	**2.38**	**2.63**	**4.19**	**5.35**	**5.76**	**6.27**

VC-16	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	54.10	45.60	0.20	0.10	100%
2.00					
3.00					
4.00					
Composite	**54.10**	**45.60**	**0.20**	**0.10**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-16					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	4.19	0.05	4.11	0.06	1.69	-0.05	0.24
2							
3							
4							
Composite	**4.19**	**0.05**	**4.11**	**0.06**	**1.69**	**-0.05**	**0.24**

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9269
Town of Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{z\phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{z\phi}-\Phi_{50})/\sigma_\phi]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\phi_1}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Feeder Channel Composites
Design Depth -5 MLW +1 Ft OD

Vibracore VC-17 (Max Dredge Depth -6 MLW)

VC-17	Sample Cumulative % by Retained Weight			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.00			
0.00	0.10			
1.00	0.20			
2.00	1.60			
3.00	14.90			
3.75	18.10			
4.00	18.50			

VC-17	Sample Cumulative % by Weight Passing			
	#1	#2	#3	#4
	100.0			
	100.0			
	100.0			
	100.0			
	100.0			
	99.9			
	99.8			
	98.4			
	85.1			
	81.9			
	81.5			

Composite VC-17	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.20	99.80
1.60	98.40
14.90	85.10
18.10	81.90
18.50	81.50

VC-17	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-4.6	-6	1.4	100.00%	OL/OH
2					
3					
4					
Composite	**-4.6**	**-6**	**1.4**	**100.00%**	**OL/OH**

VC-17	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.26	3.26	4.77	7.73	10.69	11.75	13.05
2							
3							
4							
Composite	**2.26**	**3.26**	**4.77**	**7.73**	**10.69**	**11.75**	**13.05**

VC-17	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	81.50	18.50	0.00	0.00	100%
2.00					
3.00					
4.00					
Composite	**81.50**	**18.50**	**0.00**	**0.00**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-17					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	7.73	0.00	7.58	0.01	4.25	-0.04	0.27
Composite	**7.73**	**0.00**	**7.58**	**0.01**	**4.25**	**-0.04**	**0.27**

Vibracore VC-18 (Max Dredge Depth -6 MLW)

VC-18	Sample Cumulative % by Retained Weight			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00	0.00		
-4.00	0.00	0.00		
-3.00	0.00	0.00		
-2.00	0.00	0.00		
-1.00	0.10	0.00		
0.00	0.10	0.00		
1.00	0.30	0.10		
2.00	4.50	4.50		
3.00	67.10	74.20		
3.75	72.70	79.00		
4.00	72.90	79.10		

VC-18	Sample Cumulative % by Weight Passing			
	#1	#2	#3	#4
	100.0	100.0		
	100.0	100.0		
	100.0	100.0		
	100.0	100.0		
	99.9	100.0		
	99.9	100.0		
	99.7	99.9		
	95.5	95.5		
	32.9	25.8		
	27.3	21.0		
	27.1	20.9		

Composite VC-18	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.05	99.95
0.05	99.95
0.21	99.79
4.50	95.50
70.46	29.54
75.68	24.32
75.84	24.16

VC-18	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-2.2	-4.2	2	52.63%	SM
2	-4.2	-6	1.8	47.37%	SM
3					
4					
Composite	**-2.2**	**-6**	**3.8**	**100.00%**	**SM**

VC-18	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.01	2.18	2.33	2.73	4.06	4.32	4.65
2	2.01	2.16	2.29	2.65	3.13	4.13	4.43
3							
4							
Composite	**2.01**	**2.17**	**2.31**	**2.69**	**3.65**	**4.23**	**4.54**

VC-18	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	27.10	72.80	0.10	0.00	100%
2.00	20.90	79.10	0.00	0.00	100%
3.00					
4.00					
Composite	**24.16**	**75.78**	**0.05**	**0.00**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-18					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	2.73	0.15	3.08	0.12	1.07	0.33	0.23
2	2.65	0.16	2.98	0.13	0.98	0.34	0.23
3							
4							
Composite	**2.69**	**0.15**	**3.03**	**0.12**	**1.03**	**0.33**	**0.23**

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9269
Town of Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{z\phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{z\phi}-\Phi_{50})/\sigma_\phi]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi_1}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Feeder Channel Composites
Design Depth -4 MLW +1 Ft OD

Vibracore VC-23 (Max Dredge Depth -5 MLW)

VC-23	Sample Cumulative % by Retained			Weight
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00	0.00		
-4.00	0.00	0.00		
-3.00	0.00	0.00		
-2.00	0.00	0.00		
-1.00	0.10	0.00		
0.00	0.20	0.00		
1.00	0.60	0.10		
2.00	3.90	2.40		
3.00	47.00	91.30		
3.75	53.70	99.10		
4.00	53.90	99.20		

VC-23	Sample Cumulative % by Weight Passing		
#1	#2	#3	#4
100.0	100.0		
100.0	100.0		
100.0	100.0		
100.0	100.0		
99.9	100.0		
99.8	100.0		
99.4	99.9		
96.1	97.6		
53.0	8.7		
46.3	0.9		
46.1	0.8		

Composite VC-23	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.09	99.91
0.17	99.83
0.54	99.46
3.71	96.29
52.54	47.46
59.38	40.63
59.56	40.44

VC-23	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-4.2	-4.9	0.7	87.50%	OL/OH/SM
2	-4.9	-5	0.1	12.50%	SP
3					
4					
Composite	**-4.2**	**-5**	**0.8**	**100.00%**	

VC-23	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.03	2.28	2.49	3.34	4.84	5.20	5.64
2	2.03	2.15	2.25	2.54	2.82	2.92	3.36
3							
4							
Composite	**2.03**	**2.25**	**2.44**	**2.95**	**4.55**	**4.88**	**5.27**

VC-23	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	46.10	53.80	0.10	0.00	100%
2.00	0.80	99.20	0.00	0.00	100%
3.00					
4.00					
Composite	**40.44**	**59.48**	**0.09**	**0.00**	**100%**

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

VC-23					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	3.34	0.10	3.61	0.08	1.46	0.19	0.24
2	2.54	0.17	2.54	0.17	0.38	0.00	0.73
3							
4							
Composite	**2.95**	**0.13**	**3.36**	**0.10**	**1.31**	**0.31**	**0.24**

Vibracore VC-24 (Max Dredge Depth -5 MLW)

VC-24	Sample Cumulative % by Retained			Weight
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.10			
0.00	0.20			
1.00	0.40			
2.00	2.20			
3.00	28.60			
3.75	33.00			
4.00	33.20			

VC-24	Sample Cumulative % by Weight Passing		
#1	#2	#3	#4
100.0			
100.0			
100.0			
100.0			
99.9			
99.8			
99.6			
97.8			
71.4			
67.0			
66.8			

Composite VC-24	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.20	99.80
0.40	99.60
2.20	97.80
28.60	71.40
33.00	67.00
33.20	66.80

VC-24	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-3.1	-5	1.9	100.00%	OL/OH
2					
3					
4					
Composite	**-3.1**	**-5**	**1.9**	**100.00%**	**OL/OH**

VC-24	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.11	2.52	2.86	5.08	6.70	7.28	7.99
2							
3							
4							
Composite	**2.11**	**2.52**	**2.86**	**5.08**	**6.70**	**7.28**	**7.99**

VC-24	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	66.80	33.10	0.10	0.00	100%
2.00					
3.00					
4.00					
Composite	**66.80**	**33.10**	**0.10**	**0.00**	**100%**

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

VC-24					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	5.08	0.03	4.96	0.03	2.38	-0.05	0.24
2							
3							
4							
Composite	**5.08**	**0.03**	**4.96**	**0.03**	**2.38**	**-0.05**	**0.24**

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9269
Town of Sunset Beach
Navigation Project
Sediment Analysis

Sieve Designation Legend

Sieve #	3/4	5/8	5/16	4	5	10	18	35	60	120	200	230
Sieve Size (Φ)	-4.25	-4.00	-3.00	-2.25	-2.00	-1.00	0.00	1.00	2.00	3.00	3.75	4.00
Sieve Size (mm)	19.0	16	8	4.76	4	2	1	0.5	0.25	0.125	0.0743	0.0625

Mean grain size ($M_{z\phi}$) determined by $[(\Phi_{84}+\Phi_{50}+\Phi_{16})/3]$ (Folk & Ward,1957).
Sorting determined by $[(\Phi_{84}-\Phi_{16})/2]$ (Dean & Dalrymple, 2002).
Skewness determined by $[(M_{z\phi}-\Phi_{50})/\sigma_\phi]$ (Dean & Dalrymple, 2002).
Kurtosis determined by $\{[(\Phi_{16}-\Phi_5) + (\Phi_{95}-\Phi_{84})]/2\sigma_{\Phi_1}$ (Dean & Dalrymple, 2002).
Moment statistics determined by linear interpretation of composite properties.

Feeder Channel Composites
Design Depth -4 MLW +1 Ft OD

Vibracore VC-25 (Max Dredge Depth -5 MLW)

VC-25	Sample Cumulative % by Retained Weight			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.50			
-2.00	0.50			
-1.00	0.60			
0.00	0.80			
1.00	0.90			
2.00	2.60			
3.00	22.00			
3.75	24.90			
4.00	25.10			

VC-25	Sample Cumulative % by Weight Passing			
	#1	#2	#3	#4
	100.0			
	100.0			
	99.5			
	99.5			
	99.4			
	99.2			
	99.1			
	97.4			
	78.0			
	75.1			
	74.9			

Composite VC-25	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.50	99.50
0.50	99.50
0.60	99.40
0.80	99.20
0.90	99.10
2.60	97.40
22.00	78.00
24.90	75.10
25.10	74.90

VC-25	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-2.4	-5	2.6	100.00%	OL/OH
2					
3					
4					
Composite	**-2.4**	**-5**	**2.6**	**100.00%**	**OL/OH**

VC-25	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.12	2.69	3.88	6.21	8.44	9.24	10.21
2							
3							
4							
Composite	**2.12**	**2.69**	**3.88**	**6.21**	**8.44**	**9.24**	**10.21**

VC-25	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	74.90	24.50	0.10	0.50	100%
2.00					
3.00					
4.00					
Composite	**74.90**	**24.50**	**0.10**	**0.50**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-25					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	6.21	0.01	6.05	0.02	3.27	-0.05	0.24
2							
3							
4							
Composite	**6.21**	**0.01**	**6.05**	**0.02**	**3.27**	**-0.05**	**0.24**

Vibracore VC-26 (Max Dredge Depth -5 MLW)

VC-26	Sample Cumulative % by Retained Weight			
Sieve (Phi)	#1	#2	#3	#4
-4.25	0.00			
-4.00	0.00			
-3.00	0.00			
-2.00	0.00			
-1.00	0.00			
0.00	0.10			
1.00	0.20			
2.00	2.10			
3.00	19.30			
3.75	21.60			
4.00	21.80			

VC-26	Sample Cumulative % by Weight Passing			
	#1	#2	#3	#4
	100.0			
	100.0			
	100.0			
	100.0			
	100.0			
	99.9			
	99.8			
	97.9			
	80.7			
	78.4			
	78.2			

Composite VC-26	
Weighted Composite (% Retained)	Weighted Composite (% Passing)
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.00	100.00
0.10	99.90
0.20	99.80
2.10	97.90
19.30	80.70
21.60	78.40
21.80	78.20

VC-26	Depth Interval (MLW)		Representative Values		
Sample	Top	Bottom	Length (ft)	Percent	USCS
1	-2.4	-5	2.6	100.00%	OL/OH
2					
3					
4					
Composite	**-2.4**	**-5**	**2.6**	**100.00%**	**OL/OH**

VC-26	Moment Statistics and Properties in Phi Units						
Sample	φ_5	φ_{16}	φ_{25}	φ_{50}	φ_{75}	φ_{84}	φ_{95}
1	2.17	2.81	4.32	6.86	9.40	10.31	11.43
2							
3							
4							
Composite	**2.17**	**2.81**	**4.32**	**6.86**	**9.40**	**10.31**	**11.43**

VC-26	Composite Grain Size Distribution (% by Weight Passing)				
SubSample	% Fines	% Sand	% Granular	% Gravel	Total
1.00	78.20	21.80	0.00	0.00	100%
2.00					
3.00					
4.00					
Composite	**78.20**	**21.80**	**0.00**	**0.00**	**100%**

Note: Grain size analysis did not include 4.76 mm sieve (-2.25 ϕ); therefore the divide between granular and gravel based on % passing the 4 mm (-2 ϕ) sieve.

Per 15A NCAC 07H.0312

% Fines: X < 0.0625 mm
% Sand: 0.0625 ≤ X < 2 mm
% Granular: 2 mm ≤ X < 4.76 mm
% Gravel: 4.76 ≤ X < 76 mm

VC-26					Parameters in Phi Units		
Sample	Median (ϕ)	Median (mm)	Mean (ϕ)	Mean (mm)	Sorting (σ)	Skewness (α)	Kurtosis (β)
1	6.86	0.01	6.66	0.01	3.75	-0.05	0.23
2							
3							
4							
Composite	**6.86**	**0.01**	**6.66**	**0.01**	**3.75**	**-0.05**	**0.23**

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VIBRACORE LOGS

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-11**
NORTHING: 45844	**EASTING:** 2154270	**FIELD GEO.:** Steven Hudson	**MUDLINE ELEV.:** -0.4 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 4.5 / 2.8 ft.	**DEPTH IN SEDS.:** 10.0 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate / Lined Aluminum	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -10.0 ft.
START DATE: 08/23/16	**FINISH DATE:** 10/26/16	**BORING LOCATION:** Jinks Creek	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-0.4
0.0	-0.4			V11-S01	SP			Tan to gray, poorly graded SAND	
							7.0		-7.4
7	-7.4				SP				
							10.0		-10.4
								BORING TERMINATED AT ELEVATION -10.4 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
1st Run from mudline w/Clear Acetate Core terminated w/VCR @ 7.0ft BML.
2nd Run from 6.0ft BML w/Lined Aluminum terminated @ 10.0ft BML.

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-14**
NORTHING: 45818	**EASTING:** 2153604	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -2.1 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 6.0 ft.	**DEPTH IN SEDS.:** 5.9 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -9.0 ft.
START DATE: 08/19/16	**FINISH DATE:** 08/19/16	**BORING LOCATION:** North Shore Drive Entrance Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-2.1
0.0	-2.1			V14-S01	OL/OH			Gray, Silty SAND to Sandy ORGANIC SOIL	
5.4	-7.5						5.4		-7.5
				V14-S02	SP		5.9	Gray, poorly graded SAND	-8.0
5.9	-8.0							BORING TERMINATED WITH VIBRACORE REFUSAL AT ELEVATION -8.0 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-15
NORTHING: 45665	**EASTING:** 2153018	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -1.0 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 2.3 ft.	**DEPTH IN SEDS.:** 7.4 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -9.0 ft.
START DATE: 08/17/16	**FINISH DATE:** 08/17/16	**BORING LOCATION:** North Shore Drive Entrance Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-1.0
0.0	-1.0			V15-S01	SP/SM			Gray, poorly graded SAND with silt	
3.3	-4.3			V15-S02	SP		3.3		-4.3
5.2	-6.2			V15-S03	SC		5.2	Light gray, poorly graded SAND	-6.2
7.4	-8.4						7.4	Gray, Clayey SAND	-8.4
								BORING TERMINATED WITH VIBRACORE REFUSAL AT ELEVATION -8.4 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:

VIBRACORE LOG 215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-16**
NORTHING: 45535	**EASTING:** 2152438	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -4.9 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 5.3 ft.	**DEPTH IN SEDS.:** 5.0 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -9.0 ft.
START DATE: 08/17/16	**FINISH DATE:** 08/17/16	**BORING LOCATION:** North Shore Drive Entrance Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-4.9
0.0	-4.9			V16-S01	OL/OH			Gray, Sandy ORGANIC SOIL	
3.7	-8.6			V16-S02	SP/SM		3.7		-8.6
5	-9.9						5.0	Gray, poorly graded SAND with silt	-9.9
								BORING TERMINATED AT ELEVATION -9.9 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-16 & VC-18

VIBRACORE LOG 215122 M&N SUNSET BEACH SEDIMENT SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-17
NORTHING: 45341	**EASTING:** 2151866	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -4.6 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 4.8 ft.	**DEPTH IN SEDS.:** 4.9 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -9.0 ft.
START DATE: 08/17/16	**FINISH DATE:** 08/17/16	**BORING LOCATION:** North Shore Drive Entrance Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-4.6
0.0	-4.6			V17-S01	OL/OH			Gray, ORGANIC SOIL	
2.9	-7.5			V17-S02	SP/SM		2.9		-7.5
3.6	-8.2			V17-S03	CL		3.6	Gray, poorly graded SAND with silt	-8.2
4.0	-8.6			V17-S04	SP/SM		4.0	Gray, Sandy Lean Clay	-8.6
4.9	-9.5						4.9	Gray, poorly graded SAND with silt	-9.5
								BORING TERMINATED AT ELEVATION -9.5 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:

VIBRACORE LOG 215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-18
NORTHING: 45179	**EASTING:** 2151293	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -2.2 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 3.1 ft.	**DEPTH IN SEDS.:** 5.6 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -9.0 ft.
START DATE: 08/17/16	**FINISH DATE:** 08/17/16	**BORING LOCATION:** North Shore Drive Entrance Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-2.2
0.0	-2.2	-2.2	V1618	V18-S01	SM			Gray, Silty SAND	
2.0	-4.2						2.0		-4.2
				V18-S02	SM			Gray, Silty SAND	
4.9	-7.1	-7.8		V18-S03	SP		4.9		-7.1
5.6	-7.8						5.6	Light gray, poorly graded SAND	-7.8

BORING TERMINATED WITH VIBRACORE REFUSAL AT ELEVATION -7.8 ft (MLW)

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-16 & VC-18

VIBRACORE LOG 215122 M&N SUNSET BEACH SEDIMENT SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** VC-23
NORTHING: 44643	**EASTING:** 2150941	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -4.2 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 6.5 ft.	**DEPTH IN SEDS.:** 3.0 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -7.0 ft.
START DATE: 08/16/16	**FINISH DATE:** 08/16/16	**BORING LOCATION:** Finger Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-4.2
0.0	-4.2	-4.2		V23-S01	OL/OH		0.7	Gray, ORGANIC SOIL to Silty SAND	-4.9
0.8	-5.0		V23242526	V23-S02	SP			Gray, poorly graded SAND	
		-7.2					3.0		-7.2
3	-7.2							BORING TERMINATED AT ELEVATION -7.2 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-23, VC-24, VC-25, & VC-26

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

SHEET 1 OF 1

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-24**
NORTHING: 44686	**EASTING:** 2151300	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -3.1 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 4.0 ft.	**DEPTH IN SEDS.:** 5.0 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -7.0 ft.
START DATE: 08/16/16	**FINISH DATE:** 08/16/16	**BORING LOCATION:** Finger Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-3.1
0.0	-3.1	-3.1	V23242526	V24-S01	OL/OH			Gray, ORGANIC SOIL	
3.7	-6.8						3.7		-6.8
		-8.1		V24-S02	SP		5.0	Gray, poorly graded SAND	-8.1
5	-8.1							BORING TERMINATED AT ELEVATION -8.1 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-23, VC-24, VC-25, & VC-26

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-25**
NORTHING: 44775	**EASTING:** 2151630	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -2.4 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 3.0 ft.	**DEPTH IN SEDS.:** 4.6 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -7.0 ft.
START DATE: 08/16/16	**FINISH DATE:** 08/16/16	**BORING LOCATION:** Finger Canals	

DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-2.4
0.0	-2.4	-2.4	V23242526	V25-S01	OL/OH			Gray, ORGANIC SOIL	
4	-6.4	-6.4					4.0		-6.4
							4.6	No Recovery	-7.0
								BORING TERMINATED AT ELEVATION -7.0 ft (MLW)	

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

NOTES:
Composite sample collected for chemical analysis from borings VC-23, VC-24, VC-25, & VC-26

VIBRACORE LOG_215122 M&N_SUNSET_BEACH_SEDIMENT_SAMPLING.GPJ CATLIN.GDT 11/29/16

VIBRACORE LOG

CATLIN Engineers and Scientists
215122 Wilmington, NC

CATLIN NO.: 215122	**STATE:** NC	**COUNTY:** BRUNSWICK	**CITY:** Sunset Beach
PROJECT NAME: Sunset Beach Pre-Dredge Analysis	**LOGGED BY:** Shawn McGuire **OPERATOR:** D.T. Chalmers, Jr.		**BORING ID.** **VC-26**
NORTHING: 44867	**EASTING:** 2151961	**FIELD GEO.:** Corey Futral	**MUDLINE ELEV.:** -2.4 ft.
SYSTEM: NCSP NAD 83 (USft)	**MACHINE:** PVL VC-3.5.2	**WATER DEPTH:** 3.0 ft.	**DEPTH IN SEDS.:** 4.7 ft.
METHOD: Vibracore	**CORE MATERIAL:** Unlined Acetate	**CORE DIAMETER:** 4 in.	**TARGET ELEV.:** -7.0 ft.
START DATE: 08/16/16	**FINISH DATE:** 08/16/16	**BORING LOCATION:** Finger Canals	

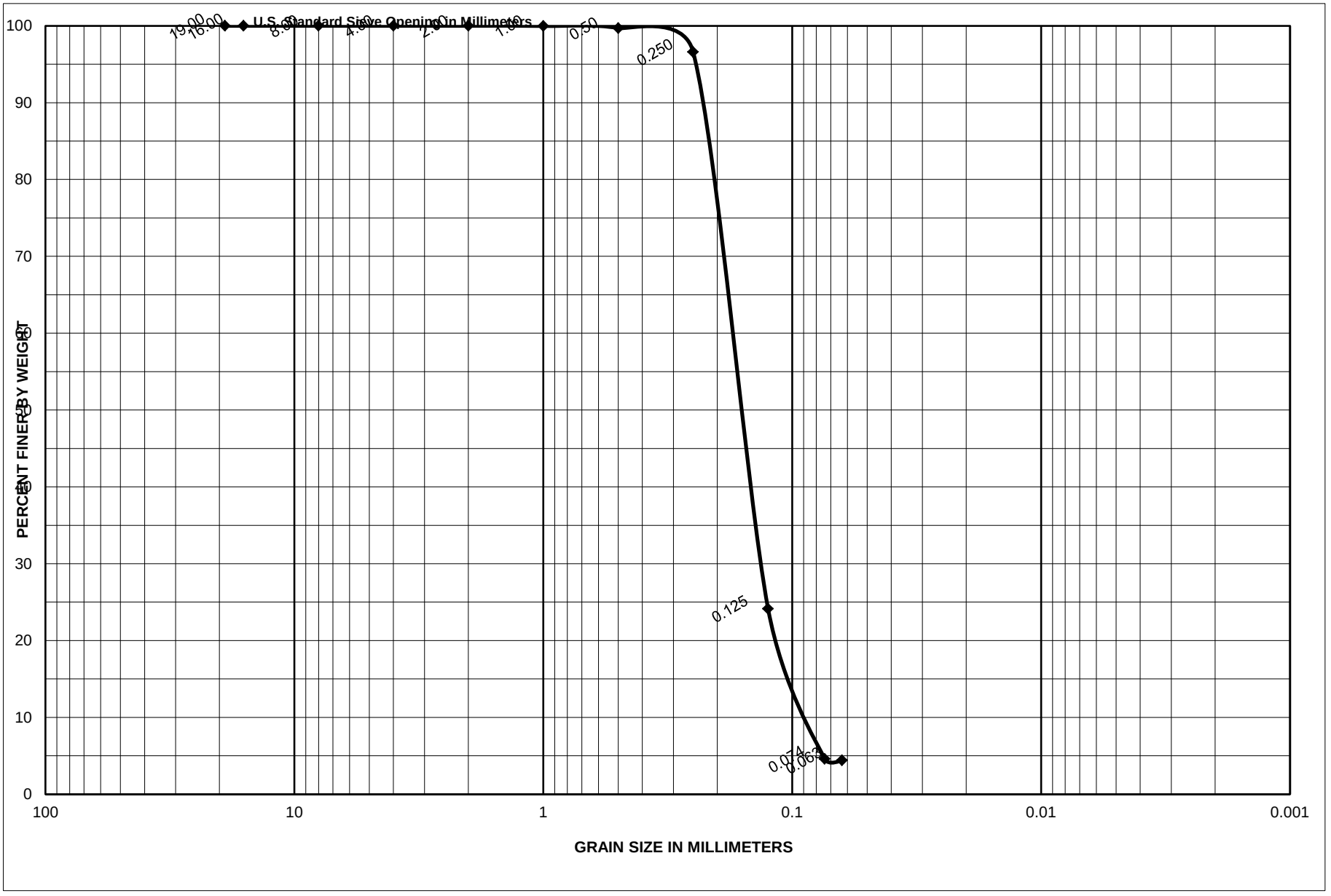
DEPTH	ELEV.	ENV. SAMP. ELEV.	ENV. SAMP. ID.	GEOTECH SAMPLE	USCS	LOG	SEDIMENT DESCRIPTION DEPTH		ELEVATION
							0.0	Mudline	-2.4
0.0	-2.4	-2.4	V23242526	V26-S01	OL/OH			Gray, ORGANIC SOIL	
2.6	-5.0	-7.1		V26-S02	SP		2.6	Gray, poorly graded SAND	-5.0
4.7	-7.1						4.7	BORING TERMINATED WITH VIBRACORE REFUSAL AT ELEVATION -7.1 ft (MLW)	-7.1

COMMENTS: All elevations referenced to Mean Low Water (MLW)
All depths and elevations in United States Feet (USft)
BML = Below Mudline
VCR = Vibracore Refusal

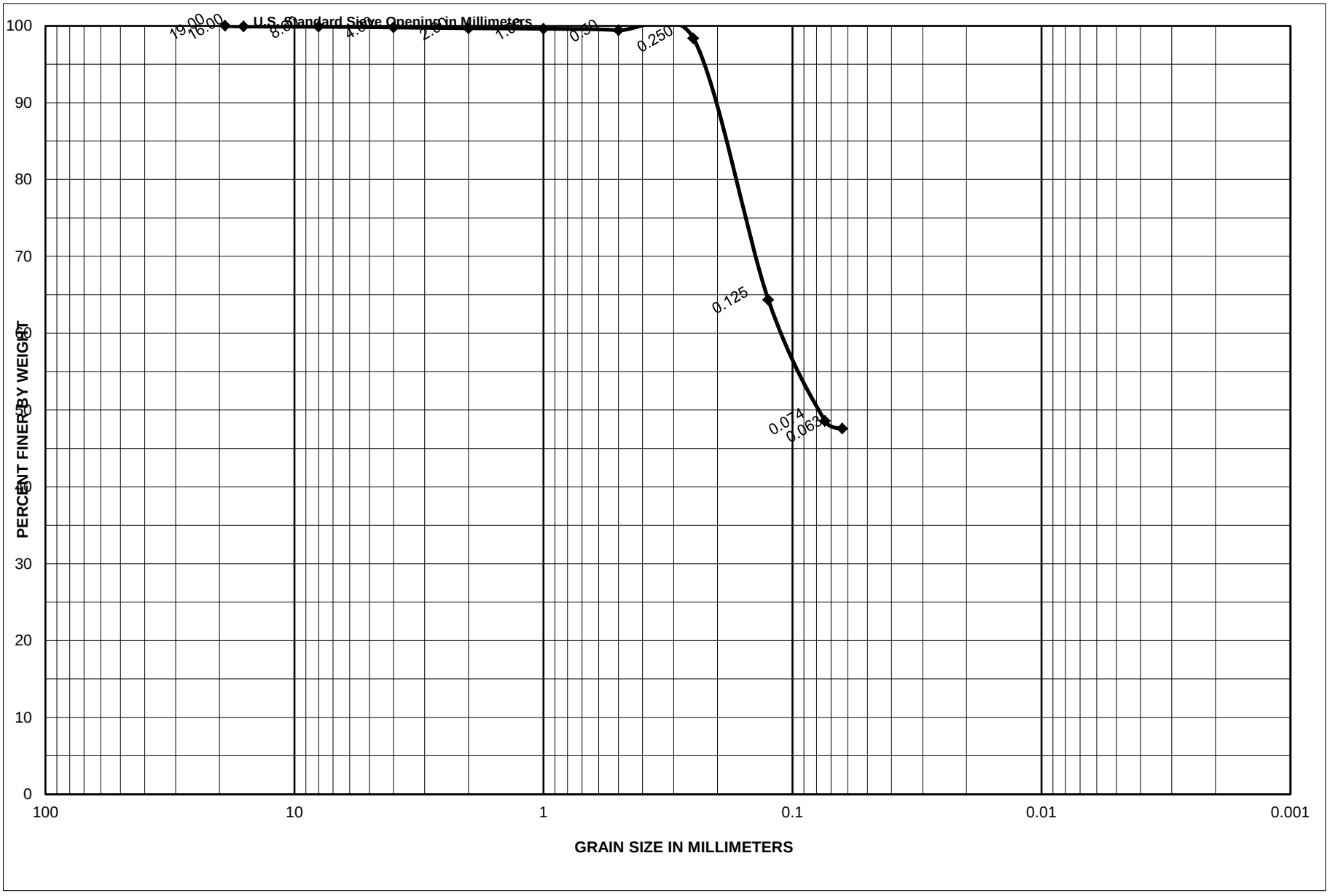
NOTES:
Composite sample collected for chemical analysis from borings VC-23, VC-24, VC-25, & VC-26

VIBRACORE LOG 215122 M&N SUNSET BEACH SEDIMENT SAMPLING.GPJ CATLIN.GDT 11/29/16

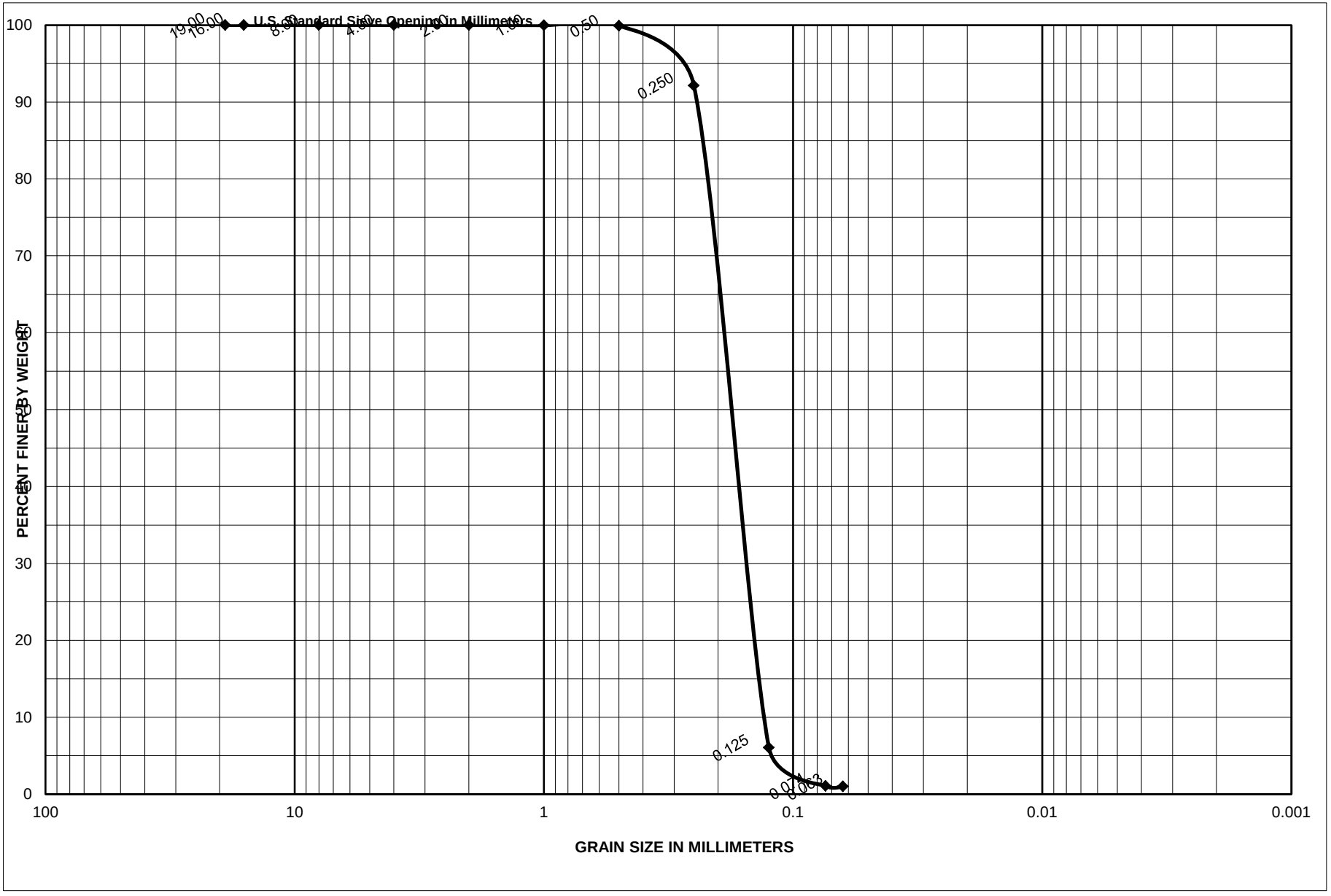
GRADATION CURVES



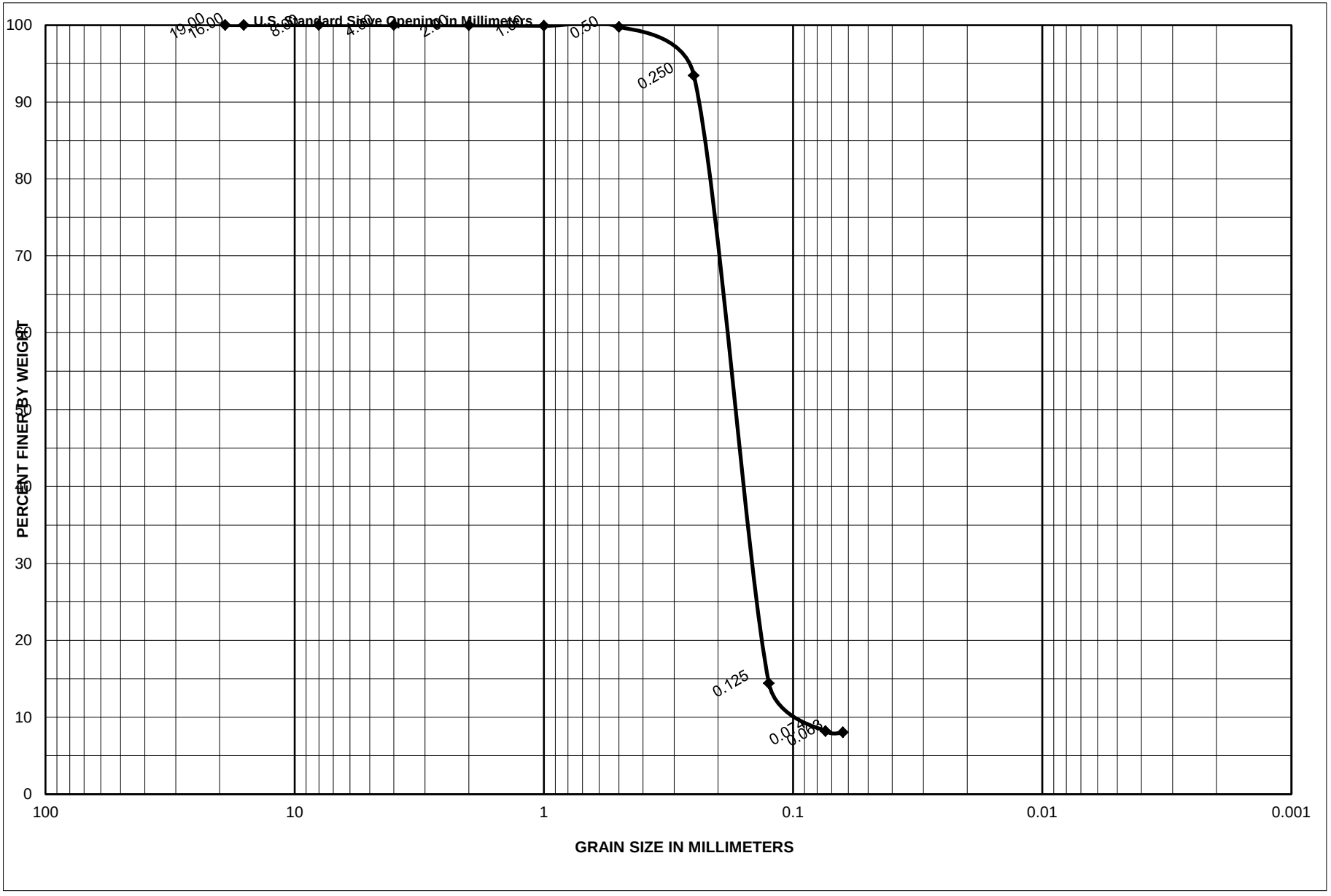
Sample No.	Depth (ft)	Classification		
V11-S01	0-7	Tan to gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-11
			Date	9/14/2016



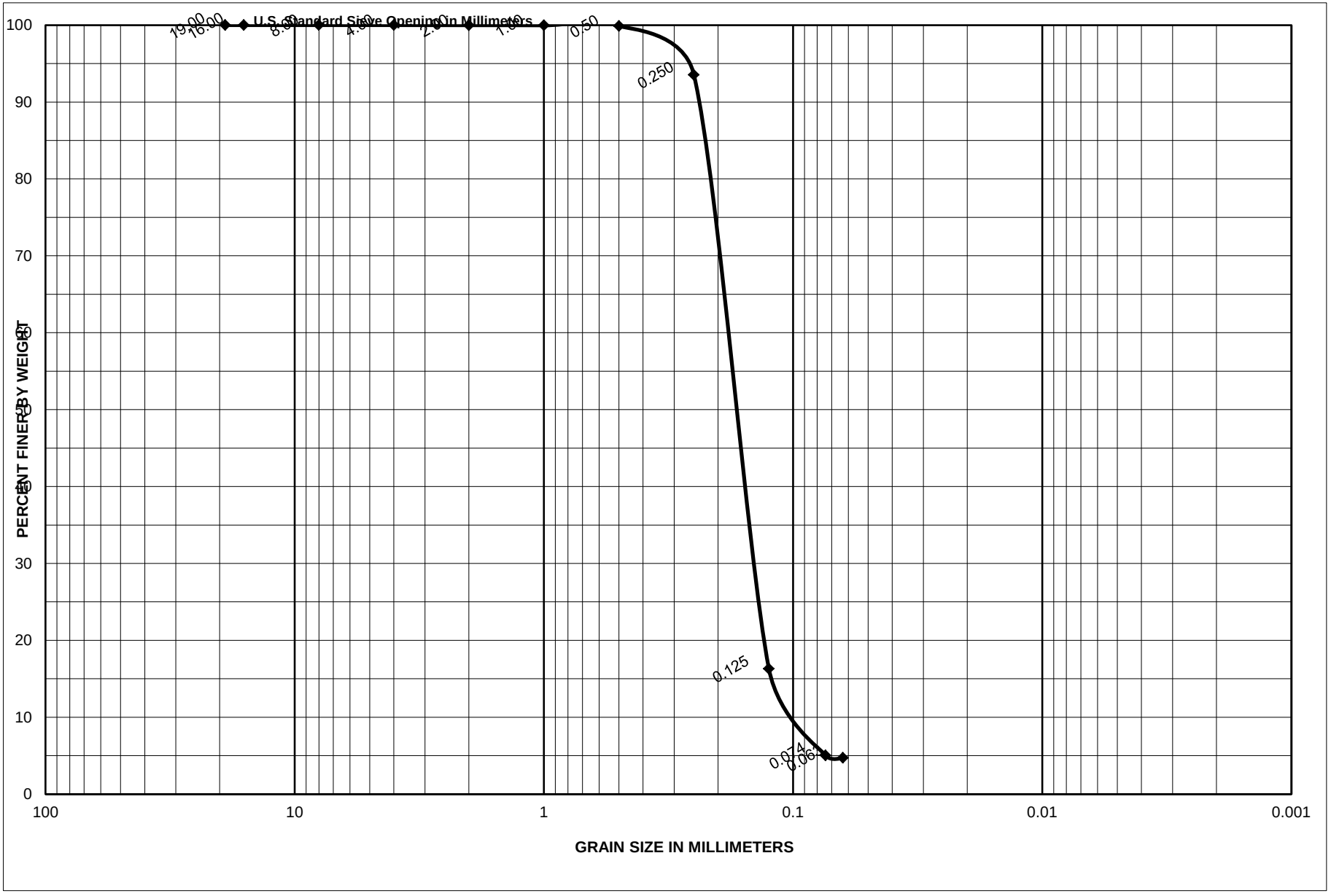
Sample No.	Depth (ft)	Classification		
V14-S01	0-5.4	Gray, Silty SAND to Sandy Organic soil, SM/OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-14
			Date	9/14/2016



