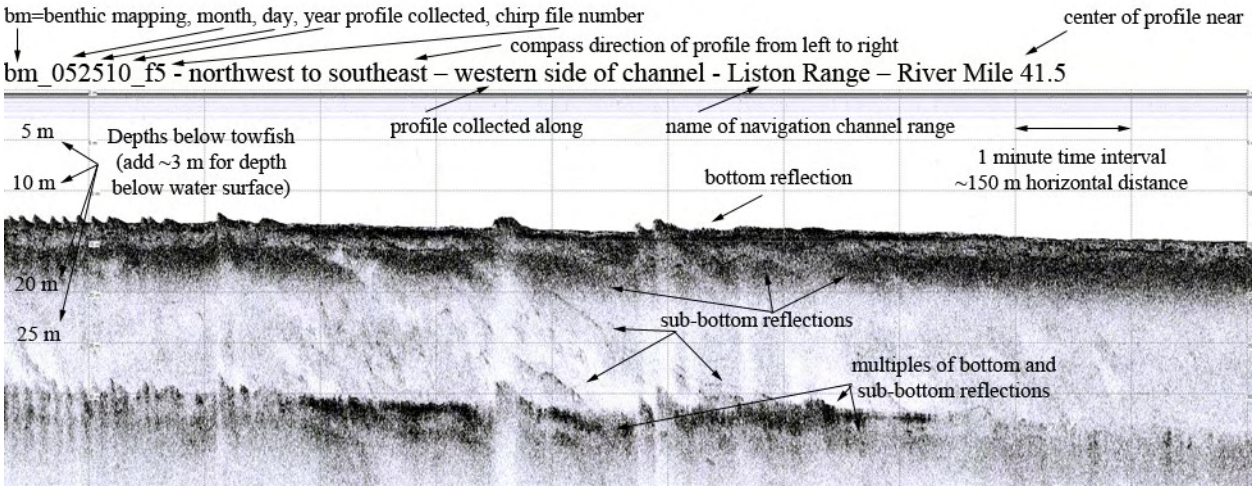
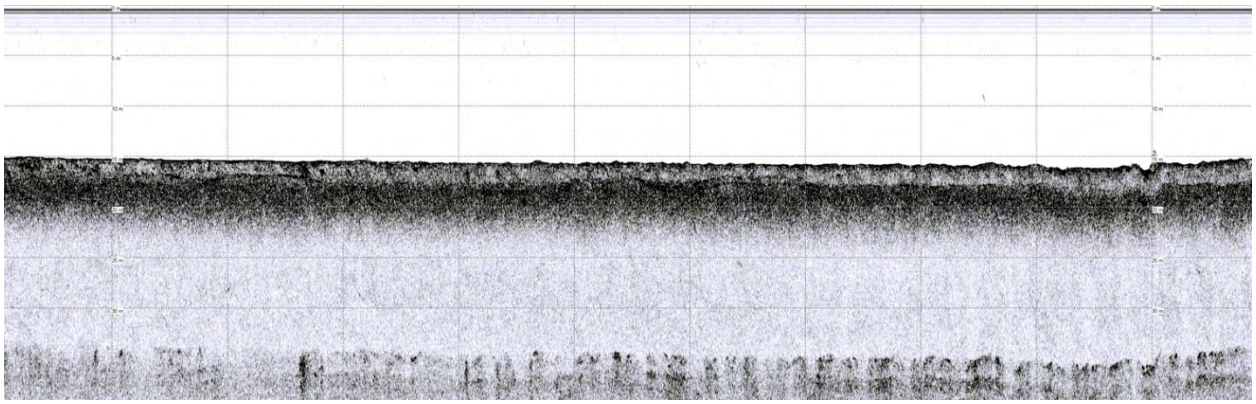
Appendix A: Chirp Sub-bottom Profile Images

The chirp profiles collected during the survey are shown as a series of images. The images begin at the northern end (near River Mile 42) of the survey along the western side of the navigation channel, continuing southeastward towards River Mile 6. After turning to the northwest near River Mile 6, the images are then shown along the eastern side of the navigation channel northwestward to near River Mile 42.

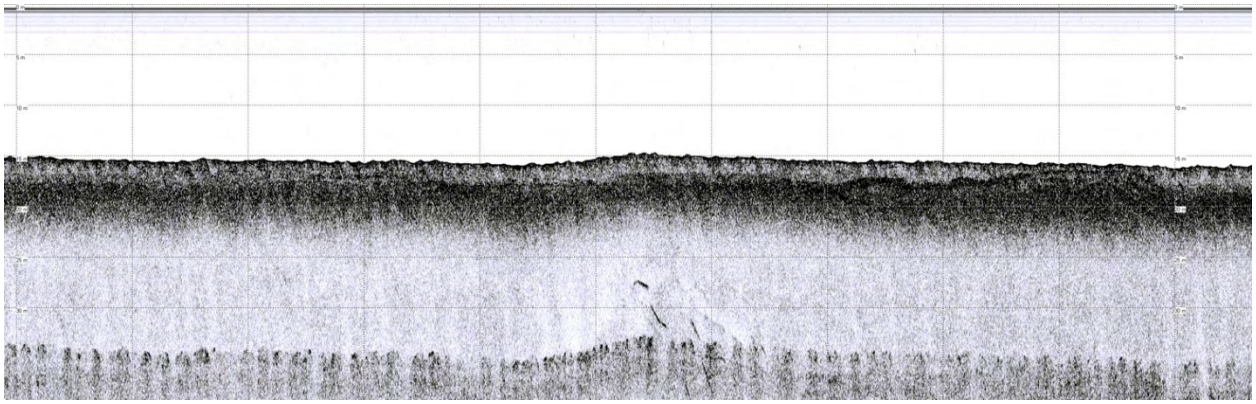
The profiles are labeled with the file name and number, the compass direction of the profile from left to right, the side of the navigation channel along which the profile was collected and the approximate location of the profile by river mile and navigation channel range. On all images, horizontal lines are drawn at 5 m (16 ft) intervals representing depths below the chirp tow-fish. The fish was towed at an approximate depth of 3 m (10 ft) below the surface, thus the horizontal lines represent depths below the water surface of approximately 3 m (10 ft), 8 m (26 ft), 13 m (43 ft), 18 m (59 ft), etc. Vertical lines are drawn every three hundredth pulse of the chirp system. Given that the system was chirping at five cycles per second, the vertical lines mark one minute time intervals. With an average ship's speed of 5 knots, the distance between the lines is approximately 150 m (492 ft). The first chirp profile is annotated to illustrate the labeling conventions.



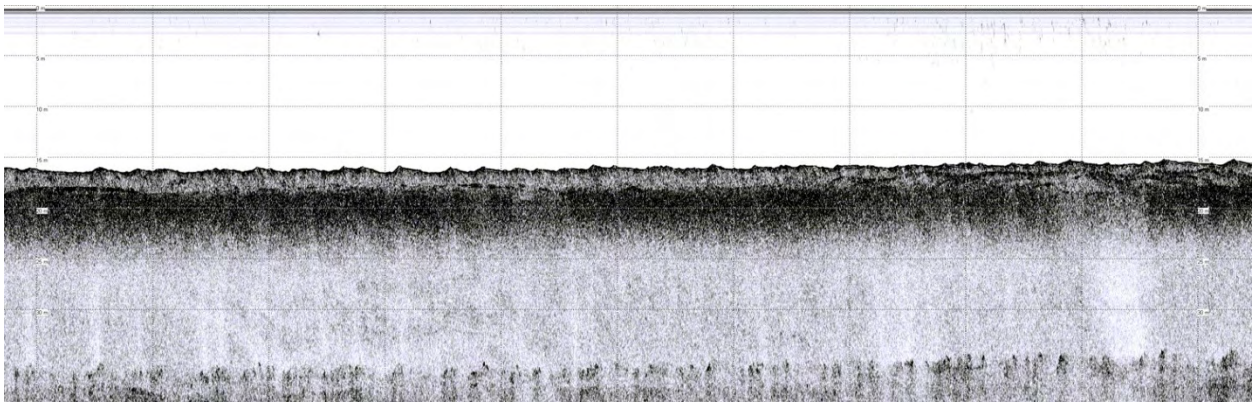
bm_052510_f6 –northwest to southeast – western side of channel - Liston Range – River Mile 40.5



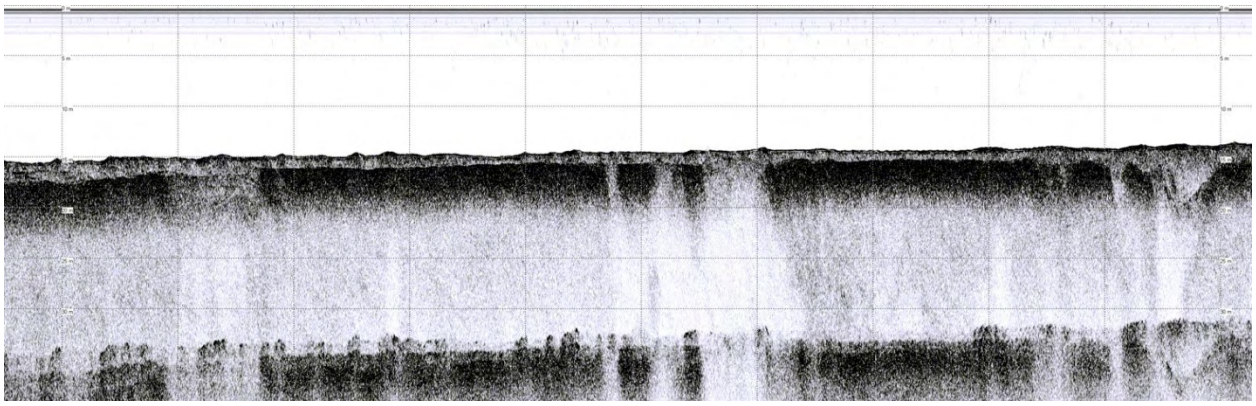
bm_052510_f7 –northwest to southeast – western side of channel - Liston Range – River Mile 39.5



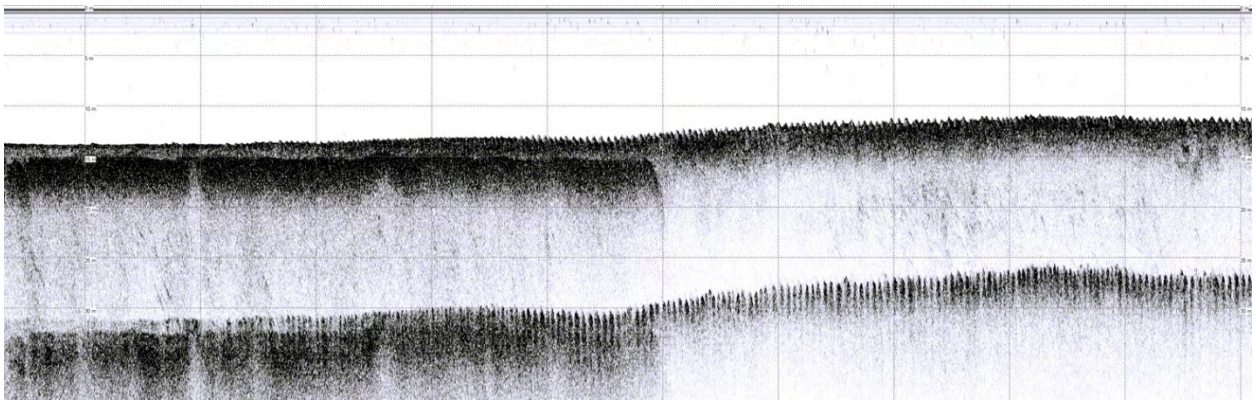
bm_052510_f8 –northwest to southeast – western side of channel - Liston Range – River Mile 38.5



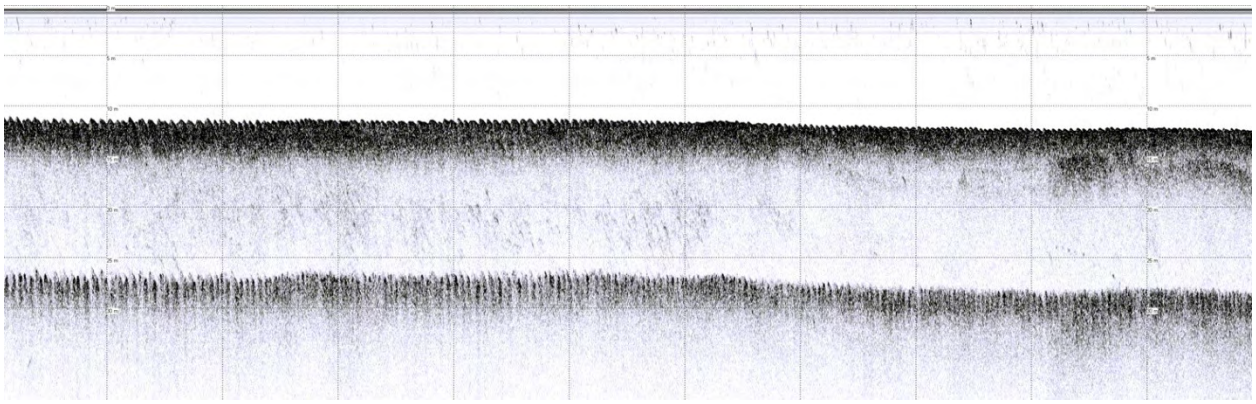
bm_052510_f9 –northwest to southeast – western side of channel - Liston Range – River Mile 37.5



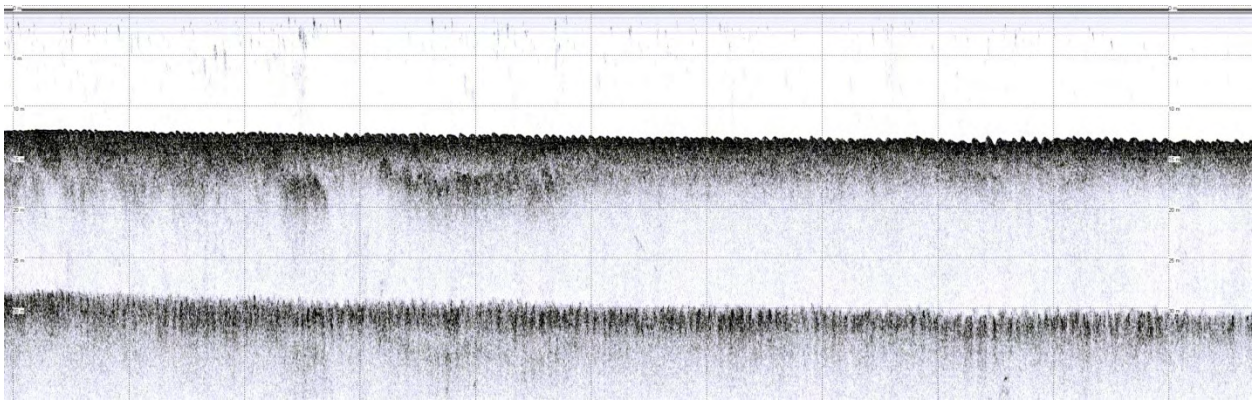
bm_052510_f10 –northwest to southeast – western side of channel - Liston Range – River Mile 36.5



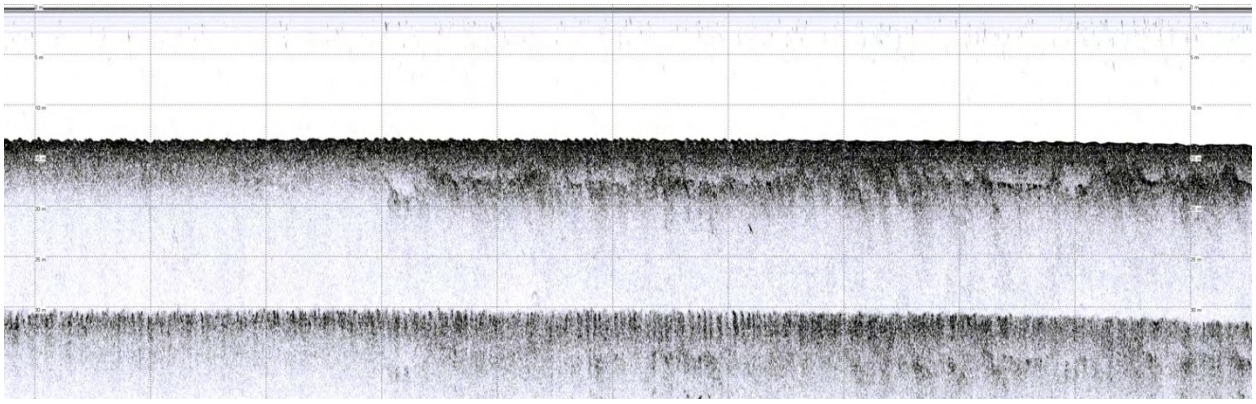
bm_052510_f11 –northwest to southeast – western side of channel - Liston Range – River Mile 35.5



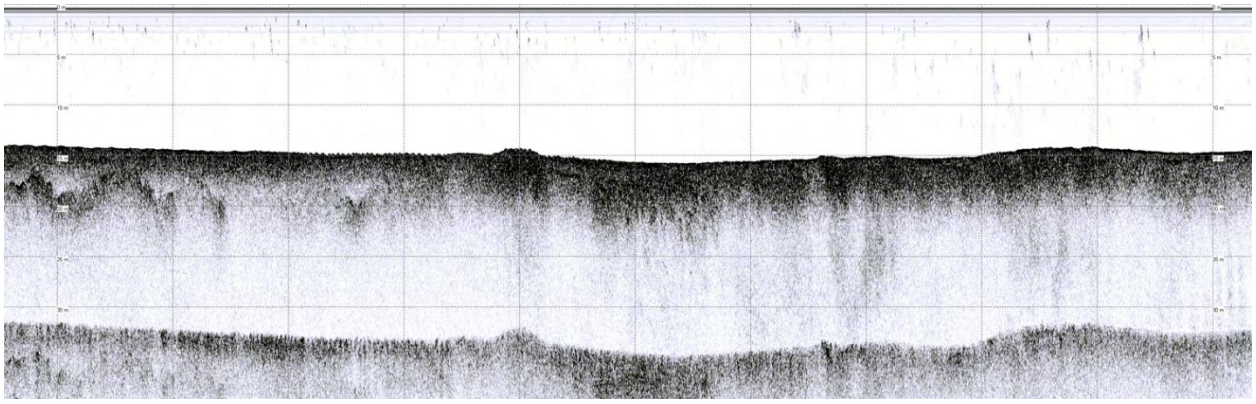
bm_052510_f12 –northwest to southeast – western side of channel - Liston Range – River Mile 34.5



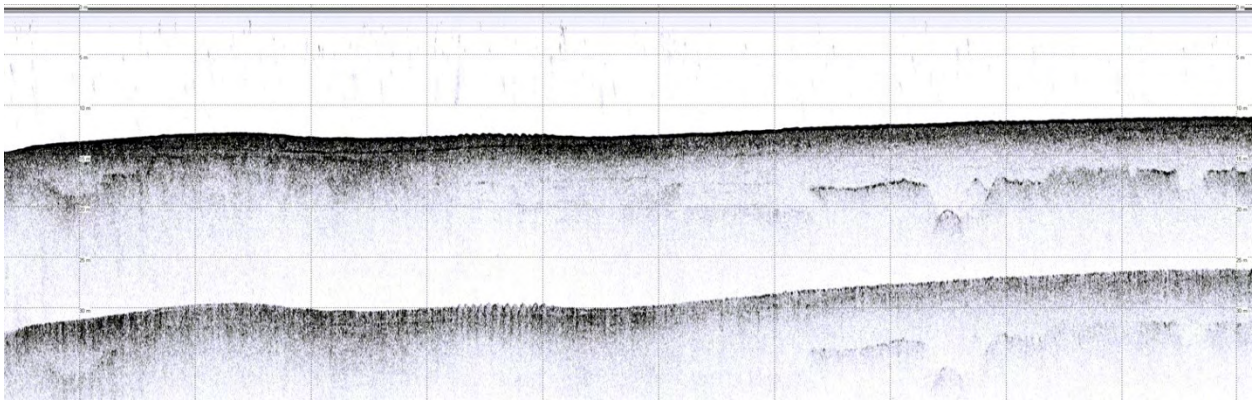
bm_052510_f13 –northwest to southeast – western side of channel - Liston Range – River Mile 33.5



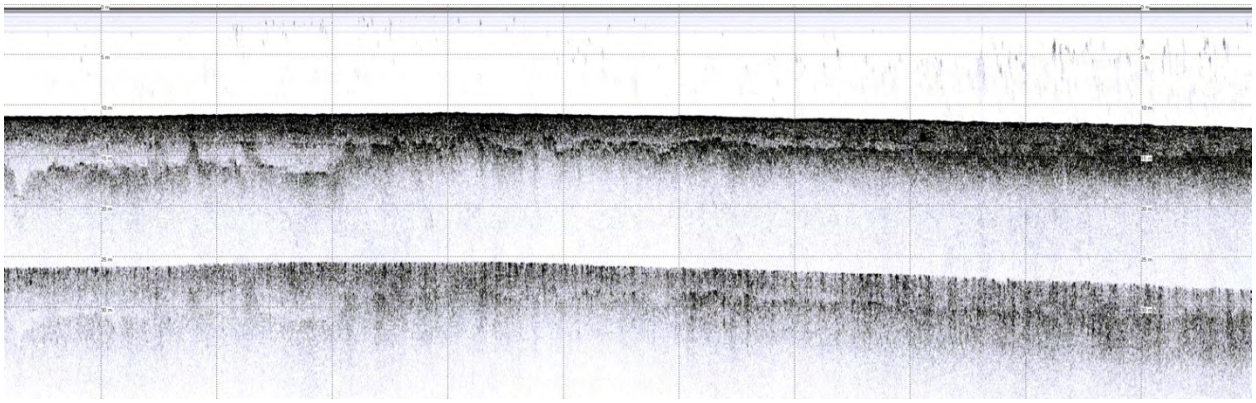
bm_052510_f14 –northwest to southeast – western side of channel - Liston Range – River Mile 32.5



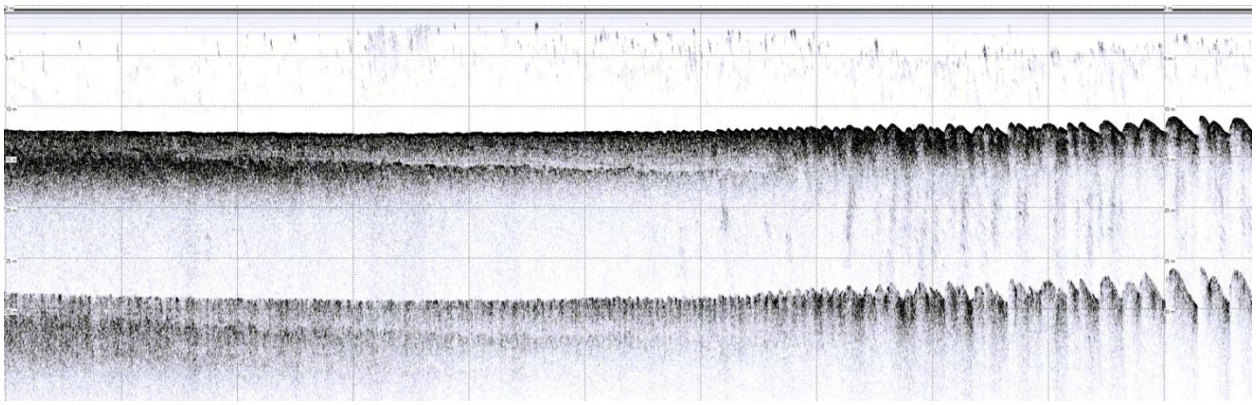
bm_052510_f15 –northwest to southeast – western side of channel - Liston to Cross Ledge Range– River Mile 31



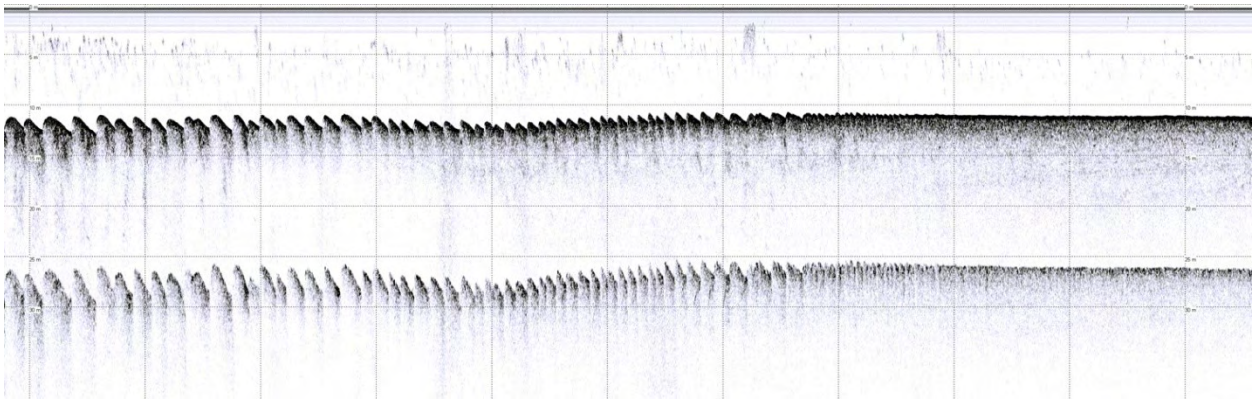
bm_052510_f16 –northwest to southeast – western side of channel - Cross Ledge Range– River Mile 29



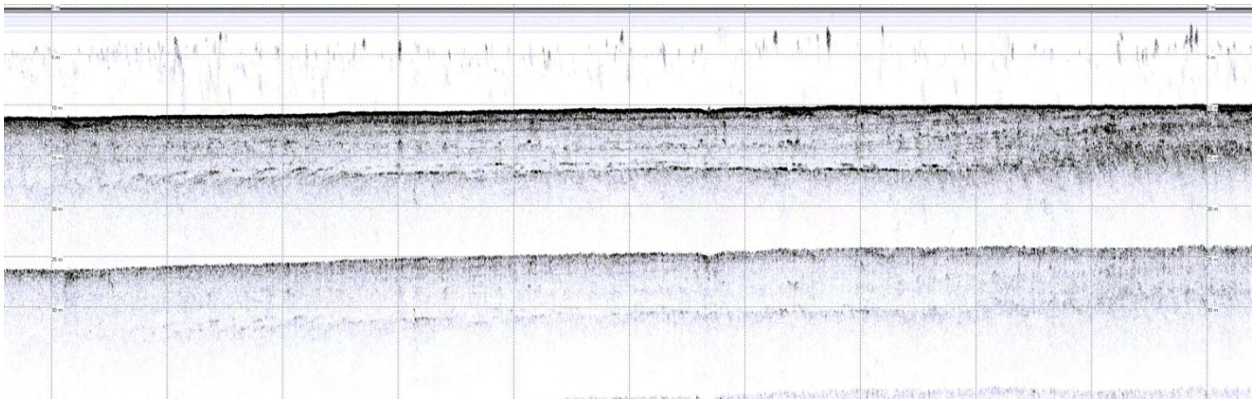
bm_052510_f17 –northwest to southeast – western side of channel - Cross Ledge Range– River Mile 28



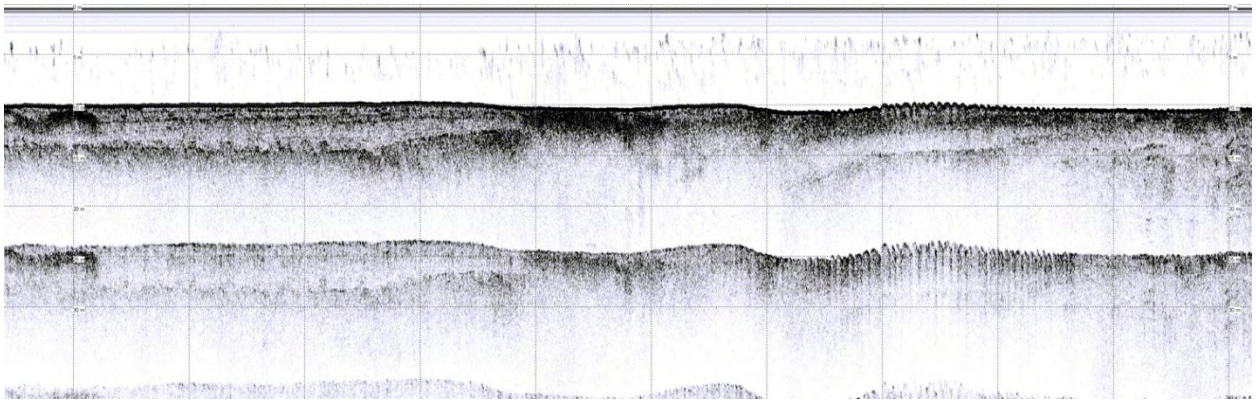
bm_052510_f18 –northwest to southeast – western side of channel - Cross Ledge to Miah Maull Range – River Mile 26.5



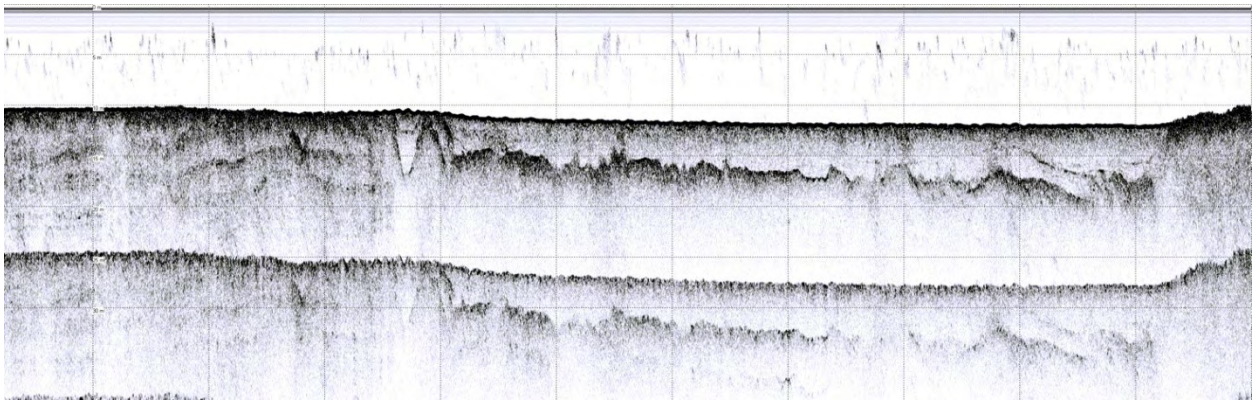
bm_052510_f19 –northwest to southeast – western side of channel - Miah Maull Range– River Mile 24.5



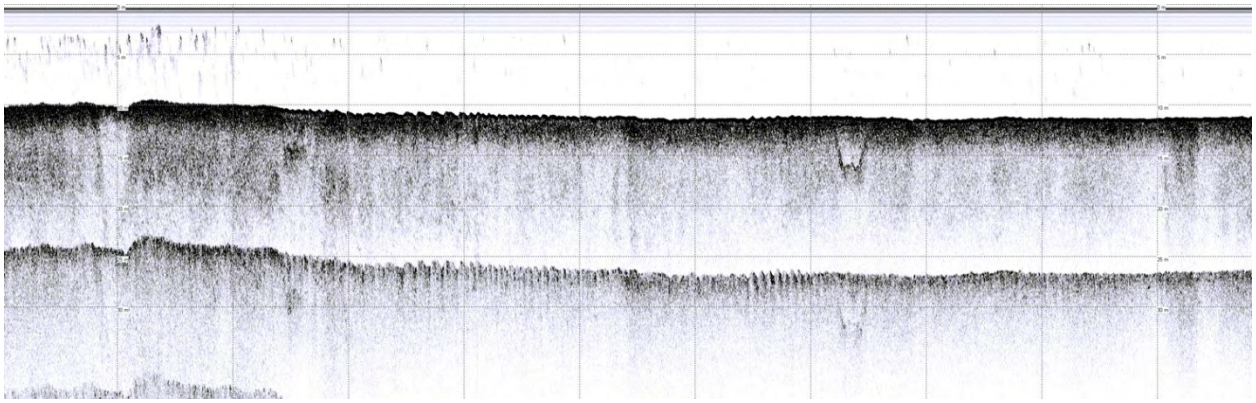
bm_052510_f20 –northwest to southeast – western side of channel - Miah Maull Range– River Mile 23



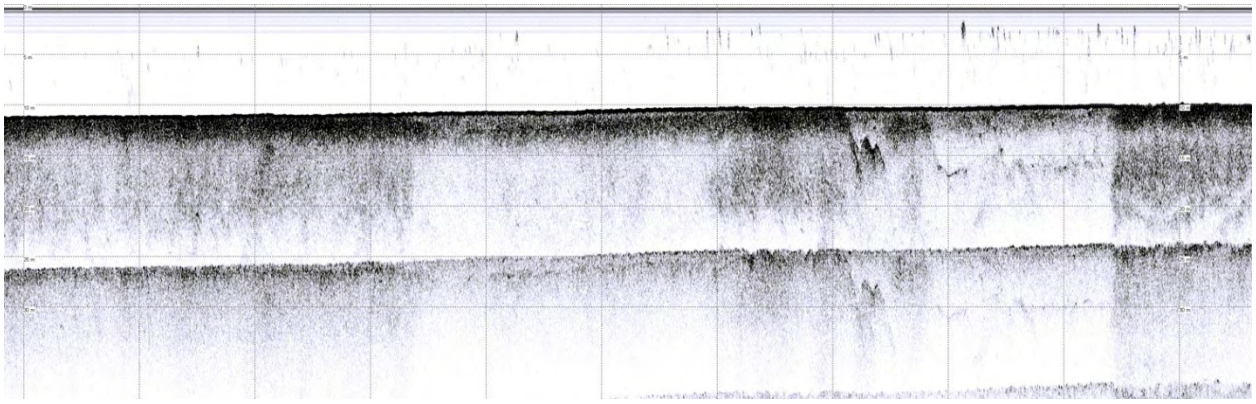
bm_052510_f21 –northwest to southeast – western side of channel - Miah Maull Range– River Mile 21.5



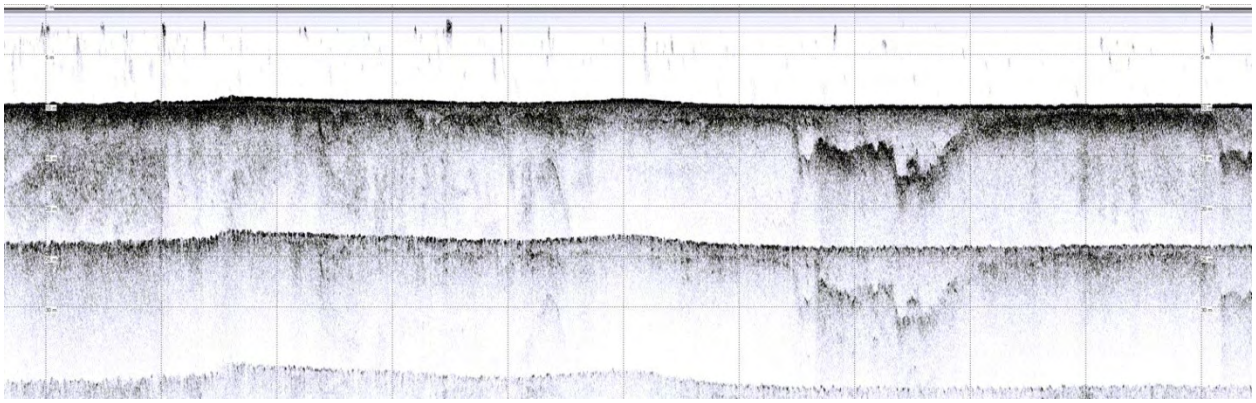
bm_052510_f22 –northwest to southeast – western side of channel - Miah Maull Range– River Mile 20



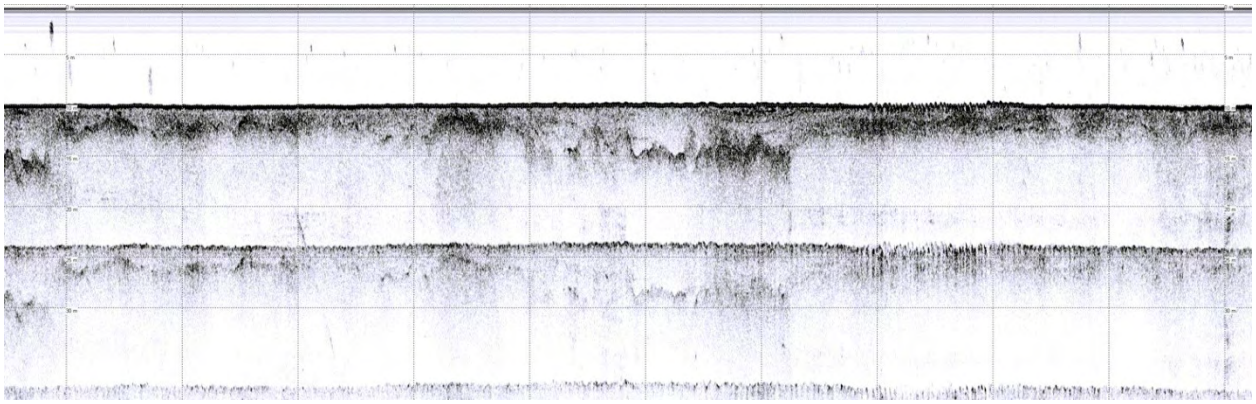
bm_052510_f23 –northwest to southeast – western side of channel - Miah Maull Range– River Mile 18.5



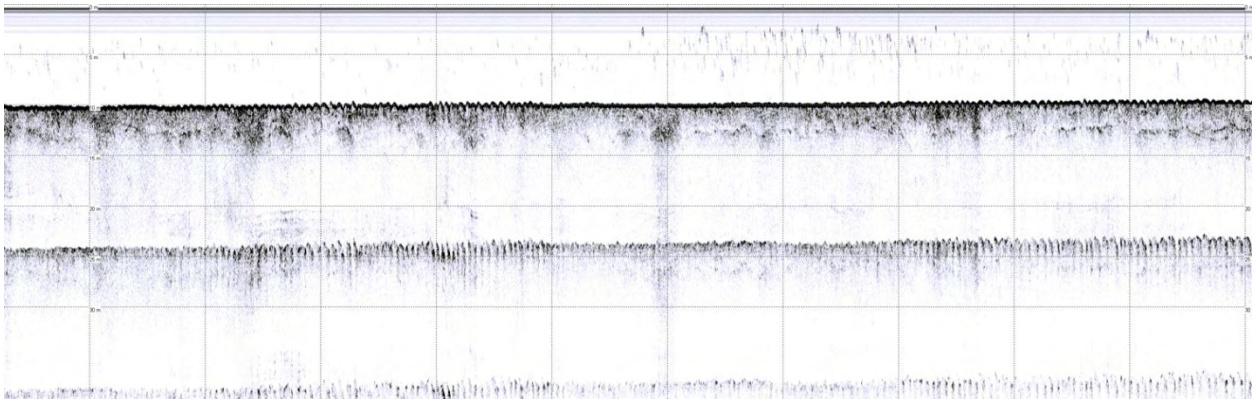
bm_052510_f24 –northwest to southeast – western side of channel - Miah Maull to Brandywine Range – River Mile 17.5



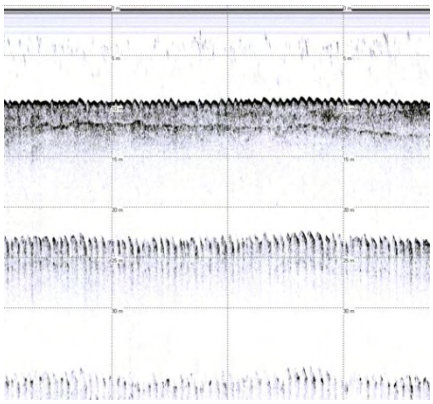
bm_052510_f25 –northwest to southeast – western side of channel - Brandywine Range– River Mile 16



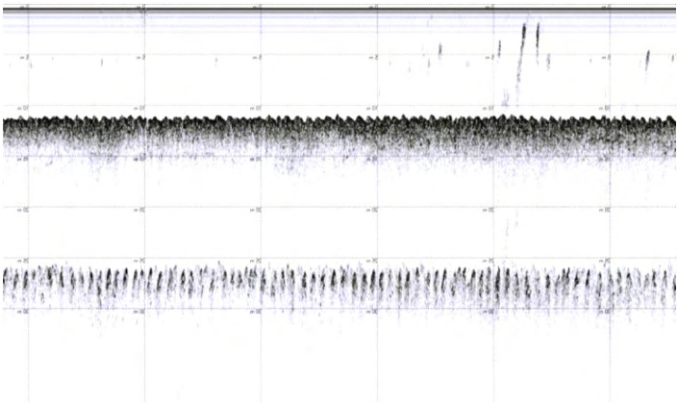
bm_052510_f26 –northwest to southeast – western side of channel - Brandywine Range– River Mile 14.5



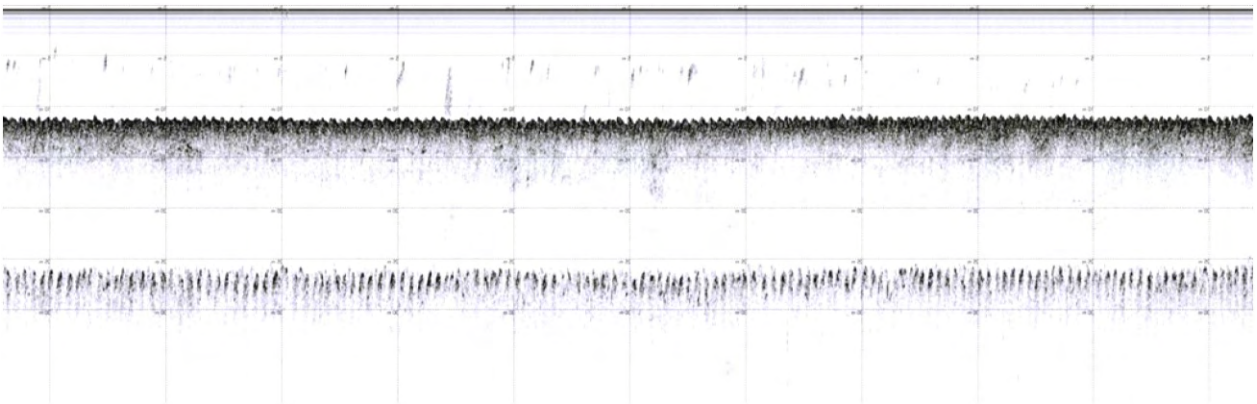
bm_052510_f27 –northwest to southeast – western side of channel - Brandywine Range– River Mile 14



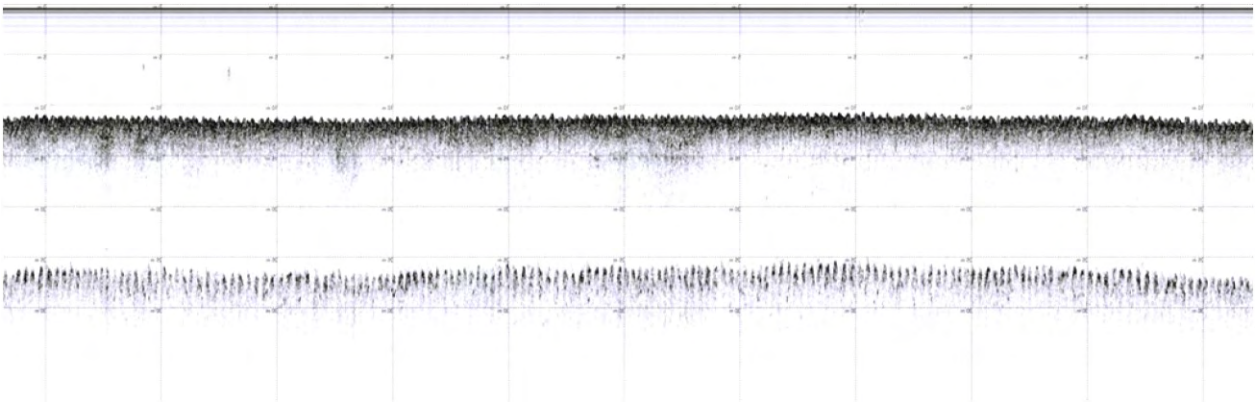
bm_052710b_f1 –northwest to southeast – western side of channel - Brandywine Range– River Mile 13



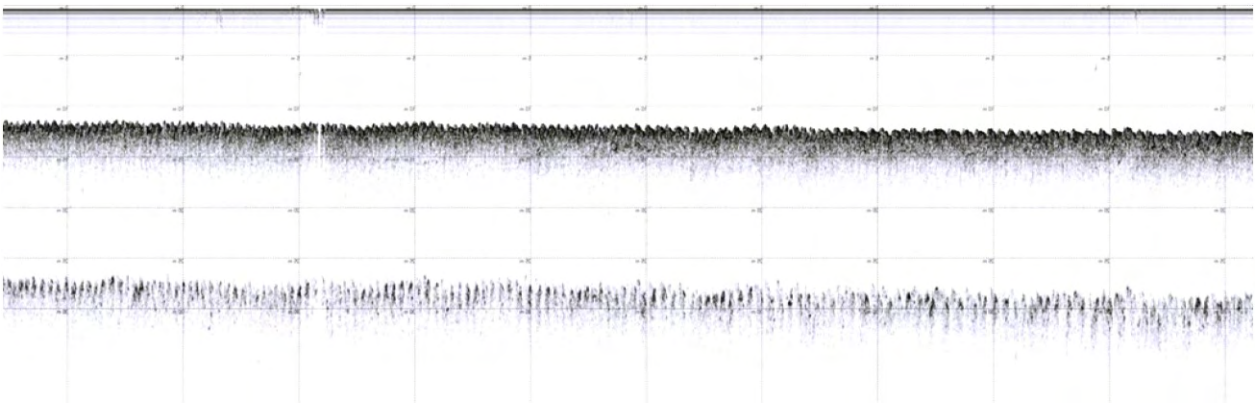
bm_052710b_f0 –northwest to southeast – western side of channel - Brandywine Range– River Mile 12.5



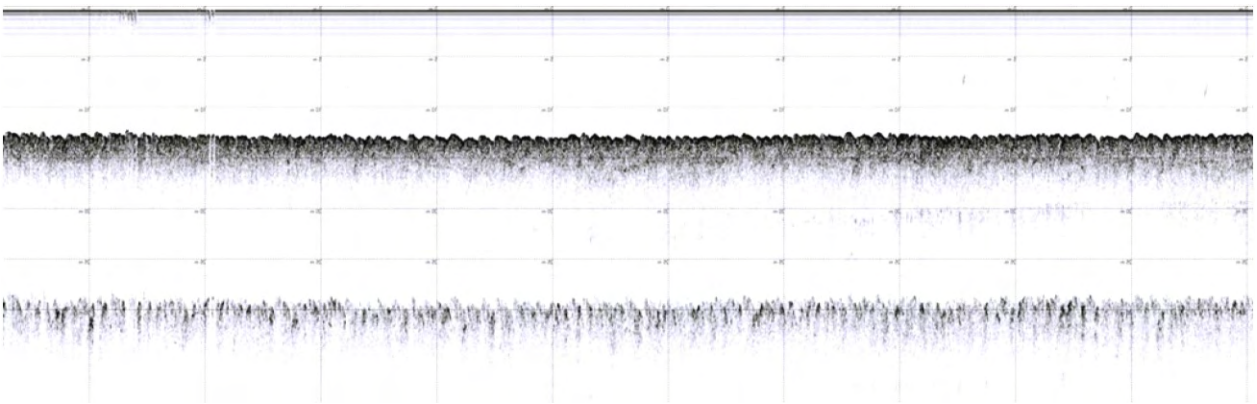
bm_052710a_f4 –northwest to southeast – western side of channel - Brandywine Range– River Mile 11.5



