

Geotechnical Data Report

for

Virginia Key (111) Shoreline Stabilization Project,
Dade County, Florida

Prepared by

Geotechnical Branch

Engineering Division

Jacksonville District Corps of Engineers

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SECTION 00320

GEOTECHNICAL DATA

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SECTION 00320

GEOTECHNICAL DATA

1.1 SCOPE

The information provided in this section encompasses the geotechnical field investigations relevant to this project. The investigations consist of borings with the associated boring logs and laboratory data presented in paragraphs 1.4.5 and 1.4.6, respectively. A character of materials paragraph is included to provide a comprehensive description of the materials utilizing both recent and historical knowledge of the project area. Also included in this section are definitions of terms and boring log notes, which provide additional explanation of the boring logs and drilling techniques. Any questions that pertain to the information provided in this section should be addressed to Chief, Geotechnical Branch at (904) 232-1616.

Items discussed in the character of materials paragraph may not appear explicitly on the core boring logs. Based on historic knowledge of the project area, the character of materials paragraph includes items that supplement the data documented by the core boring logs. When reviewing core boring logs, use all data on the logs, including the materials description, legend, and blow counts. When evaluating the subsurface conditions, use all data, including the character of materials paragraph and core boring logs.

1.2 CHARACTER OF MATERIALS

1.2.1 Regional Geology

The landforms of the coastal area of Dade County include barrier islands, lagoons, estuaries, and coastal ridges. The Atlantic Coastal Ridge ranges from 2 to 4 miles wide and lies between the sandy flatlands of the Everglades to the west and the coastal marshes or ocean to the east. In the Miami area, the Atlantic Coastal Ridge shows the expression of the Silver Bluff shoreline of the Late Wisconsin Interglacial Period.

The nearshore shelf off Dade County consists of Pleistocene rock reefs separated by sandy plateaus. The sand filled swales between the rock reefs is of a thickness and quality that it has

been used as a primary borrow source from Dade to Palm Beach County.

Virginia Key is a barrier island located along eastern Biscayne Bay and north of Key Biscayne on the Atlantic coast of Dade County, Florida. The island likely developed on a shallow, sandy, limestone reef where a mangrove population developed, trapping additional sediments and creating a stable island. Holocene sands that make up the island are underlain by the limestone units of the Miami Oolite Formation.

1.2.2 Materials Encountered

The material encountered along the shore is composed of medium dense, poorly-graded sand, to a depth of 17 to 22 feet, overlying limestone. The easternmost core boring (CB-VK01-1) encountered a 1-foot layer of peat about 3.5 feet deep and a 1-foot layer of clay about 8 feet deep. An exposed scarp in the vicinity of the easternmost core boring shows exposed layers of peat and gray lean clay 1 to 2 feet high along the beach.

The character of the material in the sand mounds is indicated in the test pit laboratory data (designated TP) at the end of this section. Sand mounds 1 and 2 are stockpiles of sand that were excavated from Key Biscayne and stored at the present locations. They contain fine to medium-grained, poorly-graded sand. The sand is composed of quartz and carbonate grains. An average visual estimate of shell content for sand mound 1 is 56 percent and 34 percent for sand mound 2. The silt content is 8 percent for both sand mounds. Vegetation presently covers the sand mounds. The core borings show rock to be just below the tip elevation of the piles. Difficult pile driving should be expected above the rock surface.

1.3 DEFINITIONS

Terms commonly used in the boring logs shall be defined as:

Banded - Rock from 0.02 to 0.1-foot thick.

Carbonate - Soil component that reacts with HCl of an indeterminate origin (shell, rock, etc.).

Cavity - Voids greater than the diameter of the core.

Decomposed - Saprolite; rock is essentially reduced to a soil with a relic rock texture; can be molded or crumbled by hand.

Dense - Equivalent to SPT N-value of 30 to 50.

Fill - Material that has been placed by man, described with all soil characteristics.

Firm - Thumb will indent soil about $\frac{1}{4}$ inch (6 mm).

Hard - Soil that can be indented with difficulty by thumbnail or rock that is difficult to scratch with knife (cannot be pitted with a geology hammer but can be chipped with moderate blows of the hammer).

Highly Weathered - Entire rock section is discolored; alteration is greater than 50%; some areas of slightly weathered rock are present; some minerals are leached away; retains only a fraction of its original strength (wet strength usually lower than dry strength).

Incompetent - Rock that disintegrates while coring; weak.

Indurated - Rock or soil hardened or consolidated by pressure or cementation. Very difficult to break by hand.

Layer - Rock or soil with thickness of 6 inches or less.

Laminated - Alternating layers of varying material or color with layers less than 6 mm thick.

Lens - A geologic deposit of variable thickness, which disappears laterally in all directions and cannot be correlated to adjacent borings.

Massive Bedded - Rock over 3-foot thick.

Moderately Hard - Rock that can be scratched easily with a knife; cannot be scratched with fingernail (can be pitted with moderate blows of geology hammer).

Moderately Weathered - Discoloration is evident; rock surface is pitted and altered, with alterations penetrating well below rock surfaces; 10% to 50% of the rock is altered; strength is noticeably less than unweathered rock.

Pitted - Rock with voids 0.03 (1 mm) to 0.02-foot (6 mm) diameter.

Poorly-Indurated - See semi-indurated.

Rock - A naturally occurring substance composed of one or more minerals bound together. This geologic term includes a range of engineering properties: strength, hardness, permeability, weathering, and discontinuity. These properties are noted or can be inferred from the boring logs as blow counts, penetration rate, RQD, hardness, etc.

Seam - Rock or soil with average thickness of 2 to 3 inches.

Semi-Indurated - Rock or soil with a lesser degree of hardening or consolidation by pressure or cementation. Crumbles with little effort by hand.

Shell - Material composed of predominantly (>75%) coarse-grained sand to gravel-sized whole or broken shell.

Slightly Weathered - Rock with superficial discoloration, alteration and/or discoloration along discontinuities; less than

10 % of the rock volume is altered; strength is essentially unaffected.

Soft - Thumb will penetrate soil about 1 inch (25 mm).

Thick Bedded - Rock from 1 to 3-foot thick.

Thin Bedded - Rock from 0.1 to 0.3-foot thick.

Unweathered - Rock with no evidence of any mechanical or chemical alteration.

Very Hard - Rock that cannot be scratched with a knife (chips can be broken off only with heavy blows of the geology hammer).

Vuggy - Rock with voids 0.02 foot (6 mm) to the diameter of the core.

1.4 GEOTECHNICAL DATA

1.4.1 Summary of Borings

The coordinates presented in the table below correspond to the project coordinate system and datum utilized throughout these plans and specifications, which may or may not correspond to the original coordinate system and datum indicated on the boring logs.

Boring Designation	State Plane, FL-East, NAD27		Project Location
	X	Y	
CB-VK01-1	779379	511185	Beach Groin Field Foundation
CB-VK01-2	778669	510636	Beach Groin Field Foundation
CB-VK01-3	777740	510105	Beach Groin Field Foundation
CB-VK01-7	779441	511218	Beach Groin Field Foundation
CB-VK01-8	779156	511087	Beach Groin Field Foundation
CB-VK01-9	778925	510910	Beach Groin Field Foundation
CB-VK01-10	777194	509690	Beach Groin Field Foundation

1.4.2 Summary of Laboratory Data

Boring Designation	Sample Designation	USCS	Visual Shell %
CB-VK01-7	3	SP-SM	
CB-VK01-7	7	SP-SM	
CB-VK01-8	1	SM	
CB-VK01-8	4	SM	
CB-VK01-9	5	SP-SM	
TP-VKSM201-1	2	SP	50
TP-VKSM201-1	4	SP	58
TP-VKSM201-1	8	SP	37

Boring Designation	Sample Designation	USCS	Visual Shell %
TP-VKSM201-2	2	SP-SM	27
TP-VKSM201-2	6	SP-SM	46
TP-VKSM201-2	9	SP-SM	27
TP-VKSM201-3	2	SP-SM	30
TP-VKSM201-3	3.5	SP-SM	38
TP-VKSM201-3	5	SP-SM	32
TP-VKSM201-4	2	SP-SM	17
TP-VKSM201-4	5	SP-SM	29
TP-VKSM201-4	7	SM	13

1.4.3 Boring Log Notes

Borings CB-VK01-1, CB-VK01-2, CB-VK01-3, CB-VK01-7, CB-VK01-8, CB-VK01-9, and CB-VK01-10 were driven using the Standard Penetration Test (SPT) procedure with a 140 lb. hammer with a 30-inch drop using a 2.0-foot split spoon (1 3/8-inch I.D. and 2-inch O.D.) until refusal was encountered. Refusal is defined as a total of 50 blows of the hammer within any 6-inch increment, a total of 100 blows of the hammer within any 1-foot increment, or no observed advance of the sampler after 10 successive blows of the hammer. After refusal, the borings were continued with a NX diameter core barrel until the rate of penetration indicated softer material, at which point the SPT procedure was resumed.

1.4.4 Recovered Materials

The material recovered from borings CB-VK01-1, CB-VK01-2, CB-VK01-3, CB-VK01-7, CB-VK01-8, CB-VK01-9, and CB-VK01-10 is available for inspection by prospective offerors at the Corps of Engineers District Warehouse listed under 1a below:

1. Florida

a) Jacksonville

Address: 3077 Talleyrand Avenue
Jacksonville, FL

Hours: 07:00 am to 2:30 pm

b) Clewiston

Address: 525 Ridgelawn Road
Clewiston, FL

2. Puerto Rico and the US Virgin Islands

a) San Juan

Address: 400 Fernandez Juncos
Parada 7.5
Puerta de Tierra, PR

b) Ponce

Address: PR 139, Km 6.1
Ponce, PR

The recovered materials will be available for inspection during normal business hours as noted above, except Federal holidays, during the entire bid period. Prospective offerors shall notify the Jacksonville District Explorations Manager at 904-232-3295; Chief, Geology Section at 904-232-1620; or Chief, Geotechnical Branch at 904-232-1616 at least four working days before the visit. The following information will be required to schedule the visit: (1) the project title; (2) the specific borings or entire set which are to be viewed; (3) the date, time, and duration of the visit; (4) the name of the person(s) and company to view the borings; and (5) a point of contact and phone number regarding the visit. Offerors shall record their material examination visit in a record book maintained at the inspection site.

It is strongly suggested that all contractors view the samples before submitting their bid. A statement shall be provided with the bid stating that it was prepared after inspection of the samples. If no such statement is submitted, the Government could find the bid non-responsive.