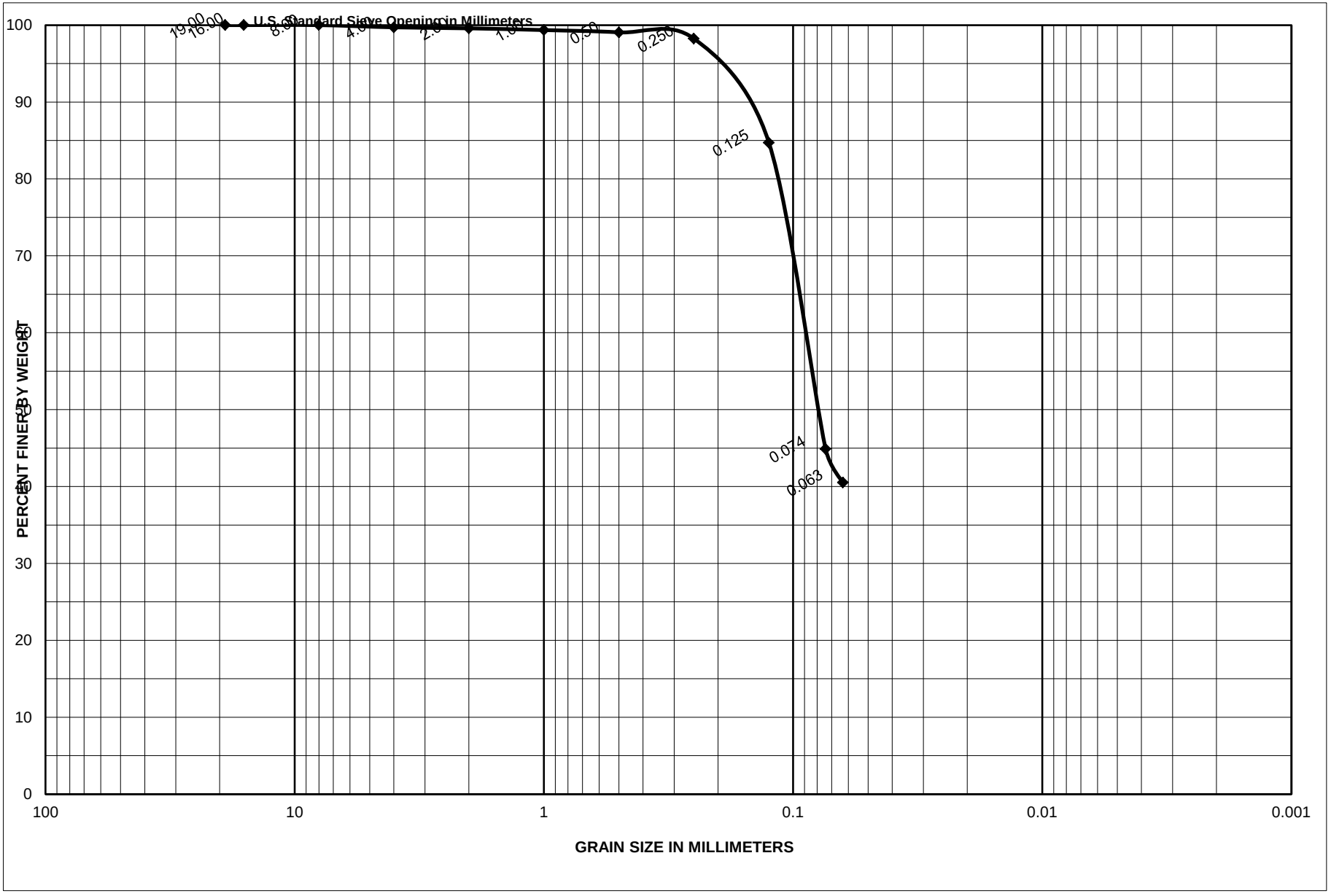
Sample No.	Depth (ft)	Classification		
V14-S02	5.4-5.9	Gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-14
			Date	9/14/2016



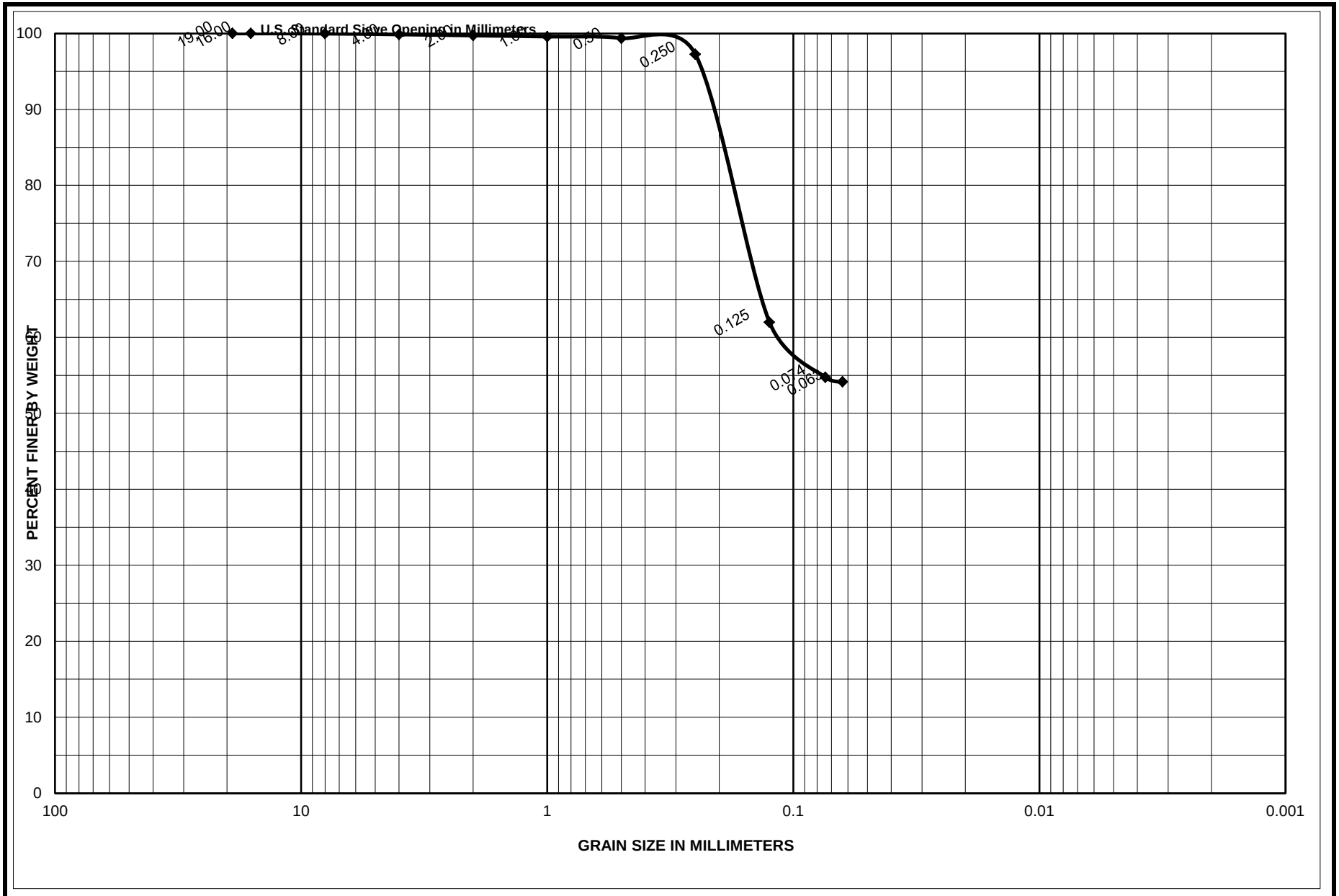
Sample No.	Depth (ft)	Classification		
V15-S01	0-3.3	Gray, poorly graded SAND with silt, SP-SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-15
			Date	9/14/2016



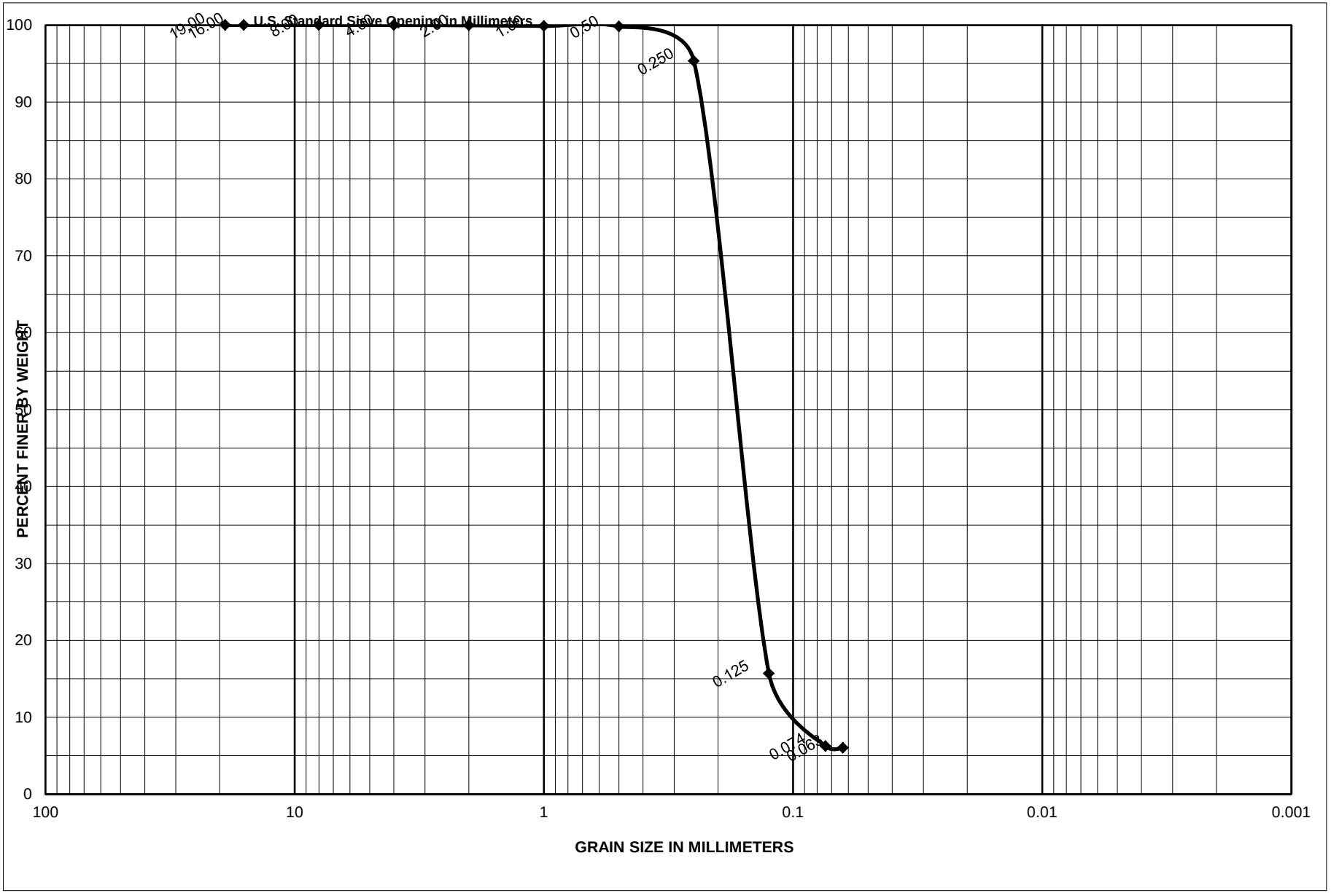
Sample No.	Depth (ft)	Classification		
V15-S02	3.3-5.2	Light gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-15
			Date	9/14/2016



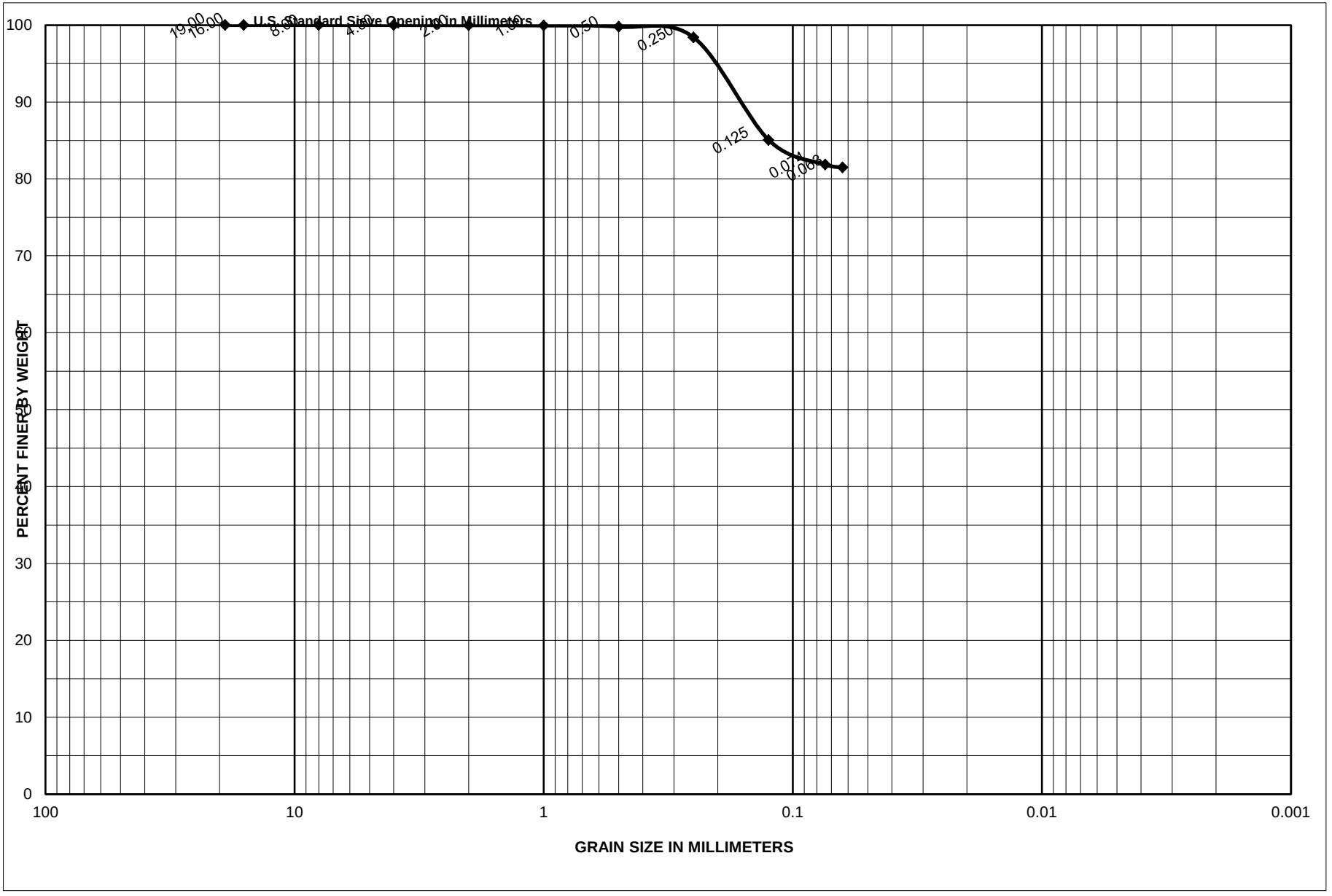
Sample No.	Depth (ft)	Classification		
V15-S03	5.2-7.4	Gray, Clayey SAND, SC	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-15
			Date	9/14/2016



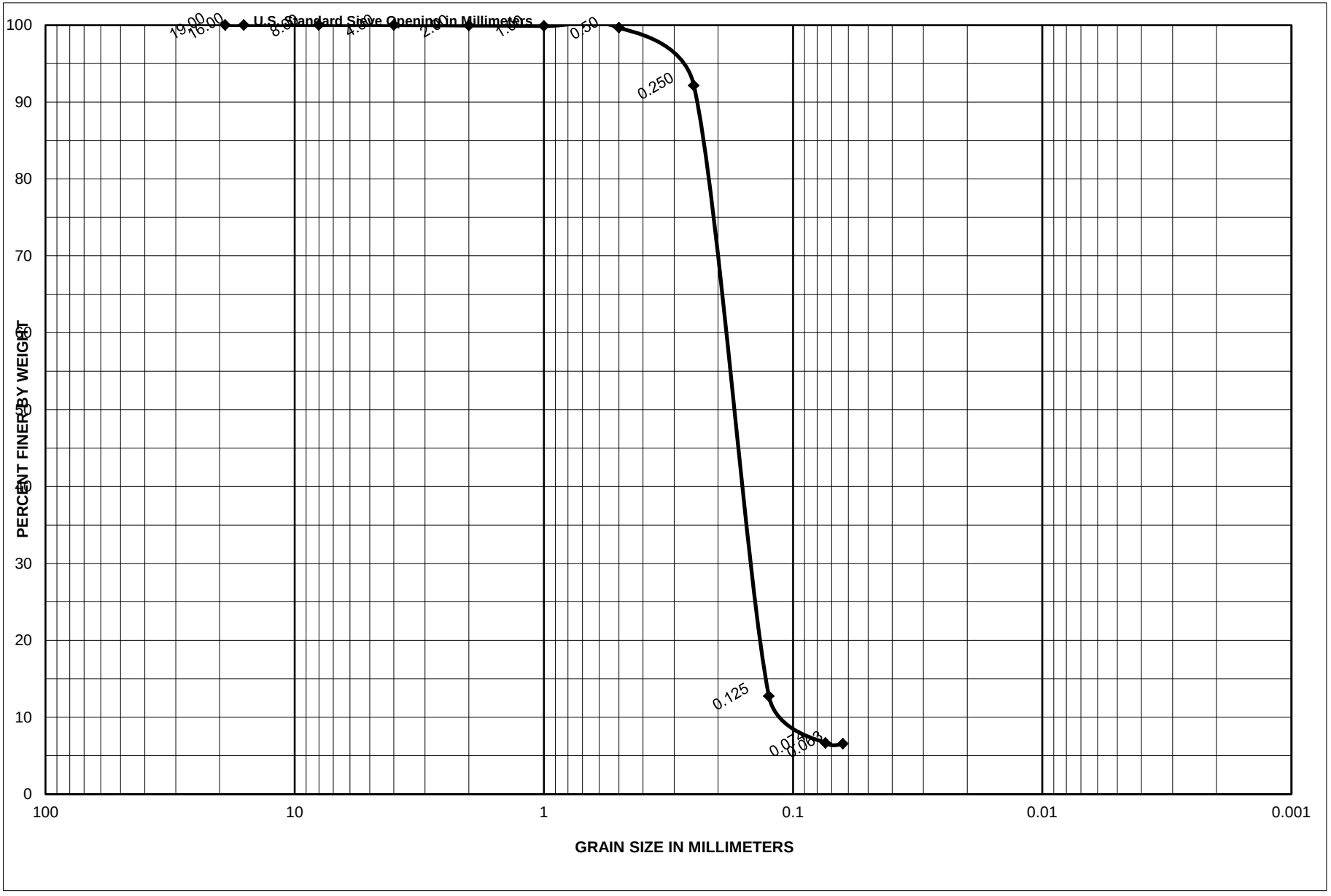
Sample No.	Depth (ft)	Classification		
V16-S01	0-3.7	Gray, Sandy Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-16
			Date	9/14/2016



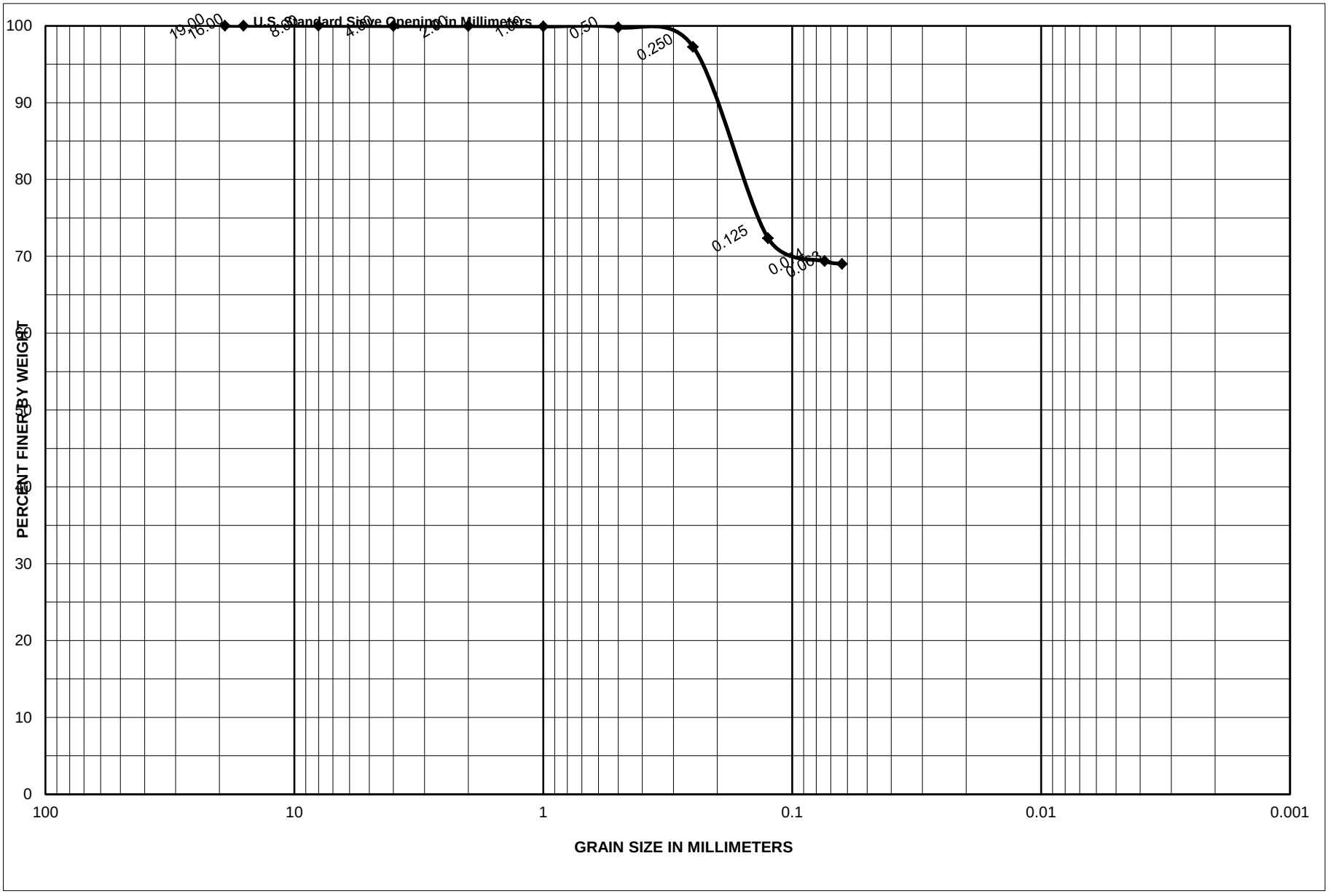
Sample No.	Depth (ft)	Classification		
V16-S02	3.7-5	Gray, poorly graded SAND with silt, SP-SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-16
			Date	9/14/2016



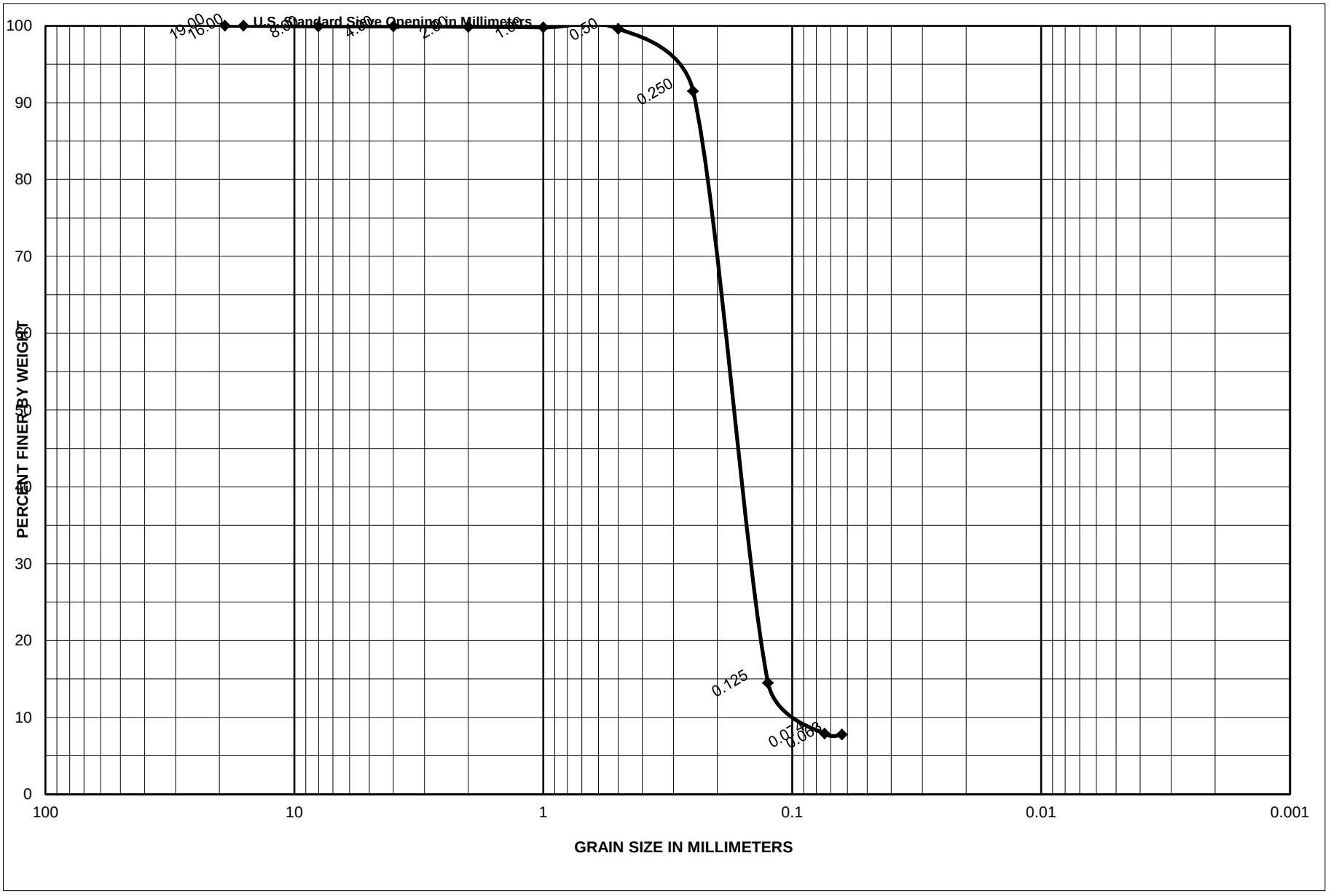
Sample No.	Depth (ft)	Classification		
V17-S01	0-2.9	Gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-17
			Date	9/14/2016



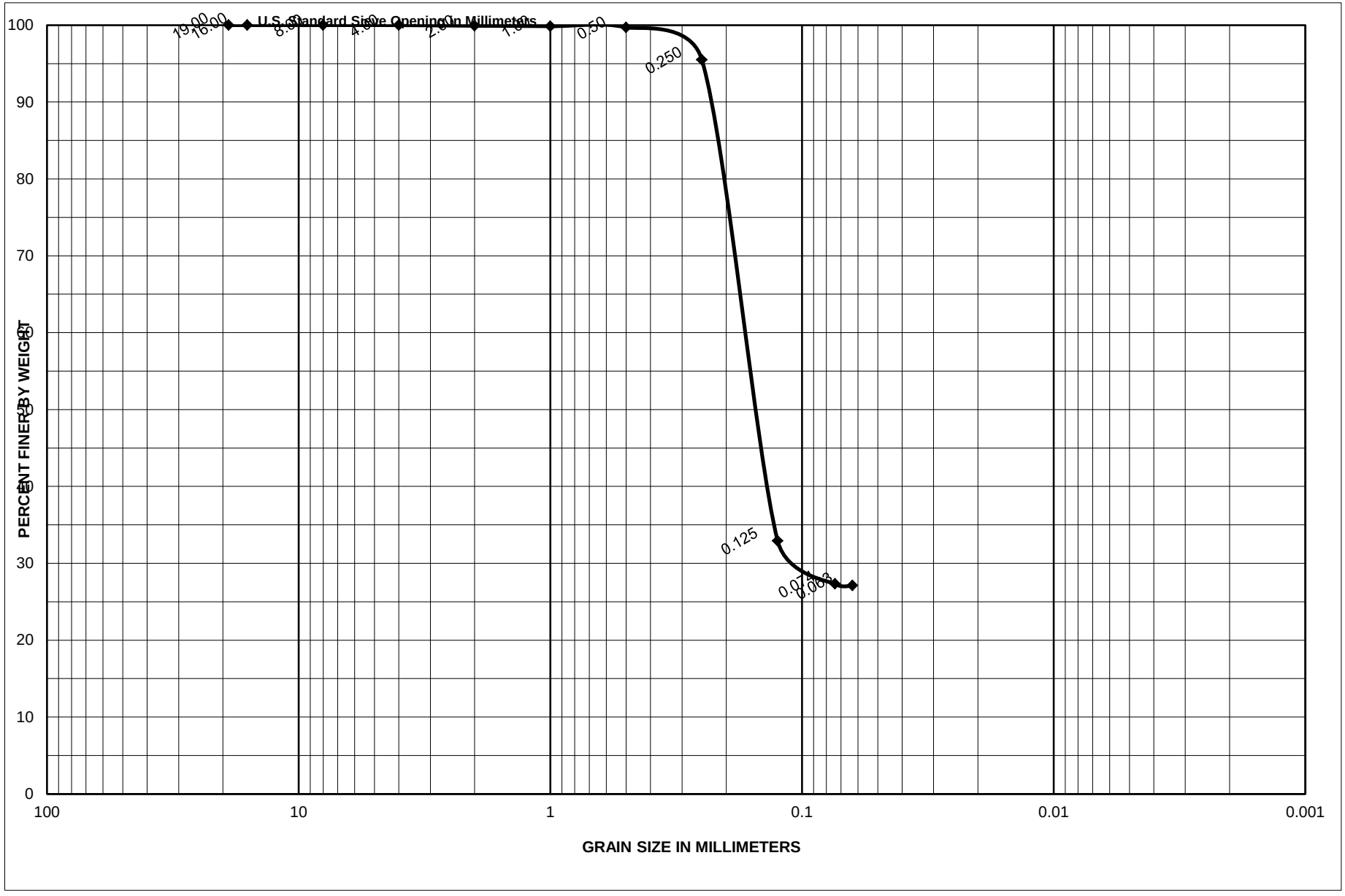
Sample No.	Depth (ft)	Classification		
V17-S02	2.9-3.6	Gray, poorly graded SAND with silt, SP-SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-17
			Date	9/14/2016



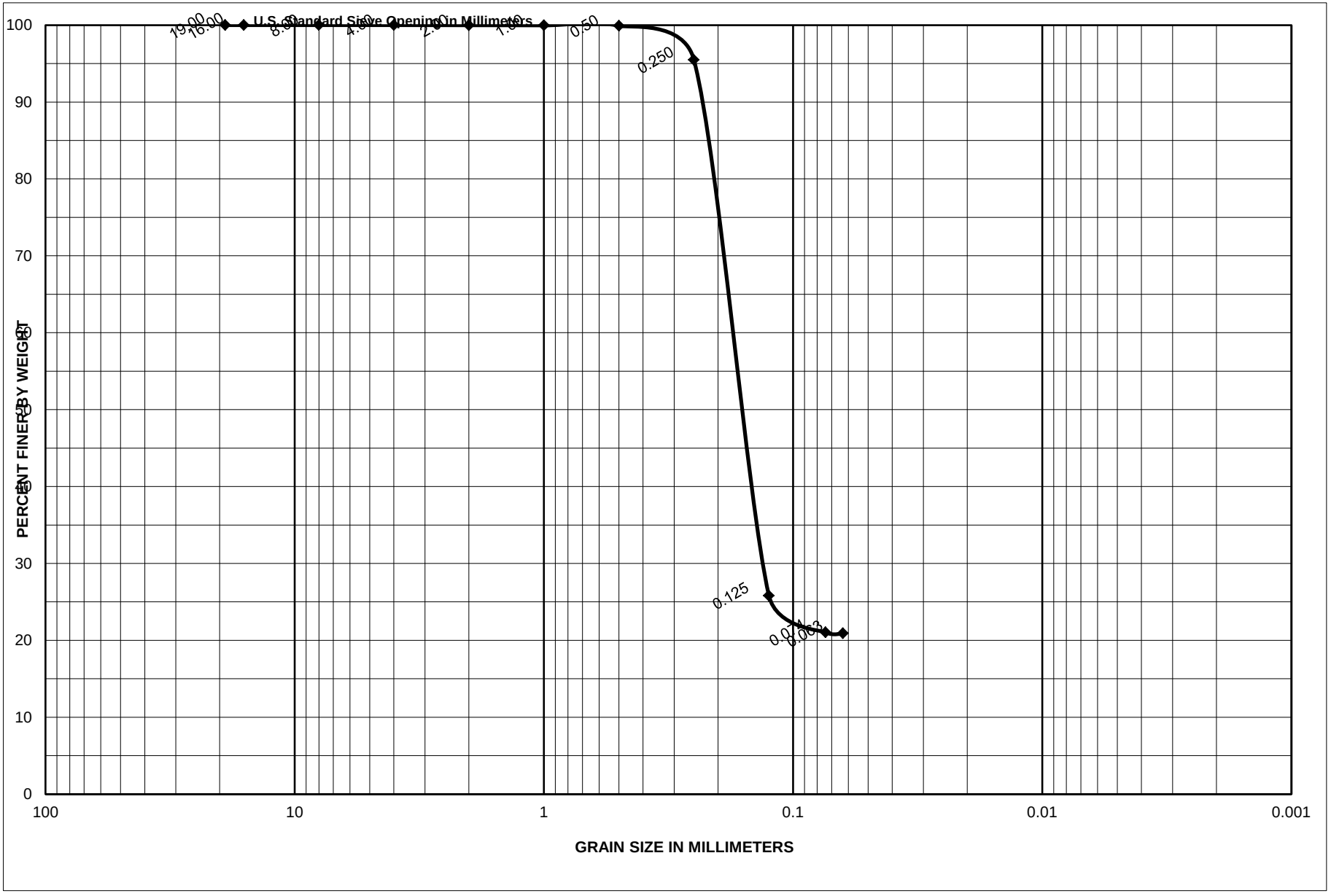
Sample No.	Depth (ft)	Classification		
V17-S03	3.6-4.0	Gray, Sandy lean CLAY, CL	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-17
			Date	9/14/2016



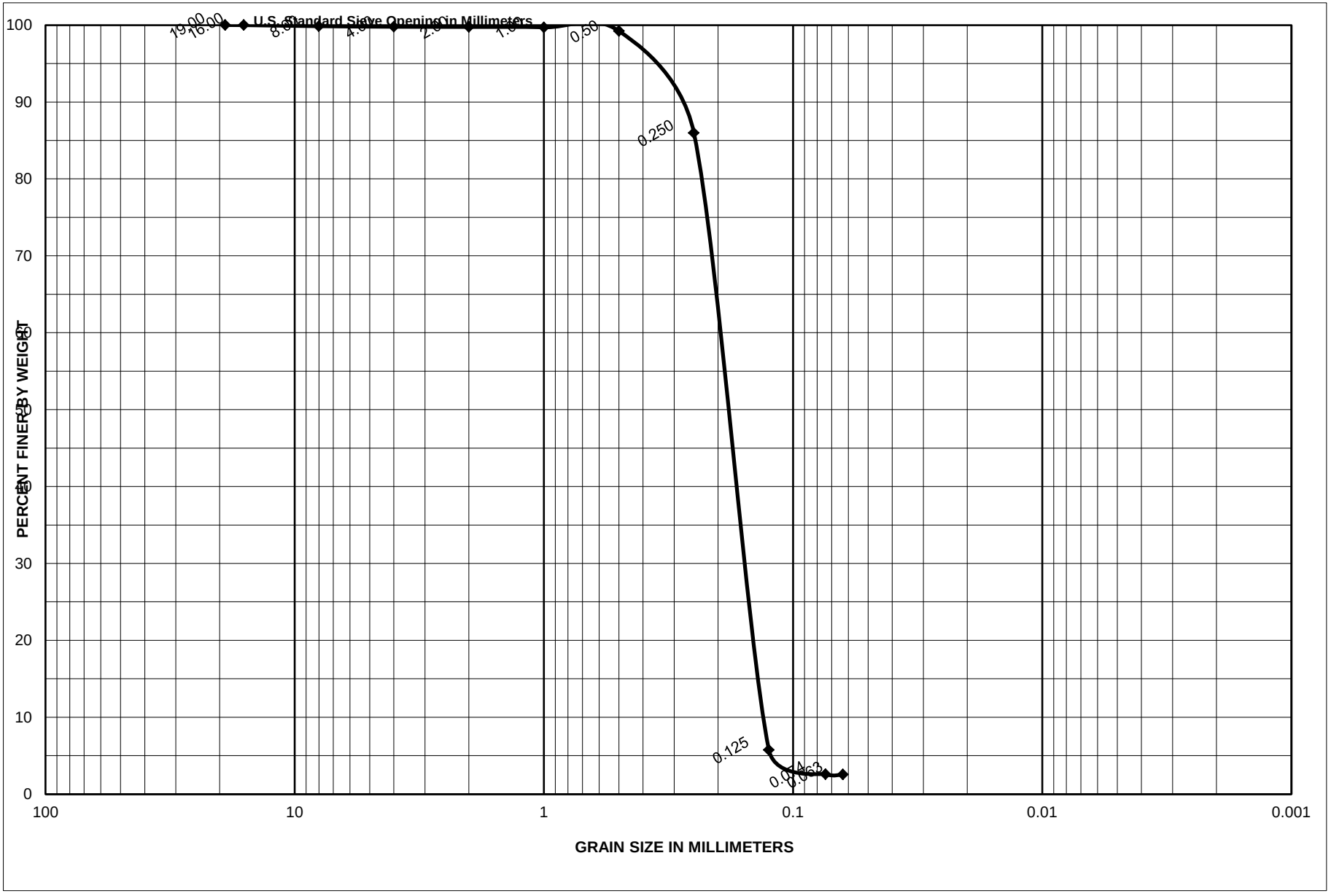
Sample No.	Depth (ft)	Classification		
V17-S04	4.0-4.9	Gray, poorly graded SAND with silt, SP-SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-17
			Date	9/14/2016



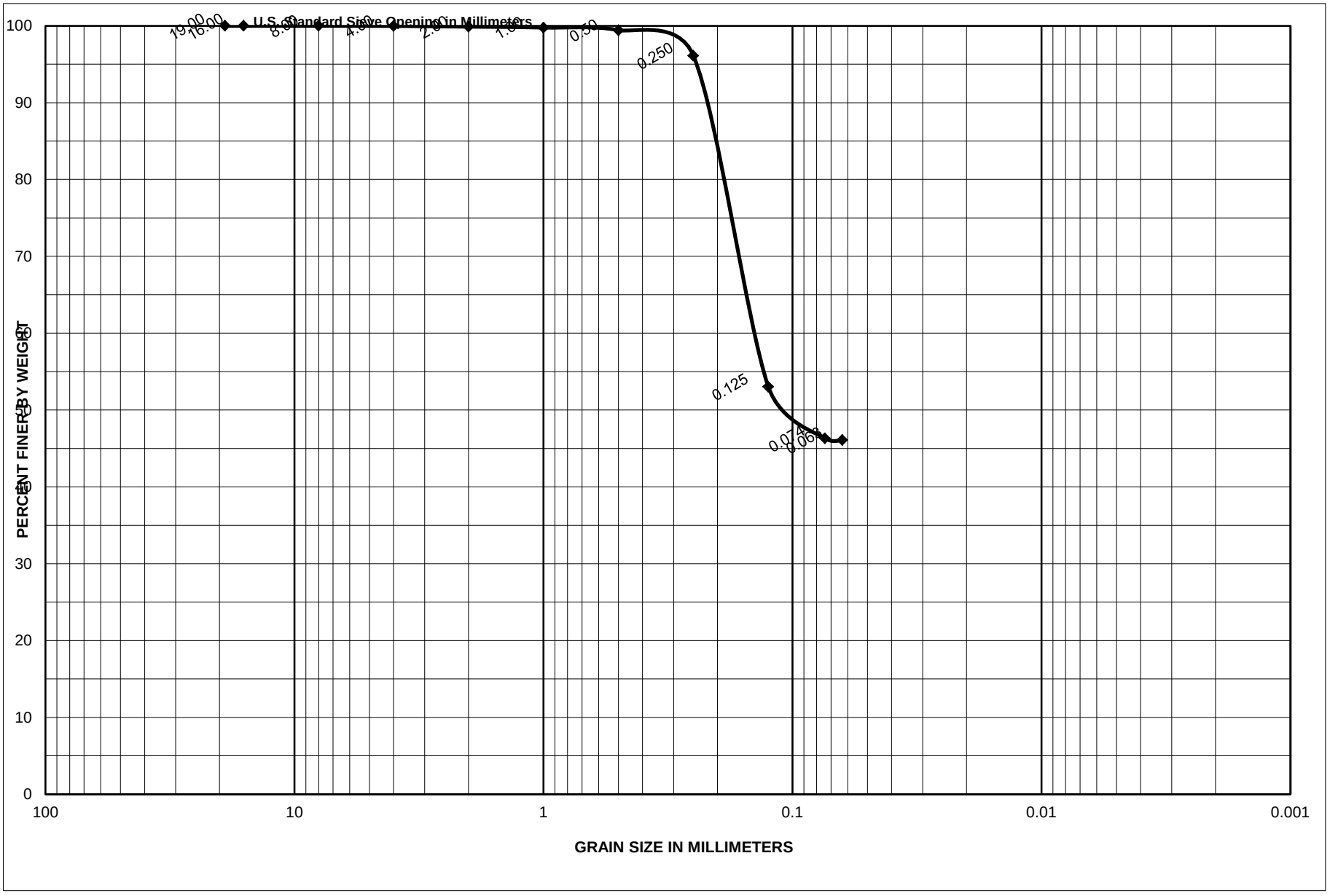
Sample No.	Depth (ft)	Classification		
V18-S01	0-2	Gray, Silty SAND, SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-18
			Date	9/14/2016