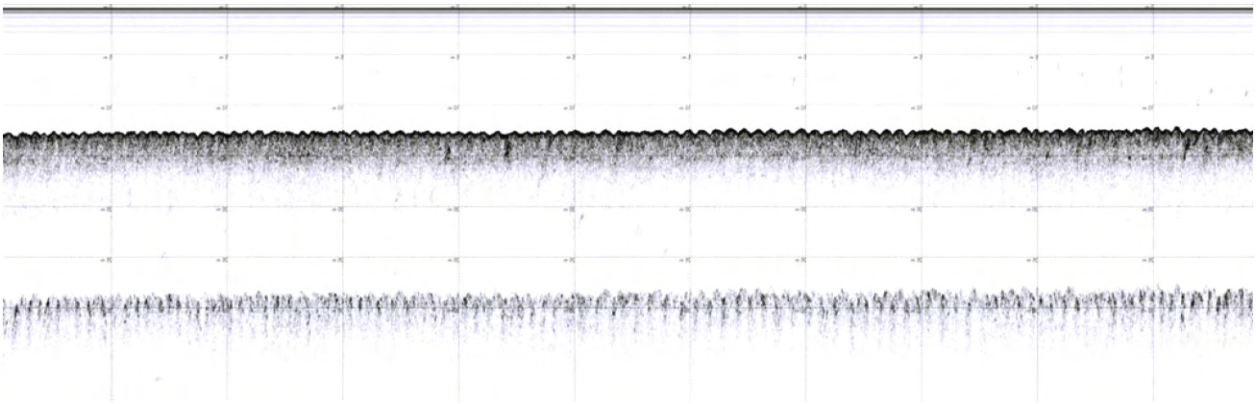
bm_052710a_f3 –northwest to southeast – western side of channel - Brandywine Range– River Mile 10.5



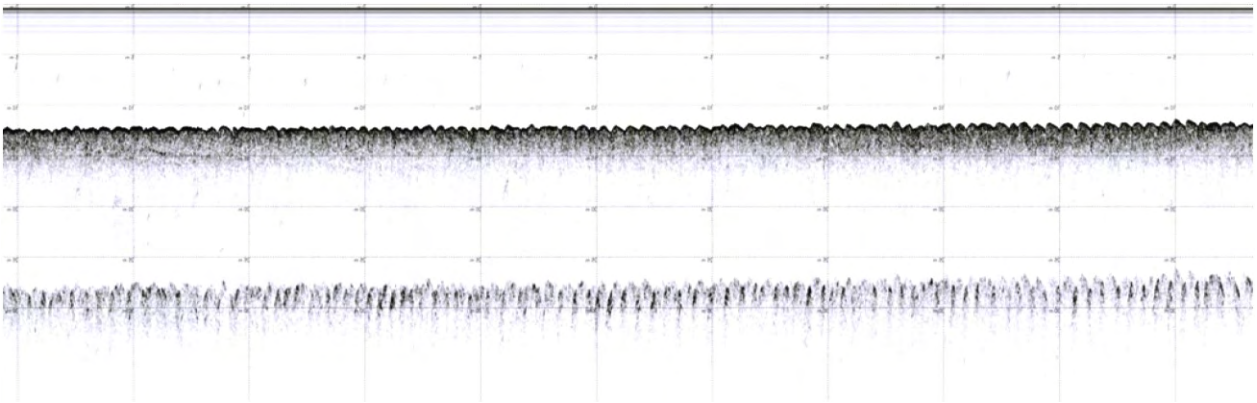
bm_052710a_f2 –northwest to southeast – western side of channel - Brandywine Range– River Mile 10



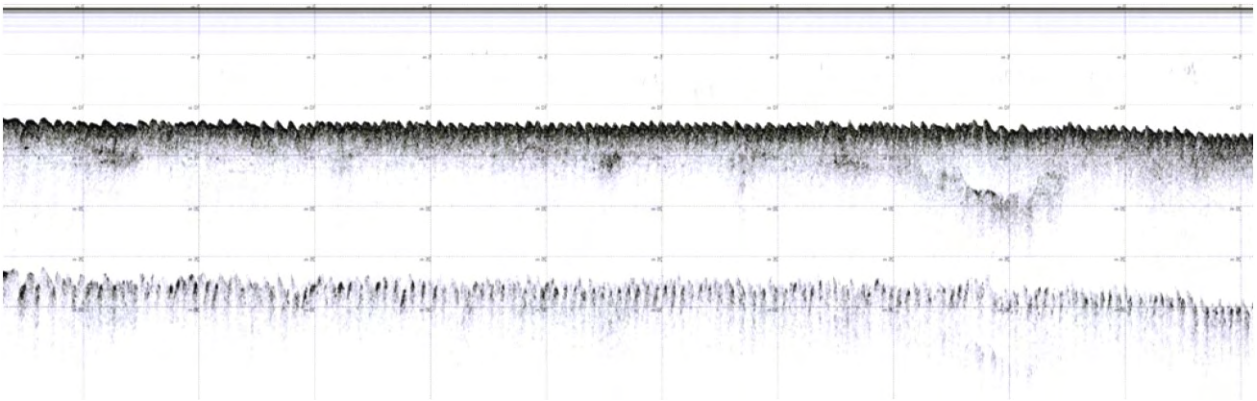
bm_052710a_f1 –northwest to southeast – western side of channel - Brandywine Range– River Mile 9



bm_052710a_f0 –northwest to southeast – western side of channel - Brandywine Range– River Mile 8

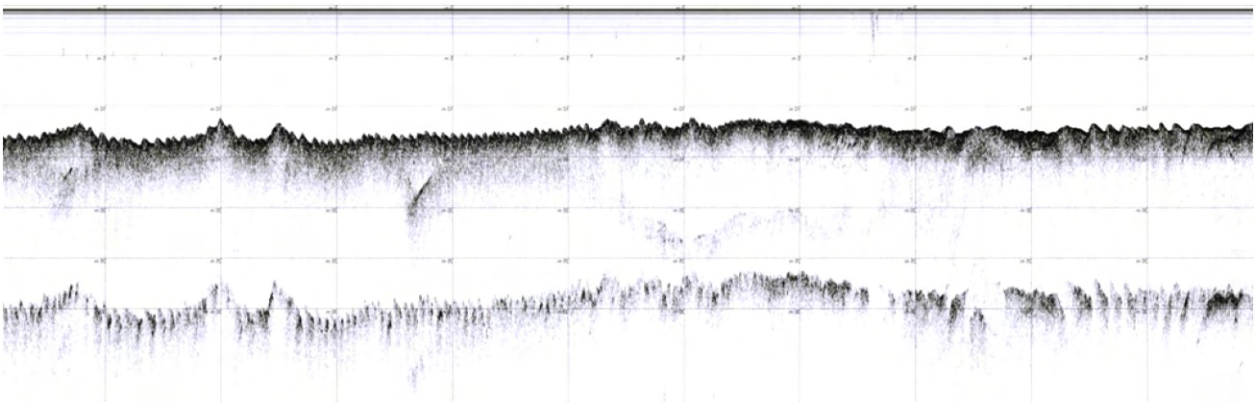


bm_052710_f12 –northwest to southeast – western side of channel - Brandywine Range– River Mile 7

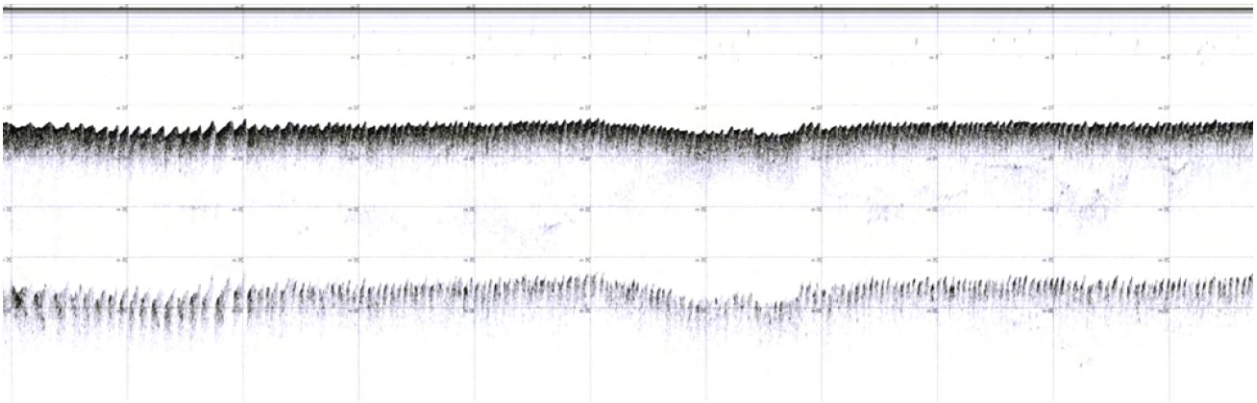


bm_052710_f11 –northwest to southeast/southeast to northwest – western to eastern side of channel –

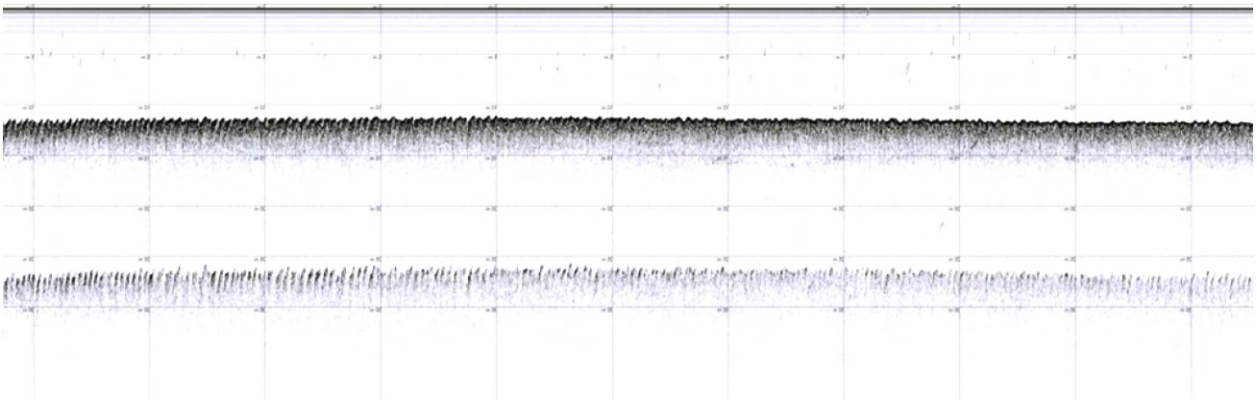
Brandywine Range– River Mile 6



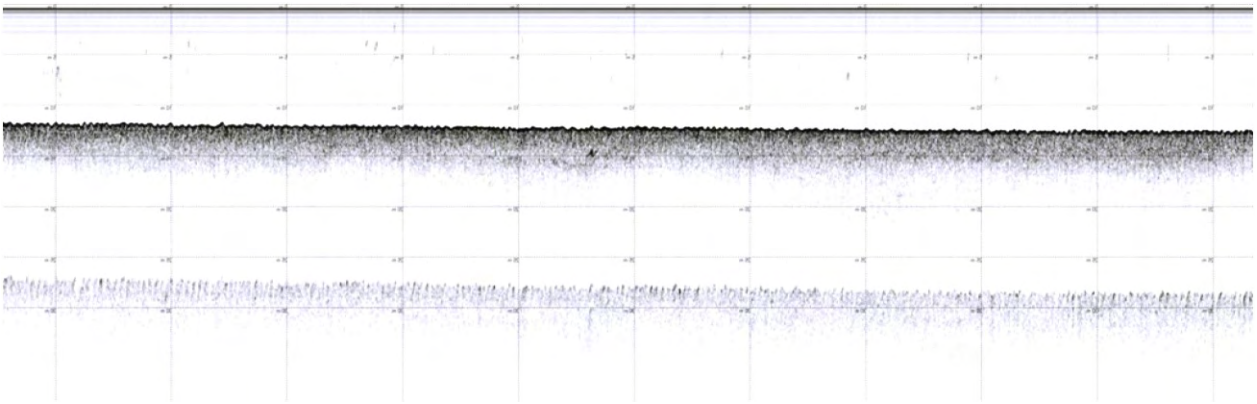
bm_052710_f10 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 6.5



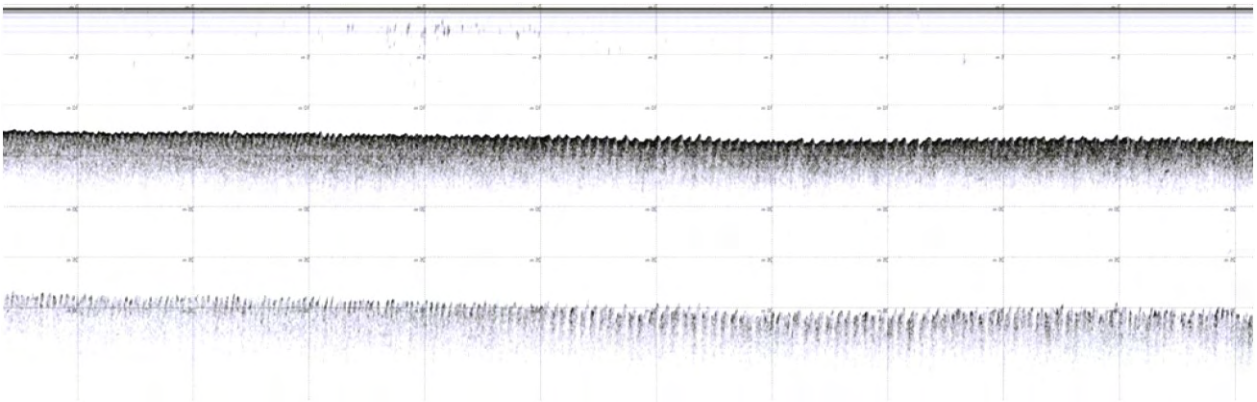
bm_052710_f9 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 7.5



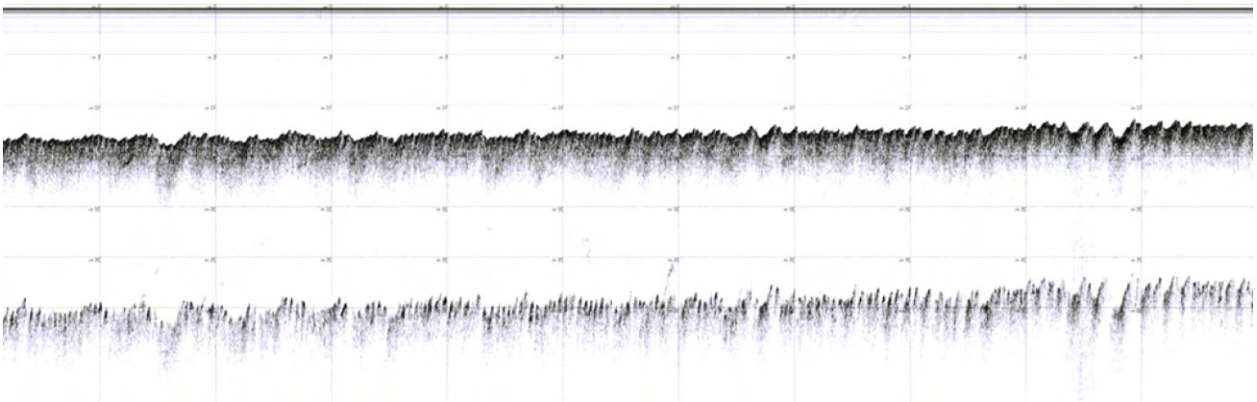
bm_052710_f8 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 8.5



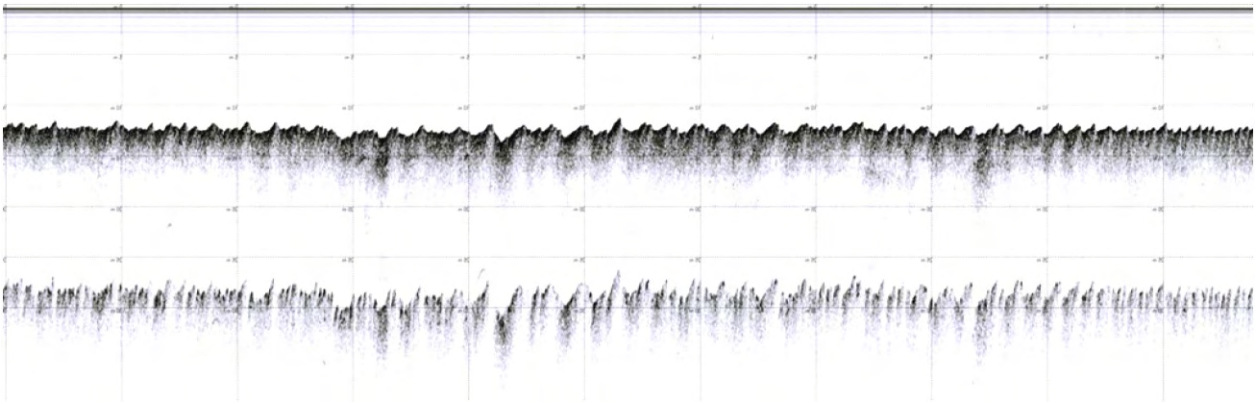
bm_052710_f7 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 10



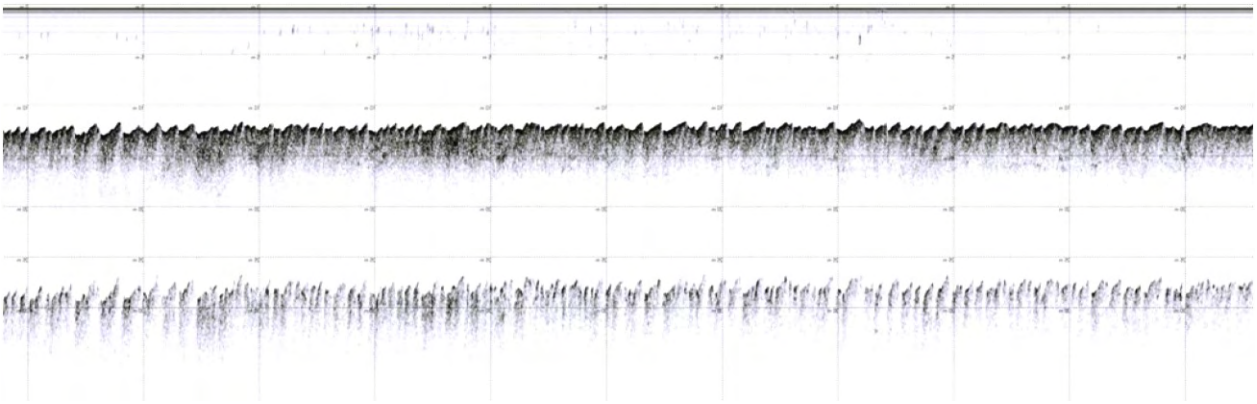
bm_052710_f6 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 11



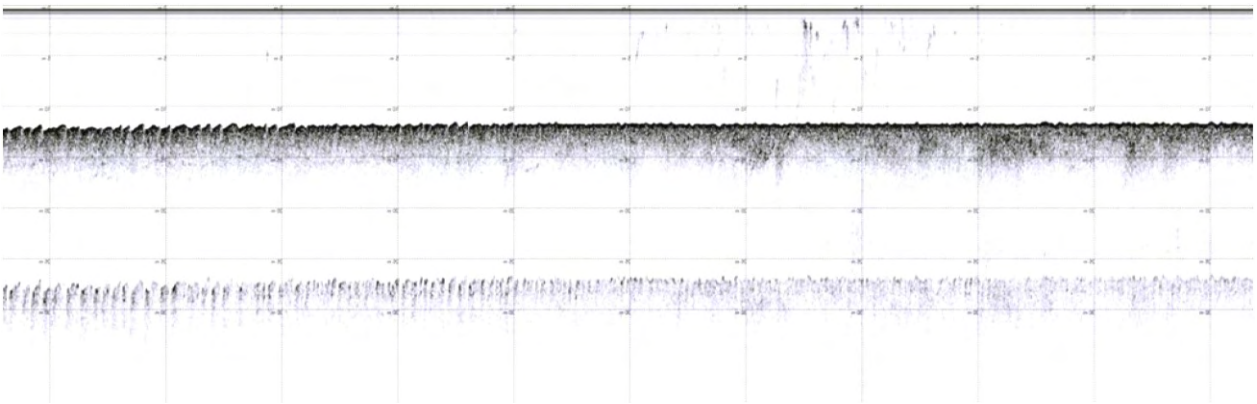
bm_052710_f5 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 12



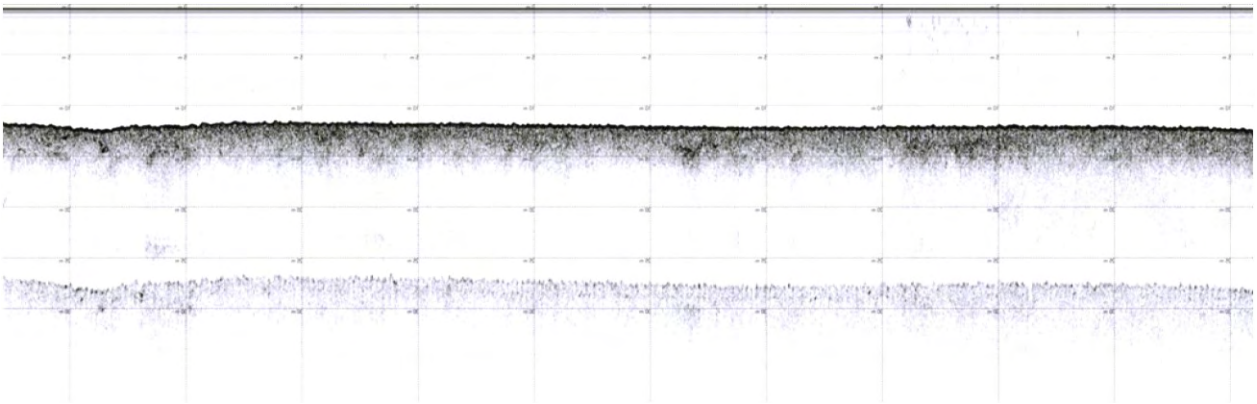
bm_052710_f4 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 13



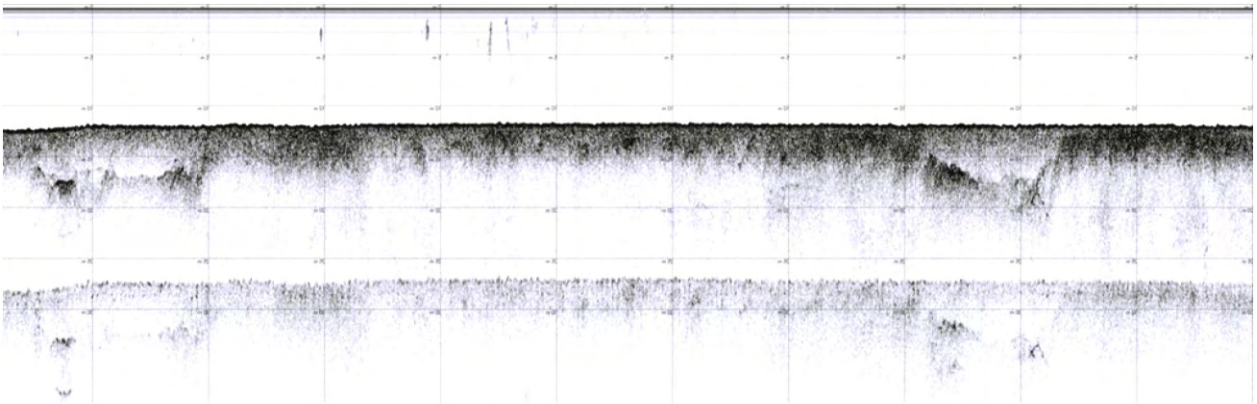
bm_052710_f3 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 14



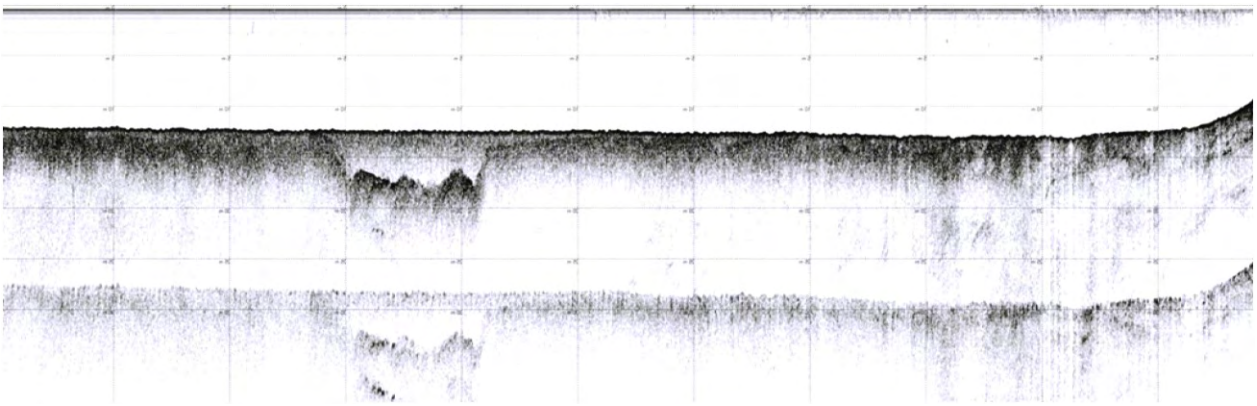
bm_052710_f2 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 15



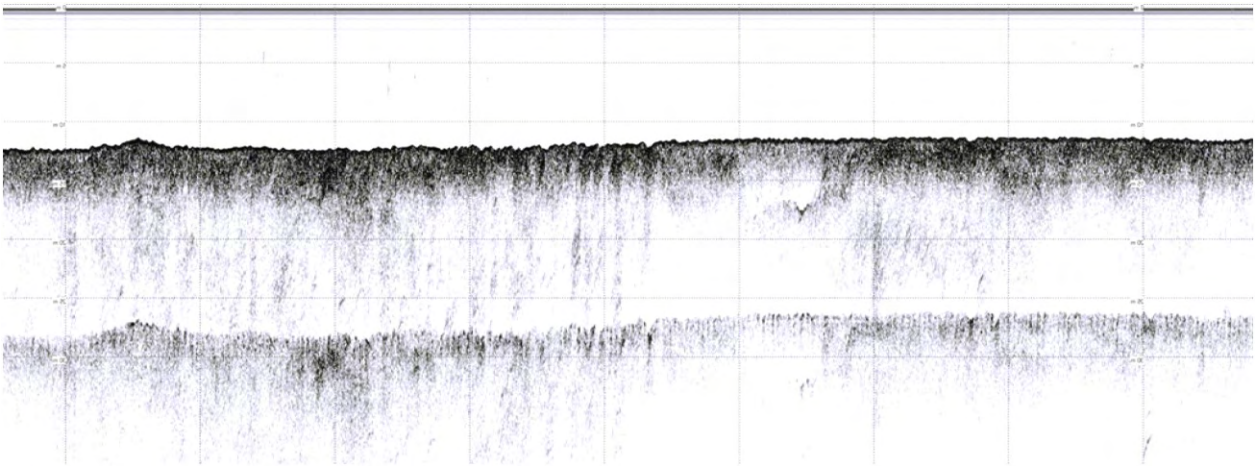
bm_052710_f1 – southeast to northwest – eastern side of channel - Brandywine Range– River Mile 16



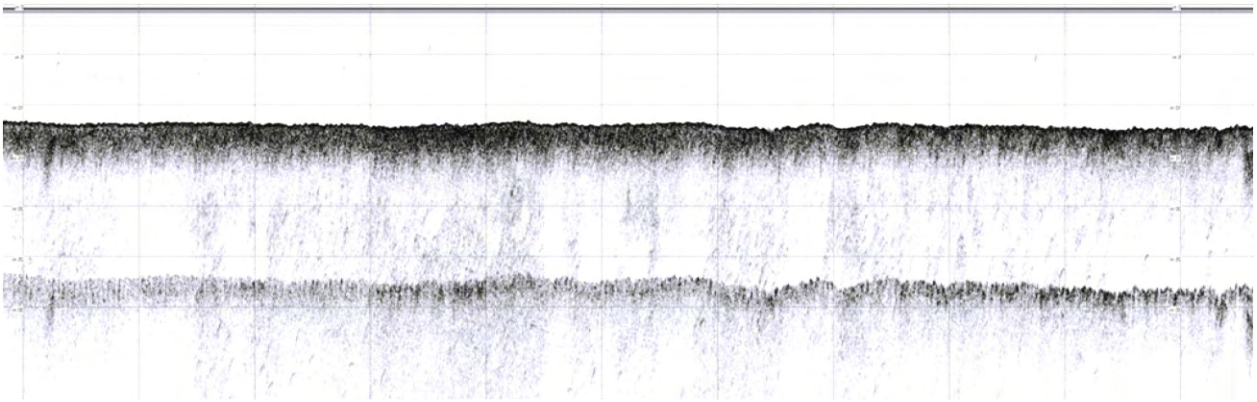
bm_052710_f0 – southeast to northwest – eastern side of channel - Brandywine to Miah Maull Range – River Mile 17



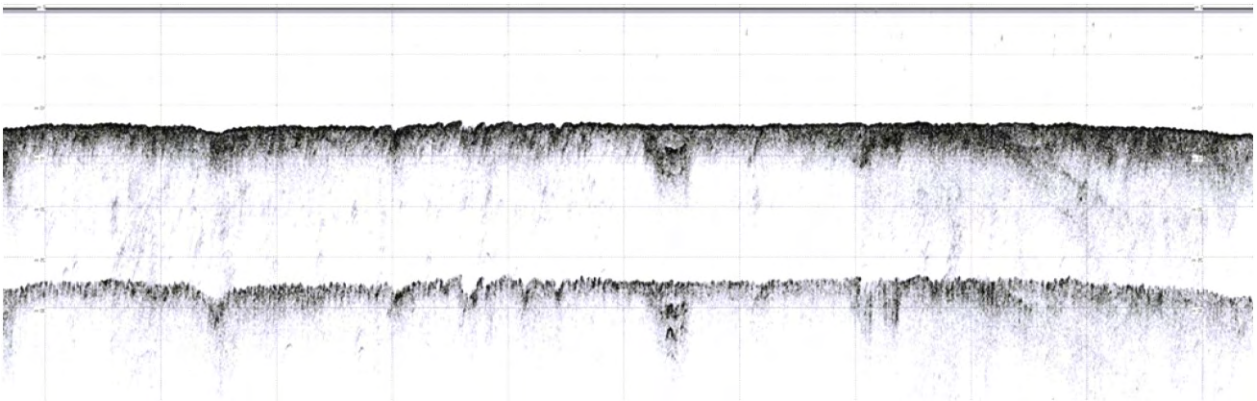
bm_052610_f12 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 18



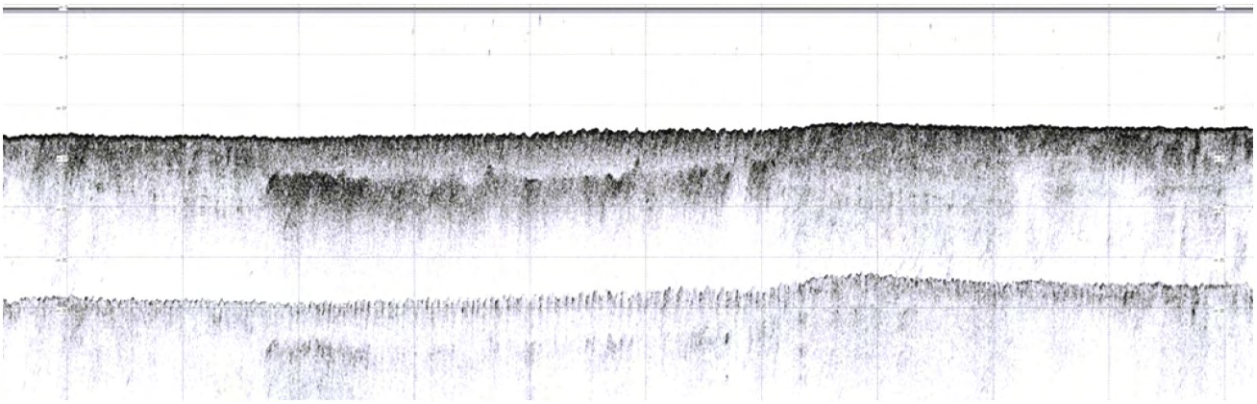
bm_052610_f11 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 19



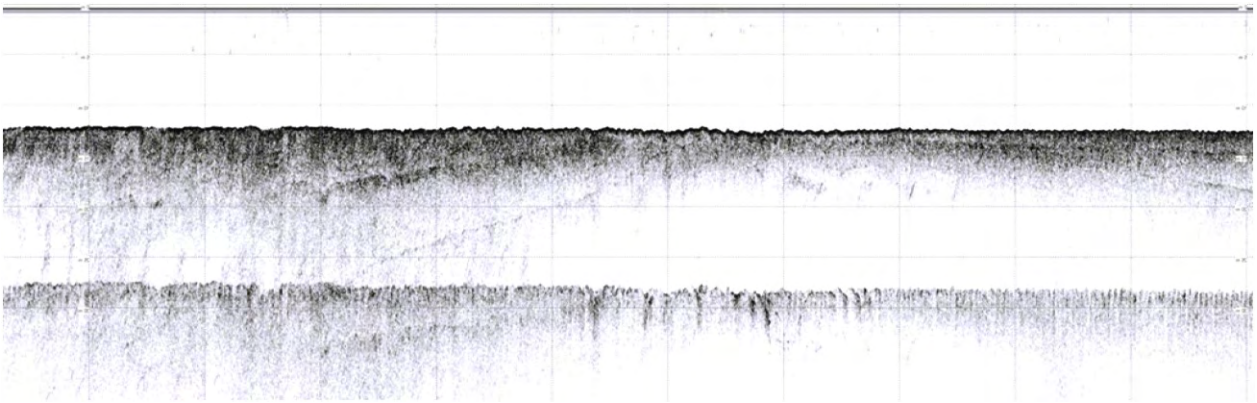
bm_052610_f10 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 20.5



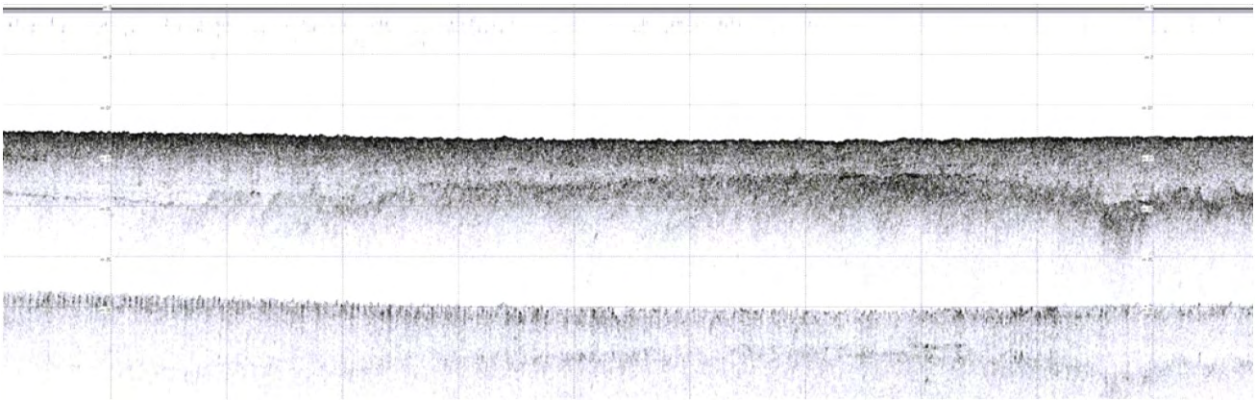
bm_052610_f9 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 21.5



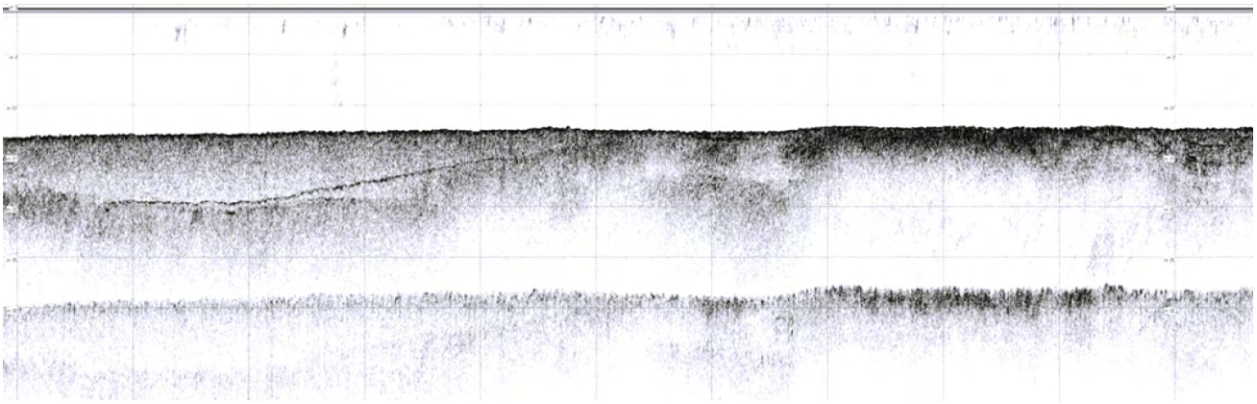
bm_052610_f8 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 23



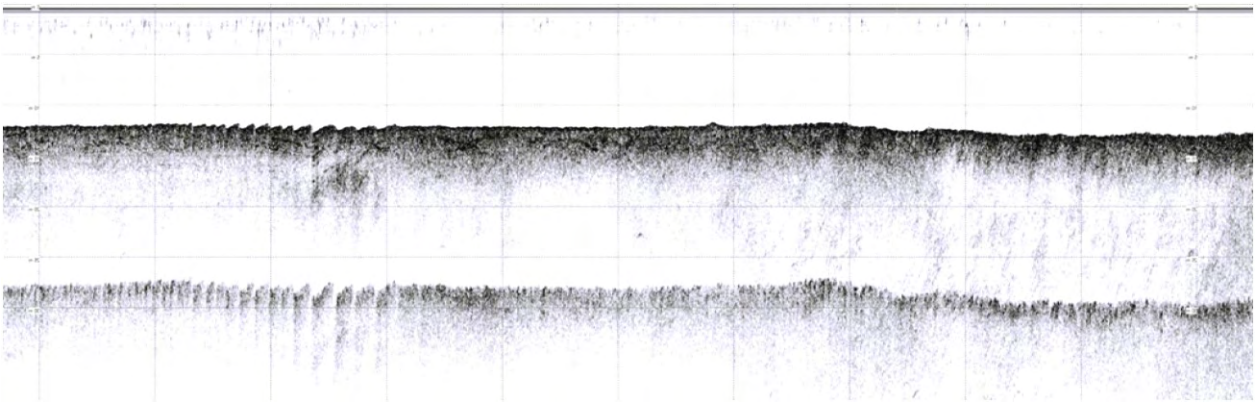
bm_052610_f7 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 24



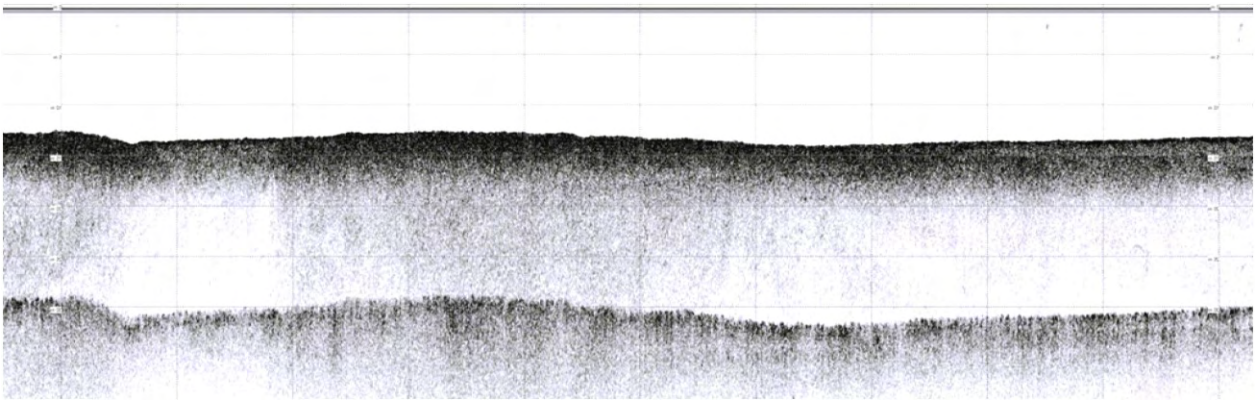
bm_052610_f6 – southeast to northwest – eastern side of channel - Miah Maull Range– River Mile 25.5



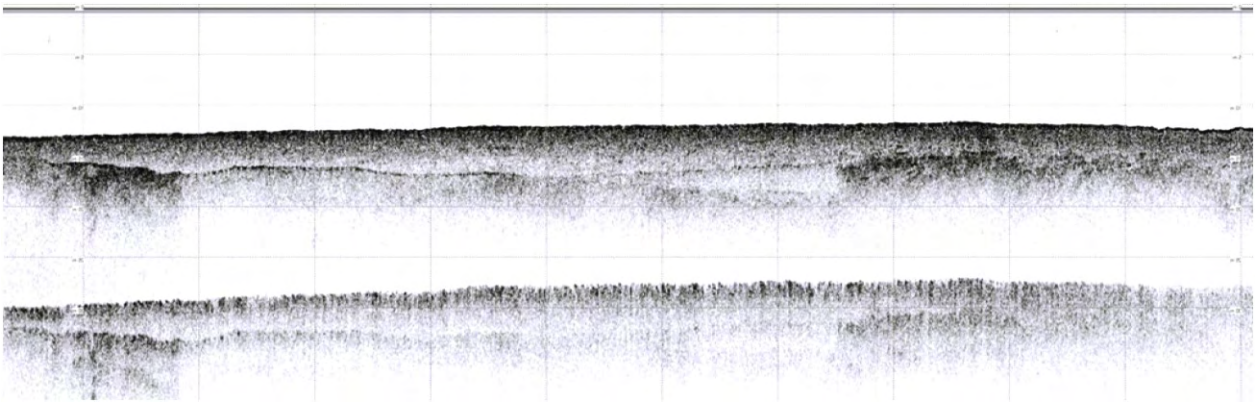
bm_052610_f5 – southeast to northwest – eastern side of channel – Cross Ledge Range– River Mile 27



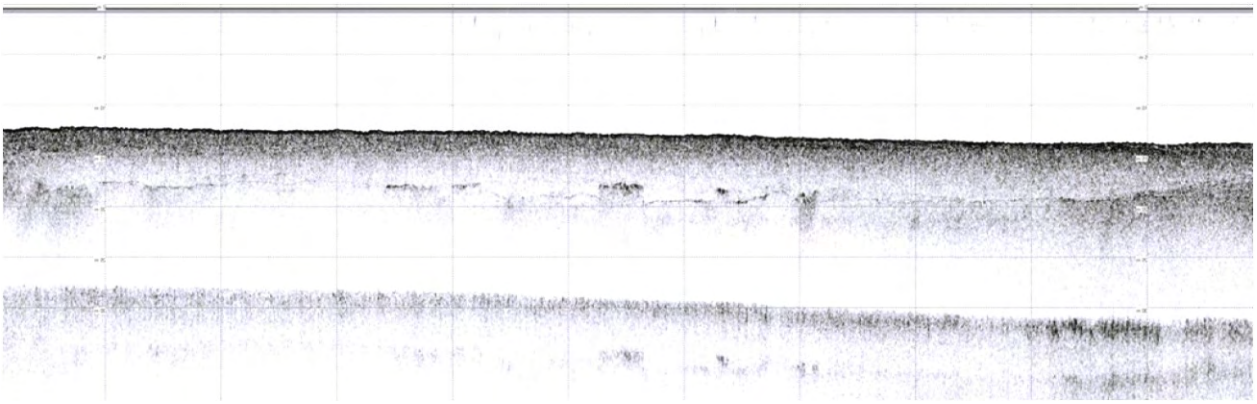
bm_052610_f4 – southeast to northwest – eastern side of channel – Cross Ledge Range– River Mile 28



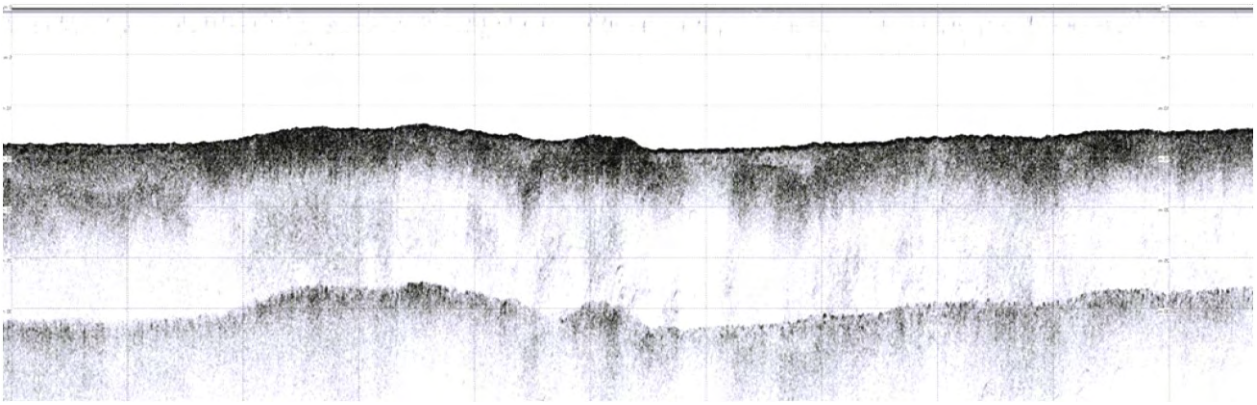
bm_052610_f3 – southeast to northwest – eastern side of channel – Cross Ledge Range– River Mile 29



