USACE JACKSONVILLE DISTRICT

Appendix D
Geotechnical

MIAMI-DADE COUNTY, FLORIDA

BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT

January 2015

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ENCLOSURE

1 BACKGROUND

This report includes a description of the regional and local geology of Miami-Dade (Dade) County, a sediment characterization of the native beach and preliminary borrow areas. Boring logs, core photographs and laboratory results are attached in **Enclosure 1**. Additional borings in the offshore borrow areas will be required prior to the design phase of the borrow areas.

1.1 REGIONAL GEOLOGY

The Florida Peninsula occupies a portion of the much larger geologic unit called the Florida Plateau. Deep water in the Gulf of Mexico is separated from deep water of the Atlantic Ocean by this partially submerged platform nearly 500 miles long and 450 miles wide. In the last 200 million years, the plateau has been alternately dry land or covered by shallow seas. During that time up to 20,000 feet of carbonate and marine sediments were deposited. There has been a tilting of the Florida Plateau about its longitudinal axis. The west coast is partially submerged, as indicated by the wide estuaries and offshore channels, while the east coast is correspondingly elevated, showing the characteristics of an emergent coastline.

During the last million years, a series of four glacial periods, or ice ages, brought about significant changes in sea level. As a result of these sea level fluctuations, the Florida peninsula was again covered and uncovered by shallow seas. Following the first glacial period, sea level rose 270 ft. above its present level. Dry land on the Florida peninsula was then restricted to a few small islands along the central Florida ridge and in northeast Florida.

About 100,000 years ago, the last glacial period began. Sea level fell to 300 feet below its present level and the Florida Plateau emerged as dry land. Approximately 15,000 years ago, sea level began its most recent rise towards present sea level (Shinn, 1988). Sea level rose at an average rate of 30 feet per 1,000 years. About 7,000 years ago, the rate of sea level rise slowed when the sea level was about 30 feet below its present level. It was at this most recent slowing of sea level rise that the modern barrier islands of southeast peninsular Florida formed.

It was at this most recent slowing of sea level rise that the modern barrier islands of southeast peninsular Florida formed. It is generally accepted that sea level is continuing to rise and is a major contributor to erosion at the shoreline. The primary causes of sea level rise today are the melting of the polar ice caps and thermal expansion of the ocean waters

The quartz component of the modern barrier island sand is quartz sand that has migrated southward along the Atlantic coast and the reworking of the Pamlico Sand that was previously deposited over the entire region. Much of the coastal sediments are carbonates locally

produced by calcite producing plants and animals. Additional carbonate material is reworked materials from outcropping Pleistocene formations offshore (Duane and Meisburger, 1969).

1.2 LOCAL GEOLOGY

The surficial geologic deposits of southeast Florida are the Miami, Key Largo, Anastasia, and Fort Thompson Formations. These limestone formations were deposited in shallow Pleistocene seas.

The Fort Thompson Formation is the oldest formation and was deposited in warm shallow seas similar in environment to the broad barren marine plains covering the Bahamas Banks today.

Later, coral reefs of the Key Largo Limestone created a shelter behind which the bryozoan facies of the Miami Limestone formed. Later broad shoals of oolitic sediments were deposited along the coast.

The Anastasia and the Miami Formations were formed as sand shoals and beach ridges 100,000 to 125,000 years ago (Shinn, 1988). Tidal channels cut through the carbonate and oolitic shoals, connecting the shallow sea covering the Everglades with the Atlantic Ocean. These channels form the parallel cuts known today as the Transverse Glades in Dade County (Hoffmeister, 1974).

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

The nearshore shelf off of Dade County consists of Pleistocene rock reefs separated by sandy plateaus. The sand filled swales between the rock reefs is of a thickness and quality that it has been used in the past as the primary borrow source for Dade County.

2 NATIVE BEACH

2.1 GENERAL

The Dade County Beach Erosion Control and Hurricane Protection Project as originally authorized provided for the placement of beach fill along the 9.3-mile reach of shoreline extending from Bakers Haulover Inlet to Government Cut and along the 1.2-mile length of Haulover Beach Park located immediately north of Bakers Haulover Inlet (**Plate 1**).

The mean grain size for Dade County native beaches, as sampled in 1977, was 1.59 phi (0.33 mm), or fine-grained sand. The mean sorting value of the native beaches was 1.04 phi and considered poorly sorted (USACE, 1984). The native sand was a browinish-orange color.

The sands which currently characterize Dade County beaches are not "native beach sands" but are the product of over 25 years of beach nourishment using sand dredged primarily from offshore of Miami Beach. The existing sand consists mainly of carbonate grains and shell fragments, with 35-40% quartz grains. The quartz grains are fine and white while the carbonate and shell materials are generally coarser and darker. Existing beach conditions are typically characterized as medium-grained sand and are moderately to moderately well-sorted.

The existing surface sediments along Dade County consist of locally eroded limestone and shell deposits and silica/quartz sands, which represent the southerly littoral transport of material from further north.

2.2 NATIVE BEACH SAMPLING AND ANALYSIS

Representative beach sediment samples were collected by the USACE in 2009 and 2010 for beach nourishment projects in Miami Beach and Bal Harbour. For comparison with the reported native beach values, the granulometric results using the method of moments for each composite sample are summarized in **Table 1.**

Table 1: Dade County Beach Sediment Characteristics

Dade County Beach Area	Mean Grain Size (mm)	Sorting (Phi)	% Fines Passing #230	% Retained on #4	Munsell Color Value (moist)
Native (1977)	0.33	1.04	N/A	N/A	N/A
R27-R31 (2010)	0.42	0.67	0.78	0.27	7
R39-R45 (2009)	0.75	0.86	0.74	3.27	6
R49-R61 (2010)	0.51	0.74	1.05	0.00	6

3 BORROW AREAS

This section summarizes the characteristics of sand sources that are currently known to be potentially available for use as beach fill material along the Dade County shoreline. These sources include offshore borrow areas and upland commercial sand mines in south Florida. This effort included consideration of native beach sand characteristics, offshore vibracore borings, sediment analyses and the evaluation of sediment characteristics at upland sand mines.

Beach nourishment began in Dade County in 1975. Traditionally, borrow areas offshore of Dade County have been used for beach nourishment but these sources have largely been depleted or are inaccessible due to environmental restrictions. Approximately 3.6 million cubic yards (mcy) of sand will need to be placed on Dade County beaches over the remaining 11 years of Federal participation (24 years for the 2.5-mile Sunny Isles segment).

Florida Administrative Code 62B-41.007(2) (the Florida Sand Rule) requires that beach fill maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Such material shall be predominately of carbonate, quartz or similar material with a particle size distribution ranging between 0.062 mm and 4.76 mm, shall be similar in color and grain size distribution to the material in the existing coastal system at the disposal site and shall not contain:

- Greater than 5 percent, by weight, silt, clay or colloids passing the #230 sieve
- Greater than 5 percent, by weight, fine gravel retained on the #4 sieve
- Coarse gravel, cobbles or material retained on the 3/4 inch sieve in a percentage or size greater than found on the native beach
- Construction debris, toxic material or other foreign matter
- And shall not result in cementation of the beach

In 2002, a solicitation for bids to construct an 8,000-foot segment of North Miami Beach was advertised. Due to a shortage of funds, the project was cancelled but the sand specification in this solicitation was agreed upon by USACE, FDEP and Dade County and established the criteria for Dade County beach fill material. This specification is more limiting than the Florida Sand Rule and will be used to evaluate potential Dade County sand sources and is described as follows:

- The sand supply shall be naturally created.
  - The sand may be processed, but manufactured sand is now allowed. Sand produced from crushed rock is considered manufactured and is not allowed.
  - The sand must be composed of quartz and/or calcium carbonate with no more than 5 percent sand of other mineralogical composition.
  - No more than 60 percent of the sand (quartz or calcium carbonate) shall be whole or broken shell.
  - The Average Mean Grain Size must be greater than or equal to 0.30 mm and less than 0.55 mm.
  - The Standard Deviation values must range from 0.50 phi to 1.75 phi (moderately well sorted to poorly sorted).
  - Silt content (passing No. 230 sieve) must be less than 5 percent.
  - 95 percent of the material must pass the #4 sieve (4.76 mm).

- 99 percent of the material must pass the 3/8 inch sieve (9.51 mm).
- 100 percent of the material must pass the 3/4 inch sieve (19.0 mm).
- Sand color shall be similar to the existing beach. Based on the Munsell Soil Color Chart, color must be within the range:
  HUE: 2.5 YR, 5 YR, 7.5 YR, 10 YR, 2.5 Y, 5 Y
  CHROMA: 1, 2, or 3
  VALUE: 6, 7, or 8

3.1 NEARSHORE BORROW AREAS

Within Dade County, there are two remaining viable sources of beach fill material; Lummus Park and the Bakers Haulover Inlet ebb shoal. Lummus Park is a wide, accretionary region along the southern reach of Miami Beach. Southward-moving sediment is deposited in this large embayment, and is prevented from moving further south by the long north jetty at Government Cut (Miami Harbor entrance channel). This area has been accreting since project construction, and berm widths have grown to over 400 feet along most of Lummus Park. Several large- and small-scale renourishments have been performed in recent years by backpassing sediment from this wide, accreting beach northward to erosive areas. Periodic beach profile surveys indicate that the entire Lummus Park area accretes at an average annual rate of about 91,000 cubic yards per year (cy/yr). Only the northern half of Lummus Park is used as a borrow source, due to its proximity to the fill areas and to minimize disruption and safety hazards along this popular tourist beach. Since only half of the region can be used as a borrow source, the available rate of extraction of borrow material is reduced by half, to approximately 50,000 cy/yr.