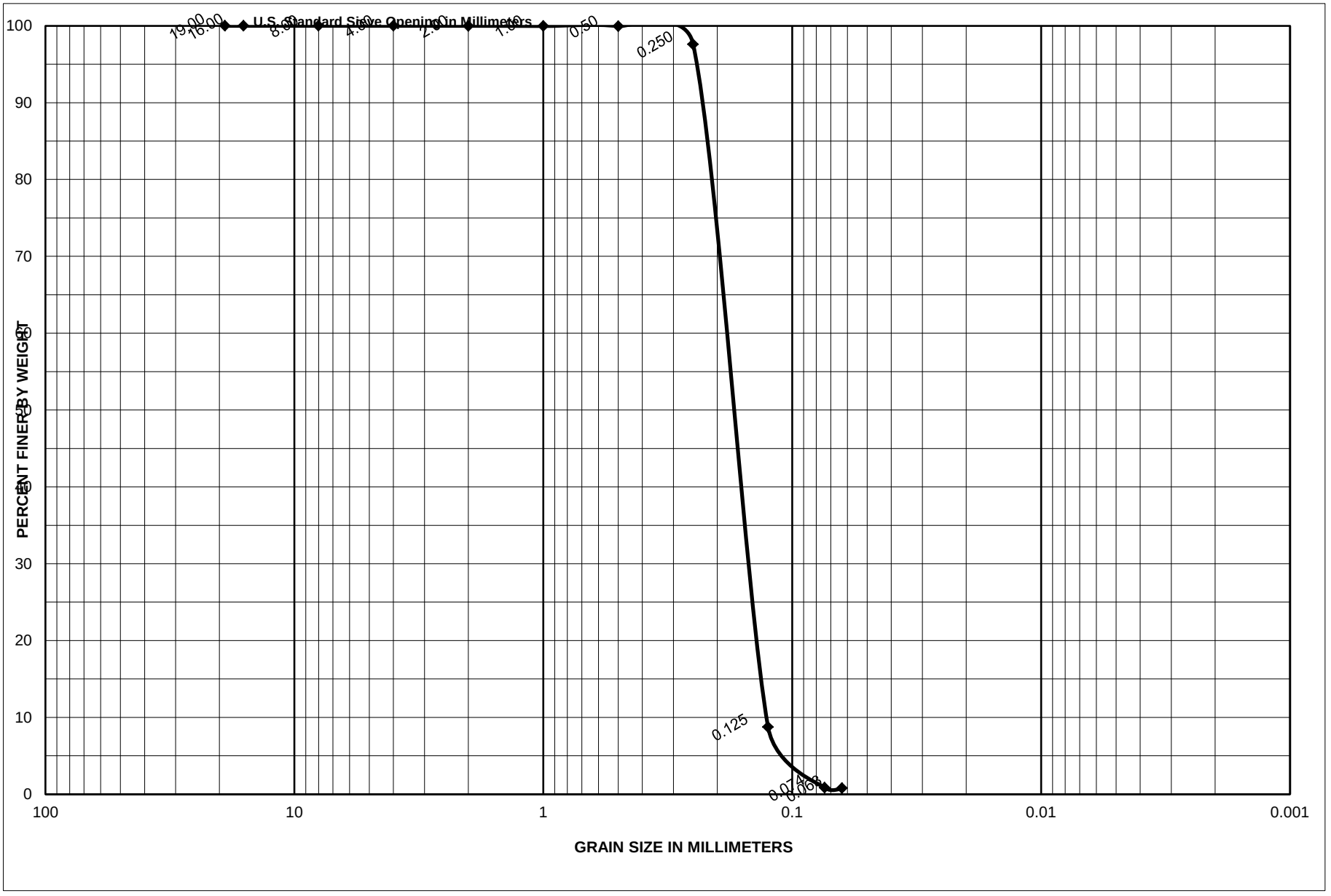
Sample No.	Depth (ft)	Classification		
V18-S02	2-4.9	Gray, Silty SAND, SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-18
			Date	9/14/2016



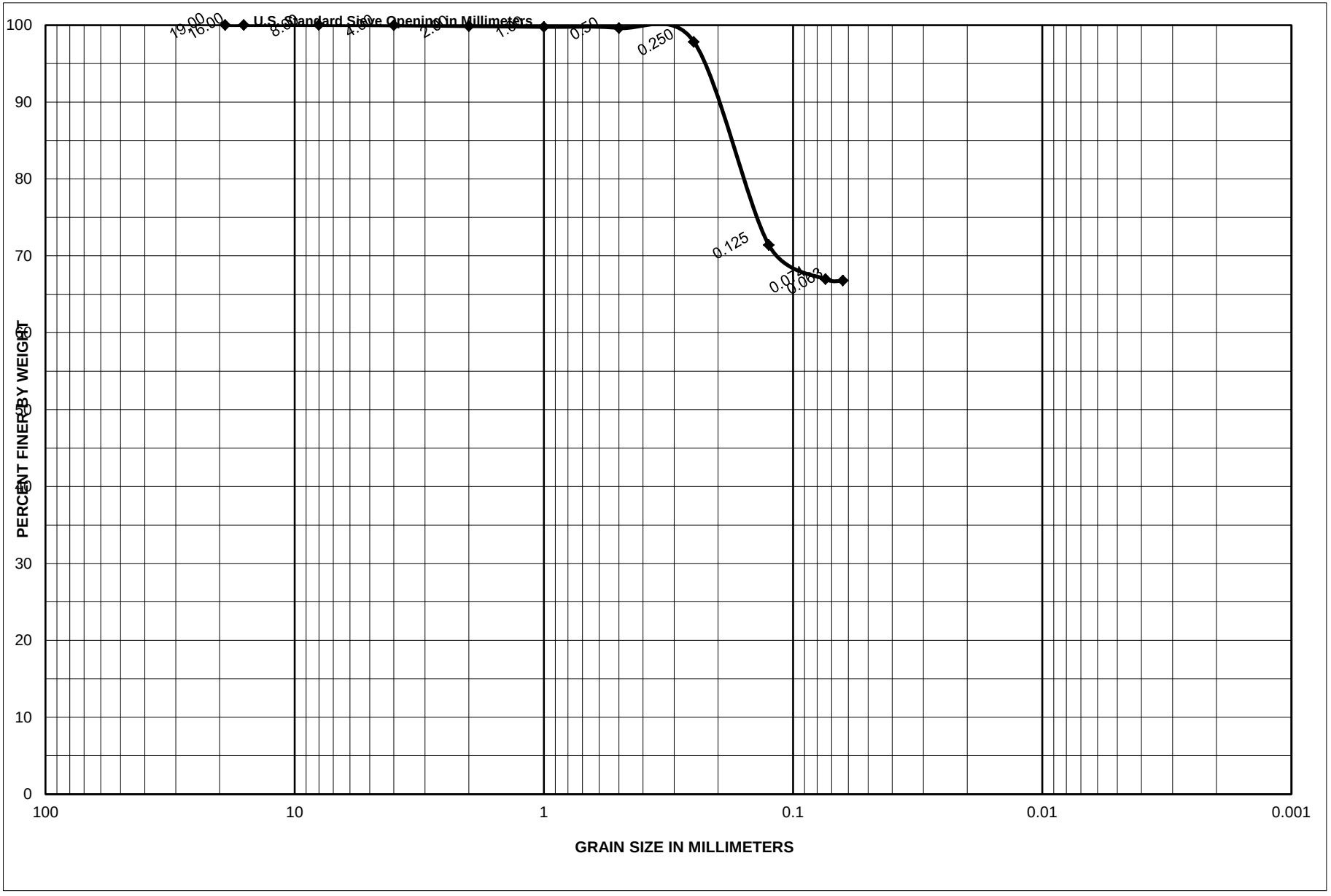
Sample No.	Depth (ft)	Classification		
V18-S03	4.9-5.6	Light gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-18
			Date	9/14/2016



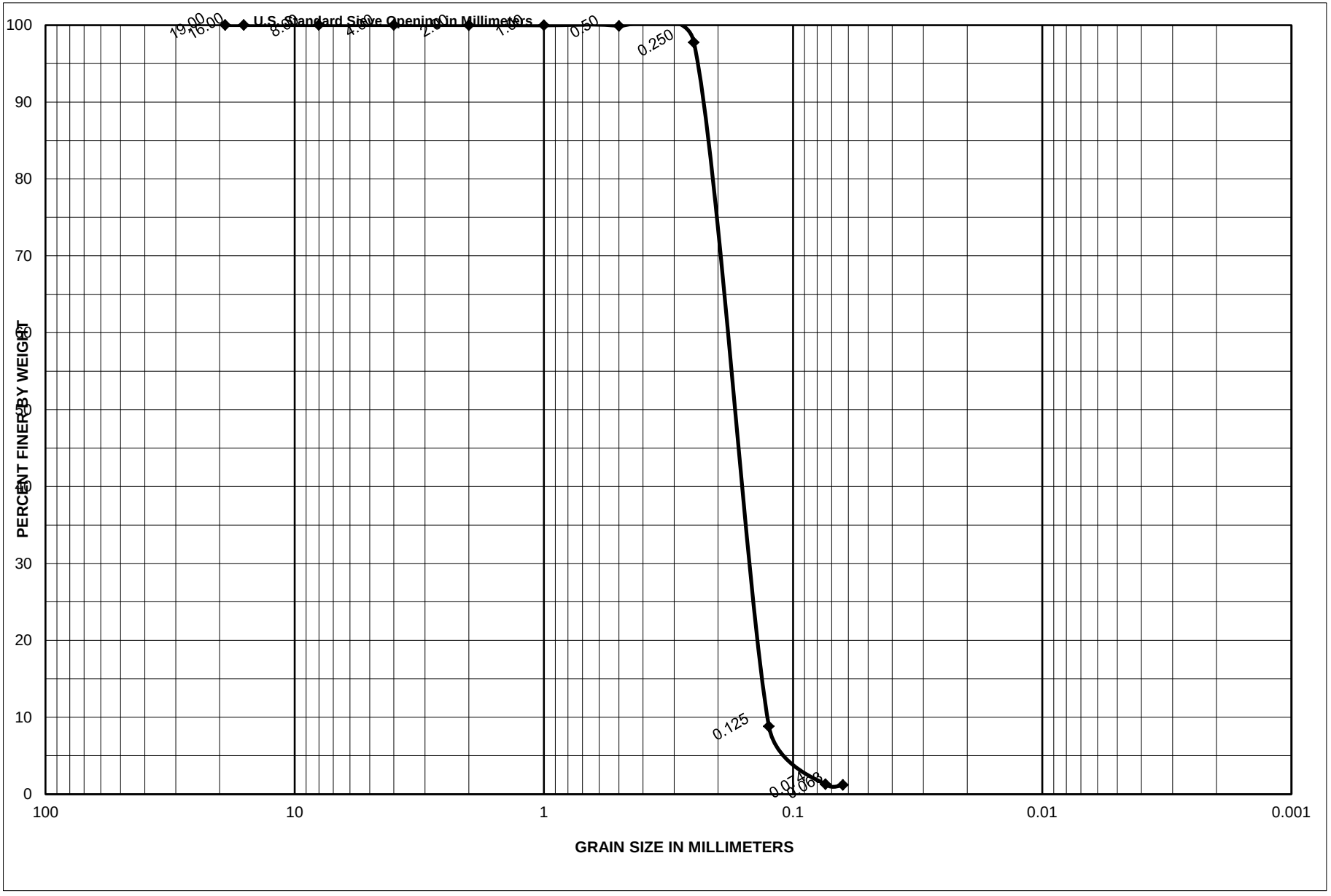
Sample No.	Depth (ft)	Classification		
V23-S01	0-0.8	Gray, Organic soil to Silty SAND, OL/OH/SM	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-23
			Date	9/14/2016



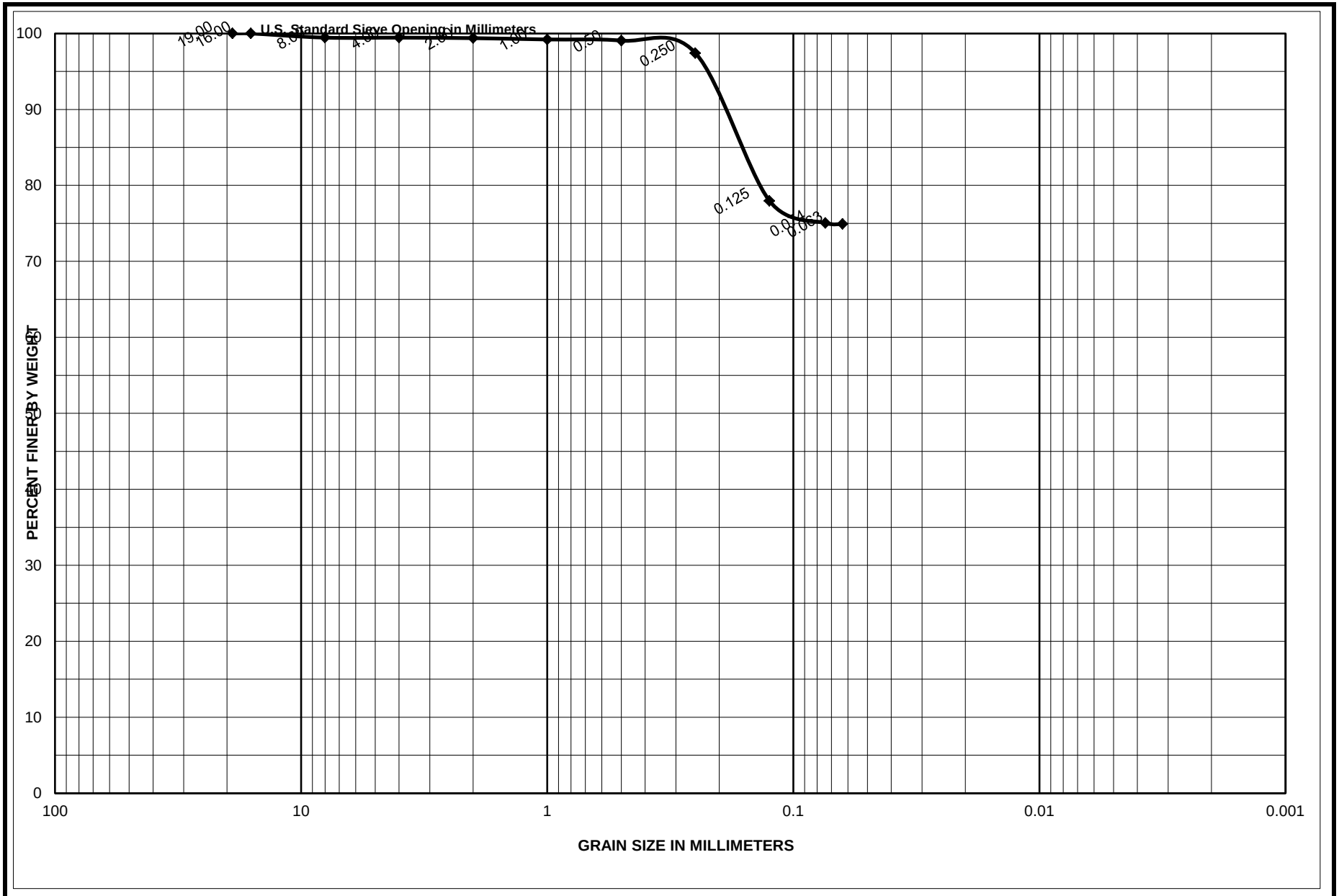
Sample No.	Depth (ft)	Classification		
V23-S02	0.8-3.0	Gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-23
			Date	9/14/2016



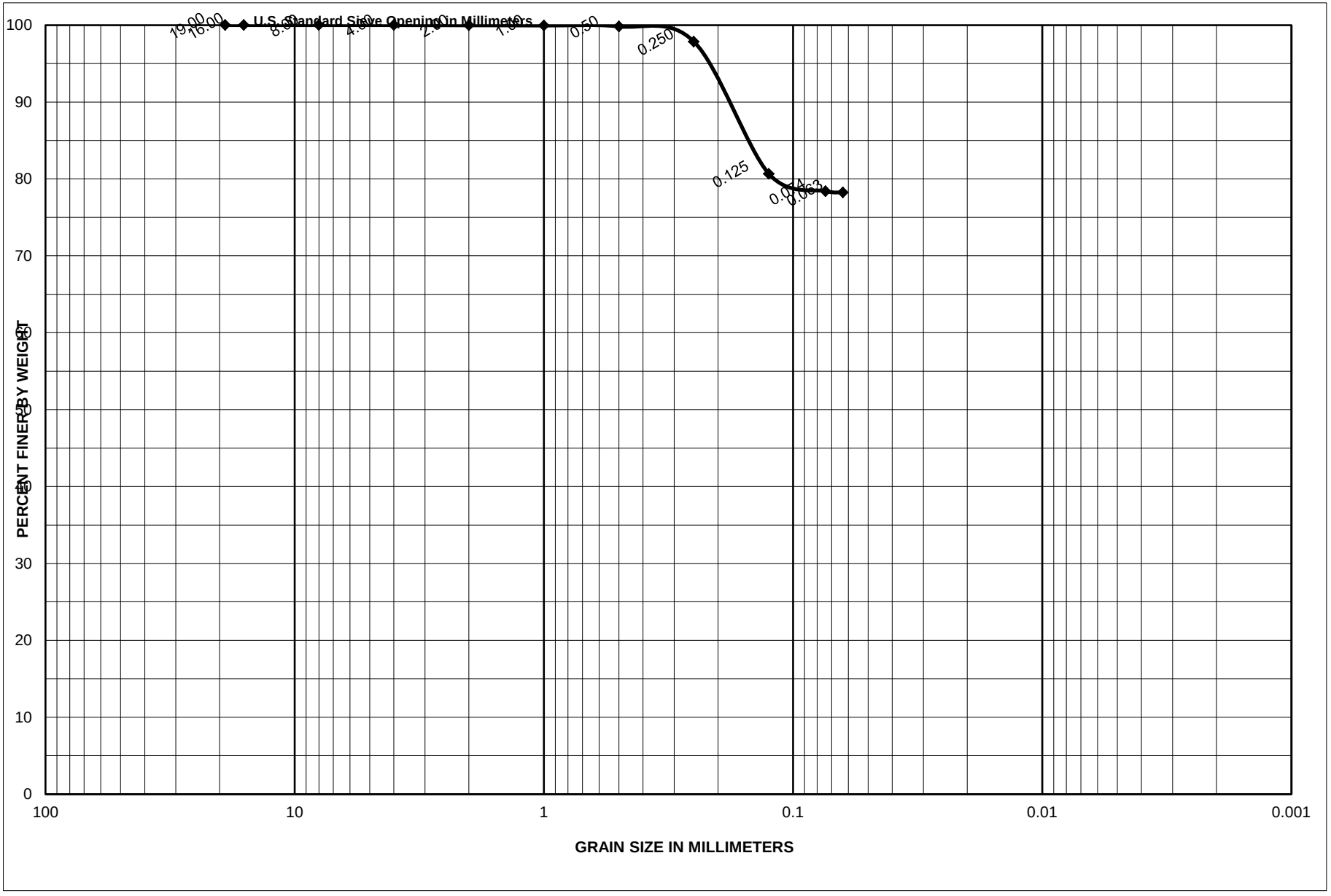
Sample No.	Depth (ft)	Classification		
V24-S01	0-3.7	Gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-24
			Date	9/14/2016



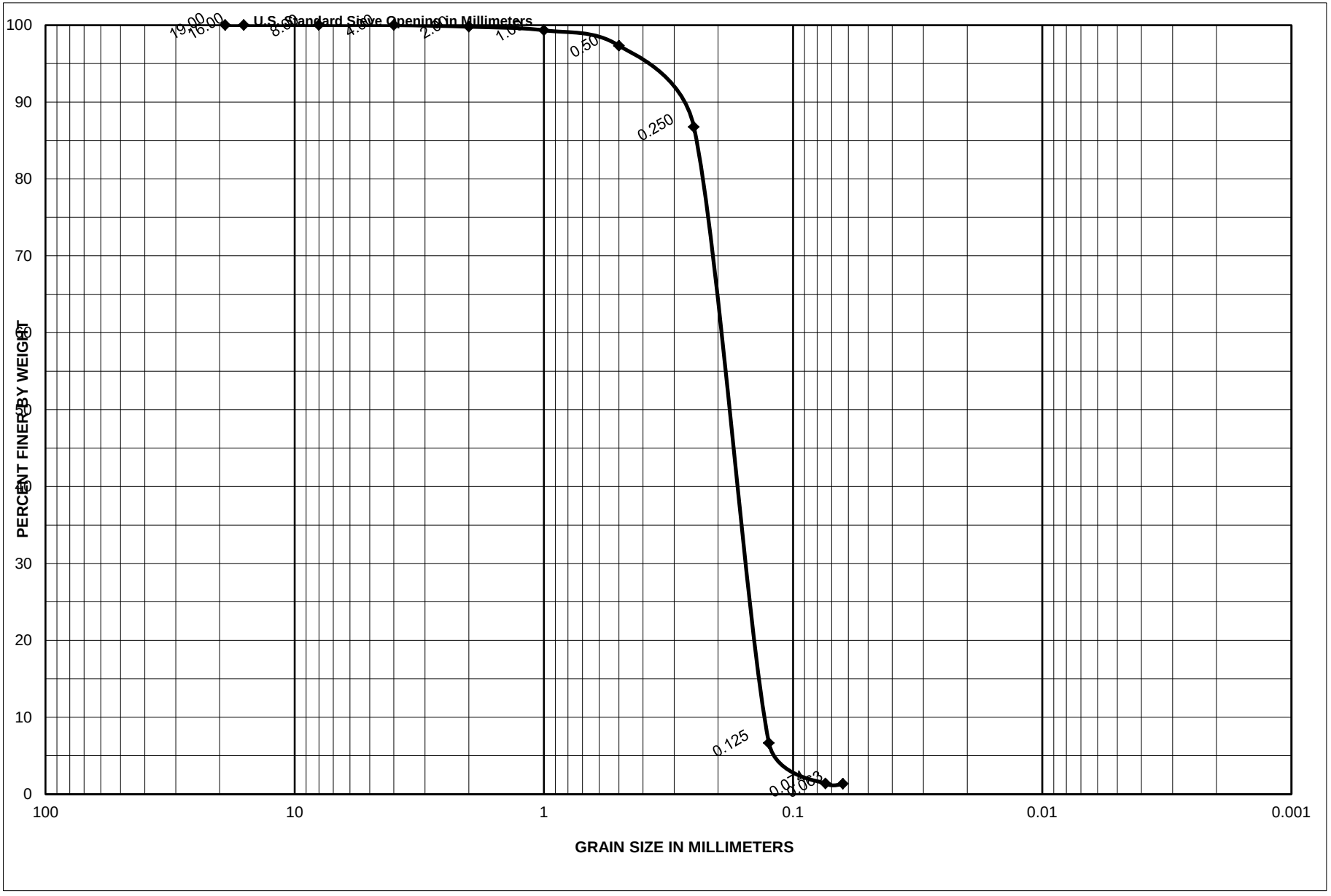
Sample No.	Depth (ft)	Classification		
V24-S02	3.7-5	Gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-24
			Date	9/14/2016



Sample No.	Depth (ft)	Classification		
V25-S01	0-4	Gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-25
			Date	9/14/2016



Sample No.	Depth (ft)	Classification		
V26-S01	0-2.6	Gray, Organic soil, OL/OH	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-26
			Date	9/14/2016



Sample No.	Depth (ft)	Classification		
V26-S02	2.6-4.7	Gray, poorly graded SAND, SP	**Project**	Sunset Beach Vibracore
			Area	Sunset Beach, NC
			CATLIN Geotechnical Laboratory	
			Boring No.	VC-26
			Date	9/14/2016

VIBRACORE PHOTOGRAPHS

Sample VC-11-1

Top Elevation: -0.4 MLW

Bottom Elevation: -3.1 MLW

Sample Length: 2.7 ft

Sample VC-11-2

Top Elevation: -3.1 MLW Bottom Elevation: -7.4 MLW

Sample Length: 4.3 ft

Sample VC-11-3

Top Elevation: -3.7 MLW Bottom Elevation: -10.4 MLW

Sample Length: 6.7 ft

Sample VC-14

Top Elevation: -2.1 MLW Bottom Elevation: -8.0 MLW

Sample Length: 5.9 ft

Sample VC-16

Top Elevation: -4.9 MLW Bottom Elevation: -9.9 MLW

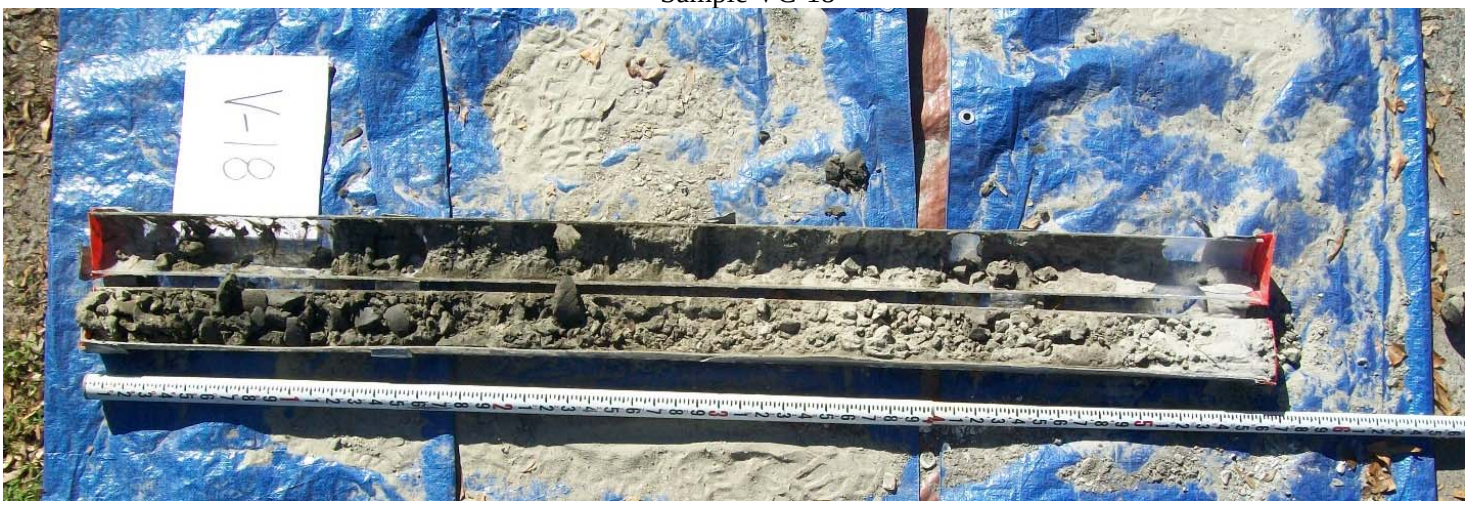
Sample Length: 5.0 ft

Sample VC-17

Top Elevation: -4.6 MLW Bottom Elevation: -9.5 MLW

Sample Length: 4.9 ft

Sample VC-18



Top Elevation: -2.2 MLW Bottom Elevation: -7.8 MLW

Sample Length: 5.6 ft

Sample VC-23

Top Elevation: -4.2 MLW

Bottom Elevation: -7.2 MLW

Sample Length: 3.0 ft

Sample VC-24

Top Elevation: -3.1 MLW Bottom Elevation: -8.1 MLW

Sample Length: 5.0 ft

Sample VC-25

Top Elevation: -2.4 MLW Bottom Elevation: -6.4 MLW

Sample Length: 4.0 ft

Sample VC-26

Top Elevation: -2.4 MLW Bottom Elevation: -7.1 MLW

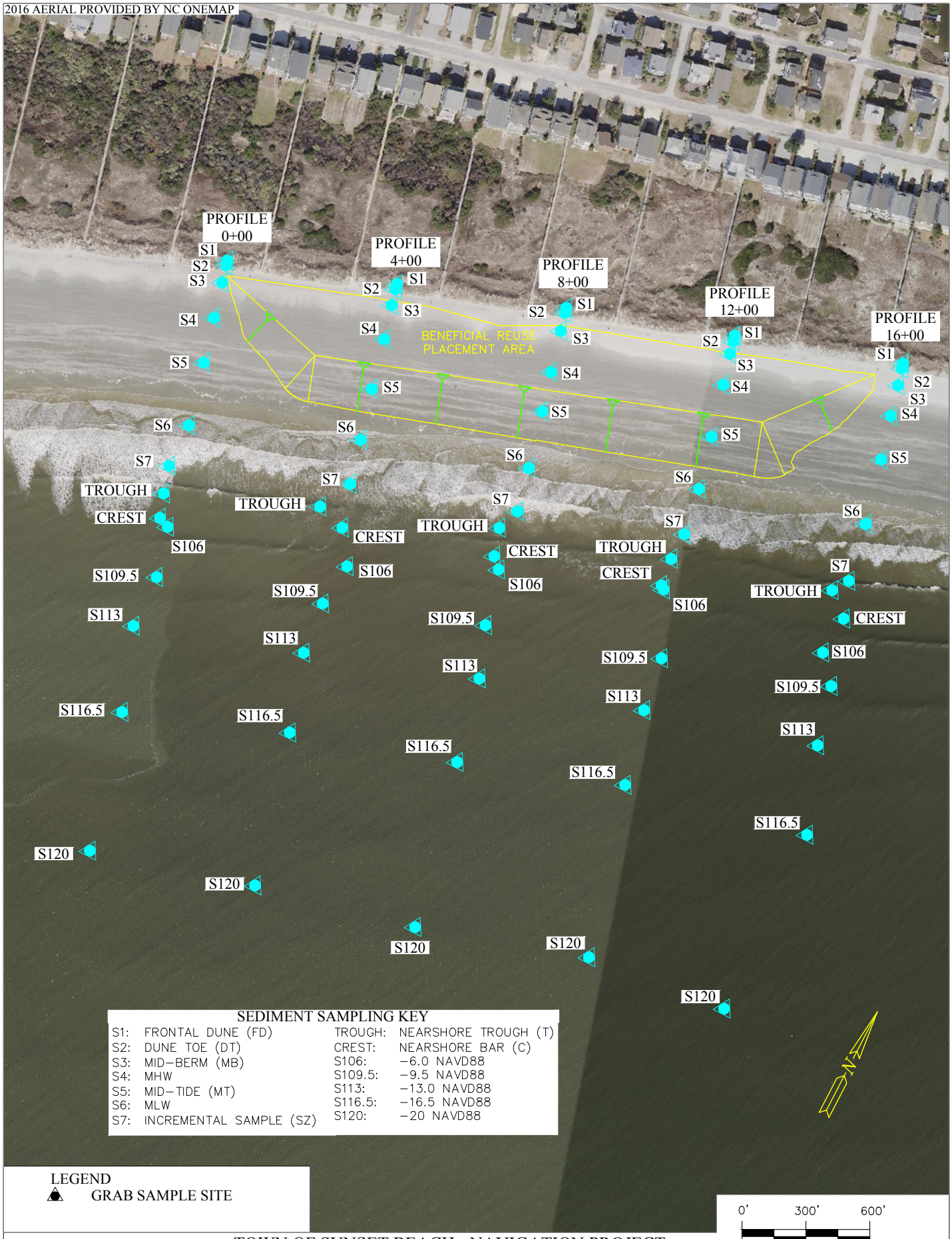
Sample Length: 4.7 ft

APPENDIX D

RECIPIENT BEACH SEDIMENT ANALYSIS

PG D1-1 ANALYSIS SUMMARY PLANVIEW
PG D2-1 & D2-2 ANALYSIS SUMMARY TABLE
PG D3-1 THRU PG D3-14 PROFILE 0+00 PARTICLE SIZE DISTRIBUTION REPORTS
PG D4-1 THRU PG D4-14 PROFILE 4+00 PARTICLE SIZE DISTRIBUTION REPORTS
PG D5-1 THRU PG D5-14 PROFILE 8+00 PARTICLE SIZE DISTRIBUTION REPORTS
PG D6-1 THRU PG D6-14 PROFILE 12+00 PARTICLE SIZE DISTRIBUTION REPORTS
PG D7-1 THRU PG D7-14 PROFILE 16+00 PARTICLE SIZE DISTRIBUTION REPORTS
PG D8-1 THRU PG D8-5 CALCITE COMPOSITE
D9 CLAST REPORT

moffatt & nichol



TOWN OF SUNSET BEACH - NAVIGATION PROJECT
MAINTENANCE DREDGING OF SOUTH JINKS CREEK, THE BAY AREA & THE FEEDER CHANNEL
RECIPIENT BEACH SEDIMENT SAMPLING MAP

D1-1

ANALYSIS SUMMARY TABLE

Recipient Beach Sediiment Analysis

DCM Compatibility Summary					
Transect	Gravel	Granular	Sand	<#230	Carbonate
0+00	0.07%	0.09%	98.61%	1.22%	2.00%
4+00	0.04%	0.06%	98.67%	1.23%	2.00%
8+00	0.04%	0.09%	98.39%	1.49%	2.00%
12+00	0.10%	2.44%	96.36%	1.11%	2.00%
16+00	0.11%	0.06%	98.70%	1.13%	2.00%
Grand Mean	**0.07%**	**0.55%**	**98.15%**	**1.23%**	**2.00%**

Native Summary							
Transect	Median (mm)	Mean (mm)	D5 (mm)	D16 (mm)	D50 (mm)	D84 (mm)	D95 (mm)
0+00	0.18	0.17	0.29	0.22	0.18	0.14	0.11
4+00	0.17	0.17	0.27	0.22	0.17	0.13	0.11
8+00	0.18	0.18	0.29	0.23	0.18	0.14	0.11
12+00	0.17	0.17	0.30	0.23	0.17	0.13	0.11
16+00	0.17	0.17	0.29	0.23	0.17	0.13	0.11
Grand Mean (mm)	**0.17**	**0.17**	**0.29**	**0.23**	**0.17**	**0.13**	**0.11**
Grand Mean (ϕ)	**2.52**	**2.52**	**1.80**	**2.15**	**2.52**	**2.90**	**3.20**

$M_{\phi n}$	2.525
$\sigma_{\phi n}$	0.420

Transect	Location	Dry Weight (g)	Gravel >#4	Granular #10<x<#4	Sand #230<x<#10	Fine <#230	Carbonate	Median (mm)	Mean (mm)	Mean (φ)	D5 (mm)	D16 (mm)	D50 (mm)	D84 (mm)	D95 (mm)	φ5	φ16	φ50	φ84	φ95
0+00	FD	230.01	0.10%	0.00%	99.80%	0.10%		0.20	0.19	2.39	0.25	0.24	0.20	0.15	0.13	2.00	2.08	2.33	2.75	2.96
0+00	DT	218.14	0.00%	0.00%	99.50%	0.50%		0.20	0.17	2.58	0.30	0.15	0.20	0.15	0.13	1.76	2.71	2.31	2.73	2.96
0+00	MB	271.78	0.00%	0.10%	99.70%	0.20%		0.20	0.19	2.40	0.25	0.23	0.20	0.15	0.13	2.02	2.09	2.34	2.76	2.96
0+00	MHW	178.47	0.00%	0.00%	99.20%	0.80%		0.18	0.18	2.49	0.25	0.23	0.18	0.14	0.12	2.01	2.12	2.49	2.86	3.01
0+00	MT	258.2	0.30%	0.10%	98.80%	0.80%		0.20	0.19	2.37	0.33	0.25	0.20	0.15	0.13	1.60	2.02	2.32	2.77	2.97
0+00	MLW	241.9	0.00%	0.00%	99.10%	0.90%		0.20	0.19	2.38	0.33	0.25	0.20	0.14	0.13	1.60	2.02	2.34	2.79	2.98
0+00	SZ	220.85	0.00%	0.00%	98.70%	1.30%		0.16	0.17	2.58	0.25	0.22	0.16	0.13	0.11	2.01	2.20	2.62	2.92	3.19
0+00	T	243.11	0.00%	0.00%	97.80%	2.20%		0.17	0.18	2.51	0.32	0.24	0.17	0.13	0.10	1.62	2.08	2.54	2.90	3.27
0+00	C	249.92	0.00%	0.10%	99.10%	0.80%		0.17	0.18	2.50	0.32	0.24	0.17	0.14	0.11	1.63	2.08	2.53	2.88	3.14
0+00	-6	232.64	0.20%	0.10%	98.90%	0.80%		0.17	0.18	2.50	0.35	0.24	0.17	0.13	0.11	1.52	2.05	2.55	2.89	3.15
0+00	-9.5	246.16	0.10%	0.20%	98.70%	1.00%		0.18	0.18	2.48	0.33	0.24	0.18	0.14	0.12	1.60	2.07	2.49	2.87	3.11
0+00	-13	246.71	0.00%	0.10%	98.70%	1.20%		0.16	0.16	2.69	0.24	0.19	0.16	0.13	0.10	2.09	2.43	2.69	2.95	3.32
0+00	-16.5	275.09	0.10%	0.40%	95.60%	3.90%		0.15	0.14	2.83	0.24	0.18	0.15	0.11	0.07	2.05	2.49	2.76	3.24	3.79
0+00	-20	233.74	0.20%	0.20%	97.00%	2.60%		0.16	0.16	2.66	0.26	0.22	0.16	0.12	0.08	1.95	2.22	2.67	3.10	3.61
	AVERAGE		**0.07%**	**0.09%**	**98.61%**	**1.22%**	**2.00%**	**0.18**	**0.17**	**2.52**	**0.29**	**0.22**	**0.18**	**0.14**	**0.11**	**1.80**	**2.18**	**2.49**	**2.88**	**3.15**
4+00	FD	301.92	0.00%	0.00%	99.90%	0.10%		0.19	0.18	2.47	0.25	0.23	0.19	0.14	0.13	2.02	2.11	2.43	2.85	2.99
4+00	DT	233.21	0.00%	0.00%	99.80%	0.20%		0.20	0.19	2.40	0.25	0.24	0.20	0.14	0.13	1.98	2.06	2.36	2.79	2.97
4+00	MB	211.64	0.00%	0.00%	99.90%	0.10%		0.17	0.17	2.55	0.01	0.22	0.17	0.13	0.12	6.38	2.18	2.58	2.89	3.05
4+00	MHW	208.26	0.00%	0.00%	99.10%	0.90%		0.17	0.18	2.50	0.26	0.23	0.17	0.14	0.12	1.94	2.11	2.52	2.88	3.11
4+00	MT	234.08	0.10%	0.00%	98.90%	1.00%		0.22	0.22	2.17	0.39	0.32	0.22	0.16	0.13	1.37	1.65	2.17	2.69	2.95
4+00	MLW	245.48	0.00%	0.00%	99.10%	0.90%		0.19	0.19	2.41	0.34	0.25	0.19	0.14	0.12	1.55	2.00	2.40	2.84	3.02
4+00	SZ	231.26	0.00%	0.00%	98.90%	1.10%		0.16	0.16	2.61	0.25	0.21	0.16	0.13	0.10	2.01	2.25	2.65	2.94	3.25
4+00	T	230.78	0.00%	0.00%	98.80%	1.20%		0.16	0.16	2.63	0.28	0.21	0.16	0.13	0.10	1.85	2.27	2.67	2.95	3.29
4+00	C	229.83	0.00%	0.10%	98.80%	1.10%		0.16	0.17	2.58	0.32	0.22	0.16	0.13	0.10	1.65	2.16	2.64	2.94	3.30
4+00	-6	231.02	0.00%	0.30%	98.60%	1.10%		0.16	0.17	2.55	0.38	0.24	0.16	0.13	0.10	1.42	2.08	2.62	2.95	3.33
4+00	-9.5	253.58	0.10%	0.20%	98.60%	1.10%		0.16	0.17	2.58	0.32	0.22	0.16	0.13	0.10	1.66	2.17	2.64	2.94	3.30
4+00	-13	215.76	0.10%	0.00%	98.20%	1.70%		0.15	0.15	2.78	0.21	0.17	0.15	0.12	0.09	2.25	2.52	2.75	3.07	3.45
4+00	-16.5	213.55	0.20%	0.10%	96.30%	3.40%		0.14	0.13	2.89	0.22	0.17	0.14	0.10	0.08	2.17	2.53	2.83	3.32	3.72
4+00	-20	271.65	0.10%	0.10%	96.50%	3.30%		0.15	0.15	2.75	0.25	0.20	0.15	0.11	0.08	2.02	2.30	2.73	3.23	3.70
	AVERAGE		**0.04%**	**0.06%**	**98.67%**	**1.23%**	**2.00%**	**0.17**	**0.17**	**2.55**	**0.27**	**0.22**	**0.17**	**0.13**	**0.11**	**1.91**	**2.15**	**2.56**	**2.94**	**3.23**
8+00	FD	222.55	0.00%	0.00%	99.90%	0.10%		0.18	0.18	2.46	0.24	0.23	0.18	0.14	0.13	2.03	2.12	2.44	2.82	2.98
8+00	DT	236.58	0.00%	0.00%	99.90%	0.10%		0.20	0.20	2.34	0.31	0.24	0.20	0.15	0.13	1.70	2.04	2.29	2.71	2.94
8+00	MB	222.25	0.00%	0.00%	99.80%	0.20%		0.19	0.18	2.44	0.25	0.23	0.19	0.14	0.13	2.02	2.11	2.39	2.82	2.99
8+00	MHW	203.83	0.00%	0.00%	99.30%	0.70%		0.19	0.19	2.42	0.25	0.23	0.19	0.14	0.13	2.01	2.09	2.38	2.80	2.98
8+00	MT	257.54	0.00%	0.10%	99.10%	0.80%		0.22	0.22	2.17	0.35	0.31	0.22	0.16	0.13	1.50	1.69	2.18	2.64	2.93
8+00	MLW	268.78	0.10%	0.00%	99.10%	0.80%		0.20	0.19	2.36	0.34	0.25	0.20	0.15	0.13	1.58	2.01	2.31	2.77	2.98
8+00	SZ	222.72	0.10%	0.00%	98.90%	1.00%		0.16	0.17	2.59	0.26	0.22	0.16	0.13	0.11	1.97	2.21	2.64	2.92	3.17
8+00	T	228.23	0.10%	0.00%	99.00%	0.90%		0.16	0.17	2.55	0.31	0.23	0.16	0.13	0.11	1.71	2.14	2.60	2.91	3.17
8+00	C	226.7	0.20%	0.00%	98.90%	0.90%		0.16	0.17	2.57	0.31	0.22	0.16	0.13	0.11	1.69	2.17	2.63	2.92	3.24
8+00	-6	272.88	0.00%	0.00%	99.00%	1.00%		0.17	0.18	2.50	0.35	0.24	0.17	0.13	0.10	1.50	2.05	2.54	2.91	3.26
8+00	-9.5	249.57	0.00%	0.00%	99.00%	1.00%		0.17	0.18	2.50	0.34	0.24	0.17	0.13	0.11	1.56	2.08	2.55	2.89	3.16
8+00	-13	224.38	0.00%	0.20%	98.70%	1.10%		0.15	0.17	2.55	0.23	0.18	0.15	0.18	0.10	2.12	2.49	2.71	2.44	3.35
8+00	-16.5	186.62	0.00%	0.80%	94.70%	4.50%		0.14	0.14	2.87	0.24	0.18	0.14	0.10	0.07	2.04	2.51	2.79	3.30	3.89
8+00	-20	258.72	0.10%	0.10%	92.10%	7.70%		0.15	0.14	2.79	0.27	0.21	0.15	0.10	0.04	1.86	2.28	2.74	3.35	4.55
	AVERAGE		**0.04%**	**0.09%**	**98.39%**	**1.49%**	**2.00%**	**0.18**	**0.18**	**2.50**	**0.29**	**0.23**	**0.18**	**0.14**	**0.11**	**1.79**	**2.13**	**2.50**	**2.85**	**3.20**