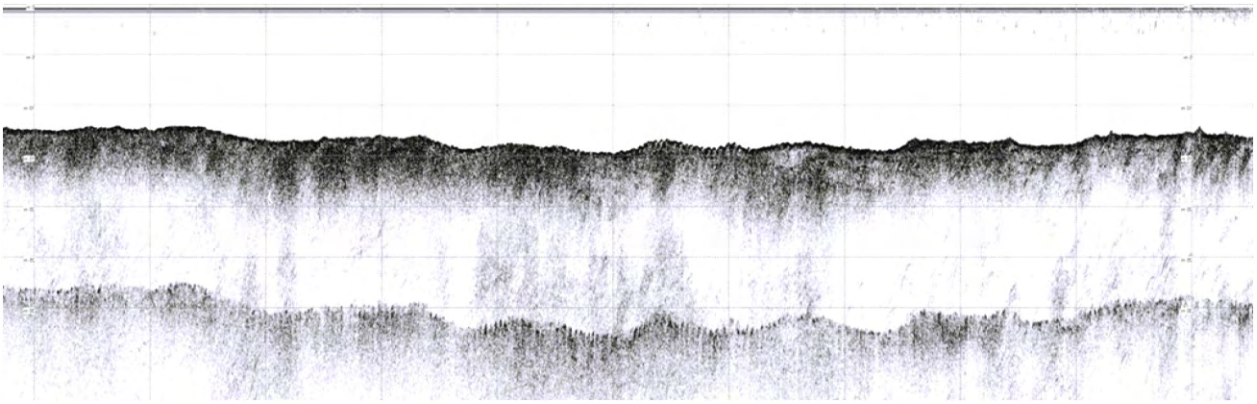
bm_052610_f2 – southeast to northwest – eastern side of channel – Cross Ledge Range– River Mile 30



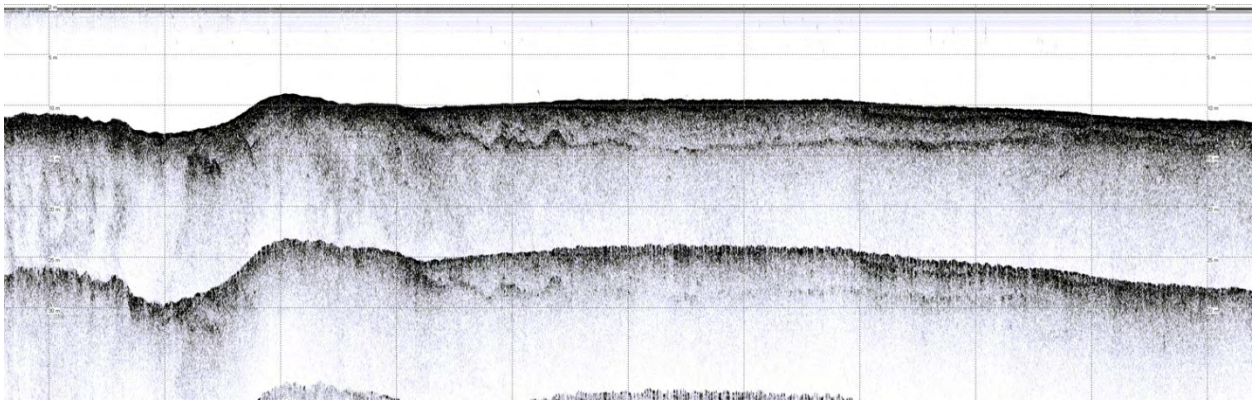
bm_052610_f1 – southeast to northwest – eastern side of channel – Cross Ledge to Liston Range– River Mile 31.5



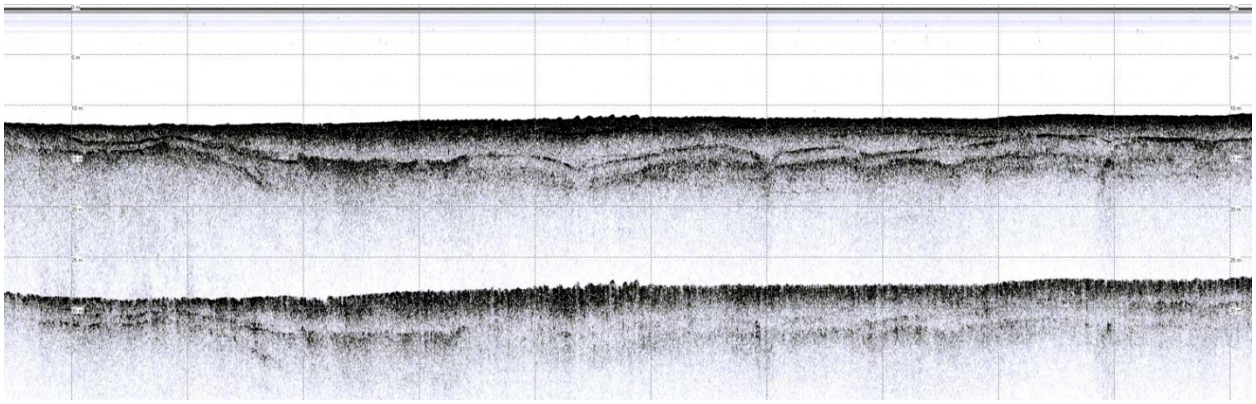
bm_052610_f0 – southeast to northwest – eastern side of channel –Liston Range– River Mile 32



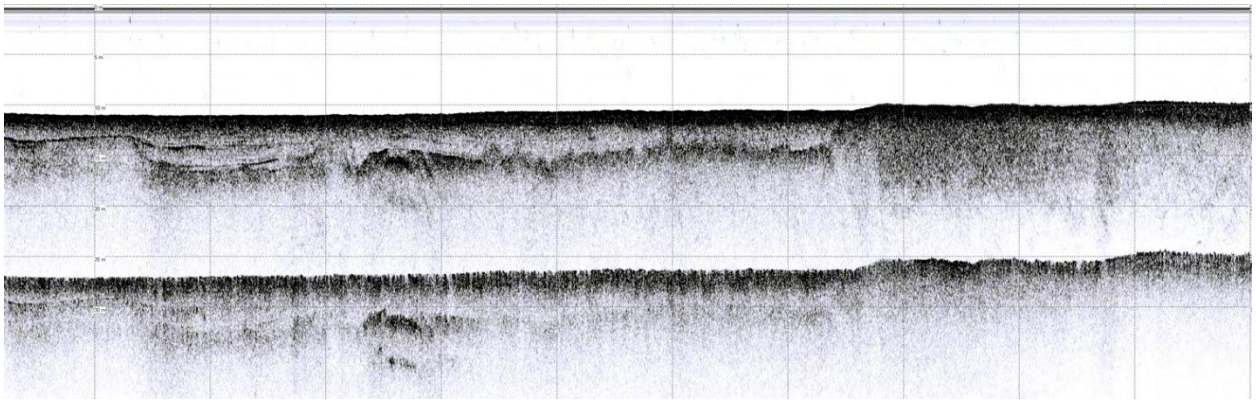
bm_052010_f0 – southeast to northwest – eastern side of channel –Liston Range– River Mile 33



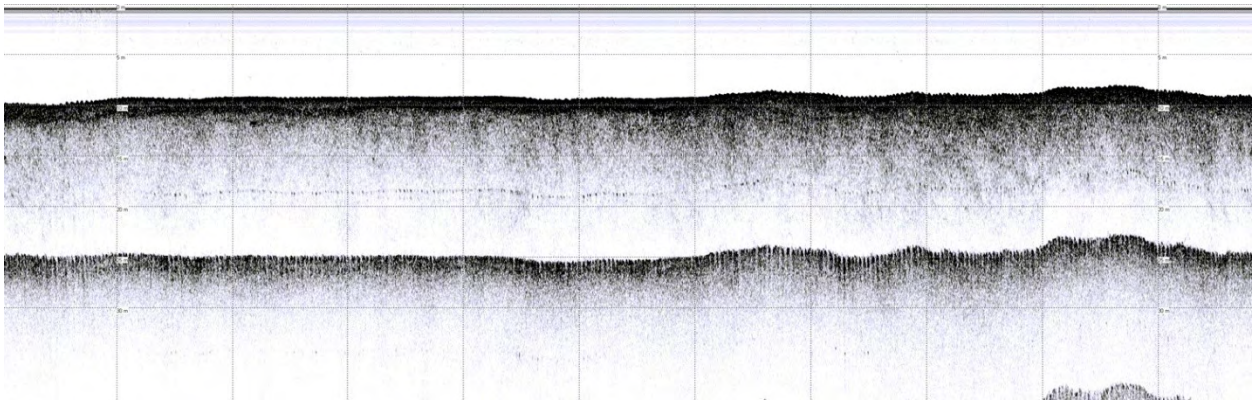
bm_052010_f1 – southeast to northwest – eastern side of channel –Liston Range– River Mile 34



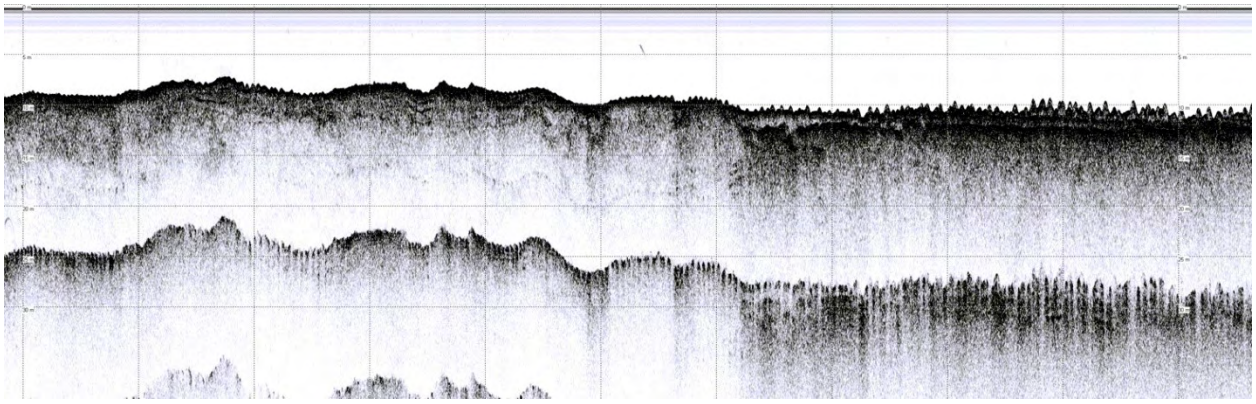
bm_052010_f2 – southeast to northwest – eastern side of channel –Liston Range– River Mile 35



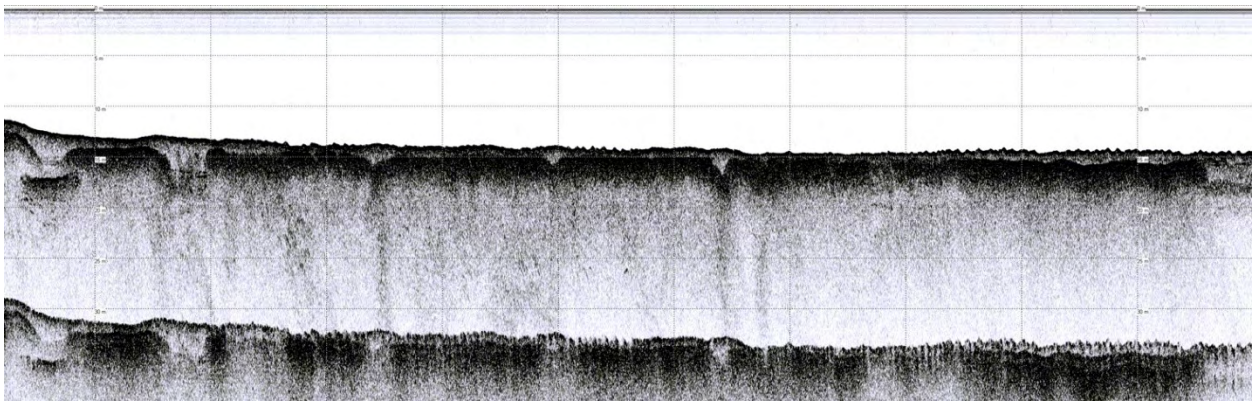
bm_052010_f3 – southeast to northwest – eastern side of channel –Liston Range– River Mile 36



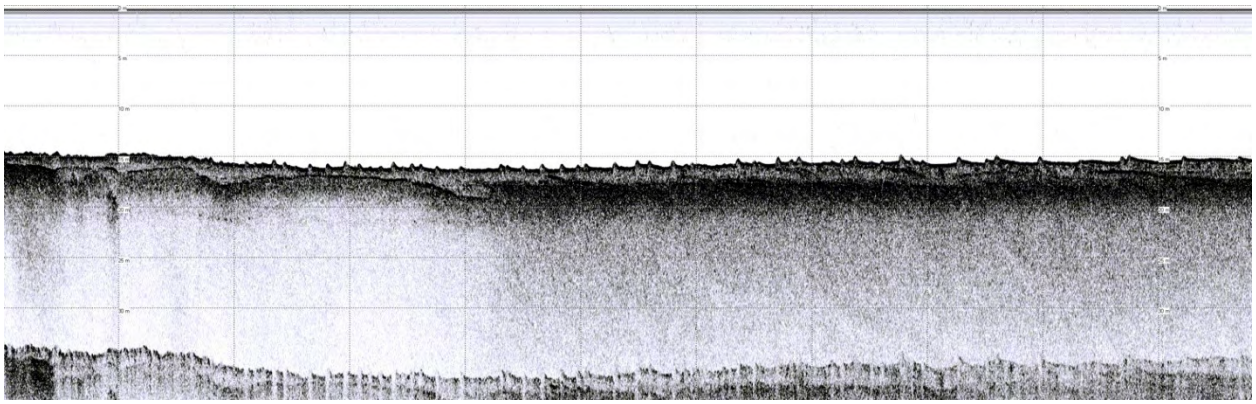
bm_052010_f4 – southeast to northwest – eastern side of channel –Liston Range– River Mile 37



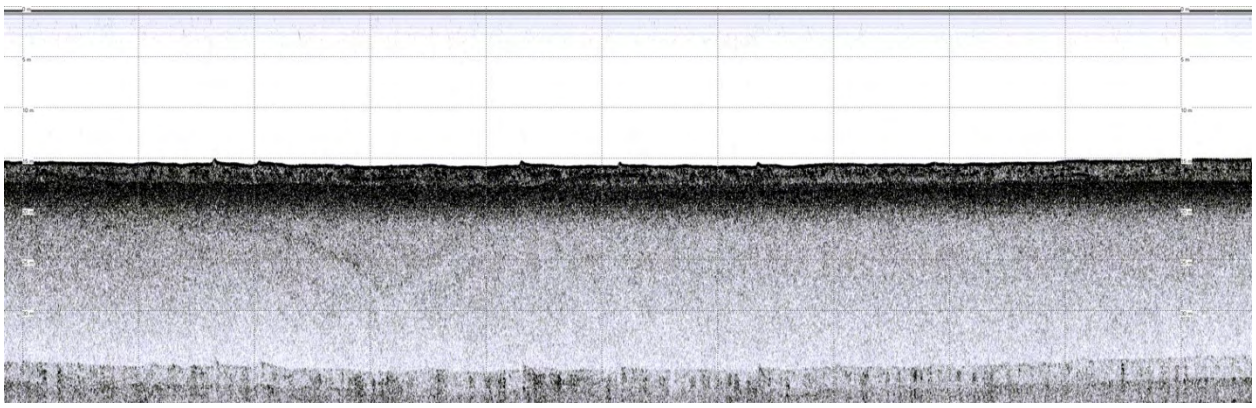
bm_052510_f0 – southeast to northwest – eastern side of channel - Liston Range – River Mile 38



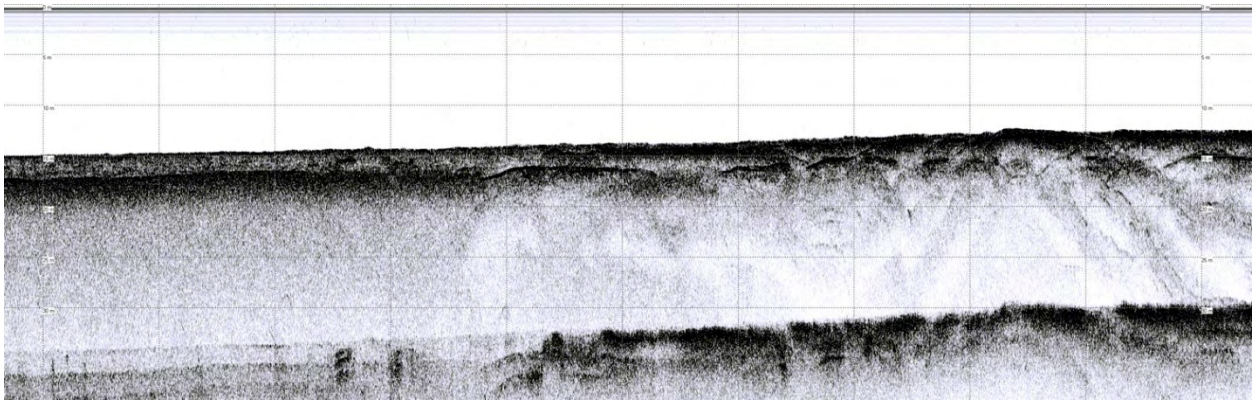
bm_052510_f1 – southeast to northwest – eastern side of channel - Liston Range – River Mile 39



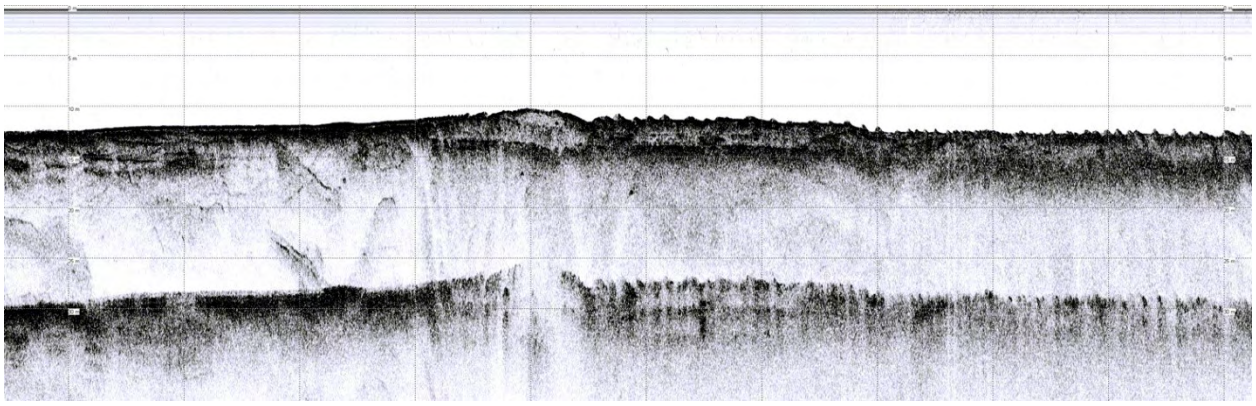
bm_052510_f2 – southeast to northwest – eastern side of channel - Liston Range – River Mile 40



bm_052510_f3 – southeast to northwest – eastern side of channel - Liston Range – River Mile 41



bm_052510_f4 – southeast to northwest/northwest to southeast – eastern to western side of channel - Liston Range – River Mile 42



Appendix B: ACOE Core logs and Composite Samples Sieve Data

Data Compiled from:

Duffield Associates, Inc. 1999. Geotechnical investigation: 1999 Vibracoring along the Delaware River Port Mahon PED, prepared for USACE Philadelphia District. Wilmington, De.

Duffield Associates, Inc., 2005. Geotechnical Investigation Vibrational Coring in the Liston Range of the Delaware River Main Channel, Delaware. Prepared for USACE Philadelphia District. Wilmington, De.

GBA Engineers and Surveyors, 2010. Delaware River Deepening - Dredged Material Characterization for Reach E. Prepared for USACE Philadelphia District.

McGee, R.G., 1996. Geoacoustic Study of Delaware Main Channel. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Ms., P. 395.

Science Applications International Corporation (SAIC), 2001. Report for vibracoring and analysis of marine sediments: Delaware River Main Channel, Delaware. Prepared for USACE Philadelphia District., p 192.

Sub-Reach E-7

DRILLING LOG DRV-84 R1

1. PROJECT : DE River Main Channel
2. LOCATION : N34273.33 E321289.97
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-84 Run1
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 20.01'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/25/01
DATE COMPLETED: 4/25/01
17. ELEVATION : -50.7 NAVD(88)
18. TOTAL RECOVERY : 9.6'/20.01'
19. INSPECTOR : Paul J. Lucot

DEPTH FEET	NAVD ELEV. -50.7	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-51	SM	SILTY SAND: Poorly Graded, Very Fine to Medium Sand, subrounded to rounded, trace Shell Fragments (<5%), wet, Dark Greenish Gray 10GY 4/1	S-1	Run 1 Uncorrected Water Depth= 49.7' MLLW= 47.4' S-1 collected from 0.0' - 5.0'
2	-53				
4	-55				
6	-57	SM	SILTY SAND: with some Very Fine Sand, 5-10% Shell Fragments, very soft, wet, Dark Greenish Gray 10GY 4/1	S-2	S-2 collected from 5.0' - 9.8'
8	-59				
10	-61	NR	NO RECOVERY		NR= No Recovery
12	-63				
14	-65				
16	-67				
18	-69				
20					Bottom of Boring= 20.01'

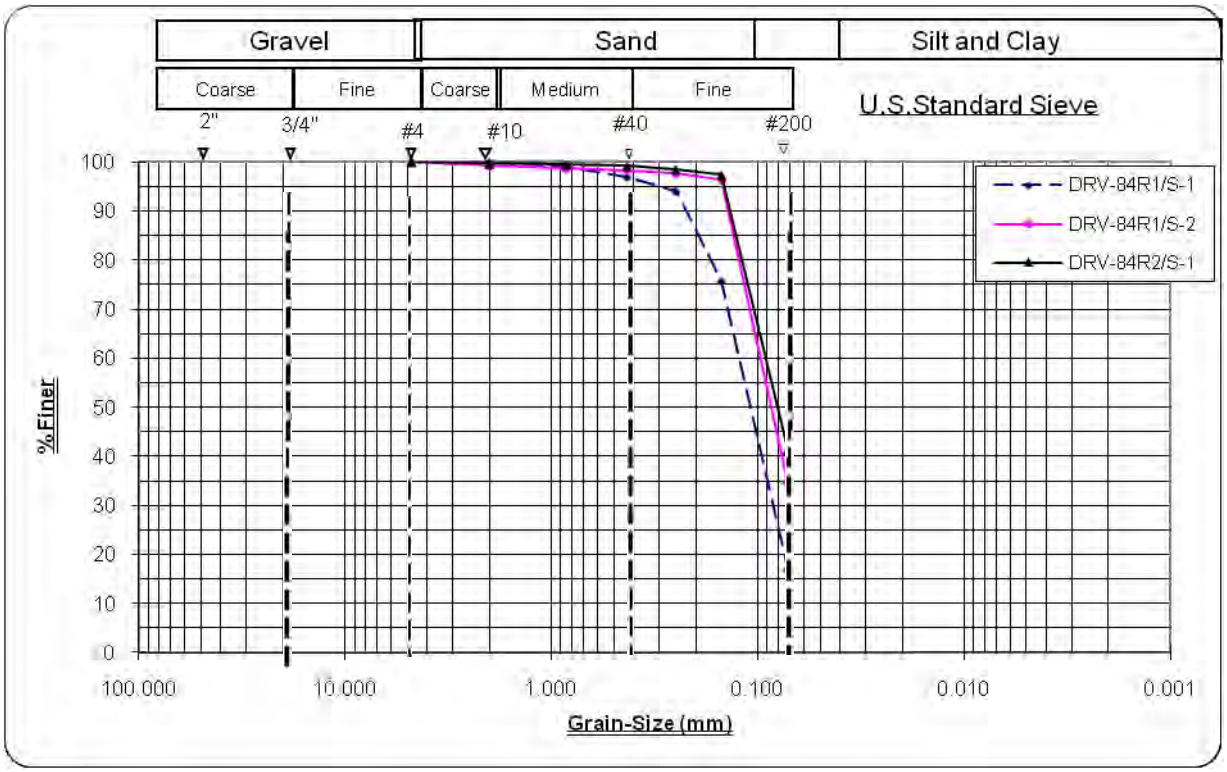
Science Applications International Corporation
An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

DRILLING LOG DRV-84 R1

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma34		
Job No.	2000g591				Date	24-May-01		
					Cu	Undefined	Undefined	Undefined
Dry Wt.	225.90	398.60	329.20		C c	Undefined	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-84R1/S-1	DRV-84R1/S-2	DRV-84R2/S-1			DRV-84R1/S-1	DRV-84R1/S-2	DRV-84R2/S-1
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70			
3/8"	0.00	0.00	0.00	3/8"	9.50			
#4	0.00	0.00	0.00	#4	4.75	100.00	100.00	100.00
#10	0.00	3.30	1.10	#10	2.00	100.00	99.17	99.67
#20	2.30	5.10	1.80	#20	0.850	98.98	98.72	99.45
#40	6.80	6.80	2.80	#40	0.430	96.99	98.29	99.15
#60	13.30	9.60	4.70	#60	0.250	94.11	97.59	98.57
#100	55.00	14.70	8.40	#100	0.150	75.65	96.31	97.45
#200	187.70	260.80	193.50	#200	0.072	16.91	34.57	41.22

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-84R1/S-1	00.00-05.00	Run-1	N.T	Gray silty sand (SM)
DRV-84R1/S-2	05.00--09.80	Run-1	N.T	Gray silty sand (SM)
DRV-84R2/S-1	07.50-12.50	Run-2	N.T	Gray silty sand (SM)
N.P- Non-Plastic N.T- Not Tested				

Sub-Reach E-6

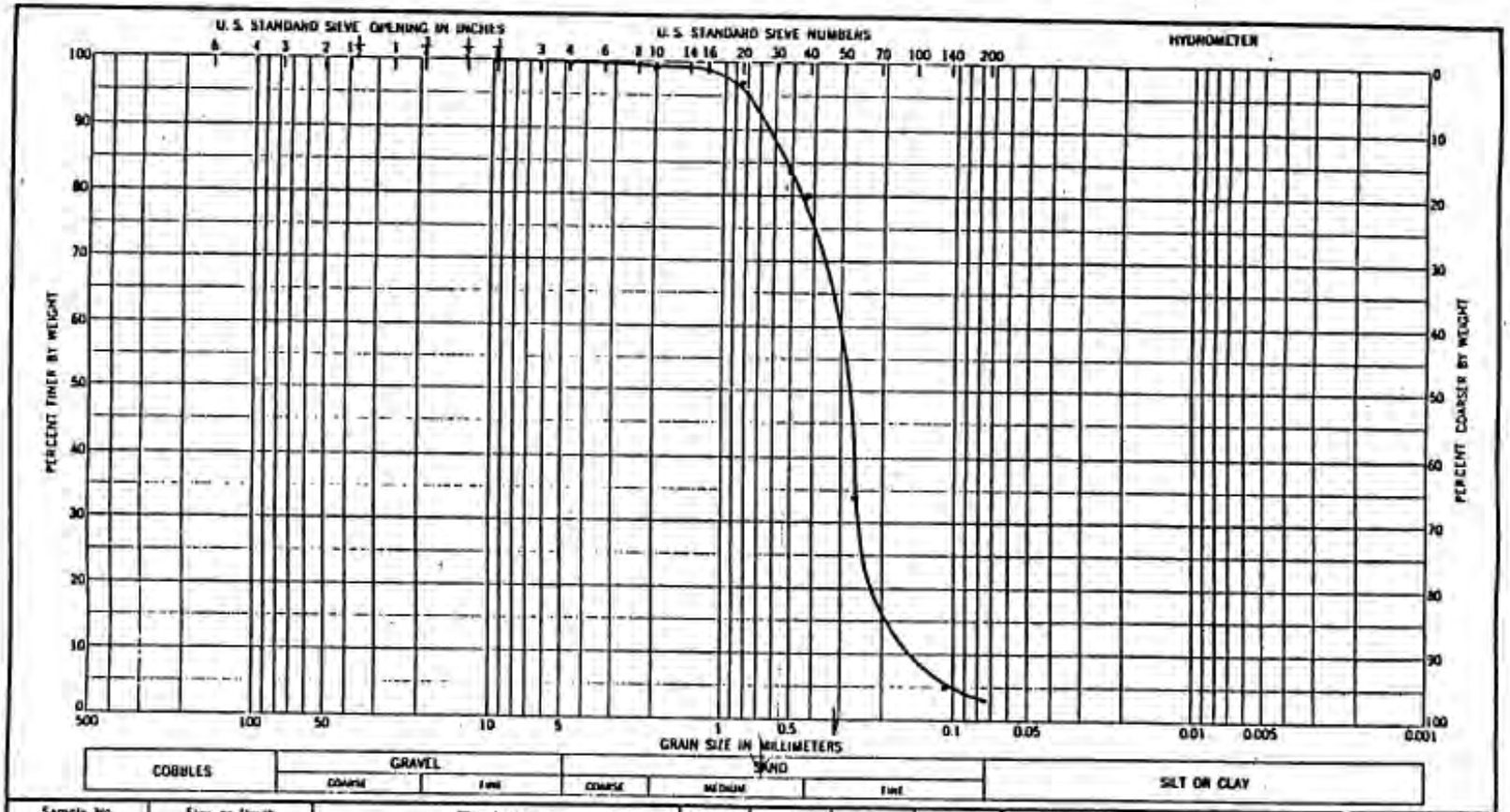
Hole No. DEV-27

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station) 38° 55' 35.16" 75° 06' 03.83"	12. MANUFACTURER'S DESIGNATION OF DRILL NA
3. DRILLING AGENCY Buckart-Horn, Inc.	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
4. HOLE NO. (As shown on drawing title and file number) DEV-27	14. TOTAL NUMBER CORE BOXES NA
5. NAME OF DRILLER Ocean Survey, Inc.	15. ELEVATION GROUND WATER NA
	16. DATE HOLE : STARTED 06/14/91 : COMPLETED 06/14/91
6. DIRECTION OF HOLE VERTICAL INCLINED _____ DEG. FROM VERT.	17. ELEVATION TOP OF HOLE -46.5 ft. NGVD
7. THICKNESS OF OVERBURDEN NA	18. TOTAL CORE RECOVERY FOR BORING 15.9/3.9 ft.
8. DEPTH DRILLED INTO ROCK NA	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE 15 ft.	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			SP			One jet retry
	.8		Brown medium to fine sand			Sample 0 - .8 ft.
	1		Interbedded brown sand with grey sand			
	.7					Sample 1.8 - 5.0 ft.
	2		Grey sandy with some shells			
			SP			
	3					
	4					
	5					
	6					
	7		Grey sandy silt with shells			Sample 7.2 - 10 ft.
			SM-SC			
	8					
	9		Grey clay silt to silty clay fine with shells			80° dips
			SM-SC			
	10					
	.6		Interbedded above and below			
	11					
	.3		Brown silty sand			Sample 11.3 - 15 ft.
	12		SP			
	13					
	14					
	15		White sand fine, loose			Sample 15 - 16.2 ft.
			SP			
	16					
	.5		Yellow brown fine sand fine some interbedded white			Sample 16.4 - 18 ft.
	17		SP			
	18					Bottom of recovery
	19					

PROJECT Delaware River Comprehensive Study | HOLE NO. DEV-27



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRU-27	0.0 - 8.0	Poorly-Graded Sand SP				

Project Delaware River Vibracores

Area

Boring No. DRU-27

Date 7/30/91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

DRILLING LOG DRV-83

1. PROJECT : DE River Main Channel
2. LOCATION : N35764.50 E320563.29
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-83
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.87'
10. BIT SIZE/ TYPE : 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: NA
UNDIST. SAMPLES: NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/26/01
DATE COMPLETED: 4/26/01
17. ELEVATION : -50.0 NAVD(88)
18. TOTAL RECOVERY : 18.4'/19.87'
19. INSPECTOR : Paul J. Lucot

DEPTH FEET	NAVD ELEV -50.0	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-50	SP	SAND: Poorly Graded, rounded to subrounded, trace Shell Fragments, very loose, wet, Very Dark Grayish Brown 2.5Y 3/2	S-1	Uncorrected Water Depth= 47.2' MLLW= 46.7' S-1 collected from 0.0' - 0.8'
2	-52	SM	SILTY SAND: with traces of Clay, low plasticity, very soft, wet, Dark Greenish Gray 10GY 4/1	S-2	S-2 collected from 0.8' - 5.0' Sieve analysis results from S-2 are indicative of 0.8' - 7.5' based on field classification
4	-54				
6	-56	SM	As above		5.0' - 7.5' zone represented in sample S-2
8	-58	SP-SM	SAND with SILT: Poorly Graded Fine to Medium Sand, rounded, Light Olive Brown 2.5Y 4/3, with occasional Clay stringers	S-3	S-3 collected from 7.5' - 10.0'
10	-60	SP-SM	As above, with no stringers		
12	-62			S-4	Sample 4 not analyzed
14	-64				
16	-66	SP-SM	As above		
18	-68	NR	NO RECOVERY		NR= No Recovery Bottom of Boring= 19.87'
20					

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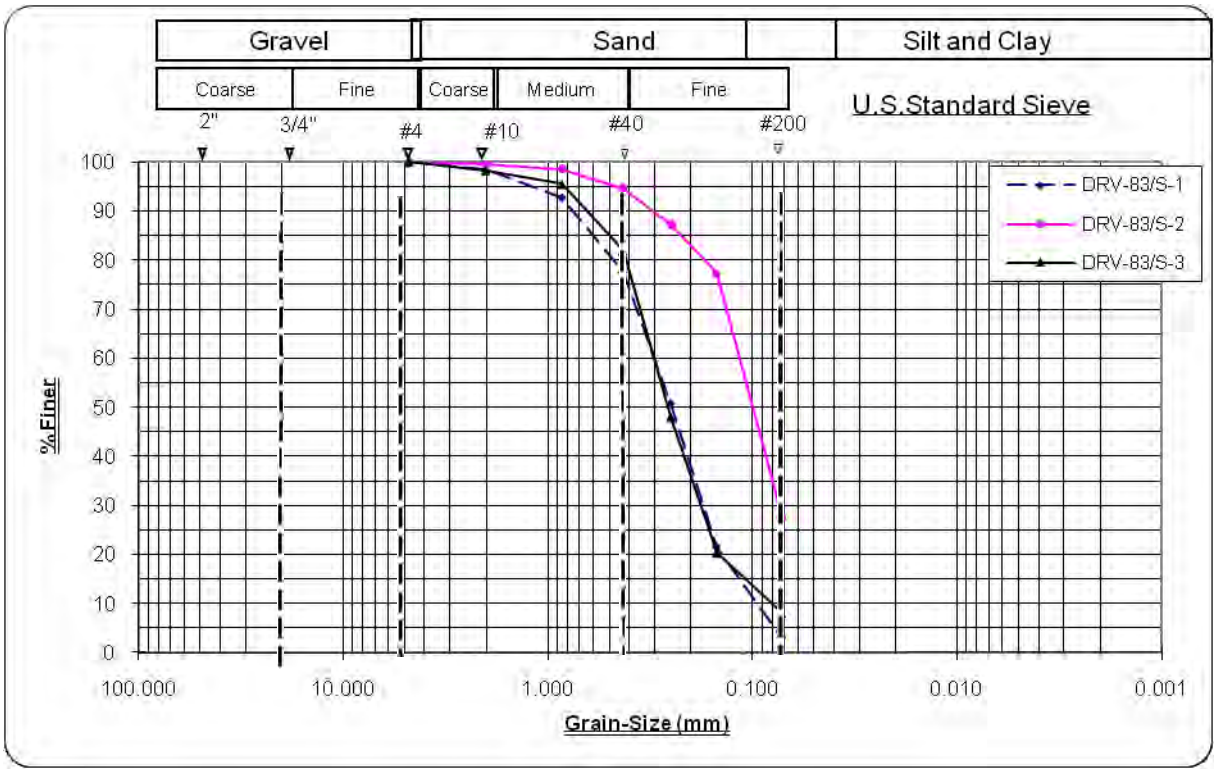
USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

DRILLING LOG DRV-83

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma33		
Job No.	2000g591				Date	24-May-01		
					Cu	3.00	Undefined	3.75
Dry Wt.	307.20	271.60	372.20		C c	1.08	Undefined	1.35
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-83/S-1	DRV-83/S-2	DRV-83/S-3			DRV-83/S-1	DRV-83/S-2	DRV-83/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70			
3/8"	0.00	0.00	0.00	3/8"	9.50			
#4	0.00	0.00	0.00	#4	4.75	100.00	100.00	100.00
#10	4.80	1.60	6.20	#10	2.00	98.44	99.41	98.33
#20	22.10	4.00	16.70	#20	0.850	92.81	98.53	95.51
#40	68.80	14.50	67.20	#40	0.430	77.60	94.66	81.95
#60	151.30	34.70	193.70	#60	0.250	50.75	87.22	47.96
#100	241.10	61.80	296.60	#100	0.150	21.52	77.25	20.31
#200	298.20	196.70	342.20	#200	0.072	2.93	27.58	8.06

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-83/S-1	00.00-00.80		N.T	Gray poorly graded sand (SP)
DRV-83/S-2	00.80-05.00		N.T	Gray silty sand (SM)
DRV-83/S-3	07.50-10.00		N.T	Gray poorly graded sand with silt (SP-SM)
N.P- Non-Plastic N.T- Not Tested				

Hole No. DRV-26

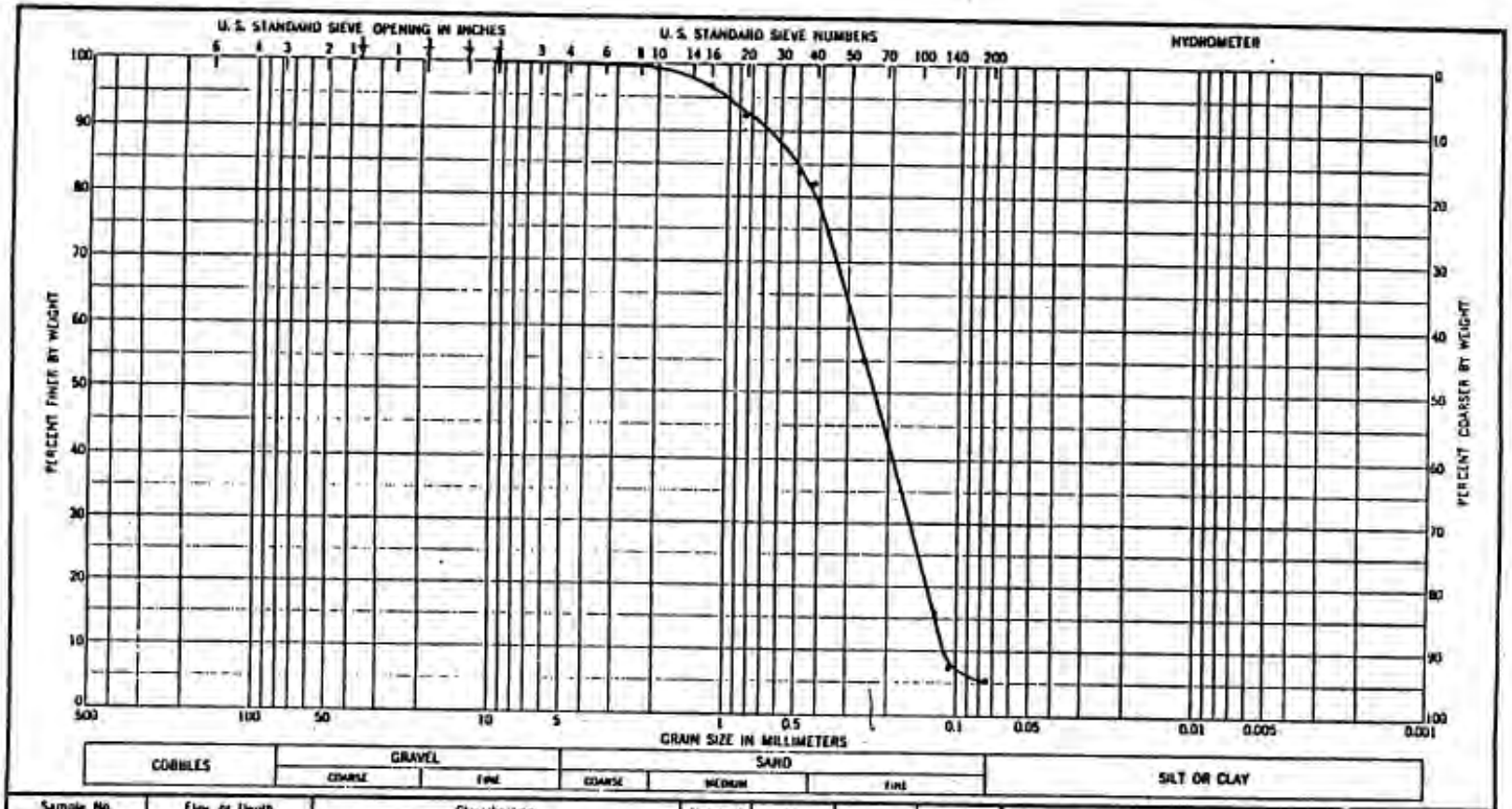
DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
2. LOCATION (Coordinates or Station) 38° 57' 7.0" 75° 06' 46.38"	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Buchart-Horn, Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL NA
4. HOLE NO. (As shown on drawing title and file number) DRV-26	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED
5. NAME OF DRILLER Ocean Survey, Inc.	14. TOTAL NUMBER CORE BOXES NA
6. DIRECTION OF HOLE VERTICAL INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NA
7. THICKNESS OF OVERBURDEN NA	16. DATE HOLE: STARTED 07/16/91: COMPLETED 07/16/91
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE -46.3 ft. MGVD
9. TOTAL DEPTH OF HOLE 20 ft.	18. TOTAL CORE RECOVERY FOR BORING 16 ft.
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Grey sand with black stains SP			
	1		Grey sand with scattered shells siltier with depth SP			Sample 0 - 5.0 ft.
	2					
	3					
	4					
	5					
	6		Grey sand SP			
	7		Red brown sand, interbedded with grey SP			
	8		Red brown sand SP			
	9					
	10		SP			Sample 8.3 - 10 ft.
	11					
	12		Grey silt ML			
	13					Sample 12 - 14.6 ft.
	14		Red silt ML			
	15		Red brown silty sand SM-SC			Sample 14.6 - 16 ft.
	16					Bottom of recovery
	17					
	18					
	19					

PROJECT Delaware River Comprehensive Study

HOLE NO. DRV-26



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRU-26	0.0-5.0	Poorly-Graded Sand				
		SP				

Project Delaware River Vibra cores

Area

Boring No. DRU-26

Date 7/30/91

GRADATION CURVES

ENG FORM 1 MAY 82 2087

DRILLING LOG DRV-82

1. PROJECT : DE River Main Channel
2. LOCATION : N513456.63 E310253.10
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-82
5. DRILLER NAME : C. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN : NA
THICKNESS :
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.97'
10. BIT SIZE/ TYPE : 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES:
UNDIST. SAMPLES : NA

14. NO. OF : NA
CORE BOXES :
15. GW ELEV. : NA
16. DATE STARTED: 4/26/01
DATE COMPLETED: 4/26/01
17. ELEVATION : -46.1 NAVD(88)
18. TOTAL : 18.6'/19.97'
RECOVERY :
19. INSPECTOR : Paul J. Lucot

DEPTH FEET	NAVD ELEV. -46.1	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-47	SP-SM	SAND with SILT: Poorly Graded, little to no Shell Fragments,rounded to subrounded, loose. Dark Bluish Gray 10BG 3/1	S-1	Uncorrected Water Depth= 47.0' MLLW= 42.8' S-1 collected from 0.0' - 2.5'
2	-49	SP	SAND: Poorly Graded, little to no Shell Fragments or Fines, very loose, wet, Light Yellowish Brown 2.5Y 6/3	S-2	S-2 collected from 2.5' - 5.0'
4	-51	SP	SAND: Poorly Graded, as above	S-3	S-3 collected from 5.0' - 10.0'
6	-53				
8	-55				
10	-57	SP	As above	S-4	Sample 4 not analyzed
12	-59				
14	-61				
16	-63	SW	SAND: Well Graded, with traces of Gravel (<5%), very loose, wet, Light Yellowish Brown 2.5Y 6/3		
18	-65	NR	NO RECOVERY		NR= No Recovery
20					Bottom of Boring= 19.97'

Science Applications International Corporation
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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

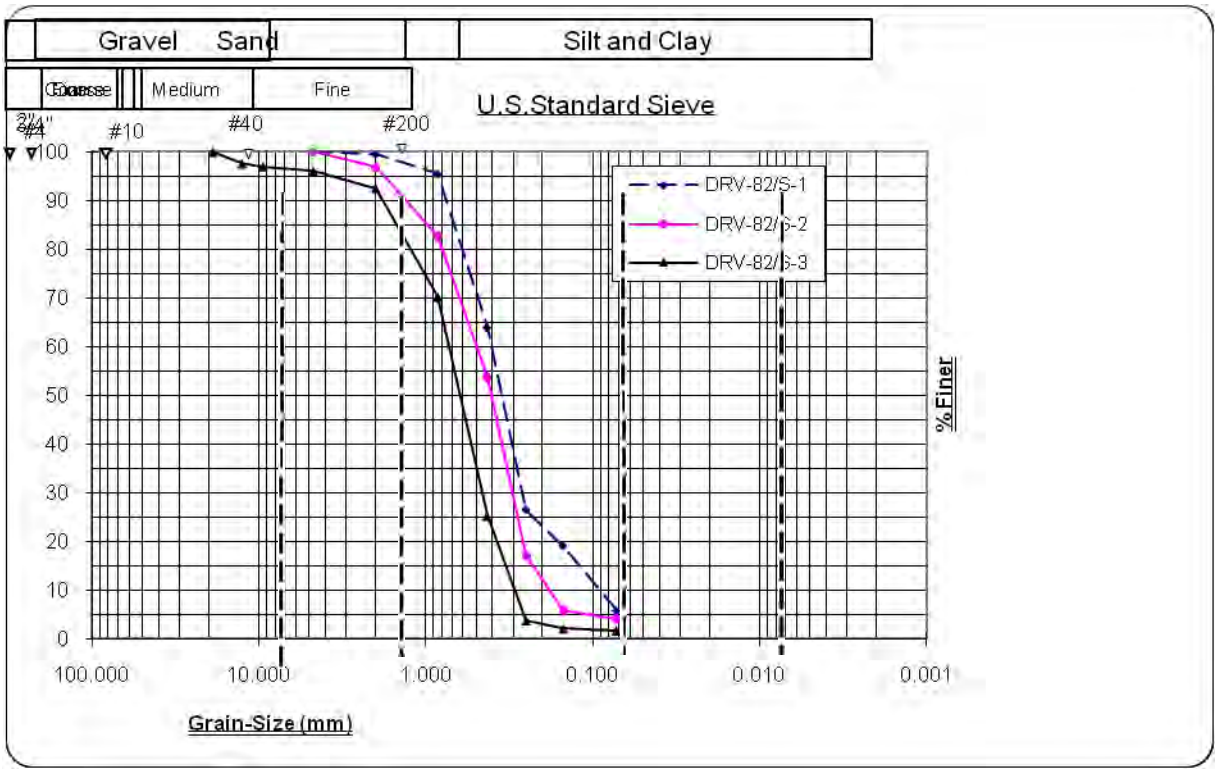
DRILLING LOG DRV-82

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma32		
Job No.	2000g591				Date	24-May-01		
					Cu	3.22	1.77	1.78
Dry Wt.	453.60	369.90	411.00		C c	1.24	0.75	0.88
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-82/S-1	DRV-82/S-2	DRV-82/S-3			DRV-82/S-1	DRV-82/S-2	DRV-82/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			100.00
1/2"	0.00	0.00	9.80	1/2"	12.70			97.62
3/8"	0.00	0.00	12.20	3/8"	9.50			97.03
#4	0.00	0.00	16.10	#4	4.75	100.00	100.00	96.08
#10	1.90	11.70	30.70	#10	2.00	99.58	96.84	92.53
#20	20.30	63.90	122.30	#20	0.850	95.52	82.73	70.24
#40	163.60	171.20	307.50	#40	0.430	63.93	53.72	25.18
#60	333.50	307.00	395.70	#60	0.250	26.48	17.00	3.72
#100	367.30	348.40	402.60	#100	0.150	19.03	5.81	2.04
#200	427.80	355.20	404.40	#200	0.072	5.69	3.97	1.61