The second source of beach fill material in Dade County is the Bakers Haulover Inlet ebb shoal. The ebb shoal lies predominantly along the north side of the navigation channel through Bakers Haulover Inlet, and has the shape of a large, flattened dome. The shoal is fed almost continuously by southward-moving sediment. The ebb shoal was used as a borrow source for the 2003 and 2014 renourishments of Bal Harbour beach. In order to avoid interrupting any natural sediment bypassing that may be occurring, the borrow area was selectively dredged to maintain the general shape of the shoal. The shoaling rate of the ebb shoal was calculated to be approximately 30,000 cy/yr. Based on the estimates of accretion and shoaling of these two borrow sources, additional borrow material will be required to meet the needs of Dade County.

3.2 PROPOSED OFFSHORE BORROW AREAS

The Florida Department of Environmental Protection (FDEP) published the "Southeast Florida Sediment Assessment and Needs Determination (SAND) Study" in May 2013. The report was also published as a US Army Corps of Engineers Engineer Research and Development Center (ERDC) Technical Report (ERDC/CHL TR-14-10) in September 2014. The purpose of the study was to quantify domestic, offshore sand resources to support the placement of planned, full-size beach nourishment projects through the next 50 years for St. Lucie, Martin, Palm Beach, Broward and Miami-Dade Counties. The SAND Study identified 87 potential offshore borrow areas. As part of the study, each county prepared a "Sand Needs Evaluation", in which they identified their sand needs for the next 50 years as well as borrow sources, into which, a significant investment had already been made. After eliminating the borrow areas that were identified by the respective counties, borrow areas that were considered a high risk due to potential shoreline impacts were eliminated. Finally, all borrow areas were compared to the Dade County sand specification. All but three remaining borrow areas were determined to be incompatible with Dade County because either the mean grain size was too fine or the color was too dark. The three remaining borrow areas (SL10-T41, M3-R45, and M4-R105) were then subjected to additional investigation (**Plate 1**). Borrow area M3-R45 was subsequently eliminated from consideration based on the criteria described in Paragraph 3.2.2. For each proposed sand source, the overfill ratio was calculated. The overfill ratio is a calculation that was devised to predict the performance of borrow materials with respect to the native beach material during initial beach stabilization. These values help determine the best available borrow material. The overfill ratio is calculated by comparing the mean sediment diameter and sorting values of borrow sediment and the native beach. **Table 2** summarizes the characteristics of the potential offshore borrow areas, including the overfill ratios, calculated using values for the native Dade County beaches.

Table 2: Characteristics of Offshore Borrow Areas

Borrow Area	Mean Grain Size (mm)	Sorting (Phi)	% Fines Passing #230	% Retained on #4	Munsell Color Value	Estimated Volume (mcy)	Overfill Ratio[1]
SL10-T41	0.39	1.06	2.04	0.59	6	4.6	1.0
M3-R45	0.48	1.07	1.84	0.76	4	N/A	1.0
M4-R105	0.51	1.22	3.45	2.17	6	0.6	1.0

1. Overfill ratios were calculated using the James-Krumbein method (USACE Coastal Engineering Manual, 2001). When the mean grain size of the borrow area is greater than the native beach, an overfill ratio of 1.0 is automatically generated.

3.2.1 Borrow Area SL10-T41

SL10-T41 is located approximately ten (10) miles offshore of Ft. Pierce, Florida (**Plate 2**). The borrow area was characterized with 16 vibracore borings. Only three (3) borings in the northeast corner and one (1) in the southeast corner were determined to be compatible with the Dade County sand specification. Of the borings that were incompatible with the Dade County sand specification, the primary non-compliant characteristic was color since most samples had a Munsell value of less than 6. Compatible material from this borrow area was described as: gray, poorly-graded, mostly fine to medium-grained sand-sized shell with little to some fine-grained sand-sized quartz and trace silt. Based on the limited available geotechnical data, up to 4.6 million cubic yards (mcy) of Dade-compatible sand is available in this borrow area.

3.2.2 Borrow M3-R45

M3-R45 is located approximately three (3) miles offshore of the St. Lucie Inlet (**Plate 3**). The borrow area was characterized with 15 vibracore borings, none of which were compatible with the Dade County sand specification. The primary non-compliant characteristic was color since most samples had a Munsell value of less than 6. Since no compatible material was identified, no further analyses were performed on this borrow area.

3.2.3 Borrow M4-R105

M4-R105 is located approximately six (6) miles northeast of the Jupiter Inlet (**Plate 4**). The borrow area was characterized with 15 vibracore borings. Only one (1) boring was determined to be compatible with the Dade County sand specification. Of the borings that were incompatible with the Miami-Dade County sand specification, the primary non-compliant characteristic was color since most samples had a Munsell value of less than 6. Compatible material from this borrow area was described as: gray, poorly-graded, mostly fine to coarse-grained sand-sized shell with some fine-grained sand-sized quartz and trace silt. Based on the limited available geotechnical data, up to 0.6 million cubic yards (mcy) of Dade-compatible sand is available in this borrow area. The proposed area to be dredged, as shown on **Plate 4**, represents an area of maximum possible impact and will be refined with the collection and analysis of additional geotechnical data.

3.3 PROPOSED UPLAND BORROW AREAS

The alternative to using domestic offshore sand borrow areas is to use domestic upland sand sources. Three commercial sand vendors have been identified (**Plate 1)**. Sand vendors were identified based on their proximity to Dade County, their ability to meet the sand quality criteria and their ability to meet the anticipated quantity and production requirements for the

project. Sand from all three mines is natural, not manufactured, and each will require processing to meet the Dade County sand specification. All three mines have an available volume of sand that far exceeds the required volume for Dade County. **Table 3** summarizes the characteristics of the potential upland borrow areas, including the overfill ratios, calculated using values for the native Dade County beach.

Table 3: Characteristics of Upland Sand Mines

Sand Mine	Mean Grain Size (mm)	Sorting (Phi)	% Fines Passing #230	% Retained on #4	Munsell Color Value	Available Volume (mcy)	Overfill Ratio[1]
Vulcan – Witherspoon[2]	0.59	0.61	0.22	0.0	8	N/A	1.0
Jahna – Ortona[2]	0.46	0.82	0.10	0.0	7	N/A	1.0
A.C.I. – Homestead[3]	0.45	1.11	1.57[4]	0.0	7	N/A	1.0

1. Overfill ratios were calculated using the James-Krumbein method (USACE Coastal Engineering Manual, 2001)
2. Geotechnical data obtained from the report "Feasibility Evaluation of Upland Truck Haul as a Beach Fill Construction Method in Broward County, FL – Segment II" prepared by Olsen Associates, Inc and Coastal Planning and Engineering, Inc, June 2012.
3. Geotechnical data provided by Atlantic Civil, Inc.
4. Percent Fines for the ACI mine are based on material passing the #200 sieve.

3.3.1 Vulcan Materials – Witherspoon

The Vulcan Witherspoon mine is located in southern Glades County, near the city of LaBelle, approximately 120 miles from the project area. The Witherspoon mine claims to have the deepest dredge in the western hemisphere. The sand is extracted from the lake pit by hydraulic dredge and pumped to a sand processing plant. The processing plant first removes larger material using vibrating screens. The remaining grains are separated using water and gravity. The sand is then mixed, based on the desired specifications, and fed into dewatering screws to remove the fine-grained material. The resulting material is then stockpiled on site.

3.3.2 E.R. Jahna – Ortona

The E.R. Jahna Ortona mine is also located in southern Glades County, adjacent to the Witherspoon mine and approximately 120 miles from the project area. Sand from the Ortona mine has been used extensively for beach fill projects throughout southeast Florida. Sand is extracted from the mine pit using one of two cutter-head dredges and pumped to a central processing plant. The processing plant first removes larger material using vibrating screens with spray bars. The remaining material is sent through a gravity classifier and remixed to

3.3.3 Atlantic Civil, Inc. – Homestead

The ACI mine is located in southern Miami-Dade County, in the city of Homestead and approximately 35 miles from the project area. The ACI mine has not been used previously to produce fill material for beach nourishment. Sand will be extracted using either a dragline or gantry dredge. The material will be screened to remove the oversized material using a mobile vibrating screen. The sand will then be transported to the central wash facility where it will be screened and washed through sand classifying screws and cyclone(s). The material will then be stockpiled on-site.