Recipient Beach Sediment Analysis

DCM Compatibility Summary					
Transect	Gravel	Granular	Sand	<#230	Carbonate
0+00	0.07%	0.09%	98.61%	1.22%	2.00%
4+00	0.04%	0.06%	98.67%	1.23%	2.00%
8+00	0.04%	0.09%	98.39%	1.49%	2.00%
12+00	0.10%	2.44%	96.36%	1.11%	2.00%
16+00	0.11%	0.06%	98.70%	1.13%	2.00%
Grand Mean	**0.07%**	**0.55%**	**98.15%**	**1.23%**	**2.00%**

Native Summary							
Transect	Median (mm)	Mean (mm)	D5 (mm)	D16 (mm)	D50 (mm)	D84 (mm)	D95 (mm)
0+00	0.18	0.17	0.29	0.22	0.18	0.14	0.11
4+00	0.17	0.17	0.27	0.22	0.17	0.13	0.11
8+00	0.18	0.18	0.29	0.23	0.18	0.14	0.11
12+00	0.17	0.17	0.30	0.23	0.17	0.13	0.11
16+00	0.17	0.17	0.29	0.23	0.17	0.13	0.11
Grand Mean (mm)	**0.17**	**0.17**	**0.29**	**0.23**	**0.17**	**0.13**	**0.11**
Grand Mean (ϕ)	**2.52**	**2.52**	**1.80**	**2.15**	**2.52**	**2.90**	**3.20**

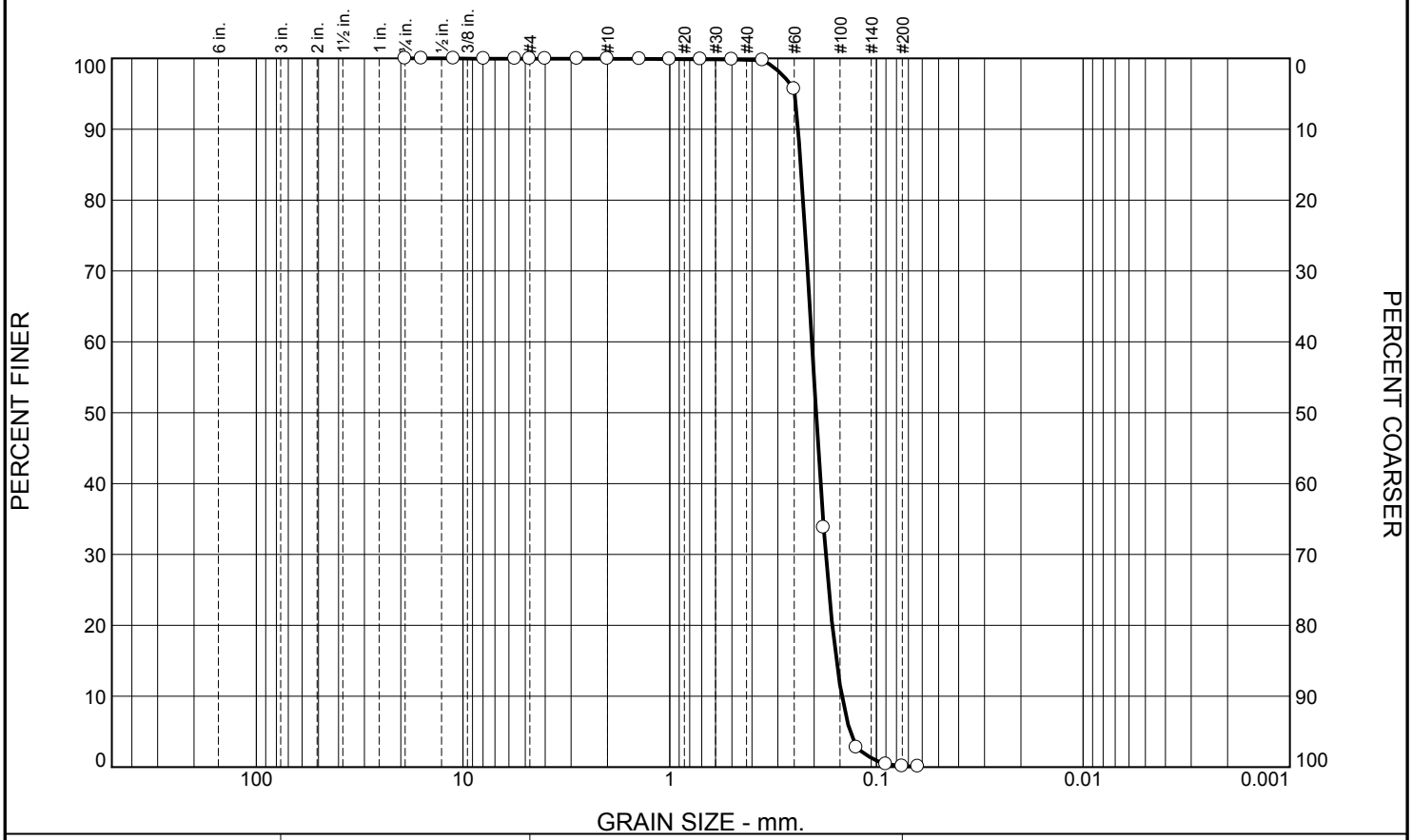
$M_{\phi n}$	**2.525**
$\sigma_{\phi n}$	**0.420**

Transect	Location	Dry Weight (g)	Gravel >#4	Granular #10<x<#4	Sand #230<x<#10	Fine <#230	Carbonate	Median (mm)	Mean (mm)	Mean (φ)	D5 (mm)	D16 (mm)	D50 (mm)	D84 (mm)	D95 (mm)	φ5	φ16	φ50	φ84	φ95
12+00	FD	254.09	0.00%	0.00%	100.00%	0.00%		0.20	0.19	2.39	0.25	0.24	0.20	0.15	0.13	2.00	2.08	2.34	2.76	2.96
12+00	DT	300.67	0.00%	0.00%	99.80%	0.20%		0.21	0.19	2.37	0.25	0.24	0.21	0.15	0.13	2.00	2.08	2.27	2.77	2.97
12+00	MB	334.19	0.00%	0.10%	99.60%	0.30%		0.20	0.19	2.37	0.25	0.24	0.20	0.15	0.13	2.00	2.07	2.31	2.72	2.96
12+00	MHW	211.01	0.00%	0.00%	99.10%	0.90%		0.17	0.17	2.54	0.29	0.23	0.17	0.13	0.12	1.81	2.14	2.60	2.90	3.09
12+00	MT	253.21	0.00%	0.00%	99.20%	0.80%		0.20	0.19	2.37	0.34	0.25	0.20	0.15	0.13	1.58	2.01	2.32	2.77	2.97
12+00	MLW	243.69	0.00%	0.10%	99.30%	0.60%		0.20	0.21	2.26	0.43	0.31	0.20	0.15	0.13	1.20	1.71	2.30	2.79	2.98
12+00	SZ	240.26	0.00%	0.00%	99.10%	0.90%		0.17	0.18	2.50	0.34	0.24	0.17	0.13	0.11	1.56	2.05	2.55	2.89	3.17
12+00	T	197.3	0.00%	0.10%	99.00%	0.90%		0.16	0.16	2.61	0.31	0.21	0.16	0.13	0.10	1.68	2.23	2.66	2.94	3.28
12+00	C	205.53	0.00%	0.10%	98.80%	1.10%		0.16	0.17	2.57	0.34	0.23	0.16	0.13	0.10	1.55	2.13	2.64	2.95	3.33
12+00	-6	224.6	0.70%	0.10%	98.10%	1.10%		0.16	0.17	2.57	0.35	0.23	0.16	0.13	0.10	1.51	2.13	2.64	2.94	3.32
12+00	-9.5	180.38	0.30%	33.10%	65.60%	1.00%		0.16	0.17	2.54	0.36	0.24	0.16	0.13	0.10	1.49	2.08	2.61	2.93	3.26
12+00	-13	193.08	0.40%	0.30%	98.00%	1.30%		0.15	0.15	2.74	0.22	0.18	0.15	0.13	0.09	2.17	2.51	2.73	2.98	3.40
12+00	-16.5	199.32	0.00%	0.00%	96.80%	3.20%		0.14	0.14	2.87	0.19	0.17	0.14	0.10	0.08	2.41	2.55	2.81	3.27	3.69
12+00	-20	194.51	0.00%	0.20%	96.60%	3.20%		0.15	0.14	2.80	0.25	0.18	0.15	0.11	0.08	2.01	2.46	2.74	3.21	3.70
	AVERAGE		**0.10%**	**2.44%**	**96.36%**	**1.11%**	**2.00%**	**0.17**	**0.17**	**2.52**	**0.30**	**0.23**	**0.17**	**0.13**	**0.11**	**1.75**	**2.14**	**2.52**	**2.91**	**3.20**
16+00	FD	298.52	0.00%	0.00%	99.80%	0.20%		0.20	0.19	2.39	0.25	0.23	0.20	0.15	0.13	2.02	2.09	2.33	2.75	2.96
16+00	DT	243.94	0.00%	0.00%	99.80%	0.20%		0.22	0.22	2.20	0.34	0.31	0.22	0.15	0.13	1.55	1.68	2.18	2.75	2.96
16+00	MB	242.18	0.10%	0.00%	99.80%	0.10%		0.19	0.19	2.42	0.25	0.24	0.19	0.14	0.13	2.01	2.09	2.37	2.80	2.99
16+00	MHW	198.11	0.00%	0.00%	99.20%	0.80%		0.18	0.18	2.47	0.25	0.23	0.18	0.14	0.12	2.01	2.11	2.46	2.85	3.01
16+00	MT	247.08	0.00%	0.10%	99.00%	0.90%		0.19	0.19	2.42	0.34	0.24	0.19	0.14	0.13	1.56	2.03	2.40	2.83	3.00
16+00	MLW	203.03	0.00%	0.00%	99.00%	1.00%		0.17	0.18	2.51	0.33	0.24	0.17	0.13	0.11	1.61	2.08	2.56	2.90	3.15
16+00	SZ	243.55	0.00%	0.00%	99.20%	0.80%		0.16	0.17	2.56	0.32	0.23	0.16	0.13	0.11	1.65	2.14	2.62	2.91	3.18
16+00	T	221.62	0.10%	0.10%	98.90%	0.90%		0.16	0.17	2.57	0.33	0.23	0.16	0.13	0.10	1.61	2.14	2.63	2.94	3.28
16+00	C	298.81	0.10%	0.10%	98.60%	1.20%		0.16	0.17	2.55	0.35	0.23	0.16	0.13	0.11	1.53	2.12	2.62	2.92	3.23
16+00	-6	255.64	0.00%	0.10%	98.90%	1.00%		0.16	0.17	2.54	0.39	0.24	0.16	0.13	0.10	1.35	2.07	2.63	2.94	3.30
16+00	-9.5	228.51	0.60%	0.30%	98.00%	1.10%		0.16	0.16	2.60	0.32	0.22	0.16	0.13	0.10	1.64	2.21	2.65	2.94	3.27
16+00	-13	239.62	0.50%	0.10%	98.00%	1.40%		0.15	0.15	2.75	0.21	0.17	0.15	0.13	0.09	2.27	2.52	2.74	2.99	3.43
16+00	-16.5	208.26	0.10%	0.10%	96.70%	3.10%		0.14	0.14	2.87	0.21	0.17	0.14	0.10	0.08	2.25	2.53	2.80	3.28	3.70
16+00	-20	253.89	0.00%	0.00%	96.90%	3.10%		0.15	0.14	2.79	0.24	0.19	0.15	0.11	0.08	2.04	2.43	2.74	3.19	3.68
	AVERAGE		**0.11%**	**0.06%**	**98.70%**	**1.13%**	**2.00%**	**0.17**	**0.17**	**2.54**	**0.29**	**0.23**	**0.17**	**0.13**	**0.11**	**1.77**	**2.15**	**2.54**	**2.92**	**3.21**

PROFILE 0+00

PARTICLE SIZE DISTRIBUTION REPORTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	0.1	99.7	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	99.9		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.9		
#25	99.9		
#35	99.8		
#45	99.7		
#60	95.7		
#80	33.8		
#120	2.8		
#170	0.4		
#200	0.1		
#230	0.1		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2396 D_{85}= 0.2324 D_{60}= 0.2051
D_{50}= 0.1957 D_{30}= 0.1759 D_{15}= 0.1561
D_{10}= 0.1469 C_u= 1.40 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.91

Source of Sample: SBSS 0
Sample Number: SBSS 0.1

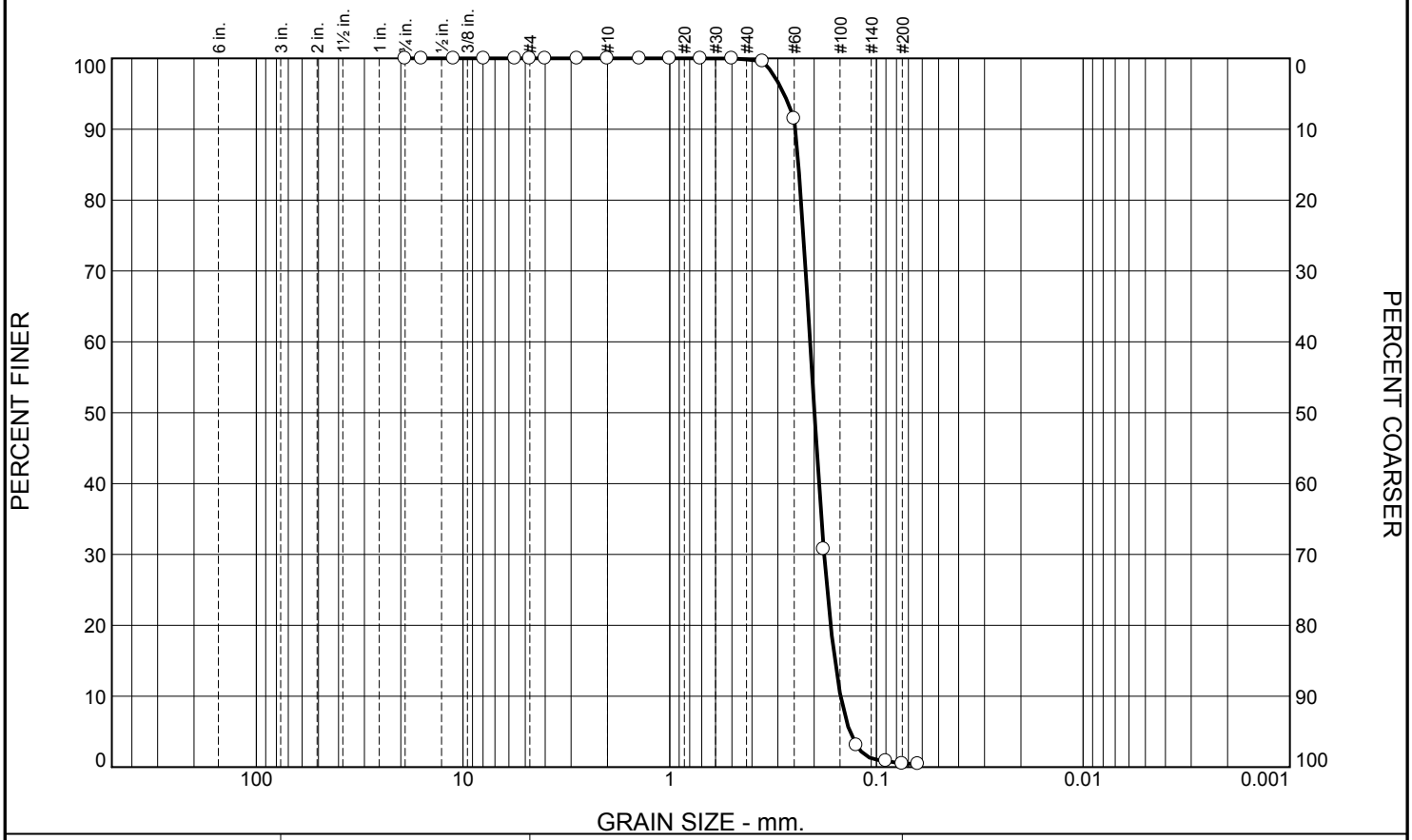
Date: 7/18/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	99.3	0.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	99.6		
#60	91.5		
#80	30.8		
#120	3.1		
#170	0.9		
#200	0.5		
#230	0.5		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2470 D_{85}= 0.2387 D_{60}= 0.2092
D_{50}= 0.1994 D_{30}= 0.1791 D_{15}= 0.1589
D_{10}= 0.1491 C_u= 1.40 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.93

Source of Sample: SBSS 0
Sample Number: SBSS 0.2

Date: 7/18/18

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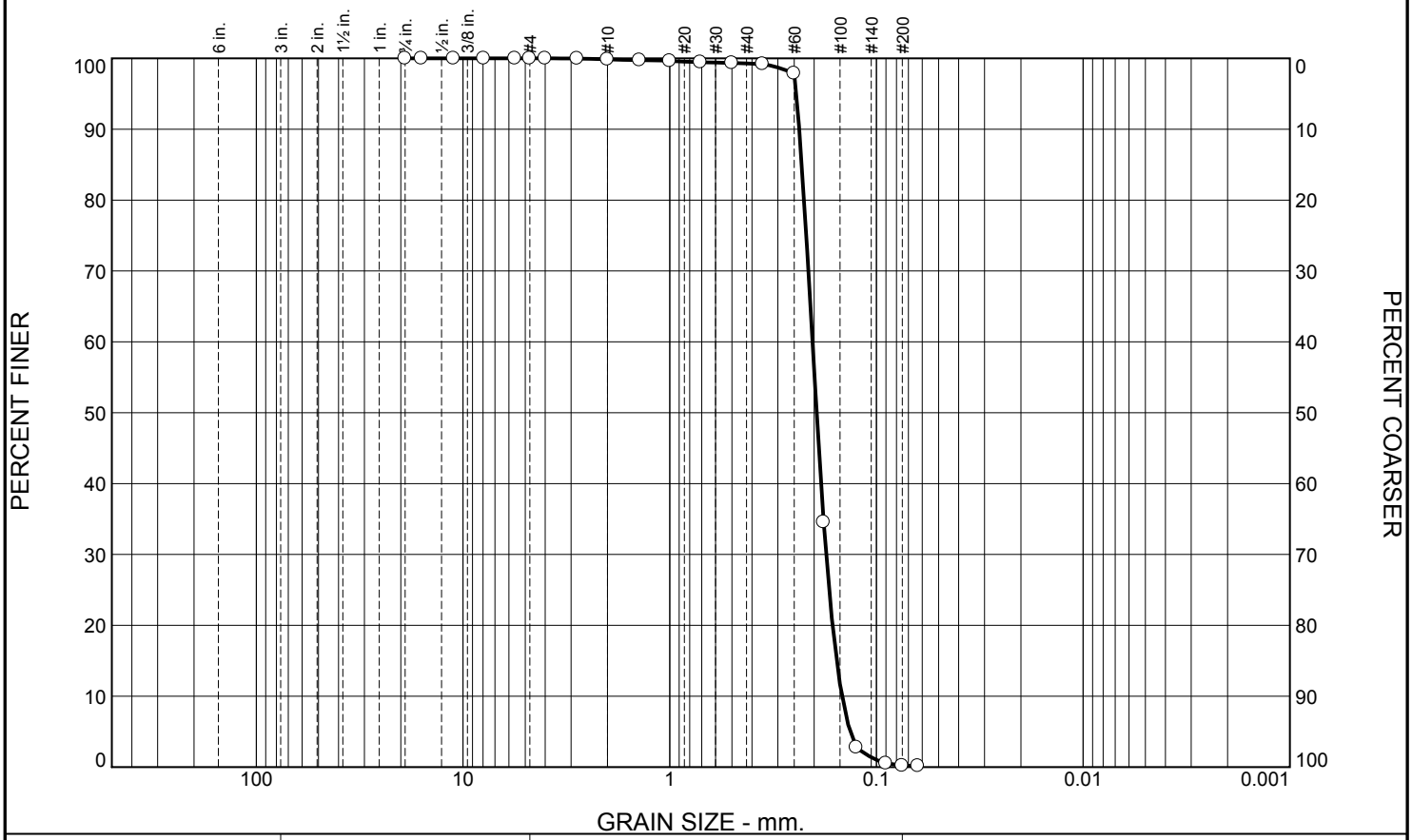
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.6	99.1	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	99.9		
#14	99.7		
#18	99.6		
#25	99.5		
#35	99.3		
#45	99.2		
#60	97.9		
#80	34.6		
#120	2.8		
#170	0.5		
#200	0.2		
#230	0.2		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2363 D_{85}= 0.2296 D_{60}= 0.2037
D_{50}= 0.1945 D_{30}= 0.1752 D_{15}= 0.1558
D_{10}= 0.1467 C_u= 1.39 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.91

Source of Sample: SBSS 0
Sample Number: SBSS 0.3

Date: 7/18/18

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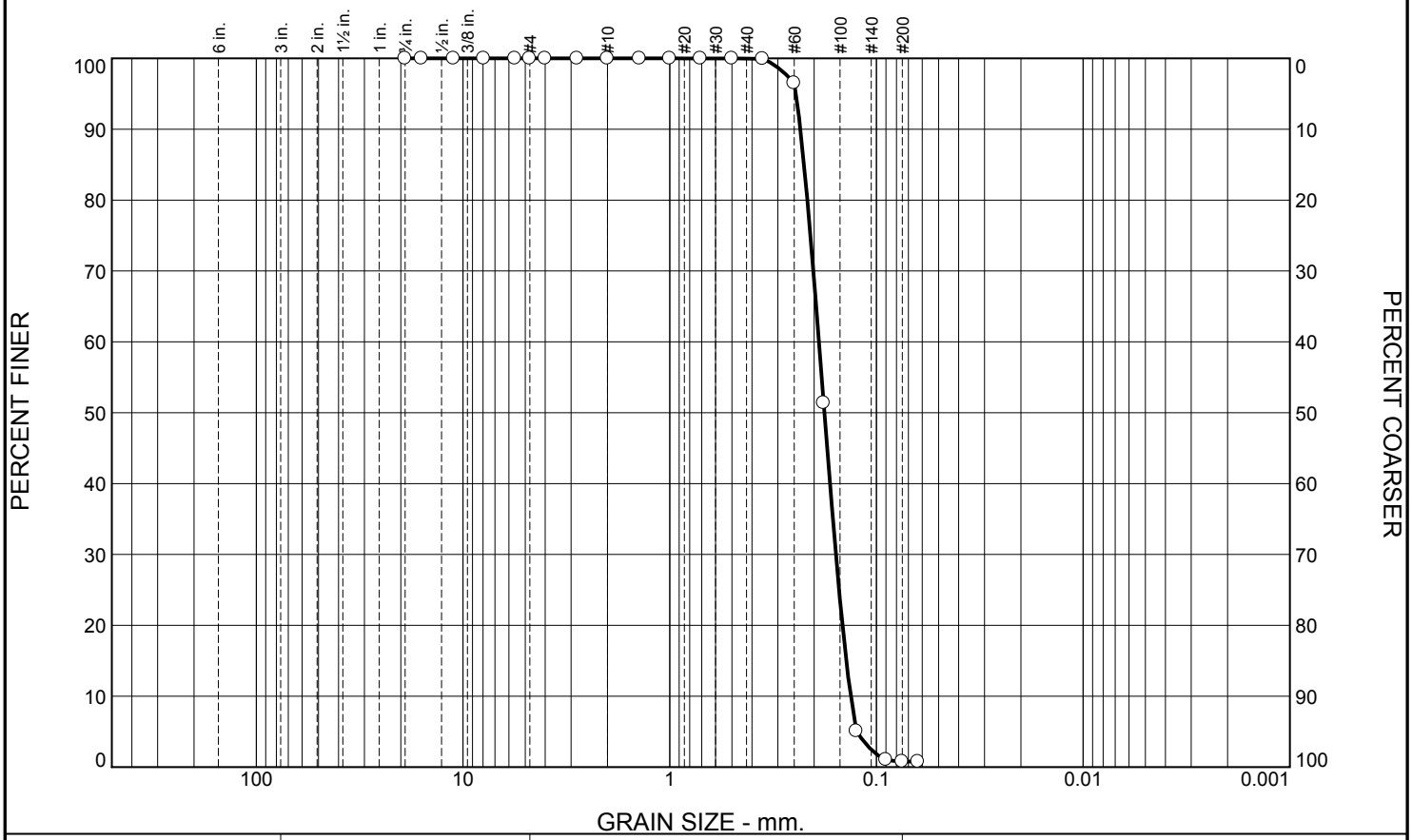
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.2	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	99.9		
#60	96.5		
#80	51.4		
#120	5.1		
#170	1.0		
#200	0.8		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2332 D_{85}= 0.2237 D_{60}= 0.1897
D_{50}= 0.1785 D_{30}= 0.1571 D_{15}= 0.1399
D_{10}= 0.1332 C_u= 1.42 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.78

Source of Sample: SBSS 0
Sample Number: SBSS 0.4

Date: 7/18/18

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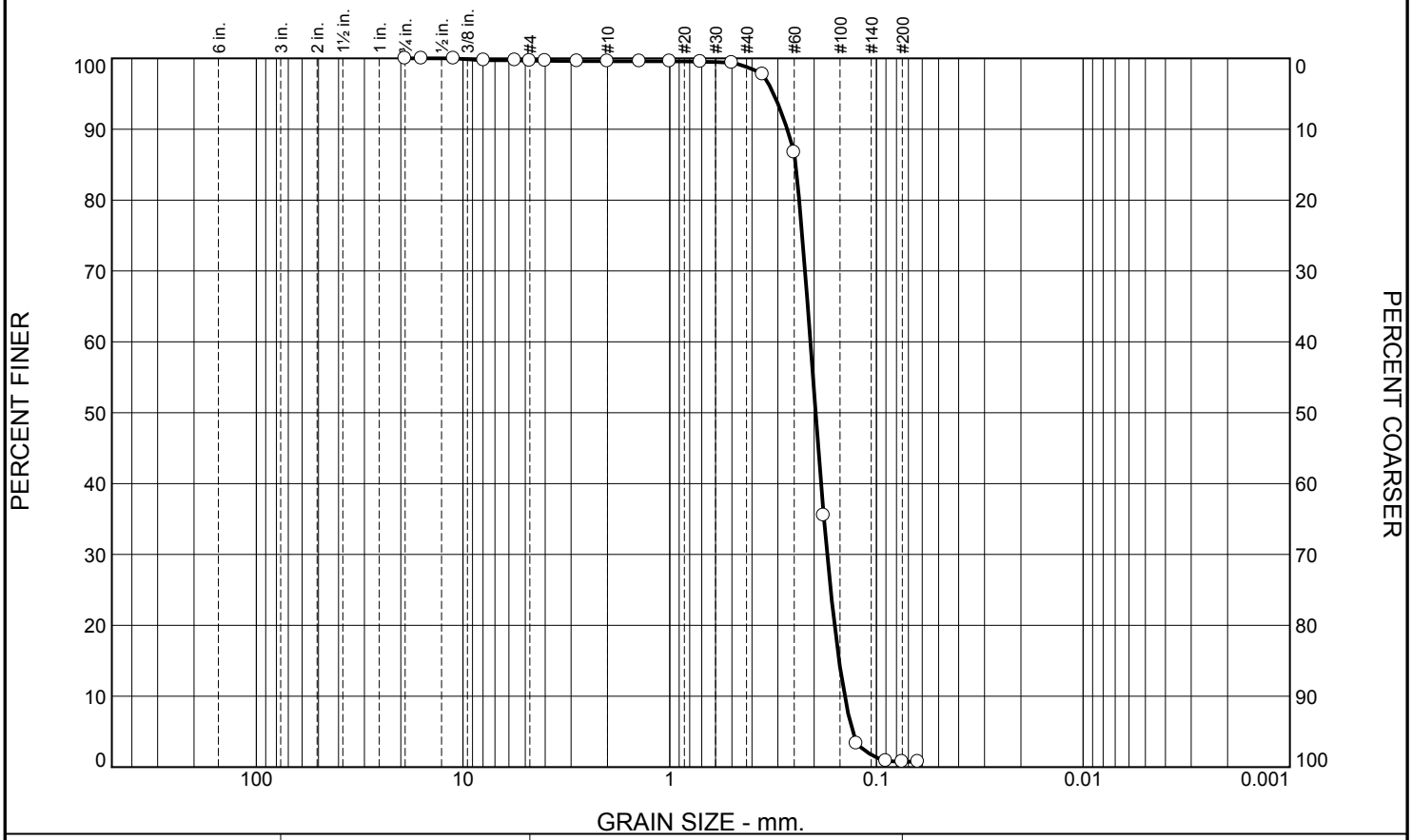
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.1	0.8	98.0	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	99.7		
#3.5	99.7		
#4	99.7		
#5	99.7		
#7	99.6		
#10	99.6		
#14	99.6		
#18	99.6		
#25	99.5		
#35	99.4		
#45	97.7		
#60	86.8		
#80	35.5		
#120	3.3		
#170	0.9		
#200	0.8		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2702 D_{85}= 0.2460 D_{60}= 0.2084
D_{50}= 0.1967 D_{30}= 0.1732 D_{15}= 0.1515
D_{10}= 0.1423 C_u= 1.46 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.94

Source of Sample: SBSS 0
Sample Number: SBSS 0.5

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.5	97.6	0.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	99.9		
#35	99.7		
#45	97.5		
#60	87.0		
#80	37.2		
#120	3.9		
#170	1.0		
#200	0.9		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2702 D_{85}= 0.2454 D_{60}= 0.2070
D_{50}= 0.1950 D_{30}= 0.1710 D_{15}= 0.1493
D_{10}= 0.1402 C_u= 1.48 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.91

Source of Sample: SBSS 0
Sample Number: SBSS 0.6

Date: 7/18/18

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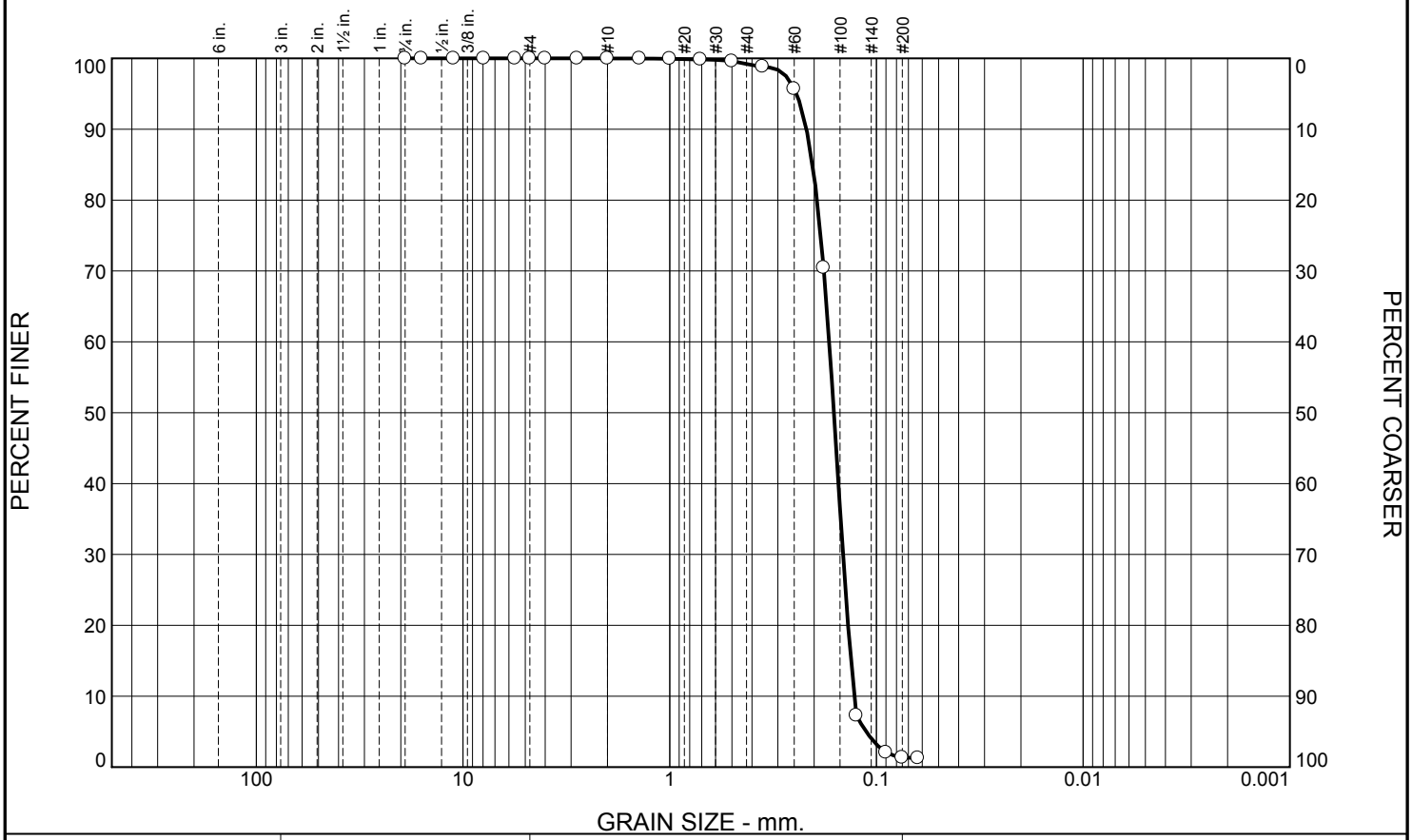
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.8	97.9	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	99.9		
#25	99.8		
#35	99.6		
#45	98.8		
#60	95.7		
#80	70.5		
#120	7.3		
#170	2.1		
#200	1.3		
#230	1.3		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2178 D_{85}= 0.2035 D_{60}= 0.1692
D_{50}= 0.1606 D_{30}= 0.1450 D_{15}= 0.1329
D_{10}= 0.1281 C_u= 1.32 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.65

Source of Sample: SBSS 0
Sample Number: SBSS 0.7

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.1	95.6	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.8		
#25	99.6		
#35	99.0		
#45	96.8		
#60	90.6		
#80	57.6		
#120	8.2		
#170	3.0		
#200	2.3		
#230	2.2		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2472 D_{85}= 0.2295 D_{60}= 0.1830
D_{50}= 0.1710 D_{30}= 0.1502 D_{15}= 0.1343
D_{10}= 0.1278 C_u= 1.43 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.75

Source of Sample: SBSS 0
Sample Number: SBSS 0.TROUGH

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.1	96.8	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.6		
#35	99.0		
#45	96.8		
#60	90.7		
#80	55.9		
#120	6.6		
#170	1.9		
#200	1.0		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2472 D_{85}= 0.2305 D_{60}= 0.1851
D_{50}= 0.1731 D_{30}= 0.1521 D_{15}= 0.1363
D_{10}= 0.1301 C_u= 1.42 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.77

Source of Sample: SBSS 0
Sample Number: SBSS 0.CREST

Date: 7/18/18

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Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.1	2.6	96.1	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.8		
#5	99.7		
#7	99.7		
#10	99.7		
#14	99.6		
#18	99.5		
#25	99.1		
#35	98.3		
#45	95.4		
#60	87.8		
#80	58.2		
#120	6.7		
#170	1.9		
#200	1.0		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2637 D_{85}= 0.2372 D_{60}= 0.1824
D_{50}= 0.1704 D_{30}= 0.1503 D_{15}= 0.1354
D_{10}= 0.1297 C_u= 1.41 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.79

Source of Sample: SBSS 0
Sample Number: SBSS 0.106

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	1.8	96.8	1.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.8		
#7	99.8		
#10	99.7		
#14	99.7		
#18	99.5		
#25	99.2		
#35	98.5		
#45	96.4		
#60	90.8		
#80	52.1		
#120	6.2		
#170	1.8		
#200	1.1		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2470 D_{85}= 0.2324 D_{60}= 0.1899
D_{50}= 0.1775 D_{30}= 0.1552 D_{15}= 0.1381
D_{10}= 0.1313 C_u= 1.45 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.82

Source of Sample: SBSS 0
Sample Number: SBSS 0.109.5

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	98.2	1.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.9		
#25	99.9		
#35	99.8		
#45	99.7		
#60	98.3		
#80	82.8		
#120	9.6		
#170	3.1		
#200	1.6		
#230	1.2		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2026 D_{85}= 0.1860 D_{60}= 0.1600
D_{50}= 0.1532 D_{30}= 0.1403 D_{15}= 0.1298
D_{10}= 0.1254 C_u= 1.28 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.56