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-82/S-1	00.00-02.50		N.T	Gray poorly graded sand with silt (SP-SM)
DRV-82/S-2	02.50-05.00		N.T	Gray poorly graded sand (SP)
DRV-82/S-3	05.00-10.00		N.T	Gray poorly graded sand (SP)
N.P- Non-Plastic			N.T-	Not Tested

Hole No. DRV-25

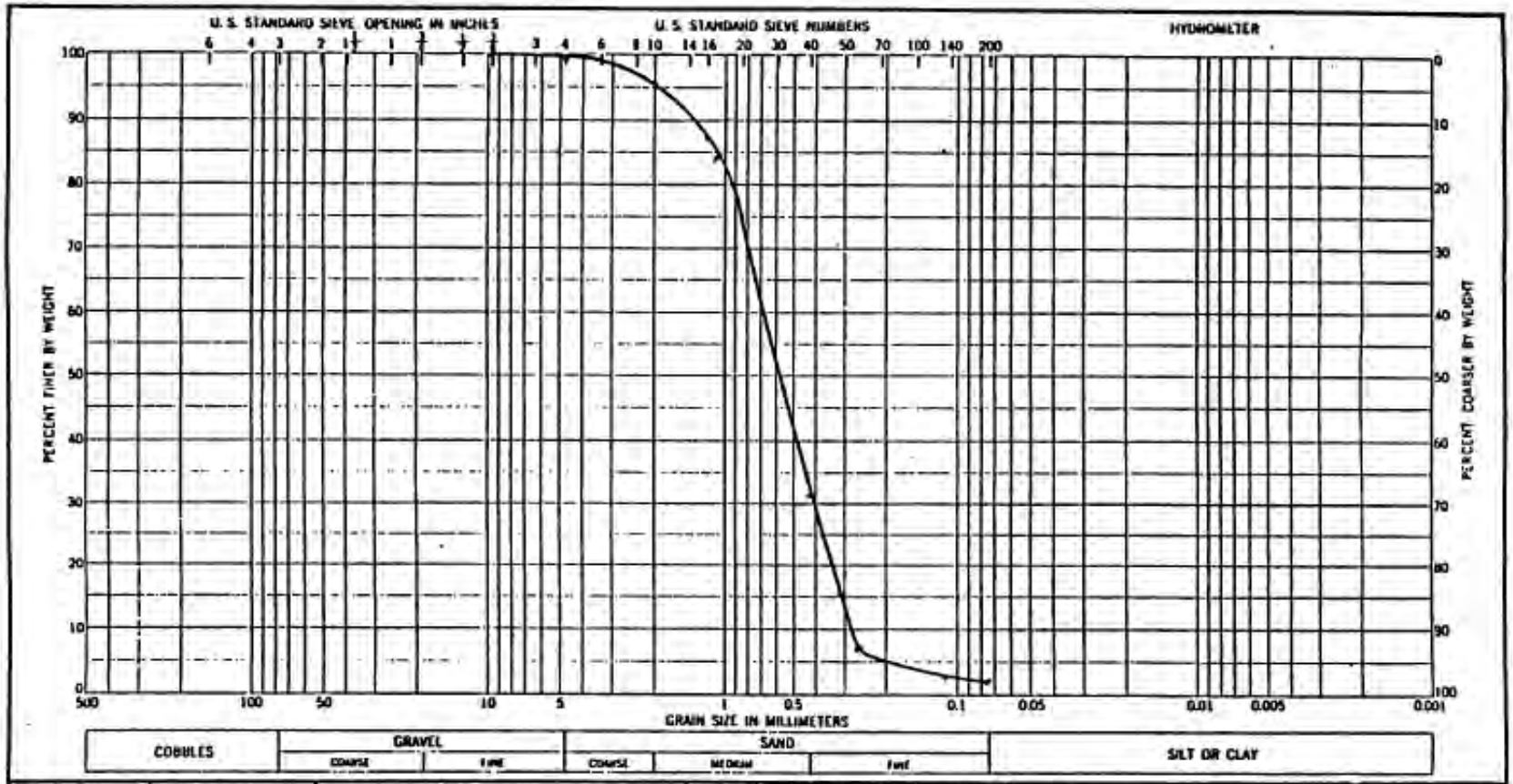
DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
2. LOCATION (Coordinates or Station) 39° 00' 9.85" 75° 08' 26.36"	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Buchart-Horn, Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL NA
4. HOLE NO. (As shown on drawing title and file number) DRV-25	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
5. NAME OF DRILLER Ocean Survey, Inc.	14. TOTAL NUMBER CORE BOXES NA
6. DIRECTION OF HOLE VERTICAL INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NA
7. THICKNESS OF OVERBURDEN NA	16. DATE HOLE : STARTED 07/17/91 : COMPLETED 07/17/91
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE +44.4 ft. NGVD
9. TOTAL DEPTH OF HOLE 20 ft.	18. TOTAL CORE RECOVERY FOR BORING 19.8 ft.
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1		Brown sand with some silt Coarse to fine sand, micaceous SP			Sample 0 - 5 ft.
	2					
	3					
	4					
	.2		Grey silt clay SM-SC			
	.4		Brown sand SP			
	5		coarse to fine micaceous			Sample 5 - 7.8 ft.
	.6		Medium to fine brown sand SP			
	6					
	7					
	.4		Coarse to fine grey sand, quartz			
	.6		Grey fine sand, micaceous SP			Sample 7.8 - 10 ft.
	8					
	9					
	10		Some 0.5 ft. clay lenses Medium to fine grey sand, micaceous, grey, quartz, thin layers of fine sand SP			Sample 10 - 15 ft.
	11					
	12					
	13					
	14					
	15					
	.3		Coarse sand with gravel SP			
	.6		Medium to fine grey sand, quartz SP			
	16					
	.7		Grey coarse sand with gravel SP			Sample 16.5 - 17.5 ft.
	17					
	.5		Silt, micaceous, dark grey ML			Sample 17.5 - 20 ft.
	18					
	19					

PROJECT Delaware River Comprehensive Study

HOLE NO. DRV-25



Sample No.	Elev. or Depth	Classification	Nat. w %	LL	PL	PI
DRV-25	0.0 - 5.0	Poorly-Graded Sand				
		SP				

Project: Delaware River Vibracores

Area:

Boring No. DRV - 25

Date 7/30/91

GRADATION CURVES

ENG FORM 1 MAY 82 2087

DRILLING LOG DRV-81

1. PROJECT : DE River Main Channel
2. LOCATION : N54694.2 E309456.6
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-81
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.99'
10. BIT SIZE/ TYPE : 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/26/01
DATE COMPLETED: 4/26/01
17. ELEVATION : -48.5 NAVD(88)
18. TOTAL RECOVERY : 20.0'/19.99'
19. INSPECTOR : Paul J. Lucot

DEPTH FEET	NAVD ELEV -48.5	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-49	SP-SM	SAND with SILT: Poorly Graded, Medium to Fine Sand, rounded to subrounded, loose, wet, Light Olive Brown 2.5Y 5/3	S-1	Uncorrected Water Depth= 49.2' MLLW= 45.2' S-1 Collected from 0.0' - 1.75'
2	-51	SM	SILTY SAND: Fine Sand with Silt, medium dense, Greenish Gray 5GY 6/1	S-2	S-2 collected from 1.75' - 3.3'
4	-53	SP	SAND: Poorly graded, rounded to subrounded, wet, Light Brownish Gray 2.5Y 6/2		
6	-55	SP	SAND: Poorly Graded, As above, Fine to Coarse Sand	S-3	S-3 collected from 5.0' - 6.4'
8	-57	SP	SAND: Poorly Graded, with some Silt and traces of Gravel, loose, wet, Light Olive Brown 2.5Y 5/3		6.4' - 10.0' zone represented in sample S-4
10	-59	SP	As above	S-4	S-4 collected from 10.0' - 15.0' Sieve analysis results from S-4 are indicative of 6.4' - 15.0' based on field classification
12	-61				
14	-63				
16	-65	ML	SILT with some Very Fine Sand, slight plasticity, soft, wet, Dark Greenish Gray 10GY 4/1	S-5	Sample 5 not analyzed
18	-67				
20					Bottom of Boring= 19.99'

Science Applications International Corporation
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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

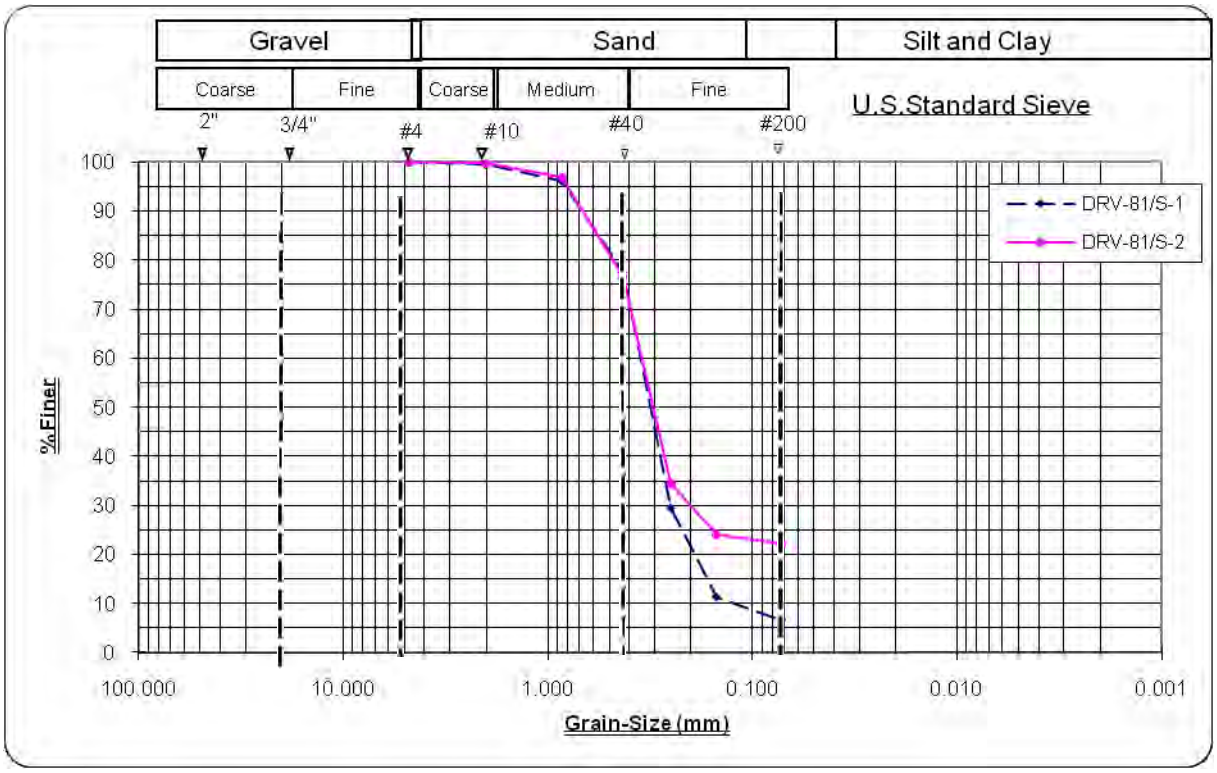
DRILLING LOG DRV-81

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma30		
Job No.	2000g591				Date	22-May-01		
					Cu	3.50	Undefined	
Dry Wt.	443.60	390.80			C c	0.41	Undefined	
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-81/S-1	DRV-81/S-2				DRV-81/S-1	DRV-81/S-2	0
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70			
3/8"	0.00	0.00		3/8"	9.50			
#4	0.00	0.00		#4	4.75	100.00	100.00	
#10	1.90	1.30		#10	2.00	99.57	99.67	
#20	16.90	12.30		#20	0.850	96.19	96.85	
#40	99.50	92.00		#40	0.430	77.57	76.46	
#60	312.90	256.00		#60	0.250	29.46	34.49	
#100	393.30	296.80		#100	0.150	11.34	24.05	
#200	414.10	304.40		#200	0.072	6.65	22.11	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-81/S-1	00.00-01.75		N.T	Gray poorly graded sand with silt (SP-SM)
DRV-81/S-2	01.75-03.30		N.T	Gray silty sand (SM)
		N.P- Non-Plastic	N.T-	Not Tested

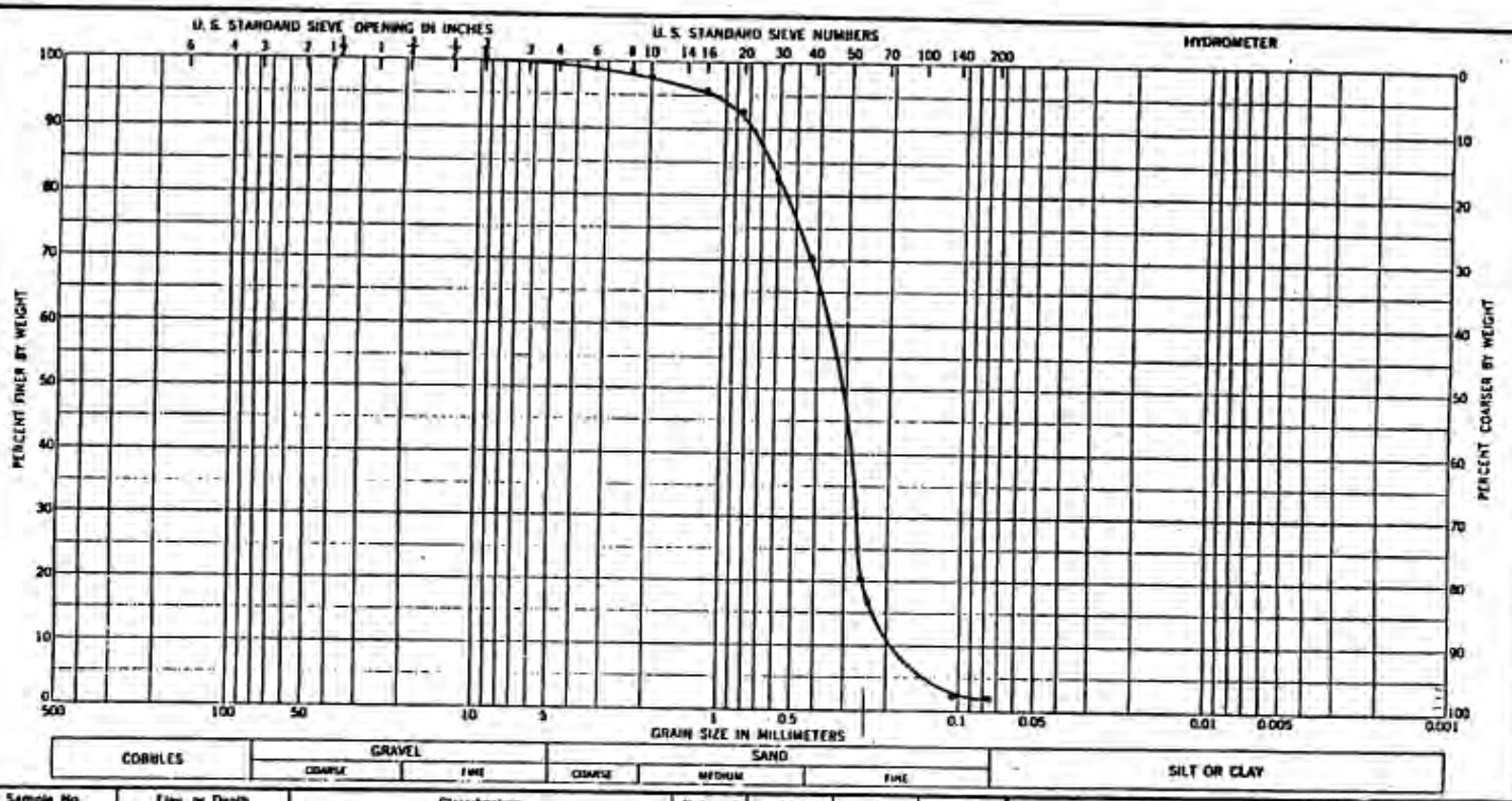
Hole No. DRV-24

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station) 39° 01' 40" 75° 50' 18.02"	12. MANUFACTURER'S DESIGNATION OF DRILL NA
3. DRILLING AGENCY Buchart-Horn, Inc.	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED:
4. HOLE NO. (As shown on drawing title and file number) DRV-24	14. TOTAL NUMBER CORE BOXES NA
5. NAME OF DRILLER Ocean Survey, Inc.	15. ELEVATION GROUND WATER NA
	16. DATE HOLE: STARTED 07/17/91: COMPLETED 07/17/91
6. DIRECTION OF HOLE VERTICAL INCLINED _____ DEG. FROM VERT.	17. ELEVATION TOP OF HOLE -47.1 ft. MGVD
7. THICKNESS OF OVERBURDEN NA	18. TOTAL CORE RECOVERY FOR BORING 15.4 ft.
8. DEPTH DRILLED INTO ROCK NA	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE 19 ft.	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1		Medium to fine dark grey micaceous sand with some shells SP			Sample 0 - 3 ft.
	2					
	3		Light grey medium to fine sand micaceous...			
	4					
	5		...with locally coarse to fine quartz sand zones			
	6					
	7					
	8		SP			Sample 5 - 10 ft.
	9					
	10					
	11					
	11.6		Grey medium to fine sand SP			Sample 11.6 - 13.6 ft.
	12					
	13					
	13.6		Grey brown (tan) to light grey very coarse to fine gravelly sand, one cobble SP			Sample 13.6 - 15.6 ft.
	14					
	15		Light grey medium to fine sand with trace of gravel SP			
	16		Gravelly sand SP			Bottom of recovery
	17					
	18					
	19					

PROJECT Delaware River Comprehensive Study | HOLE NO. DRV-24



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRU-24	0.0-3.0	Poorly-Graded Sand				
		SP				

Project: Delaware River Vibracores

Area:

Boring No. DRU-24

Date: 8/6/91

GRADATION CURVES

ENG FORM 1 MAY 83 2087

DRILLING LOG DRV-80

1. PROJECT : DE River Main Channel
2. LOCATION : N76192.38 E303843.29
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-80
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.75'
10. BIT SIZE/ TYPE : 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES:
UNDIST. SAMPLES: NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/26/01
DATE COMPLETED: 4/26/01
17. ELEVATION : -50.4 NAVD(88)
18. TOTAL RECOVERY : 19.3'/19.75'
19. INSPECTOR : Paul J. Lucot

DEPTH FEET	NAVD ELEV. -50.4	LEGEND	DESCRIPTION	Bot. Or Sample No.	REMARKS
0	-51	SP	SAND: Poorly Graded Medium to Fine Sand, subrounded to rounded, trace Shell Fragments (<5%), very loose, Dark Greenish Gray 5GY 3/1	S-1	Uncorrected Water Depth= 49.6' MLLW= 47.1' S-1 collected from 0.0' - 5.0'
2	-53				
4	-55				
6	-57	SP-SM	SAND with SILT: Poorly Graded Fine to Medium Sand with some silt, trace shell fragments, Dark Greenish Gray 5GY 3/1	S-2	S-2 collected from 5.0' - 10.0'
8	-59				
10	-61	SP-SM	As above		
		SP-SM	SAND with SILT: As above, but with occasional Fine Gravel		
12	-63	CL	SILTY CLAY: traces of Fine to Very Fine Sand, slight to moderate plasticity, soft to medium dense, wet, Dark Greenish Gray 10GY 5/4	S-3	Sample 3 not analyzed
14	-65				
16	-67				
18	-69				
20					Bottom of Boring= 19.75'

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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

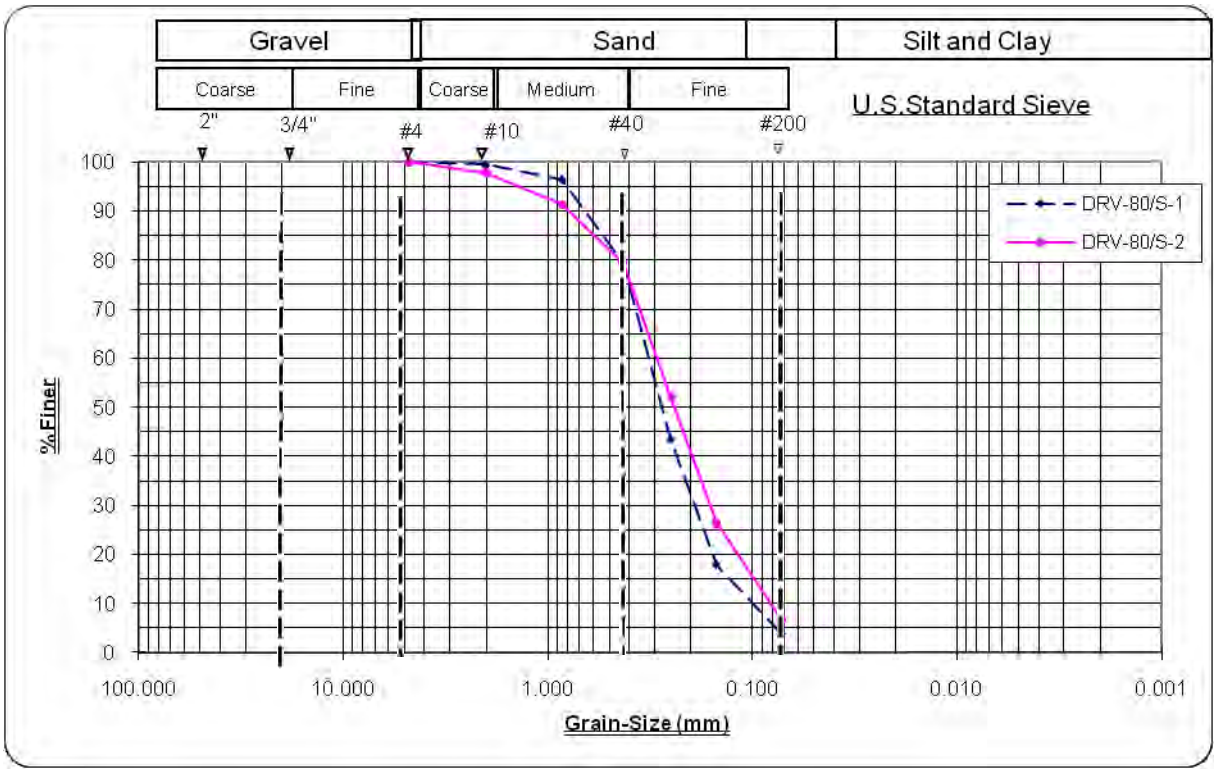
DRILLING LOG DRV-80

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma29		
Job No.	2000g591				Date	22-May-01		
					Cu	3.20	3.75	
Dry Wt.	425.40	333.40			C c	1.13	0.94	
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-80/S-1	DRV-80/S-2				DRV-80/S-1	DRV-80/S-2	0
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70			
3/8"	0.00	0.00		3/8"	9.50			
#4	0.00	0.00		#4	4.75	100.00	100.00	
#10	2.50	7.50		#10	2.00	99.41	97.75	
#20	15.00	28.70		#20	0.850	96.47	91.39	
#40	87.20	68.30		#40	0.430	79.50	79.51	
#60	240.40	159.70		#60	0.250	43.49	52.10	
#100	349.30	245.50		#100	0.150	17.89	26.36	
#200	409.60	311.40		#200	0.072	3.71	6.60	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-80/S-1	00.00-05.00		N.T	Gray poorly graded sand (SP)
DRV-80/S-2	05.00-10.00		N.T	Gray poorly graded sand with silt (SP-SM))
		N.P- Non-Plastic	N.T-	Not Tested

Sub-Reach E-5

DRILLING LOG DRV-79

1. PROJECT : DE River Main Channel
2. LOCATION : N80027.07 E302929.33
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-79
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.71'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/26/01
DATE COMPLETED: 4/26/01
17. ELEVATION : -49.7 NAVD(88)
18. TOTAL RECOVERY : 19.3'/19.71'
19. INSPECTOR : Paul J. Lucot

DEPTH FEET	NAVD ELEV. -49.7	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-50	SP	SAND: Poorly Graded, Fine to Medium Sand, with 25% Shell Fragments, rounded to subrounded, loose, Greenish Gray 5GY 4/1	S-1	Uncorrected Water Depth= 47.8' MLLW= 46.4' S-1 collected from 0.0' - 1.25'
2	-52	SP	SAND: Poorly Graded, Medium Sand, rounded to subrounded, loose, wet, Dark Grayish Brown 2.5Y 4/2	S-2	S-2 collected from 1.25' - 5.0' Sieve analysis results from S-2 are indicative of 1.25' - 8.0' based on field classification
4	-54				
6	-56	SP	As above		
8	-58	SP	SAND: Poorly Graded, Medium to Coarse Sand, trace of Fine Gravel, loose, Pale Yellow 5Y 7/4	S-3	S-3 collected from 8.0' - 9.0'
		SP	SAND: As 1.25-8.0' interval, but with some (~15%) rounded, well graded Gravel		
10	-60	SP	SAND: As 8.0-9.0' interval, but with Coarse Gravel and Cobbles		
12	-62	CL	SILTY CLAY: with traces of very Fine Sand, slight to moderate plasticity, soft, wet, Dark Greenish Gray 10GY 6/4	S-4	Sample 4 not analyzed
14	-64				
16	-66	CL	As above		
18	-68				
20					Bottom of Boring= 19.71'

Science Applications International Corporation
An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

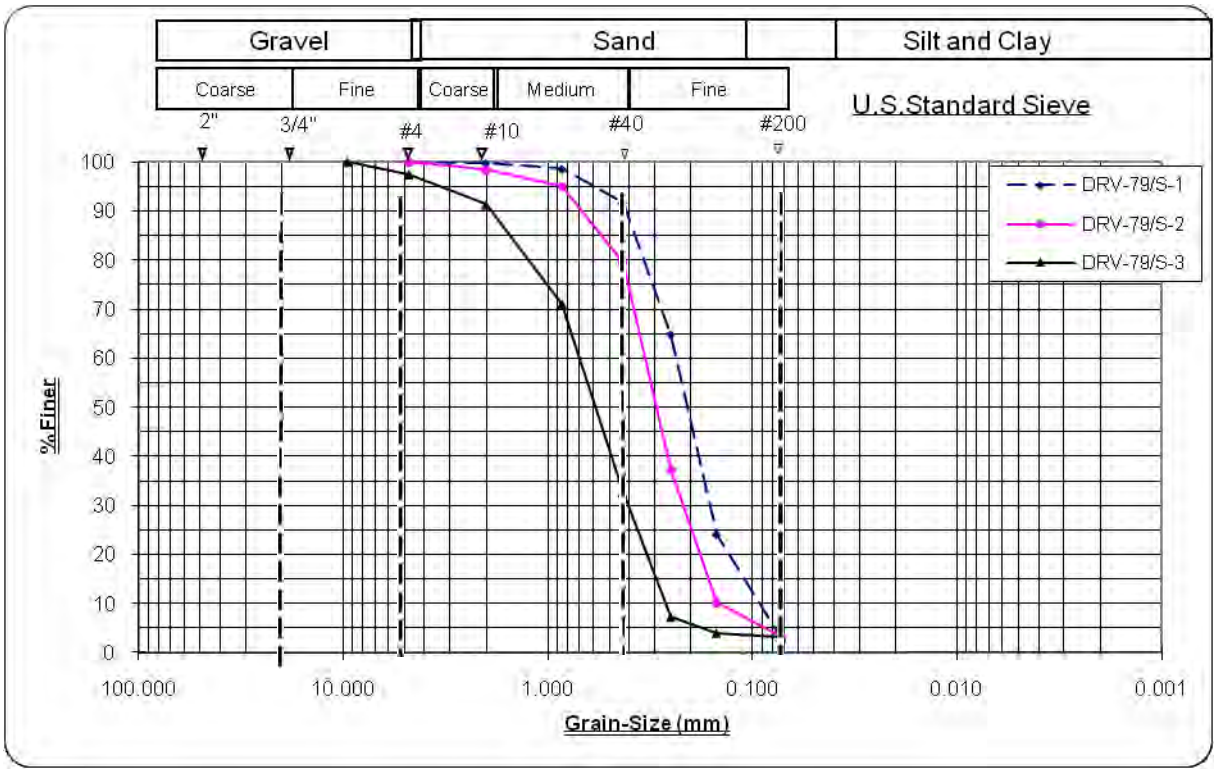
DRILLING LOG DRV-79

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma28		
Job No.	2000g591				Date	24-May-01		
					Cu	2.64	1.94	2.50
Dry Wt.	415.10	305.00	233.80		C c	1.32	0.86	0.82
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-79/S-1	DRV-79/S-2	DRV-79/S-3			DRV-79/S-1	DRV-79/S-2	DRV-79/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70			
3/8"	0.00	0.00	0.00	3/8"	9.50			100.00
#4	0.00	0.00	5.90	#4	4.75	100.00	100.00	97.48
#10	1.00	4.80	20.30	#10	2.00	99.76	98.43	91.32
#20	5.70	15.20	67.50	#20	0.850	98.63	95.02	71.13
#40	34.40	62.80	157.60	#40	0.430	91.71	79.41	32.59
#60	145.70	191.20	216.90	#60	0.250	64.90	37.31	7.23
#100	314.90	273.90	224.60	#100	0.150	24.14	10.20	3.93
#200	404.30	295.60	226.60	#200	0.072	2.60	3.08	3.08

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-79/S-1	00.00-01.25		N.T	Gray poorly graded sand (SP)
DRV-79/S-2	01.25-05.00		N.T	Gray poorly graded sand (SP)
DRV-79/S-3	08.00-09.00		N.T	Gray poorly graded sand (SP)
N.P- Non-Plastic			N.T-	Not Tested

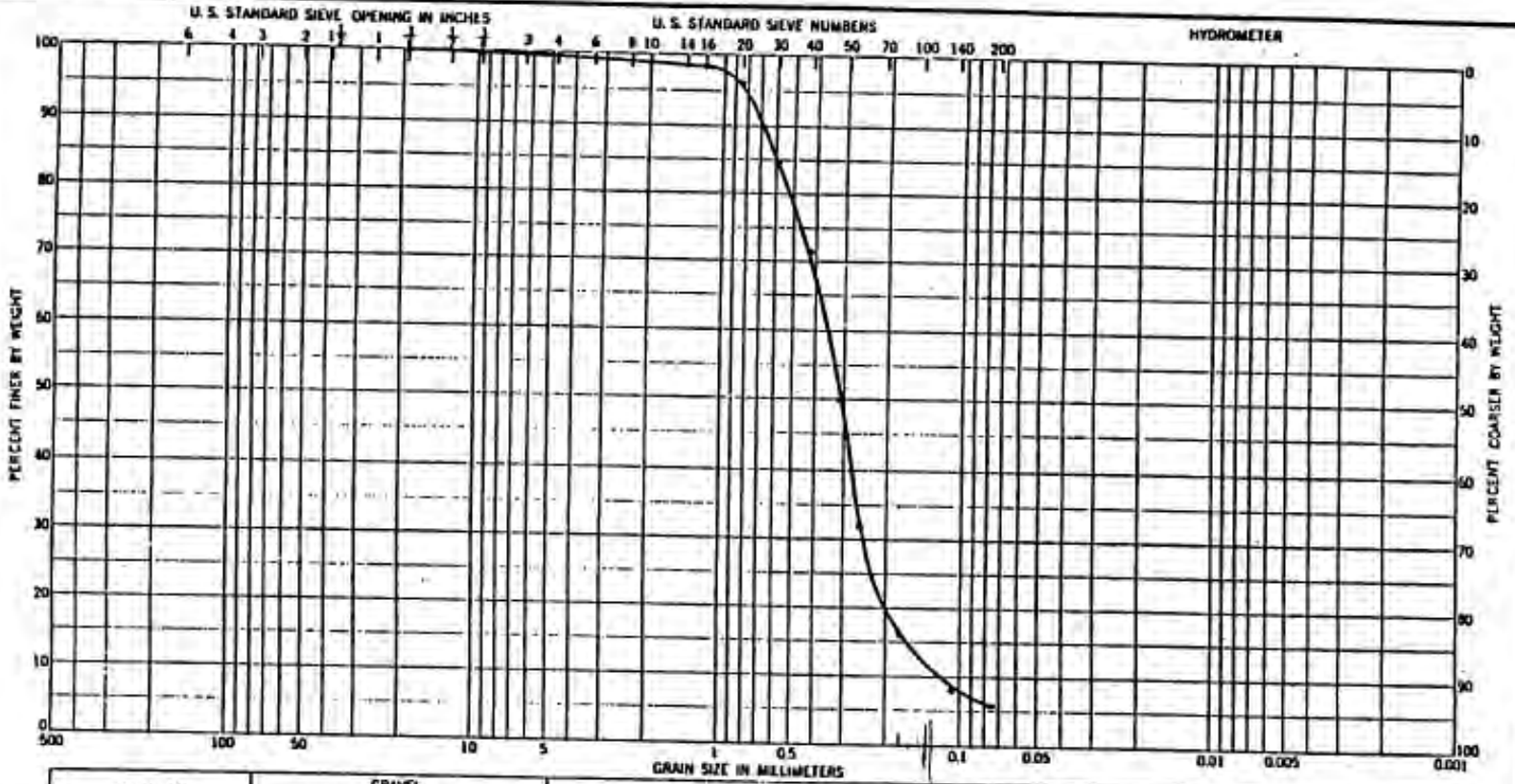
Hole No. DRV-23

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station) 39° 03' 10.54" 75° 10' 7.61"	12. MANUFACTURER'S DESIGNATION OF DRILL NA
3. DRILLING AGENCY Buchart-Horn, Inc.	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
4. HOLE NO. (As shown on drawing title and file number) DRV-23	14. TOTAL NUMBER CORE BOXES NA
5. NAME OF DRILLER Ocean Survey, Inc.	15. ELEVATION GROUND WATER NA
	16. DATE HOLE : STARTED 07/17/91 : COMPLETED 07/17/91
6. DIRECTION OF HOLE VERTICAL INCLINED ____ DEG. FROM VERT.	17. ELEVATION TOP OF HOLE -47.8 ft. NGVD
7. THICKNESS OF OVERBURDEN NA	18. TOTAL CORE RECOVERY FOR BORING 12.8 ft.
8. DEPTH DRILLED INTO ROCK NA	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE 15.5 ft.	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1, 2, 3		Grey and grey brown mixed fine sand with shells SP Light grey fine sand			Sample 0 - 3.7 ft.
	4, 5, 6, 7, 8		Sandy gravel-brown, coarse to fine gravel with coarse to fine sand GP Varying to gravelly coarse to fine sand			Sample 3.7 - 5.0 ft.
	8.1		White fine to medium sand SP			Sample 6.3 - 9.2 ft.
	8.3		Red brown clay CL			
	9.2		Grey silty sand SM-SC Becoming finer with depth			Sample 9.2 - 13 ft.
	13.8					Bottom of recovery
	14, 15, 16, 17, 18, 19					

PROJECT Delaware River Comprehensive Study | HOLE NO. DRV-23



Sample No.	Elev. or Depth	Classification	Nat. w %	LL	PL	PI
DRU-23	0.0 - 3.7	Poorly-Graded Sand				
		SP				

Project Delaware River Vibracores

Area

Boring No. DRU - 23

Date 7/30/91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

DRILLING LOG DRV-78

1. PROJECT : DE River Main Channel
2. LOCATION : N84547.37 E300727.30
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-78
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN : NA
THICKNESS :
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 20.03'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES: NA

14. NO. OF : NA
CORE BOXES :
15. GW ELEV. : NA
16. DATE STARTED: 4/29/01
DATE COMPLETED: 4/29/01
17. ELEVATION : -44.6 NAVD(88)
18. TOTAL : 19.4'/20.03'
RECOVERY :
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -44.6	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-45	SP-SM	SAND with SILT: and Gravel, Poorly Graded subrounded to rounded, loose, wet, Gray 10YR 5/1	S-1	Uncorrected Water Depth= 43.2' MLLW= 41.3' S-1 collected from 0.0' - 1.0'
		ML	SILT: with Fine Sand, Yellowish Brown 10YR 5/8		
2	-47	SM	SILTY SAND: Fine Sand, trace Silt, medium dense, Greenish Gray 5GY 5/1	S-2	S-2 collected from 2.0' - 5.0'
4	-49				
6	-51	SM	SILTY SAND: Fine Sand with Silt, Greenish Gray 5GY 5/1	S-3	S-3 collected from 5.0' - 10.0'
8	-53				
10	-55	SM	As above	S-4	Sample 4 not analyzed
12	-57				
14	-59				
16	-61	SM	As above		
18	-63				
20		ML			Bottom of Boring= 20.03'

Science Applications International Corporation
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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

DRILLING LOG DRV-78

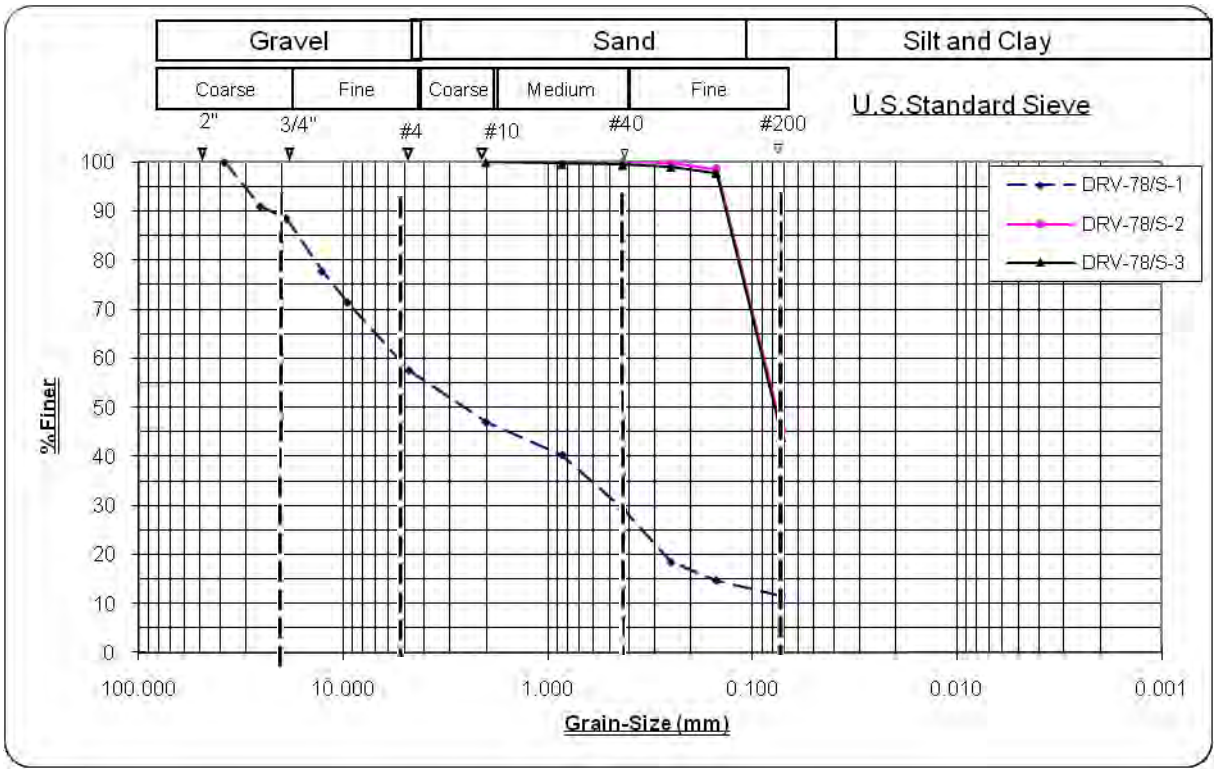
C:\MITCHS\VIBRACORE\DE RIVER MC\DRV78C.BOR

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma27		
Job No.	2000g591				Date	24-May-01		
					Cu	Undefined	Undefined	Undefined
Dry Wt.	471.00	324.00	391.30		C c	Undefined	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-78/S-1	DRV-78/S-2	DRV-78/S-3			DRV-78/S-1	DRV-78/S-2	DRV-78/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10	100.00		
1"	42.40	0.00	0.00	1"	25.40	91.00		
3/4	53.90	0.00	0.00	3/4	19.00	88.56		
1/2"	104.60	0.00	0.00	1/2"	12.70	77.79		
3/8"	134.60	0.00	0.00	3/8"	9.50	71.42		
#4	199.80	0.00	0.00	#4	4.75	57.58		
#10	249.70	0.00	0.00	#10	2.00	46.99		100.00
#20	281.10	0.00	1.30	#20	0.850	40.32		99.67
#40	333.30	0.00	2.30	#40	0.430	29.24	100.00	99.41
#60	384.20	1.10	3.70	#60	0.250	18.43	99.66	99.05
#100	401.60	4.80	8.50	#100	0.150	14.73	98.52	97.83
#200	417.30	177.50	219.60	#200	0.072	11.40	45.22	43.88

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-78/S-1	00.00-01.00		N.T	Gray poorly graded sand with silt and gravel (SP-SM)
DRV-78/S-2	02.00-05.00		N.T	Gray silty sand (SM)
DRV-78/S-3	05.00-10.00		N.T	Gray silty sand (SM)
N.P- Non-Plastic N.T- Not Tested				

DRILLING LOG DRV-77 R1

1. PROJECT : DE River Main Channel
2. LOCATION : N90759.06 E297984.99
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-77 Run1
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 7.88'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 3
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/29/01
DATE COMPLETED: 4/29/01
17. ELEVATION : -45.7 NAVD(88)
18. TOTAL RECOVERY : 5.6'/7.88'
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -45.7	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-45	SP	SAND: Poorly Graded, Medium to Coarse Sand with some Gravel (3%) and some Shell Fragments, subrounded to rounded, loose, Gray 5Y 5/1	S-1	Uncorrected Water Depth= 45.3' MLLW= 42.4' S-1 collected from 0.0' - 1.0'
2	-46	SP	SAND: Poorly Graded, Medium Sand, loose, subrounded, coarser with depth, Gray 5Y 5/1	S-2	S-2 collected from 1.0' - 3.5'
4	-50	SP	SAND: Poorly Graded, Medium to Coarse Sand with Silt and Fine to Coarse Gravel, loose, subangular to subrounded, Gray 5Y 4/1	S-3	S-3 collected from 3.5' - 5.6'
6	-52	NR	NO RECOVERY		NR= No Recovery Bottom of Boring= 7.88'
8	-54				
10	-56				
12	-58				
14	-60				
16	-62				
18	-64				
20					

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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

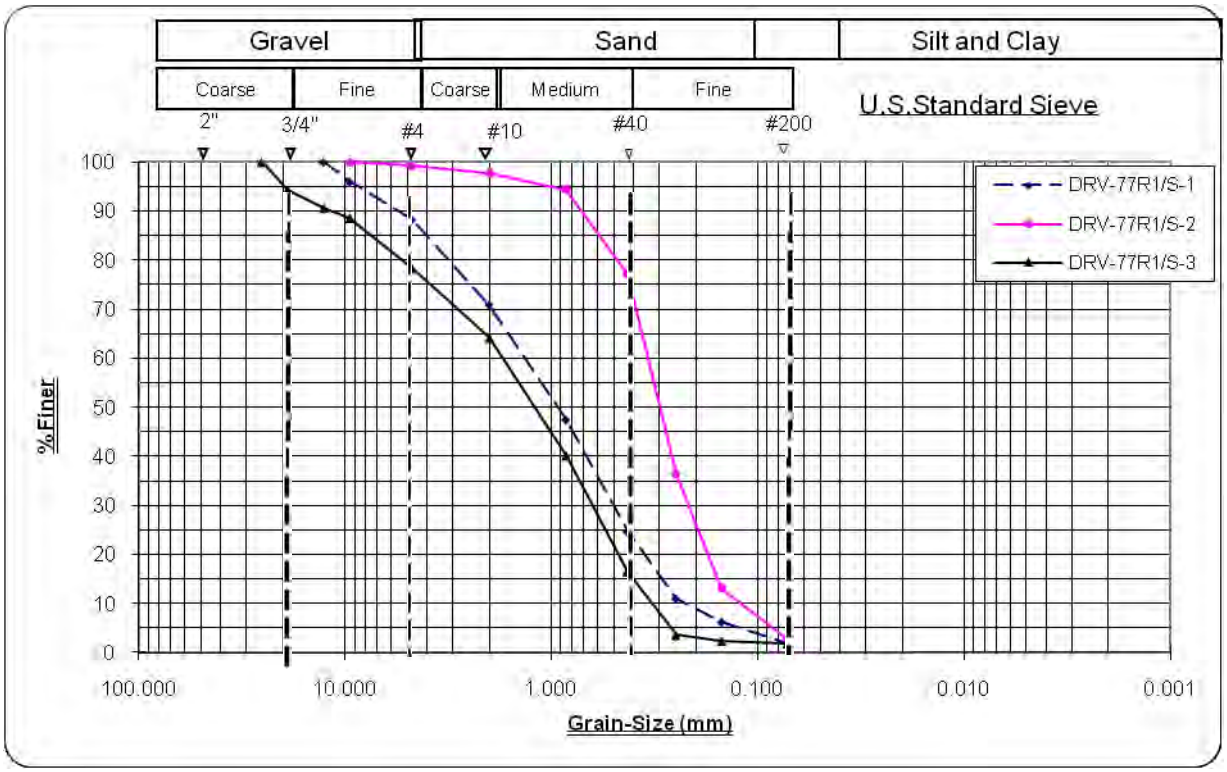
DRILLING LOG DRV-77 R1

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma25		
Job No.	2000g591				Date	24-May-01		
					Cu	6.82	2.62	5.63
Dry Wt.	313.30	245.80	314.90		C c	0.76	1.10	0.71
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-77R1/S-1	DRV-77R1/S-2	DRV-77R1/S-3			DRV-77R1/S-1	DRV-77R1/S-2	DRV-77R1/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			100.00
3/4	0.00	0.00	17.70	3/4	19.00			94.38
1/2"	0.00	0.00	29.50	1/2"	12.70	100.00		90.63
3/8"	12.40	0.00	35.80	3/8"	9.50	96.04	100.00	88.63
#4	36.80	2.10	68.20	#4	4.75	88.25	99.15	78.34
#10	91.10	5.70	112.90	#10	2.00	70.92	97.68	64.15
#20	164.70	13.90	188.30	#20	0.850	47.43	94.34	40.20
#40	235.90	56.20	262.70	#40	0.430	24.70	77.14	16.58
#60	278.90	156.30	303.60	#60	0.250	10.98	36.41	3.59
#100	293.90	213.40	307.30	#100	0.150	6.19	13.18	2.41
#200	307.80	239.40	309.10	#200	0.072	1.76	2.60	1.84

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-77R1/S-1	00.00-01.00		N.T	Brownish gray poorly graded sand (SP)
DRV-77R1/S-2	01.00-03.50		N.T	Brownish gray poorly graded sand (SP)
DRV-77R1/S-3	03.50-05.60		N.T	Brownish gray poorly graded sand with gravel (SP)
N.P- Non-Plastic N.T- Not Tested				