1.4.5 Boring Logs

Applicable boring logs are presented on the following pages.

While the Government's borings are representative of subsurface conditions at their respective locations and vertical reaches, local variations characteristic of the rocks and subsurface materials of this region are to be expected. Accordingly, offerors shall form their own conclusions from the examination of the recovered materials prior to submission of their offer.

Hole No. CB-VK01-1

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 2			
1. PROJECT Virginia Key		South Atlantic	Jacksonville District				
2. LOCATION (Coordinates or Station) X=779,378 Y=511,185			10. SIZE AND TYPE OF BIT See Remarks				
3. DRILLING AGENCY Corps of Engineers			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW; Horizontal Datum: FLE NAD27 US Ft				
4. HOLE NO. (As shown on drawing title and file number) CB-VK01-1			12. MANUFACTURER'S DESIGNATION OF DRILL CME 45				
5. NAME OF DRILLER L. WOOTERS			13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 18 undisturbed: 0				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED			14. TOTAL NUMBER OF CORE BOXES 2				
7. THICKNESS OF BURDEN 0 Ft.			15. ELEVATION GROUND WATER 1.3 ft.				
8. DEPTH DRILLED INTO ROCK 0 Ft.			16. DATE HOLE STARTED COMPLETED 01/30/01 01/30/01				
9. TOTAL DEPTH OF HOLE 27.5 Ft.			17. ELEVATION TOP OF HOLE 4.8 Ft.				
			18. TOTAL CORE RECOVERY FOR BORDING 88 %				
			19. SIGNATURE OF GEOLOGIST S. MYERS				
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS Bit & Barrel	BLOWS/15'
4.8	0.0					4.8	
			SAND, poorly-graded, mostly fine to medium grained quartz and carbonate, trace of wood, dry, tan (SP)	20	1	SPT	1
						3.3	2
							4
			At 2.3', Little shell fragments up to 1/4", moist, gray	40	2	SPT	4
						1.8	7
							4
1.3	3.5		PEAT, trace quartz sand, wet, fibrous, brown (PT)	93	3	SPT	4
						.3	5
							7
			SAND, poorly-graded, mostly fine to medium grained carbonate and quartz, some shell fragments <2mm, wet, gray (SP)	80	4	SPT	5
						-1.2	8
							10
						-2.7	3
							2
							3
							2
-3.8	8.4		CLAY, fat, medium plasticity, some silt, calcareous, moist, light grey (CH)	87	6	SPT	1
						-4.2	10
							1
			SAND, poorly-graded, fine to medium grained, some shells, calcareous, wet (SP)	40	7	SPT	1
						-5.7	WOH
							1
							2
							1
			SILT, inorganic-H, calcareous, wet, imbedded silt and very fine sand, light grey (MH)	100	8	SPT	1
						-7.2	3
							4
						-8.7	6
							12
			SAND, poorly-graded, mostly fine to coarse grained quartz, some round to subangular shell fragments, weak reaction to HCl, black and white (SP)	100	10	SPT	17
						-10.2	50
							12
						-11.7	15
							15
							34
							5
						-13.2	12
							23
							7
							15
						-14.7	23
							13
			LIMESTONE, fine grained, massive, vuggy, poorly cemented, few mostly graded oolites and shell fragments	67	14	SPT	17
						-16.2	13
							12
							15
						-17.7	28
						(continued)	

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PROJECT Virginia Key HOLE NUMBER CB-VK01-1

DRILLING LOG (Cont. Sheet)		ELEVATION TOP OF HOLE		SHEET 2 OF 2			
PROJECT			INSTALLATION				
Virginia Key			Jacksonville District				
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS Bit & Barrel	BLOWS/5'
-17.7	22.5					-17.7	
				36	16	NX Diamond Bit D.T. = 7 min	22.5 25 27.5
-22.7	27.5					-22.7	
			<p>Note:</p> <ol style="list-style-type: none"> Soils are visually classified in accordance with the Unified Soils Classification System. Elevation determined from temporary tide staffs set to high tide on 1/29/01 at 2.24 ft above MLLW at Virginia Key tide gauge. Tide gauge located on Miami University School of Marine Science, 1/4 mile south of the project site. Sand Pile Sample #1: Location: 303' N83W of CB-VK01-1 on vertical open face of pile. Photo taken. Dug into face 12". No sample collected. <100% passing 3/4". Description: SAND, poorly-graded, mostly fine grained carbonate, few shells and shell fragments up to 1 3/8", trace quartz, trace silt, strong reaction with HCl, moist, tan (SP) Sand Pile Sample #2: Location: 510' S69W of CB-VK01-1 on open face of pile 45' from beach. Photo taken. Dug into face 12" for sample. No sample collected because shells exceeded 3/4" in diameter. Description: SAND, poorly-graded, mostly fine to medium grained angular to subrounded carbonate and quartz, few shells 1/4" to 1 1/2", trace silt, moist, tan (SP) 			140# hammer w/30" drop used with 2.0' split spoon (1 3/8" I.D. X 2" O.D.).	27.5 30 32.5 35 37.5 40 42.5 45 47.5 50

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PROJECT
Virginia Key

HOLE NUMBER
CB-VK01-1

DRILLING LOG (Cont. Sheet)		ELEVATION TOP OF HOLE	
PROJECT		5.1 Ft.	
Virginia Key		INSTALLATION	
		Jacksonville District	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS Bit & Barrel	BLOWS/ ft	
-17.4	22.5							
				47	16	SPT	10	
							18	
							22	
				47	17	SPT	14	
							12	
-19.9	25.0							
			Note: 1. Soils are visually classified in accordance with the Unified Soils Classification System.			140# hammer w/30" drop used with 2.0' split spoon (1 3/8" I.D. X 2" O.D.).		

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PROJECT	HOLE NUMBER
Virginia Key	CB-VK01-2

DRILLING LOG Hole No. **CB-VK01-3**

1. PROJECT Virginia Key	DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 2
2. LOCATION (Coordinates or Station) X=777,740 Y=510,105		10. SIZE AND TYPE OF BIT See Remarks	
3. DRILLING AGENCY Corps of Engineers		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MLLW; Horizontal Datum: FLE NAD27 US Ft	
4. HOLE NO. (As shown on drawing title and file number) CB-VK01-3		12. MANUFACTURER'S DESIGNATION OF DRILL CME 45	
5. NAME OF DRILLER L. WOOTERS		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN disturbed: 17 undisturbed: 0	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		14. TOTAL NUMBER OF CORE BOXES 2	
7. THICKNESS OF BURDEN 0 Ft.		15. ELEVATION GROUND WATER -0.8 ft.	
8. DEPTH DRILLED INTO ROCK 0 Ft.		16. DATE HOLE STARTED COMPLETED 01/31/01 01/31/01	
9. TOTAL DEPTH OF HOLE 25.0 Ft.		17. ELEVATION TOP OF HOLE 3.8 Ft.	
		18. TOTAL CORE RECOVERY FOR BORING 72 %	
		19. SIGNATURE OF GEOLOGIST S. MYERS	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS Bit & Barrel	BLOWS/ft.
3.8	0.0		SAND, poorly-graded, fine to medium grained subangular quartz and carbonate, strong reaction to HCl, moist, tan (SP)	87	1	3.8	0
			At -3.8', fine to coarse grained, some shell fragments	53	2	2.3	1
			At 5.4', gray and wet	87	3	.8	3
			At 8.3', trace silt	100	4	-.7	6
				53	5	-2.2	7
				87	6	-3.7	4
				67	7	-5.2	7
				67	8	-6.7	9
				67	9	-8.2	4
			At 14.1', well-graded layer, fine grained	73	10	-9.7	8
				53	11	-11.2	35
				53	12	-12.7	24
				60	13	-14.2	36
				67	14	-15.7	22
				100	15	-17.2	19
				87	16	-18.2	23
					17		78
					12		12
					19		19
					23		23
					12		12
					16		16
					15		15

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PROJECT Virginia Key	HOLE NUMBER CB-VK01-3
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DRILLING LOG (Cont. Sheet)

Hole No. CB-VK01-3

ELEVATION TOP OF HOLE
3.8 Ft.

SHEET 2
OF 2

PROJECT
Virginia Key

INSTALLATION
Jacksonville District

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC #	SAMPLE NUMBER	REMARKS Bit & Barrel	BLOWS/ 's
-18.7	22.5		grained, vuggy, fossiliferous, oolitic, weakly cemented, tan	87	8		10
						SPT	18
							22
-21.2	25.0			100	17	SPT	14
							12
Notes:			140# hammer w/30" drop used with 2.0' split spoon (1 3/8" I.D. X 2" O.D.).				
1. Soils are visually classified in accordance with the Unified Soils Classification System.							
2. Location approximately 5 ft west of high tide mark.							

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PROJECT
Virginia Key

HOLE NUMBER
CB-VK01-3

DRILLING LOG		DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 2 SHEETS
1. PROJECT Virginia Key FL Beach Groin Field Foundation			9. SIZE AND TYPE OF BIT See Remarks	
2. BORING DESIGNATION CB-VK01-7		10. COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)		
3. DRILLING AGENCY Corps Of Engineers		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER		
4. NAME OF DRILLER Larry Wooters		12. TOTAL SAMPLES DISTURBED: 17, UNDISTURBED (UD): 0		
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		13. TOTAL NUMBER CORE BOXES 2		
6. THICKNESS OF OVERBURDEN 0.0 Ft.		14. ELEVATION GROUND WATER 0.5 Ft.		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.		15. DATE BORING STARTED: 10-16-01, COMPLETED: 10-16-01		
8. TOTAL DEPTH OF BORING 25.5 Ft.		16. ELEVATION TOP OF BORING 2.0 Ft.		
		17. TOTAL RECOVERY FOR BORING 72 %		
		18. SIGNATURE AND TITLE OF INSPECTOR Steve Myers, Geologist		