Source of Sample: SBSS 0
Sample Number: SBSS 0.113

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.4	1.0	93.2	5.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.8		
#7	99.7		
#10	99.5		
#14	99.4		
#18	99.2		
#25	99.0		
#35	98.7		
#45	98.2		
#60	96.3		
#80	85.7		
#120	25.3		
#170	8.6		
#200	5.3		
#230	3.9		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2000 D_{85}= 0.1790 D_{60}= 0.1532
D_{50}= 0.1452 D_{30}= 0.1293 D_{15}= 0.1115
D_{10}= 0.0971 C_u= 1.58 C_c= 1.12

Classification

USCS= AASHTO=

Remarks

F.M.=0.49

Source of Sample: SBSS 0
Sample Number: SBSS 0.116.5

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.2	0.5	95.4	3.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.8		
#5	99.8		
#7	99.6		
#10	99.6		
#14	99.6		
#18	99.6		
#25	99.5		
#35	99.4		
#45	98.6		
#60	94.7		
#80	73.1		
#120	18.8		
#170	6.5		
#200	3.7		
#230	2.6		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2196 D_{85}= 0.2027 D_{60}= 0.1644
D_{50}= 0.1547 D_{30}= 0.1366 D_{15}= 0.1197
D_{10}= 0.1094 C_u= 1.50 C_c= 1.04

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.59

Source of Sample: SBSS 0
Sample Number: SBSS 0.120

Date: 7/18/18

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Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

PROFILE 4+00

PARTICLE SIZE DISTRIBUTION REPORTS

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.9	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	100.0		
#60	97.7		
#80	46.3		
#120	4.6		
#170	0.5		
#200	0.1		
#230	0.1		

* (no specification provided)

Soil Description

Light Gray (10YR 7/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2332 D_{85}= 0.2251 D_{60}= 0.1945
D_{50}= 0.1839 D_{30}= 0.1621 D_{15}= 0.1432
D_{10}= 0.1355 C_u= 1.43 C_c= 1.00

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.81

Source of Sample: SBSS 4
Sample Number: SBSS 4.1

Date: 7/17/18

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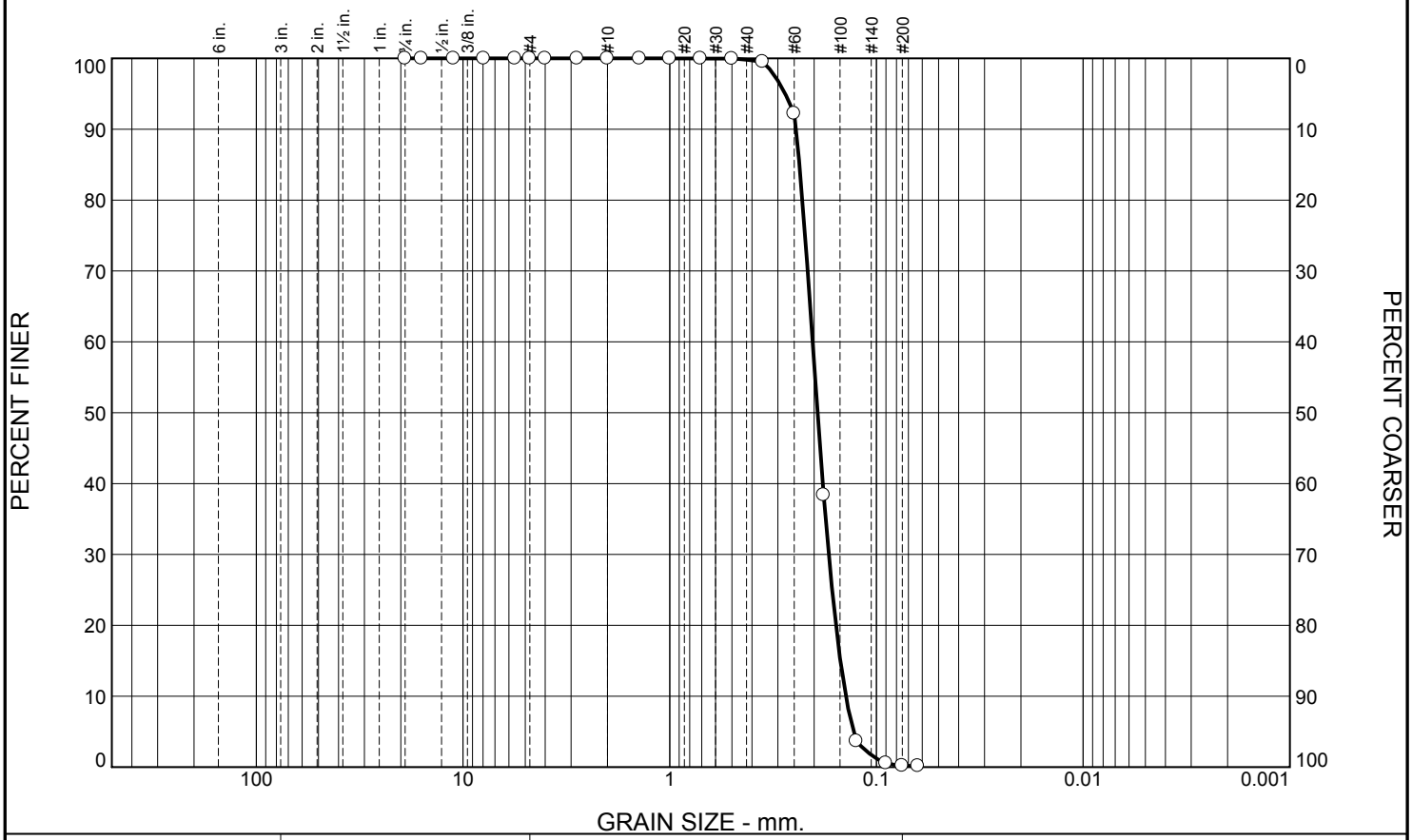
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	99.6	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	99.5		
#60	92.2		
#80	38.4		
#120	3.6		
#170	0.6		
#200	0.2		
#230	0.2		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2450 D_{85}= 0.2358 D_{60}= 0.2034
D_{50}= 0.1926 D_{30}= 0.1702 D_{15}= 0.1494
D_{10}= 0.1406 C_u= 1.45 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.88

Source of Sample: SBSS 4
Sample Number: SBSS 4.2

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.9	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	99.9		
#60	98.4		
#80	63.6		
#120	5.6		
#170	0.6		
#200	0.1		
#230	0.1		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2212 D_{85}= 0.2104 D_{60}= 0.1762
D_{50}= 0.1665 D_{30}= 0.1490 D_{15}= 0.1356
D_{10}= 0.1304 C_u= 1.35 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.70

Source of Sample: SBSS 4
Sample Number: SBSS 4.3

Date: 7/17/18

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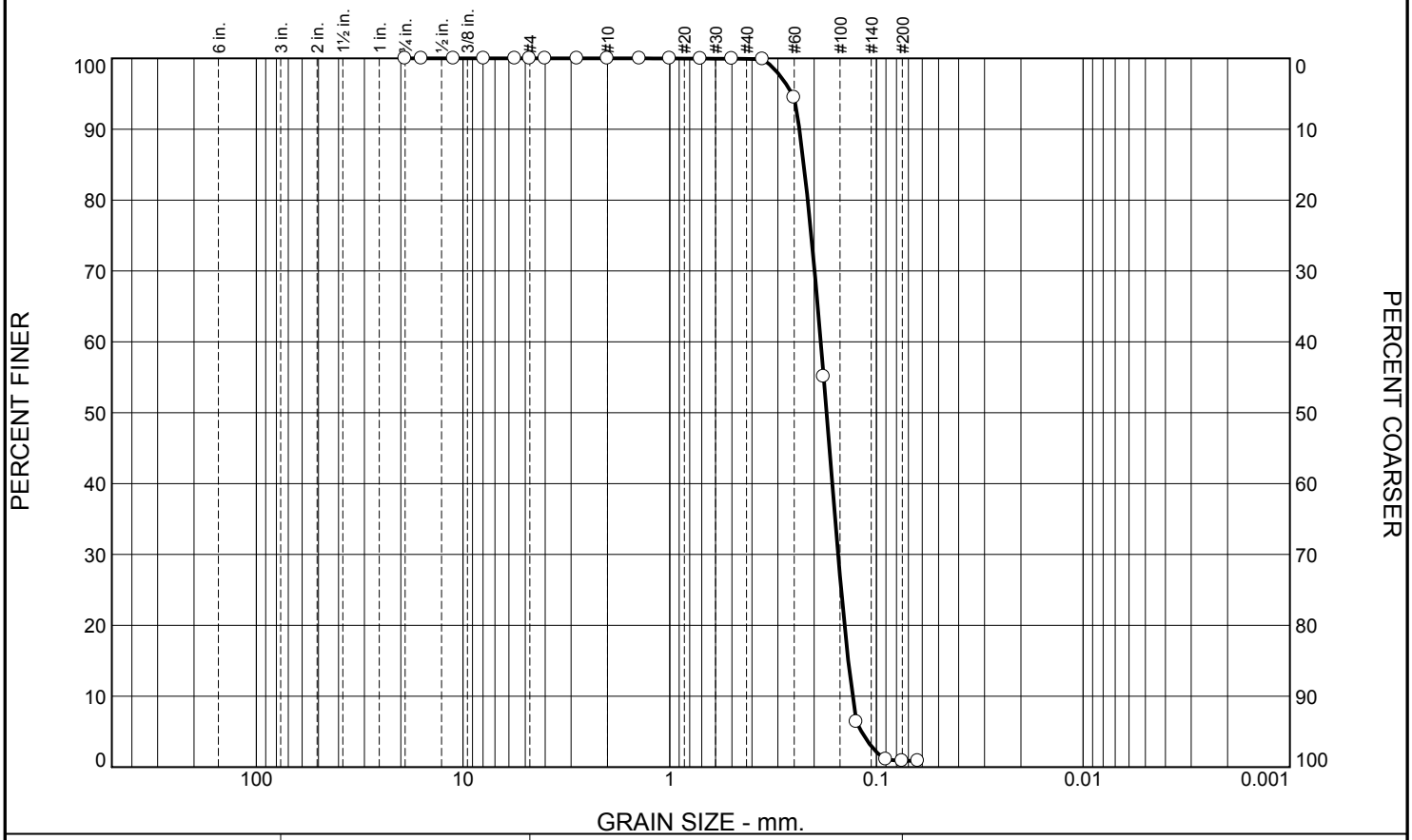
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	99.0	0.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	99.9		
#60	94.5		
#80	55.1		
#120	6.4		
#170	1.1		
#200	0.9		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2359 D_{85}= 0.2243 D_{60}= 0.1858
D_{50}= 0.1743 D_{30}= 0.1532 D_{15}= 0.1369
D_{10}= 0.1305 C_u= 1.42 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.75

Source of Sample: SBSS 4
Sample Number: SBSS 4.4

Date: 7/17/18

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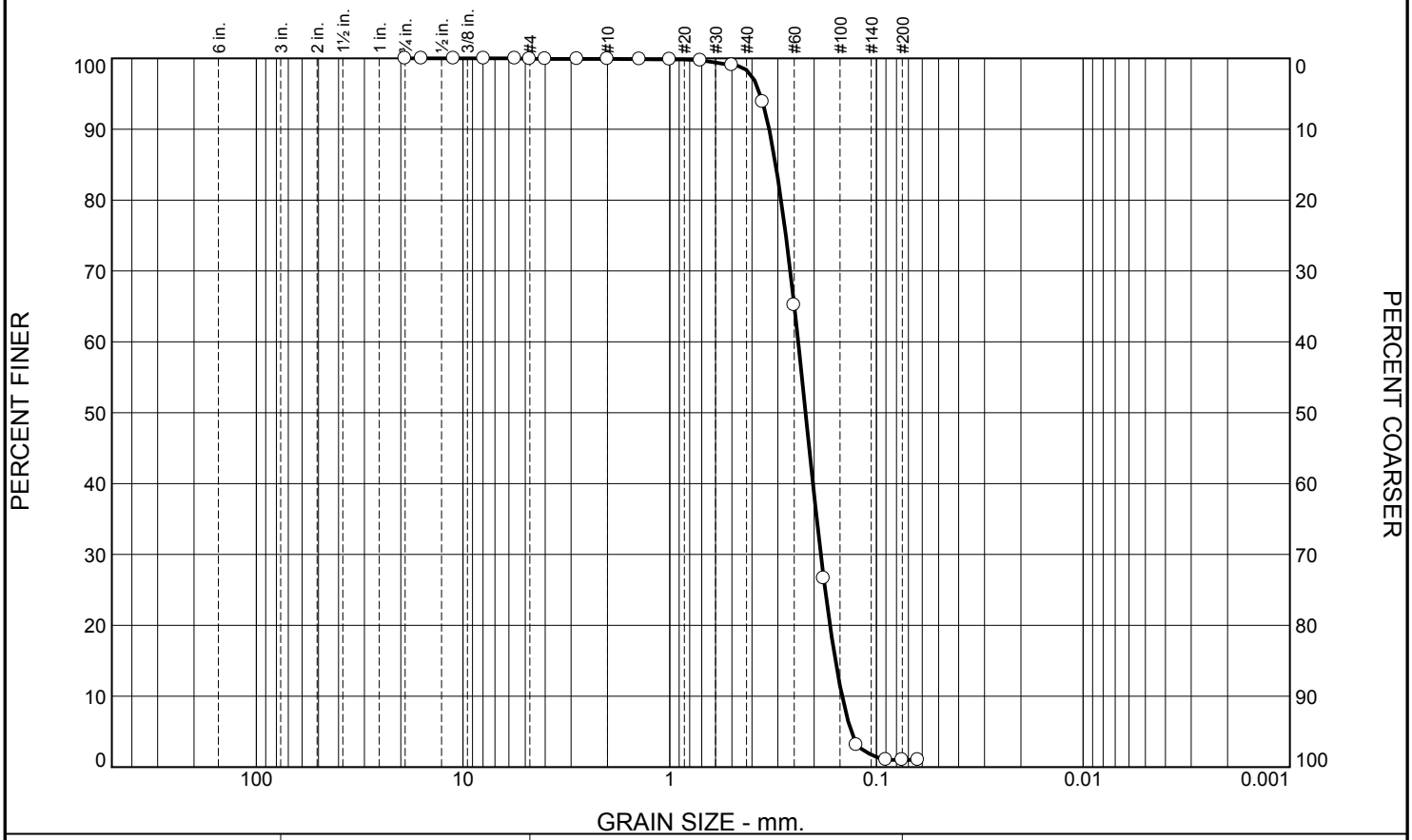
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	1.5	97.4	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.9		
#25	99.7		
#35	99.1		
#45	93.9		
#60	65.2		
#80	26.7		
#120	3.1		
#170	1.0		
#200	1.0		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3300 D_{85}= 0.3071 D_{60}= 0.2391
D_{50}= 0.2201 D_{30}= 0.1858 D_{15}= 0.1578
D_{10}= 0.1465 C_u= 1.63 C_c= 0.99

Classification

USCS= SP AASHTO=

Remarks

F.M.=1.06

Source of Sample: SBSS 4
Sample Number: SBSS 4.5

Date: 7/17/18

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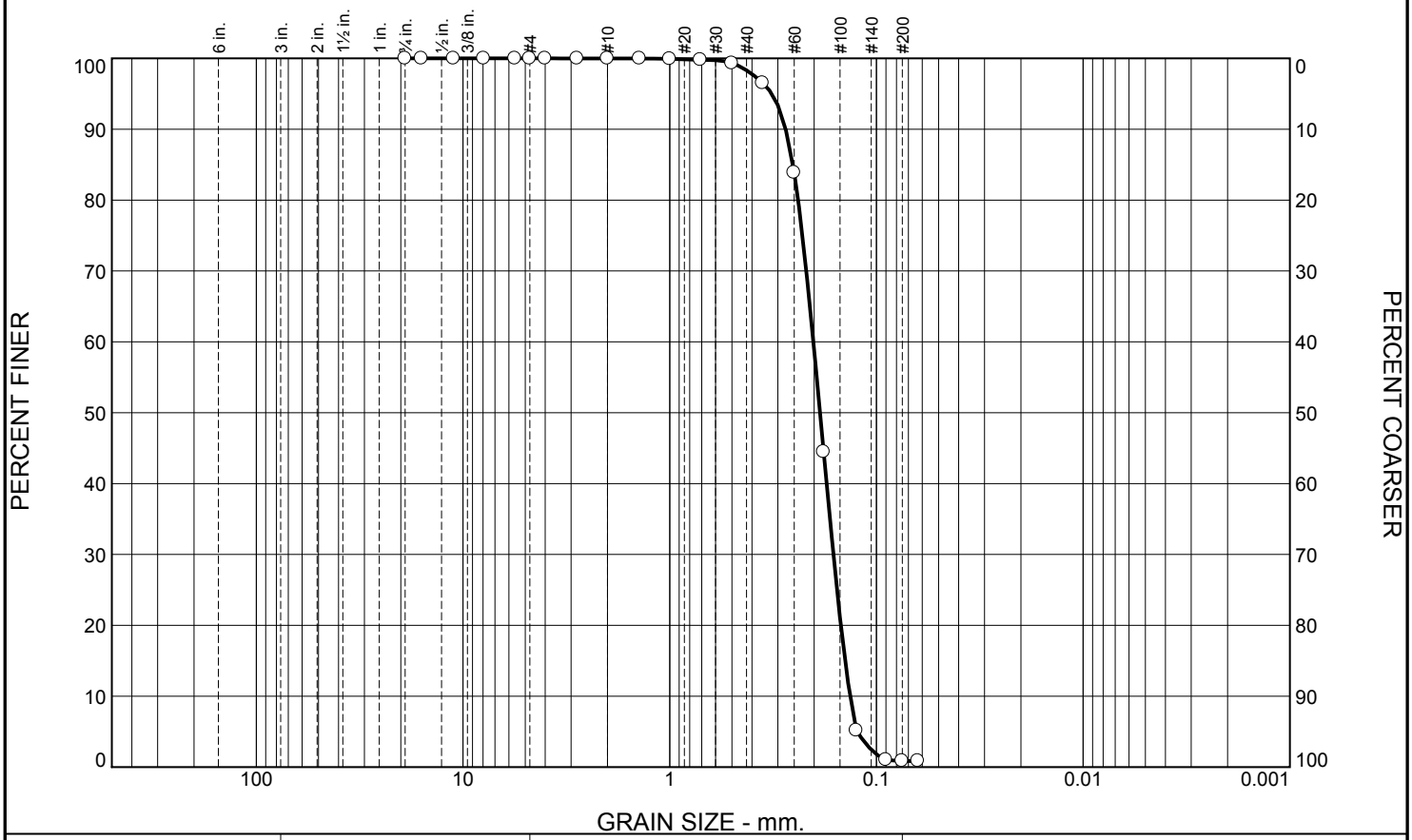
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.7	97.4	0.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	99.9		
#25	99.8		
#35	99.3		
#45	96.5		
#60	83.9		
#80	44.5		
#120	5.2		
#170	1.0		
#200	0.9		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2749 D_{85}= 0.2537 D_{60}= 0.2017
D_{50}= 0.1874 D_{30}= 0.1615 D_{15}= 0.1417
D_{10}= 0.1341 C_u= 1.50 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.86

Source of Sample: SBSS 4
Sample Number: SBSS 4.6

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.6	98.2	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	99.9		
#35	99.7		
#45	98.8		
#60	95.4		
#80	75.3		
#120	9.3		
#170	1.8		
#200	1.2		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2092 D_{85}= 0.1954 D_{60}= 0.1648
D_{50}= 0.1568 D_{30}= 0.1422 D_{15}= 0.1305
D_{10}= 0.1258 C_u= 1.31 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.62

Source of Sample: SBSS 4
Sample Number: SBSS 4.7

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.1	97.6	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.9		
#25	99.7		
#35	99.3		
#45	97.9		
#60	94.0		
#80	77.4		
#120	10.2		
#170	2.3		
#200	1.3		
#230	1.2		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2067 D_{85}= 0.1923 D_{60}= 0.1629
D_{50}= 0.1552 D_{30}= 0.1410 D_{15}= 0.1296
D_{10}= 0.1244 C_u= 1.31 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.62

Source of Sample: SBSS 4
Sample Number: SBSS 4.TROUGH
Date: 7/17/18

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Wilmington, NC 28405
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Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.6	97.0	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.5		
#35	98.9		
#45	96.9		
#60	91.5		
#80	71.3		
#120	10.1		
#170	2.6		
#200	1.3		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2345 D_{85}= 0.2078 D_{60}= 0.1676
D_{50}= 0.1587 D_{30}= 0.1428 D_{15}= 0.1302
D_{10}= 0.1248 C_u= 1.34 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.67

Source of Sample: SBSS 4
Sample Number: SBSS 4.CREST

Date: 7/17/18

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Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	3.2	95.2	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	99.8		
#7	99.8		
#10	99.7		
#14	99.6		
#18	99.3		
#25	98.7		
#35	97.5		
#45	94.6		
#60	87.8		
#80	68.3		
#120	11.3		
#170	2.6		
#200	1.3		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2750 D_{85}= 0.2260 D_{60}= 0.1699
D_{50}= 0.1600 D_{30}= 0.1428 D_{15}= 0.1292
D_{10}= 0.1208 C_u= 1.41 C_c= 0.99

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.72

Source of Sample: SBSS 4
Sample Number: SBSS 4.106

Date: 7/17/18

ECS SOUTHEAST, LLP
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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	1.8	96.7	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.8		
#7	99.8		
#10	99.7		
#14	99.6		
#18	99.5		
#25	99.2		
#35	98.6		
#45	96.8		
#60	92.0		
#80	71.3		
#120	10.5		
#170	2.3		
#200	1.2		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2312 D_{85}= 0.2072 D_{60}= 0.1675
D_{50}= 0.1586 D_{30}= 0.1425 D_{15}= 0.1297
D_{10}= 0.1232 C_u= 1.36 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.67

Source of Sample: SBSS 4
Sample Number: SBSS 4.109.5

Date: 7/17/18

ECS SOUTHEAST, LLP
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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	0.2	97.6	2.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.8		
#35	99.7		
#45	99.6		
#60	98.6		
#80	92.3		
#120	18.2		
#170	4.4		
#200	2.1		
#230	1.7		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1771 D_{85}= 0.1717 D_{60}= 0.1526
D_{50}= 0.1463 D_{30}= 0.1337 D_{15}= 0.1220
D_{10}= 0.1160 C_u= 1.32 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.45

Source of Sample: SBSS 4
Sample Number: SBSS 4.113

Date: 7/17/18

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6714 Netherlands Drive
Wilmington, NC 28405
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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.1	0.3	94.6	4.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.8		
#5	99.7		
#7	99.7		
#10	99.7		
#14	99.7		
#18	99.7		
#25	99.6		
#35	99.5		
#45	99.3		
#60	97.9		
#80	90.7		
#120	33.5		
#170	9.1		
#200	4.8		
#230	3.4		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1787 D_{85}= 0.1713 D_{60}= 0.1467
D_{50}= 0.1387 D_{30}= 0.1217 D_{15}= 0.1028
D_{10}= 0.0922 C_u= 1.59 C_c= 1.10

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.39

Source of Sample: SBSS 4
Sample Number: SBSS 4.116.5

Date: 7/17/18

ECS SOUTHEAST, LLP
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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	0.3	94.9	4.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.8		
#14	99.8		
#18	99.8		
#25	99.7		
#35	99.7		
#45	99.1		
#60	95.7		
#80	78.2		
#120	24.9		
#170	7.9		
#200	4.6		
#230	3.3		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2082 D_{85}= 0.1930 D_{60}= 0.1582
D_{50}= 0.1487 D_{30}= 0.1303 D_{15}= 0.1109
D_{10}= 0.0982 C_u= 1.61 C_c= 1.09

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.51

Source of Sample: SBSS 4
Sample Number: SBSS 4.120

Date: 7/17/18

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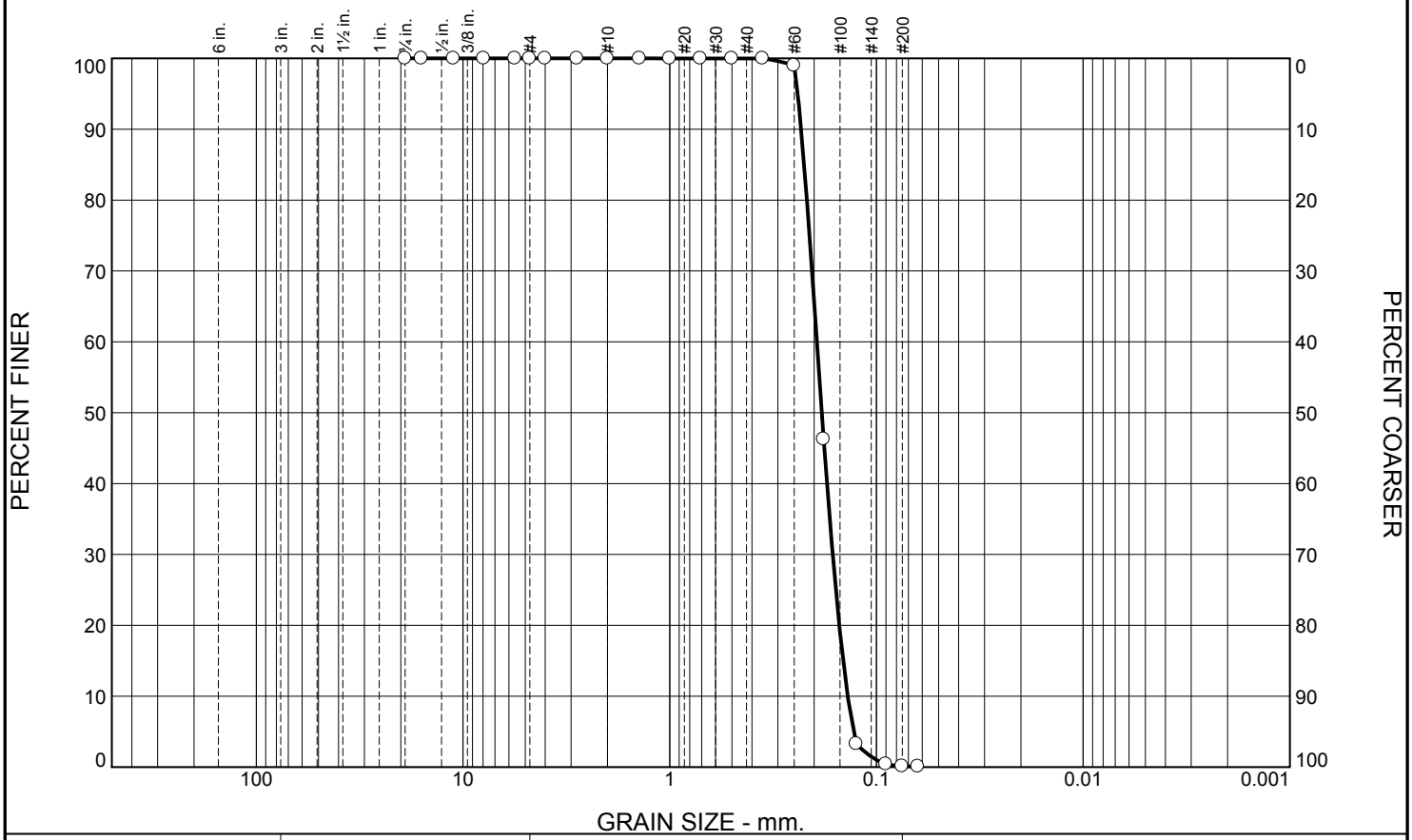
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

PROFILE 8+00

PARTICLE SIZE DISTRIBUTION REPORTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.9	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	100.0		
#60	99.0		
#80	46.3		
#120	3.3		
#170	0.4		
#200	0.1		
#230	0.1		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2311 D_{85}= 0.2235 D_{60}= 0.1940
D_{50}= 0.1838 D_{30}= 0.1628 D_{15}= 0.1448
D_{10}= 0.1377 C_u= 1.41 C_c= 0.99

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.81

Source of Sample: SBSS 8
Sample Number: SBSS 8.1

Date: 7/18/18

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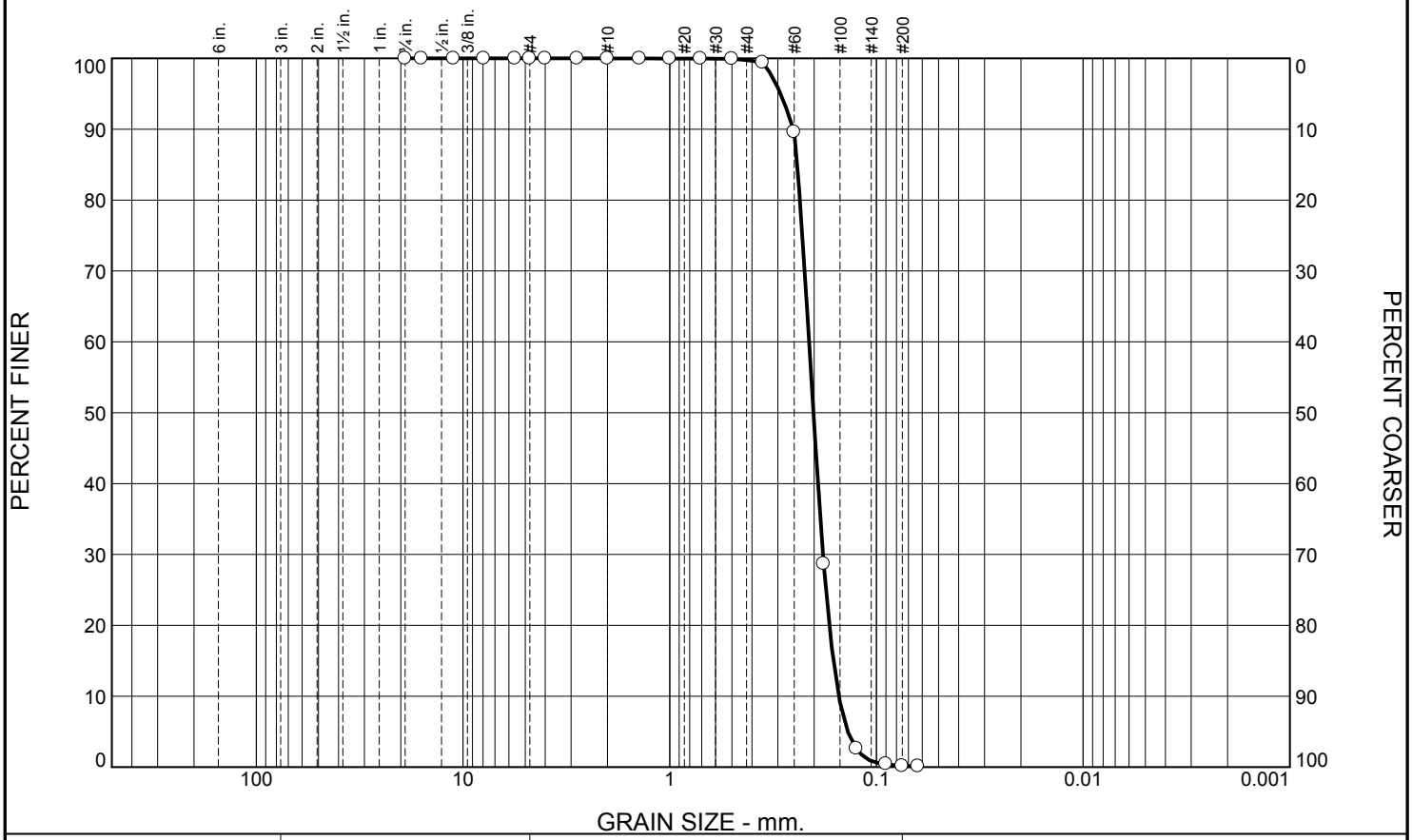
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	99.6	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	99.9		
#45	99.4		
#60	89.6		
#80	28.7		
#120	2.6		
#170	0.4		
#200	0.1		
#230	0.1		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2523 D_{85}= 0.2418 D_{60}= 0.2115
D_{50}= 0.2016 D_{30}= 0.1815 D_{15}= 0.1616
D_{10}= 0.1520 C_u= 1.39 C_c= 1.02

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.95

Source of Sample: SBSS 8
Sample Number: SBSS 8.2

Date: 7/18/18

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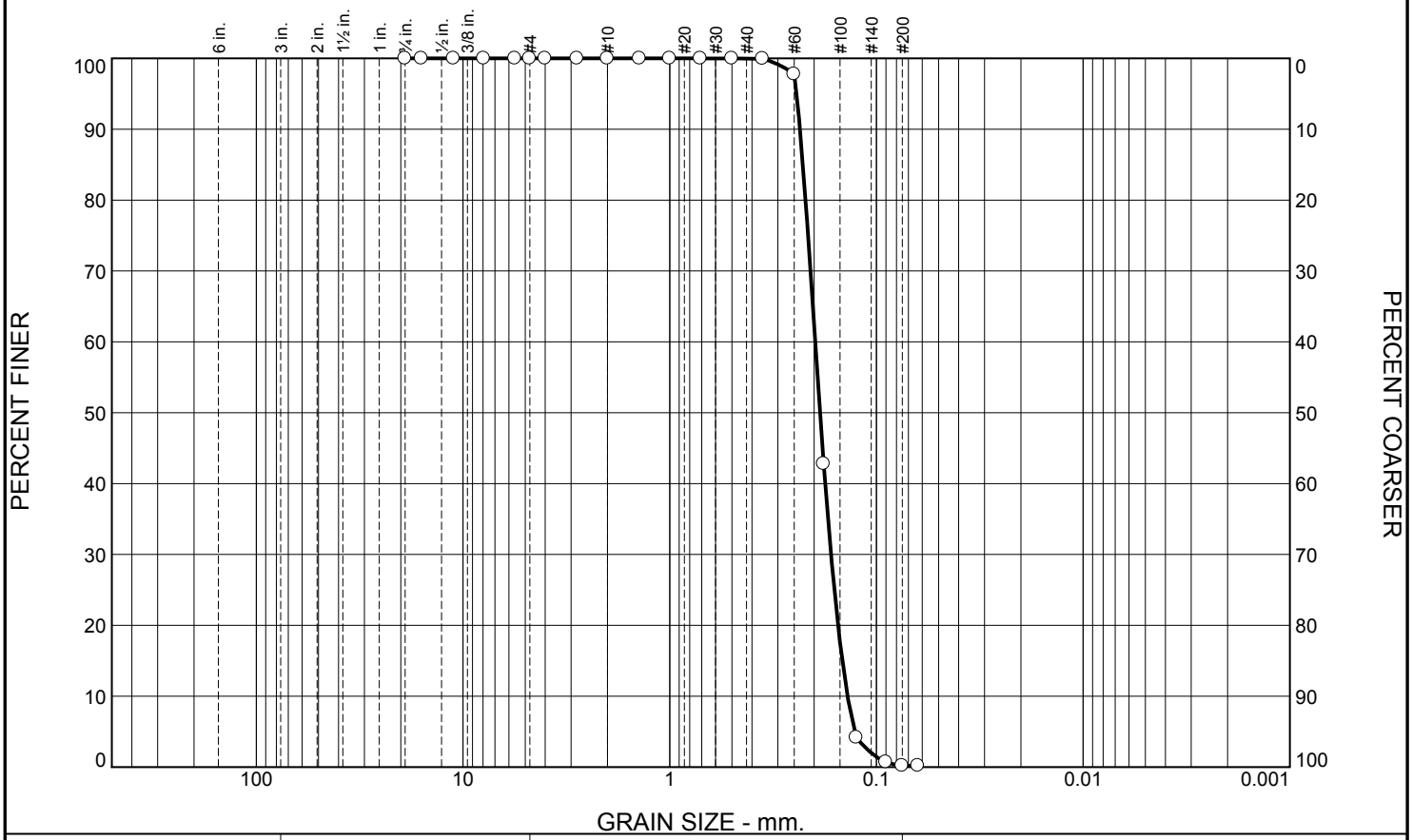
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.8	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	99.9		
#60	97.8		
#80	42.8		
#120	4.2		
#170	0.7		
#200	0.2		
#230	0.2		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2343 D_{85}= 0.2267 D_{60}= 0.1976
D_{50}= 0.1874 D_{30}= 0.1659 D_{15}= 0.1462
D_{10}= 0.1380 C_u= 1.43 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.83

Source of Sample: SBSS 8
Sample Number: SBSS 8.3

Date: 7/18/18

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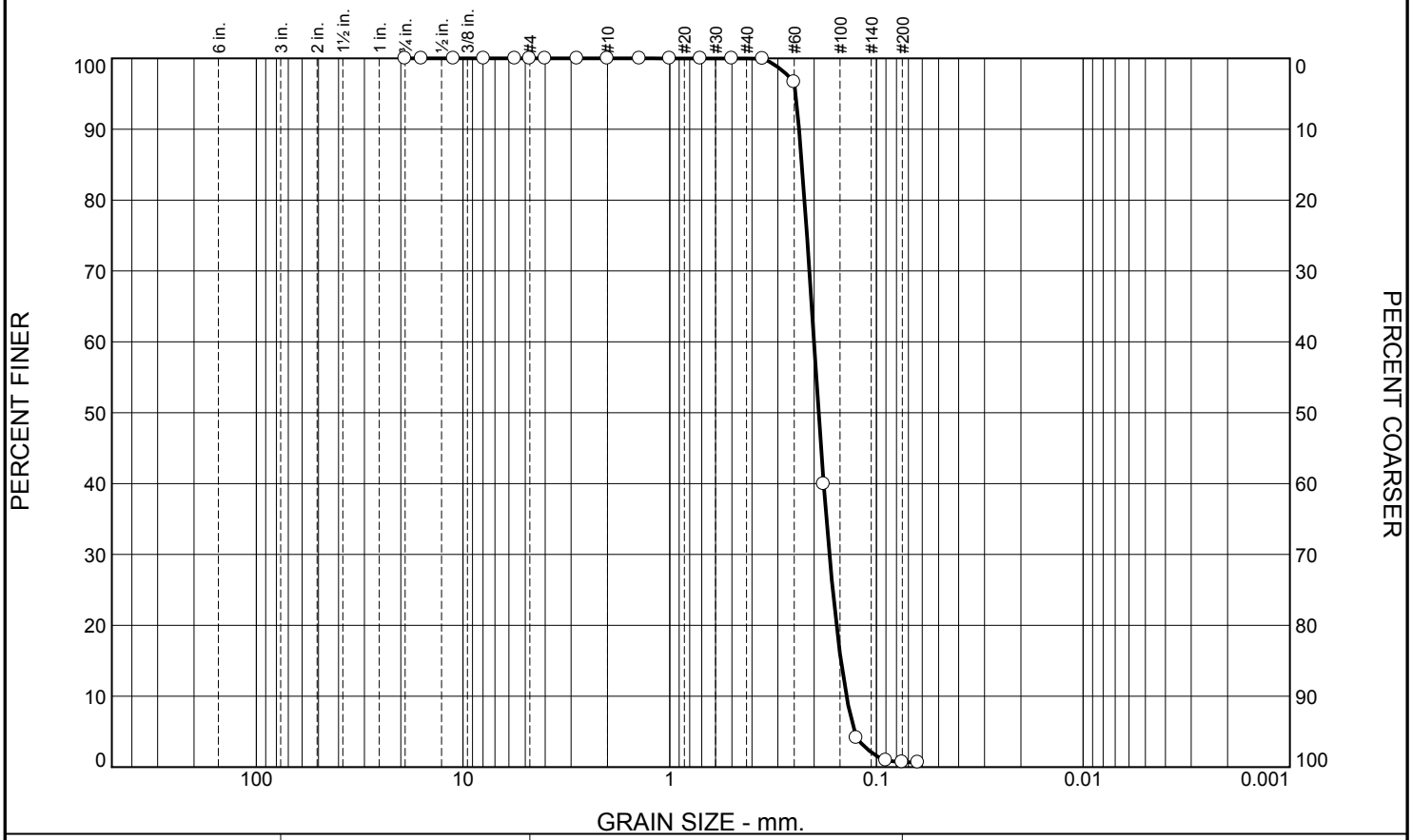
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.3	0.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	100.0		
#60	96.7		
#80	39.9		
#120	4.1		
#170	0.9		
#200	0.7		
#230	0.7		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2368 D_{85}= 0.2292 D_{60}= 0.2003
D_{50}= 0.1903 D_{30}= 0.1689 D_{15}= 0.1485
D_{10}= 0.1396 C_u= 1.44 C_c= 1.02