Hole No. DRV-22

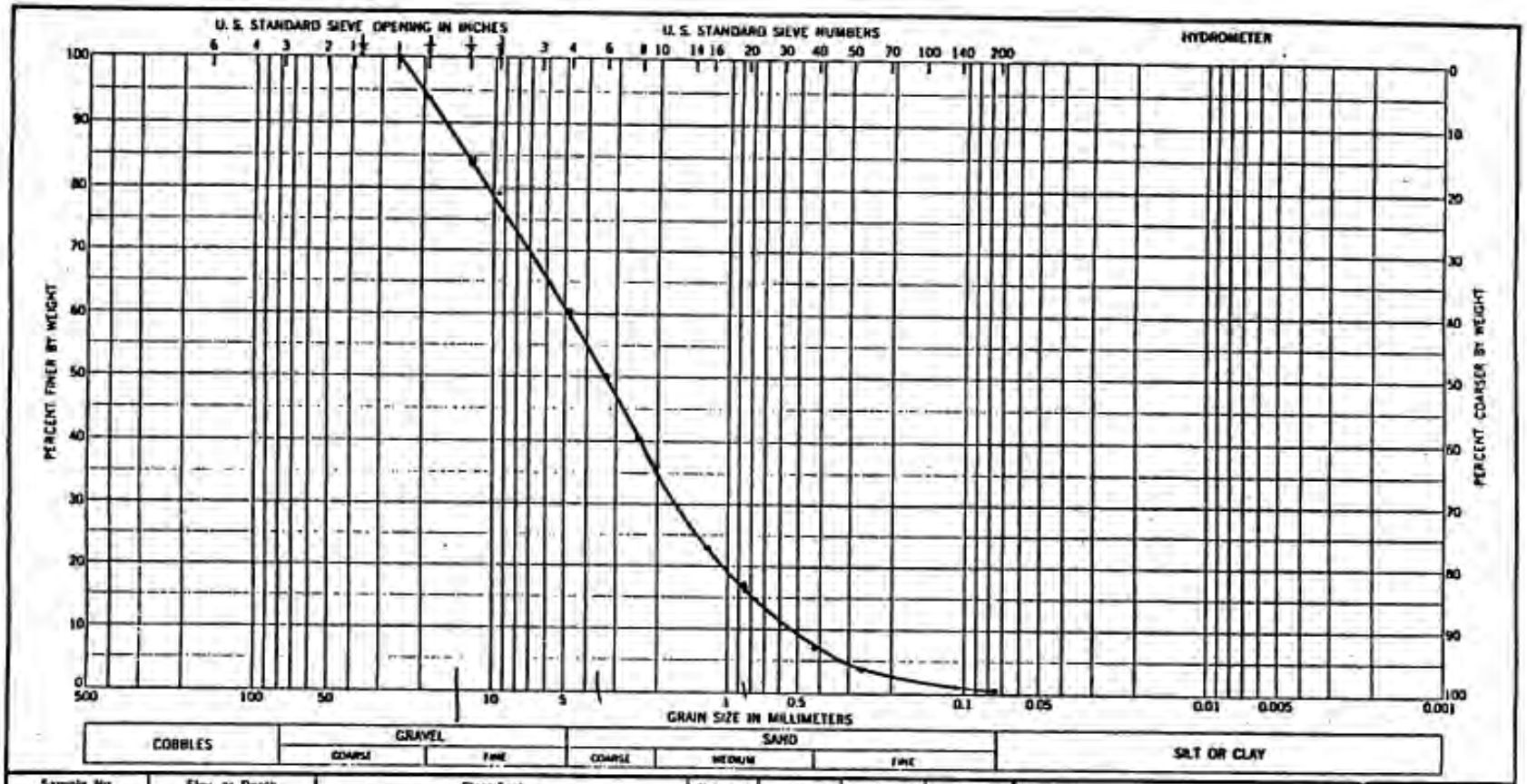
DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
2. LOCATION (Coordinates or Station) 39° 05' 01.5" 75° 11' 02.94"	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Buchert-Horn, Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL NA
4. HOLE NO. (As shown on drawing title and file number) DRV-22	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
5. NAME OF DRILLER Ocean Survey, Inc.	14. TOTAL NUMBER CORE BOXES NA
6. DIRECTION OF HOLE VERTICAL INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NA
7. THICKNESS OF OVERBURDEN NA	16. DATE HOLE : STARTED 07/18/91 : COMPLETED 07/18/91
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE -48.9 ft. NGVD
9. TOTAL DEPTH OF HOLE 20 ft.	18. TOTAL CORE RECOVERY FOR BORING 10.5 ft.
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant g
			Coarse to medium gravel some cobbles SP			Sample 0 - 1.0 ft.
	1		Black coarse to fine sandy gravel some cobble SP			
	.6		Dark grey clay, piece of wood at 3 feet ML			Two jet retrys
	2					
	3					Sample 1.6 to 5.3 ft.
	4					
	5		Pockets of dark medium brown silt at 6.0 to 6.3, 6.9 to 7.0 9.3 to 9.7, 10.3 to 10.5 CH			
	6					
	7					Sample 7.0 - 9.2 ft.
	8					Two retries with jetting, unable to penetrate gravel
	9					
	10					Bottom of recovery
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					

PROJECT Delaware River Comprehensive Study

HOLE NO. DRV-22



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRU-22	0.0-1.0	Poorly-Graded Sand				
		SP				

Project Delaware River Vibracores

Area

Boring No. DRU-22

Date 8/6/91

GRADATION CURVES

ENG FORM 1 MAY 83 2087

DRILLING LOG DRV-76

1. PROJECT : DE River Main Channel	6. DIR. OF HOLE : vertical	14. NO. OF CORE BOXES : NA
2. LOCATION : N93100.24 E296732.81	7. OVERBURDEN THICKNESS : NA	15. GW ELEV. : NA
2a. DATUM : NJ State Plane NAD-83	8. DEPTH TO ROCK: NA	16. DATE STARTED: 4/29/01
3. DRILLING AGENCY: Alpine	9. TOTAL DEPTH : 19.1'	DATE COMPLETED: 4/29/01
4. HOLE NO. : DRV-76	10. BIT SIZE/ TYPE: 3.5" Cutting Shoe	17. ELEVATION : -45.5 NAVD(88)
5. DRILLER NAME : O. Hernandez	11. ELEV. DATUM : NAVD(88)	18. TOTAL RECOVERY : 19.6'/19.1'
	12. DRILL RIG : Alpine Model 271	19. INSPECTOR : Tamera L. Renninger
	13a. DIST. SAMPLES: 4	
	UNDIST. SAMPLES : NA	

DEPTH FEET	NAVD ELEV. -45.5	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-46	SM	SILTY SAND: with trace Gravel, trace amounts of Shell Fragments, Light Brownish Gray 2.5Y 6/2		Uncorrected Water Depth= 46.6' MLLW= 42.2'
2	-48	SM	SILTY SAND: As above, Gray 10YR 6/1, with Brownish Yellow laminations 10YR 6/8	S-1	S-1 collected from 0.25' - 2.5'
4	-50	SM	SILTY SAND: Fine Sand, Light Gray 5Y 7/2	S-2	S-2 collected from 2.5' - 5.0' Sieve anlaysis results from S-2 are indicative of 2.5' - 7.5' based on field classification
6	-52	SM	As above		
8	-54	SP-SM	SAND with SILT: Poorly Graded Fine Sand, Light Gray 2.5Y 7/2, and Light Yellowish Brown 2.5Y 6/4	S-3	S-3 collected from 7.5' - 10.0'
10	-56	SM	SILTY SAND: Fine Sand, very loose, wet, Light Yellowish Brown 2.5Y 6/4 and Light Gray 2.5Y 7/1		
12	-58				
14	-60	ML	SILT with SAND: Fine Sand, medium stiffness, Dark Gray 5Y 3/1	S-4	Sample 4 not analyzed
16	-62	ML	As above		
18	-64				Bottom of Boring= 19.1'
20					

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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

DRILLING LOG DRV-76

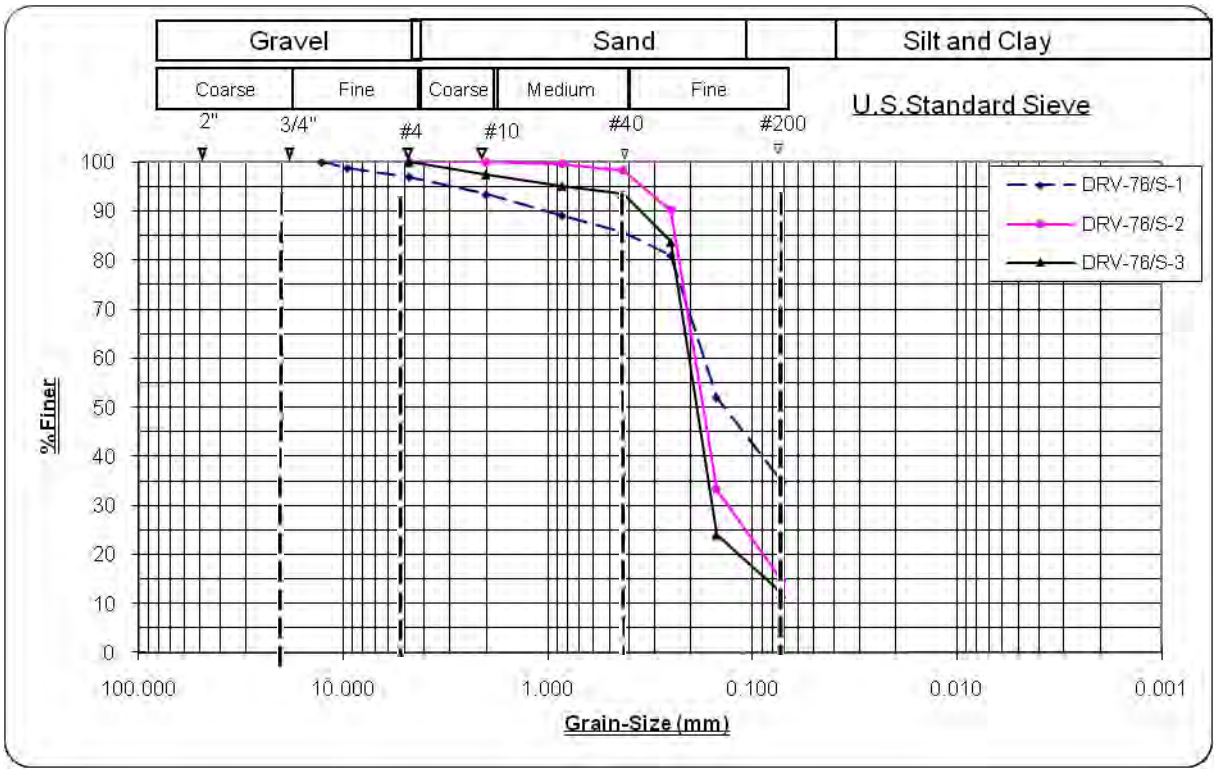
C:\MITECH5\VIBRACORE\DE RIVER MC\DRV76C.BOR

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma24		
Job No.	2000g591				Date	24-May-01		
					Cu	Undefined	Undefined	Undefined
Dry Wt.	198.90	258.40	241.00		C c	Undefined	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-76/S-1	DRV-76/S-2	DRV-76/S-3			DRV-76/S-1	DRV-76/S-2	DRV-76/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70	100.00		
3/8"	2.40	0.00	0.00	3/8"	9.50	98.79		
#4	5.90	0.00	0.00	#4	4.75	97.03	100.00	100.00
#10	13.10	0.10	6.00	#10	2.00	93.41	99.96	97.51
#20	21.60	1.00	11.60	#20	0.850	89.14	99.61	95.19
#40	28.60	4.30	15.70	#40	0.430	85.62	98.34	93.49
#60	37.80	25.30	39.20	#60	0.250	81.00	90.21	83.73
#100	95.40	172.40	183.20	#100	0.150	52.04	33.28	23.98
#200	129.80	220.60	212.10	#200	0.072	34.74	14.63	11.99

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-76/S-1	00.25-02.50		N.T	Brown silty sand (SM)
DRV-76/S-2	02.50-05.00		N.T	Brown silty sand (SM)
DRV-76/S-3	07.50-10.00		N.T	Gray poorly graded sand with silt (SP-SM)
N.P- Non-Plastic			N.T-	Not Tested

U.S. Army Corps of Engineers
Vibrocore - Delaware Coast
Contract Number DACW61-99-D-0009
Task Order 6
Port Mahon PED

Vibrocore DRV-67

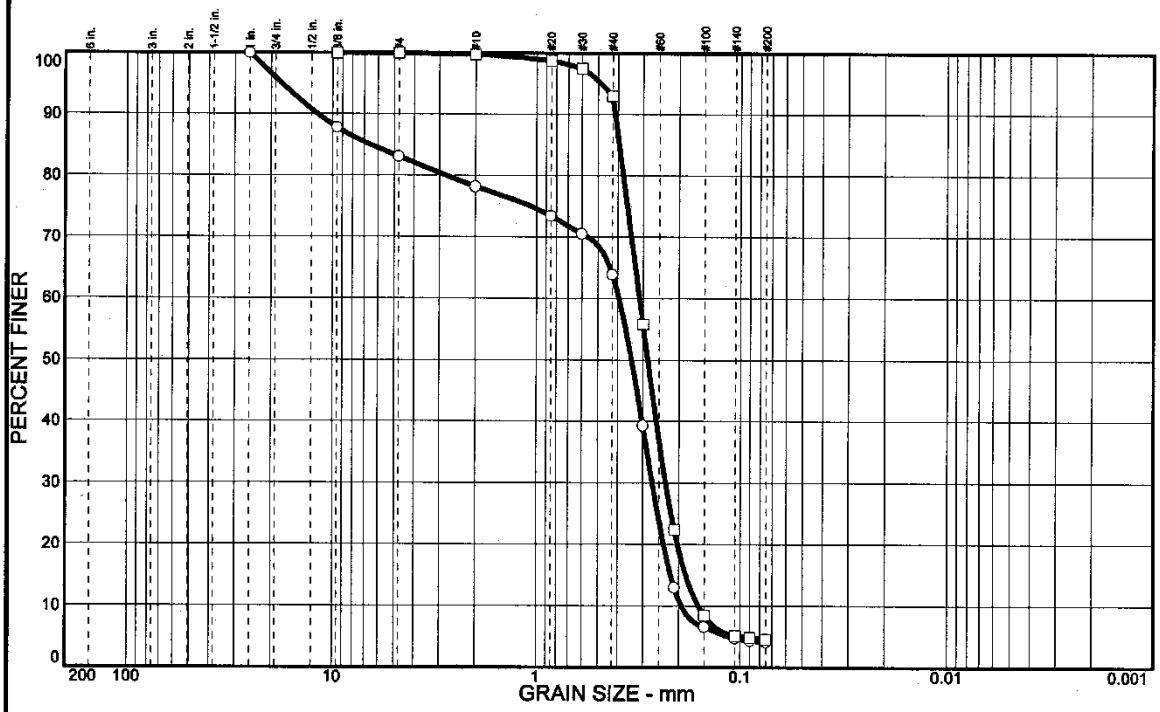
Date	March 14, 1999
Weather	Overcast, 1-2 foot seas
Vibrocore contractor	Alpine Ocean Seismic Sur
Location	Port Mahon, DE
Northing Coord.	N 87,804.3
Easting Coord.	E 294,196.4

Uncorrected Depth	47.3 feet
Tide	-0.1 feet
Corrected Depth	47.4 feet (1)
Vibration time	6:04
Core penetration	17.55 feet
Core recovery	17.0 feet
Percent recovery	97%

Depth in Feet	Surf Elev -47.4 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0		SP		Orange/tan fine SAND, little gravel, little medium sand, trace coarse sand, trace silt/clay.	1	1/0.0-1.8
	-50	SP		Orange/tan fine SAND, trace medium sand, trace silt/clay.		2/1.8-5.1
5		SP-SM		Orange/tan fine SAND, some med. sand, trace silt/clay.	2	3/5.1-6.0
	-55			Dark gray/green SILT/CLAY, some fine sand.		4/6.0-10.1 (not tested, fine grained sample)
10	-60			SAME	3	5/10.1-15.1 (not tested, fine grained sample)
15				SAME	4	6/15.1-16.2 (not tested, fine grained sample)
		SP-SM		Gray fine SAND, little silt/clay, trace medium sand.		7/16.2-17.0
	-65					
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recovery lengths.

Particle Size Distribution Report DRV-67



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		16.9	78.9	4.2		SP			
□			95.4	4.6		SP			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	
1	100.0		
3/8	87.8	100.0	
	GRAIN SIZE		
D_{60}	0.394	0.312	
D_{30}	0.269	0.232	
D_{10}	0.194	0.160	
	COEFFICIENTS		
C_c	0.95	1.07	
C_u	2.03	1.95	

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	
#4	83.1	100.0	
#10	78.2	99.8	
#20	73.4	98.8	
#30	70.5	97.5	
#40	63.9	93.0	
#50	39.3	55.8	
#70	13.0	22.4	
#100	6.6	8.5	
#140	4.8	5.2	
#170	4.4	4.9	
#200	4.2	4.6	

SOIL DESCRIPTION

○ Orange/tan fine SAND, little gravel, little medium sand, trace coarse sand, trace silt.

□ Orange/tan fine SAND, trace medium sand, trace silt.

REMARKS:

○

□

○ Source: DRV67 Sample No.: S-1 Elev./Depth: 0.0'-1.6'

□ Source: DRV67 Sample No.: S-2 Elev./Depth: 1.6'-5.1'

DUFFIELD ASSOCIATES
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E-MAIL: DUFFIELD@DUFFNET.COM

Client: U.S. Army Corps of Engineers

Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

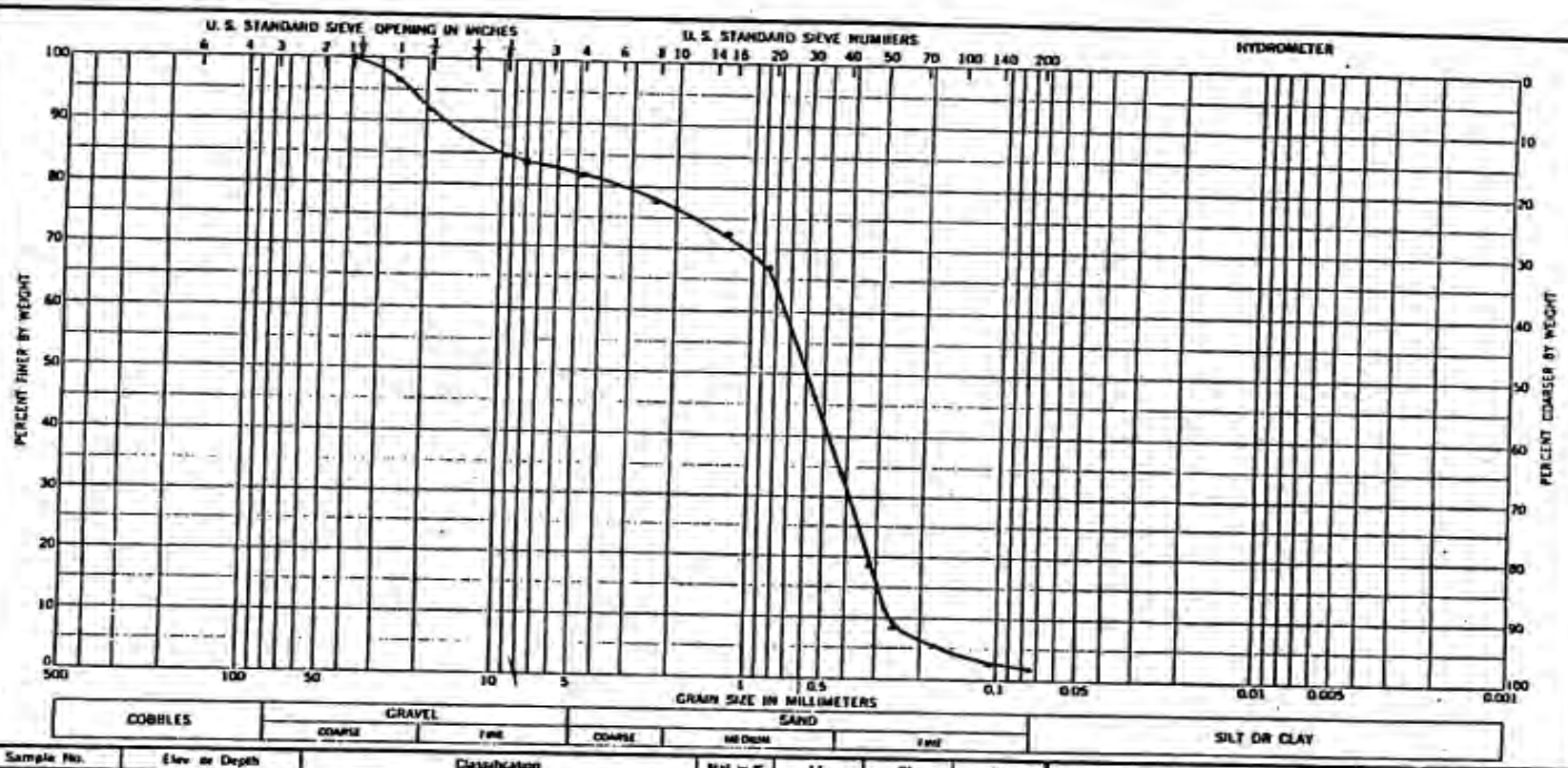
Hole No. DRV-21

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
2. LOCATION (Coordinates or Station) 39° 06' 6.7" 75° 12' 2.54"	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Buchart-Horn, Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL NA
4. HOLE NO. (As shown on drawing title and file number) DRV-21	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED
5. NAME OF DRILLER Ocean Survey, Inc.	14. TOTAL NUMBER CORE BOXES NA
6. DIRECTION OF HOLE VERTICAL INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NA
7. THICKNESS OF OVERBURDEN NA	16. DATE HOLE: STARTED 07/18/91: COMPLETED 07/18/91
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE -45.7 ft. NGVD
9. TOTAL DEPTH OF HOLE 10 ft.	18. TOTAL CORE RECOVERY FOR BORING 14 ft.
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1		Light red brown medium to fine sand with scattered gravel SP			Sample 0 - 5 ft.
	2					
	3					
	.4		Light red brown sandy gravel SP			
	4					
	.3		Light red brown medium to fine sand SP			
	5					Sample 4.3 - 5.7 ft.
	.7		Dark grey silty sand SM			
	6					Sample 5.7 - 10 ft.
	.6		Dark grey silty sand M-SC			
	7					
	.1		Dark grey clayey sand			
	8					
	9					
	10					
	11		SM-SC			Sample 10 - 14 ft.
	12					
	13					
	.75		Grey sandy silt			
	14					Bottom of recovery
	15					
	16					
	17					
	18					
	19					

PROJECT Delaware River Comprehensive Study | HOLE NO. DRV-21



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRU-21	0.0-5.0	Poorly-Graded Sand				
		SP				

Project Delaware River
Vibracores
Area
Boring No. DRU-21
Date 8/6/91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

Vibrocore DRV-66 R1

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW61-98-D-0008
Task Order 8
Port Mahon PED

Date	: March 14, 1999
Weather	: Overcast, 1-2 foot seas
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 100,002.5
Easting Coord.	: E 292,477.8

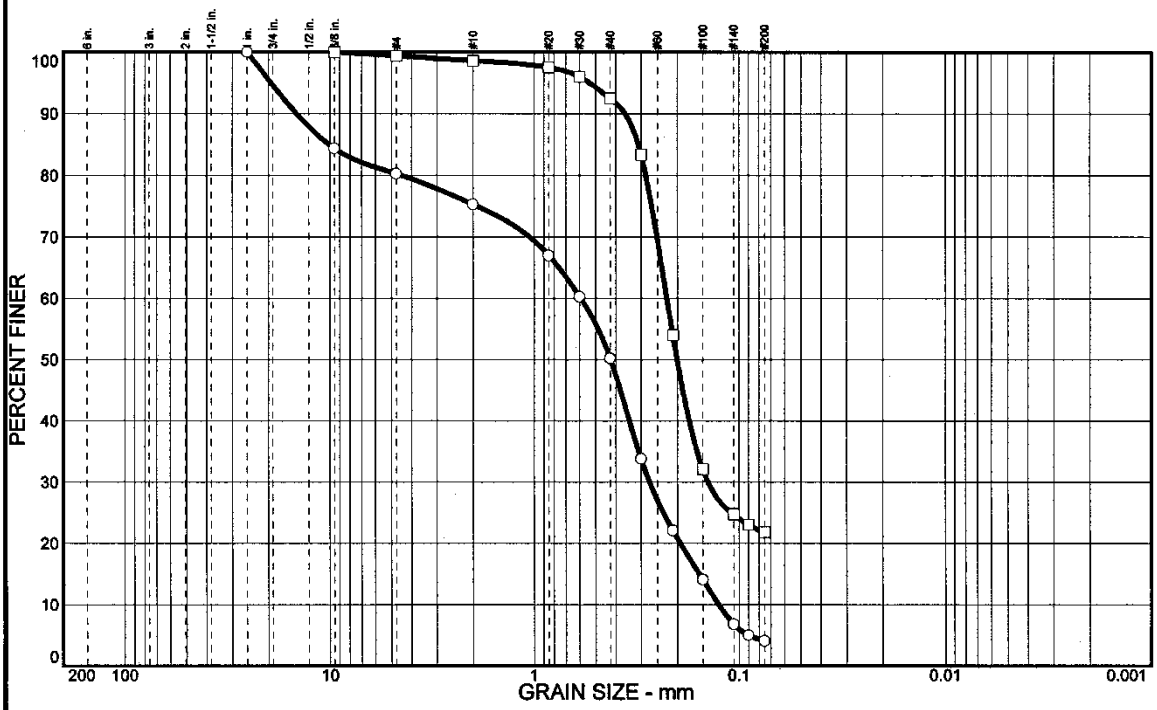
Uncorrected Depth	: 47.9 feet
Tide	: -0.1 feet
Corrected Depth	: 48.0 feet (1)
Vibration time	: 10'50"
Core penetration	: 19.02 feet
Core recovery	: 14.3 feet
Percent recovery	: 75%

Depth in Feet	Surf. Elev. -48.0 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0		SP		Gray fine SAND, some medium sand, little gravel, trace coarse sand, trace silt/clay		1/0.0-0.5
	-50	SM		Tan/brown fine SAND, some silt/clay, trace medium sand trace coarse sand, trace gravel.	1	2/0.5-3.9
				Dark gray/tan SILT/CLAY, trace fine sand.		3/3.9-5.0 (not tested, fine grained sample)
5	-55	SM		Dark gray fine SAND, some silt/clay, trace medium sand.	2	4/5.0-10.0
10	-60	SP		Dark gray fine SAND, little medium sand, trace silt/clay.	3	5/10.0-14.3
15	-65					
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recovery lengths.

c:
mlech5
vibro69
portmahon
drv66r1.bor
03-24-1999

Particle Size Distribution Report DRV-66R1



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		19.7	76.2	4.1		SP			
□		0.6	77.6	21.8		SM			

SIEVE Inches size	PERCENT FINER ○	PERCENT FINER □	
1	100.0		
3/8	84.4	100.0	
	GRAIN SIZE		
D_{60}	0.592	0.225	
D_{30}	0.273	0.142	
D_{10}	0.126		
	COEFFICIENTS		
C_c	1.00		
C_u	4.71		

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	
#4	80.3	99.4	
#10	75.3	98.6	
#20	67.0	97.5	
#30	60.3	96.0	
#40	50.2	92.5	
#50	33.8	83.4	
#70	22.1	54.0	
#100	14.1	32.1	
#140	6.8	24.7	
#170	5.0	23.0	
#200	4.1	21.8	

SOIL DESCRIPTION

○ Gray fine SAND, some medium sand, little gravel, trace coarse sand, trace silt.

□ Tan/brown fine SAND, some silt, trace medium sand, trace coarse sand, trace gravel.

REMARKS:

○

□

○ Source: DRV66R1 Sample No.: S-1 Elev./Depth: 0.0'-0.5'

□ Source: DRV66R1 Sample No.: S-2 Elev./Depth: 0.5'-3.9'

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Client: U.S. Army Corps of Engineers

Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

U.S. Army Corps of Engineers
Vibrocore - Delaware Coast
Contract Number DACW61-96-D-0008
Task Order 6
Port Mahon PED

Vibrocore DRV-65 R1

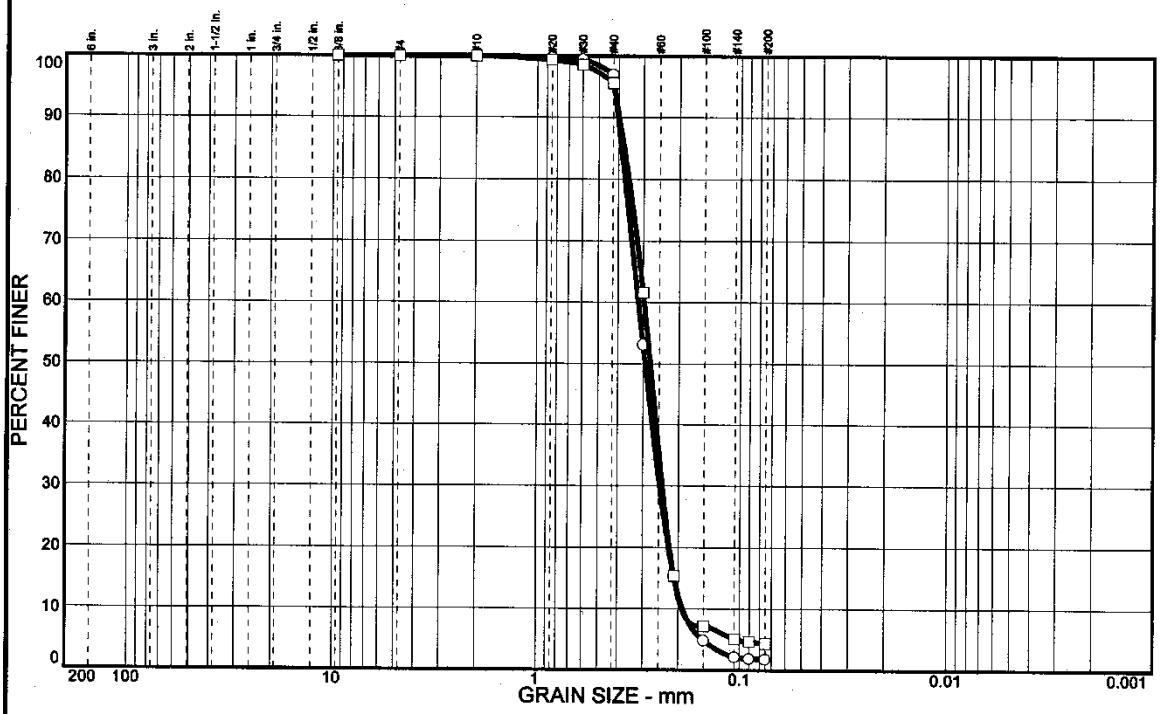
Date	March 14, 1999
Weather	Overcast, 1-2 foot seas
Vibrocore contractor	Alpine Ocean Seismic Sur
Location	Port Mahon, DE
Northing Coord.	N 103,340.8
Easting Coord.	E 296,214.3

Uncorrected Depth	-48.0 feet
Tide	-1.1 feet
Corrected Depth	-46.9 feet (1)
Vibration time	4:17"
Core penetration	19.48 feet
Core recovery	12.5 feet
Percent recovery	64%

Depth in Feet	Surf Elev -46.9 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0				Gray medium SAND, little gravel, trace coarse sand, trace fine sand, trace silt/clay.		1/0.4-5.0
		SP		Gray fine SAND, trace medium sand, trace silt/clay.	1	
	-50					
5		SP		SAME.	2	2/5.0-8.9
	-55					
				Gray SILT/CLAY, trace fine sand.		3/8.9-10.0 (not tested, fine grained sample)
10				SAME.	3	4/10.0-11.3 (not tested, fine grained sample)
				Tan fine SAND, little medium sand, trace silt, trace coarse sand.		5/11.3-12.5 (not tested, see DRV-65 run #2)
	-60					
15						
	-65					
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recovery lengths.

Particle Size Distribution Report DRV-65R1



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			98.2	1.8		SP			
□			95.6	4.4		SP			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	
3/8	100.0	100.0	
	GRAIN SIZE		
D_{60}	0.317	0.296	
D_{30}	0.247	0.240	
D_{10}	0.190	0.192	
	COEFFICIENTS		
C_c	1.02	1.01	
C_u	1.67	1.55	

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	
#4	100.0	100.0	
#10	100.0	100.0	
#20	99.8	99.4	
#30	99.5	98.6	
#40	97.0	95.6	
#50	53.1	61.6	
#70	15.4	15.4	
#100	4.9	7.2	
#140	2.2	5.1	
#170	1.9	4.7	
#200	1.8	4.4	

SOIL DESCRIPTION

○ Gray fine SAND, trace medium sand, trace silt.

□ Gray fine SAND, trace medium sand, trace silt.

REMARKS:

○

□

○ Source: DRV65R1 Sample No.: S-1 Elev./Depth: 0.4'-5.0'

□ Source: DRV65R1 Sample No.: S-2 Elev./Depth: 5.0'-8.9'

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Client: U.S. Army Corps of Engineers

Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

Hole No. DRV-20

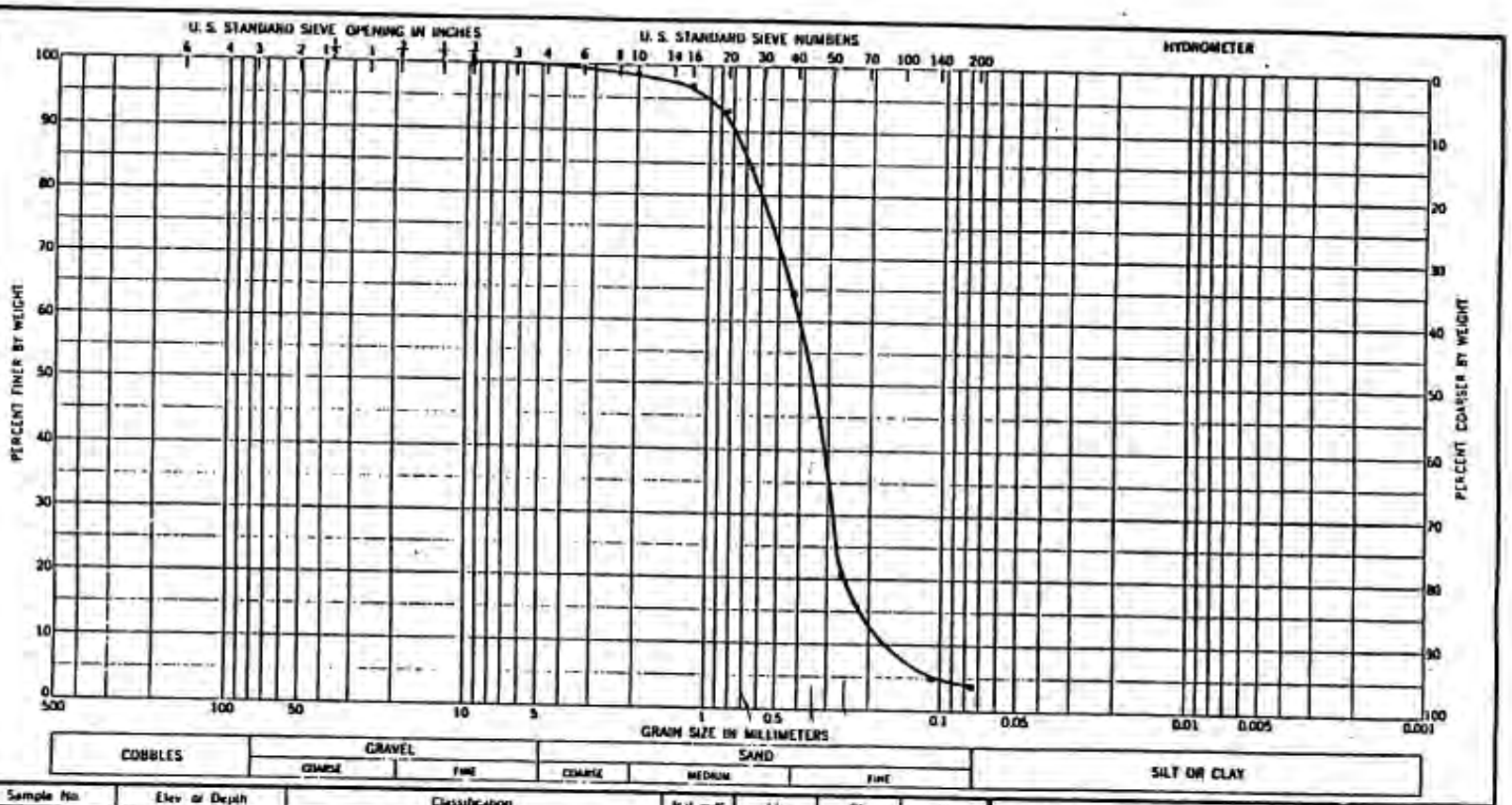
DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
2. LOCATION (Coordinates or Station) 39° 7' 8.45" 75° 13' 5.44"	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Buchart-Horn, Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL NA
4. HOLE NO. (As shown on drawing title and file number) DRV-20	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
5. NAME OF DRILLER Ocean Survey, Inc.	14. TOTAL NUMBER CORE BOXES NA
6. DIRECTION OF HOLE VERTICAL INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NA
7. THICKNESS OF OVERBURDEN NA	16. DATE HOLE : STARTED 07/18/91 : COMPLETED 07/18/91
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE -44.9 ft. NGVD
9. TOTAL DEPTH OF HOLE 20 ft.	18. TOTAL CORE RECOVERY FOR BORING 20 ft.
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Black sandy gravel-medium to fine gravel			
	1 .1		Light grey silt clay			
	2		Yellow fine sand with scattered gravel, red clay pod at 2.4-2.5; grey clay packets (1") throughout			Sample 1.1 - 5.0 ft.
	3					
	4		No gravel below 4.2 ft.			
	5					
	6					
	7					
	8		Grey silty sand grading finer downward			
	9					Sample 8.1 - 10 ft.
	10					
	11 .2		Red sandy silt			
	12					
	13 .3		Brown clayey sand, fining downward, micaceous			Sample 13.4 - 15.2 ft.
	14					
	15					
	16 .9		Fine clayey sand			
	17					Sample 15.9 - 20 ft.
	18					
	19					

PROJECT Delaware River Comprehensive Study

HOLE NO. DRV-20



Sample No.	Elev. or Depth	Classification	Nat. w %	LL	PL	PI
DRU-20	1.1-5.0	Poorly-Graded Sand SP				

Project: Delaware River Vibracore

Area:

Boring No. DRU-20

Date 7/30/91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

Sub-Reach E4

DRILLING LOG DRV-75

1. PROJECT : DE River Main Channel
2. LOCATION : N105208.27 E289014.55
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-75
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN : NA
THICKNESS :
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.2'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES : NA

14. NO. OF : NA
CORE BOXES :
15. GW ELEV. : NA
16. DATE STARTED: 4/29/01
DATE COMPLETED: 4/29/01
17. ELEVATION : -47.5 NAVD(88)
18. TOTAL : 20.0'/19.2'
RECOVERY :
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -47.5	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-48	SP	SAND: Poorly Graded, Fine to Medium Sand with Silt, subrounded, loose, moist, Olive 5Y 4/3	S-1	Uncorrected Water Depth= 48.7' MLLW= 44.0' S-1 collected from 0.5' - 2.0'
		ML	SILT: with trace Fine Sand, dense, Greenish Gray 5GY 5/1, with thin Brownish Yellow 10YR 6/8 laminations		
2	-50	ML	SILT: with Fine Sand, dense, Gray 2.5Y 5/1	S-2	S-2 collected from 2.0' - 5.0'
4	-52				
		SM	SILTY SAND: Fine Sand, medium dense, Dark Greenish Gray 5GY 4/1 with trace Silt	S-3	S-3 collected from 5.0' - 7.0'
6	-54				
		SM	SILTY SAND: Fine Sand, slight plasticity, medium dense, Dark Greenish Gray 5GY 4/1	S-4	S-4 collected from 7.0' - 10.0'
8	-56				
10	-58	SM	As above		
12	-60				
14	-62				
		SM	As above		
16	-64				
18	-66				Bottom of Boring= 19.2'
20					

Science Applications International Corporation
An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

DRILLING LOG DRV-75

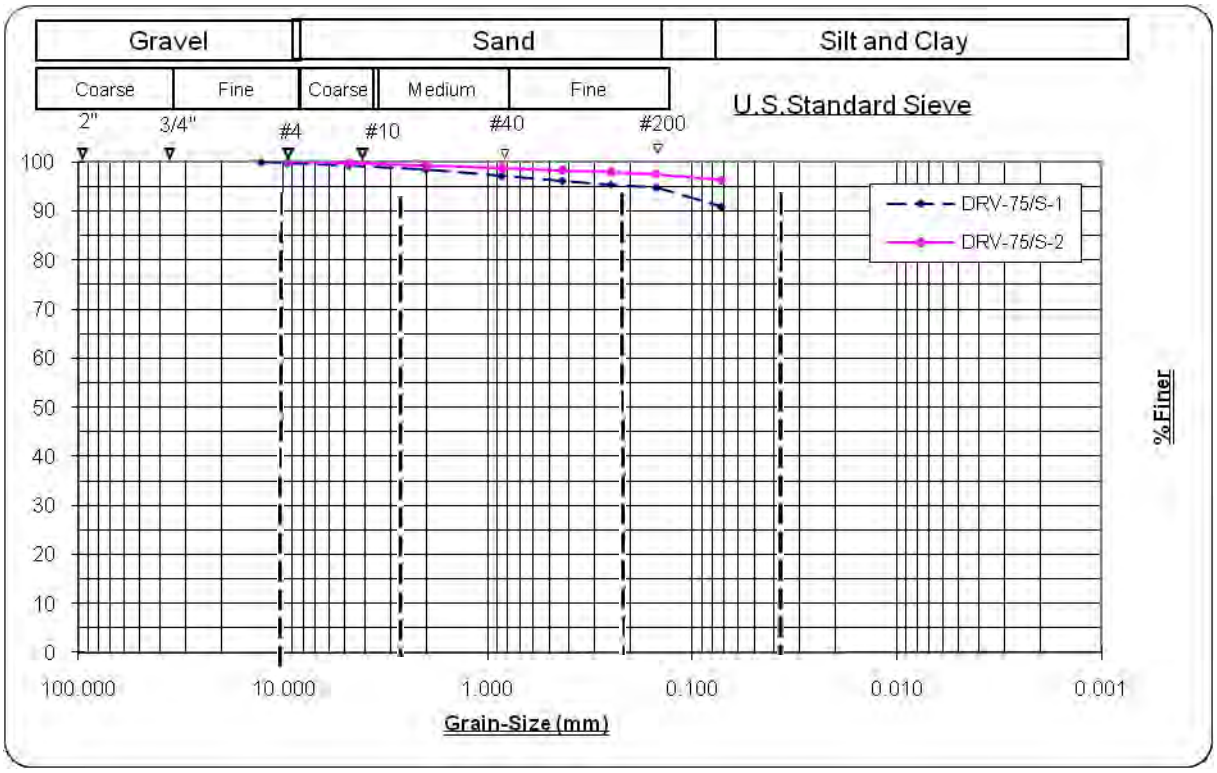
C:\MITCHISM\BR\ACORE\DE RIVER MC\DRV75C.BOR
12-11-2001

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma22a		
Job No.	2000g591				Date	22-May-01		
					Cu	Undefined	Undefined	Undefined
Dry Wt.	231.20	2221.90			C c	Undefined	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-75/S-1	DRV-75/S-2				DRV-75/S-1	DRV-75/S-2	0
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70	100.00		
3/8"	0.59	0.00		3/8"	9.50	99.74	100.00	
#4	1.50	5.30		#4	4.75	99.35	99.76	
#10	3.50	16.50		#10	2.00	98.49	99.26	
#20	6.30	27.50		#20	0.850	97.28	98.76	
#40	8.70	37.20		#40	0.430	96.24	98.33	
#60	10.50	44.70		#60	0.250	95.46	97.99	
#100	11.90	55.00		#100	0.150	94.85	97.52	
#200	21.10	80.90		#200	0.072	90.87	96.36	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-75/S-1	00.50-02.00		N.T	Dark gray silt (ML?)
DRV-75/S-2	02.00-05.00		N.T	Dark gray silt (ML?)
N.P- Non-Plastic			N.T-	Not Tested

DRILLING LOG DRV-74

1. PROJECT : DE River Main Channel
2. LOCATION : N112490.32 E263487.05
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-74
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 19.31'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 3
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/29/01
DATE COMPLETED: 4/29/01
17. ELEVATION : -46.1 NAVD(88)
18. TOTAL RECOVERY : 20.0'/19.31'
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -46.1	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-47	ML	SILT: organics, low to medium plasticity, medium stiffness, moist, Dark Gray 5Y 4/1	S-1	Uncorrected Water Depth= 47.9' MLLW= 42.6' 3" Cobble at 2.0' S-1 collected from 0.0' - 5.0' Sieve analysis results from S-1 are indicative of 0.0' - 6.3'
2	-49				
4	-51	ML	SILT: with organics, and trace amounts of Sand, medium plasticity, medium stiffnes, moist, Dark Gray 5Y 4/1		
6	-53	ML	SILT: with organics, trace amounts of Mica, low to nonplastic, medium stiffness, dry, Very Dark Gray 5Y 3/1		7.2' - 7.6' SILT SAND lens, Medium Sand, trace amounts of Fine Gravel
8	-55	ML	As above	S-2	S-2 collected from 7.6' - 10.0' Sieve analysis results from S-2 are indicative of 6.3' - 10.0'
10	-57	ML	As above		
12	-59				
14	-61				
16	-63	ML	As above	S-3	Sample 3 not analyzed
18	-65	CL	SILTY CLAY: with some Sand and organics, low plasticity, moist, Very Dark Gray 5Y 3/1		Bottom of Boring= 19.31'
20					

Science Applications International Corporation
An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