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/0.5 FT.	N-VALUE
2.0	0.0						2.0		
			SAND, silty, mostly fine to coarse-grained carbonate, some angular to subrounded quartz, little silt, tan (SM)	3	1		SPT Sampler	WOH	0
			At El. 0.5 Ft., wet	40	2		SPT Sampler	WOH	2
				100	3		SPT Sampler	WOH	9
-2.5	4.5		From El. -2.0 to -2.2 Ft., peat bed						
			SAND, clayey, mostly angular to subrounded fine to medium-grained carbonate, some silt, few clay, wet, gray (SC)	40	4		SPT Sampler	2	5
-4.0	6.0								
			SAND, poorly-graded, mostly fine to coarse-grained quartz, some subangular to rounded carbonate, trace silt, wet, gray (SP)	100	5		SPT Sampler	2	8
				73	6		SPT Sampler	7	20
				100	7		SPT Sampler	12	53
				100	8		SPT Sampler	21	56
				87	9		SPT Sampler	32	24
				93	10		SPT Sampler	4	40
								9	
								15	
								4	
								18	
								22	
									15

DRILLING LOG (Cont. Sheet)			INSTALLATION Jacksonville District			SHEET 2 OF 2 SHEETS												
PROJECT Virginia Key FL			COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)		HORIZONTAL NAD27	VERTICAL NGVD29												
LOCATION COORDINATES X = 779,441 Y = 511,218			ELEVATION TOP OF BORING 2.0 Ft.															
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/0.5 FT.	N-VALUE									
-17.5	19.5	[Dotted Pattern]		73	11		SPT Sampler	8 18 27	45									
						53	12		SPT Sampler	9 14 20	34							
						80	13		SPT Sampler	5 18 25	43							
		[Vertical Lines]	SAND, silty, mostly fine to medium-grained quartz, some angular to rounded carbonate, little silt, strong reaction with HCl, wet, gray (SM)	60	14		SPT Sampler	4 13 28	41									
						100	15		SPT Sampler	17 40 45	85							
						53	16		SPT Sampler	10 27 34	61							
				67	17		SPT Sampler	5 16 31	47									
-23.5	25.5								25									
			NOTES: 1. Soils are field visually classified in accordance with the Unified Soils Classification System. 2. Laboratory Testing Results <table border="1"> <thead> <tr> <th>SAMPLE ID</th> <th>SAMPLE DEPTH</th> <th>LABORATORY CLASSIFICATION</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>3.0/4.5</td> <td>SP-SM*</td> </tr> <tr> <td>7</td> <td>9.0/10.5</td> <td>SP-SM*</td> </tr> </tbody> </table> *Lab visual classification based on gradation curve. No Atterberg limits.	SAMPLE ID	SAMPLE DEPTH	LABORATORY CLASSIFICATION	3	3.0/4.5	SP-SM*	7	9.0/10.5	SP-SM*				140# hammer w/30" drop used with 2.0' split spoon (1-3/8" I.D. x 2" O.D.). Abbreviations: WOH = Weight of Hammer.		
SAMPLE ID	SAMPLE DEPTH	LABORATORY CLASSIFICATION																
3	3.0/4.5	SP-SM*																
7	9.0/10.5	SP-SM*																

DRILLING LOG		DIVISION South Atlantic	INSTALLATION Jacksonville District		SHEET 1 OF 2 SHEETS
1. PROJECT Virginia Key FL Beach Groin Field Foundation			9. SIZE AND TYPE OF BIT See Remarks		
2. BORING DESIGNATION CB-VK01-8		LOCATION COORDINATES X = 779,156 Y = 511,087		10. COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)	HORIZONTAL NAD27
3. DRILLING AGENCY Corps Of Engineers		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL CME-45 (land-based)	
4. NAME OF DRILLER Larry Wooters			12. TOTAL SAMPLES		UNDISTURBED (UD) 0
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES 1	
6. THICKNESS OF OVERBURDEN 0.0 Ft.			14. ELEVATION GROUND WATER 0.8 Ft.		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.			15. DATE BORING		STARTED 10-17-01
8. TOTAL DEPTH OF BORING 25.5 Ft.			16. ELEVATION TOP OF BORING 5.5 Ft.		COMPLETED 10-17-01
			17. TOTAL RECOVERY FOR BORING 69 %		
			18. SIGNATURE AND TITLE OF INSPECTOR Steve Myers, Geologist		

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/0.5 FT.	N-VALUE	
5.5	0.0						5.5			
			SAND, silty, mostly subangular fine to medium-grained carbonate, little silt, trace angular to subrounded quartz, trace fine gravel-sized limestone, dry, tan (SM)	40	1		SPT Sampler	2		
								4	11	
							4.0	7		
					47	2		SPT Sampler	3	
							2.5	5	11	
								6		
					67	3		SPT Sampler	4	
							1.0	7	16	
								9		
					60	4		SPT Sampler	3	5
						-0.5	5	12		
							7			
				100	5		SPT Sampler	10	25	
						-2.0	15			
							3			
				40	6		SPT Sampler	5	13	
						-3.5	8			
							3			
				73	7		SPT Sampler	7	19	
						-5.0	12	10		
							8			
				73	8		SPT Sampler	11	17	
						-6.5	6			
							7			
				67	9		SPT Sampler	18	29	
						-8.0	11			
							5			
				80	10		SPT Sampler	14	30	
						-9.5	16	15		

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JUN 02

(Continued)

DRILLING LOG (Cont. Sheet)	INSTALLATION Jacksonville District	SHEET 2 OF 2 SHEETS
PROJECT Virginia Key FL	COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)	HORIZONTAL NAD27
LOCATION COORDINATES X = 779,156 Y = 511,087	VERTICAL NGVD29	
ELEVATION TOP OF BORING 5.5 Ft.		

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OF SAMPLE	RQD OR UD	REMARKS	BLOWS/0.5 FT.	N-VALUE
				53	11		SPT Sampler	5	
							-11.0	19	60
								41	
				100	12		SPT Sampler	13	
			At El. -12.3 Ft., trace fine gravel-sized limestone, brown				-12.5	19	55
								36	
				100	13		SPT Sampler	18	
			At El. -14.1 Ft., trace wood debris				-14.0	39	124
								85	
				87	14		SPT Sampler	11	
							-15.5	38	20
								46	84
				93	15		SPT Sampler	12	
			At El. -17.0 Ft., mostly fine to coarse-grained carbonate				-17.0	31	73
								42	
				33	16		SPT Sampler	19	
							-18.5	27	48
								21	
				67	17		SPT Sampler	16	
-20.0	25.5						-20.0	28	48
								20	25

NOTES:

- Soils are field visually classified in accordance with the Unified Soils Classification System.
- Laboratory Testing Results

SAMPLE ID	SAMPLE DEPTH	LABORATORY CLASSIFICATION
1	0.0/1.5	SM*
4	4.5/6.0	SM*

*Lab visual classification based on gradation curve. No Atterberg limits.

140# hammer w/30" drop used with 2.0' split spoon (1-3/8" I.D. x 2" O.D.).

DRILLING LOG		DIVISION South Atlantic		INSTALLATION Jacksonville District			SHEET 1 OF 2 SHEETS	
1. PROJECT Virginia Key FL Beach Groin Field Foundation				9. SIZE AND TYPE OF BIT See Remarks				
2. BORING DESIGNATION CB-VK01-9		LOCATION COORDINATES X = 778,925 Y = 510,910		10. COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)		HORIZONTAL NAD27	VERTICAL NGVD29	
3. DRILLING AGENCY Corps Of Engineers			CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL CME-45 (land-based)			<input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER
4. NAME OF DRILLER Larry Wooters				12. TOTAL SAMPLES		DISTURBED 17	UNDISTURBED (UD) 0	
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING		13. TOTAL NUMBER CORE BOXES 2			
6. THICKNESS OF OVERBURDEN 0.0 Ft.				14. ELEVATION GROUND WATER 2.0 Ft.				
7. DEPTH DRILLED INTO ROCK 0.0 Ft.				15. DATE BORING		STARTED 10-17-01	COMPLETED 10-18-01	
8. TOTAL DEPTH OF BORING 25.5 Ft.				16. ELEVATION TOP OF BORING 5.5 Ft.				
				17. TOTAL RECOVERY FOR BORING 71 %				
				18. SIGNATURE AND TITLE OF INSPECTOR Steve Myers, Geologist				

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N-VALUE	
5.5	0.0						5.5			
			SAND, silty, mostly angular to subrounded fine to coarse-grained carbonate, little quartz, little fine gravel-sized limestone, little silt, strong reaction with HCl, moist, tan (SM)	93	1		SPT Sampler	3	0	
								7	14	
							4.0	7		
					40	2		SPT Sampler	4	18
							2.5	11		
					47	3		SPT Sampler	5	17
							1.0	10		
					27	4		SPT Sampler	3	5
							-0.5	1	3	
					73	5		SPT Sampler	3	11
						-2.0	7			
				60	6		SPT Sampler	4	11	
						-3.5	7			
				73	7		SPT Sampler	4	39	
						-5.0	30			
				100	8		SPT Sampler	5	9	
						-6.5	4			
				93	9		SPT Sampler	5	40	
						-8.0	13			
				67	10		SPT Sampler	4	38	
						-9.5	6			
							15			
							23			

At El. 1.0 Ft., gray

At El. -3.0 Ft., discontinue limestone

DRILLING LOG (Cont. Sheet)			INSTALLATION Jacksonville District			SHEET 2 OF 2 SHEETS			
PROJECT Virginia Key FL			COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)		HORIZONTAL NAD27	VERTICAL NGVD29			
LOCATION COORDINATES X = 778,925 Y = 510,910			ELEVATION TOP OF BORING 5.5 Ft.						
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 0.5 FT.	N-VALUE
				80	11		SPT Sampler	4	35
								9	
							-11.0	26	
				67	12		SPT Sampler	5	43
							-12.5	15	
								28	
				73	13		SPT Sampler	5	35
							-14.0	11	
								24	
				93	14		SPT Sampler	4	20
							-15.5	5	
								13	
				73	15		SPT Sampler	4	37
							-17.0	11	
								26	
				67	16		SPT Sampler	6	40
							-18.5	12	
								28	
				73	17		SPT Sampler	4	39
							-20.0	12	
-20.0	25.5							27	25
			NOTES:						
			1. Soils are field visually classified in accordance with the Unified Soils Classification System.						
			2. Laboratory Testing Results						
			SAMPLE ID	SAMPLE DEPTH	LABORATORY CLASSIFICATION				
			5	6.0/7.5	SP-SM*				
			*Lab visual classification based on gradation curve. No Atterberg limits.						
				140# hammer w/30" drop used with 2.0' split spoon (1-3/8" I.D. x 2" O.D.).					