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.85

Source of Sample: SBSS 8
Sample Number: SBSS 8.4

Date: 7/18/18

ECS SOUTHEAST, LLP
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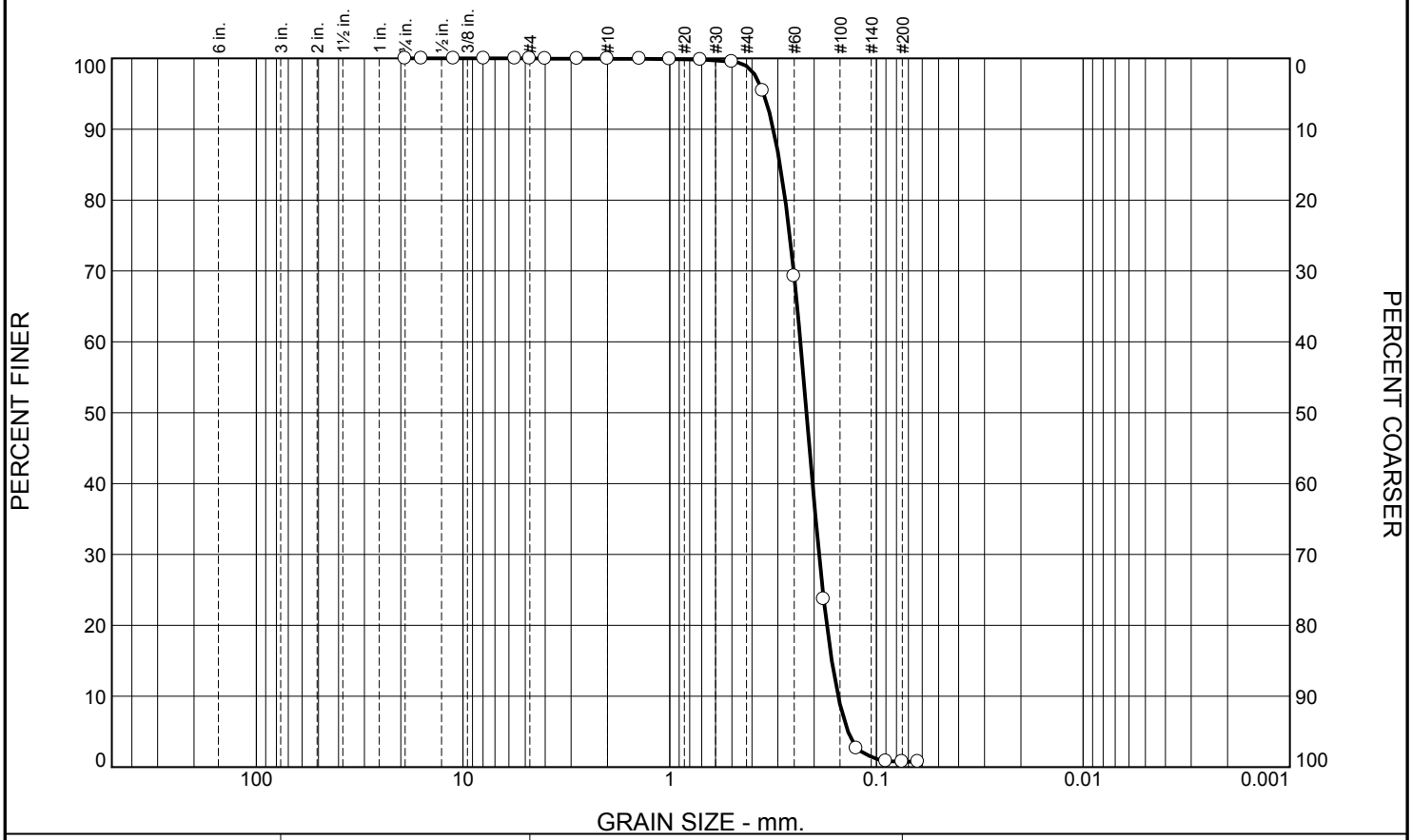
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.0	98.1	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.9		
#25	99.8		
#35	99.5		
#45	95.4		
#60	69.3		
#80	23.7		
#120	2.6		
#170	0.8		
#200	0.8		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3150 D_{85}= 0.2926 D_{60}= 0.2332
D_{50}= 0.2178 D_{30}= 0.1895 D_{15}= 0.1645
D_{10}= 0.1531 C_u= 1.52 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=1.05

Source of Sample: SBSS 8
Sample Number: SBSS 8.5

Date: 7/18/18

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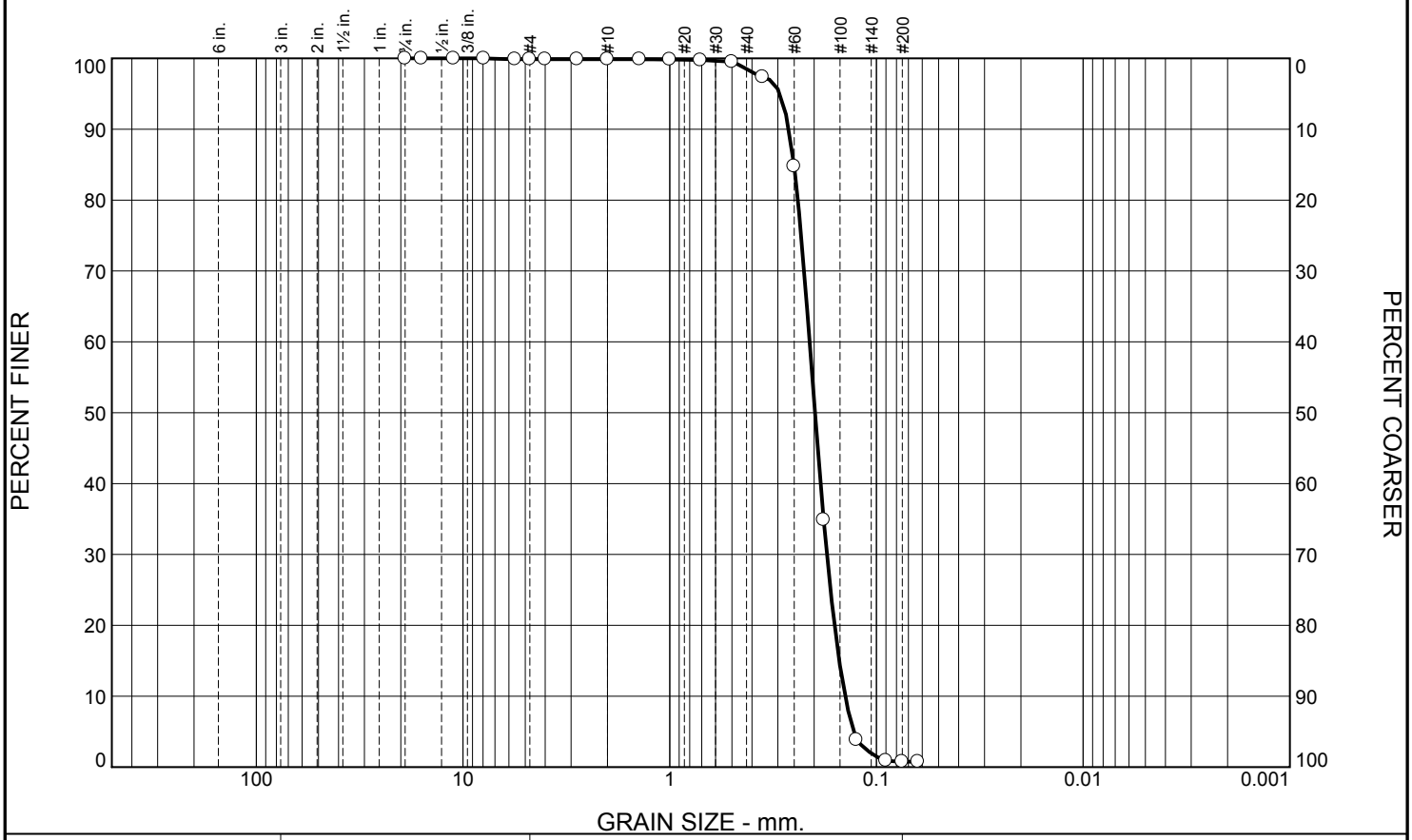
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	1.4	97.7	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.8		
#35	99.5		
#45	97.4		
#60	84.8		
#80	34.9		
#120	3.8		
#170	0.9		
#200	0.8		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2652 D_{85}= 0.2505 D_{60}= 0.2103
D_{50}= 0.1981 D_{30}= 0.1738 D_{15}= 0.1513
D_{10}= 0.1416 C_u= 1.48 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.91

Source of Sample: SBSS 8
Sample Number: SBSS 8.6

Date: 7/18/18

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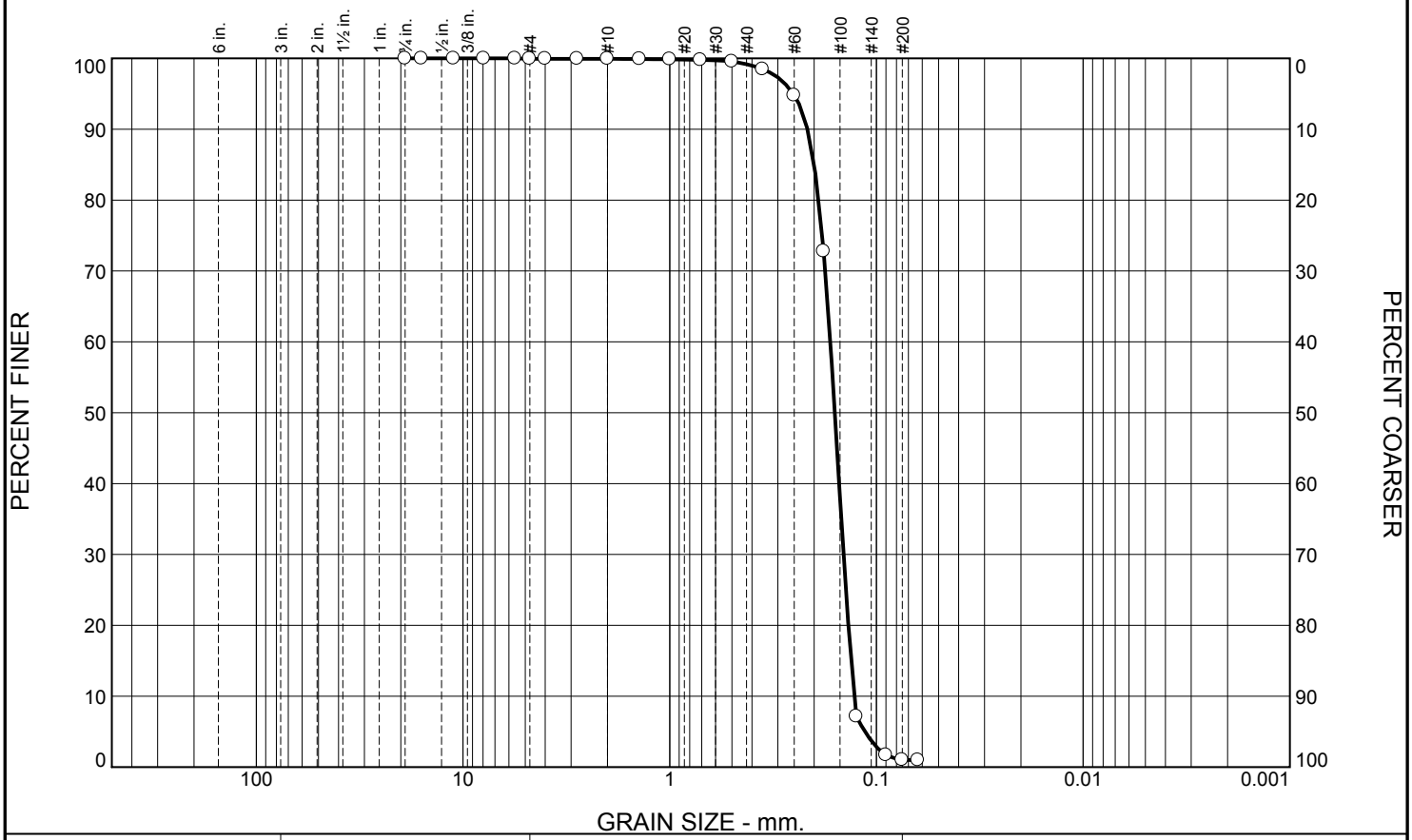
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	0.7	98.2	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.9		
#25	99.8		
#35	99.5		
#45	98.5		
#60	94.8		
#80	72.8		
#120	7.2		
#170	1.7		
#200	1.0		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2155 D_{85}= 0.2001 D_{60}= 0.1672
D_{50}= 0.1590 D_{30}= 0.1441 D_{15}= 0.1326
D_{10}= 0.1280 C_u= 1.31 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.65

Source of Sample: SBSS 8
Sample Number: SBSS 8.7

Date: 7/18/18

ECS SOUTHEAST, LLP
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Wilmington, NC 28405
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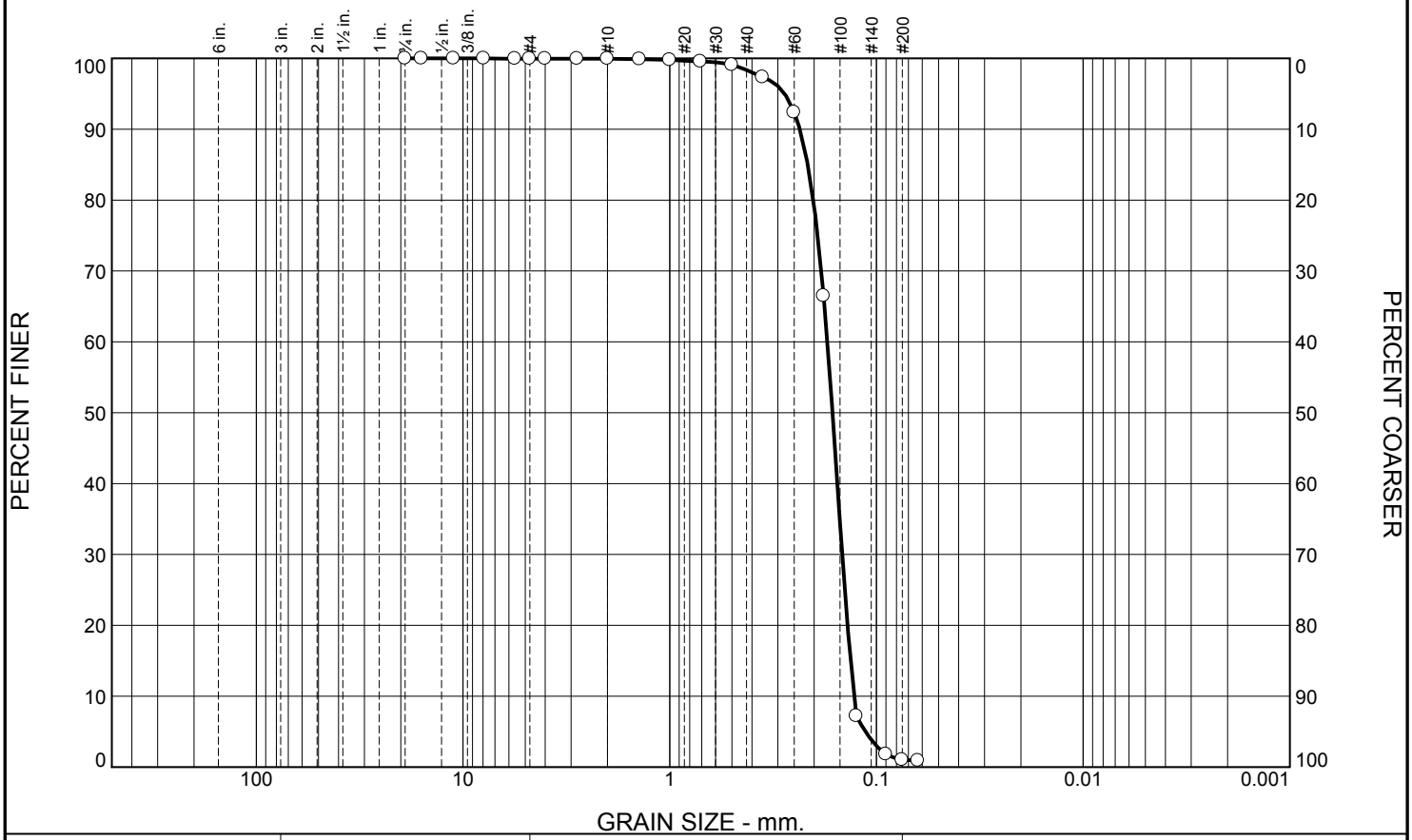
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	1.5	97.4	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.6		
#35	99.1		
#45	97.3		
#60	92.4		
#80	66.5		
#120	7.2		
#170	1.8		
#200	1.0		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2347 D_{85}= 0.2147 D_{60}= 0.1727
D_{50}= 0.1631 D_{30}= 0.1463 D_{15}= 0.1334
D_{10}= 0.1283 C_u= 1.35 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.70

Source of Sample: SBSS 8
Sample Number: SBSS 8.TROUGH
Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.0	1.6	97.0	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.8		
#5	99.8		
#7	99.8		
#10	99.8		
#14	99.8		
#18	99.7		
#25	99.4		
#35	98.9		
#45	97.0		
#60	92.4		
#80	70.9		
#120	8.1		
#170	2.5		
#200	1.2		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2282 D_{85}= 0.2063 D_{60}= 0.1684
D_{50}= 0.1597 D_{30}= 0.1442 D_{15}= 0.1321
D_{10}= 0.1272 C_u= 1.32 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.68

Source of Sample: SBSS 8
Sample Number: SBSS 8.CREST

Date: 7/18/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
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Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	3.2	95.5	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.7		
#25	99.3		
#35	98.2		
#45	95.1		
#60	87.9		
#80	57.6		
#120	8.5		
#170	2.5		
#200	1.3		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2625 D_{85}= 0.2372 D_{60}= 0.1832
D_{50}= 0.1707 D_{30}= 0.1496 D_{15}= 0.1337
D_{10}= 0.1272 C_u= 1.44 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.78

Source of Sample: SBSS 8
Sample Number: SBSS 8.106

Date: 7/18/18

ECS SOUTHEAST, LLP
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Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.9	95.9	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.8		
#25	99.3		
#35	98.3		
#45	95.9		
#60	90.0		
#80	58.2		
#120	6.8		
#170	1.9		
#200	1.2		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2501 D_{85}= 0.2303 D_{60}= 0.1823
D_{50}= 0.1705 D_{30}= 0.1505 D_{15}= 0.1354
D_{10}= 0.1295 C_u= 1.41 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.77

Source of Sample: SBSS 8
Sample Number: SBSS 8.109.5

Date: 7/18/18

ECS SOUTHEAST, LLP
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Wilmington, NC 28405
Phone: (910) 686-9114
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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.3	98.0	1.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	99.9		
#7	99.9		
#10	99.8		
#14	99.7		
#18	99.7		
#25	99.7		
#35	99.6		
#45	99.4		
#60	98.2		
#80	87.4		
#120	11.1		
#170	3.2		
#200	1.5		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1910 D_{85}= 0.1773 D_{60}= 0.1571
D_{50}= 0.1508 D_{30}= 0.1385 D_{15}= 0.1283
D_{10}= 0.1207 C_u= 1.30 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.53

Source of Sample: SBSS 8
Sample Number: SBSS 8.113

Date: 7/18/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	1.4	91.9	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	99.5		
#10	99.2		
#14	98.9		
#18	98.6		
#25	98.3		
#35	98.0		
#45	97.6		
#60	95.8		
#80	88.2		
#120	29.0		
#170	9.8		
#200	5.9		
#230	4.5		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1911 D_{85}= 0.1751 D_{60}= 0.1502
D_{50}= 0.1423 D_{30}= 0.1259 D_{15}= 0.1059
D_{10}= 0.0906 C_u= 1.66 C_c= 1.17

Classification

USCS= AASHTO=

Remarks

F.M.=0.47

Source of Sample: SBSS 8
Sample Number: SBSS 8.116.5

Date: 7/18/18

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6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	1.1	89.4	9.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.8		
#10	99.8		
#14	99.7		
#18	99.5		
#25	99.3		
#35	99.1		
#45	97.9		
#60	94.1		
#80	78.3		
#120	26.9		
#170	12.7		
#200	9.3		
#230	7.7		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND, with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2118 D_{85}= 0.1938 D_{60}= 0.1575
D_{50}= 0.1478 D_{30}= 0.1285 D_{15}= 0.1017
D_{10}= 0.0783 C_u= 2.01 C_c= 1.34

Classification

USCS= AASHTO=

Remarks

F.M.=0.53

Source of Sample: SBSS 8
Sample Number: SBSS 8.120

Date: 7/18/18

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Phone: (910) 686-9114
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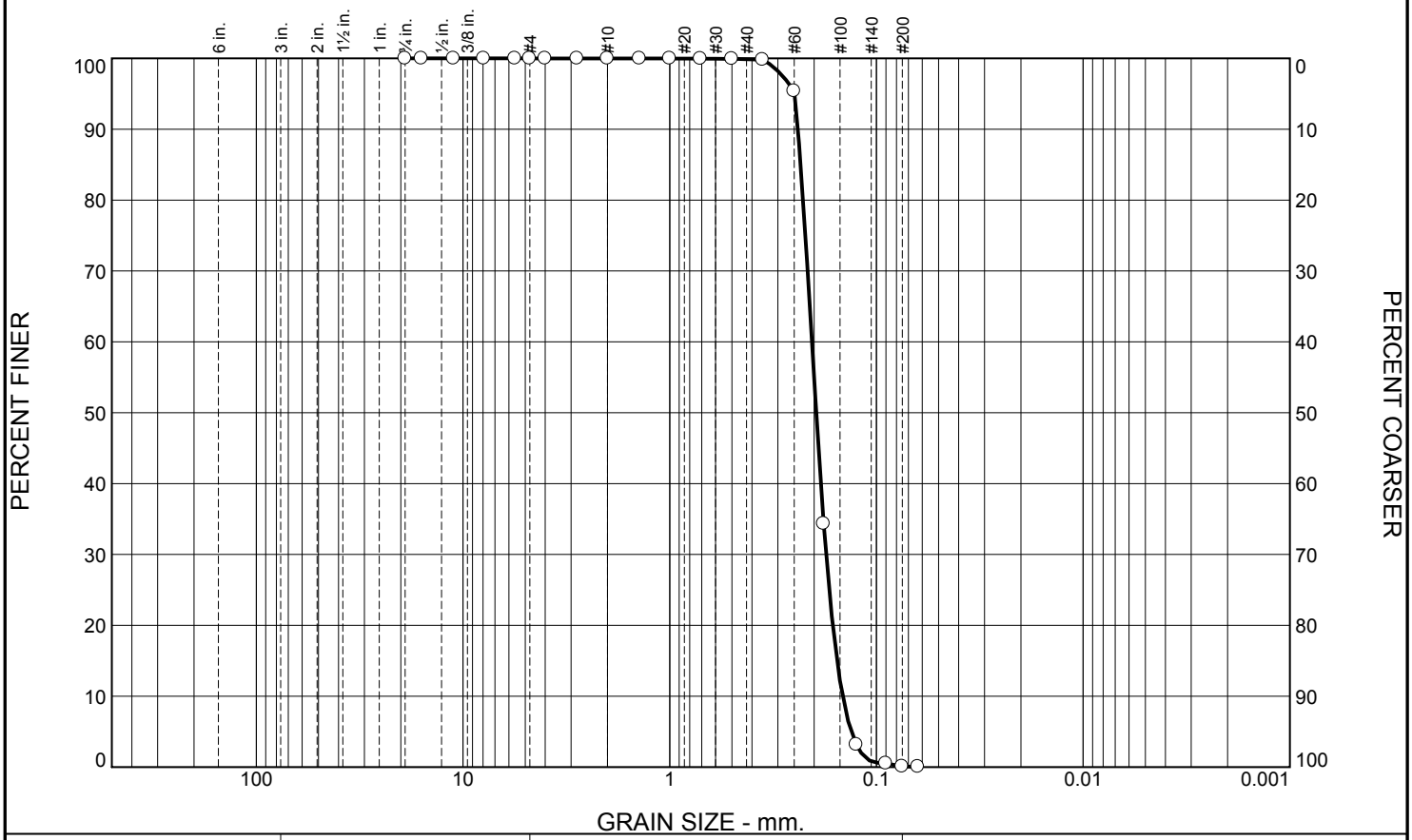
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

PROFILE 12+00

PARTICLE SIZE DISTRIBUTION REPORTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	99.8	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	99.9		
#45	99.8		
#60	95.4		
#80	34.3		
#120	3.2		
#170	0.5		
#200	0.1		
#230	0.0		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2400 D_{85}= 0.2326 D_{60}= 0.2049
D_{50}= 0.1954 D_{30}= 0.1753 D_{15}= 0.1551
D_{10}= 0.1457 C_u= 1.41 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.90

Source of Sample: SBSS 12
Sample Number: SBSS 12.1

Date: 7/17/18

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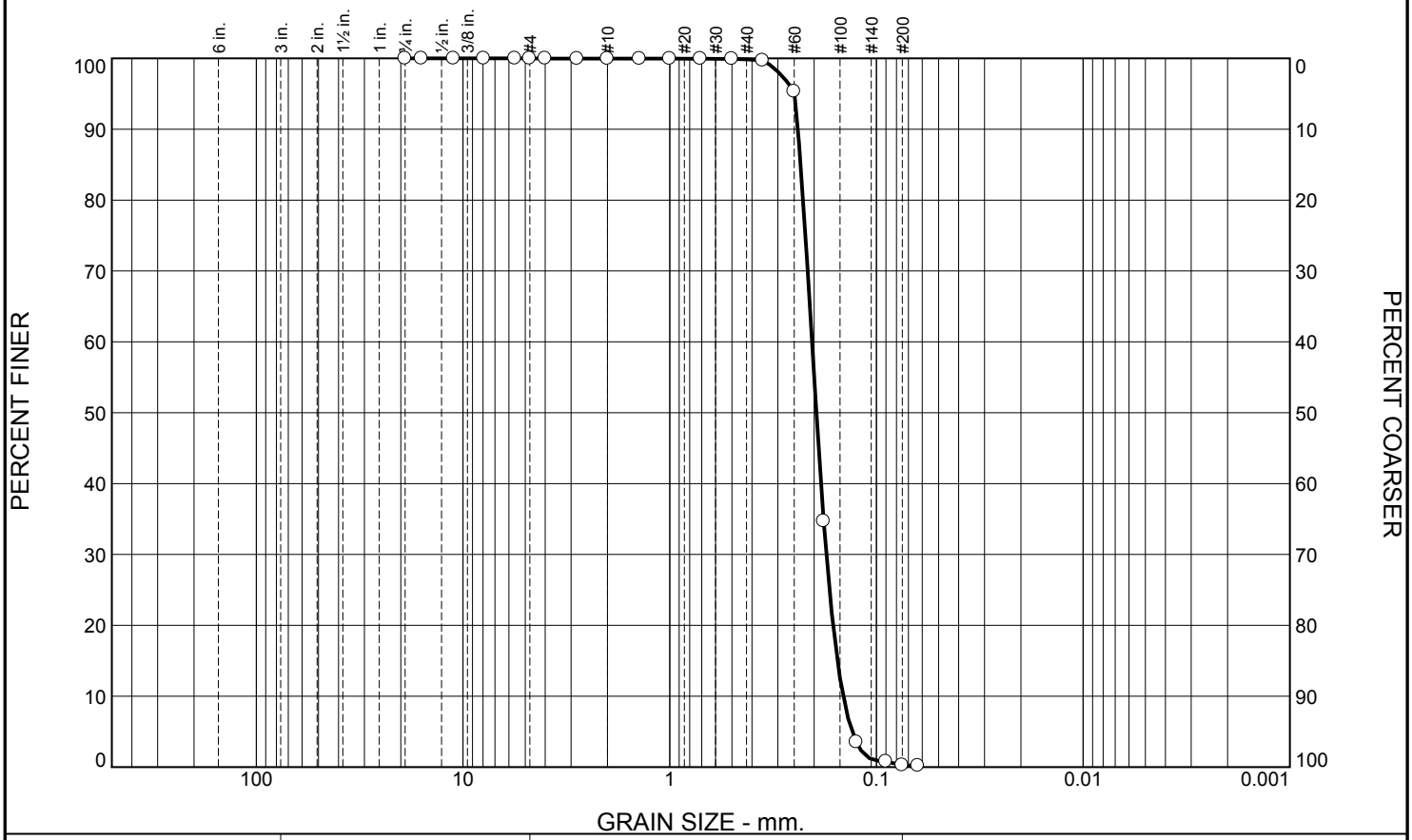
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	99.6	0.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	99.9		
#45	99.7		
#60	95.3		
#80	34.7		
#120	3.5		
#170	0.8		
#200	0.3		
#230	0.2		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2400 D_{85}= 0.2326 D_{60}= 0.2047
D_{50}= 0.1951 D_{30}= 0.1749 D_{15}= 0.1544
D_{10}= 0.1448 C_u= 1.41 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.89

Source of Sample: SBSS 12
Sample Number: SBSS 12.2

Date: 7/17/18

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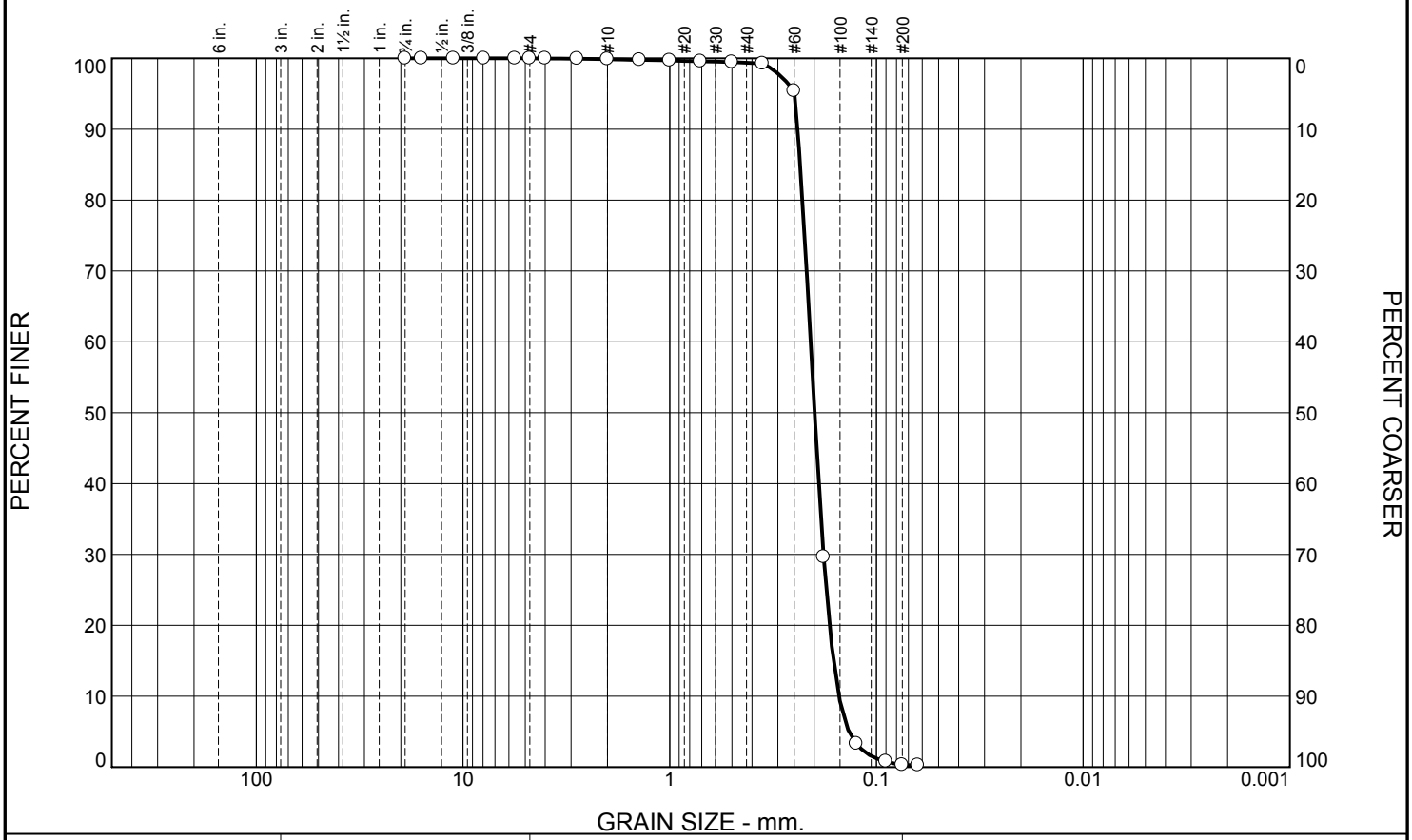
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	99.1	0.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	99.9		
#10	99.9		
#14	99.8		
#18	99.7		
#25	99.6		
#35	99.5		
#45	99.3		
#60	95.4		
#80	29.6		
#120	3.3		
#170	0.8		
#200	0.3		
#230	0.3		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2407 D_{85}= 0.2339 D_{60}= 0.2079
D_{50}= 0.1990 D_{30}= 0.1804 D_{15}= 0.1613
D_{10}= 0.1517 C_u= 1.37 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.94

Source of Sample: SBSS 12
Sample Number: SBSS 12.3

Date: 7/17/18

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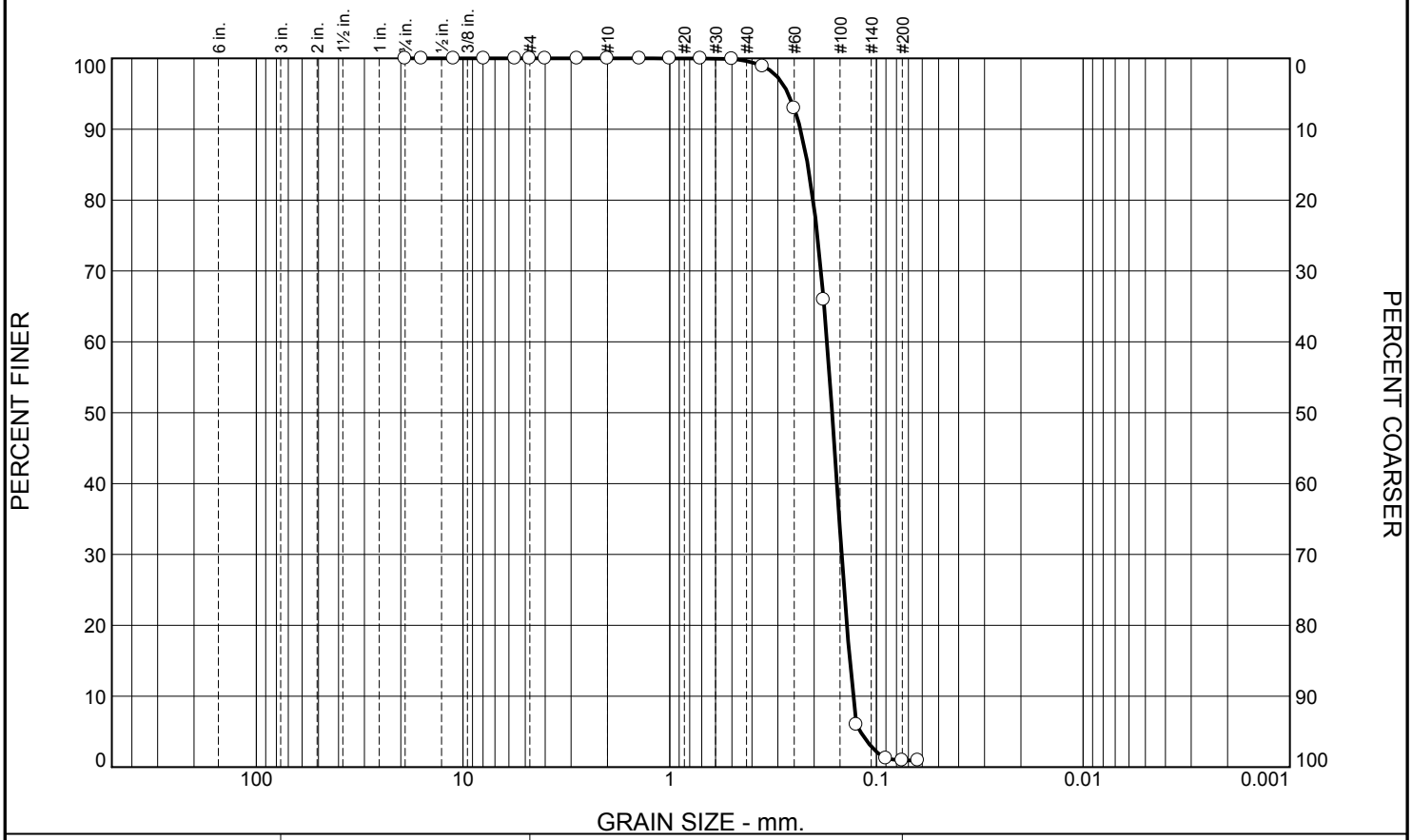
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	98.7	0.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	99.9		
#45	98.9		
#60	93.0		
#80	65.9		
#120	6.0		
#170	1.2		
#200	0.9		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2331 D_{85}= 0.2146 D_{60}= 0.1734
D_{50}= 0.1638 D_{30}= 0.1472 D_{15}= 0.1345
D_{10}= 0.1296 C_u= 1.34 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.69

Source of Sample: SBSS 12
Sample Number: SBSS 12.4

Date: 7/17/18

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Wilmington, NC 28405
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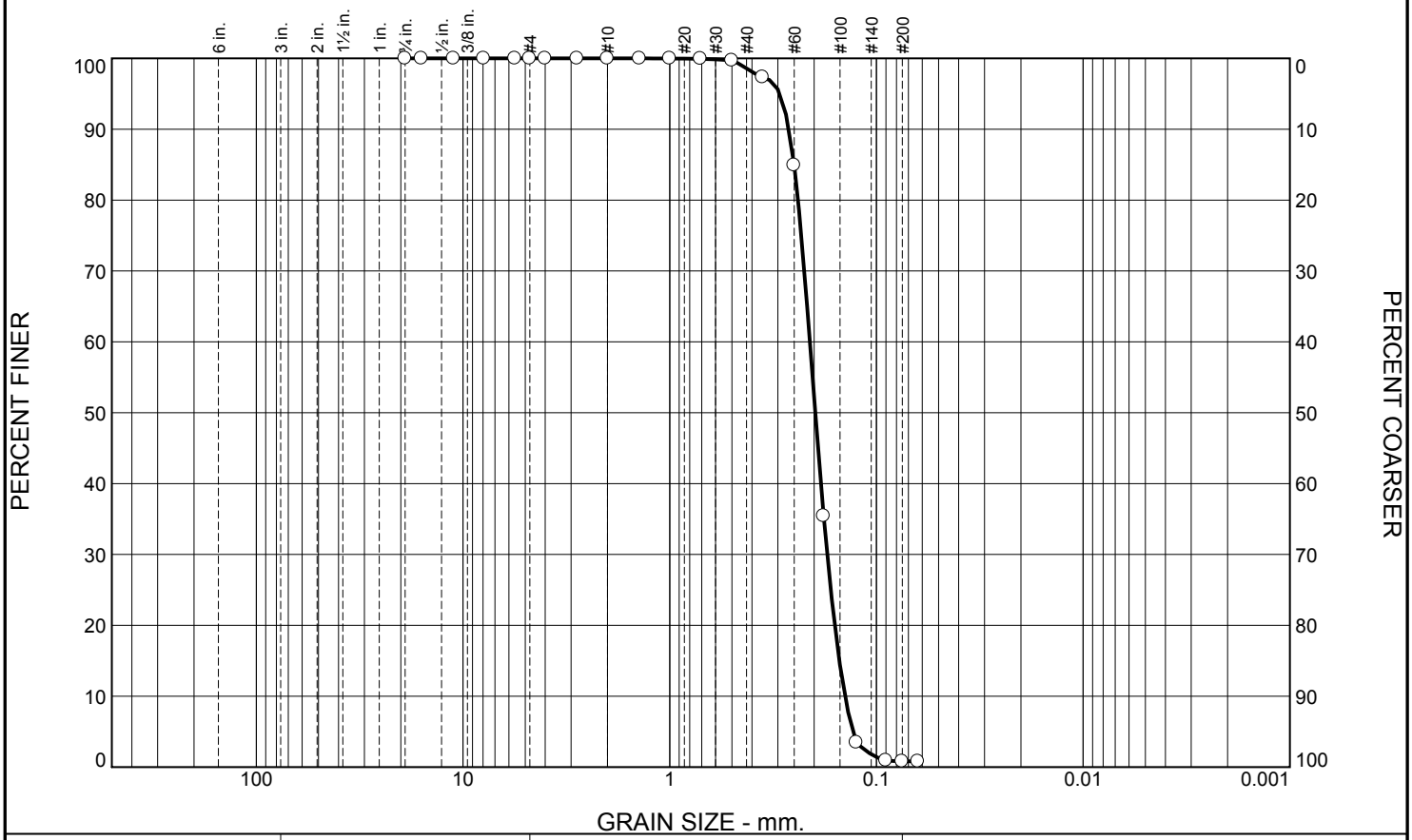
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.4	97.8	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	99.9		
#35	99.7		
#45	97.3		
#60	84.9		
#80	35.4		
#120	3.5		
#170	0.9		
#200	0.8		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2651 D_{85}= 0.2502 D_{60}= 0.2097
D_{50}= 0.1974 D_{30}= 0.1731 D_{15}= 0.1511
D_{10}= 0.1418 C_u= 1.48 C_c= 1.01