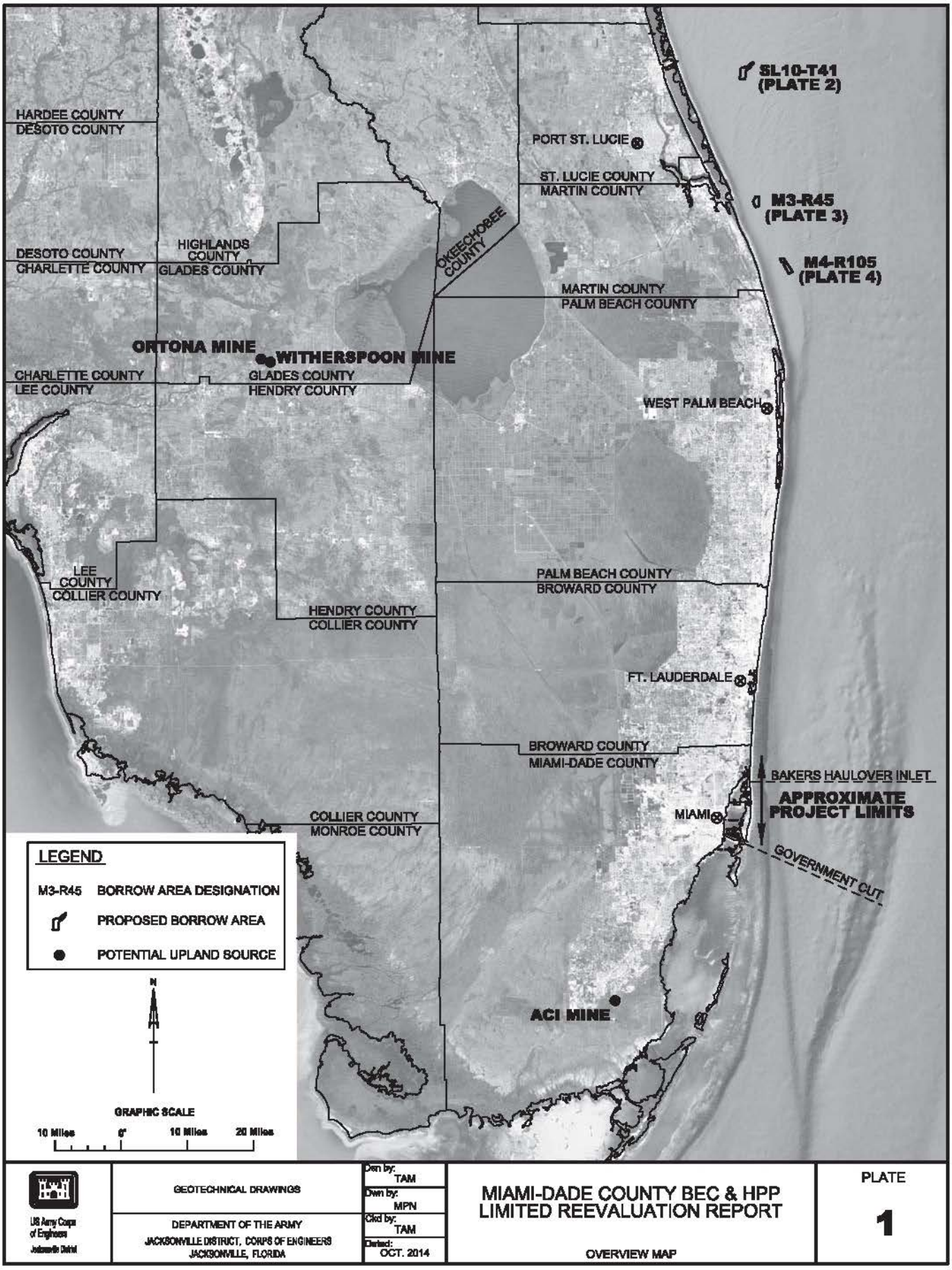
4 COMPATIBILITY OF THE BORROW AREAS WITH THE BEACHES

Borrow area compatibility was determined by the Dade County sand specification described in Section 3.1. The sands which currently characterize Dade County beaches are not "native beach sands" but are the product of over 25 years of beach nourishment using sand dredged primarily from offshore of Miami Beach. Native Dade County sand was finer-grained and slightly darker than the material that is on the beach today. Two offshore borrow areas, SL10-T41 and M4-R105, both contain material that is compliant with the Dade County sand specification. It is estimated that SL10-T41 contains 4.6 mcy of compatible material and M4-R105 contains an additional 0.6 mcy of compatible material. Additional investigation will be required to more accurately define the limits and available volumes of compatible material.

Three upland commercial sand mines were also identified. The borrow material from all three mines is natural but requires processing to remove coarse-grained and fine-grained material in order to meet the Dade County sand specification. As a result of the sand processing, material from all three mines is very similar. The main difference between the three sand mines is that the Witherspoon and Ortona mines are almost 100% quartz sand and the Homestead mine is approximately 50% carbonate and 50% quartz, based on available laboratory data. **Table 4** is a summary of characteristics of the native beach and the proposed borrow areas.

Table 4: Summary of Sediment Characteristics

Parameter	Offshore			Upland			Native Beach
	SL10-T41	M3-R45	M4-R105	Witherspoon	Ortona	ACI	
Mean (mm)	0.39	0.48	0.51	0.59	0.46	0.45	0.33
Sorting (phi)	1.06	1.07	1.22	0.61	0.82	1.11	1.04
Munsell Value	6	4	6	8	7	7	NA
Overfill Ratio	1.0	1.0	1.0	1.0	1.0	1.0	NA



US Army Corps of Engineers
Jacksonville District

GEOTECHNICAL DRAWINGS

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

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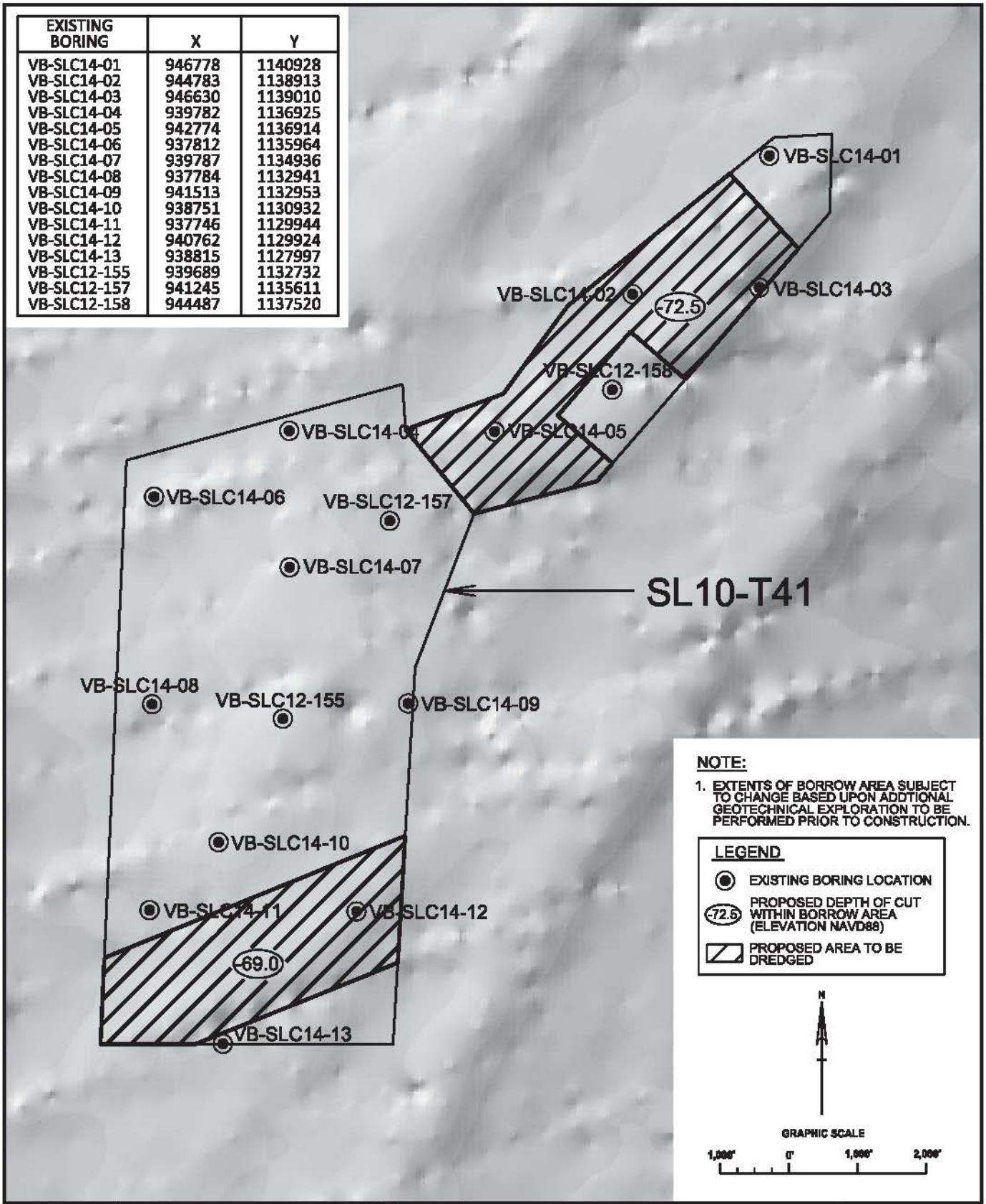
Dwn by: MPN
Ckd by: TAM
Dated: OCT. 2014

MIAMI-DADE COUNTY BEC & HPP
LIMITED REEVALUATION REPORT

OVERVIEW MAP

PLATE
1



EXISTING BORING	X	Y
VB-SLC14-01	946778	1140928
VB-SLC14-02	944783	1138913
VB-SLC14-03	946630	1139010
VB-SLC14-04	939782	1136925
VB-SLC14-05	942774	1136914
VB-SLC14-06	937812	1135964
VB-SLC14-07	939787	1134936
VB-SLC14-08	937784	1132941
VB-SLC14-09	941513	1132953
VB-SLC14-10	938751	1130932
VB-SLC14-11	937746	1129944
VB-SLC14-12	940762	1129924
VB-SLC14-13	938815	1127997
VB-SLC12-155	939689	1132732
VB-SLC12-157	941245	1135611
VB-SLC12-158	944487	1137520