DRILLING LOG		DIVISION South Atlantic	INSTALLATION Jacksonville District	SHEET 1 OF 2 SHEETS
1. PROJECT Virginia Key FL Beach Groin Field Foundation		9. SIZE AND TYPE OF BIT See Remarks		
2. BORING DESIGNATION CB-VK01-10		10. COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)		HORIZONTAL NAD27
3. DRILLING AGENCY Corps Of Engineers		11. MANUFACTURER'S DESIGNATION OF DRILL CME-45 (land-based)		VERTICAL NGVD29
4. NAME OF DRILLER Larry Wooters		12. TOTAL SAMPLES		<input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		13. TOTAL NUMBER CORE BOXES		DISTURBED 17
6. THICKNESS OF OVERBURDEN 0.0 Ft.		14. ELEVATION GROUND WATER		UNDISTURBED (UD) 0
7. DEPTH DRILLED INTO ROCK 0.0 Ft.		15. DATE BORING		STARTED 10-18-01
8. TOTAL DEPTH OF BORING 25.5 Ft.		16. ELEVATION TOP OF BORING		COMPLETED 10-18-01
		17. TOTAL RECOVERY FOR BORING		66 %
		18. SIGNATURE AND TITLE OF INSPECTOR Steve Myers, Geologist		

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/0.5 FT.	N-VALUE
6.0	0.0						6.0		
			SAND, poorly-graded, mostly subangular to rounded fine to medium-grained carbonate, some fine-grained quartz, trace silt, strong reaction with HCl, dry, tan (SP)	40	1		SPT Sampler	2 4	9
			At El. 3.0 Ft., mostly fine to coarse-grained carbonate, trace angular coarse-grained shell	60	2		SPT Sampler	3 4	10
			At El. 2.0 Ft., trace clay	80	3		SPT Sampler	6 3	16
1.5	4.5		SAND, silty, mostly fine to medium-grained carbonate, little angular to rounded fine-grained quartz, little silt, strong reaction with HCl, wet, gray (SM)	40	4		SPT Sampler	5 5	9
			From El. -1.0 to -1.5 Ft., mostly fine to coarse-grained carbonate, tan	53	5		SPT Sampler	5 7	12
				73	6		SPT Sampler	4 7	17
				73	7		SPT Sampler	10 6	21
				67	8		SPT Sampler	12 9	44
				27	9		SPT Sampler	16 28	42
			At El. -7.5 Ft., gray	73	10		SPT Sampler	7 15	43
								27	

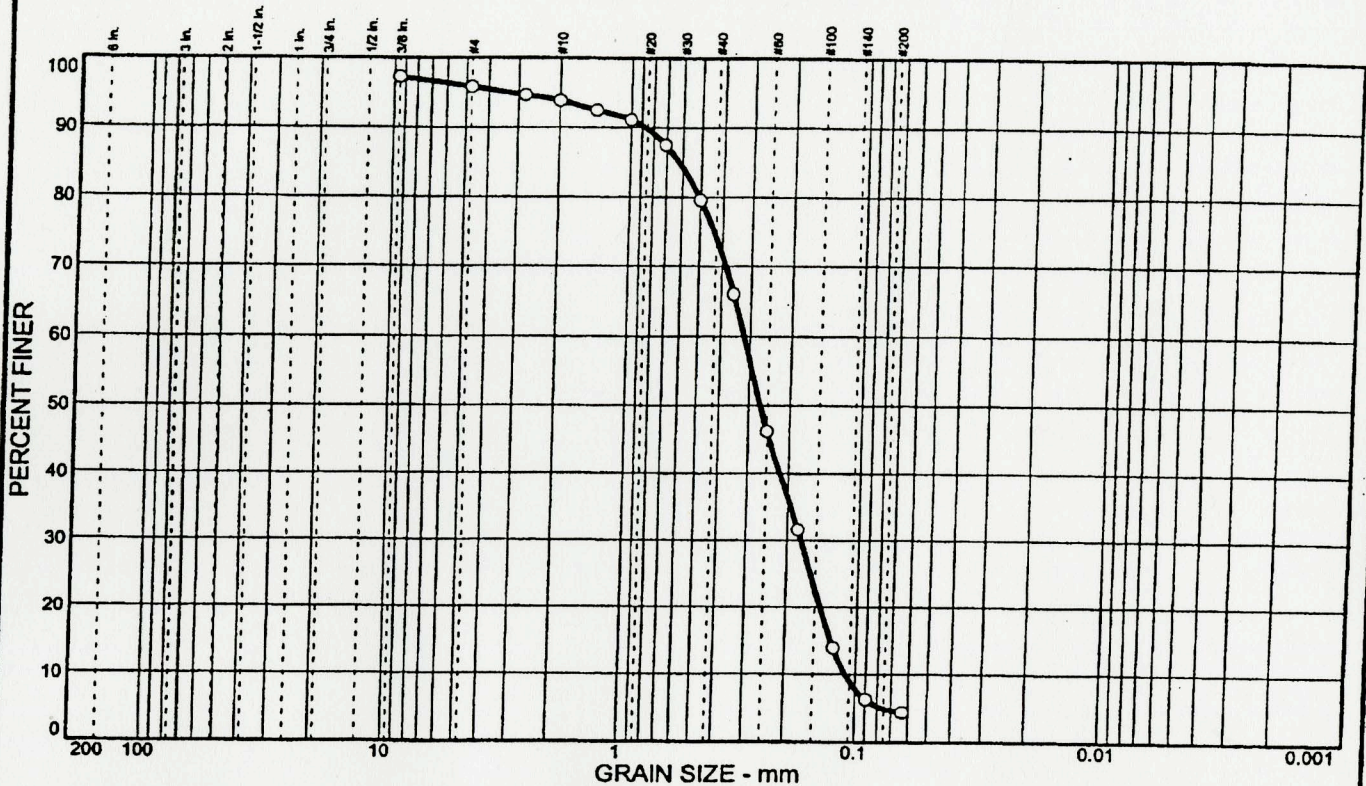
DRILLING LOG (Cont. Sheet)			INSTALLATION Jacksonville District			SHEET 2 OF 2 SHEETS			
PROJECT Virginia Key FL			COORDINATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)		HORIZONTAL NAD27	VERTICAL NGVD29			
LOCATION COORDINATES X = 777,194 Y = 509,690			ELEVATION TOP OF BORING 6.0 Ft.						
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	ROD OR UD	REMARKS	BLOWS/ 0.5 FT.	N-VALUE
			At El. -9.0 Ft., some fine-grained quartz	93	11		SPT Sampler	9 24	71
							-10.5	47	
				80	12		SPT Sampler	16 29	72
							-12.0	43	
				67	13		SPT Sampler	16 33	94
							-13.5	61	
				60	14		SPT Sampler	10 34	20
							-15.0	39	73
				80	15		SPT Sampler	4 14	49
							-16.5	35	
				73	16		SPT Sampler	14 28	51
			At El. -17.9 Ft., trace fine to coarse gravel-sized limestone, tan				-18.0	23	
				80	17		SPT Sampler	6 21	43
-19.5	25.5		At El. -19.0 Ft., discontinue limestone, gray				-19.5	22	25
NOTES:			140# hammer w/30" drop used with 2.0' split spoon (1-3/8" I.D. x 2" O.D.).						
1. Soils are field visually classified in accordance with the Unified Soils Classification System.									

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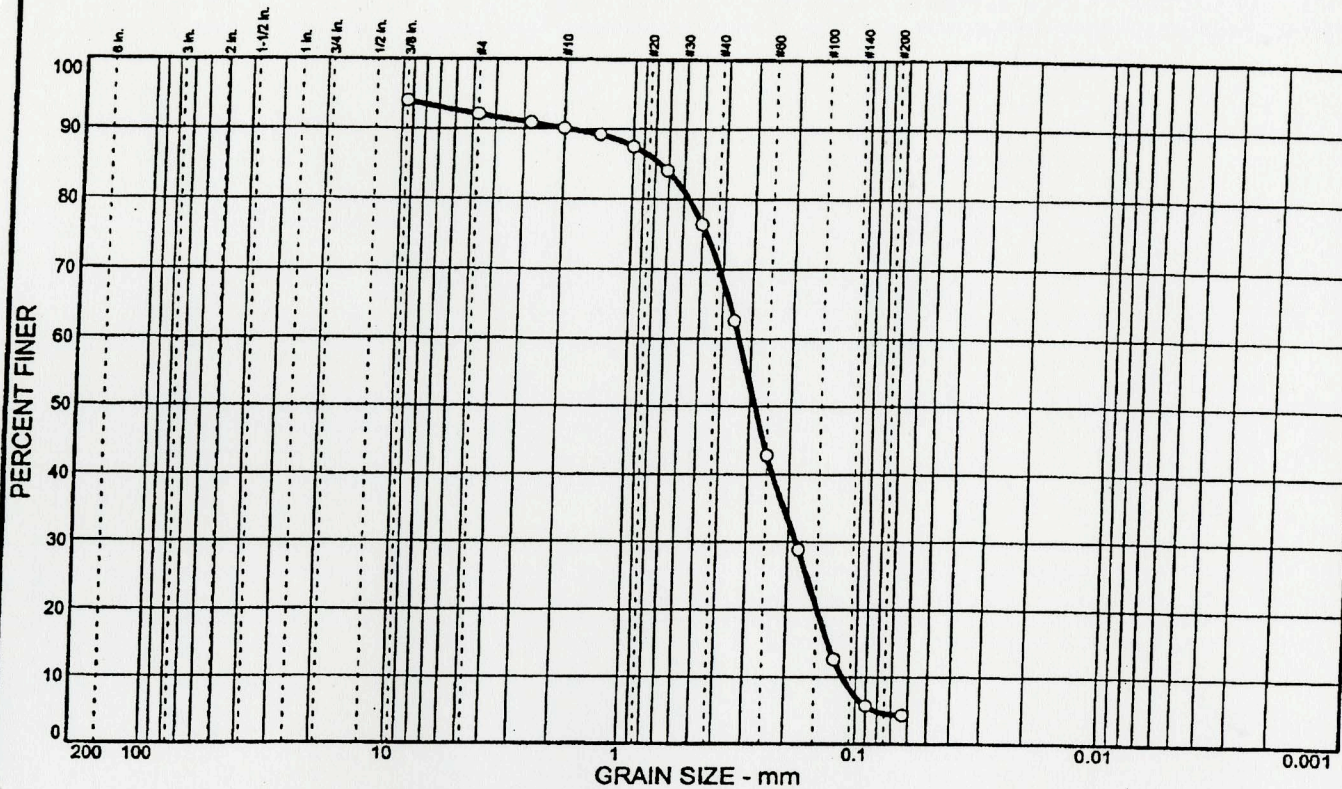
1.4.6 Laboratory Data

Applicable laboratory data are presented on the following pages.