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.90

Source of Sample: SBSS 12
Sample Number: SBSS 12.5

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	4.3	94.9	0.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	99.9		
#14	99.9		
#18	99.6		
#25	99.1		
#35	97.4		
#45	92.1		
#60	74.9		
#80	37.3		
#120	3.8		
#170	0.8		
#200	0.7		
#230	0.6		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3292 D_{85}= 0.2905 D_{60}= 0.2166
D_{50}= 0.1995 D_{30}= 0.1694 D_{15}= 0.1468
D_{10}= 0.1383 C_u= 1.57 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.98

Source of Sample: SBSS 12
Sample Number: SBSS 12.6

Date: 7/17/18

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Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.9	97.1	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.8		
#25	99.7		
#35	99.0		
#45	96.4		
#60	87.4		
#80	58.0		
#120	7.2		
#170	1.6		
#200	1.0		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2649 D_{85}= 0.2389 D_{60}= 0.1827
D_{50}= 0.1704 D_{30}= 0.1500 D_{15}= 0.1349
D_{10}= 0.1289 C_u= 1.42 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.77

Source of Sample: SBSS 12
Sample Number: SBSS 12.7

Date: 7/17/18

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6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.4	97.5	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.6		
#35	99.1		
#45	97.0		
#60	92.2		
#80	76.8		
#120	10.0		
#170	2.0		
#200	1.0		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2134 D_{85}= 0.1943 D_{60}= 0.1632
D_{50}= 0.1554 D_{30}= 0.1412 D_{15}= 0.1298
D_{10}= 0.1250 C_u= 1.30 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.64

Source of Sample: SBSS 12
Sample Number: SBSS 12.TROUGH

Date: 7/17/18

ECS SOUTHEAST, LLP
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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.2	96.3	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	99.9		
#10	99.9		
#14	99.8		
#18	99.7		
#25	99.3		
#35	98.5		
#45	95.8		
#60	89.6		
#80	71.6		
#120	10.9		
#170	2.8		
#200	1.4		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2555 D_{85}= 0.2108 D_{60}= 0.1669
D_{50}= 0.1580 D_{30}= 0.1420 D_{15}= 0.1293
D_{10}= 0.1217 C_u= 1.37 C_c= 0.99

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.68

Source of Sample: SBSS 12
Sample Number: SBSS 12.CREST

Date: 7/17/18

ECS SOUTHEAST, LLP
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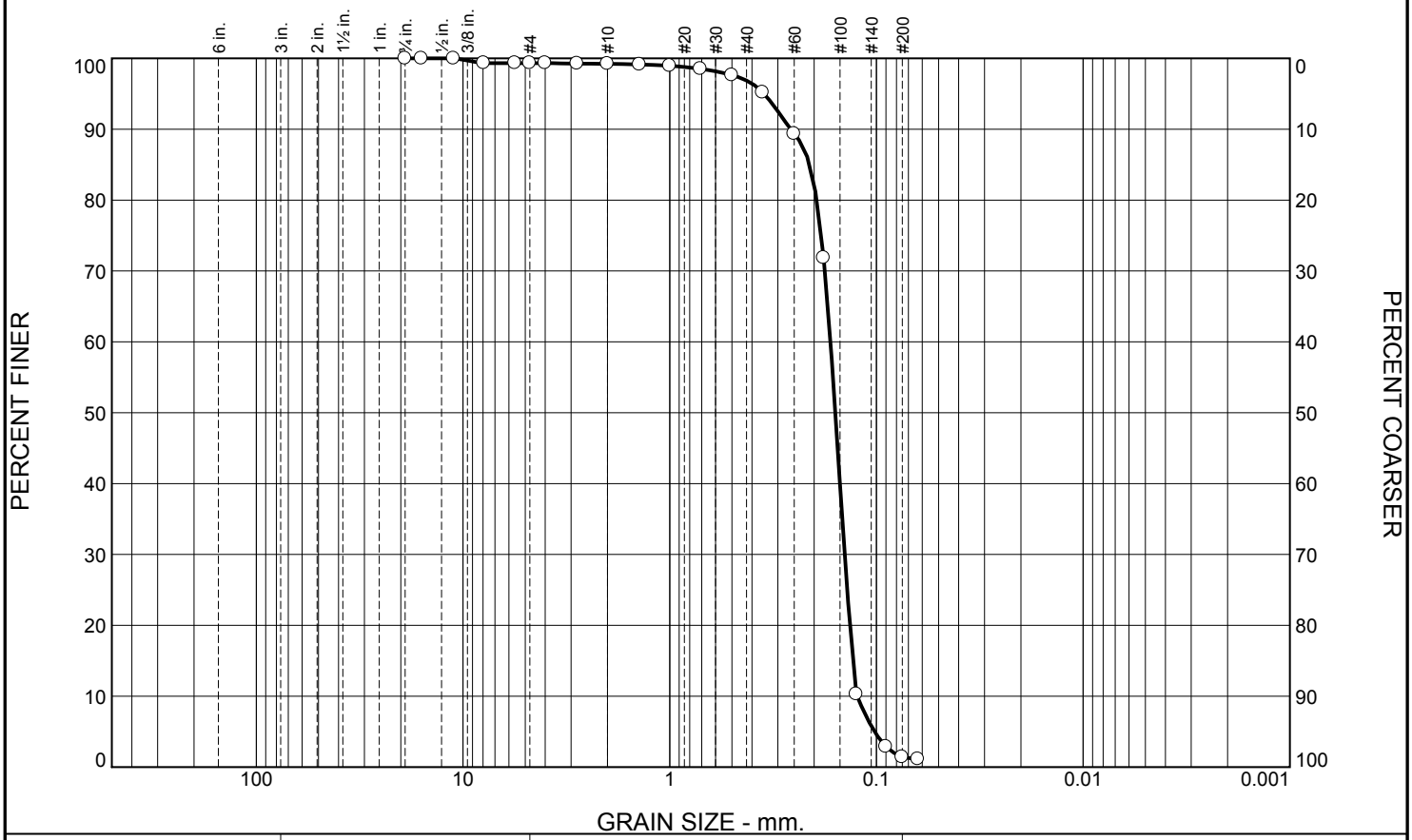
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.1	2.3	95.5	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	99.3		
#3.5	99.3		
#4	99.3		
#5	99.3		
#7	99.3		
#10	99.2		
#14	99.1		
#18	99.0		
#25	98.5		
#35	97.6		
#45	95.2		
#60	89.3		
#80	71.9		
#120	10.3		
#170	2.9		
#200	1.4		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2600 D_{85}= 0.2103 D_{60}= 0.1668
D_{50}= 0.1580 D_{30}= 0.1424 D_{15}= 0.1299
D_{10}= 0.1239 C_u= 1.35 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.72

Source of Sample: SBSS 12
Sample Number: SBSS 12.106

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.1	3.0	95.5	1.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.7		
#5	99.7		
#7	99.6		
#10	99.6		
#14	99.5		
#18	99.3		
#25	98.8		
#35	97.7		
#45	94.9		
#60	88.5		
#80	66.2		
#120	9.3		
#170	2.0		
#200	1.1		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2642 D_{85}= 0.2260 D_{60}= 0.1725
D_{50}= 0.1624 D_{30}= 0.1449 D_{15}= 0.1314
D_{10}= 0.1259 C_u= 1.37 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.74

Source of Sample: SBSS 12
Sample Number: SBSS 12.109.5

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.3	0.4	97.3	1.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.6		
#5	99.5		
#7	99.3		
#10	99.3		
#14	99.2		
#18	99.1		
#25	99.1		
#35	99.0		
#45	98.7		
#60	97.8		
#80	90.7		
#120	14.1		
#170	3.6		
#200	1.6		
#230	1.3		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1792 D_{85}= 0.1736 D_{60}= 0.1546
D_{50}= 0.1484 D_{30}= 0.1363 D_{15}= 0.1258
D_{10}= 0.1133 C_u= 1.36 C_c= 1.06

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.52

Source of Sample: SBSS 12
Sample Number: SBSS 12.113

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	95.5	4.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	99.9		
#25	99.9		
#35	99.9		
#45	99.8		
#60	99.1		
#80	94.5		
#120	28.3		
#170	8.2		
#200	4.4		
#230	3.2		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1738 D_{85}= 0.1682 D_{60}= 0.1479
D_{50}= 0.1410 D_{30}= 0.1265 D_{15}= 0.1096
D_{10}= 0.0972 C_u= 1.52 C_c= 1.11

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.38

Source of Sample: SBSS 12
Sample Number: SBSS 12.116.5

Date: 7/17/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.4	94.9	4.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	99.9		
#7	99.8		
#10	99.8		
#14	99.8		
#18	99.8		
#25	99.7		
#35	99.7		
#45	98.9		
#60	95.3		
#80	82.5		
#120	23.2		
#170	8.1		
#200	4.5		
#230	3.2		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1960 D_{85}= 0.1841 D_{60}= 0.1558
D_{50}= 0.1475 D_{30}= 0.1314 D_{15}= 0.1141
D_{10}= 0.1005 C_u= 1.55 C_c= 1.10

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.51

Source of Sample: SBSS 12
Sample Number: SBSS 12.120

Date: 7/17/18

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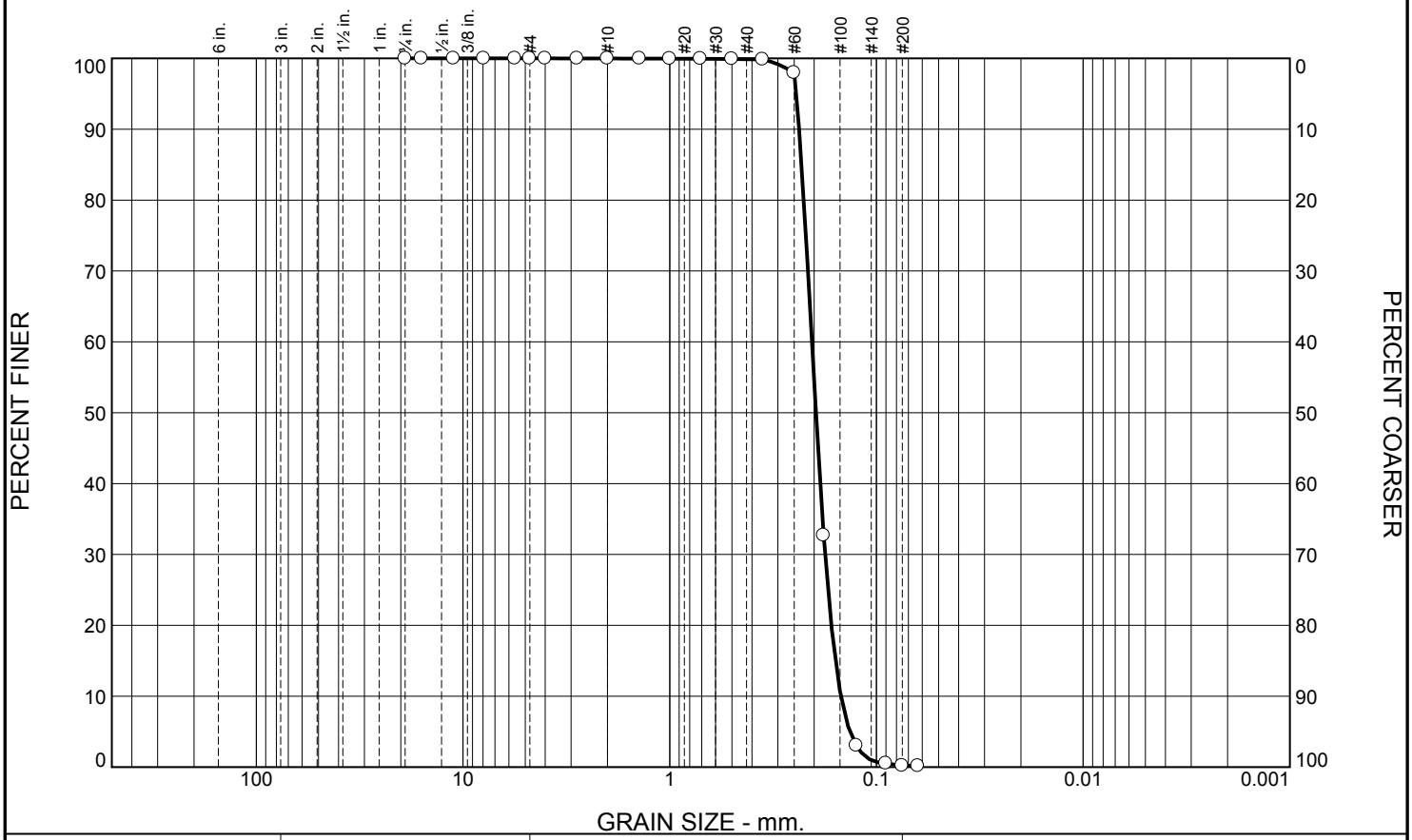
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

PROFILE 16+00

PARTICLE SIZE DISTRIBUTION REPORTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	99.7	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	99.9		
#35	99.9		
#45	99.8		
#60	98.0		
#80	32.7		
#120	3.0		
#170	0.5		
#200	0.2		
#230	0.2		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2367 D_{85}= 0.2302 D_{60}= 0.2049
D_{50}= 0.1960 D_{30}= 0.1772 D_{15}= 0.1579
D_{10}= 0.1485 C_u= 1.38 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.90

Source of Sample: SBSS 16
Sample Number: SBSS 16.1

Date: 7/20/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	99.6	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	99.9		
#45	99.6		
#60	92.1		
#80	33.1		
#120	3.1		
#170	0.5		
#200	0.2		
#230	0.2		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2458 D_{85}= 0.2374 D_{60}= 0.2074
D_{50}= 0.1973 D_{30}= 0.1765 D_{15}= 0.1557
D_{10}= 0.1461 C_u= 1.42 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.91

Source of Sample: SBSS 16
Sample Number: SBSS 16.2

Date: 7/20/18

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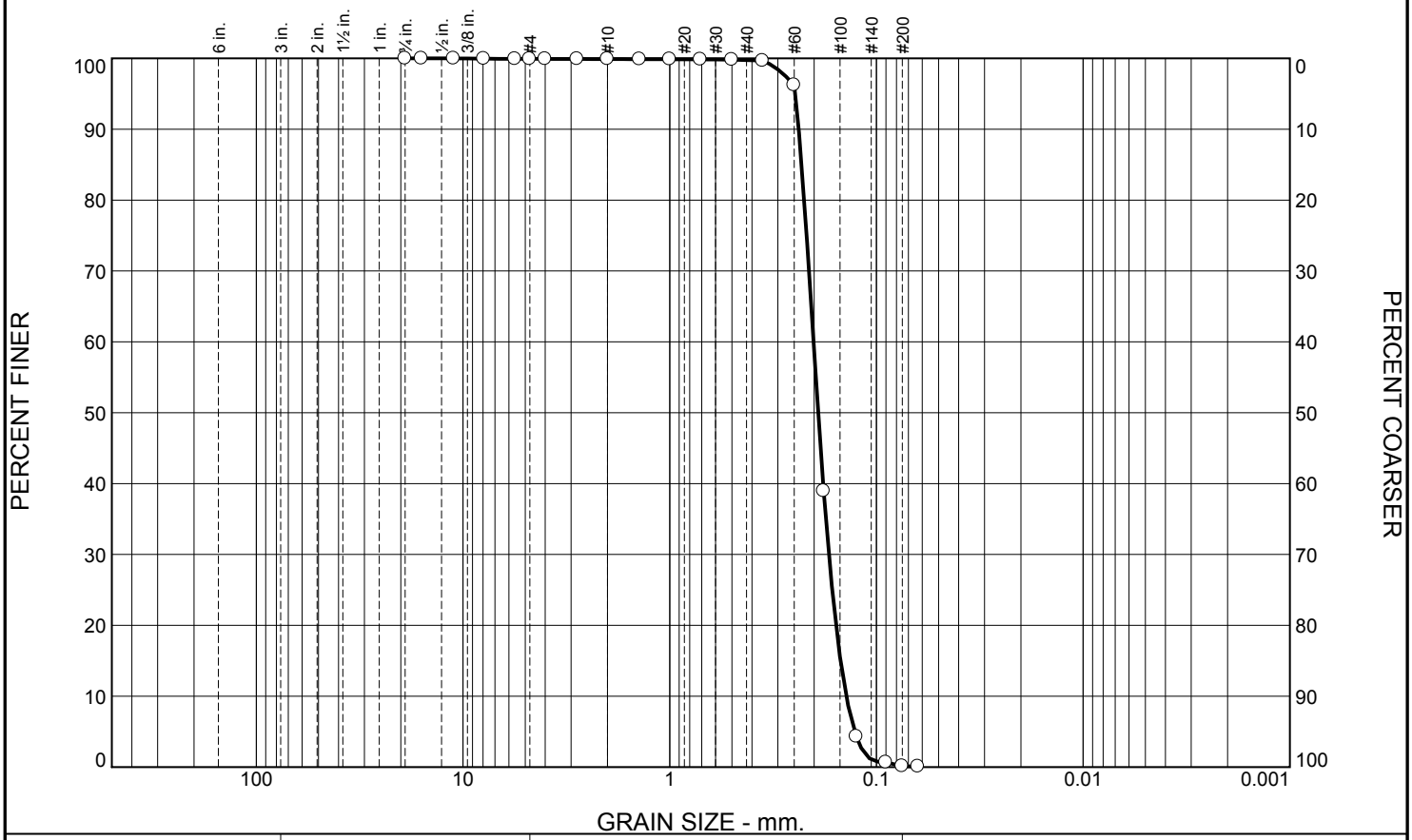
Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	0.1	99.7	0.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.9		
#4	99.9		
#5	99.9		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.9		
#25	99.9		
#35	99.8		
#45	99.7		
#60	96.2		
#80	39.0		
#120	4.3		
#170	0.7		
#200	0.1		
#230	0.1		

* (no specification provided)

Soil Description

Light Gray (10YR 7/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2378 D_{85}= 0.2301 D_{60}= 0.2013
D_{50}= 0.1913 D_{30}= 0.1699 D_{15}= 0.1491
D_{10}= 0.1399 C_u= 1.44 C_c= 1.03

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.87

Source of Sample: SBSS 16
Sample Number: SBSS 16.3

Date: 7/20/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	99.2	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	100.0		
#18	100.0		
#25	100.0		
#35	100.0		
#45	100.0		
#60	96.3		
#80	49.1		
#120	5.1		
#170	1.0		
#200	0.8		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2345 D_{85}= 0.2254 D_{60}= 0.1921
D_{50}= 0.1810 D_{30}= 0.1590 D_{15}= 0.1409
D_{10}= 0.1337 C_u= 1.44 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.79

Source of Sample: SBSS 16
Sample Number: SBSS 16.4

Date: 7/20/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.3	96.7	0.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	99.9		
#10	99.9		
#14	99.9		
#18	99.8		
#25	99.5		
#35	98.9		
#45	96.4		
#60	87.1		
#80	43.8		
#120	5.0		
#170	1.1		
#200	0.9		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2601 D_{85}= 0.2442 D_{60}= 0.2007
D_{50}= 0.1877 D_{30}= 0.1629 D_{15}= 0.1429
D_{10}= 0.1350 C_u= 1.49 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.85

Source of Sample: SBSS 16
Sample Number: SBSS 16.5

Date: 7/20/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.8	97.1	1.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.8		
#25	99.6		
#35	99.1		
#45	96.9		
#60	89.7		
#80	60.5		
#120	7.0		
#170	1.5		
#200	1.1		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2520 D_{85}= 0.2296 D_{60}= 0.1794
D_{50}= 0.1681 D_{30}= 0.1489 D_{15}= 0.1345
D_{10}= 0.1289 C_u= 1.39 C_c= 0.96

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.74

Source of Sample: SBSS 16
Sample Number: SBSS 16.6

Date: 7/20/18

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Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.7	97.3	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.8		
#25	99.6		
#35	99.0		
#45	96.9		
#60	91.3		
#80	68.8		
#120	7.4		
#170	1.8		
#200	1.0		
#230	0.8		

* (no specification provided)

Soil Description

Gray (10YR 6/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2385 D_{85}= 0.2125 D_{60}= 0.1703
D_{50}= 0.1612 D_{30}= 0.1452 D_{15}= 0.1328
D_{10}= 0.1280 C_u= 1.33 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.70

Source of Sample: SBSS 16
Sample Number: SBSS 16.7

Date: 7/20/18

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Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	1.7	97.1	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.9		
#7	99.8		
#10	99.8		
#14	99.8		
#18	99.7		
#25	99.5		
#35	98.8		
#45	96.6		
#60	90.7		
#80	70.5		
#120	9.8		
#170	2.1		
#200	1.0		
#230	0.9		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2423 D_{85}= 0.2110 D_{60}= 0.1683
D_{50}= 0.1592 D_{30}= 0.1431 D_{15}= 0.1305
D_{10}= 0.1252 C_u= 1.34 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.68

Source of Sample: SBSS 16
Sample Number: SBSS 16.TROUGH
Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	2.6	95.8	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.8		
#7	99.8		
#10	99.8		
#14	99.7		
#18	99.5		
#25	99.1		
#35	98.1		
#45	95.5		
#60	89.8		
#80	69.1		
#120	8.0		
#170	2.4		
#200	1.4		
#230	1.2		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2519 D_{85}= 0.2151 D_{60}= 0.1698
D_{50}= 0.1607 D_{30}= 0.1447 D_{15}= 0.1323
D_{10}= 0.1273 C_u= 1.33 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.72

Source of Sample: SBSS 16
Sample Number: SBSS 16.CREST

Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	3.5	95.1	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	99.9		
#14	99.8		
#18	99.6		
#25	99.0		
#35	97.6		
#45	94.1		
#60	87.1		
#80	69.5		
#120	9.8		
#170	2.6		
#200	1.3		
#230	1.0		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2885 D_{85}= 0.2261 D_{60}= 0.1689
D_{50}= 0.1596 D_{30}= 0.1433 D_{15}= 0.1305
D_{10}= 0.1252 C_u= 1.35 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.72

Source of Sample: SBSS 16
Sample Number: SBSS 16.106

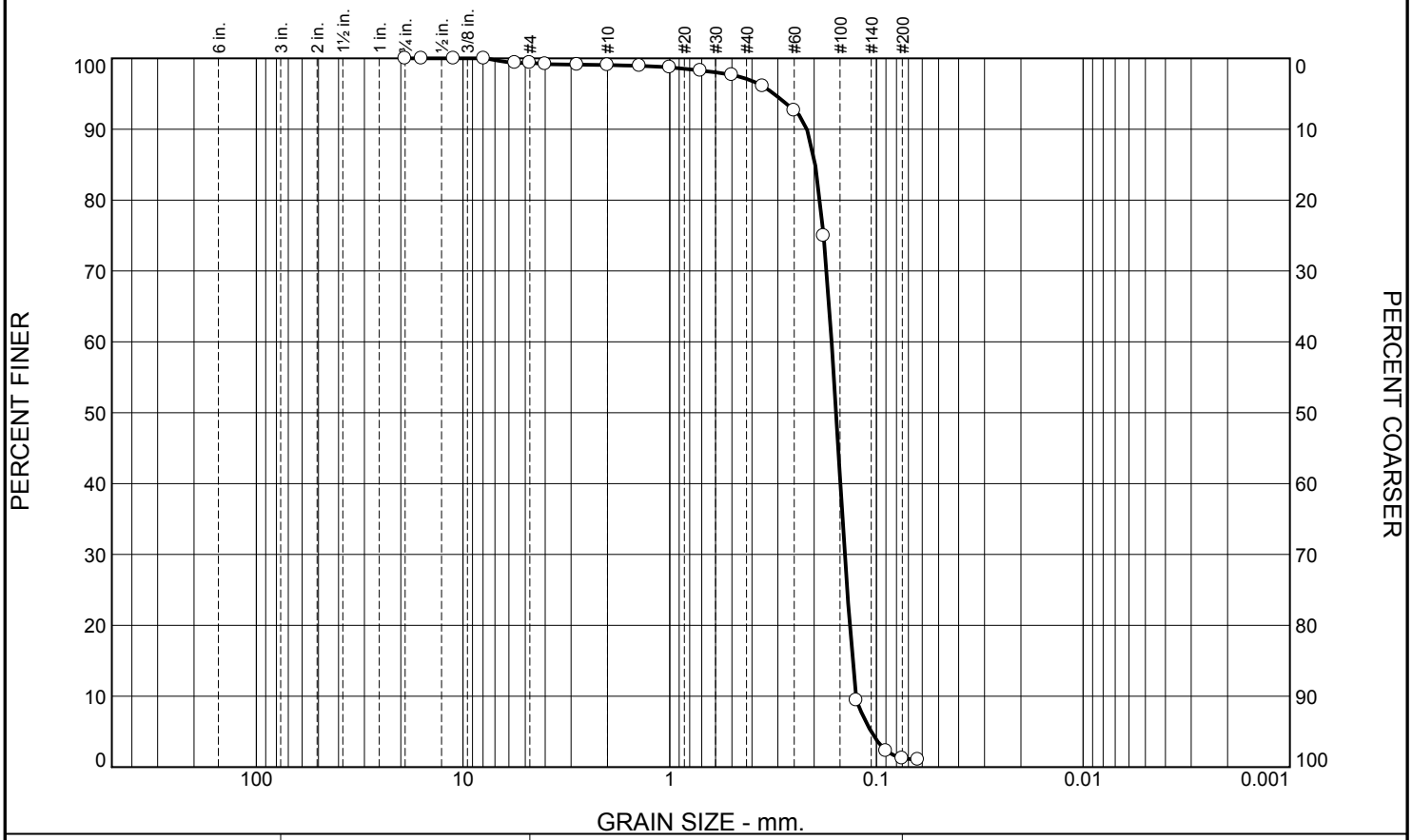
Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.3	2.0	95.9	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	99.4		
#4	99.4		
#5	99.2		
#7	99.1		
#10	99.1		
#14	98.9		
#18	98.7		
#25	98.3		
#35	97.6		
#45	96.1		
#60	92.7		
#80	75.0		
#120	9.4		
#170	2.3		
#200	1.2		
#230	1.1		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2168 D_{85}= 0.1977 D_{60}= 0.1648
D_{50}= 0.1567 D_{30}= 0.1421 D_{15}= 0.1304
D_{10}= 0.1256 C_u= 1.31 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.69

Source of Sample: SBSS 16
Sample Number: SBSS 16.109.5

Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.1	0.4	97.1	1.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	99.9		
#3.5	99.7		
#4	99.5		
#5	99.5		
#7	99.4		
#10	99.4		
#14	99.3		
#18	99.2		
#25	99.1		
#35	99.0		
#45	98.9		
#60	98.3		
#80	92.8		
#120	15.3		
#170	4.1		
#200	1.9		
#230	1.4		

* (no specification provided)

Soil Description

Gray (10YR 5/1), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1766 D_{85}= 0.1715 D_{60}= 0.1533
D_{50}= 0.1473 D_{30}= 0.1353 D_{15}= 0.1242
D_{10}= 0.1104 C_u= 1.39 C_c= 1.08

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.50

Source of Sample: SBSS 16
Sample Number: SBSS 16.113

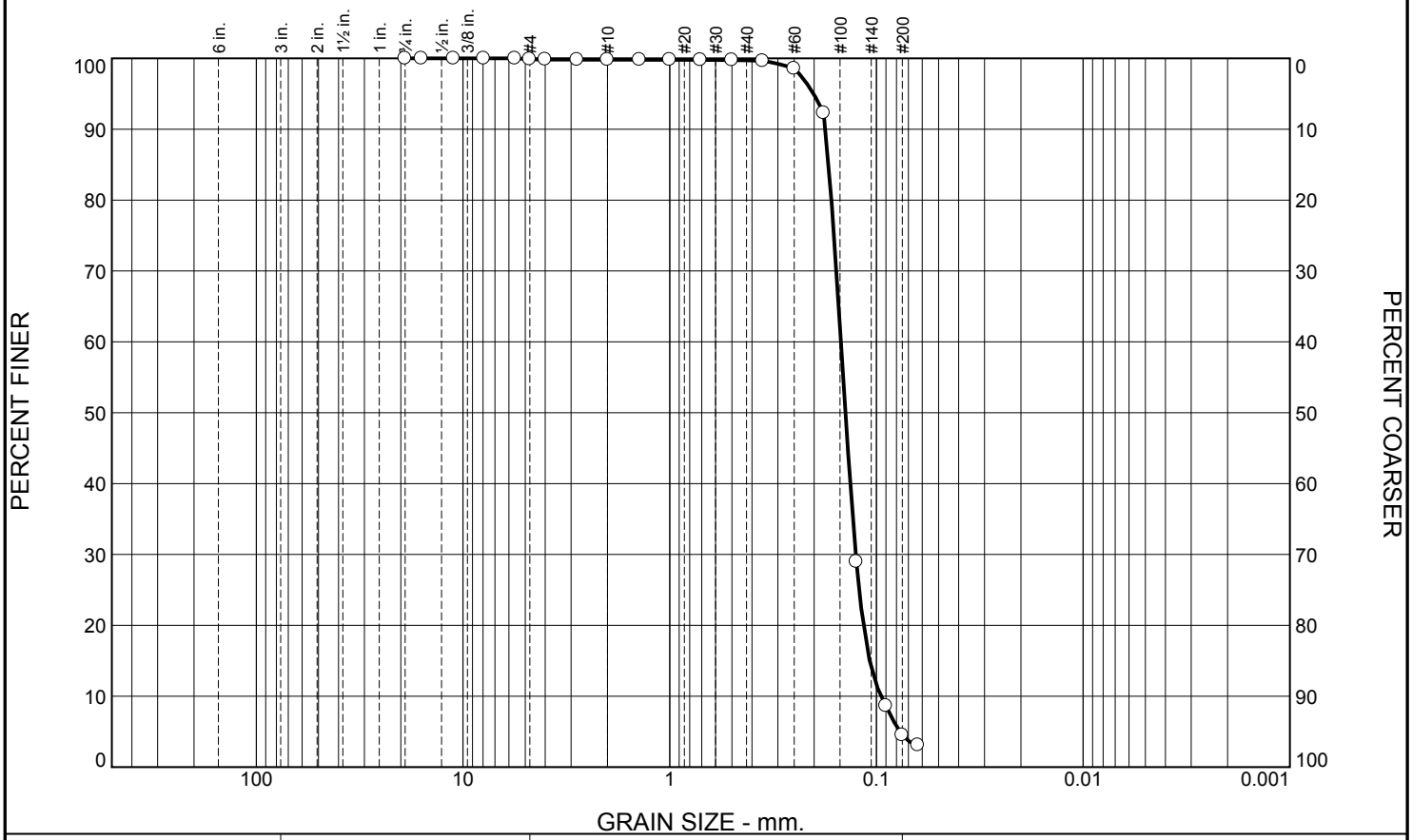
Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	0.1	95.2	4.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	99.9		
#5	99.8		
#7	99.8		
#10	99.8		
#14	99.8		
#18	99.8		
#25	99.8		
#35	99.8		
#45	99.6		
#60	98.5		
#80	92.3		
#120	29.0		
#170	8.6		
#200	4.5		
#230	3.1		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1765 D_{85}= 0.1703 D_{60}= 0.1485
D_{50}= 0.1412 D_{30}= 0.1259 D_{15}= 0.1079
D_{10}= 0.0949 C_u= 1.56 C_c= 1.12

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.39

Source of Sample: SBSS 16
Sample Number: SBSS 16.116.5

Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	95.3	4.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
5/8	100.0		
7/16	100.0		
5/16	100.0		
#3.5	100.0		
#4	100.0		
#5	100.0		
#7	100.0		
#10	100.0		
#14	99.9		
#18	99.9		
#25	99.9		
#35	99.8		
#45	99.3		
#60	96.4		
#80	83.0		
#120	22.6		
#170	7.5		
#200	4.3		
#230	3.1		

* (no specification provided)

Soil Description

Grayish Brown (10YR 5/2), Poorly Graded SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1939 D_{85}= 0.1832 D_{60}= 0.1558
D_{50}= 0.1477 D_{30}= 0.1318 D_{15}= 0.1154
D_{10}= 0.1037 C_u= 1.50 C_c= 1.08

Classification

USCS= SP AASHTO=

Remarks

F.M.=0.50

Source of Sample: SBSS 16
Sample Number: SBSS 16.120

Date: 7/20/18

ECS SOUTHEAST, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666

Client: Moffatt & Nichol
Project: Sunset Beach Shoreline Management
Project No: 25777 **Figure**

Tested By: EG **Checked By:** KEL

CALCITE COMPOSITE

ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666
www.ecslimited.com

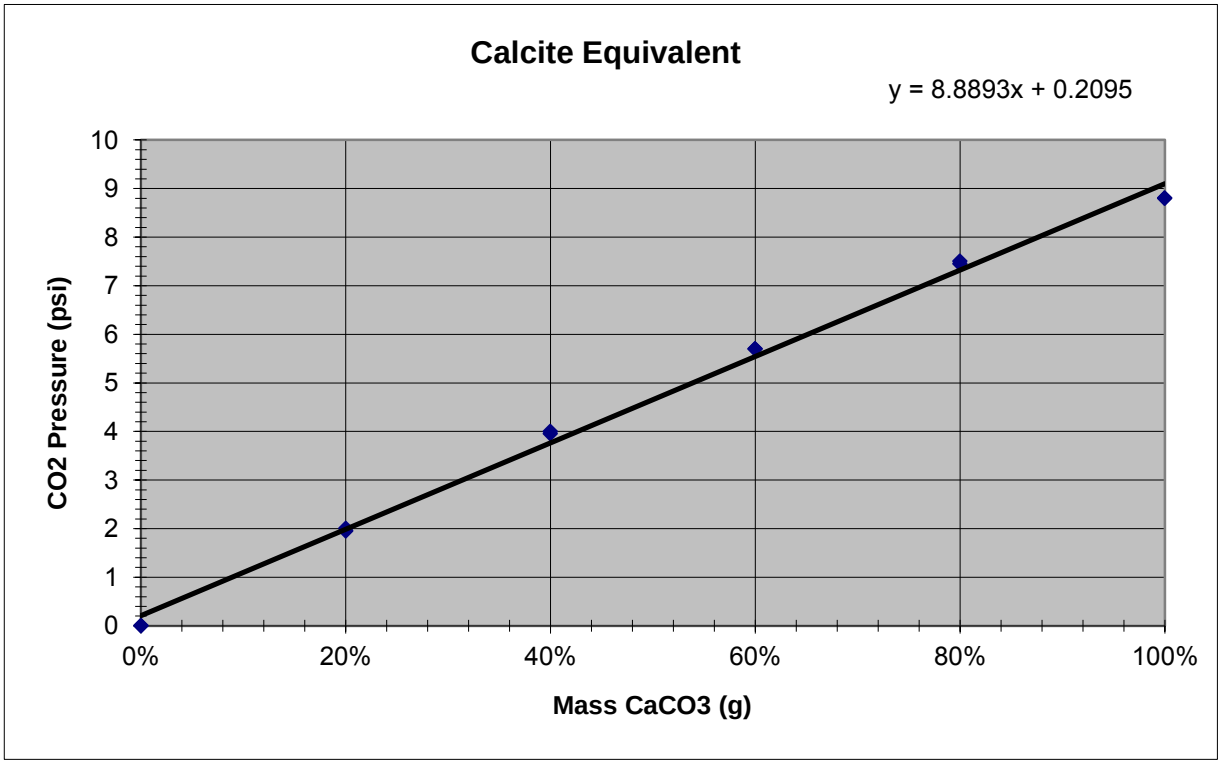
Standard Test Method for Rapid Determination of Carbonate Content of Soils
ASTM D 4373

PROJECT NAME: Sunset Beach Shoreline Management
PROJECT NUMBER: 25777
PROJECT MANAGER: K. Leimer
DATE: 7/20/2018

SAMPLE LOCATION: SBSS 0 Composite
SAMPLE DATE:
SAMPLE DESCRIPTION: Composite Sample (Light Gray to Gray to Grayish Brown, Poorly Graded SAND)

TEST DATA

Sample	Sample Size (g)	Gauge Reading (psi)	Correction Factor	Corrected Reading	Calcite Equivalent
SBSS 0 Composite	4.99	0.75	5.00	0.15	2%



Tested By: KEL

Reviewed By: KJS

ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666
www.ecslimited.com

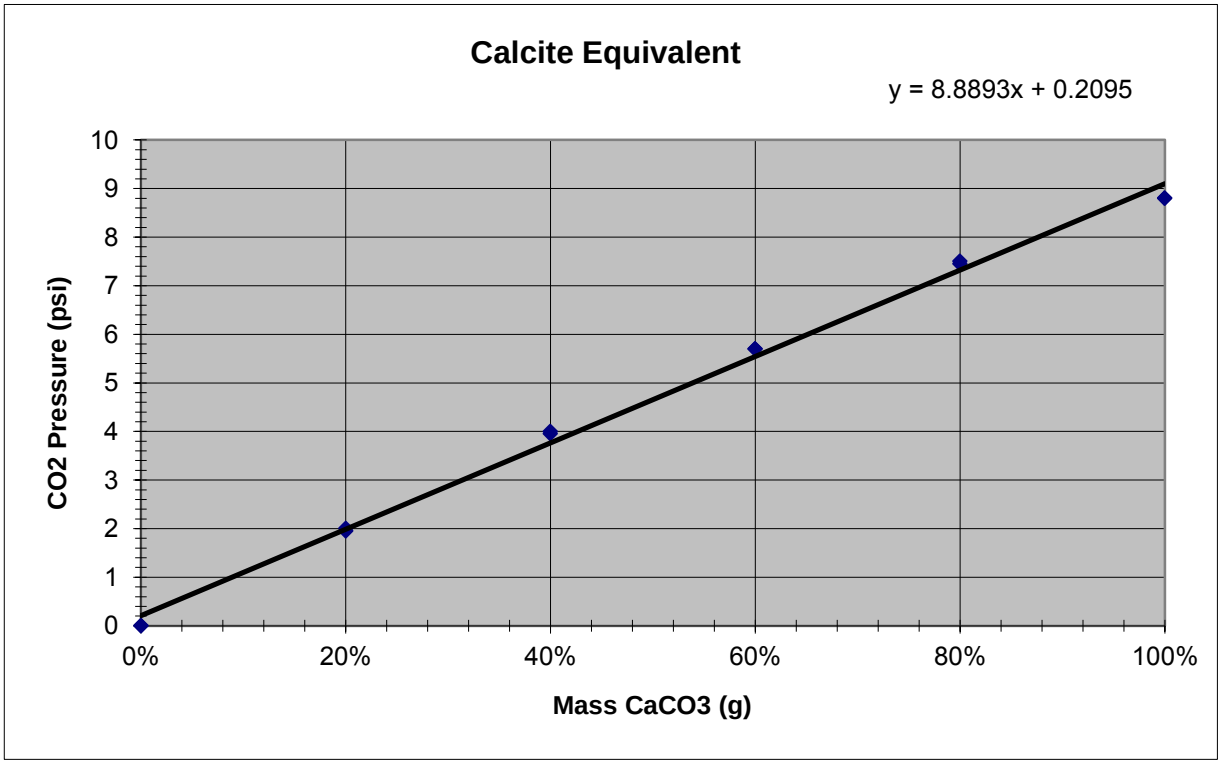
Standard Test Method for Rapid Determination of Carbonate Content of Soils
ASTM D 4373

PROJECT NAME: Sunset Beach Shoreline Management
PROJECT NUMBER: 25777
PROJECT MANAGER: K. Leimer
DATE: 7/20/2018

SAMPLE LOCATION: SBSS 4 Composite
SAMPLE DATE:
SAMPLE DESCRIPTION: Composite Sample (Light Gray to Gray to Grayish Brown, Poorly Graded SAND)

TEST DATA

Sample	Sample Size (g)	Gauge Reading (psi)	Correction Factor	Corrected Reading	Calcite Equivalent
SBSS 4 Composite	5.01	1.00	5.00	0.20	2%