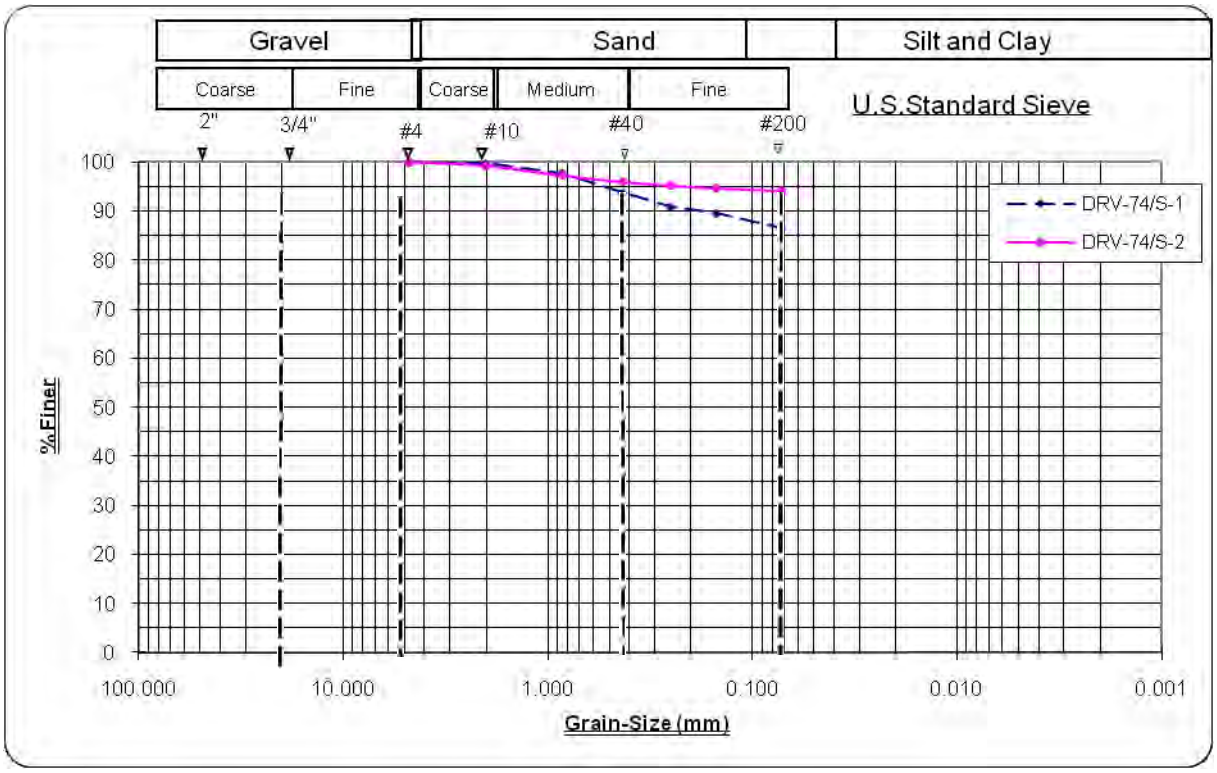
DRILLING LOG DRV-74

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma21		
Job No.	2000g591				Date	22-May-01		
					Cu	Undefined	Undefined	Undefined
Dry Wt.	260.70	222.10			C c	Undefined	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-74/S-1	DRV-74/S-2				DRV-74/S-1	DRV-74/S-2	
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70			
3/8"	0.00	0.00		3/8"	9.50			
#4	0.00	0.00		#4	4.75	100.00	100.00	
#10	0.70	1.90		#10	2.00	99.73	99.14	
#20	5.70	6.10		#20	0.850	97.81	97.25	
#40	16.20	8.90		#40	0.430	93.79	95.99	
#60	23.70	10.80		#60	0.250	90.91	95.14	
#100	27.10	11.90		#100	0.150	89.60	94.64	
#200	35.20	13.30		#200	0.072	86.50	94.01	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-74/S-1	00.00-05.0		N.T	Dark gray silt (ML?)
DRV-74/S-2	07.60-10.00		N.T	Dark gray silt (ML?)
		N.P- Non-Plastic	N.T-	Not Tested

Sub-Reach E-3

DRILLING LOG DRV-73		
1. PROJECT : DE River Main Channel 2. LOCATION : N115856.99 E281652.66 2a. DATUM : NJ State Plane NAD-83 3. DRILLING AGENCY: Alpine 4. HOLE NO. : DRV-73 5. DRILLER NAME : O. Hernandez	6. DIR. OF HOLE : vertical 7. OVERBURDEN : NA THICKNESS : 8. DEPTH TO ROCK: NA 9. TOTAL DEPTH : 19.63' 10. BIT SIZE/ TYPE: 3.5" Cutting Shoe 11. ELEV. DATUM : NAVD(88) 12. DRILL RIG : Alpine Model 271 13a. DIST. SAMPLES: 3 UNDIST. SAMPLES : NA	14. NO. OF CORE BOXES : NA 15. GW ELEV. : NA 16. DATE STARTED: 4/29/01 DATE COMPLETED: 4/29/01 17. ELEVATION : -48.4 NAVD(88) 18. TOTAL RECOVERY : 19.60'/19.63' 19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -48.4	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-49	SP-SM	SAND with SILT: Poorly Graded, Fine to Coarse Sand, with Silt, subangular to subrounded, very loose, wet, Dark Gray 5Y 4/1	S-1	Uncorrected Water Depth= 50.3' MLLW= 44.9' S-1 collected from 0.0' - 3.0' Sieve analysis results from S-1 are indicative of 0.0' - 5.0' based on field classification.
2	-51				
4	-53	SP-SM	SAND: As above, but with Silt to Clayey Silt stringers		
6	-55	SM	SILTY SAND: Fine to Medium Sand with Silt, with Silt and Clayey Silt interbeds, Dark Gray 2.5Y 4/1	S-2	S-2 collected from 5.0' - 8.0' Sieve analysis results from S-2 are indicative of 5.0' - 9.0' based on field classification.
8	-57	SM	SILTY SAND: As above, but coarser, Medium to Coarse Sand with Fine Gravel		
		ML	SILT: with Fine Sand, low plasticity, soft, moist, Very Dark Grayish Brown 2.5Y 3/2		With peat from 9.5-10.0'
10	-59	ML	SILT: with occasional peat nodules, nonplastic, soft, wet, Very Dark Gray 2.5Y 3/1	S-3	S-3 collected from 10.0' - 15.0' Sieve analysis results from S-3 are indicative of 9.0' - 15.0' based on field classification.
12	-61				
14	-63				
16	-65	ML	As above		
18	-67				Bottom of Boring= 19.63'
20					

Science Applications International Corporation An Employee-Owned Company	USACE Philadelphia District Contract No. DACW61-00-D-0007 Task Order No. 008 Vibracoring Delaware River Main Channel	DRILLING LOG DRV-73

C:\MITECH5\VIBRACORE\DE RIVER MC\DRV73C.BOR

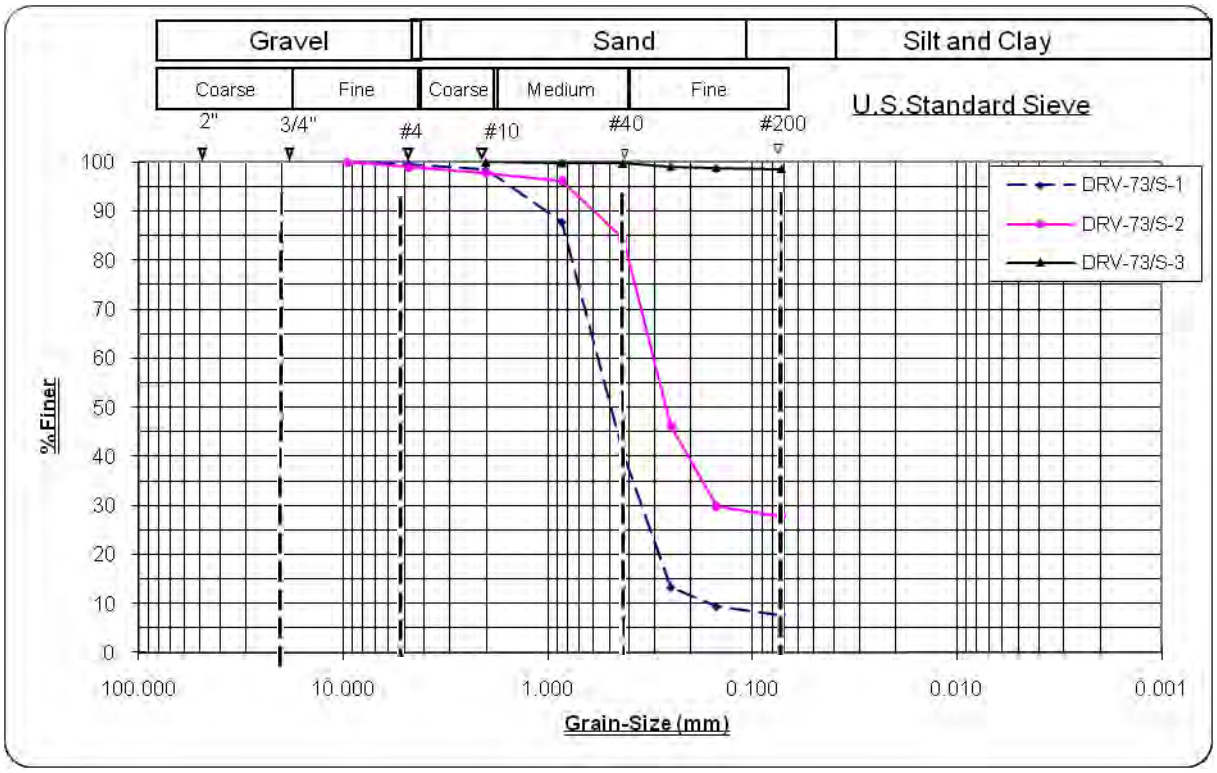
12-11-2001

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma20		
Job No.	2000g591				Date	22-May-01		
					Cu	162.50	200.00	362.50
Dry Wt.	275.40	372.50	140.40		C c	2.16	0.14	1.04
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-73/S-1	DRV-73/S-2	DRV-73/S-3			DRV-73/S-1	DRV-73/S-2	DRV-73/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70			
3/8"	0.00	0.00	0.00	3/8"	9.50	100.00	100.00	
#4	1.03	4.10	0.00	#4	4.75	99.63	98.90	
#10	4.20	8.16	0.00	#10	2.00	98.47	97.81	100.00
#20	33.68	14.49	0.19	#20	0.850	87.77	96.11	99.86
#40	163.86	58.50	0.43	#40	0.430	40.50	84.30	99.69
#60	238.96	200.46	1.29	#60	0.250	13.23	46.19	99.08
#100	249.81	261.56	1.70	#100	0.150	9.29	29.78	98.79
#200	254.23	268.90	2.06	#200	0.072	7.69	27.81	98.53

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-73/S-1	00.00-03.00		N.T	Dark gray poorly graded sand with silt (SP-SM)
DRV-73/S-2	05.00-08.00		N.T	Dark gray silty sand (SM)
DRV-73/S-3	10.00-15.00		N.T	Gray-brown silt (ML?)
		N.P- Non-Plastic	N.T-	Not Tested

Hole No. DEV-18

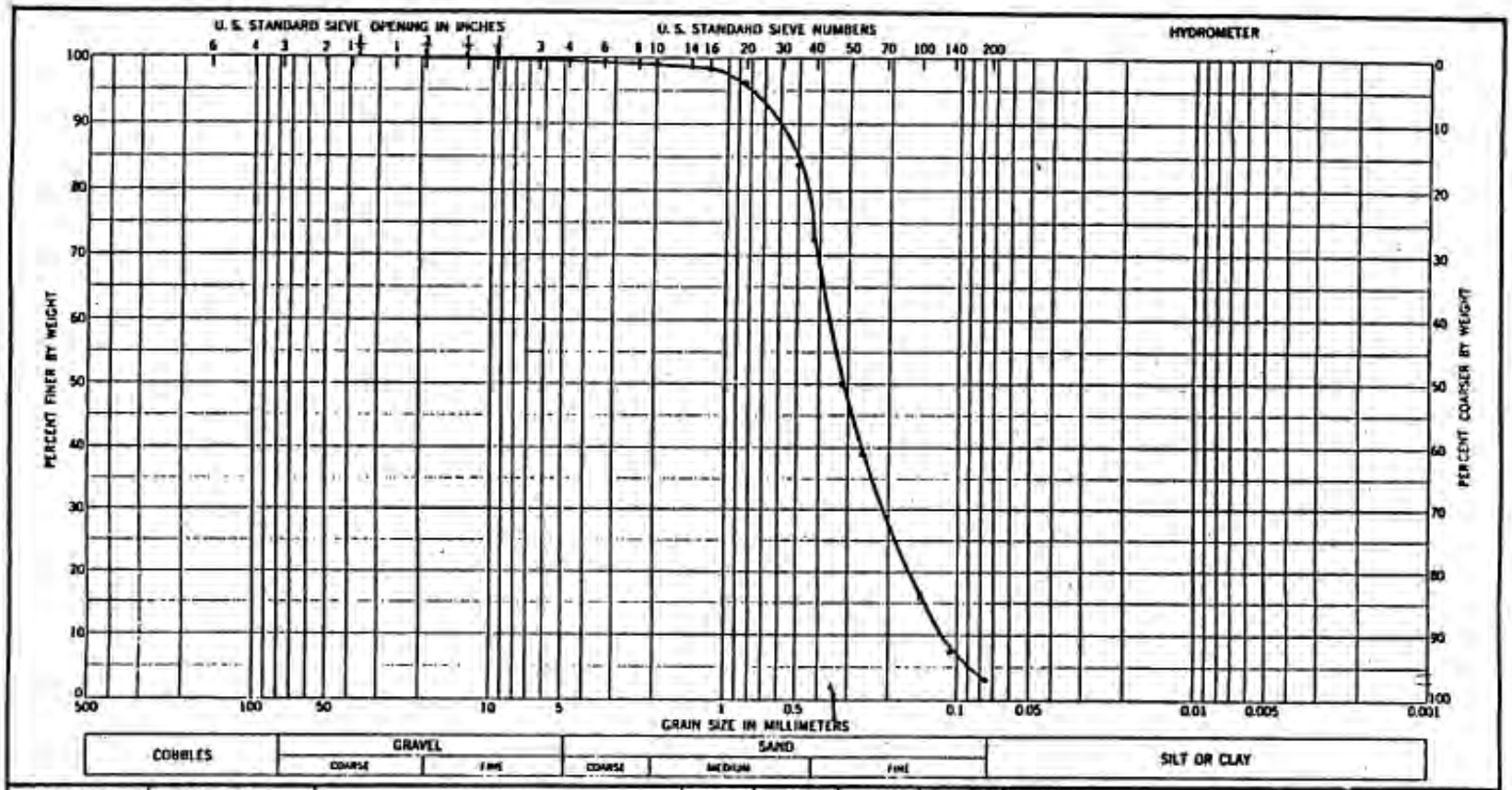
DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
2. LOCATION (Coordinates or Station) 39° 10' 35.68" 75° 16' 0.16"	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY Buchart-Horn, Inc.	12. MANUFACTURER'S DESIGNATION OF DRILL NA
4. HOLE NO. (As shown on drawing title and file number) DEV-18	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED
5. NAME OF DRILLER Ocean Survey, Inc.	14. TOTAL NUMBER CORE BOXES NA
6. DIRECTION OF HOLE VERTICAL INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER NA
7. THICKNESS OF OVERBURDEN NA	16. DATE HOLE: STARTED 07/18/91: COMPLETED 07/18/91
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE -43.2 ft. NGVD
9. TOTAL DEPTH OF HOLE 14.5 ft.	18. TOTAL CORE RECOVERY FOR BORING 12 ft.
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1 .5		Fine sand grey			Sample 0 - 4.1 ft.
	2 .2		Brown fine sand			
	3		Black fine sand			
	4 .2		Black fine sand			
	5 .2		Sandy gravel			Sample 5.2 - 9.1 ft.
	6					
	7					
	8					
	9 .1		Grey fine silty sand			Sample 9.1 - 10 ft.
	10 .3		Grey coarse to fine sand			
	.7		Grey silty fine sand with scattered gravel			Sample 10.7 - 11.7 ft.
	11 .7		Silty gravel			Bottom of recovery
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					

PROJECT Delaware River Comprehensive Study

HOLE NO. DEV-18



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRV-18	0.0-4.1	Poorly-Graded Sand				
		SP				

Project Delaware River Vibracores

Area

Boring No. DRV-18

Date 8/6/91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

DRILLING LOG DRV-72

1. PROJECT : DE River Main Channel
2. LOCATION : N125867.14 E273824.08
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-72
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 20.02'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/27/01
DATE COMPLETED: 4/27/01
17. ELEVATION : -49.4 NAVD(88)
18. TOTAL RECOVERY : 19.6'/20.02'
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -49.4	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-50	SM	SILTY SAND: Fine to Medium Grain, subangular to subrounded, with some Shell Fragments, Dark Olive Gray 5Y 3/2	S-1	Uncorrected Water Depth= 48.9' MLLW= 45.9'
2	-52				S-1 collected from 0.0' - 5.0'
4	-54	SP-SM	SAND with SILT: Poorly Graded, Fine to Medium Grain with trace amount of shell fragments, Dark Olive Gray 5Y 3/2	S-2	
6	-56				
8	-58				S-2 collected from 0.0' - 10.0'
10	-60	SP-SM	SAND with SILT: Poorly Graded with some Silt, and occasional Clayey Silt to Silty Sand interbeds, trace amounts of Shell Fragments, loose, wet, Very Dark Gray 5Y 3/1	S-3	
12	-62				Samples 3 & 4 were not analyzed
14	-64	SP-SM	SAND with SILT: Poorly Graded, Medium to Coarse Sand, subrounded to rounded, with some Shell Fragments, and occasional Clayey Silt to Silty Sand interbeds, loose, wet, Dark Gray 5Y 4/1	S-4	
16	-66				
18	-68	ML	CLAYEY SILT: with some Fine Sand, trace amounts of Shell Fragments, Very Dark Gray 5Y 3/1		Bottom of Boring= 20.02'
20	-70				
22					

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12-11-2001

Science Applications International Corporation
An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

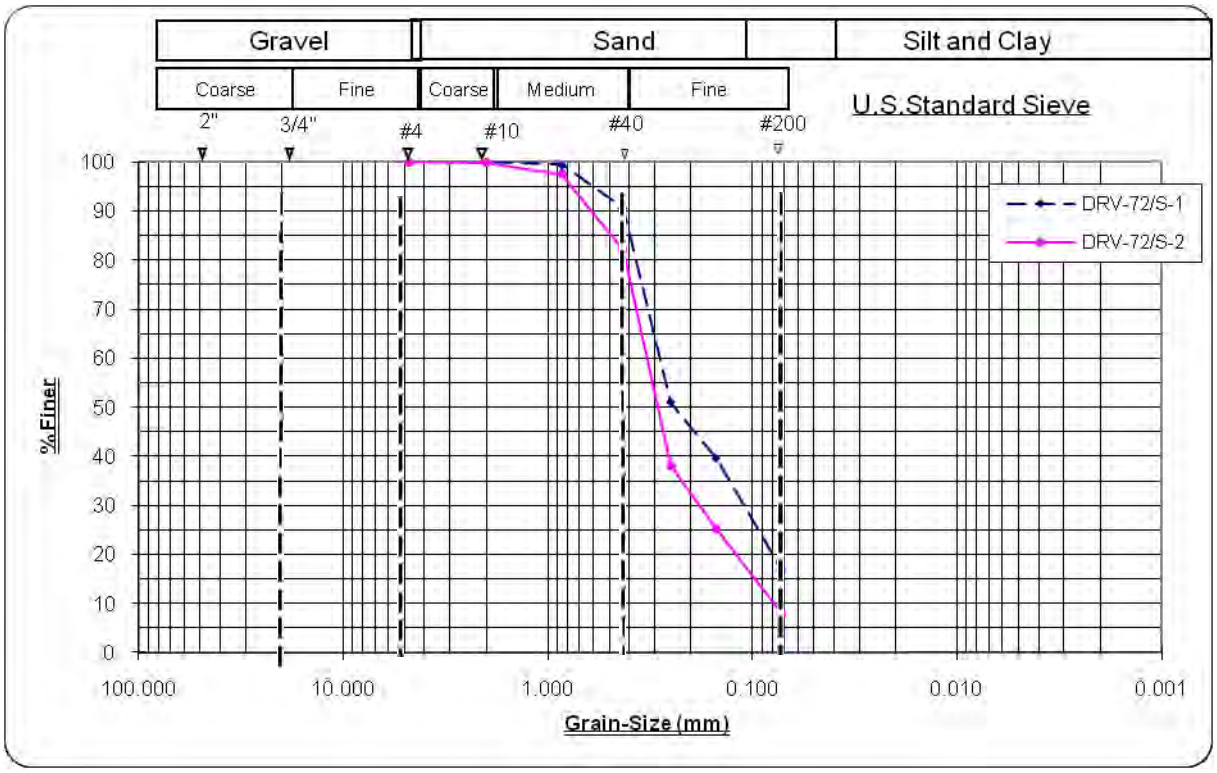
DRILLING LOG DRV-72

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma19		
Job No.	2000g591				Date	22-May-01		
					Cu	Undefined	4.00	Undefined
Dry Wt.	275.20	281.80			C c	Undefined	1.27	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-72/S-1	DRV-72/S-2				DRV-72/S-1	DRV-72/S-2	0
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70			
3/8"	0.00	0.00		3/8"	9.50			
#4	0.00	0.00		#4	4.75	100.00	100.00	
#10	0.10	0.28		#10	2.00	99.96	99.90	
#20	1.60	7.10		#20	0.850	99.42	97.48	
#40	26.00	50.31		#40	0.430	90.55	82.15	
#60	134.80	174.50		#60	0.250	51.02	38.08	
#100	166.40	210.98		#100	0.150	39.53	25.13	
#200	229.10	259.69		#200	0.072	16.75	7.85	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-72/S-1	00.00-05.00		N.T	Dark gray silty sand (SM)
DRV-72/S-2	05.00-10.00		N.T	Dark gray poorly graded sand with silt (SP-SM)
N.P- Non-Plastic			N.T-	Not Tested

DRILLING LOG DRV-71

1. PROJECT : DE River Main Channel
2. LOCATION : N129134.81 E272958.36
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-71
5. DRILLER NAME : O. Hernandez

6. DIR. OF HOLE : vertical
7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 18.24'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES: NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/27/01
DATE COMPLETED: 4/27/01
17. ELEVATION : -48.5 NAVD(88)
18. TOTAL RECOVERY : 20.0'/18.24'
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -48.5	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-49	SP-SM	SAND with SILT: Poorly Graded, Fine to Medium Sand with some Silt, trace amounts of Shell Fragments, loose, Very Dark Gray 2.5Y 3/1		Uncorrected Water Depth= 49.1' MLLW= 44.9'
2	-51		Grading downward to Fine Sand: 2.5-4.3'	S-1	S-1 collected from 0.0' - 4.3'
4	-53	SW	GRAVELLY SAND: Fine to Coarse Sand with Fine Gravel, Gray N 5/0		
6	-55	ML	SANDY SILT: nonplastic, wet, loose, Dark Olive Gray 5Y 3/2	S-2	S-2 collected from 5.0' - 8.6' Sieve analysis results from S-2 are indicative of 4.8' - 8.6' based on field classification.
8	-57	ML	SILT: contains some Mica, low plasticity, medium stiffness, Very Dark Gray 5Y 3/1		
10	-59	ML	As above		
12	-61			S-3	S-3 collected from 10.0' - 15.0' Sieve analysis results from S-3 are indicative of 8.6' - 15.0' based on field classification.
14	-63				
16	-65	ML	SILT: with Fine Sand laminations, low plasticity, medium stiffness, Very Dark Gray 5Y 3/1	S-4	Sample 4 not analyzed
18	-67				Bottom of Boring= 18.24'
20					

Science Applications International Corporation
An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

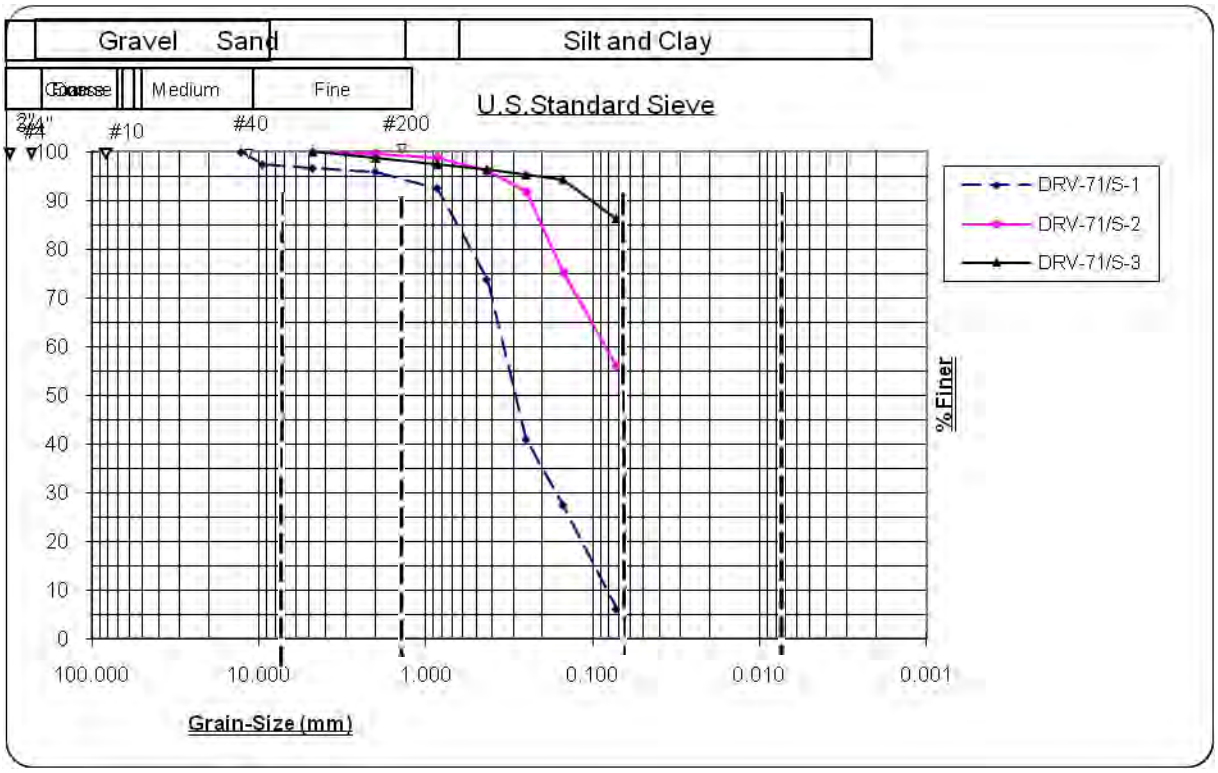
DRILLING LOG DRV-71

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma18		
Job No.	2000g591				Date	22-May-01		
					Cu	3.68	Undefined	Undefined
Dry Wt.	248.00	272.90	273.90		C c	0.87	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-71/S-1	DRV-71/S-2	DRV-71/S-3			DRV-71/S-1	DRV-71/S-2	DRV-71/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70	100.00		
3/8"	6.30	0.00	0.00	3/8"	9.50	97.46		
#4	8.20	0.00	0.00	#4	4.75	96.69	100.00	100.00
#10	9.90	0.90	3.45	#10	2.00	96.01	99.67	98.74
#20	18.40	3.20	6.89	#20	0.850	92.58	98.83	97.48
#40	64.90	10.80	9.81	#40	0.430	73.83	96.04	96.42
#60	146.20	22.20	12.93	#60	0.250	41.05	91.87	95.28
#100	179.90	67.50	15.40	#100	0.150	27.46	75.27	94.38
#200	232.90	120.20	37.73	#200	0.072	6.09	55.95	86.22

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-71/S-1	00.00-04.30		N.T	Gray poorly graded sand with silt (SP-SM)
DRV-71/S-2	05.00-08.60		N.T	Dark gray sandy silt (ML?)
DRV-71/S-3	10.00-15.00		N.T	Dark gray silt (ML?)
N.P- Non-Plastic			N.T-	Not Tested

Hole No. DEV-17

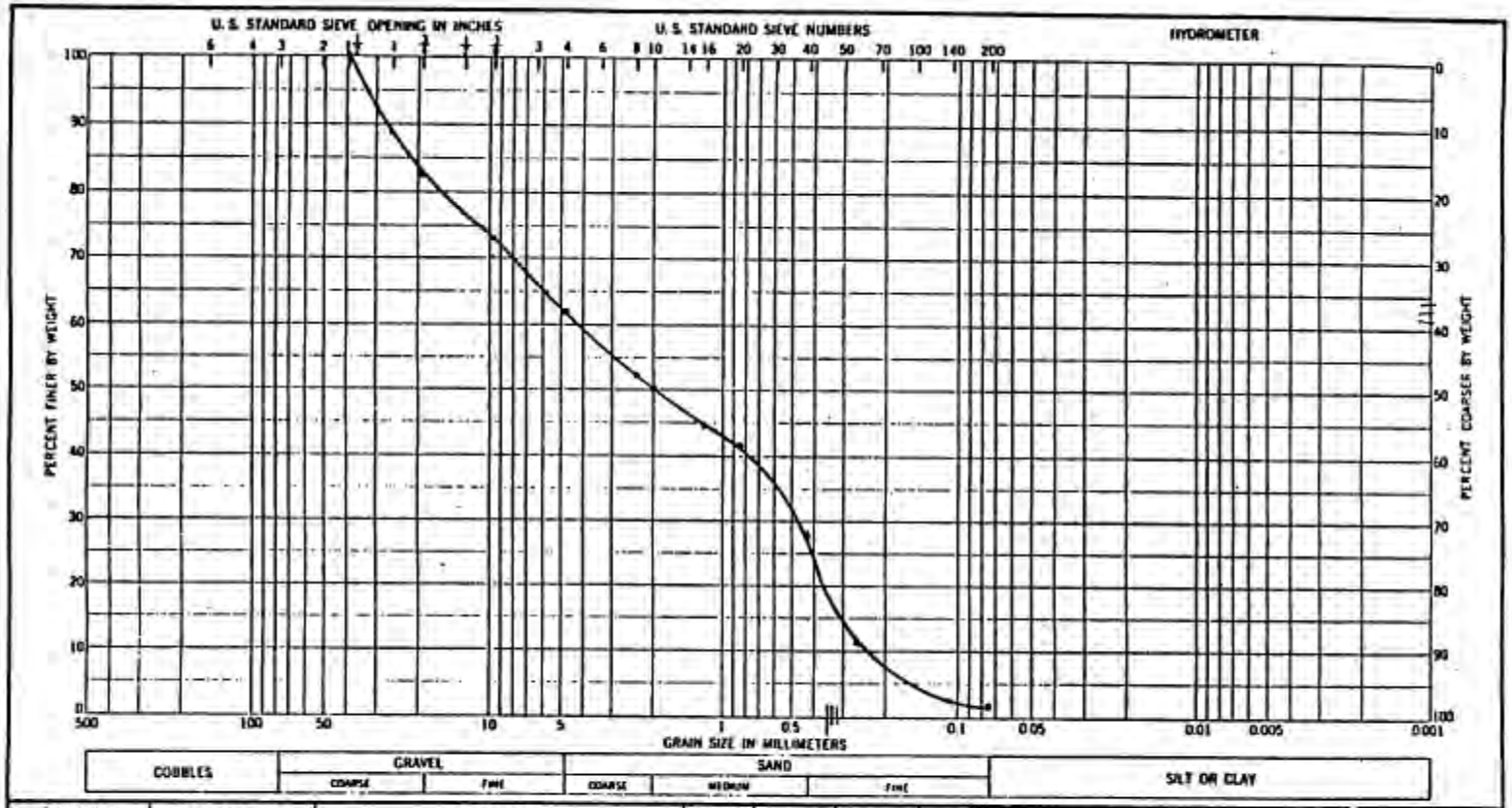
DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station) 39° 13' 02.87" 75° 17' 40.30"	12. MANUFACTURER'S DESIGNATION OF DRILL NA
3. DRILLING AGENCY Buchart-Horn, Inc.	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
4. HOLE NO. (As shown on drawing title and file number) DEV-17	14. TOTAL NUMBER CORE BOXES NA
5. NAME OF DRILLER Ocean Survey, Inc.	15. ELEVATION GROUND WATER NA
	16. DATE HOLE : STARTED 07/19/91 : COMPLETED 07/19/91
6. DIRECTION OF HOLE VERTICAL INCLINED _____ DEG. FROM VERT.	17. ELEVATION TOP OF HOLE -46.3 ft. NGVD
7. THICKNESS OF OVERBURDEN NA	18. TOTAL CORE RECOVERY FOR BORING 10 ft.
8. DEPTH DRILLED INTO ROCK NA	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE 20 ft.	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Brown medium to fine sand SP			20 ft. penetration 10 ft. recovery, rest of sample fell out. Oyster shells destroyed capture core
	1 .2		Grey silt SM-SC			Sample 0 - 1.2 ft.
	2 .4					Sample 1.1 - 2.4 ft. Sample 2.4 - 3.7 ft.
	3 .7		Grey fine sand, some shells SM-SC			
	4		Grey clay or silt with sand and sand silt layers at 4.4 to 4.6, 5.3 to 5.4 to 6.1, 6.5, 7.4 to 7.6 and 8.2 to 8.3			
	5		SM-SC			
	6					Sample 3.7 - 10 ft. Sand in sample
	7					
	8					
	9					
	10				10.5	Bottom of recovery
	11		Rest of sample fell out.			
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					

PROJECT Delaware River Comprehensive Study

HOLE NO. DEV-17



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRU-17	0 - 1.2	Poorly-Graded Sand				
		SP				

Project Delaware River Vibracores

Area

Boring No. DRU-17

Date 8/6/91

GRADATION CURVES

ENG FORM 1 MAY 83 2087

Sub-Reach E-2

DRILLING LOG DRV-70		
1. PROJECT : DE River Main Channel 2. LOCATION : N141101.48 E267384.25 2a. DATUM : NJ State Plane NAD-83 3. DRILLING AGENCY: Alpine 4. HOLE NO. : DRV-70 5. DRILLER NAME : O. Hernandez	6. DIR. OF HOLE : vertical 7. OVERBURDEN : NA THICKNESS : 8. DEPTH TO ROCK: NA 9. TOTAL DEPTH : 19.52' 10. BIT SIZE/ TYPE: 3.5" Cutting Shoe 11. ELEV. DATUM : NAVD(88) 12. DRILL RIG : Alpine Model 271 13a. DIST. SAMPLES: 4 UNDIST. SAMPLES : NA	14. NO. OF CORE BOXES : NA 15. GW ELEV. : NA 16. DATE STARTED: 4/27/01 DATE COMPLETED: 4/27/01 17. ELEVATION : -48.3 NAVD(88) 18. TOTAL RECOVERY : 18.60'/19.52' 19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -48.3	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-49	SP-SM	SAND and SILT: Poorly Graded, Fine Sand with some Silt, rounded grains, 20-25% Shell Fragments, loose, Dark Olive Gray 5Y 3/2	S-1	Uncorrected Water Depth= 49.7' MLLW= 44.8' S-1 collected from 0.0' - 2.5' Complete/Whole Bivalve Shell at 24"
2	-51	ML	SANDY SILT: contains 20% Shell Fragments, very soft, with occasional (1-2") lens of shell fragments, trace amounts of peat, Dark Gray 5Y 4/1	S-2	S-2 collected from 2.5' - 5.0' Sieve analysis results are indicative of 2.5' - 10.0' based on field classification.
4	-53				
6	-55				
8	-57				
10	-59	CL	SILT to CLAYEY SILT: with trace amounts of Shell Fragments, low to nonplastic, soft to medium stiffness, Very Dark Gray 5Y 3/1	S-3	Samples 3 & 4 were not analyzed
12	-61				
14	-63		14.5-15.0' Peat lenses		
16	-65	CL	SILT to CLAYEY SILT: medium plasticity, medium stiffness, Very Dark Gray 5Y 3/1, with increased peat lenses	S-4	
18	-67	CL	CLAY: with trace amounts of Shell Fragments, low to medium plasticity, medium stiffness, Very Dark Gray 2.5Y 3/1		Bottom of Boring= 19.52'
20					

C:\MITECH\5\VIBRACORE\DE RIVER MC\DRV70C.BOR

SAIC Science Applications International Corporation An Employee-Owned Company

USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

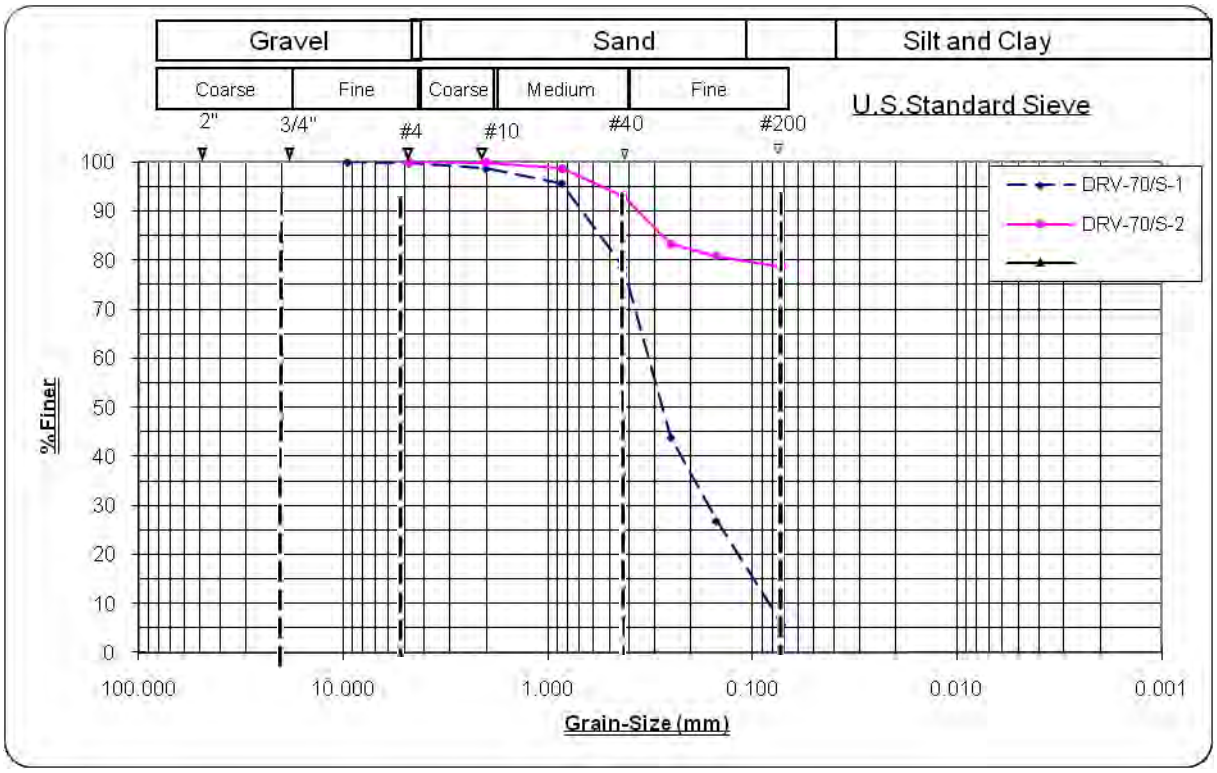
DRILLING LOG DRV-70

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma17		
Job No.	2000g591				Date	22-May-01		
					Cu	3.37	Undefined	
Dry Wt.	431.90	237.50			C c	0.95	Undefined	
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-70/S-1	DRV-70/S-2				DRV-70/S-1	DRV-70/S-2	
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70			
3/8"	0.00	0.00		3/8"	9.50	100.00		
#4	0.97	0.00		#4	4.75	99.78	100.00	
#10	5.86	0.37		#10	2.00	98.64	99.84	
#20	18.60	3.13		#20	0.850	95.69	98.68	
#40	92.40	16.40		#40	0.430	78.61	93.09	
#60	242.64	39.69		#60	0.250	43.82	83.29	
#100	316.10	45.59		#100	0.150	26.81	80.80	
#200	407.30	50.62		#200	0.072	5.70	78.69	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-70/S-1	00.00-02.50			Gray poorly graded sand with silt (SP-SM)
DRV-70/S-2	02.50-05.00		N.T	Gray sandy silt (ML?)
N.P- Non-Plastic			N.T-	Not Tested

DRILLING LOG DRV-69

1. PROJECT : DE River Main Channel
2. LOCATION : N149544.77 E262635.19
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-69
5. DRILLER NAME : O. Hernandez

7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 18.58'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 4
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/27/01
DATE COMPLETED: 4/27/01
17. ELEVATION : -51.7 NAVD(88)
18. TOTAL RECOVERY : 20.0'/18.58'
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -51.7	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-52	SP-SM	SAND with SILT: Poorly Graded, with some Silt, loose, subrounded to rounded grains, wet, Light Olive Brown 2.5Y 5/3		Uncorrected Water Depth= 53.8' MLLW= 48.2'
		ML			
2	-54	SP-SM	SILT: with trace Fine Sand and Fine Gravel, Greenish Gray 5GY 5/1		
			SAND with SILT: Poorly Graded Fine to Coarse Sand with Gravel, Yellowish Brown 10YR 5/8		
4	-56	SP-SM	SAND with SILT: Poorly Graded, Fine to Medium Sand, subangular to subrounded grains, loose, wet, Yellowish Brown 10YR 5/8	S-1	S-1 collected from 2.5' - 5.0' Sieve analysis results from S-1 are indicative of 0.0' - 5.5' based on field classification.
6	-58	ML	SILT: with Sand and Gravel, medium plasticity, soft to medium stiffness, Very Dark Gray 7.5YR 3/1		
8	-60			S-2	S-2 collected from 5.5' - 10.0'
10	-62				
12	-64	ML	SANDY SILT to SILTY SAND: Fine Sand, low plasticity, Very Dark Gray 7.5YR 3/1	S-3	Samples 3 & 4 were not analyzed
14	-66				
16	-68	ML	CLAYEY SILT: with Fine Sand, low plasticity, soft, Very Dark Grayish Brown 2.5Y 3/2	S-4	
18	-70				Bottom of Boring= 18.58'
20					

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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

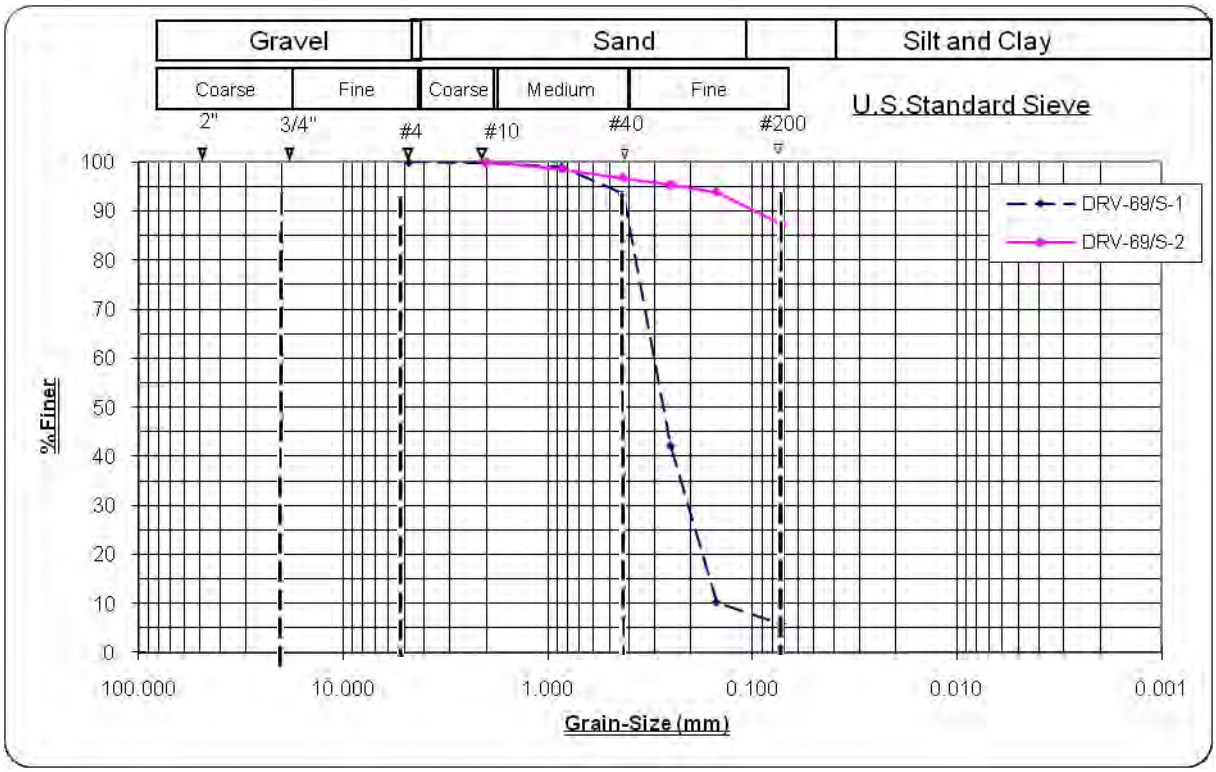
DRILLING LOG DRV-69

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma16		
Job No.	2000g591				Date	22-May-01		
					Cu	19.38	Undefined	
Dry Wt.	427.30	223.30			C c	8.89	Undefined	
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-69/S-1	DRV-69/S-2				DRV-69/S-1	DRV-69/S-2	
3"	0.00	0.00		3"	76.00			
2"	0.00	0.00		2"	50.80			
1.5"	0.00	0.00		1.5"	38.10			
1"	0.00	0.00		1"	25.40			
3/4	0.00	0.00		3/4	19.00			
1/2"	0.00	0.00		1/2"	12.70			
3/8"	0.00	0.00		3/8"	9.50			
#4	0.00	0.00		#4	4.75	100.00		
#10	0.40	0.00		#10	2.00	99.91	100.00	
#20	3.70	3.13		#20	0.850	99.13	98.60	
#40	28.10	7.38		#40	0.430	93.42	96.70	
#60	247.30	10.36		#60	0.250	42.12	95.36	
#100	383.70	13.77		#100	0.150	10.20	93.83	
#200	402.30	28.25		#200	0.072	5.85	87.35	

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-69/S-1	02.50-05.00		N.T	Light brown poorly graded sand with silt (SP-SM)
DRV-69/S-2	05.50-10.00		N.T	Brown silt (ML?)
N.P- Non-Plastic			N.T-	Not Tested

DRILLING LOG DRV-68 R2

1. PROJECT : DE River Main Channel
2. LOCATION : N152617.28 E260020.89
2a. DATUM : NJ State Plane NAD-83
3. DRILLING AGENCY: Alpine
4. HOLE NO. : DRV-68 Run 2
5. DRILLER NAME : O. Hernandez

7. OVERBURDEN THICKNESS : NA
8. DEPTH TO ROCK: NA
9. TOTAL DEPTH : 18.18'
10. BIT SIZE/ TYPE: 3.5" Cutting Shoe
11. ELEV. DATUM : NAVD(88)
12. DRILL RIG : Alpine Model 271
13a. DIST. SAMPLES: 5
UNDIST. SAMPLES : NA

14. NO. OF CORE BOXES : NA
15. GW ELEV. : NA
16. DATE STARTED: 4/27/01
DATE COMPLETED: 4/27/01
17. ELEVATION : -49.4 NAVD(88)
18. TOTAL RECOVERY : 19.70'/18.18'
19. INSPECTOR : Tamera L. Renninger

DEPTH FEET	NAVD ELEV. -49.4	LEGEND	DESCRIPTION	Box Or Sample No.	REMARKS
0	-50	SP	SAND: Poorly Graded, Fine to Medium Sand, wet, loose, subangular to subrounded grains, Dark Yellowish Brown 10YR 4/6	S-1	Run1 Uncorrected Water Depth= 50.4' MLLW=46.0' Liner could not be removed; therefore, sample was recollected. Run1 Location: N152613.54 E260031.90 Total Penetration= 19.58' Total Recovery= 0.0' Run 2 Uncorrected water depth= 52.0' MLLW= 45.9' S-1 collected from 0.0' - 4.5' S-2 collected from 4.5' - 6.0' S-3 collected from 6.0' - 10.0'
2	-52				
4	-54	ML	SILT: with trace amounts of Fine Sand, low plasticity, soft, Brownish Yellow 10YR 6/8 to Gray 2.5Y 6/1	S-2	
6	-56	SM	SILTY SAND: with some Clay, very Fine to Fine Sand, low to medium plasticity, soft, Light Yellowish Brown 2.5Y 6/3		
8	-58			S-3	
10	-60	SM	As above		
12	-62				
14	-64	ML	CLAYEY SILT: with Fine to Medium Sand, angular, low plasticity, soft, Light Olive Brown 2.5Y 5/3	S-4	Samples 4 & 5 were not analyzed
16	-66	ML	As above		
18	-68	ML	SANDY SILT: Poorly Graded, rounded, Very Dark Gray 2.5Y 3/1	S-5	Bottom of Boring= 18.18' Greater recovery than penetration
20					

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USACE Philadelphia District
Contract No. DACW61-00-D-0007
Task Order No. 008
Vibracoring Delaware River Main Channel

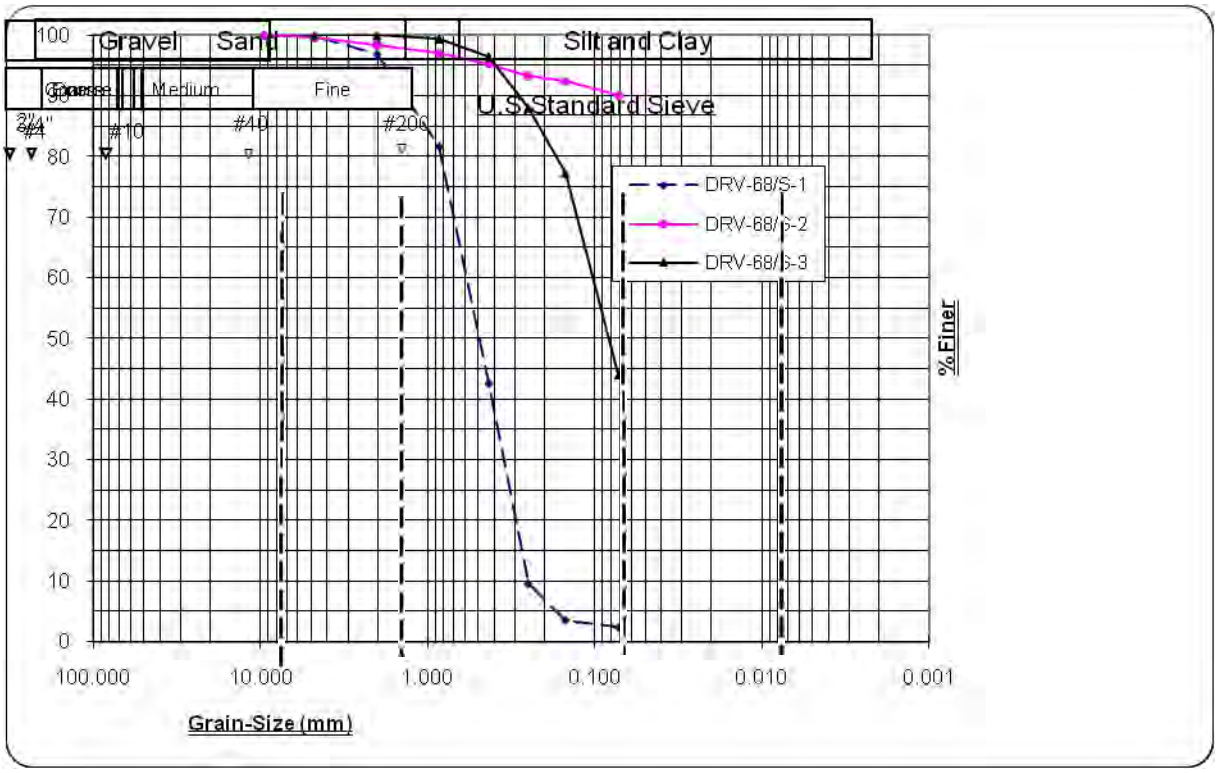
DRILLING LOG DRV-68 R2

GeoSystems Consultants Inc.