US Army Corps of Engineers Jacksonville District

GEOTECHNICAL DRAWINGS

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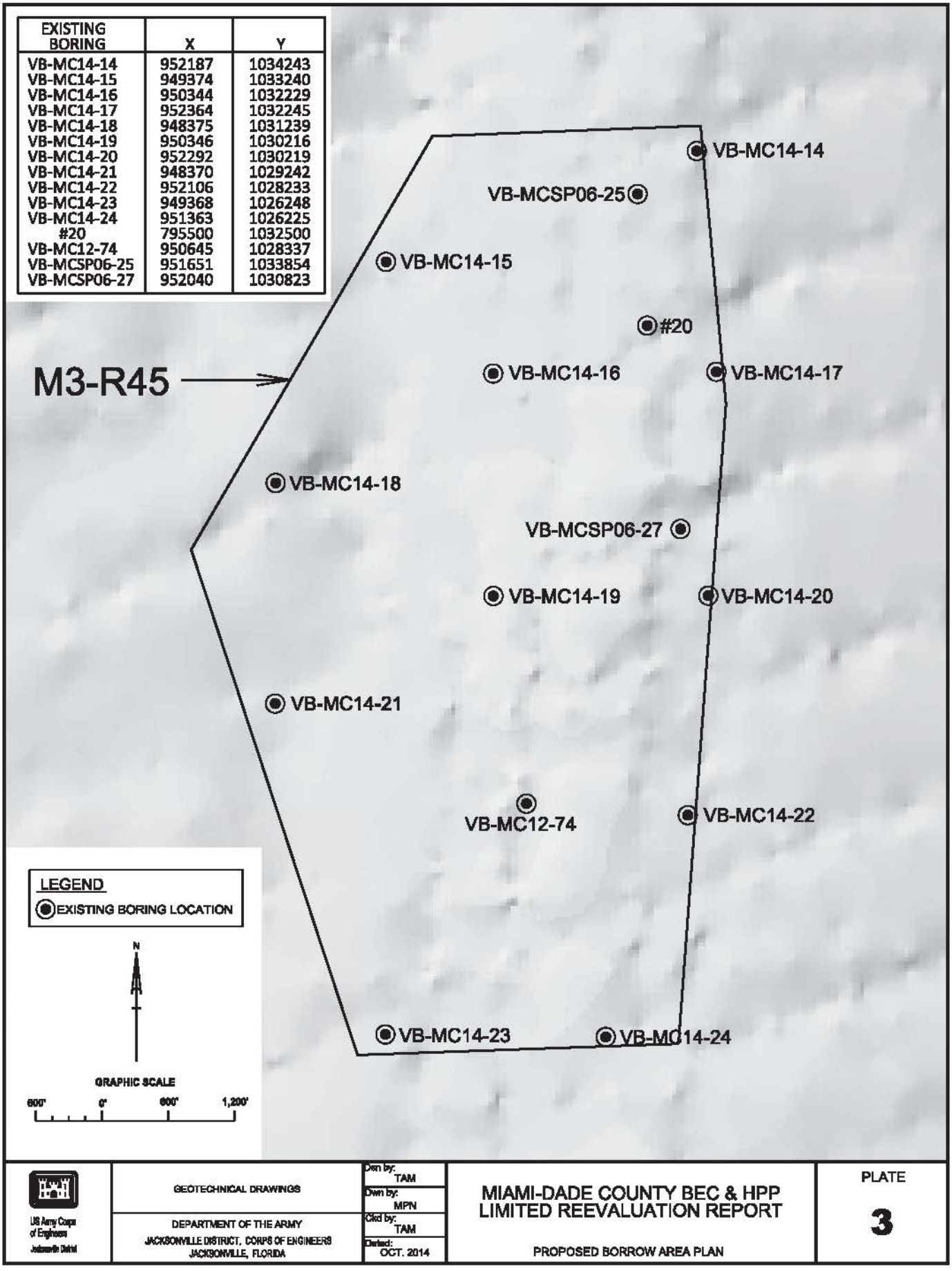
Ckd by: TAM
Dated: OCT. 2014

MIAMI-DADE COUNTY BEC & HPP LIMITED REEVALUATION REPORT

PROPOSED BORROW AREA PLAN

PLATE
2


EXISTING BORING | X | Y
VB-MC14-14 | 952187 | 1034243
VB-MC14-15 | 949374 | 1033240
VB-MC14-16 | 950344 | 1032229
VB-MC14-17 | 952364 | 1032245
VB-MC14-18 | 948375 | 1031239
VB-MC14-19 | 950346 | 1030216
VB-MC14-20 | 952292 | 1030219
VB-MC14-21 | 948370 | 1029242
VB-MC14-22 | 952106 | 1028233
VB-MC14-23 | 949368 | 1026248
VB-MC14-24 | 951363 | 1026225
#20 | 795500 | 1032500
VB-MC12-74 | 950645 | 1028337
VB-MCSP06-25 | 951651 | 1033854
VB-MCSP06-27 | 952040 | 1030823
M3-R45
VB-MC14-14
VB-MCSP06-25
VB-MC14-15
#20
VB-MC14-16
VB-MC14-17
VB-MC14-18
VB-MCSP06-27
VB-MC14-19
VB-MC14-20
VB-MC14-21
VB-MC12-74
VB-MC14-22
VB-MC14-23
VB-MC14-24
LEGEND
EXISTING BORING LOCATION
N
GRAPHIC SCALE
600' 0' 600' 1,200'
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GEOTECHNICAL DRAWINGS
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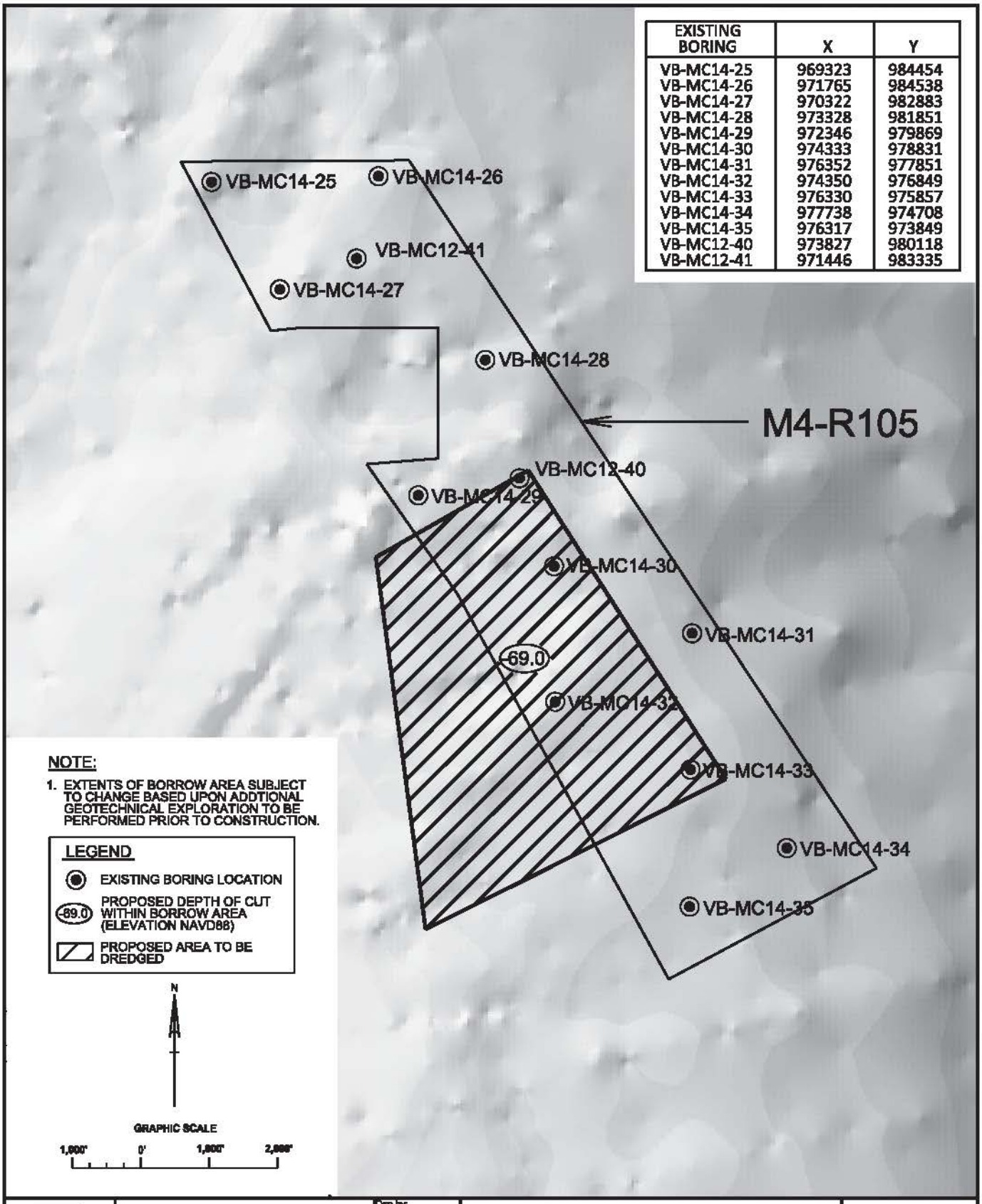
LIMITED REEVALUATION REPORT
PROPOSED BORROW AREA PLAN
PLATE
3