Tested By: KEL

Reviewed By: KJS

ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666
www.ecslimited.com

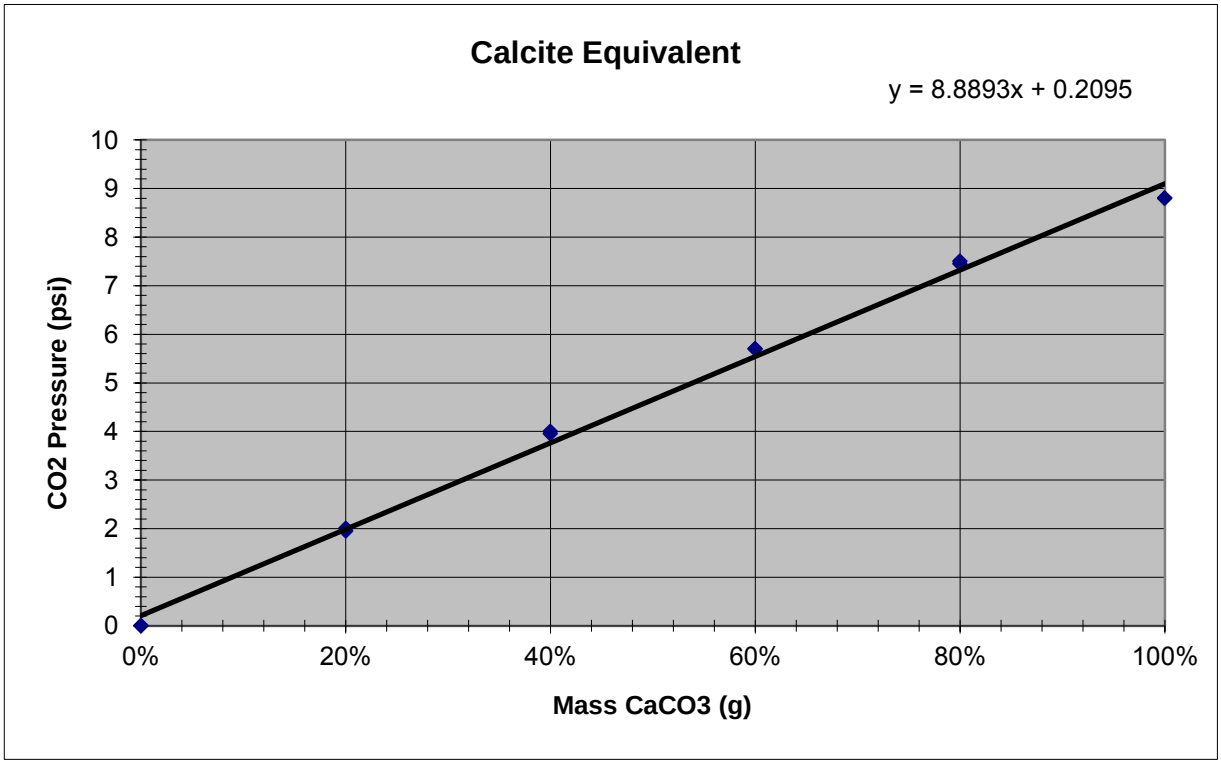
Standard Test Method for Rapid Determination of Carbonate Content of Soils
ASTM D 4373

PROJECT NAME: Sunset Beach Shoreline Management
PROJECT NUMBER: 25777
PROJECT MANAGER: K. Leimer
DATE: 7/20/2018

SAMPLE LOCATION: SBSS 8 Composite
SAMPLE DATE:
SAMPLE DESCRIPTION: Composite Sample (Light Gray to Gray to Grayish Brown, Poorly Graded SAND)

TEST DATA

Sample	Sample Size (g)	Gauge Reading (psi)	Correction Factor	Corrected Reading	Calcite Equivalent
SBSS 8 Composite	5.00	0.90	5.00	0.18	2%



Tested By: KEL

Reviewed By: KJS

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Phone: (910) 686-9114
Fax: (910) 686-9666
www.ecslimited.com

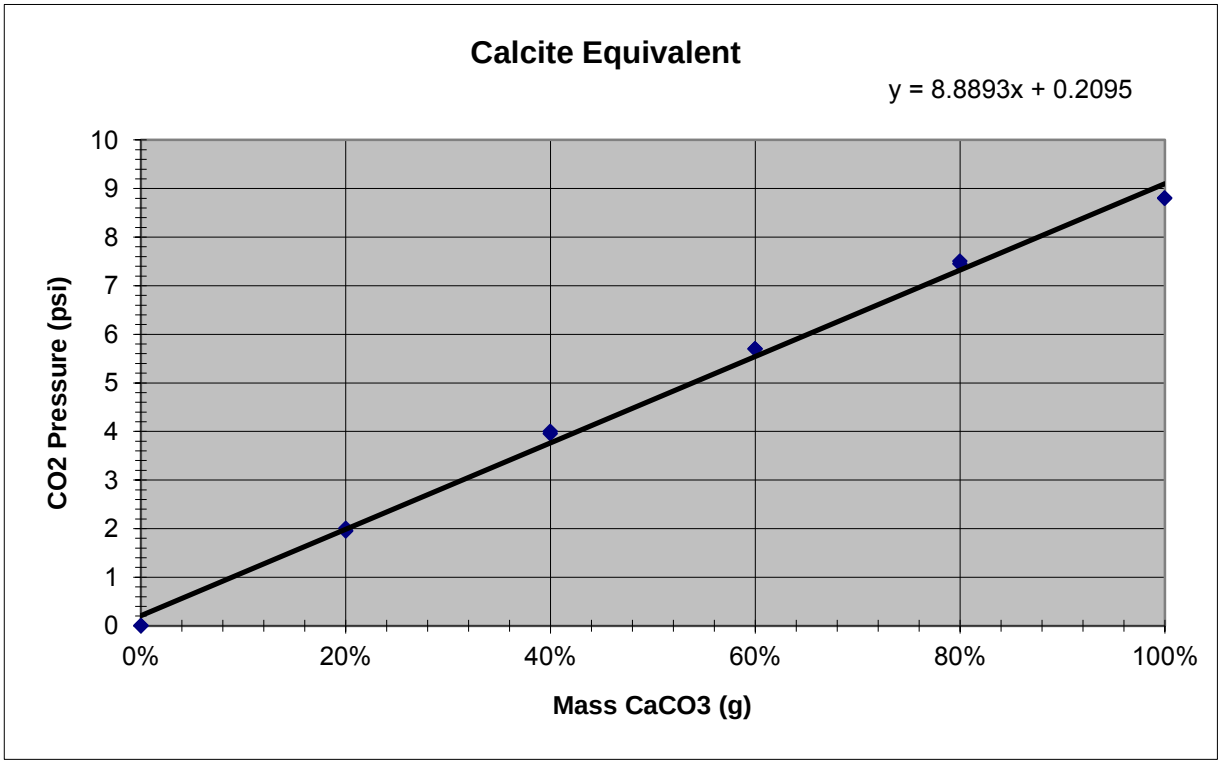
Standard Test Method for Rapid Determination of Carbonate Content of Soils
ASTM D 4373

PROJECT NAME: Sunset Beach Shoreline Management
PROJECT NUMBER: 25777
PROJECT MANAGER: K. Leimer
DATE: 7/20/2018

SAMPLE LOCATION: SBSS 12 Composite
SAMPLE DATE:
SAMPLE DESCRIPTION: Composite Sample (Light Gray to Gray to Grayish Brown, Poorly Graded SAND)

TEST DATA

Sample	Sample Size (g)	Gauge Reading (psi)	Correction Factor	Corrected Reading	Calcite Equivalent
SBSS 12 Composite	4.99	0.85	5.00	0.17	2%



Tested By: KEL

Reviewed By: KJS

ECS Southeast, LLP
6714 Netherlands Drive
Wilmington, NC 28405
Phone: (910) 686-9114
Fax: (910) 686-9666
www.ecslimited.com

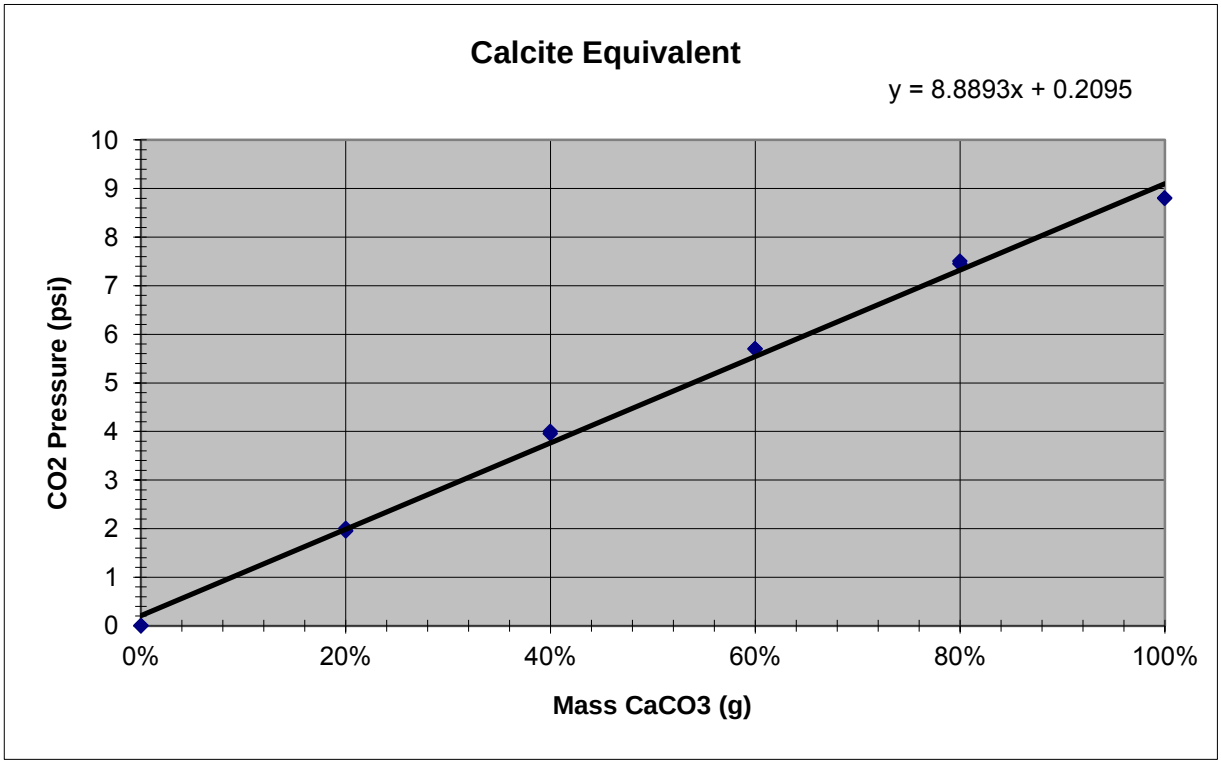
Standard Test Method for Rapid Determination of Carbonate Content of Soils
ASTM D 4373

PROJECT NAME: Sunset Beach Shoreline Management
PROJECT NUMBER: 25777
PROJECT MANAGER: K. Leimer
DATE: 7/20/2018

SAMPLE LOCATION: SBSS 16 Composite
SAMPLE DATE:
SAMPLE DESCRIPTION: Composite Sample (Light Gray to Gray to Grayish Brown, Poorly Graded SAND)

TEST DATA

Sample	Sample Size (g)	Gauge Reading (psi)	Correction Factor	Corrected Reading	Calcite Equivalent
SBSS 16 Composite	5.00	0.80	5.00	0.16	2%



Tested By: KEL

Reviewed By: KJS

CLAST REPORT

CLAST FIELD INVESTIGATION

Purpose

As part of the State Sediment Criteria to ensure the compatibility of sand characteristics, the number of clasts (rocks and shells) greater than or equal to 3-inches in diameter present on the native beach is to be quantified. This value shall be calculated from observable clasts on the beach surface found between the frontal dune toe and mean low water (MLW) for a 50,000 square foot area. This representative sample will quantify the "background" value of the entire project area. As a result, the criteria stipulate that the borrow area material is considered incompatible if more than twice the background level that existed on the native beach is placed in the project area.

Method

The Sunset Beach project extends from 5th Street to 12th Street, Transects 0+00 – 16+00. Once onsite, a walkthrough was completed of the project area in order to determine a representative section to sample. The area identified was between 6th Street and 7th Street, over Transect 4+00.

Before the investigation began the timing of low tide was identified to allow easier survey of the area between the frontal dune toe and MLW. The length from the frontal dune toe to MLW was measured to be 350 feet. This length was marked with a rope that was staked at both ends with survey flags. The rope used was 100 feet long; the remaining 250 feet out to MLW was marked with survey flags every 50-100 feet. A tape measure was used to measure 25 feet from each survey flag to mark the boundaries of the next section. Following along the frontal dune toe survey flags staked at 25-foot spacing allowed for the continual creation of sections once the previous section was fully surveyed. General notes were made about the location, number, and type of clasts found (above MHW, rock, etc.). A picture of a representative clast(s) was taken from each section to document the findings.

Results

The survey area began at the 6th Street beach access. The length from the frontal dune toe to MLW was measured to be 350 feet; this allowed for the creation of six 25-foot wide sections to calculate a 52,500 square foot area. The survey area extended 150 feet east ending approximately 50 feet west of the 7th Street beach access. The 52,500 square foot area is shown in Figure 1. Photos of the section setup are documented in Figures 2 and 3.

Figure 1. Sunset Beach Survey Area

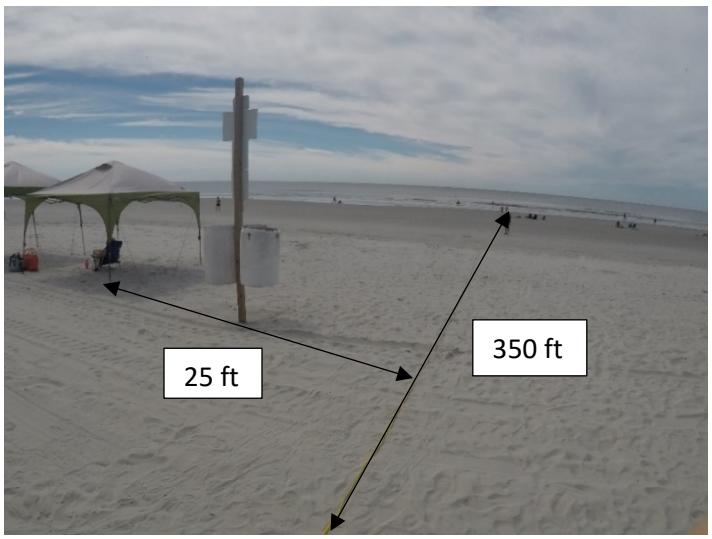


Figure 2. Sunset Beach setup - looking at MLW

Figure 3. Sunset Beach setup - looking at frontal dune toe

Table 1 shows the detailed results from the investigation; a total of 2 clasts greater than or equal to 3-inches in diameter were surveyed. Figure 4 shows the clasts found in the study area. The clasts surveyed were shells, no rocks were found. The beach had a gradual slope, with no berm drop off. All shells meeting size requirements were documented near MLW.

Table 1. Sunset Beach Results

Sunset Beach		
Section #	**# Clasts**	**Comments**
1	0	
2	0	
3	0	
4	0	
5	1	Found @ MLW
6	1	Found @ MLW
Total	**2**	

Figure 4. Section 5 and 6 documentation

Due to the lack of shells greater than 3-inches in diameter present in the project area, pictures were taken of clasts that were representative of the project area (Figure 5). The typical shells found in the project area were smaller than 3-inches in diameter. Overall, very few shells of any size were observed on the beach. While performing the investigation several locals from the area shared comments that very few shells had been on the shore in recent years. Another individual recalled there used to be a significant amount of shells when he was a child (approximately 30 years ago).

Figure 5. Representative Clasts

The lack of shells is thought to be influenced by observed nearshore shoaling. In Figure 6 the breaking of waves seen farther offshore from MLW indicate the presence of a shoaled bar. It is possible that the clasts were trapped on the outside of the bar and not drifting to the shore.

Figure 6. Shoaling offshore

APPENDIX E

CHEMICAL ANALYSIS

moffatt & nichol

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	V23242526		
Lab Sample ID:	FA36573-2	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	SW846 8270D BY SIM SW846 3546	**Percent Solids:**	47.9
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	W094790.D	1	09/07/16	MG	09/06/16	OP61755	SW4248
Run #2							

	Initial Weight	Final Volume
Run #1	15.3 g	1.0 ml
Run #2		

BN PAH List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.14	0.055	mg/kg	
208-96-8	Acenaphthylene	ND	0.14	0.055	mg/kg	
120-12-7	Anthracene	ND	0.14	0.034	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.027	0.0068	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.027	0.0068	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.027	0.0068	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.027	0.0068	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.027	0.0068	mg/kg	
218-01-9	Chrysene	ND	0.027	0.0068	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.027	0.0068	mg/kg	
206-44-0	Fluoranthene	ND	0.14	0.034	mg/kg	
86-73-7	Fluorene	ND	0.14	0.055	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.027	0.0068	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.14	0.055	mg/kg	
91-57-6	2-Methylnaphthalene	ND	0.14	0.055	mg/kg	
91-20-3	Naphthalene	ND	0.14	0.055	mg/kg	
85-01-8	Phenanthrene	ND	0.14	0.034	mg/kg	
129-00-0	Pyrene	ND	0.14	0.034	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	84%		40-105%
321-60-8	2-Fluorobiphenyl	83%		43-107%
1718-51-0	Terphenyl-d14	73%		45-119%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V23242526		
Lab Sample ID:	FA36573-2	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	MADEP VPH REV 1.1	**Percent Solids:**	47.9
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	UU017068.D	1	09/01/16	CG	n/a	n/a	GUU879
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	5.86 g	5.1 ml	100 ul
Run #2			

MADEP VPH List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	0.15	0.15	mg/kg	
100-41-4	Ethylbenzene	ND	0.29	0.15	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.29	0.15	mg/kg	
91-20-3	Naphthalene	ND	0.73	0.44	mg/kg	
108-88-3	Toluene	ND	0.29	0.15	mg/kg	
	m,p-Xylene	ND	0.58	0.29	mg/kg	
95-47-6	o-Xylene	ND	0.29	0.15	mg/kg	
	C5- C8 Aliphatics (Unadj.)	ND	15	5.1	mg/kg	
	C9- C12 Aliphatics (Unadj.)	ND	15	5.1	mg/kg	
	C9- C10 Aromatics (Unadj.)	ND	15	5.1	mg/kg	
	C5- C8 Aliphatics	ND	15	5.1	mg/kg	
	C9- C12 Aliphatics	ND	15	5.1	mg/kg	
	C9- C10 Aromatics	ND	15	5.1	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	BFB	155% [a]		70-130%
460-00-4	BFB	159% [a]		70-130%

(a) Outside control limits due to moisture content.

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V23242526		
Lab Sample ID:	FA36573-2	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	MADEP EPH REV 1.1 SW846 3546	**Percent Solids:**	47.9
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	NN016011.D	1	09/08/16	FS	09/06/16	OP61759	GNN794
Run #2							

	Initial Weight	Final Volume
Run #1	3.3 g	2.0 ml
Run #2		

MAEPH List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	2.5	1.3	mg/kg	
208-96-8	Acenaphthylene	ND	2.5	1.3	mg/kg	
120-12-7	Anthracene	ND	2.5	1.3	mg/kg	
56-55-3	Benzo(a)anthracene	ND	2.5	1.3	mg/kg	
50-32-8	Benzo(a)pyrene	ND	2.5	1.3	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	2.5	1.3	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	2.5	1.3	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	2.5	1.3	mg/kg	
218-01-9	Chrysene	ND	2.5	1.3	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	2.5	1.3	mg/kg	
206-44-0	Fluoranthene	ND	2.5	1.3	mg/kg	
86-73-7	Fluorene	ND	2.5	1.3	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.5	1.3	mg/kg	
91-57-6	2-Methylnaphthalene	ND	2.5	1.3	mg/kg	
91-20-3	Naphthalene	ND	2.5	1.3	mg/kg	
85-01-8	Phenanthrene	ND	2.5	1.3	mg/kg	
129-00-0	Pyrene	ND	2.5	1.3	mg/kg	
	C11-C22 Aromatics (Unadj.)	ND	130	95	mg/kg	
	C11-C22 Aromatics	ND	130	95	mg/kg	
	C9-C18 Aliphatics	ND	130	63	mg/kg	
	C19-C36 Aliphatics	ND	130	63	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
3386-33-2	1-Chlorooctadecane	78%		40-140%
580-13-2	2-Bromonaphthalene	94%		40-140%
84-15-1	o-Terphenyl	71%		40-140%
321-60-8	2-Fluorobiphenyl	81%		40-140%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V23242526		
Lab Sample ID:	FA36573-2	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	SW846 8081B SW846 3546	**Percent Solids:**	47.9
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	KK78609.D	1	09/14/16	NG	09/09/16	OP61809	GKK2537
Run #2 [a]	KK78589.D	10	09/14/16	NG	09/09/16	OP61809	GKK2537

	Initial Weight	Final Volume
Run #1	4.00 g	5.0 ml
Run #2	4.00 g	5.0 ml

Pesticide PPL List

CAS No.	Compound	Result	RL	MDL	Units	Q
309-00-2	Aldrin	ND	0.013	0.0040	mg/kg	
319-84-6	alpha-BHC [b]	ND	0.013	0.0040	mg/kg	
319-85-7	beta-BHC [b]	ND	0.013	0.0040	mg/kg	
319-86-8	delta-BHC	ND	0.013	0.0038	mg/kg	
58-89-9	gamma-BHC (Lindane) [b]	ND	0.013	0.0040	mg/kg	
12789-03-6	Chlordane	ND	0.13	0.052	mg/kg	
60-57-1	Dieldrin	ND	0.013	0.0049	mg/kg	
72-54-8	4,4'-DDD [b]	ND	0.026	0.0045	mg/kg	
72-55-9	4,4'-DDE	ND	0.026	0.0042	mg/kg	
50-29-3	4,4'-DDT	ND [c]	0.26	0.051	mg/kg	
72-20-8	Endrin	ND	0.026	0.0049	mg/kg	
1031-07-8	Endosulfan sulfate	ND	0.026	0.0049	mg/kg	
7421-93-4	Endrin aldehyde	ND	0.026	0.0049	mg/kg	
959-98-8	Endosulfan-I	ND	0.013	0.0038	mg/kg	
33213-65-9	Endosulfan-II	ND	0.013	0.0048	mg/kg	
76-44-8	Heptachlor	ND	0.013	0.0044	mg/kg	
1024-57-3	Heptachlor epoxide	ND	0.013	0.0046	mg/kg	
72-43-5	Methoxychlor	ND [c]	0.26	0.067	mg/kg	
8001-35-2	Toxaphene	ND	0.65	0.26	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	101%	105%	50-122%
2051-24-3	Decachlorobiphenyl	92%	106%	50-133%

(a) Dilution required due to matrix interference.
(b) Associated CCV outside control limits.
(c) Result is from Run# 2

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V23242526		
Lab Sample ID:	FA36573-2	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
		Percent Solids:	47.9
Project:	215122; Sunset Beach, NC		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Antimony	< 1.8	1.8	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Arsenic	6.2	0.88	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Beryllium	< 0.44	0.44	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Cadmium	< 0.35	0.35	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Chromium	24.3	0.88	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Copper	7.5	2.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Lead	7.8	1.8	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Mercury	< 0.079	0.079	mg/kg	1	09/08/16	09/08/16	JL	SW846 7471B [2]	SW846 7471B [4]
Nickel	4.6	3.5	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Selenium	< 1.8	1.8	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Silver	< 0.88	0.88	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Thallium	< 0.88	0.88	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Zinc	23.8	1.8	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA13390
(2) Instrument QC Batch: MA13391
(3) Prep QC Batch: MP30803
(4) Prep QC Batch: MP30806

RL = Reporting Limit

Report of Analysis

Client Sample ID:	V23242526		
Lab Sample ID:	FA36573-2	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
		Percent Solids:	47.9
Project:	215122; Sunset Beach, NC		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
HEM Oil and Grease	< 960	960	mg/kg	1	09/10/16 15:00	KC	SW846 9071B
Solids, Percent	47.9		%	1	09/01/16 12:15	JL	SM19 2540G
Total Organic Carbon	65500	2100	mg/kg	1	09/12/16 13:38	FN	SW846 9060A M

RL = Reporting Limit

Report of Analysis

Client Sample ID:	V2022		
Lab Sample ID:	FA36573-3	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	SW846 8270D BY SIM SW846 3546	**Percent Solids:**	35.8
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	W094791.D	1	09/07/16	MG	09/06/16	OP61755	SW4248
Run #2							

	Initial Weight	Final Volume
Run #1	15.5 g	1.0 ml
Run #2		

BN PAH List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.18	0.072	mg/kg	
208-96-8	Acenaphthylene	ND	0.18	0.072	mg/kg	
120-12-7	Anthracene	ND	0.18	0.045	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.036	0.0090	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.036	0.0090	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.036	0.0090	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.036	0.0090	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.036	0.0090	mg/kg	
218-01-9	Chrysene	ND	0.036	0.0090	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.036	0.0090	mg/kg	
206-44-0	Fluoranthene	ND	0.18	0.045	mg/kg	
86-73-7	Fluorene	ND	0.18	0.072	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.036	0.0090	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.18	0.072	mg/kg	
91-57-6	2-Methylnaphthalene	ND	0.18	0.072	mg/kg	
91-20-3	Naphthalene	ND	0.18	0.072	mg/kg	
85-01-8	Phenanthrene	ND	0.18	0.045	mg/kg	
129-00-0	Pyrene	ND	0.18	0.045	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	96%		40-105%
321-60-8	2-Fluorobiphenyl	90%		43-107%
1718-51-0	Terphenyl-d14	89%		45-119%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V2022		
Lab Sample ID:	FA36573-3	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	MADEP VPH REV 1.1	**Percent Solids:**	35.8
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	UU017069.D	1	09/01/16	CG	n/a	n/a	GUU879
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.74 g	5.1 ml	100 ul
Run #2			

MADEP VPH List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	0.24	0.24	mg/kg	
100-41-4	Ethylbenzene	ND	0.48	0.24	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.48	0.24	mg/kg	
91-20-3	Naphthalene	ND	1.2	0.72	mg/kg	
108-88-3	Toluene	ND	0.48	0.24	mg/kg	
	m,p-Xylene	ND	0.96	0.48	mg/kg	
95-47-6	o-Xylene	ND	0.48	0.24	mg/kg	
	C5- C8 Aliphatics (Unadj.)	ND	24	8.4	mg/kg	
	C9- C12 Aliphatics (Unadj.)	ND	24	8.4	mg/kg	
	C9- C10 Aromatics (Unadj.)	ND	24	8.4	mg/kg	
	C5- C8 Aliphatics	ND	24	8.4	mg/kg	
	C9- C12 Aliphatics	ND	24	8.4	mg/kg	
	C9- C10 Aromatics	ND	24	8.4	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	BFB	105%		70-130%
460-00-4	BFB	108%		70-130%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V2022		
Lab Sample ID:	FA36573-3	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	MADEP EPH REV 1.1 SW846 3546	**Percent Solids:**	35.8
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	NN016012.D	1	09/08/16	FS	09/06/16	OP61759	GNN794
Run #2							

	Initial Weight	Final Volume
Run #1	3.5 g	2.0 ml
Run #2		

MAEPH List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	3.2	1.6	mg/kg	
208-96-8	Acenaphthylene	ND	3.2	1.6	mg/kg	
120-12-7	Anthracene	ND	3.2	1.6	mg/kg	
56-55-3	Benzo(a)anthracene	ND	3.2	1.6	mg/kg	
50-32-8	Benzo(a)pyrene	ND	3.2	1.6	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	3.2	1.6	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	3.2	1.6	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	3.2	1.6	mg/kg	
218-01-9	Chrysene	ND	3.2	1.6	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	3.2	1.6	mg/kg	
206-44-0	Fluoranthene	ND	3.2	1.6	mg/kg	
86-73-7	Fluorene	ND	3.2	1.6	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	3.2	1.6	mg/kg	
91-57-6	2-Methylnaphthalene	ND	3.2	1.6	mg/kg	
91-20-3	Naphthalene	ND	3.2	1.6	mg/kg	
85-01-8	Phenanthrene	ND	3.2	1.6	mg/kg	
129-00-0	Pyrene	ND	3.2	1.6	mg/kg	
	C11-C22 Aromatics (Unadj.)	ND	160	120	mg/kg	
	C11-C22 Aromatics	ND	160	120	mg/kg	
	C9-C18 Aliphatics	ND	160	80	mg/kg	
	C19-C36 Aliphatics	ND	160	80	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
3386-33-2	1-Chlorooctadecane	63%		40-140%
580-13-2	2-Bromonaphthalene	89%		40-140%
84-15-1	o-Terphenyl	65%		40-140%
321-60-8	2-Fluorobiphenyl	78%		40-140%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V2022		
Lab Sample ID:	FA36573-3	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	SW846 8081B SW846 3546	**Percent Solids:**	35.8
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	KK78610.D	1	09/14/16	NG	09/09/16	OP61809	GKK2537
Run #2 [a]	KK78590.D	10	09/14/16	NG	09/09/16	OP61809	GKK2537

	Initial Weight	Final Volume
Run #1	4.30 g	5.0 ml
Run #2	4.30 g	5.0 ml

Pesticide PPL List

CAS No.	Compound	Result	RL	MDL	Units	Q
309-00-2	Aldrin	ND	0.016	0.0049	mg/kg	
319-84-6	alpha-BHC [b]	ND	0.016	0.0050	mg/kg	
319-85-7	beta-BHC [b]	ND	0.016	0.0050	mg/kg	
319-86-8	delta-BHC	ND	0.016	0.0047	mg/kg	
58-89-9	gamma-BHC (Lindane) [b]	ND	0.016	0.0050	mg/kg	
12789-03-6	Chlordane	ND	0.16	0.065	mg/kg	
60-57-1	Dieldrin	ND	0.016	0.0061	mg/kg	
72-54-8	4,4'-DDD [b]	ND	0.032	0.0056	mg/kg	
72-55-9	4,4'-DDE	ND	0.032	0.0052	mg/kg	
50-29-3	4,4'-DDT	ND [c]	0.32	0.064	mg/kg	
72-20-8	Endrin	ND	0.032	0.0060	mg/kg	
1031-07-8	Endosulfan sulfate	ND	0.032	0.0061	mg/kg	
7421-93-4	Endrin aldehyde	ND	0.032	0.0060	mg/kg	
959-98-8	Endosulfan-I	ND	0.016	0.0047	mg/kg	
33213-65-9	Endosulfan-II	ND	0.016	0.0060	mg/kg	
76-44-8	Heptachlor	ND	0.016	0.0055	mg/kg	
1024-57-3	Heptachlor epoxide	ND	0.016	0.0057	mg/kg	
72-43-5	Methoxychlor	ND [c]	0.32	0.083	mg/kg	
8001-35-2	Toxaphene	ND	0.81	0.32	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	101%	110%	50-122%
2051-24-3	Decachlorobiphenyl	92%	110%	50-133%

(a) Dilution required due to matrix interference.
(b) Associated CCV outside control limits.
(c) Result is from Run# 2

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V2022		
Lab Sample ID:	FA36573-3	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
		Percent Solids:	35.8
Project:	215122; Sunset Beach, NC		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Antimony	< 2.5	2.5	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Arsenic	15.7	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Beryllium	0.94	0.62	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Cadmium	< 0.50	0.50	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Chromium	48.7	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Copper	11.6	3.1	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Lead	23.9	2.5	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Mercury	< 0.11	0.11	mg/kg	1	09/08/16	09/08/16	JL	SW846 7471B [2]	SW846 7471B [4]
Nickel	11.8	5.0	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Selenium	< 2.5	2.5	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Silver	< 1.2	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Thallium	< 1.2	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Zinc	51.0	2.5	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA13390
(2) Instrument QC Batch: MA13391
(3) Prep QC Batch: MP30803
(4) Prep QC Batch: MP30806

RL = Reporting Limit

Report of Analysis

Client Sample ID:	V2022		
Lab Sample ID:	FA36573-3	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
		Percent Solids:	35.8
Project:	215122; Sunset Beach, NC		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
HEM Oil and Grease	< 550	550	mg/kg	1	09/10/16 15:00	KC	SW846 9071B
Solids, Percent	35.8		%	1	09/01/16 12:15	JL	SM19 2540G
Total Organic Carbon	111000	2800	mg/kg	1	09/12/16 14:34	FN	SW846 9060A M

RL = Reporting Limit

Report of Analysis

Client Sample ID:	V1618		
Lab Sample ID:	FA36573-4	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	SW846 8270D BY SIM SW846 3546	**Percent Solids:**	63.1
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	W094792.D	1	09/07/16	MG	09/06/16	OP61755	SW4248
Run #2							

	Initial Weight	Final Volume
Run #1	15.3 g	1.0 ml
Run #2		

BN PAH List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	0.10	0.041	mg/kg	
208-96-8	Acenaphthylene	ND	0.10	0.041	mg/kg	
120-12-7	Anthracene	ND	0.10	0.026	mg/kg	
56-55-3	Benzo(a)anthracene	ND	0.021	0.0052	mg/kg	
50-32-8	Benzo(a)pyrene	ND	0.021	0.0052	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	0.021	0.0052	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	0.021	0.0052	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	0.021	0.0052	mg/kg	
218-01-9	Chrysene	ND	0.021	0.0052	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	0.021	0.0052	mg/kg	
206-44-0	Fluoranthene	ND	0.10	0.026	mg/kg	
86-73-7	Fluorene	ND	0.10	0.041	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	0.021	0.0052	mg/kg	
90-12-0	1-Methylnaphthalene	ND	0.10	0.041	mg/kg	
91-57-6	2-Methylnaphthalene	ND	0.10	0.041	mg/kg	
91-20-3	Naphthalene	ND	0.10	0.041	mg/kg	
85-01-8	Phenanthrene	ND	0.10	0.026	mg/kg	
129-00-0	Pyrene	ND	0.10	0.026	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-60-0	Nitrobenzene-d5	79%		40-105%
321-60-8	2-Fluorobiphenyl	82%		43-107%
1718-51-0	Terphenyl-d14	85%		45-119%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V1618		
Lab Sample ID:	FA36573-4	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	MADEP VPH REV 1.1	**Percent Solids:**	63.1
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	UU017070.D	1	09/01/16	CG	n/a	n/a	GUU879
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	5.28 g	5.1 ml	100 ul
Run #2			

MADEP VPH List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	0.11	0.11	mg/kg	
100-41-4	Ethylbenzene	ND	0.21	0.11	mg/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.21	0.11	mg/kg	
91-20-3	Naphthalene	ND	0.53	0.32	mg/kg	
108-88-3	Toluene	0.112	0.21	0.11	mg/kg	J
	m,p-Xylene	ND	0.42	0.21	mg/kg	
95-47-6	o-Xylene	ND	0.21	0.11	mg/kg	
	C5- C8 Aliphatics (Unadj.)	ND	11	3.7	mg/kg	
	C9- C12 Aliphatics (Unadj.)	ND	11	3.7	mg/kg	
	C9- C10 Aromatics (Unadj.)	ND	11	3.7	mg/kg	
	C5- C8 Aliphatics	ND	11	3.7	mg/kg	
	C9- C12 Aliphatics	ND	11	3.7	mg/kg	
	C9- C10 Aromatics	ND	11	3.7	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	BFB	104%		70-130%
460-00-4	BFB	106%		70-130%

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RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V1618		
Lab Sample ID:	FA36573-4	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	MADEP EPH REV 1.1 SW846 3546	**Percent Solids:**	63.1
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	NN016013.D	1	09/08/16	FS	09/06/16	OP61759	GNN794
Run #2							

	Initial Weight	Final Volume
Run #1	3.2 g	2.0 ml
Run #2		

MAEPH List

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	2.0	0.99	mg/kg	
208-96-8	Acenaphthylene	ND	2.0	0.99	mg/kg	
120-12-7	Anthracene	ND	2.0	0.99	mg/kg	
56-55-3	Benzo(a)anthracene	ND	2.0	0.99	mg/kg	
50-32-8	Benzo(a)pyrene	ND	2.0	0.99	mg/kg	
205-99-2	Benzo(b)fluoranthene	ND	2.0	0.99	mg/kg	
191-24-2	Benzo(g,h,i)perylene	ND	2.0	0.99	mg/kg	
207-08-9	Benzo(k)fluoranthene	ND	2.0	0.99	mg/kg	
218-01-9	Chrysene	ND	2.0	0.99	mg/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	2.0	0.99	mg/kg	
206-44-0	Fluoranthene	ND	2.0	0.99	mg/kg	
86-73-7	Fluorene	ND	2.0	0.99	mg/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	2.0	0.99	mg/kg	
91-57-6	2-Methylnaphthalene	ND	2.0	0.99	mg/kg	
91-20-3	Naphthalene	ND	2.0	0.99	mg/kg	
85-01-8	Phenanthrene	ND	2.0	0.99	mg/kg	
129-00-0	Pyrene	ND	2.0	0.99	mg/kg	
	C11-C22 Aromatics (Unadj.)	ND	99	74	mg/kg	
	C11-C22 Aromatics	ND	99	74	mg/kg	
	C9-C18 Aliphatics	ND	99	50	mg/kg	
	C19-C36 Aliphatics	ND	99	50	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
3386-33-2	1-Chlorooctadecane	69%		40-140%
580-13-2	2-Bromonaphthalene	102%		40-140%
84-15-1	o-Terphenyl	74%		40-140%
321-60-8	2-Fluorobiphenyl	90%		40-140%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V1618		
Lab Sample ID:	FA36573-4	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
Method:	SW846 8081B SW846 3546	**Percent Solids:**	63.1
Project:	215122; Sunset Beach, NC		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	KK78611.D	1	09/14/16	NG	09/09/16	OP61809	GKK2537
Run #2 [a]	KK78591.D	10	09/14/16	NG	09/09/16	OP61809	GKK2537

	Initial Weight	Final Volume
Run #1	4.50 g	5.0 ml
Run #2	4.50 g	5.0 ml

Pesticide PPL List

CAS No.	Compound	Result	RL	MDL	Units	Q
309-00-2	Aldrin	ND	0.0088	0.0027	mg/kg	
319-84-6	alpha-BHC [b]	ND	0.0088	0.0027	mg/kg	
319-85-7	beta-BHC [b]	ND	0.0088	0.0027	mg/kg	
319-86-8	delta-BHC	ND	0.0088	0.0026	mg/kg	
58-89-9	gamma-BHC (Lindane) [b]	ND	0.0088	0.0027	mg/kg	
12789-03-6	Chlordane	ND	0.088	0.035	mg/kg	
60-57-1	Dieldrin	ND	0.0088	0.0033	mg/kg	
72-54-8	4,4'-DDD [b]	ND	0.018	0.0030	mg/kg	
72-55-9	4,4'-DDE	ND	0.018	0.0028	mg/kg	
50-29-3	4,4'-DDT	ND [c]	0.18	0.035	mg/kg	
72-20-8	Endrin	ND	0.018	0.0033	mg/kg	
1031-07-8	Endosulfan sulfate	ND	0.018	0.0033	mg/kg	
7421-93-4	Endrin aldehyde	ND	0.018	0.0033	mg/kg	
959-98-8	Endosulfan-I	ND	0.0088	0.0026	mg/kg	
33213-65-9	Endosulfan-II	ND	0.0088	0.0033	mg/kg	
76-44-8	Heptachlor	ND	0.0088	0.0030	mg/kg	
1024-57-3	Heptachlor epoxide	ND	0.0088	0.0031	mg/kg	
72-43-5	Methoxychlor	ND [c]	0.18	0.045	mg/kg	
8001-35-2	Toxaphene	ND	0.44	0.18	mg/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
877-09-8	Tetrachloro-m-xylene	101%	116%	50-122%
2051-24-3	Decachlorobiphenyl	89%	113%	50-133%

(a) Dilution required due to matrix interference.
(b) Associated CCV outside control limits.
(c) Result is from Run# 2

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	V1618		
Lab Sample ID:	FA36573-4	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
		Percent Solids:	63.1
Project:	215122; Sunset Beach, NC		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Antimony	< 1.2	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Arsenic	3.4	0.58	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Beryllium	0.30	0.29	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Cadmium	< 0.23	0.23	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Chromium	17.0	0.58	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Copper	3.7	1.4	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Lead	6.0	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Mercury	< 0.061	0.061	mg/kg	1	09/08/16	09/08/16	JL	SW846 7471B [2]	SW846 7471B [4]
Nickel	3.3	2.3	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Selenium	< 1.2	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Silver	< 0.58	0.58	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Thallium	< 0.58	0.58	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]
Zinc	16.3	1.2	mg/kg	1	09/07/16	09/08/16	LM	SW846 6010D [1]	SW846 3050B [3]

(1) Instrument QC Batch: MA13390
(2) Instrument QC Batch: MA13391
(3) Prep QC Batch: MP30803
(4) Prep QC Batch: MP30806

RL = Reporting Limit

Report of Analysis

Client Sample ID:	V1618		
Lab Sample ID:	FA36573-4	**Date Sampled:**	08/30/16
Matrix:	SO - Soil	**Date Received:**	08/31/16
		Percent Solids:	63.1
Project:	215122; Sunset Beach, NC		

General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
HEM Oil and Grease	< 310	310	mg/kg	1	09/10/16 15:00	KC	SW846 9071B
Solids, Percent	63.1		%	1	09/01/16 12:15	JL	SM19 2540G
Total Organic Carbon	33700	1600	mg/kg	1	09/12/16 15:04	FN	SW846 9060A M

RL = Reporting Limit