Particle Size Distribution Report



Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		87.5	4.6		SP	A-3		

SIEVE	PERCENT FINER		SIEVE	PERCENT FINER		SOIL DESCRIPTION
inches size	○		number size	○		
3/8	94.0		#4	92.1		○ SAND, medium to fine quartz, some coarse to fine sand sized shell fragments, brown
GRAIN SIZE						
D60	0.338		#7	90.9		REMARKS: ○ North Sand Mound Test Pits Visual Percent Shell: 58%
D30	0.185		#10	90.1		
D10	0.115		#14	89.2		
COEFFICIENTS						
C _c	0.88		#18	87.5		
C _u	2.95		#25	84.1		
			#35	76.4		
			#45	62.6		
			#60	42.8		
			#80	28.8		
			#120	12.7		
			#170	5.7		
			#230	4.3		

○ Source: TP-VKSM201-1

Sample No.: 4'

Elev./Depth: +13.2'

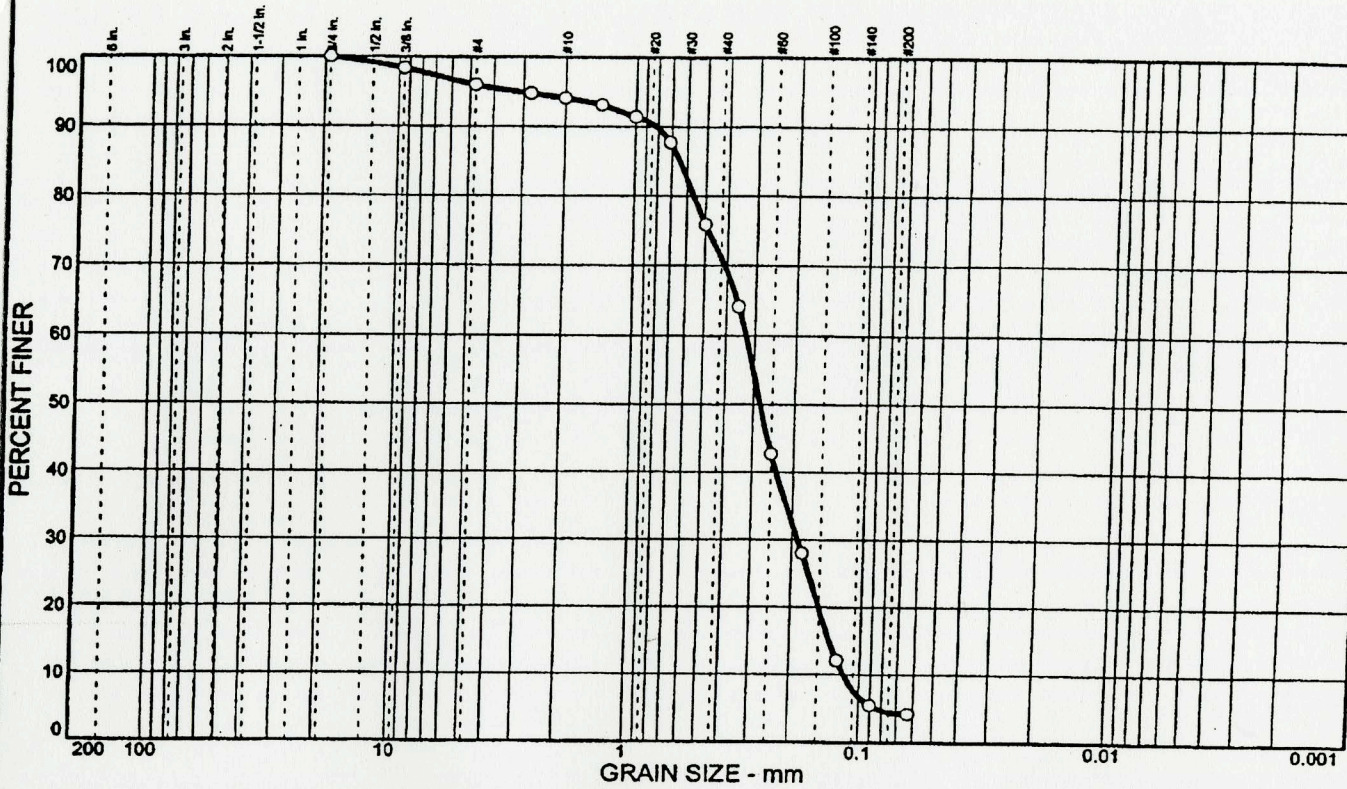
Law Engineering and Environmental Services, Inc.

Client: USACE, Jacksonville District
Project: Virginia Key

Project No.: 40521-1-8482-07

Plate

Particle Size Distribution Report



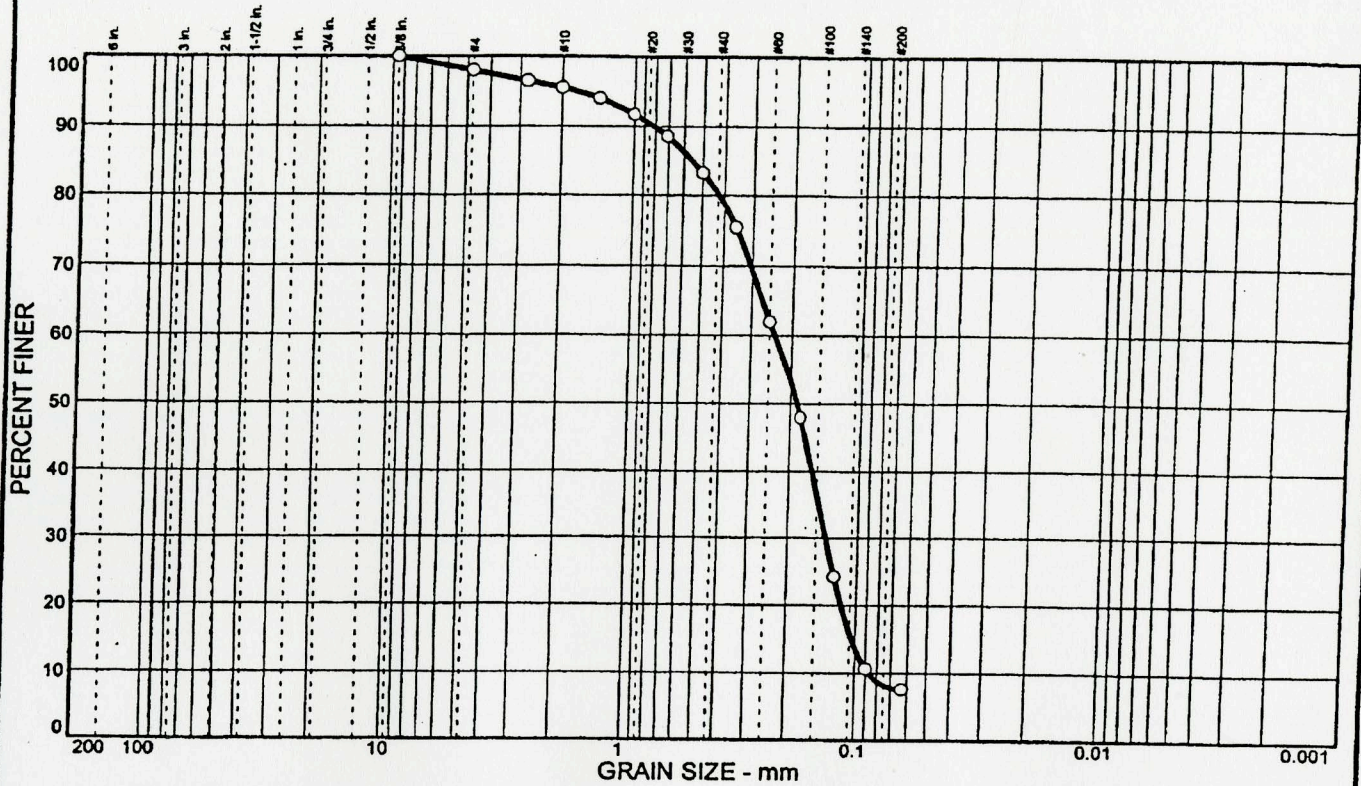
% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0	4.0	91.5		4.5	SP	A-3		

SIEVE Inches size	PERCENT FINER		SIEVE number size	PERCENT FINER		SOIL DESCRIPTION	
	○			○			
3/4	100.0		#4	96.0		○ SAND, medium to fine quartz, some coarse to fine sand sized shell fragments, brown	
3/8	98.4		#7	94.8			
GRAIN SIZE							
D60	0.329		#10	94.1		REMARKS: ○ North Sand Mound Test Pits Visual Percent Shell: 37%	
D30	0.189		#14	93.1			
D10	0.117		#18	91.4			
COEFFICIENTS							
Cc	0.93		#25	87.7			
Cu	2.82		#35	75.9			
			#45	64.2			
			#60	42.7			
			#80	28.0			
			#120	12.1			
			#170	5.5			
			#230	4.2			

○ Source: TP-VKSM201-1 Sample No.: 8' Elev./Depth: +17.2'

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	Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	2.0	89.8	8.2		SP-SM	A-3		

SIEVE Inches size	PERCENT FINER		
	○		
3/8	100.0		
GRAIN SIZE			
D60	0.237		
D30	0.137		
D10	0.0870		
COEFFICIENTS			
C _c	0.91		
C _u	2.73		

SIEVE number size	PERCENT FINER		
	○		
#4	98.0		
#7	96.5		
#10	95.6		
#14	94.1		
#18	91.8		
#25	88.6		
#35	83.3		
#45	75.5		
#60	62.0		
#80	48.0		
#120	24.2		
#170	10.7		
#230	7.6		

SOIL DESCRIPTION
 ○ SAND, medium to fine quartz, some sand sized shell fragments, trace silt, light brown-brown

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 27%

○ Source: TP-VKSM201-2

Sample No.: 2'