EXISTING BORING	X	Y
VB-MC14-25	969323	984454
VB-MC14-26	971765	984538
VB-MC14-27	970322	982883
VB-MC14-28	973328	981851
VB-MC14-29	972346	979869
VB-MC14-30	974333	978831
VB-MC14-31	976352	977851
VB-MC14-32	974350	976849
VB-MC14-33	976330	975857
VB-MC14-34	977738	974708
VB-MC14-35	976317	973849
VB-MC12-40	973827	980118
VB-MC12-41	971446	983335

US Army Corps of Engineers Jacksonville District

GEOTECHNICAL DRAWINGS

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MIAMI-DADE COUNTY BEC & HPP
LIMITED REEVALUATION REPORT

PROPOSED BORROW AREA PLAN

PLATE
4

Enclosure 1

Borrow Area

SL10-T41

DRILLING LOG

DIVISION South Atlanticm	**INSTALLATION** Jacksonville Districtm	**SHEET** 1m **OF SHEETS**	
1. PROJE Dade SAND Study 20m14m	**9. SIZE AND TYPE OF BIT** See Remarksm		
	10. COORDI AT E SYSTEM/DATUM State Plane, FLE (U.S. Ft.)m	**HORIZONT** NAD83	**VERTICAL** NAVD88m
2. BORING DESI NAT ION VB-SLC14-m Bm	**LOCATION COORDINATES** X = 944,783 Y = 1,138,913m	**11. MANUFACTURER'S DESIGNATION OF DRILL** D.B. Snellm	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY Corps of Engineers - CESAJm	**CONTRACTOR FI E NO.** 6738-14-5337m	**12. TOTAL SAMPLES** 5	**DISTURBED** **UNDISTURBED (UD)**
4. NAME OF DRILLER		**13. TOTAL NUMBER CORE BOXES**	
5. DIREC I N OF BORI NG ☒ VERTICAL ☐ INCLINED	**DEG. FROM E RTICAL** **BEARING**	**14. ELEVA ON GROUND WATER**	
		15. DATE RI NG	**STARTED** 425m14m **COMPLETE** 425m14m
6. THICKNESS OF OVERBURD N/Am		**16. ELEVA ON TOP OF BORING** -66.0 Ft.m	
7. DEPTH DRILLED NTO ROCK N/Am		**17. TOTAL RECOV Y FOR BORING** 10m %m	
8. TOTAL DEPTH OF BORING 13.5 Ft.m		**18. SIGNATURE AND TI LE OF INSPEC OR** Stephanie A. Setser, P.E., Geotechnical Engineerm	

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-66.0m	.0						-66.0m		
			SAND, poorly-graded, mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt, strong reaction with HCl, moist, 5Y 6/1 gray (SP)m	675m			Vibracorem		
							-68.0m		
					1m				
							-7m.0m		
							-7m.0m		
			At El. -72m0 Ft., mostly fine to coarse-grainedm sand-sized shell, little fine-grainedm sand-sized quartzm		3m		-74.0m		
			At El. -74.0 Ft., mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartzm		4m		-76.0m		
			At El. -75.0 Ft., 5Y 5/1 graym		5m				
-76.8m	10m8m								
			SAND, silty, mostly fine-grained sand-sizedm quartz, some silt, few medium to coarse-grained sand-sized shell, strongm reaction with HCl, moist, 5Y 7/1 light gray (SM)m						
-79.5m	13.5m						-79.5		
			NOTES:m 1. USACE Jacksonville is the custodian form these original files.m				Abbreviations:m NR = Not Recorded.m		

5m 10m 15

(Continued)

DRILLING LOG (ont. Sheet)	INSTALLATION Jacksonville Districtm	SHEET OF SHEETS
PROJECT Dade SAND Study 2014m	COORDINAT SYS M/DATUM State Plane, FLE (U.S. Ft.)m	HORIZONT NAD83m / VERTICAL NAVD88m
LOCATION COORDINATES X = 944,783 Y = 1,138,913m	ELEVATION TOP OF BORI G -66.0 Ft.m	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
1m	.0/2.3m	SP*
	4.0/4.3m	SP*2
3m	6.0/6.3m	SP*2
4m	8.0/8.3m	SP*2
5m	1mm/10.3m	SP*2m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

15m
5m
30m
35m

SAJ RM 1836-A
JUN 02

DRILLING LOG

DIVISION South Atlanticm	**INSTALLATION** Jacksonville Districtm	**SHEET** 1m **OF SHEETS**	
1. PROJE Dade SAND Study 20m14m	**9. SIZE AND TYPE OF BIT** See Remarksm		
	10. COORDI AT E SYSTEM/DATUM State Plane, FLE (U.S. Ft.)m	**HORIZONT** NAD83	**VERTICAL** NAVD88m
2. BORING DESI NAT ION VB-SLC14-m3m; **LOCATION COORDINATES** X = 946,63m Y = 1,139,m10m	**11. MANUFACTURER'S DESIGNATION OF DRILL** D.B. Snellm	☐ AUTO HAMMER ☐ MANUAL HAMMER	
3. DRILLING AGENCY Corps of Engineers - CESAJm; **CONTRACTOR FI E NO.** 6738-14-5337m	**12. TOTAL SAMPLES**	**DISTURBED** 5	**UNDISTURBED (UD)**
4. NAME OF DRILLER	**13. TOTAL NUMBER CORE BOXES**		
5. DIREC I N OF BORI NG ☒ VERTICAL ☐ INCLINED; **DEG. FROM E RTICAL**; **BEARING**	**14. ELEVA ON GROUND WATER**		
	15. DATE RI NG	**STARTED** 425m14m	**COMPLETE** 425m14m
6. THICKNESS OF OVERBURD N/Am	**16. ELEVA ON TOP OF BORING** -6m.5 Ft.m		
7. DEPTH DRILLED NTO ROCK N/Am	**17. TOTAL RECOV Y FOR BORING** 84 %m		
8. TOTAL DEPTH OF BORING 19.0 Ft.m	**18. SIGNATURE AND TI LE OF INSPEC OR** Stephanie A. Setser, P.E., Geotechnical Engineerm		

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 1 .	N-VALUE
-6m.5m	.0						-6m.5m		
			SAND, poorly-graded, mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt, strong reaction with HCl, moist, 5Y 6/1 gray (SP)m	80m			Vibracorem		
					1m		-6m.5m		
							-65.5m		
							-68.5m		
			At El. -68.5 Ft., little fine-grained sand-sizedm quartzm		3m				
							-71.5m		
			At El. -71.5 Ft., some fine-grainedm sand-sized quartzm		4m				
							-74.5m		
					5m				
			At El. -75.0 Ft., 5Y 5/1 graym						

5m 10m 15

(Continued)

DRILLING LOG (ont. Sheet)	INSTALLATION Jacksonville Districtm	SHEET OF SHEETS
PROJECT Dade SAND Study 2014m	COORDINAT SYS M/DATUM State Plane, FLE (U.S. Ft.)m	HORIZONT NAD83m / VERTICAL NAVD88m
LOCATION COORDINATES X = 946,630m Y = 1,139,010m	ELEVATION TOP OF BORI G -6m.5 Ft.m	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-76.5m	16.m		At El. -75.5 Ft., few medium to coarse-grained sand-sized shellm						
-79.5m	19.0m	NO RECOVERY					-79.5m		

NOTES:m

1. USACE Jacksonville is the custodian form these original files.m

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
1m	.0/2.3m	SP*
	5.0/5.3m	SP*2
3m	8.0/8.3m	SP*2
4m	11.m/11.3m	SP*2
5m	14.m/14.3m	SP*2m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

Abbreviations:m
NR = Not Recorded.m

15m
5m
30m
35

SAJ RM 1836-A
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DRILLING LOG

DIVISION South Atlanticm	**INSTALLATION** Jacksonville Districtm	**SHEET** 1m **OF SHEETS**	
1. PROJE Dade SAND Study 20m14m	**9. SIZE AND TYPE OF BIT** See Remarksm		
	10. COORDI AT E SYSTEM/DATUM State Plane, FLE (U.S. Ft.)m	**HORIZONT** NAD83	**VERTICAL** NAVD88m
2. BORING DESI NAT ION VB-SLC14-m5m; **LOCATION COORDINATES** X = 942,774 Y = 1,136,914m	**11. MANUFACTURER'S DESIGNATION OF DRILL** D.B. Snellm	☐ **AUTO HAMMER** ☐ **MANUAL HAMMER**	
3. DRILLING AGENCY Corps of Engineers - CESAJm; **CONTRACTOR FI E NO.** 6738-14-5337m	**12. TOTAL SAMPLES**	**DISTURBED** 5	**UNDISTURBED (UD)**
4. NAME OF DRILLER	**13. TOTAL NUMBER CORE BOXES**		
5. DIREC I N OF BORI NG ☒ **VERTICAL** ☐ **INCLINED**; **DEG. FROM E RTICAL**; **BEARING**	**14. ELEVA ON GROUND WATER**		
	15. DATE RI NG	**STARTED** 424m14m	**COMPLETE** 424m14m
6. THICKNESS OF OVERBURD N/Am	**16. ELEVA ON TOP OF BORING** -65.5 Ft.m		
7. DEPTH DRILLED NTO ROCK N/Am	**17. TOTAL RECOV Y FOR BORING** 10m %m		
8. TOTAL DEPTH OF BORING .0 Ft.m	**18. SIGNATURE AND TI LE OF INSPEC OR** Stephanie A. Setser, P.E., Geotechnical Engineerm		