Fort Washington , Pa.

Job Name:	SAIC:USACE/Vibrocore Sample				File No	2000591ma15		
Job No.	2000g591				Date	22-May-01		
					Cu	2.27	Undefined	Undefined
Dry Wt.	445.40	177.80	449.30		C c	0.80	Undefined	Undefined
Sieve	Weight	Weight	Weight	Sieve	Sieve	%	%	%
No.	Retained	Retained	Retained	No.	Size , mm	Finer	Finer	Finer
Sample No	DRV-68/S-1	DRV-68/S-2	DRV-68/S-3			DRV-68/S-1	DRV-68/S-2	DRV-68/S-3
3"	0.00	0.00	0.00	3"	76.00			
2"	0.00	0.00	0.00	2"	50.80			
1.5"	0.00	0.00	0.00	1.5"	38.10			
1"	0.00	0.00	0.00	1"	25.40			
3/4	0.00	0.00	0.00	3/4	19.00			
1/2"	0.00	0.00	0.00	1/2"	12.70			
3/8"	0.00	0.00	0.00	3/8"	9.50	100.00	100.00	
#4	0.70	0.62	0.00	#4	4.75	99.84	99.65	100.00
#10	13.90	2.89	0.10	#10	2.00	96.88	98.37	99.98
#20	81.40	5.27	2.48	#20	0.850	81.72	97.04	99.45
#40	255.50	8.50	15.67	#40	0.430	42.64	95.22	96.51
#60	402.60	11.92	53.66	#60	0.250	9.61	93.30	88.06
#100	429.40	13.58	102.11	#100	0.150	3.59	92.36	77.27
#200	434.50	17.75	251.76	#200	0.072	2.45	90.02	43.97

ASTMD-422



Boring/Sample No.	Depth	Water	LL/PL	Description
	Ft.	Content, %	%	
DRV-68/S-1	00.00-04.50			Light brown poorly graded sand (SP)
DRV-68/S-2	04.50-06.00		N.T	Brown silt (ML?)
DRV-68/S-3	06.00-10.00		N.T	Brown silty sand (SM)
		N.P- Non-Plastic		N.T- Not Tested

Vibrocore DRV-64

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW-61-98-D-0008
Task Order 8
Port Mahon PED

Date	: March 17, 1999
Weather	: Sunny and calm
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 165,037.4
Easting Coord.	: E 248,482.6

Uncorrected Depth	: 49.0 feet
Tide	: +4.25 feet
Corrected Depth	: 44.75 feet (1)
Vibration time	: 4'08"
Core penetration	: 19.76 feet
Core recovery	: 18.7 feet
Percent recovery	: 95%

Depth in Feet	Surf. Elev. -44.8 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0	-45	SP		Brown/orange medium SAND, some fine sand, some gravel, trace coarse sand, trace silt/clay.	1	1/0.0-4.8
5	-50			Light gray SILT / CLAY, trace fine sand.	2	2/4.8-6.3 (not tested, fine grained sample)
		SM		Light gray/tan fine SAND, some silt/clay.		3/6.3-10.1
10	-55	SM		Light gray/tan fine SAND, little silt/clay.	3	4/10.1-14.8
15	-60	SP-SM		SAME.	4	5/14.8-18.7
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recovery lengths.

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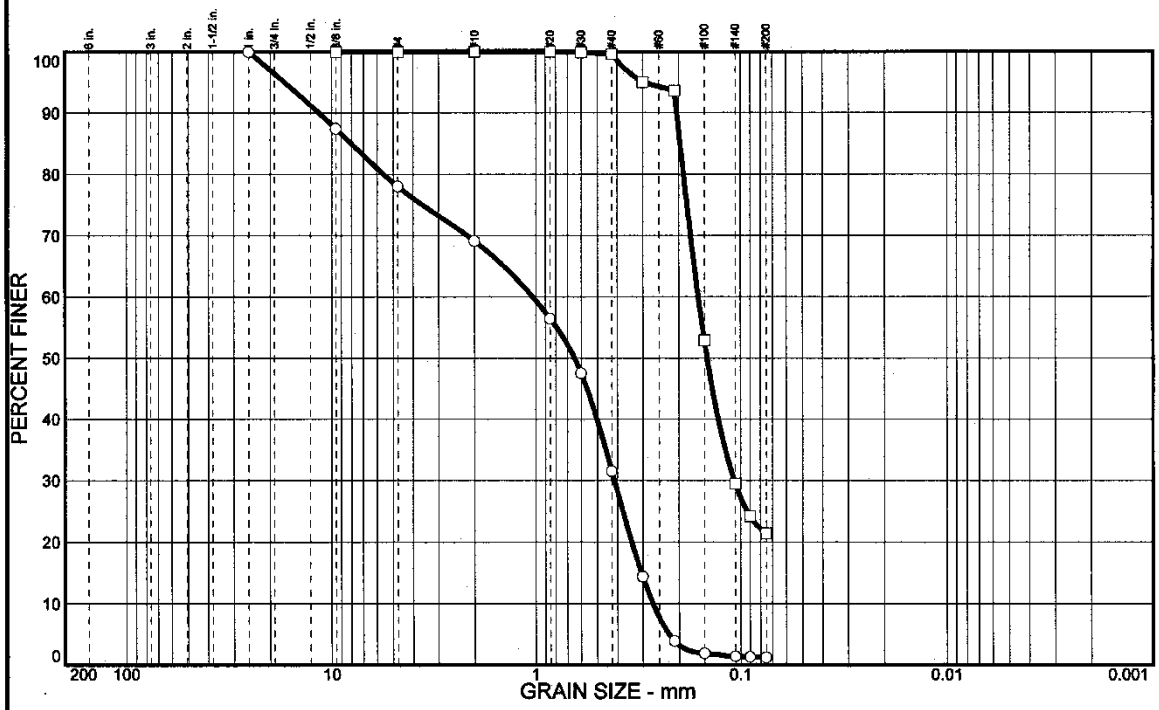
Particle Size Distribution Report DRV-64



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		22.0	76.8	1.2		SP			
□			78.6	21.4		SM			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	
1	100.0		
3/8	87.4	100.0	
	GRAIN SIZE		
D_{60}	1.04	0.161	
D_{30}	0.413	0.107	
D_{10}	0.267		
	COEFFICIENTS		
C_c	0.61		
C_u	3.88		

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	
#4	78.0	100.0	
#10	69.1	100.0	
#20	56.4	100.0	
#30	47.5	99.9	
#40	31.5	99.6	
#50	14.4	95.0	
#70	3.9	93.6	
#100	1.9	52.9	
#140	1.4	29.5	
#170	1.3	24.2	
#200	1.2	21.4	

SOIL DESCRIPTION

○ Brown/orange medium SAND, some fine sand, some gravel, trace coarse sand, trace silt.

□ Light-gray/tan fine SAND, some silt.

REMARKS:

○

□

○ Source: DRV64 Sample No.: S-1 Elev./Depth: 0.0'-4.8'

□ Source: DRV64 Sample No.: S-3 Elev./Depth: 6.3'-10.1'

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Client: U.S. Army Corps of Engineers

Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

U.S. Army Corps of Engineers
Vibrocore - Delaware Coast
Contract Number DACW61-96-D-0008
Task Order 8
Port Mahon PED

Vibrocore DRV-63

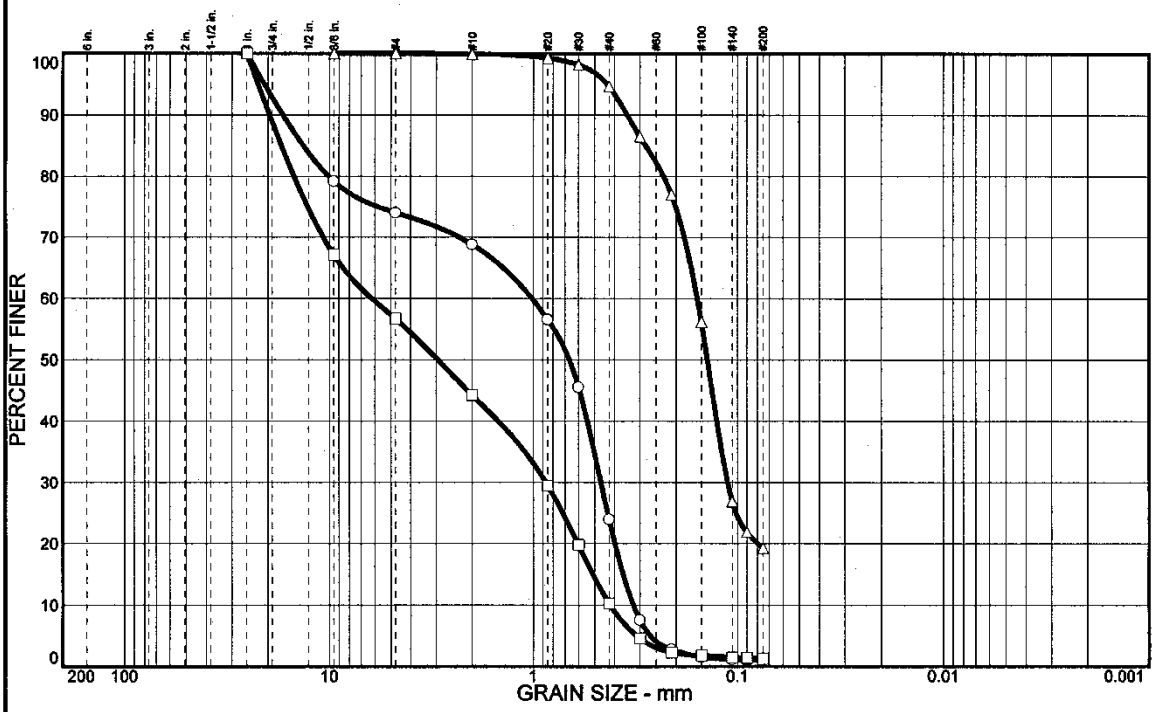
Date	March 17, 1999
Weather	Sunny and calm
Vibrocore contractor	Alpine Ocean Seismic Sur.
Location	Port Mahon, DE
Northing Coord.	N 166,826.1
Easting Coord.	E 247,820.1

Uncorrected Depth	: 49.5 feet
Tide	: +2.7 feet
Corrected Depth	: 46.8 feet (1)
Vibration time	: 4'04"
Core penetration	: 19.55 feet
Core recovery	: 19.6 feet
Percent recovery	: 100%

Depth in Feet	Surf. Elev. 49.2 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0	-50	SP		Orange/tan medium SAND, some gravel, some fine sand, trace coarse sand, trace silt/clay.	1	1/0.0-4.5
5	-55	SW		Brown/orange fine to coarse SAND and gravel, trace silt/clay.	2	2/4.5-8.9
		SM		Tan/gray/orange fine SAND, little silt/clay, trace medium sand.		3/8.9-9.7
10	-60	SM		SAME.	3	4/9.7-14.8
15	-65	SP-SM		SAME.	4	5/14.8-19.6
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recovery lengths.

Particle Size Distribution Report DRV-63



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		26.0	72.9	1.1		SP			
□		43.3	55.4	1.3		SW			
△			80.7	19.3		SM			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
1	100.0	100.0	
3/8	79.2	67.1	100.0
	GRAIN SIZE		
D_{60}	1.01	6.20	0.157
D_{30}	0.466	0.868	0.112
D_{10}	0.323	0.419	
	COEFFICIENTS		
C_c	0.66	0.29	
C_u	3.14	14.79	

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	74.0	56.7	100.0
#10	68.8	44.3	99.9
#20	56.6	29.5	99.3
#30	45.6	19.8	98.2
#40	24.0	10.3	94.7
#50	7.6	4.6	86.5
#70	2.8	2.3	77.0
#100	1.6	1.8	56.2
#140	1.2	1.5	26.9
#170	1.1	1.4	21.9
#200	1.1	1.3	19.3

SOIL DESCRIPTION

○ Orange/tan medium SAND, some gravel, some fine sand, trace coarse sand, trace silt.

□ Brown/orange fine to coarse SAND and gravel, trace silt.

△ Tan/gray/orange fine SAND, little silt, trace medium sand.

REMARKS:

○

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△

○ Source: DRV63 Sample No.: S-1 Elev./Depth: 0.0'-4.5'

□ Source: DRV63 Sample No.: S-2 Elev./Depth: 4.7'-8.9'

△ Source: DRV63 Sample No.: S-3 Elev./Depth: 8.9'-9.7'

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Client: U.S. Army Corps of Engineers

Project: Vibrocoring, New Jersey Coast, Lower Cape May Inlet PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

Vibrocore DRV-62 R1

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW-61-98-D-0008
Task Order 8
Port Mahon PED

Date	: March 17, 1999
Weather	: Sunny and calm
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 166,314.0
Easting Coord.	: E 247,758.4

Uncorrected Depth	: 49.9 feet
Tide	: +1.8 feet
Corrected Depth	: 48.1 feet (1)
Vibration time	: 8'11"
Core penetration	: 17.65 feet
Core recovery	: 13.2 feet
Percent recovery	: 75%

Depth in Feet	Surf. Elev. -48.1 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0	-50	SP		Gray medium SAND, some fine sand, little gravel, trace coarse sand, trace silt/clay, trace shell fragments.	1	1/0.0-3.3
		SP		Gray medium SAND, and fine sand, little gravel, trace coarse sand, trace silt/clay.		2/3.3-5.0
5		SP		Gray medium SAND, some gravel, little coarse sand, trace fine sand, trace silt/clay.	2	3/5.0-6.7
	-55	SP-SM		Orange/tan fine SAND, trace silt/clay, trace medium sand.		4/6.7-10.0
10	-60	SP-SM		Orange/tan fine SAND, little silt/clay.	3	5/10.0-13.2
15	-65					
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Penetration stopped at 17.65 feet due to boat traffic.
3. Sample depths are based on core recovery lengths.

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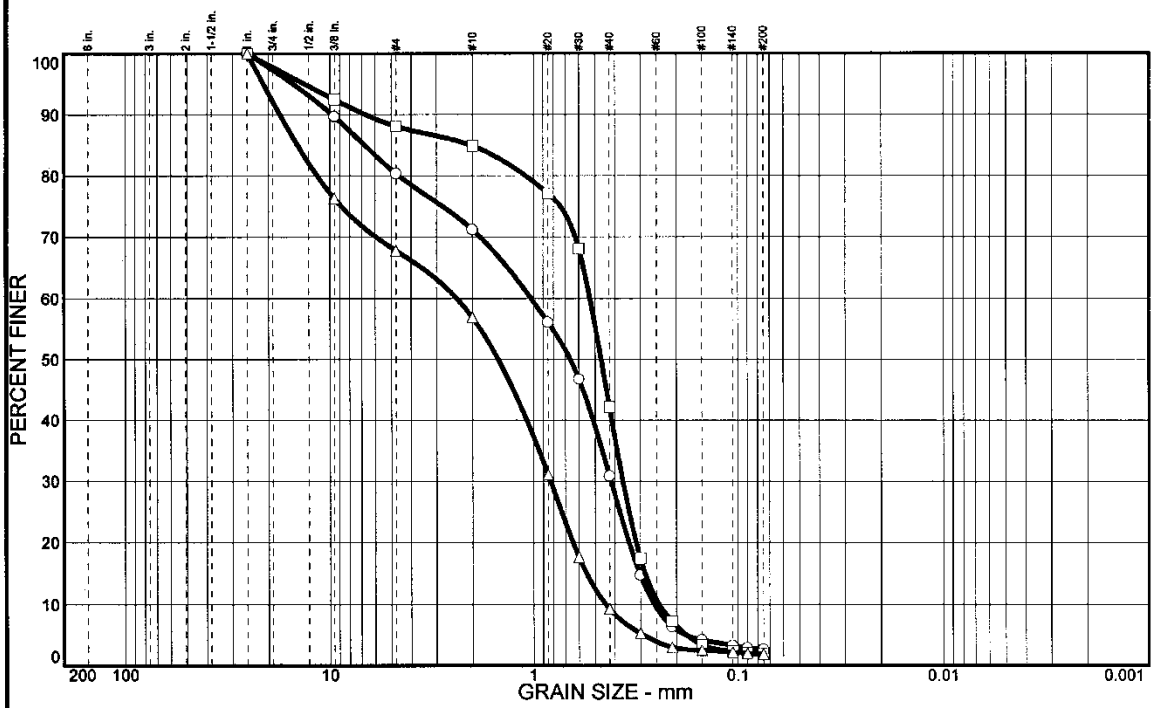
Particle Size Distribution Report DRV-62R1



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		19.6	77.7	2.7		SP			
□		11.9	86.1	2.0		SP			
△		32.2	65.9	1.9		SP			

SIEVE inches size	PERCENT FINER ○	□	△
1	100.0	100.0	100.0
3/8	89.7	92.5	76.3
	GRAIN SIZE		
D_{60}	1.03	0.528	2.38
D_{30}	0.418	0.365	0.827
D_{10}	0.256	0.242	0.443
	COEFFICIENTS		
C_c	0.66	1.04	0.65
C_u	4.01	2.18	5.38

SIEVE number size	PERCENT FINER ○	□	△
#4	80.4	88.1	67.8
#10	71.2	84.9	56.9
#20	56.1	77.1	31.1
#30	46.8	68.1	17.7
#40	30.9	42.2	9.3
#50	14.8	17.5	5.3
#70	6.4	7.3	3.0
#100	4.2	3.4	2.5
#140	3.3	2.4	2.2
#170	2.9	2.1	2.0
#200	2.7	2.0	1.9

SOIL DESCRIPTION

○ Gray medium SAND, some fine sand, little gravel, trace coarse sand, trace silt.

□ Gray medium SAND and fine sand, little gravel, trace coarse sand, trace silt.

△ Gray medium SAND, some gravel, little coarse sand, trace fine sand, trace silt.

REMARKS:

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△

○ Source: DRV62R1 Sample No.: S-1 Elev./Depth: 0.0'-3.3'

□ Source: DRV62R1 Sample No.: S-2 Elev./Depth: 3.3'-5.0'

△ Source: DRV62R1 Sample No.: S-3 Elev./Depth: 5.0'-6.7'

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Client: U.S. Army Corps of Engineers

Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW-61-98-D-0008
Task Order 8
Port Mahon PED

Vibrocore DRV-61 R1

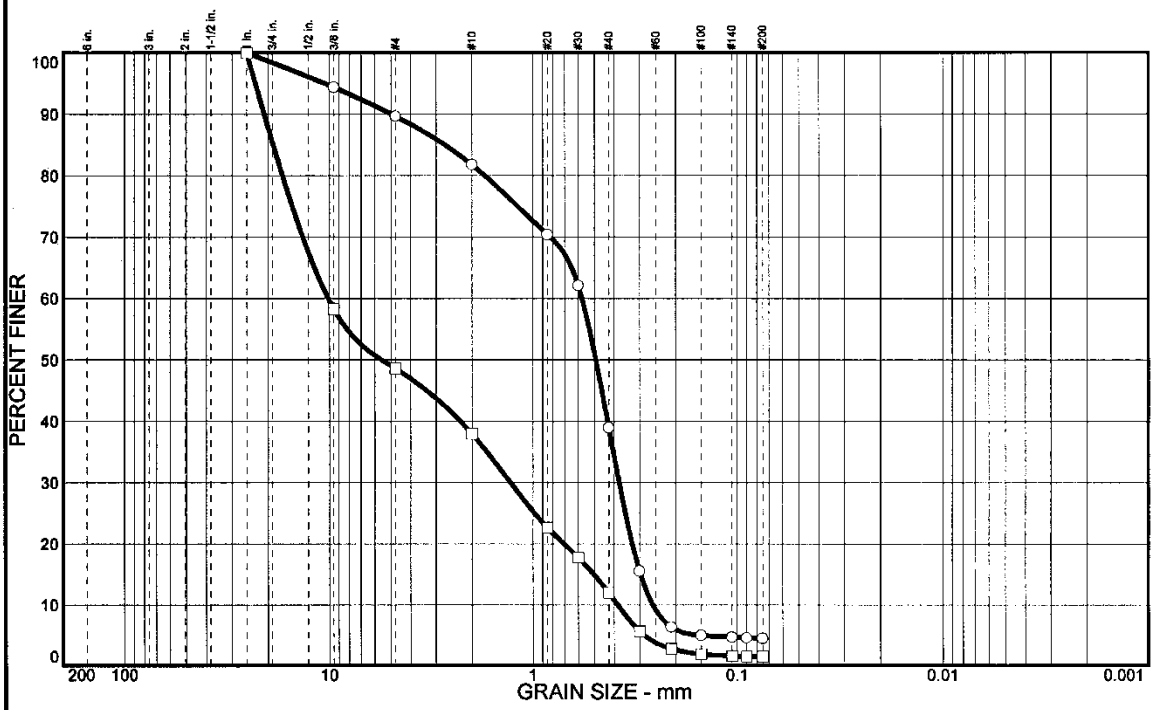
Date	: March 17, 1999
Weather	: Sunny and calm
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 166,435.5
Easting Coord.	: E 246,759.4

Uncorrected Depth	: 43.3 feet
Tide	: -2.7 feet
Corrected Depth	: 46.0 feet (1)
Vibration time	: 3'57"
Core penetration	: 4.82 feet
Core recovery	: 4.8 feet
Percent recovery	: 100%

Depth in Feet	Surf. Elev. -46.0 (1)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0		SP		Orange/gray medium SAND, some fine sand, trace gravel, trace coarse sand, trace silt/clay.	1	1/0.0-4.0
	-50	GW		Orange/tan GRAVEL, some medium sand, little coarse sand, little fine sand, trace silt/clay (two cobbles at approximately 4.6 feet to 4.8 feet).		2/4.0-4.8
5						
	-55					
10						
	-60					
15						
	-65					
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recovery lengths.

Particle Size Distribution Report DRV-61R1



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		10.3	85.2	4.5		SP			
□		51.4	47.1	1.5		GW			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □
1	100.0	100.0
3/8	94.4	58.3
	GRAIN SIZE	
D_{60}	0.575	10.1
D_{30}	0.377	1.29
D_{10}	0.258	0.383
	COEFFICIENTS	
C_c	0.96	0.43
C_u	2.23	26.45

SIEVE number size	PERCENT FINER ○	PERCENT FINER □
#4	89.7	48.6
#10	81.8	38.0
#20	70.4	22.7
#30	62.1	17.8
#40	39.0	12.0
#50	15.6	5.7
#70	6.4	2.8
#100	5.0	1.9
#140	4.7	1.6
#170	4.6	1.5
#200	4.5	1.5

SOIL DESCRIPTION

○ Orange/gray medium SAND, some fine sand, trace gravel, trace coarse sand, trace silt.

□ Orange/tan GRAVEL, some medium sand, little coarse sand, little fine sand, trace silt.

REMARKS:

○

□

○ Source: DRV61R1 Sample No.: S-1 Elev./Depth: 0.0'-4.0'

□ Source: DRV61R1 Sample No.: S-2 Elev./Depth: 4.0'-4.8'

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Client: U.S. Army Corps of Engineers

Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

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VIBRATIONAL CORE DRV-88 R1

(Page 1 of 1)

U.S. Army Corps of Engineers
Vibrational Coring in the Liston Range
of the Delaware River Main Channel
Contract No. DACW61-01-D-0004
Task Order 027, Modification 01

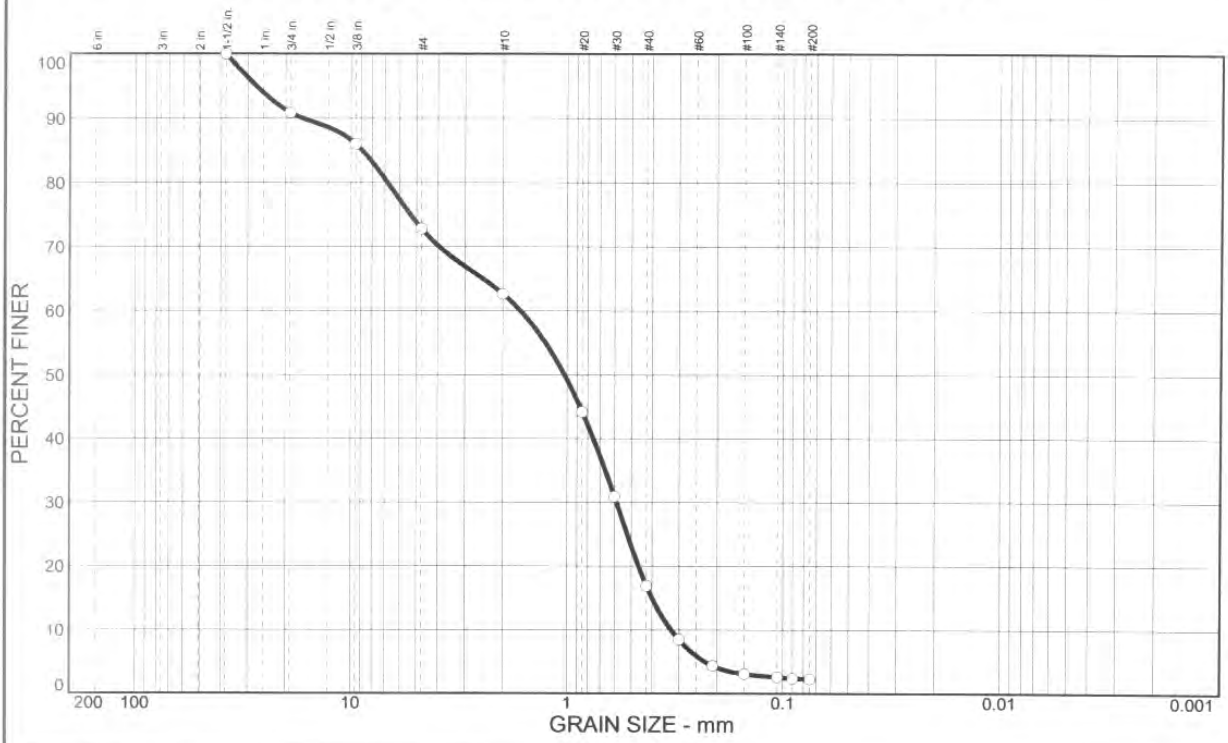
Date Started	: August 16, 2004	Drilling Equipment	: 271B Alpine Vibracore
Date Completed	: August 16, 2004	Drilling Methods	: Vibrational Core
Logged by	: STS	Surface Elevation	: -49.4 feet NAVD 88
Weather	: P. Cloudy, 70s	Northing	: 167,293 NJ-NAD 83
Driller/Agency	: Alpine Ocean Seismic Sur.	Easting	: 247,031 NJ-NAD 83

Depth in feet	Surf. Elev. -49.4 ft	GRAPHIC	USCS	DESCRIPTION	Core Interval	Remarks
0	-50					S-1/ 0.0-4.1 Not tested, over lap with DRV-88-R2, S-1
2	-52		SP	Dark gray fine to medium SAND, some to and gravel, trace coarse sand, trace silt		
4	-54		SP	Brown fine SAND, trace to little medium to coarse sand, trace silt		S-2/ 4.1-5.2 Not tested, over lap with DRV-88-R2, S-1
6	-56		SP	Light brown, light gray fine SAND, trace silt, trace medium sadn		S-3/ 5.2-7.6 Not tested, over lap with DRV-88-R2, S-1
8	-58					
10	-60					
12	-62					
14	-64					
16	-66					
18	-68					
20	-70					
22	-72					

NOTES:
1. Soil descriptions and USCS classifications according to Visual-Manual Procedure (ASTM D 2488) and/or mechanical sieve analysis if performed.
2. Sample depths are based on core recovery lengths.
3. Core Penetration = 6.4 feet, Core Recovery = 7.2 feet.
4. Percent Recovery = 112.7 %

VIBRACORE 5739GB-DRV.GPJ DUFFIELD.GDT 01/21/05

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	27.2	70.5	2.3		SP			

SIEVE inches size	PERCENT FINER		
1-1/2	100.0		
3/4"	90.9		
3/8"	86.0		
	GRAIN SIZE		
D_{60}	1.66		
D_{30}	0.587		
D_{10}	0.326		
	COEFFICIENTS		
C_c	0.64		
C_u	5.09		

SIEVE number size	PERCENT FINER		
#4	72.8		
#10	62.6		
#20	44.2		
#30	30.9		
#40	16.9		
#50	8.5		
#70	4.4		
#100	3.1		
#140	2.6		
#170	2.4		
#200	2.3		

SOIL DESCRIPTION

Gray/dark-gray medium SAND, some gravel, little fine sand, trace coarse sand, trace silt/clay.

REMARKS:

Source: DRV-88 R2 Sample No.: 1 Elev./Depth: 0.0'-5.0'

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Project: Vibrational Coring - Delaware River Main Channel, Delaware
Contract No. DACW61-01-D-0004, Task Order 027, Modification No. 1

Project No.: 5739.GB.02 Date/Chk'd by: January 2005/ Pm

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW61-96-D-0008
Task Order 8
Port Mahon PED

Vibrocore DRV-60

Date	: March 17, 1999
Weather	: Sunny and calm
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 167,364.6
Easting Coord.	: E 246,321.0

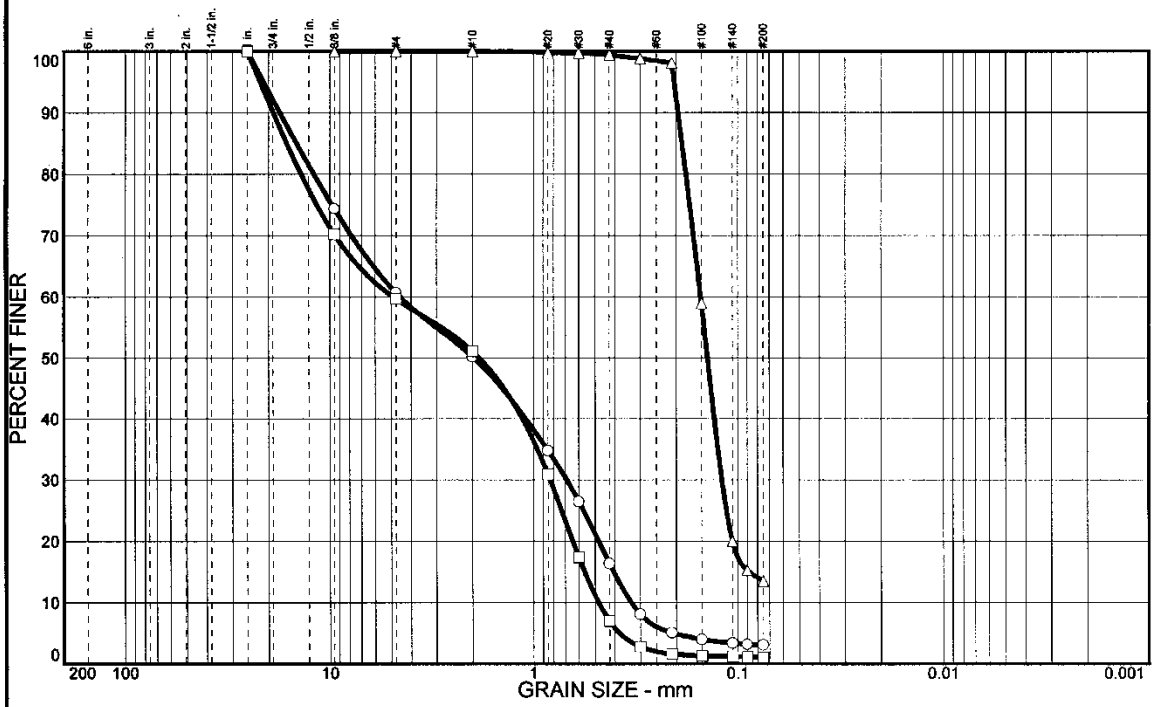
Uncorrected Depth	: 41.0 feet
Tide	: -3.8 feet
Corrected Depth	: 44.8 feet (2)
Vibration time	: 8'10"
Core penetration	: 18.23 feet
Core recovery	: 19.2 feet (1)
Percent recovery	: 105% (1)

Depth in Feet	Surf. Elev. -44.8 (2)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0	-45	SW		Gray medium SAND and gravel, little fine sand, little coarse sand, trace silt/clay.	1	1/0.0-4.8 2/4.8-9.0
5	-50	SW		Gray medium SAND and gravel, trace coarse sand, trace fine sand, trace silt/clay.	2	
		SP-SM		Tan/green fine SAND, little silt/clay; trace med. sand.		3/9.0-9.9
10	-55	SP-SM		SAME.	3	4/9.9-14.8
15	-60	SM		SAME.	4	5/14.8-19.2
20						

Notes:

1. Percent recovery reflects "over recovery" of sample possibly due to sample heave in liner and/or difficulty of penetration through dense strata. Core intervals reflect recovered material obtained from the vibrocore liner.
2. Corrected water depth and ground surface datum is NVGD.
3. Sample depths based on core recovery lengths.

Particle Size Distribution Report DRV-60



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		39.3	57.6	3.1		SW			
□		40.3	58.7	1.0		SW			
△			86.5	13.5		SP-SM			

SIEVE inches size	PERCENT FINER ○	□	△
1	100.0	100.0	
3/8	74.4	70.2	100.0
	GRAIN SIZE		
D_{60}	4.53	4.89	0.151
D_{30}	0.688	0.829	0.119
D_{10}	0.332	0.480	
	COEFFICIENTS		
C_c	0.31	0.29	
C_u	13.64	10.19	

SIEVE number size	PERCENT FINER ○	□	△
#4	60.7	59.7	100.0
#10	50.2	51.1	100.0
#20	34.8	30.9	99.8
#30	26.5	17.4	99.7
#40	16.4	7.0	99.4
#50	8.1	2.8	98.8
#70	5.1	1.6	98.1
#100	4.0	1.3	58.9
#140	3.4	1.2	20.0
#170	3.2	1.1	15.3
#200	3.1	1.0	13.5

SOIL DESCRIPTION

○ Gray medium SAND and gravel, little fine sand, little coarse sand, trace silt.

□ Gray medium SAND and gravel, trace coarse sand, trace fine sand, trace silt.

△ Tan/green fine SAND, little silt, trace medium sand.

REMARKS:

○

□

△

○ Source: DRV60 Sample No.: S-1 Elev./Depth: 0.0'-4.8'

□ Source: DRV60 Sample No.: S-2 Elev./Depth: 4.8'-9.0'

△ Source: DRV60 Sample No.: S-3 Elev./Depth: 9.0'-9.9'

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Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

DUFFIELD ASSOCIATES
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VIBRATIONAL CORE DRV-87

(Page 1 of 1)

U.S. Army Corps of Engineers
Vibrational Coring in the Liston Range
of the Delaware River Main Channel
Contract No. DACW61-01-D-0004
Task Order 027, Modification 01

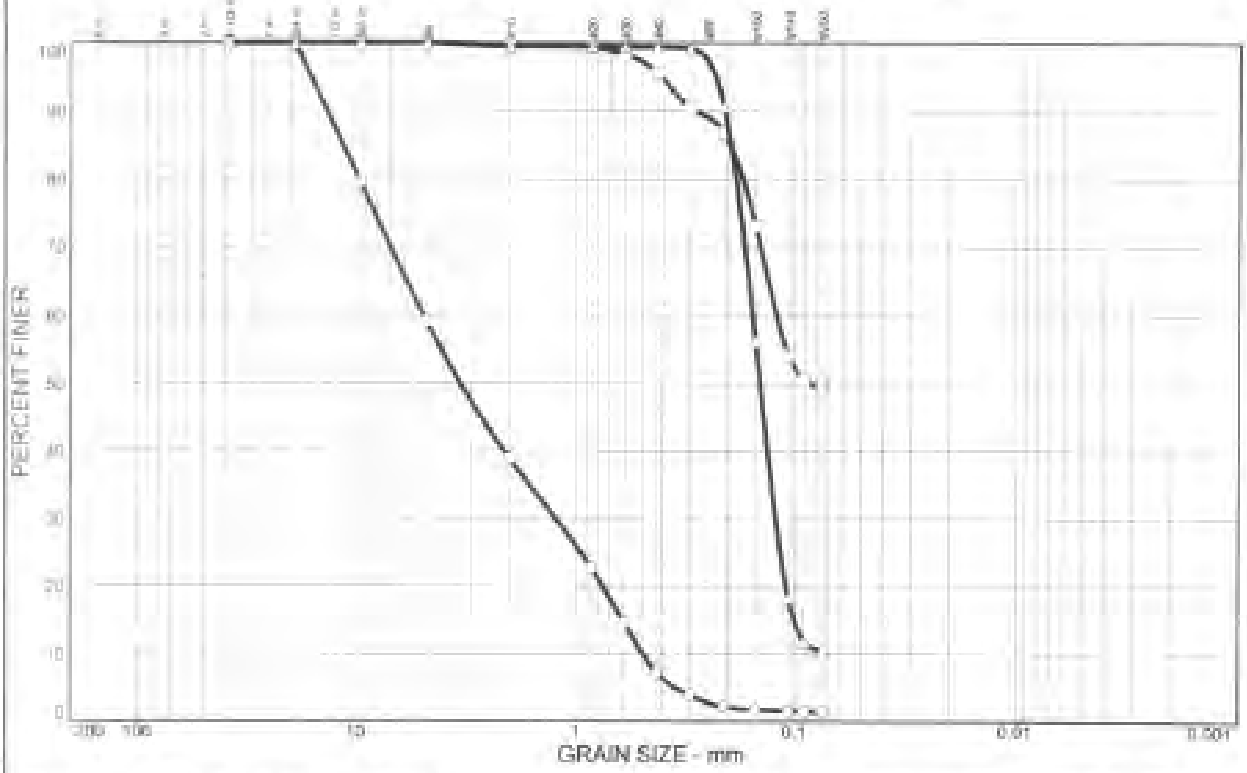
Date Started	: August 16, 2004	Drilling Equipment	: 271B Alpine Vibracore
Date Completed	: August 16, 2004	Drilling Methods	: Vibrational Core
Logged by	: STS	Surface Elevation	: -48.5 feet NAVD 88
Weather	: P. Cloudy, 70s	Northing	: 168,167 NJ-NAD 83
Driller/Agency	: Alpine Ocean Seismic Sur.	Easting	: 246,213 NJ-NAD 83

Depth in feet	Surf. Elev. -48.5 ft	GRAPHIC	USCS	DESCRIPTION	Core Interval	Remarks
0			SP	Dark gray medium to coarse SAND and gravel, trace fine sand, trace silt/clay		S-1/ 0.0-1.1
	-50		SM	Tan, orange fine to medium SAND and silt/clay		S-2/ 1.1-2.1
2						S-3/ 2.1-5.0
	-52		SP-SM	Orange, tan fine SAND, little silt/clay, trace coarse sand		
4						
	-54					S-4/ 5.0-10.0
6						
	-56		SP-SM	Orange, tan fine SAND, little silt/clay, trace medium sand, trace coarse sand		
8						
	-58					
10			SM	Orange, tan fine SAND, some silt/clay		S-5/ 10.0-11.5
	-60					
12			SM	Brown, gray fine SAND, little silt/clay, trace medium sand		S-6/ 11.5-13.8
	-62					
14			SP-SM	Dark gray fine SAND, little medium sand, trace silt/clay		S-7/ 13.8-15.0
	-64					S-8/ 15.0-19.5
16						
	-66		SP-SM	Dark gray fine SAND, little medium sand, little silt/clay		
18						
	-68					
20						
	-70					
22						

NOTES:
1. Soil descriptions and USCS classifications according to Visual-Manual Procedure (ASTM D 2488) and/or mechanical sieve analysis if performed.
2. Sample depths are based on core recovery lengths.
3. Core Penetration = 18.6 feet, Core Recovery = 19.5 feet.
4. Percent Recovery = 105.0 %

VIBRACORE 5739GB-DRV.GPJ DUFFIELD.GDT 01/18/05

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
	40.9	57.7	1.4		SP			
		50.5	49.5		SM			
		89.3	10.7		SP-SM			

SIEVE (number size)	PERCENT FINER		
1 1/2"	100.0	100.0	100.0
3/4"	100.0	100.0	100.0
3/8"	79.6	100.0	100.0
	GRAIN SIZE		
D_{60}	0.91	0.120	0.155
D_{30}	1.23		0.121
D_{10}	0.493		
	COEFFICIENTS		
C_u	0.65		
C_c	0.95		

SIEVE (number size)	PERCENT FINER		
#4	59.1	100.0	100.0
#10	38.9	99.8	99.4
#20	22.7	99.3	99.4
#30	14.6	98.3	99.3
#40	7.2	95.6	99.3
#50	4.0	90.5	99.2
#70	2.2	86.9	90.7
#100	1.8	71.2	56.2
#140	1.6	54.2	18.3
#170	1.5	50.6	11.9
#200	1.4	49.5	10.7

SOIL DESCRIPTION

- Dark gray medium to coarse SAND and gravel, trace fine sand, trace silt/clay
- Tan/orange fine to medium SAND and silt/clay
- Orange/tan fine SAND, little silt/clay, trace coarse sand.