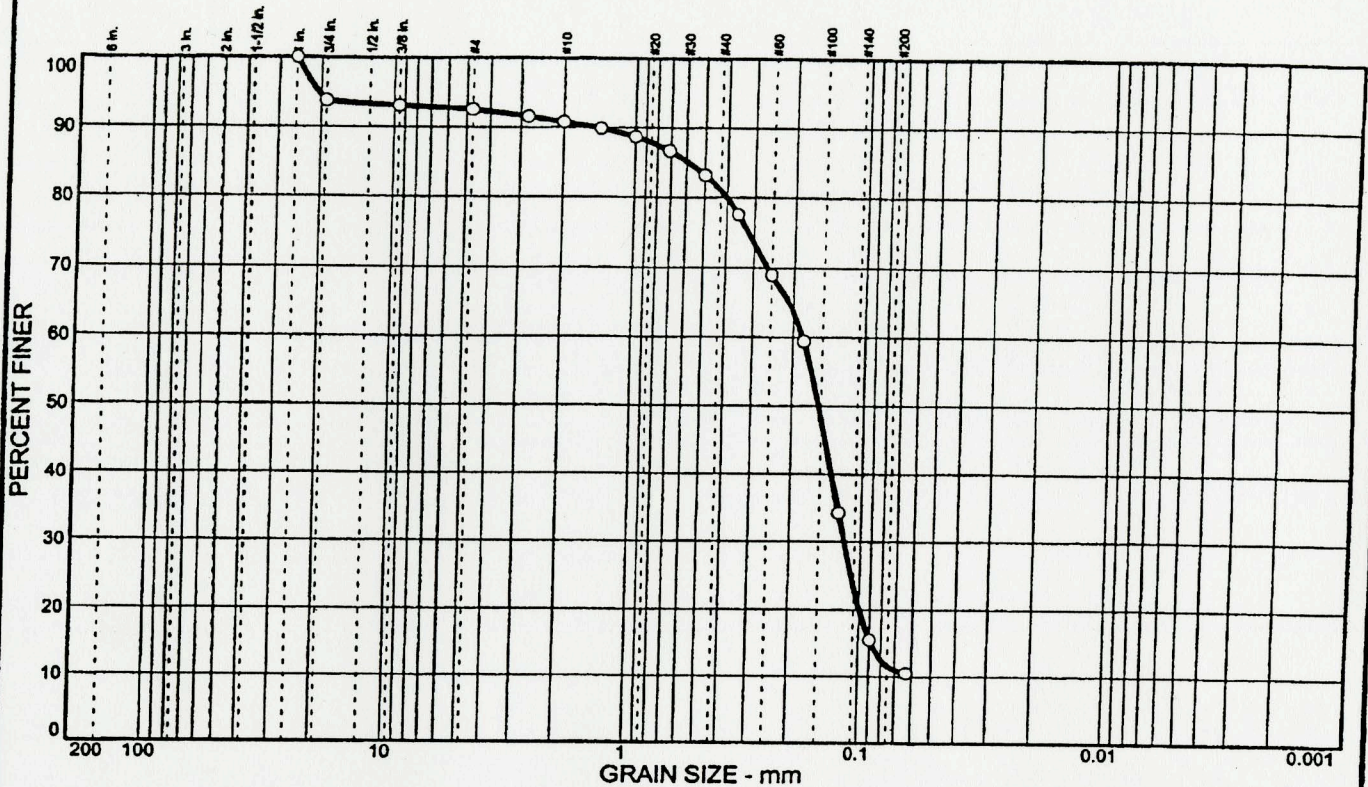
Elev./Depth: +6.9'

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Client: USACE, Jacksonville District
 Project: Virginia Key
 Project No.: 40521-1-8482-07

Plate

Particle Size Distribution Report



○	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		7.4	81.0	11.6		SP-SM	A-2-4(0)		

SIEVE Inches size	PERCENT FINER		
	○		
1	100.0		
3/4	93.8		
3/8	93.1		
GRAIN SIZE			
D60	0.182		
D30	0.118		
D10			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	92.6		
#7	91.6		
#10	90.8		
#14	89.9		
#18	88.7		
#25	86.7		
#35	83.2		
#45	77.6		
#60	69.0		
#80	59.4		
#120	34.2		
#170	15.5		
#230	10.5		

SOIL DESCRIPTION
 ○ SAND, fine quartz, some coarse to fine sand sized shell fragments, trace limestone fragments, little silt, light brown

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 46%

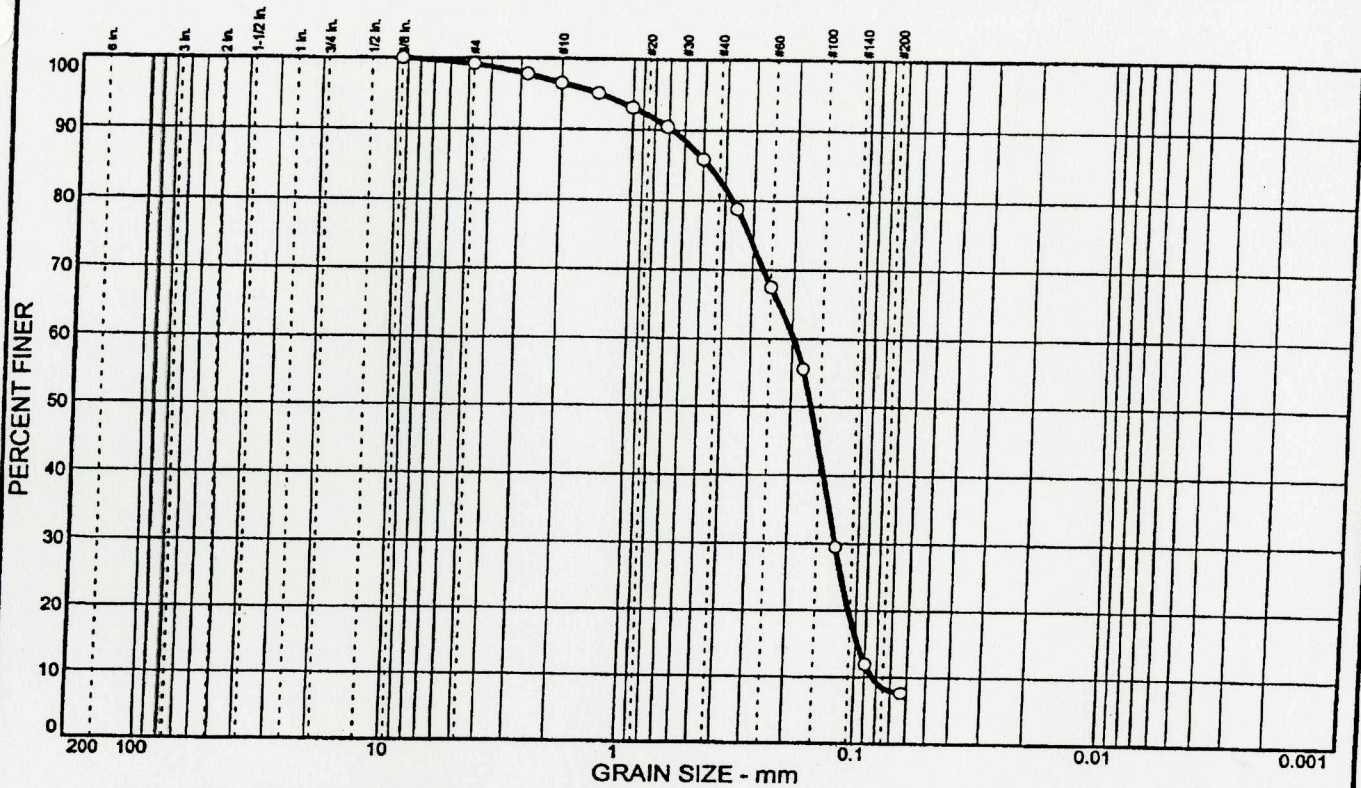
○ Source: TP-VKSM201-2

Sample No.: 6'

Elev./Depth: +10.9'

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	Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	0.9	90.7	8.4		SP-SM	A-3		

SIEVE inches size	PERCENT FINER		
	○		
3/8	100.0		
GRAIN SIZE			
D ₆₀	0.198		
D ₃₀	0.126		
D ₁₀	0.0836		
COEFFICIENTS			
C _c	0.96		
C _u	2.37		

SIEVE number size	PERCENT FINER		
	○		
#4	99.1		
#7	97.7		
#10	96.5		
#14	95.1		
#18	93.1		
#25	90.5		
#35	85.9		
#45	78.8		
#60	67.5		
#80	55.6		
#120	29.5		
#170	11.9		
#230	7.6		

SOIL DESCRIPTION
 ○ SAND, medium to fine quartz, little sand sized shell fragments, trace silt, light brown-brown

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 27%

○ Source: TP-VKSM201-2

Sample No.: 9'

Elev./Depth: +13.9'