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-65.5m	.0						-65.5m		
			SAND, poorly-graded, mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt, strong reaction with HCl, moist, 5Y 6/1 gray (SP)m	10m			Vibracorem		
							-67.5m		
					1m				
							-7m.5m		
									5m
							-73.5m		
					3m				
			At El. -75.5 Ft., 2.5Y 3/1 very dark graym						10m
-77.5m	12m0m						-77.5m		
			SAND, poorly-graded, mostly fine-grainedm sand-sized quartz, some fine to edium-grained sand-sized shell,m 5Y 3/1 very dark gray (SP)m		4m				
-8m.5m	15.0m						-8m.5m		15

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(Continued)

DRILLING LOG (ont. Sheet)

INSTALLATION	SHEET
Jacksonville Districtm	OF SHEETS

PROJECT	COORDINAT SYS M/DATUM	HORIZONT	VERTICAL
Dade SAND Study 2014m	State Plane, FLE (U.S. Ft.)m	NAD83m	NAVD88m

LOCATION COORDINATES	ELEVATION TOP OF BORI G
X = 942,774 Y = 1,136,914m	-65.5 Ft.m

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 . N-VALUE
-81.2m	15.7m		SAND, poorly-graded with silt, mostly fine to edium-grained sand-sized shell, somem fine-grained sand-sized quartz, few silt, strong reaction with HCl, moist, 2.5Y 5/1 gray (SP-SM)m		5			
-81.6m	16.1m		CLAY, fat, some silt, few fine-grained sand-sized quartz, strong reaction with HCl, oist, 5Y 4/1 dark gray (CH)m					
-8m.4m	16.9m		SAND, clayey, mostly fine tom edium-grained sand-sized quartz, little clay, trace shell, strong reaction with HCl, oist, 5Y 3/1 very dark gray (SC)m					
-8m.6m	17.1m		SAND, poorly-graded with clay, mostly fine to medium-grained sand-sized quartz, few clay, few medium to coarse-grained sand-sized shell, few limestone, weak reaction with HCl, moist, 5Y 4/1 dark gray (SP-SC)m					
-83.7m	18.2m		SAND, silty, mostly fine-grained sand-sizedm quartz, little silt, few sand to gravel-sized shell, strong reaction with HCl, moist, 2.5Y 6/1 gray (SM)m At El. -83.1 Ft., trace shellm At El. -83.4 Ft., little sand to gravel-sizedm shellm					
-85.5m	.0m		SAND, poorly-graded with silt, mostly fine to edium-grained sand-sized quartz, few silt, trace shell, trace limestone, strong reactionm with HCl, moist, fossiliferous, m.5Y 7/1 lightm gray (SP-SM) At El. -84.6 Ft., little sand to gravel-sizedm shellm				-85.5m	

NOTES:m

1. USACE Jacksonville is the custodian form these original files.m

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
1m	.0/2.3m	SP*
	5.0/5.3m	SP*
3m	8.0/8.3m	SP*
4m	1mm/12.3m	SP*
5m	15.m/15.3m	SP-SM*m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

Abbreviations:m
NR = Not Recorded.m

15m
5m
30m
35

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JUN 02

Boring DesignationmVB-SLC14-12m

DRILLING LOG	DIVISION: South Atlanticm	INSTALLATION: Jacksonville Districtm	SHEET 1m OF SHEETS

1. PROJE: Dade SAND Study 20m14m		9. SIZE AND TYPE OF BIT: See Remarksm	
		10. COORDI AT E SYSTEM/DATUM: State Plane, FLE (U.S. Ft.)m	HORIZONT: NAD83 / VERTICAL: NAVD88m
2. BORING DESI NAT ION: VB-SLC14-12m	LOCATION COORDINATES: X = 940,76m Y = 1,129,924m	11. MANUFACTURER'S DESIGNATION OF DRILL: D.B. Snellm	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY: Corps of Engineers - CESAJm	CONTRACTOR FI E NO.: 6738-14-5337m	12. TOTAL SAMPLES	DISTURBED: 5 / UNDISTURBED (UD):
4. NAME OF DRILLER		13. TOTAL NUMBER CORE BOXES	
5. DIREC I N OF BORI NG: ☒ VERTICAL ☐ INCLINED	DEG. FROM E RTICAL / BEARING	14. ELEVA ON GROUND WATER	
		15. DATE RI NG	STARTED: 414-14m / COMPLETE: 425-14m
6. THICKNESS OF OVERBURD: N/Am		16. ELEVA ON TOP OF BORING: -61.0 Ft.m	
7. DEPTH DRILLED NTO ROCK: N/Am		17. TOTAL RECOV Y FOR BORING: 10m %m	
8. TOTAL DEPTH OF BORING: 18.6 Ft.m		18. SIGNATURE AND TI LE OF INSPEC OR: Stephanie A. Setser, P.E., Geotechnical Engineerm	

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-61.0m	.0						-61.0m		
			SAND, poorly-graded, mostly fine-grainedm sand-sized quartz, some fine to edium-grained sand-sized shell, strongm reaction with HCl, moist, 5Y 6/1 gray (SP)m	1860m	1m		Vibracorem -6m.0m		
-65.0m	4.0m		SAND, poorly-graded, mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt (SP)m				-65.0m		
					3m		-68.0m		
-71.0m	10m0m		SAND, poorly-graded, mostly fine-grainedm sand-sized quartz, some fine to edium-grained sand-sized shell,m .5Y 3/1 very dark gray (SP)m		4m		-71.0m		
-73.6m	12m6m								
-74.4m	13.4m		SAND, poorly-graded with silt, mostly sand to gravel-sized shell, little fine-grainedm sand-sized quartz, few silt, trace limestone, strong reaction with HCl, moist, 2.5Y 5/1 gray (SP-SM)		5m		-74.0m		
-74.6m	13.6m		At El. -74.0 Ft., discontinue limestone,m .5Y 3/1 very dark graym						
			SAND, silty, mostly fine to medium-grainedm						

5m 10m 15

(Continued)

Boring DesignationmVB-SLC14-12m

DRILLING LOG (ont. Sheet)	INSTALLATION Jacksonville Districtm	SHEET OF SHEETS
PROJECT Dade SAND Study 2014m	COORDINAT SYS M/DATUM State Plane, FLE (U.S. Ft.)m / HORIZONT NAD83m / VERTICAL NAVD88m	
LOCATION COORDINATES X = 940,762m Y = 1,129,924m	ELEVATION TOP OF BORI G -61.0 Ft.m	

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
			sand-sized quartz, little silt, few coarse-grained sand-sized shell, strongm reaction with HCl, moist, 2.5Y 3/1 very dark gray (SM)m						
-79.0m	18.0m		SAND, poorly-graded, mostly fine tom edium-grained sand-sized quartz, few edium to coarse-grained sand-sized shell,m trace silt, strong reaction with HCl, moist, 2.5Y 3/1 very dark gray (SP)						
			At El. -75.0 Ft., some coarse gravel-sizedm shell, 2.5Y 6/1 graym						
-79.6m	18.6m		At El. -75.9 Ft., 2.5Y 6/2 light brownish gray				-79.6m		
			At El. -76.9 Ft., some medium tom coarse-grained sand-sized shell,m 2.5Y 7/3 pale yellow				Abbreviations:m NR = Not Recorded.m		
			At El. -78.1 Ft., some sand to gravel-sizedm shell, 2.5Y 6/4 light yellowish brown						
			At El. -78.7 Ft., some medium tom coarse-grained sand-sized shell,m 2.5Y 6/2 light brownish graym						
			SAND, poorly-graded with silt, mostly fine to edium-grained sand-sized quartz, some2 sand to gravel-sized shell, few silt, strong2 reaction with HCl, moist, 2.5Y 6/2 light2 brownish gray (SP-SM)2m						

NOTES:m

1. USACE Jacksonville is the custodian form these original files.m

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

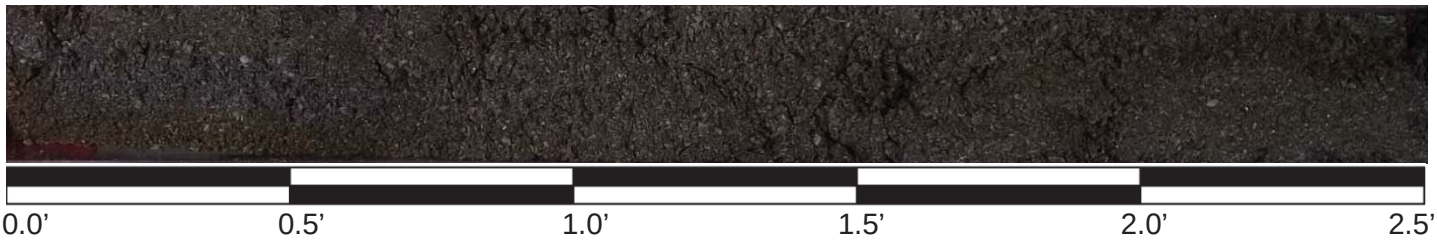
SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
1m	1.0/1.3m	SP*
	4.0/4.3m	SP*
3m	7.0/7.3m	SP*
4m	1mm/10.3m	SP*
5m	13.m/13.3m	SP-SM*m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