REMARKS:

Source: DRV-87 Sample No.: 1 Elev./Depth: 0.0'-1.1'
Source: DRV-87 Sample No.: 2 Elev./Depth: 1.1'-2.1'
Source: DRV-87 Sample No.: 3 Elev./Depth: 2.1'-5.0'

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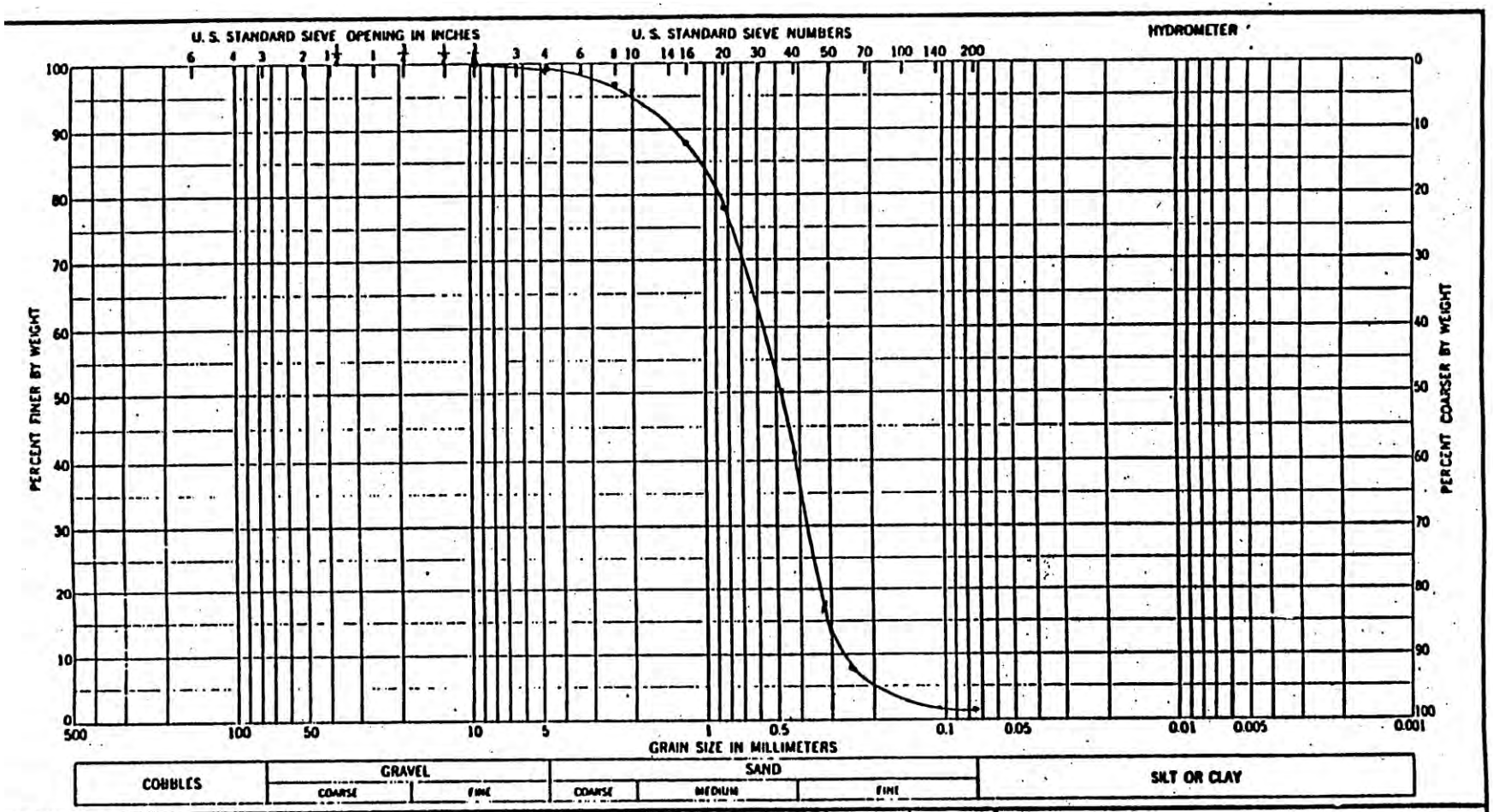
Project: Vibrational Coring – Delaware River Main Channel, Delaware
Contract No. DACW61-01-D-0004, Task Order 027, Modification No. 1

Project No.: 5739.GB.02 Date/Chk'd by: January 2005/ PC



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
DRV-15	0-3.4'	POORLY-GRADED SAND (SP)				

Project: DELAWARE RIVER VIBRACORES

Area:

Boring No.: DRV-15

Date: 8-9-91

GRADATION CURVES

ENG FORM 1 MAY 63 2087

Hole No. DRV-15

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Delaware River Comprehensive Study	10. SIZE AND TYPE OF BIT Vibracore
	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
2. LOCATION (Coordinates or Station) 39° 17' 28.98" 75° 22' 18.93"	12. MANUFACTURER'S DESIGNATION OF DRILL NA
3. DRILLING AGENCY Buchart-Horn, Inc.	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN : DISTURBED : UNDISTURBED
4. HOLE NO. (As shown on drawing title and file number) DRV-15	14. TOTAL NUMBER CORE BOXES NA
	15. ELEVATION GROUND WATER NA
5. NAME OF DRILLER Ocean Survey, Inc.	16. DATE HOLE : STARTED 07/29/91 : COMPLETED 07/29/91
6. DIRECTION OF HOLE VERTICAL INCLINED _____ DEG. FROM VERT.	17. ELEVATION TOP OF HOLE -46.1 ft. NGVD
7. THICKNESS OF OVERBURDEN NA	18. TOTAL CORE RECOVERY FOR BORING 16.5 ft.
8. DEPTH DRILLED INTO ROCK NA	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE 20 ft.	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant g
	1, 2, 3		Coarse to fine sand SP			Sample 0 - 3.4 ft.
	.4, 4		Brown fine to medium gravel gravelly coarse to fine brown sand sand SP			Sample 3.4 - 5.0 ft.
	5		Black silt with gravel			
	.15, 7		Coarse to fine gravel with scattered cobbles -rounders brown sand at bottom SP			
	.5, 8		Very dense brown, orange interbedded sand SP			Sample 7.5 - 9.2 ft.
	9, .2, 10		White and dark brown marbled silt sand			
			White sandy silt SM-SC			
	11, 12		Orange sand silt with dark brown pods SP			Sample 10.8 - 14 ft.
	13, 14		White silty sand with dark brown pods SP			
	15		Orange sandy silt SM-SC			
	16					Bottom of recovery
	17, 18, 19					

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW61-96-D-0008
Task Order 8
Port Mahon PED

Vibrocore DRV-59

Date	: March 17, 1999
Weather	: Sunny, 1-2 foot seas
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 168,911.8
Easting Coord.	: E 245,433.7

Uncorrected Depth	: 45.4 feet
Tide	: -1.9 feet
Corrected Depth	: 47.3 feet (2)
Vibration time	: 9'46"
Core penetration	: 15.98 feet
Core recovery	: 17.7 feet
Percent recovery	: 111% (1)

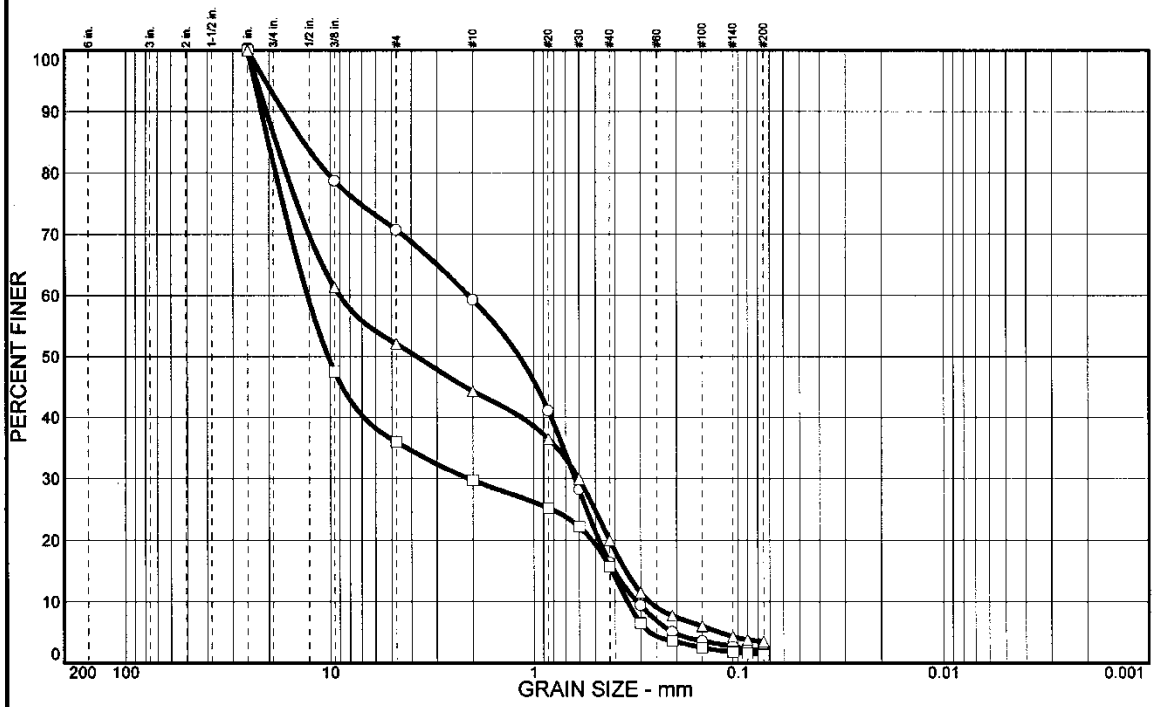
Depth in Feet	Surf. Elev. -47.3 (2)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0		SW		Orange/brown medium SAND, some gravel, little fine sand, little coarse sand, trace silt/clay.	1	1/0.0-4.4
	-50					
		SW		Orange/brown GRAVEL, little fine sand, little medium sand, trace coarse sand, trace silt/clay.		2/4.4-5.2
5		SW				3/5.2-5.7
		SW		Orange/brown medium to fine SAND, and gravel, trace coarse sand, trace silt/clay.	2	4/5.7-10.2
		SM		Orange/tan fine SAND, some silt/clay.		
	-55					
10		SP-SM		Orange/tan fine SAND, little silt/clay, trace medium sand.	3	5/10.2-15.2
	-60					
15		SP-SM		Gray fine SAND, little silt/clay, trace medium sand.	4	6/15.2-17.7
	-65					
20						

Notes:

1. Percent recovery reflects "over recovery" of sample possibly due to sample heave in liner and/or difficulty of penetration through dense strata. Core intervals reflect recoved material obtained from the vibrocore liner.
2. Corrected water depth and ground surface datum is NVGD.
3. Sample depths are based on core recovery lengths.

03-24-1999

Particle Size Distribution Report DRV-59



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		29.3	68.6	2.1		SW			
□		64.0	34.6	1.4		SW			
△		47.9	48.6	3.5		SW			

SIEVE inches size	PERCENT FINER ○	□	△
1.0	100.0	100.0	100.0
3/8	78.7	47.5	61.3
	GRAIN SIZE		
D_{60}	2.10	12.9	8.99
D_{30}	0.629	2.11	0.602
D_{10}	0.312	0.347	0.272
	COEFFICIENTS		
C_c	0.60	0.99	0.15
C_u	6.73	37.20	33.09

SIEVE number size	PERCENT FINER ○	□	△
#4	70.7	36.0	52.1
#10	59.3	29.7	44.3
#20	41.1	25.2	36.5
#30	28.2	22.2	29.9
#40	16.4	15.7	20.0
#50	9.4	6.5	11.5
#70	5.1	3.6	7.7
#100	3.6	2.5	6.0
#140	2.7	1.8	4.3
#170	2.3	1.6	3.8
#200	2.1	1.4	3.5

SOIL DESCRIPTION

○ Orange/brown medium SAND, some gravel, little fine sand, little coarse sand, trace silt.

□ Orange/brown GRAVEL, little fine sand, little medium sand, trace coarse sand, trace silt

△ Orange/brown medium to fine SAND and GRAVEL, trace coarse sand, trace silt.

REMARKS:

○

□

△

○ Source: DRV59 Sample No.: S-1 Elev./Depth: 0.0'-4.4'

□ Source: DRV59 Sample No.: S-2 Elev./Depth: 4.4'-5.2'

△ Source: DRV59 Sample No.: S-3 Elev./Depth: 5.2'-5.7'

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Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

DUFFIELD ASSOCIATES
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VIBRATIONAL CORE DRV-86

(Page 1 of 1)

U.S. Army Corps of Engineers
Vibrational Coring in the Liston Range
of the Delaware River Main Channel
Contract No. DACW61-01-D-0004
Task Order 027, Modification 01

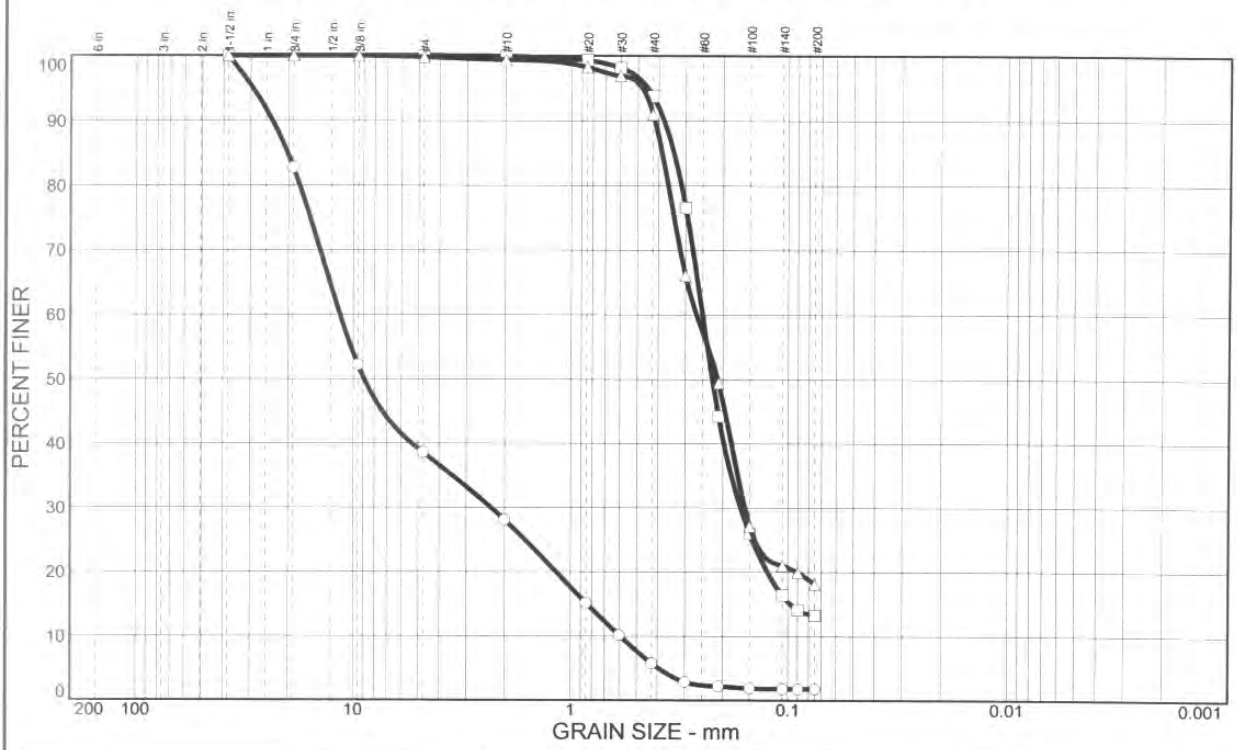
Date Started	: August 16, 2004	Drilling Equipment	: 271B Alpine Vibracore
Date Completed	: August 16, 2004	Drilling Methods	: Vibrational Core
Logged by	: STS	Surface Elevation	: -48.3 feet NAVD 88
Weather	: P. Cloudy, 70s	Northing	: 168,800 NJ-NAD 83
Driller/Agency	: Alpine Ocean Seismic Sur.	Easting	: 244,653 NJ-NAD 83

Depth in feet	Surf. Elev. -48.3 ft	GRAPHIC	USCS	DESCRIPTION	Core Interval	Remarks
0			GP	Brown, gray GRAVEL, some medium sand, little coarse sand, trace fine sand, trace silt/clay		S-1/ 0.0-2.0
2	-50		SM	Orange, brown, tan fine SAND, little silt/clay, trace medium sand		S-2/ 2.0-5.0
4	-52					
6	-54		SM	Gray, orange fine SAND, little silt/clay, trace medium sand		S-3/ 5.0-7.5
8	-56		SM	Orange, brown, tan fine SAND, some silt/clay, trace medium sand		S-4/ 7.5-10.0
10	-58					
12	-60		SM	Brown, orange fine SAND, little silt/clay, trace medium sand, trace coarse sand		S-5/ 10.0-15.0
14	-62					
16	-64		SM	Dark gray fine SAND, little silt/clay, little medium sand, trace coarse sand, trace gravel		S-6/ 15.4-16.7
18	-66		SP-SM	Dark gray fine SAND, some medium sand, trace coarse sand, trace silt/clay, trace shell fragments, trace organic matter		S-7/ 16.7-19.5
20	-68					
22	-70					

NOTES:
1. Soil descriptions and USCS classifications according to Visual-Manual Procedure (ASTM D 2488) and/or mechanical sieve analysis if performed.
2. Sample depths are based on core recovery lengths.
3. Core Penetration = 18.04 feet, Core Recovery = 19.5 feet.
4. Percent Recovery = 108.1 %

VIBRACORE 5739GB-DRV.GPJ DUFFIELD.GDT 01/19/05

PARTICLE SIZE DISTRIBUTION REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		61.4	36.8	1.8		GP			
□			86.7	13.3		SM			
△		0.2	81.7	18.1		SM			

SIEVE inches size	PERCENT FINER ○	□	△
1-1/2"	100.0	100.0	100.0
3/4"	82.8	100.0	100.0
3/8"	52.2	100.0	100.0
GRAIN SIZE			
D_{60}	11.5	0.250	0.266
D_{30}	2.30	0.165	0.158
D_{10}	0.591		
COEFFICIENTS			
C_c	0.78		
C_u	19.51		

SIEVE number size	PERCENT FINER ○	□	△
#4	38.6	100.0	99.8
#10	28.1	99.9	99.4
#20	15.2	99.4	98.2
#30	10.2	98.2	96.9
#40	5.8	93.8	91.0
#50	2.9	76.6	66.1
#70	2.2	44.3	49.4
#100	1.9	26.0	27.1
#140	1.8	16.4	21.0
#170	1.8	14.1	20.0
#200	1.8	13.3	18.1

SOIL DESCRIPTION

○ Brown/gray GRAVEL, some medium sand, little coarse sand, trace fine sand, trace silt/clay.

□ Orange/brown/tan fine SAND, little silt/clay, trace medium sand.

△ Gray/orange fine SAND, little silt/clay, trace medium sand.

REMARKS:

○

□

△

○ Source: DRV-86	Sample No.: 1	Elev./Depth: 0.0'-2.0'
□ Source: DRV-86	Sample No.: 2	Elev./Depth: 2.0'-5.0'
△ Source: DRV-86	Sample No.: 3	Elev./Depth: 5.0'-7.5'

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Client: U.S. Army Corps of Engineers' Philadelphia District

Project: Vibrational Coring - Delaware River Main Channel, Delaware
Contract No. DACW61-01-D-0004, Task Order 027, Modification No. 1

Project No.: 5739.GB.02 Date/Chk'd by: January 2005/

U.S. Army Corps of Engineers
Vibrocore - Deleware Coast
Contract Number DACW-61-96-D-0008
Task Order 8
Port Mahon PED

Vibrocore DRV-58 R1

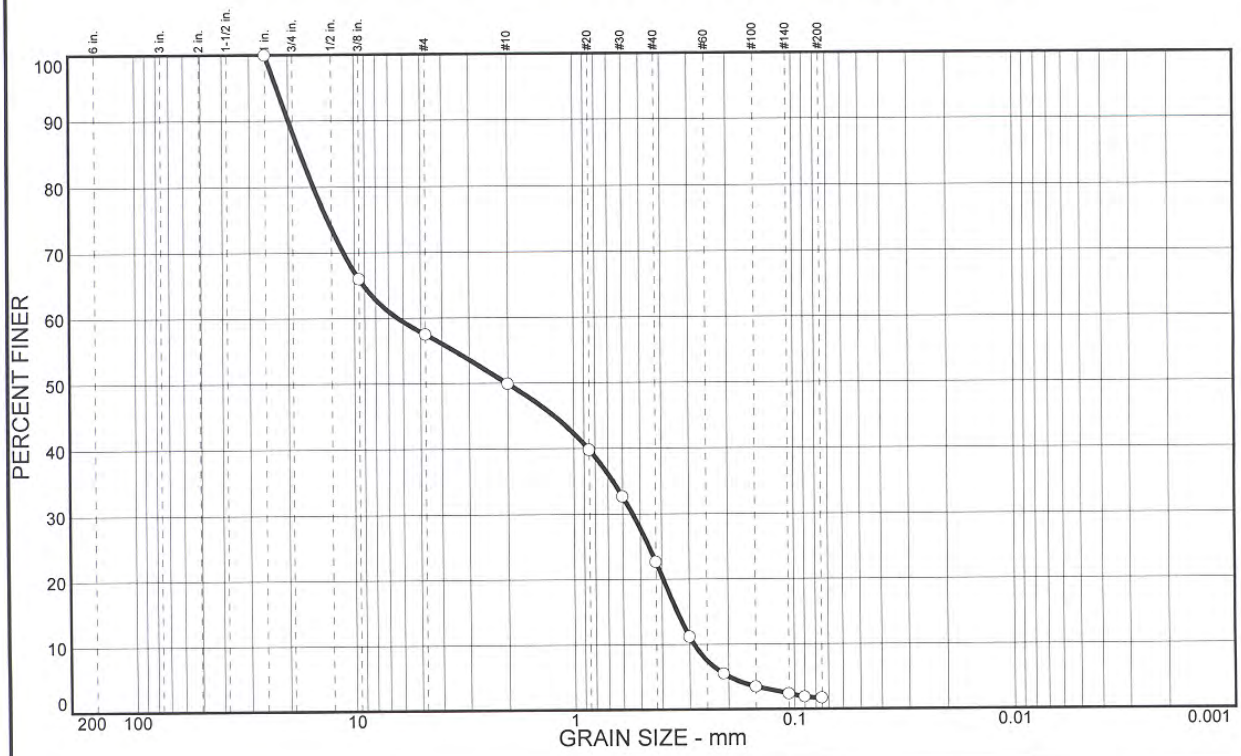
Date	: March 17, 1999
Weather	: Sunny and calm
Vibrocore contractor	: Alpine Ocean Seismic Sur.
Location	: Port Mahon, DE
Northing Coord.	: N 169,362.9
Easting Coord.	: E 244,340.4

Uncorrected Depth	: 46.7 feet
Tide	: - 0.2 feet
Corrected Depth	: 46.9 feet (2)
Vibration time	: 6'49"
Core penetration	: 5.55 feet
Core recovery	: 3.7 feet
Percent recovery	: 67%

Depth in Feet	Surf. Elev. -46.9 (2)	USCS	GRAPHIC	DESCRIPTION	Core interval	Sample No./Interval
0		SW		Brown fine to medium SAND, and gravel, trace coarse sand, trace silt/clay, trace shells.	1	1/0.0-3.7
	-50					
5						
	-55					
10						
	-60					
15						
	-65					
20						

Notes:
1. Corrected water depth and ground surface datum is NVGD.
2. Sample depths are based on core recoverylengths.

Particle Size Distribution Report DRV-58R1



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		42.5	55.8	1.7		SW			

SIEVE inches size	PERCENT FINER ○		
1	100.0		
3/8	66.0		
	GRAIN SIZE		
D_{60}	6.36		
D_{30}	0.540		
D_{10}	0.286		
	COEFFICIENTS		
C_c	0.16		
C_u	22.26		

SIEVE number size	PERCENT FINER ○		
#4	57.5		
#10	49.9		
#20	39.8		
#30	32.7		
#40	22.7		
#50	11.2		
#70	5.5		
#100	3.5		
#140	2.4		
#170	1.9		
#200	1.7		

SOIL DESCRIPTION

○ Brown fine to medium SAND and gravel, trace coarse sand, trace silt.

REMARKS:

○

○ Source: DRV58R1 Sample No.: S-1 Elev./Depth: 0.0'-3.7'

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Project: Vibrocoring, Delaware Coast, Port Mahon PED, Contract #DACW-61-98-D-0008, Task Order #8.

Project No.: 3769.GI Date/chk'd by: June 1999/WHS

Sub-Reach E-1

DUFFIELD ASSOCIATES
Consultants of the Environment

VIBRATIONAL CORE DRV-85

(Page 1 of 1)

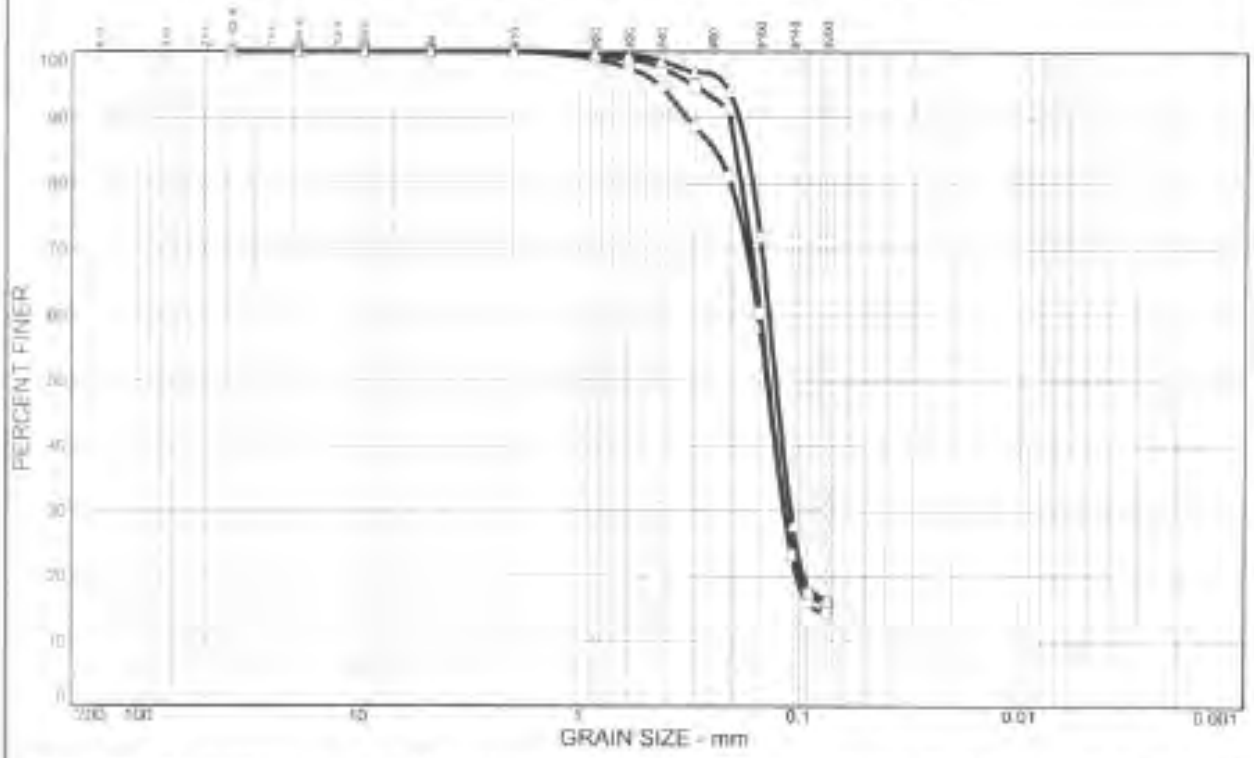
U.S. Army Corps of Engineers
Vibrational Coring in the Liston Range
of the Delaware River Main Channel
Contract No. DACW61-01-D-0004
Task Order 027, Modification 01

Date Started	: August 18, 2004	Drilling Equipment	: 2715 Alpine Vibracore
Date Completed	: August 18, 2004	Drilling Methods	: Vibrational Core
Logged by	: STS	Surface Elevation	: -51.9 feet NAVD 88
Weather	: P. Cloudy, 70s	Northing	: 170,029 NJ-NAD 83
Driller/Agency	: Alpine Ocean Seismic Sur.	Easting	: 344,497 NJ-NAD 83

Depth in feet	Surf. Elev. -51.9 ft	GRAPHIC	USCS	DESCRIPTION	Core Interval	Remarks
0	-52		SM	Tan, brown, orange fine SAND, little silt/clay, trace medium sand		S-1/ 0.0-5.0
2	-54					
4	-56					
6	-58		SM	Tan, brown, orange fine SAND, little silt/clay, trace medium sand		S-2/ 5.0-10.0
8	-60					
10	-62		SM	Tan, gray, orange fine SAND, little silt/clay, trace medium sand		S-3/ 10.0-15.0
12	-64					
14	-66					
			SM	Tan, gray, orange fine SAND, little silt/clay, trace medium sand		S-4/ 15.0-16.0
16	-68		ML	Dark gray SILT, little fine sand		S-5/ 16.0-16.8 Fine-grained sample, sieve analysis not performed.
						S-6/ 16.8-20.0
18	-70		SM	Dark gray fine SAND, little silt/clay, trace medium sand		
20	-72					
22	-74					

NOTES:
1. Soil descriptions and USCS classifications according to Visual-Manual Procedure (ASTM D 2488) and/or mechanical sieve analysis if performed.
2. Sample depths are based on core recovery lengths.
3. Core Penetration = 16.8 feet; Core Recovery = 19.0 feet.
4. Percent Recovery = 101.2 %

PARTICLE SIZE DISTRIBUTION REPORT



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
		85.6	14.4		SM			
		84.1	15.9		SM			
		83.7	16.3		SM			

SIEVE (lower size)	PERCENT FINER		
1-1/2"	100.0	100.0	100.0
3/4"	100.0	100.0	100.0
3/8"	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.153	0.150	0.137
D_{30}	0.116	0.115	0.108
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE (lower size)	PERCENT FINER		
#4	100.0	100.0	100.0
#10	100.0	100.0	100.0
#20	98.9	99.5	99.7
#30	97.6	98.9	99.4
#40	94.7	97.5	98.7
#50	88.7	94.9	96.9
#70	81.0	91.2	94.1
#100	58.0	60.3	71.9
#140	22.4	23.3	27.7
#170	15.9	17.4	17.9
#200	14.4	15.9	16.3

SOIL DESCRIPTION

- Tan/brown/orange fine SAND, little silt/clay, trace medium sand.
- Tan/brown/orange fine SAND, little silt/clay, trace medium sand.
- Tan/gray/orange fine SAND, little silt/clay, trace medium sand.

REMARKS:

Source: DRV-85 Sample No.: 1 Elev./Depth: 0.0'-5.0'
Source: DRV-85 Sample No.: 2 Elev./Depth: 5.0'-10.0'
Source: DRV-85 Sample No.: 3 Elev./Depth: 10.0'-15.0'

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Project: Vibrational Coring - Delaware River Main Channel, Delaware
Contract No. DACW61-01-D-0004, Task Order 027, Modification No. 1
Project No.: 5739.GB.02 Date/Chk'd by: January 2005/ [signature]

Appendix C: Delaware Coastal Program Reach E Surface Sediment Grab Sample Sieve Results

									Soil Separate (millimeters) %						
Sample ID	Latitude	Longitude	Easting (Delaware State Plane Meters)	Northing (Delaware State Plane Meters)	% Sand	%Silt	%Clay	Soil Textural Class	2.0 mm and larger %	2.0-1.0	1.0-0.5	0.5-0.25	0.25-0.10	0.10-0.05	<0.05
MC52710-1	38.948	75.111	105245.590	226483.726	95.5	0.5	3.9	Sand	3.1	1.3	11.9	53.1	28.2	1.3	1.1
MC52710-2	39.010	75.144	112121.225	223582.151	95.4	0.6	4	Sand	0.8	0.9	18.7	67.8	10.3	0.5	1.0
MC52710-3	39.044	75.163	115928.230	222003.786	95	0.6	4.4	Sand	0.4	0.0	0.7	23.9	69.8	3.8	1.3
MC52710-4	39.077	75.183	119596.248	220215.287	92.2	2.9	4.9	Sand	1.9	1.8	3.0	6.6	44.4	38.6	3.6
MC52710-5	39.083	75.183	120236.467	220222.294	94.2	1.7	4.1	Sand	14.2	6.6	9.3	18.1	39.6	10.5	1.6
MC52710-6	39.119	75.216	124242.974	217388.373	95.3	0.6	4.2	Sand	51.2	2.2	5.8	24.5	14.5	1.0	0.8
MC52710-8	39.139	75.235	126483.784	215677.338	95.6	0.6	3.8	Sand	7.6	2.1	16.2	44.7	23.0	5.4	1.1
MC52710-9	39.165	75.261	129364.241	213430.307	92.6	3	4.4	Sand	0.2	0.2	0.1	0.6	50.3	45.4	3.1
MC52710-10	39.200	75.281	133163.845	211690.388	92.3	0.6	7.1	Sand	2.7	4.3	10.7	14.2	41.6	22.2	4.3
MC52710-11	39.209	75.289	134180.587	211048.284	94.5	2.3	3.2	Sand	1.6	0.5	8.8	31.6	42.4	13.4	1.7
MC52710-12	39.215	75.290	134876.201	210972.454	92.7	2.2	5.1	Sand	0.1	0.0	0.1	0.8	47.2	48.7	3.1
MC52710-13	39.232	75.304	136806.317	209746.567	94.3	1.7	4	Sand	1.4	0.2	3.0	15.6	49.0	28.6	2.2
MC52710-14	39.241	75.311	137795.482	209116.555	94.2	1.2	4.6	Sand	2.5	2.4	11.0	39.0	32.3	11.0	1.7
MC52710-15	39.288	75.367	143029.651	204310.782	95.3	0	4.7	Sand	1.5	0.5	2.0	38.8	49.8	6.1	1.2

Appendix D: Delaware River Deepening - Dredged Material Characterization for Reach E.

(Prepared by GBA Engineers and Surveyors, 2010)

Table 1 - Material Going to Kelly Island

Boring I.D.	Approx. Channel STA.	Date	Location (NJ State Plane NAD 83) Northing	Easting	Top Elevation (ft MLLW)	Sample Above -47 ft MLLW (ft)	Sample Above -46 ft MLLW (ft)	Sample Depth (ft BGS)	Soil Type for Material Above -46 ft MLLW	% Fines	% Sand	Avg. Grainsize d-50 (mm)	Sub-Reach I.D.	Sub-Reach General Soil Type	Sub-Reach Dredge Quantity (cy)	Sub-Reach % of Total to K.I. (%)	Notes
DRV-14	329100	7/29/1991	228968.33	188423.49	-42.9	4.1	3.1	5.0	SM-SC	36	64	0.3	N/A	N/A			Outside borrow limit for Kelly Island fill.
WC-28	329100	8/30/1995															
	351200																--- Borrow Limit for Kelly Island Fill at 351+200
DRV-85	353100	8/16/2004	244497.07	170028.99	-48.4	Below	Below	5.0	Below; SM	14	86	0.1					Even though DRV-85 is below -47' MLLW, it was assumed representative of Sub-reach E-1.
	353300								Sub-reach Avg.	14	86	0.1	E-1	SM	13,864	1	
	353300																--- 353+300 is approx. dividing line between Sub-reaches E-1 and E-2.
DRV-58	353500	3/17/1999	244365.1	169317.1	-44.3	2.7	1.7	3.7	SW	2	98	2.0					
DRV-86	354100	8/16/2004	244653.08	168799.79	-44.8	2.2	1.2	2.0	GP	2	98	9.0					Ignored outlier DRV-86 gravel data so sub-reach avgs. were more representative.
DRV-59	354500	3/17/1999	245433.7	168911.8	-44.7	2.3	1.3	4.4	SW	2	98	1.2					
DRV-15	355200	7/29/1991	245360.35	168004.65	-44.2	2.8	1.8	3.4	SP	2	98	0.5					
DRV-87	355600	8/16/2004	246212.69	168166.53	-45.0	2.0	1.0	1.1	SP	1	99	3.4					
DRV-60	356300	3/17/1999	246321.0	167364.6	-42.2	4.8	3.8	4.8	SW	3	97	2.0					
DRV-88	356800	8/16/2004	246981.23	167315.34	-45.9	1.1	0.1	5.0	SP	2	98	1.0					
DRV-61	357200	3/17/1999	246753.6	166456.8	-43.4	3.6	2.6	4.0	SP	5	96	0.5					
DRV-62	358000	3/17/1999	247704.1	166290.9	-45.5	1.5	0.5	3.3	SP	3	97	0.7					
DRV-63	358500	3/17/1999	247580.1	165526.1	-44.2	2.8	1.8	4.5	SP	1	99	0.7					
DRV-64	359500	3/17/1999	248482.6	165037.4	-42.2	4.8	3.8	4.8	SP	1	99	0.7					
DRV-68-R2	376400	4/27/2001	260020.89	152617.28	-45.9	1.1	0.1	4.5	SP	3	98	0.5					
DRV-69	380400	4/27/2001	262635.19	149544.77	-48.2	Below	Below	5.0	Below; SP-SM	6	94	0.3					Even though DRV-69 is below -47' MLLW, it was assumed representative.
DRV-70	390200	4/27/2001	267384.25	141101.48	-44.8	2.2	1.2	2.5	SP-SM	6	94	0.3					
	390200								Sub-reach Avg.	3	97	1.0	E-2	SP	468,443	19	
	390200																--- 390+200 is approx. dividing line between Sub-reaches E-2 and E-3.
DRV-17*	390200	7/19/1991	267028.53	140862.51	-43.5	3.5	2.5	2.4	SM-SC	24	76	1.0					DRV-17* data shown is weighted average of S-1 (0'-1.1) and S-2 (1.1'-2.4).
DRV-71	403300	4/27/2001	272958.36	129134.81	-44.9	2.1	1.1	4.3	SP-SM	6	94	0.3					
DRV-72	406600	4/27/2001	273824.08	125867.14	-45.9	1.1	0.1	5.0	SM	17	83	0.2					
DRV-18	407200	7/18/1991	274783.04	125863.19	-43.6	3.4	2.4	4.1	SP	3	97	0.3					
DRV-73	419300	4/29/2001	281652.66	115856.99	-44.9	2.1	1.1	3.0	SP-SM	8	92	0.5					
DRV-19	420200	7/18/1991	281772.02	114886.32	-46.6	0.4	-0.6	2.1	SM-SC	15	85	0.2					
	421700								Sub-reach Avg.	12	88	0.4	E-3	SP-SM	580,243	23	
	421700																--- 421+700 is approx. dividing line between Sub-reaches E-3 and E-4.
DRV-74	423100	4/29/2001	283487.05	112490.32	-42.6	4.4	3.4	5.0	ML	87	14	0.01					DRV-74 grainsize curve was extrapolated to estimate d-50.
DRV-75	432200	4/29/2001	289014.55	105208.27	-44.0	3.0	2.0	5.0	ML	94	6	0.01					DRV-75 grainsize curve was extrapolated to estimate d-50; data is avg of S-1 and S-2.
	432200								Sub-reach Avg.	90	10	0.01	E-4	ML	252,064	10	
	432200																--- 432+200 is approx. dividing line between Sub-reaches E-4 and E-5.
DRV-20	432200	7/18/1991	288375.65	104846.38	-46.1	0.9	Below	5.0	Below; SP	4	96	0.4					Even though DRV-20 is below -46' MLLW, it was assumed representative.
DRV-65	434500	3/14/1999	290222.3	103339.3	-44.5	2.5	1.5	5.0	SP	2	98	0.3					
DRV-66	438500	3/13/1999	292506.5	100010.5	-45.6	1.4	0.4	0.5	SP	4	96	0.4					
DRV-21	440100	7/18/1991	293282.86	98560.63	-45.6	1.4	0.4	5.0	SP	2	98	0.6					
DRV-67	441400	3/13/1999	294196.4	97506.5	-45.0	2.0	1.0	5.1	SP	4	96	0.4					
DRV-76**	446600	4/29/2001	296732.81	93100.24	-42.2	4.8	3.8	5.0	SM	25	75	0.2					DRV-76** data shown is weighted average of S-1 (0'-2.5) and S-2 (2.5'-5.0).
DRV-22	448200	7/18/1991	297853.97	91929.37	-45.7	1.3	0.3	1.6	SP	1	99	3.3					
DRV-77-R1***	449300	4/29/2001	297984.99	90759.06	-42.4	4.6	3.6	5.6	SP	2	98	0.8					DRV-77*** data shown is weighted average of S-1 (0'-1.0), S-2 (1.0'-3.5), and S-3 (3.5'-5.6').
DRV-78^	456100	4/29/2001	300727.30	84547.37	-41.3	5.7	4.7	5.0	SM	37	63	0.7					DRV-78^ data shown is weighted average of S-1 (0'-1.0) and S-2 (2.0'-5.0).
DRV-23	460200	7/17/1991	302212.81	80670.96	-48.7	Below	Below	3.7	Below; SP	6	94	0.3					Even though DRV-23 is below -47' MLLW, it was assumed representative.
DRV-79	461100	4/26/2001	302929.33	80027.07	-46.4	0.6	Below	1.3	Below; SP	3	97	0.1					Even though DRV-79 is below -46' MLLW, it was assumed representative.
	461300								Sub-reach Avg.	8	92	0.7	E-5	SP-SM	1,168,313	47	--- Borrow Limit for Kelly Island Fill at 461+300

USCS SOIL SYMBOLS: (based on ASTM D 2487)	
SW	Sand, well-graded, less than 5% fines.
SP	Sand, poorly-graded, less than 5% fines.
SP-SM	Sand with little silt, fines from 5% to 12%.
SM	Silty Sand, fines from 12% to 50%.
ML	Silt, low-plasticity, fines greater than 50%.
SM-SC	Silty or Clayey Sand, fines from 12% to 50%.

SUB-REACH AVERAGE DATA SUMMARY:

Sub-Reach Limits	% Fines	% Sand	d-50	Sub-reach I.D.	USCS Symbol	Volume (cy)	% Total Volume	Proposed Placement Scenario
E-1: 351+200 to 353+300	14	86	0.1	E-1	SM	13,864	1	Use for initial capping of E-4 (ML) material.
E-2: 353+300 to 390+200	3	97	1.0	E-2	SP	468,443	19	Use for outer (seaward) portion of containment berm.
E-3: 390+200 to 421+700	12	88	0.4	E-3	SP-SM	580,243	23	Use for final capping of E-1 (SM) material.
E-4: 421+700 to 432+200	90	10	0.01	E-4	ML	252,064	10	Use for intial pumping into CDF.
E-5: 432+200 to 461+300	8	92	0.7	E-5	SP-SM	1,168,313	47	Use for inner portion of containment berm.

Weighted Average of Granular Borrow Material: 8.1 | 91.9 | 0.7
(does not include E-4 ML material)

Total Borrow Vol: 2,482,927 cy
Kelly Island

GENERAL NOTES - TABLE 1:

1. Borrow Area Limits for Kelly Island Fill: STA. 351+200 to 461+300.
2. Sub-reach limits were based on the geotechnical data shown herein. These limits represent the approximate line where notable changes in soil composition occur.
3. Channel is 1000' wide in Reach E.
4. Dredging quantities within sub-reaches were calculated from Gahagan & Bryant Assoc.'s "Dredging Quantity QA/QC Memo Report, Nov. 2008".
5. Dredging quantities shown include the volume to the project depth (-45' MLLW) + the additional volume for 1' allowable overdepth (-46' MLLW).
6. DRV-16 (not listed) is located outside Main Channel (1959' W of CL) and is therefore not included in Kelly Island borrow area summary table.
7. " % Fines" is short for the percent passing the No. 200 sieve (0.075mm), which is the dividing line between sand and silt per the Unified Soil Classification System (USCS) per ASTM D 2487.
8. "d-50" is the average grain size by weight of the soil sample. 50% of the sample is coarser than the d-50, and the other 50% of the sample is finer than the d-50.

Table 2 - Material Going to Broadkill Beach

Boring I.D.	Approx. Channel STA.	Date	Location (NJ State Plane NAD 83) Northing	Easting	Top Elevation (ft MLLW)	Sample Above -47 ft MLLW (ft)	Sample Above -46 ft MLLW (ft)	Sample Depth (ft BGS)	Soil Type for Material Above -46 ft MLLW	% Fines	% Sand	Avg. Grainsize d-50 (mm)	Sub-Reach I.D.	Sub-Reach General Soil Type	Sub-Reach Dredge Quantity (cy)	Sub-Reach % of Total to B.B. (%)	Notes
	461300																--- Borrow Limit for Broadkill Beach at 461+300.
DRV-80	465000	4/26/2001	303843.29	76192.38	-47.1	Below	Below	5.0	Below; SP	4	96	0.28					Even though DRV-80 is below -47' MLLW, it was assumed representative.
DRV-24	470200	7/17/1991	306058.54	71483.00	-48.2	Below	Below	3.0	Below; SP	2	98	0.30					Even though DRV-24 is below -47' MLLW, it was assumed representative.
DRV-81	477200	4/26/2001	308486.80	64884.20	-45.2	1.8	0.8	1.8	SP-SM	7	93	0.30					
DRV-25	480200	7/17/1991	310070.76	62333.99	-44.7	2.3	1.3	5.0	SP	3	98	0.57					
DRV-82*	481200	4/26/2001	310253.10	61346.63	-42.8	4.2	3.2	5.0	SP	5	95	0.38					DRV-82* data shown is weighted average of S-1 (0'-2.5) and S-2 (2.5'-5.0).
DRV-26	500200	7/16/1991	317838.97	43872.89	-47.2	Below	Below	5.0	Below; SP	5	95	0.24					Even though DRV-26 is below -47' MLLW, it was assumed representative.
DRV-83	508700	4/25/2001	320563.29	35764.50	-46.7	0.3	Below	0.8	Below; SP	3	97	0.25					Even though DRV-83 is below -46' MLLW, it was assumed representative.
DRV-27	510200	6/14/1991	321138.24	34468.63	-47.7	Below	Below	0.8	Below; SP	3	97	0.28					Even though DRV-27 is below -47' MLLW, it was assumed representative.
	510300								Sub-reach Avg.	4	96	0.3	E-6	SP	1,567,281	98	
	510300																--- 510+300 is approx. dividing line between Sub-reaches E-6 and E-7.
DRV-84	510400	4/25/2001	321289.97	34273.33	-47.4	Below	Below	5.0	Below; SM	17	83	0.11					Even though DRV-69 is below -47' MLLW, it was assumed representative.
	512000								Sub-reach Avg.	17	83	0.1	E-7	SM	31,289	2	--- Borrow Limit for Broadkill Beach at 512+000.
DRV-28	520000	7/15/1991	327674.35	26489.85	-44.7	2.3	1.3	5.0	SP	2	99	0.18					Outside borrow limit for Broadkill Beach fill.
DRV-29	535000	6/14/1991	331698.37	11712.65	-44.7	2.3	1.3	1.8	SP-SM	8	92	0.17					

USCS SOIL SYMBOLS: (based on ASTM D 2487)	
SW	Sand, well-graded, less than 5% fines.
SP	Sand, poorly-graded, less than 5% fines.
SP-SM	Sand with little silt, fines from 5% to 12%.
SM	Silty Sand, fines from 12% to 50%.
ML	Silt, low-plasticity, fines greater than 50%.
SM-SC	Silty or Clayey Sand, fines from 12% to 50%.

SUB-REACH AVERAGE DATA SUMMARY:

Sub-Reach Limits	% Fines	% Sand	d-50	Sub-reach I.D.	USCS Symbol	Volume (cy)	% Total Volume	Notes
E-6: 461+300 to 510+300	4	96	0.3	E-6	SP	1,567,281	98	Use for beachfill.
E-7: 510+300 to 512+000	17	83	0.1	E-7	SM	31,289	2	Use for intial pumping onto beach; pump E-6 material overtop.
Weighted Average of E-6 and E-7:	4	96	0.3					

Total Borrow Vol: 1,598,570 cy
Broadkill Beach

GENERAL NOTES - TABLE 2:

1. Borrow Area Limits for Broadkill Beach: STA. 461+300 to 512+000.
2. Sub-reach limits were based on the geotechnical data shown herein. These limits represent the approximate line where notable changes in soil composition occur.
3. Channel is 1000' wide in Reach E.
4. Dredging quantities within sub-reaches were calculated from Gahagan & Bryant Assoc.'s "Dredging Quantity QA/QC Memo Report, Nov. 2008".
5. Dredging quantities shown include the volume to the project depth (-45' MLLW) + the additional volume for 1' allowable overdepth (-46' MLLW).

Total Reach E Volume: 4,081,497 cy

Appendix E: Delaware Coastal Program Broadkill Beach Sediment Grab Sample Sieve Results

Field Name No	% Gravel	Very Coarse Sand (Sand fraction % # 18)	Coarse Sand(Sand fraction % # 35)	Medium Sand (Sand fraction % # 60)	Fine Sand (Sand fraction % # 140)	Very Fine Sand (Sand fraction % # 270)	Sand fraction % fines
BK1 L	33.8	22.9	32.4	7.8	3	0.1	0
BK1 M	2.6	3.3	13.9	33.4	46.4	0.4	0
BK1 H	0	0.1	0.4	18.3	80.7	0.5	0
BK2 L	47.2	17	21.8	5.7	8.1	0.2	0
BK2 M	0.5	1.3	13.9	41.2	42.5	0.5	0
BK2 H	0.3	0	0.9	28.8	69.4	0.6	0
BK3 L	41.1	21.2	22.6	5.5	9.4	0.3	0
BK3 M	4.1	8.1	13.3	22.2	51.9	0.4	0
BK3 H	0	0.1	1.7	24.3	73.4	0.5	0
BK4 L	31	24.7	22.5	8.3	13.4	0.2	0
BK4 M	0	0.5	7.8	24.3	67.1	0.3	0
BK4 H	1.9	0.2	4.6	34.2	58.9	0.2	0