**Law Engineering and
Environmental Services, Inc.**

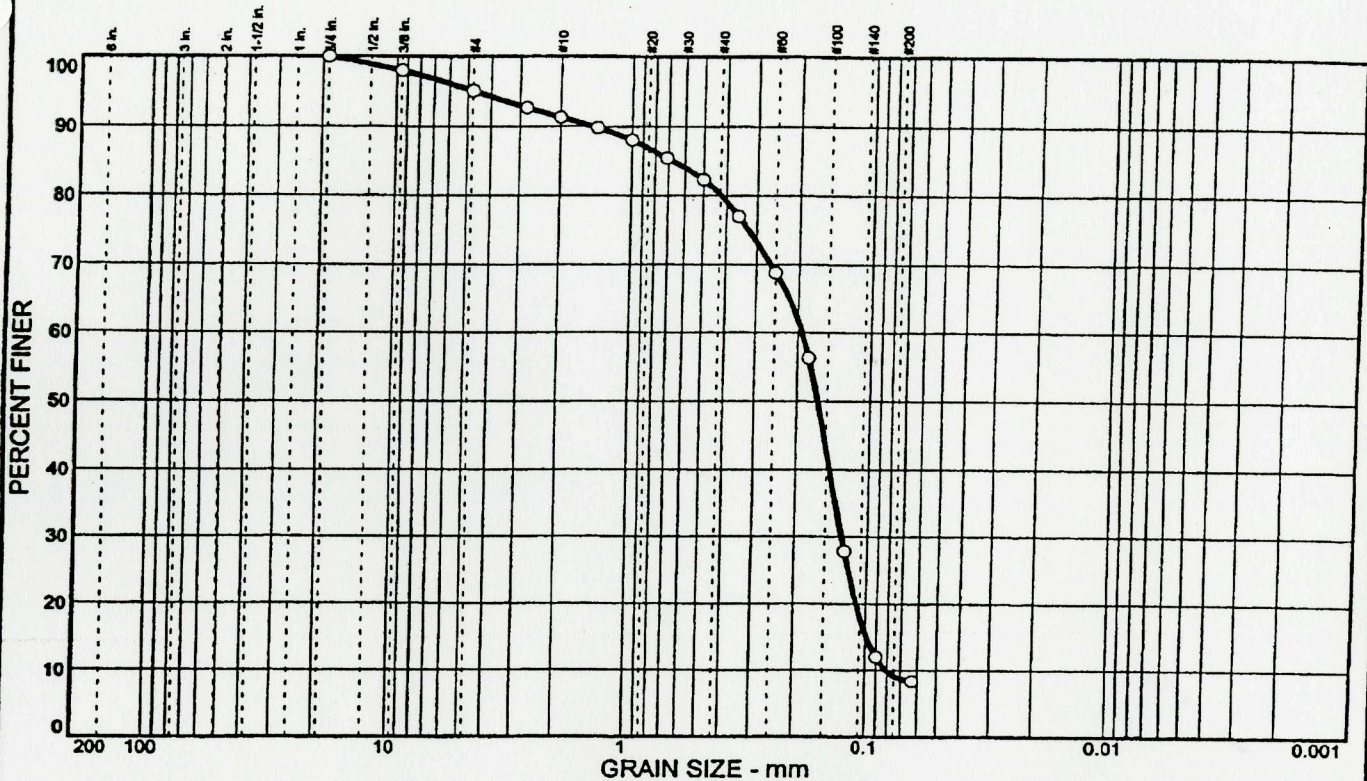
Client: USACE, Jacksonville District

Project: Virginia Key

Project No.: 40521-1-8482-07

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	4.9	86.0	9.1		SP-SM	A-3		

SIEVE Inches size	PERCENT FINER		
	○		
3/4	100.0		
3/8	98.0		
GRAIN SIZE			
D ₆₀	0.193		
D ₃₀	0.129		
D ₁₀	0.0813		
COEFFICIENTS			
C _c	1.06		
C _u	2.37		

SIEVE number size	PERCENT FINER		
	○		
#4	95.1		
#7	92.7		
#10	91.3		
#14	89.8		
#18	88.0		
#25	85.4		
#35	82.3		
#45	77.0		
#60	68.8		
#80	56.3		
#120	27.8		
#170	12.0		
#230	8.3		

SOIL DESCRIPTION
 ○ SAND, medium to fine quartz, some sand sized shell fragments, trace silt, brown

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 30%

○ Source: TP-VKSM201-3

Sample No.: 2'

Elev./Depth: +6.8'

Law Engineering and Environmental Services, Inc.

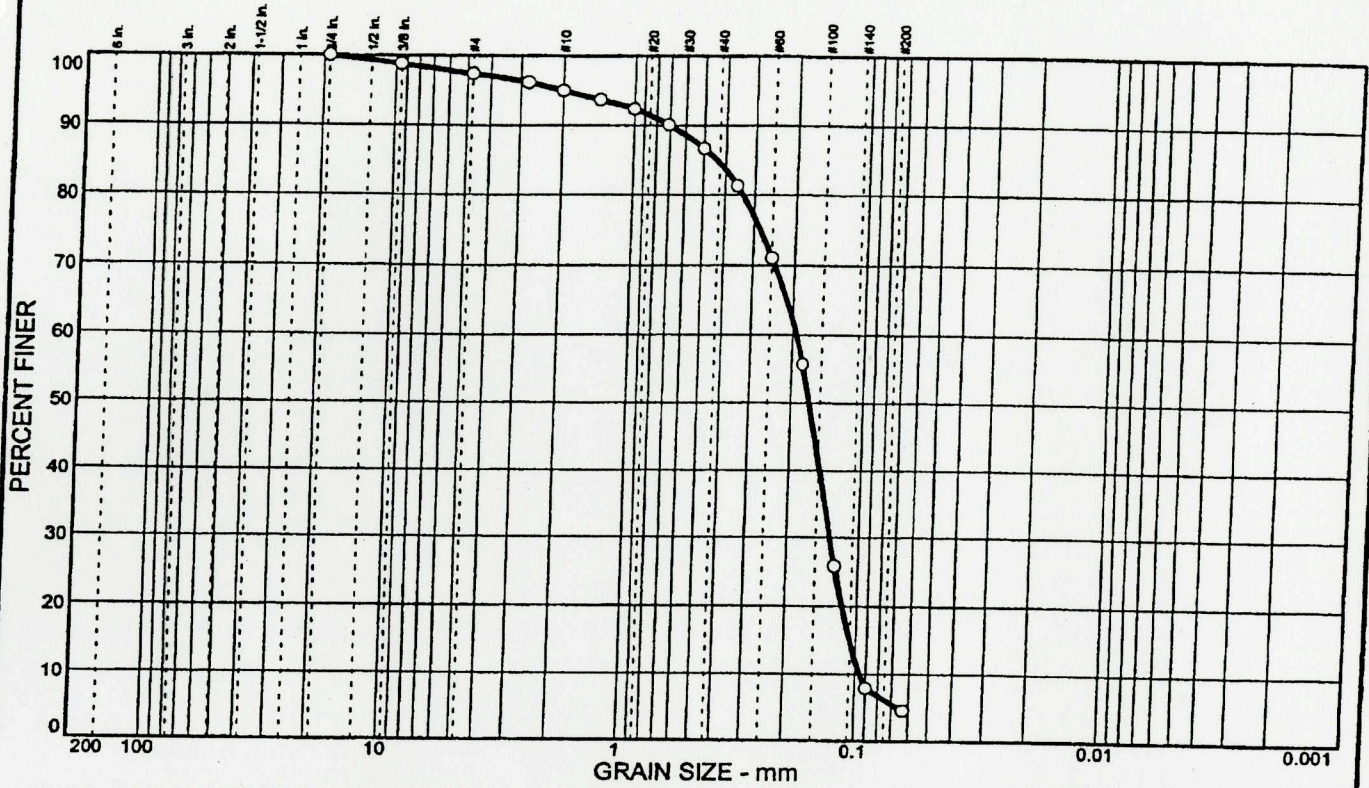
Client: USACE, Jacksonville District

Project: Virginia Key

Project No.: 40521-1-8482-07

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0	2.6	91.2	6.2		SP-SM	A-3		

SIEVE Inches size	PERCENT FINER	
	○	
3/4	100.0	
3/8	98.8	
GRAIN SIZE		
D60	0.193	
D30	0.132	
D10	0.0957	
COEFFICIENTS		
C _c	0.94	
C _u	2.02	

SIEVE number size	PERCENT FINER	
	○	
#4	97.4	
#7	96.2	
#10	95.0	
#14	93.7	
#18	92.4	
#25	90.1	
#35	86.7	
#45	81.3	
#60	71.1	
#80	55.7	
#120	25.8	
#170	7.9	
#230	4.5	

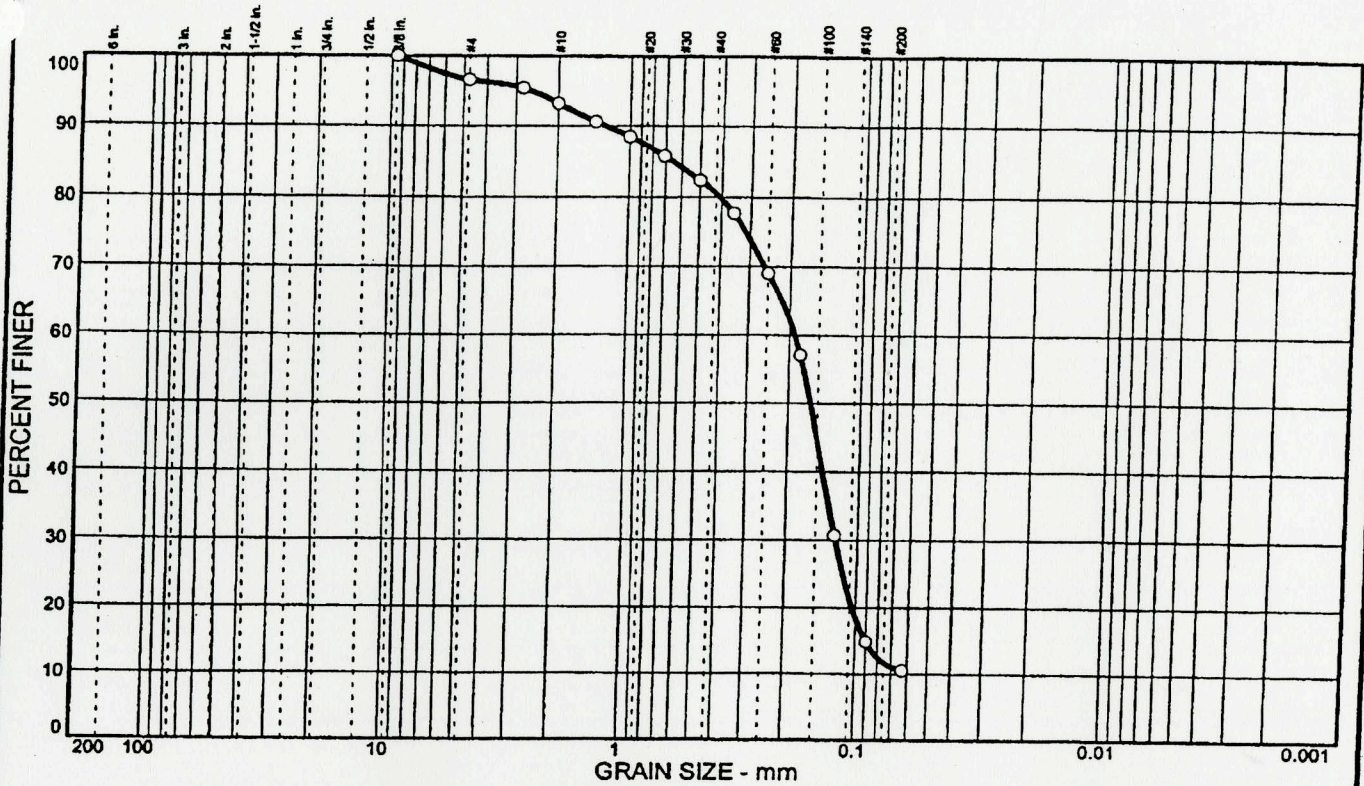
SOIL DESCRIPTION
 ○ SAND, medium to fine quartz, little sand sized shell fragments, trace silt, light brown and tan