15m
5m
30m
35m

SAJ RM 1836-A
JUN 02

VB-SLC14-02
0.0’ to 2.5’

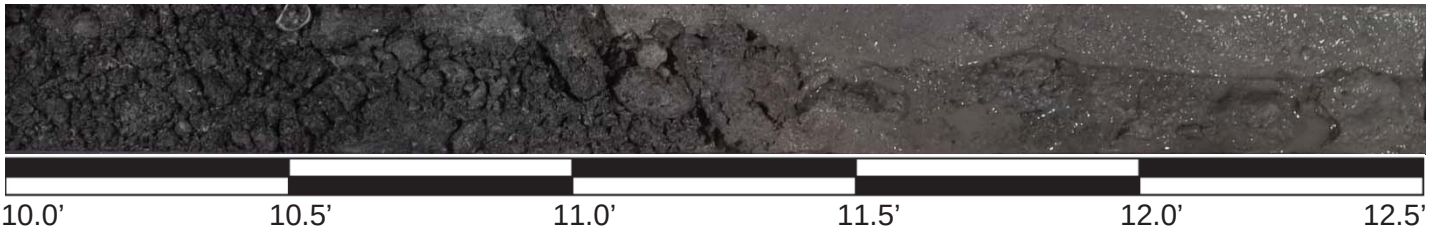


VB-SLC14-02
2.5’ to 5.0’

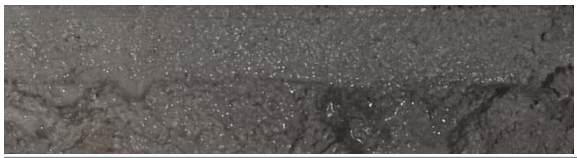
VB-SLC14-02
5.0’ to 7.5’

VB-SLC14-02
7.5’ to 10.0’

VB-SLC14-02
10.0’ to 12.5’



VB-SLC14-02
12.5’ to 13.5’



VB-SLC14-03
0.0’ to 2.5’

VB-SLC14-03
2.5’ to 5.0’

VB-SLC14-03
5.0’ to 7.5’

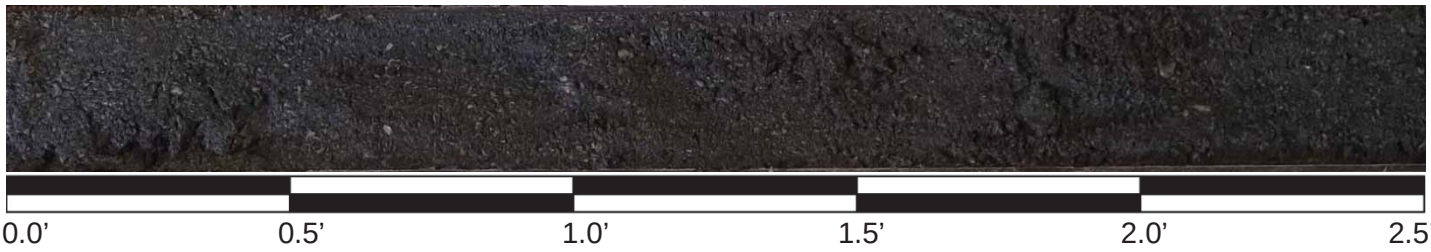
VB-SLC14-03
7.5’ to 10.0’

VB-SLC14-03
10.0’ to 12.5’

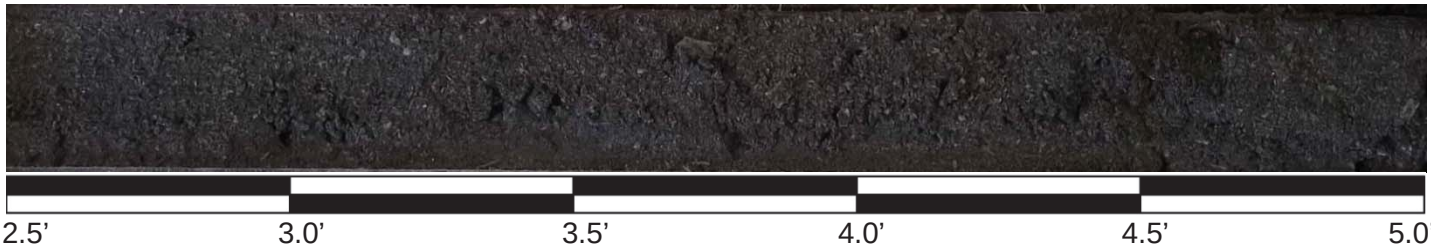
VB-SLC14-03
12.5’ to 15.0’

VB-SLC14-03
15.0’ to 15.3’

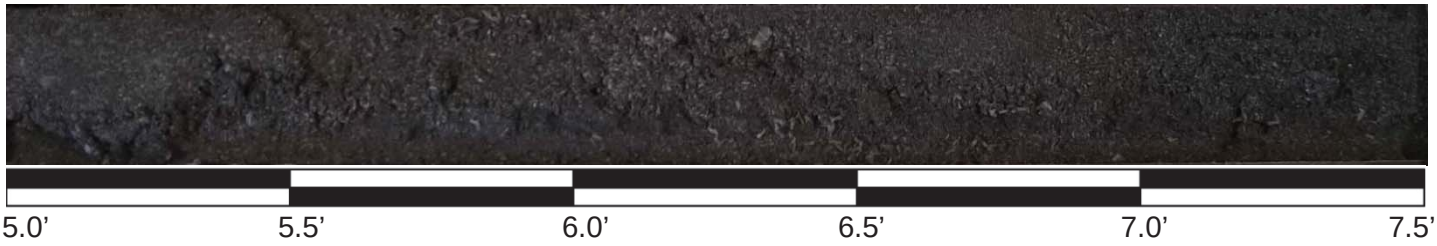
VB-SLC14-05
0.0’ to 2.5’



VB-SLC14-05
2.5’ to 5.0’



VB-SLC14-05
5.0’ to 7.5’



VB-SLC14-05
7.5’ to 10.0’

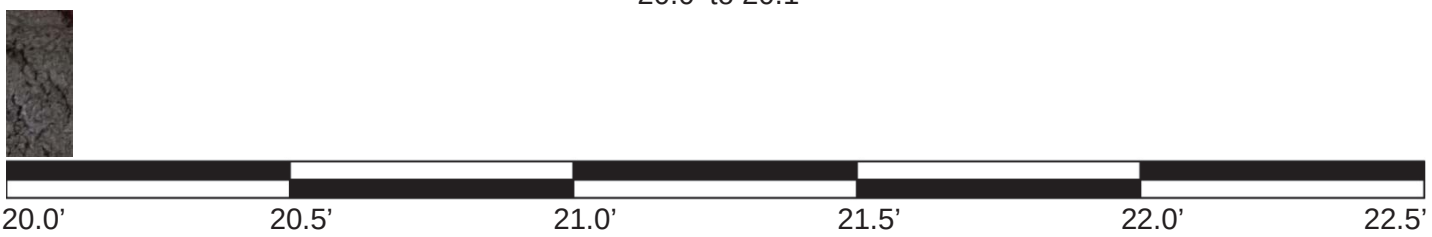
VB-SLC14-05
10.0’ to 12.5’

VB-SLC14-05
12.5’ to 15.0’

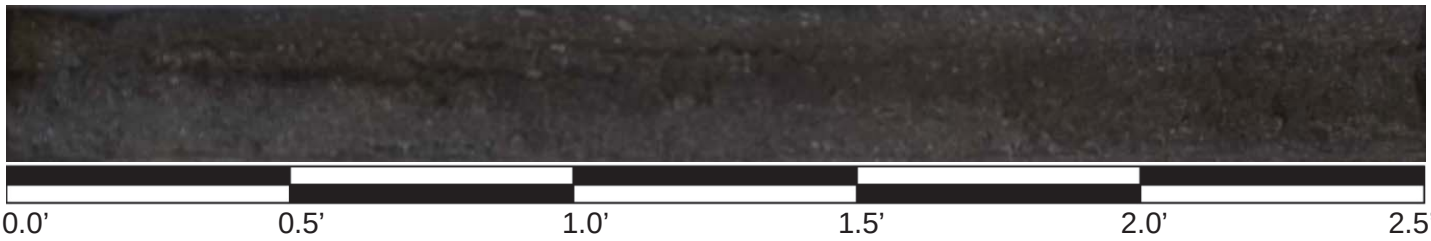
VB-SLC14-05
15.0’ to 17.5’

VB-SLC14-05
17.5’ to 20.0’

VB-SLC14-05
20.0’ to 20.1’

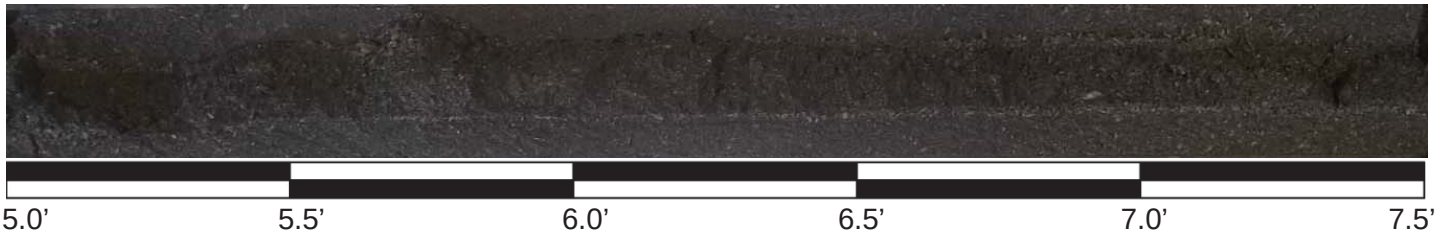


VB-SLC14-12
0.0’ to 2.5’