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 32%

○ Source: TP-VKSM201-3 Sample No.: 5' Elev./Depth: +9.8'

Law Engineering and Environmental Services, Inc.	Client: USACE, Jacksonville District Project: Virginia Key Project No.: 40521-1-8482-07
	Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	3.4	85.0	11.6		SP-SM	A-2-4(0)		

SIEVE Inches size	PERCENT FINER			SIEVE number size	PERCENT FINER			SOIL DESCRIPTION
	○				○			
3/8	100.0			#4	96.6			○ SAND, medium to fine quartz, little sand sized shell fragments, little silt, light brown and dark brown
 	GRAIN SIZE			#7	95.4			
D60	0.190			#10	93.2			REMARKS: ○ North Sand Mound Test Pits Visual Percent Shell: 17%
D30	0.124			#14	90.6			
D10				#18	88.5			
 	COEFFICIENTS			#25	85.8			
C _c				#35	82.4			
C _u				#45	77.7			
				#60	69.0			
				#80	57.1			
				#120	30.7			
				#170	14.9			
				#230	10.5			

○ Source: TP-VKSM201-4

Sample No.: 2'

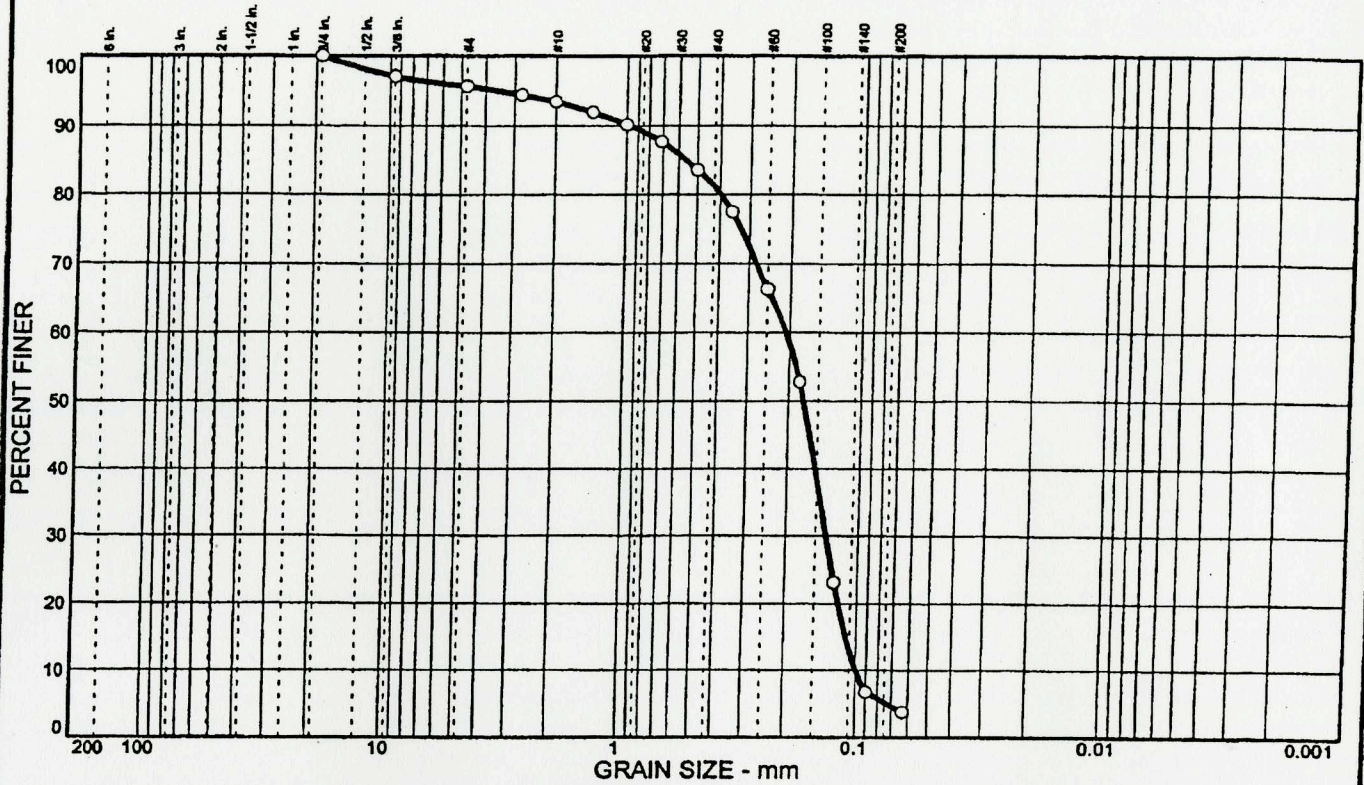
Elev./Depth: +8.8'

Law Engineering and Environmental Services, Inc.

Client: USACE, Jacksonville District
 Project: Virginia Key
 Project No.: 40521-1-8482-07

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0	4.3	90.5	5.2		SP-SM	A-3		

SIEVE Inches size	PERCENT FINER	
	○	
3/4	100.0	
3/8	97.1	
GRAIN SIZE		
D ₆₀	0.208	
D ₃₀	0.136	
D ₁₀	0.0996	
COEFFICIENTS		
C _c	0.90	
C _u	2.08	

SIEVE number size	PERCENT FINER	
	○	
#4	95.7	
#7	94.5	
#10	93.5	
#14	92.0	
#18	90.2	
#25	87.7	
#35	83.6	
#45	77.5	
#60	66.3	
#80	52.8	
#120	23.1	
#170	6.7	
#230	3.7	

SOIL DESCRIPTION
 ○ SAND, medium to fine quartz, some sand size shell fragments, trace silt, light brown

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 29%

○ Source: TP-VKSM201-4

Sample No.: 5'

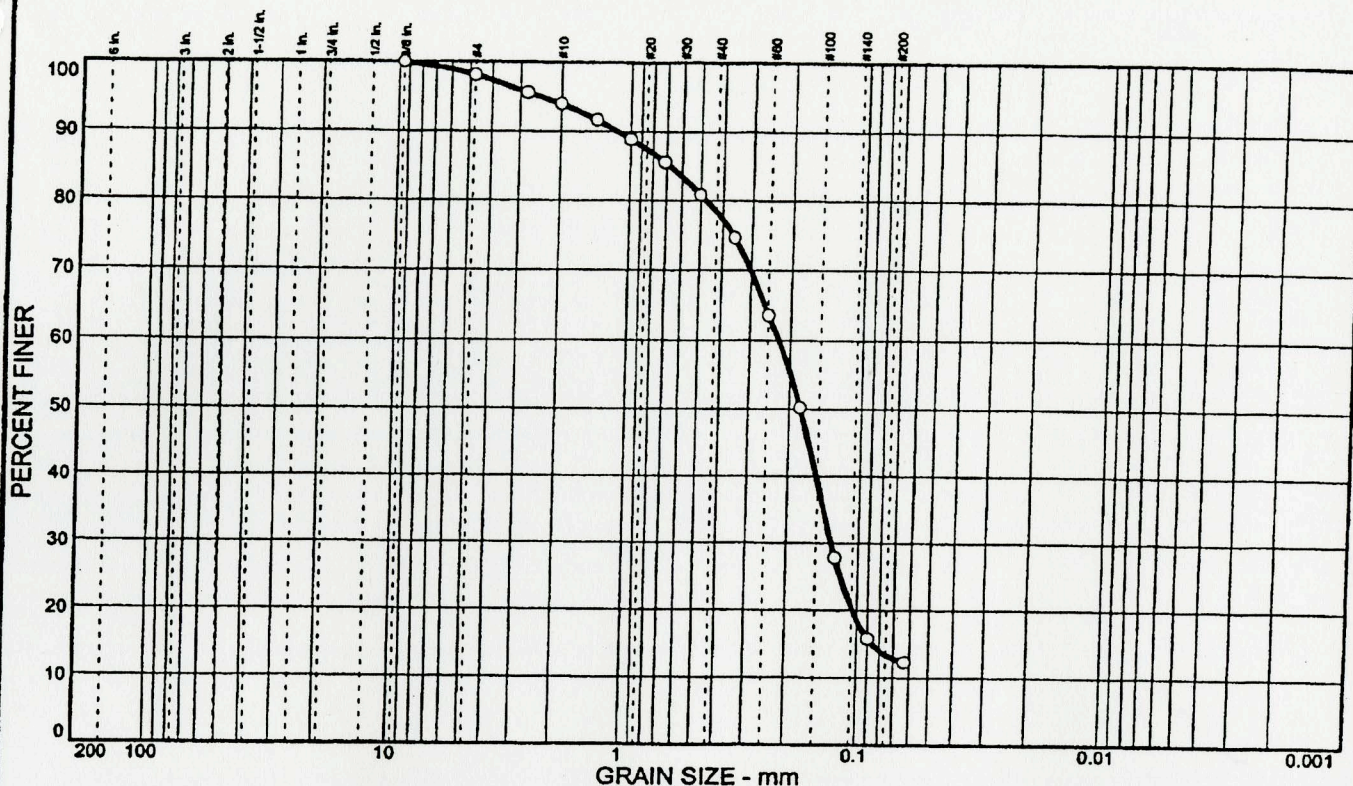
Elev./Depth: +11.8'

**Law Engineering and
 Environmental Services, Inc.**

Client: USACE, Jacksonville District
 Project: Virginia Key
 Project No.: 40521-1-8482-07

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
0	1.9	84.8	13.3		SM	A-2-4(0)		

SIEVE Inches size	PERCENT FINER		
	○		
3/8	100.0		
GRAIN SIZE			
D60	0.226		
D30	0.130		
D10			
COEFFICIENTS			
C _c			
C _u			

SIEVE number size	PERCENT FINER		
	○		
#4	98.1		
#7	95.6		
#10	94.0		
#14	91.7		
#18	88.9		
#25	85.6		
#35	80.9		
#45	74.7		
#60	63.6		
#80	50.2		
#120	27.8		
#170	15.8		
#230	12.3		

SOIL DESCRIPTION
 ○ SAND, medium to fine quartz, little sand sized shell fragments, little silt, trace sand sized limestone fragments, dark brown-gray

REMARKS:
 ○ North Sand Mound Test Pits
 Visual Percent Shell: 13%

○ Source: TP-VKSM201-4

Sample No.: 7'

Elev./Depth: +13.8'

Law Engineering and Environmental Services, Inc.	Client: USACE, Jacksonville District Project: Virginia Key Project No.: 40521-1-8482-07
	Plate