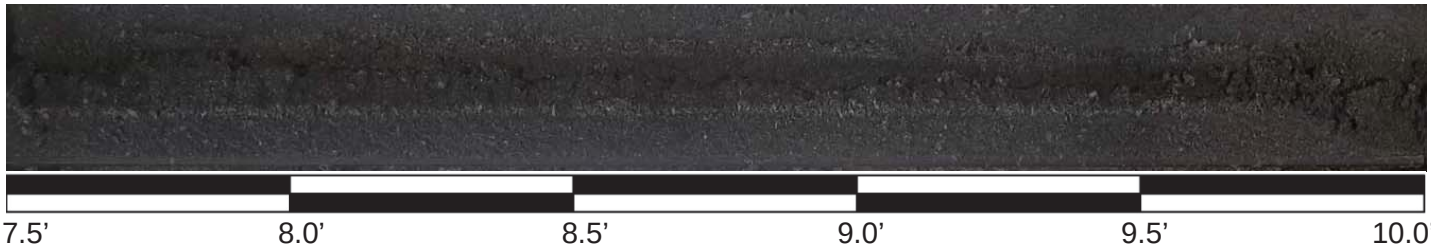


VB-SLC14-12
2.5’ to 5.0’

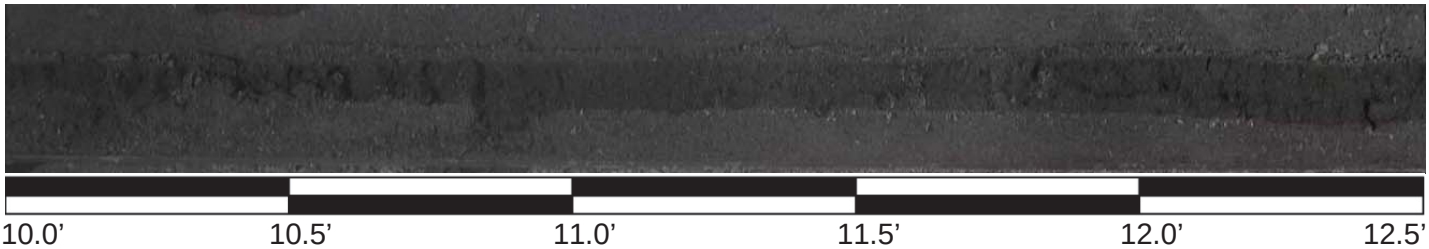
VB-SLC14-12
5.0’ to 7.5’



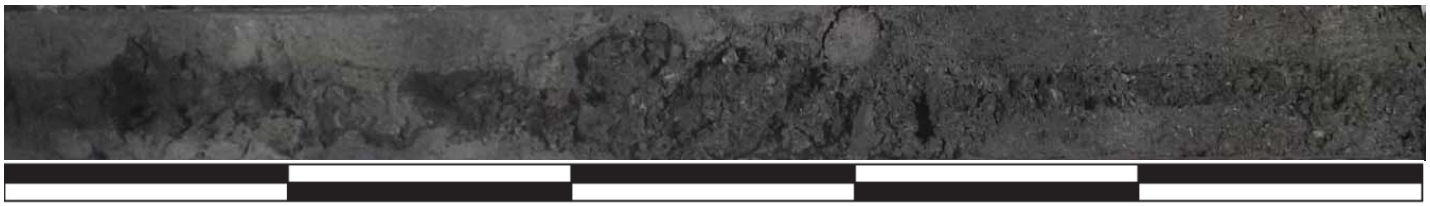
VB-SLC14-12
7.5’ to 10.0’



VB-SLC14-12
10.0’ to 12.5’

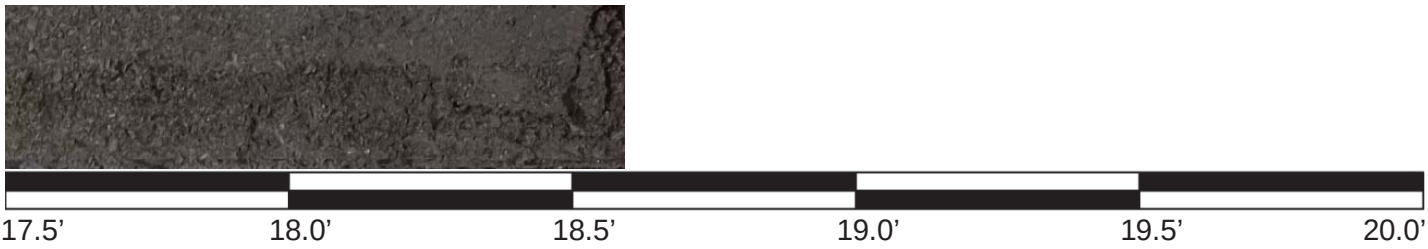


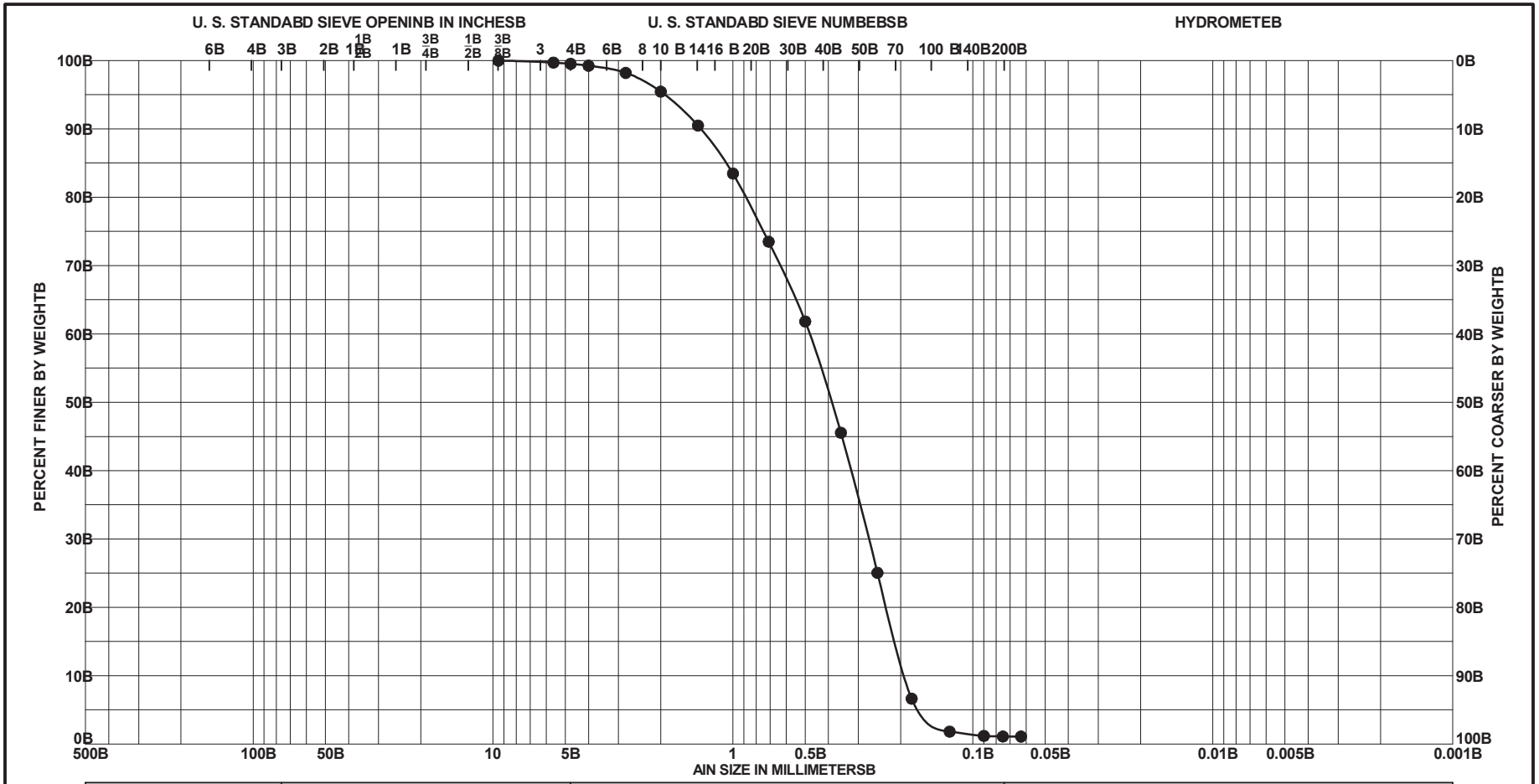
VB-SLC14-12
12.5’ to 15.0’



VB-SLC14-12
15.0’ to 17.5’

VB-SLC14-12
17.5’ to 18.6’





Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	2.0 to 2.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	70s	86s						
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-62Bs
BORING ELEV.	6.0 Ft., NAVD88s
DATE	7/8/2014s

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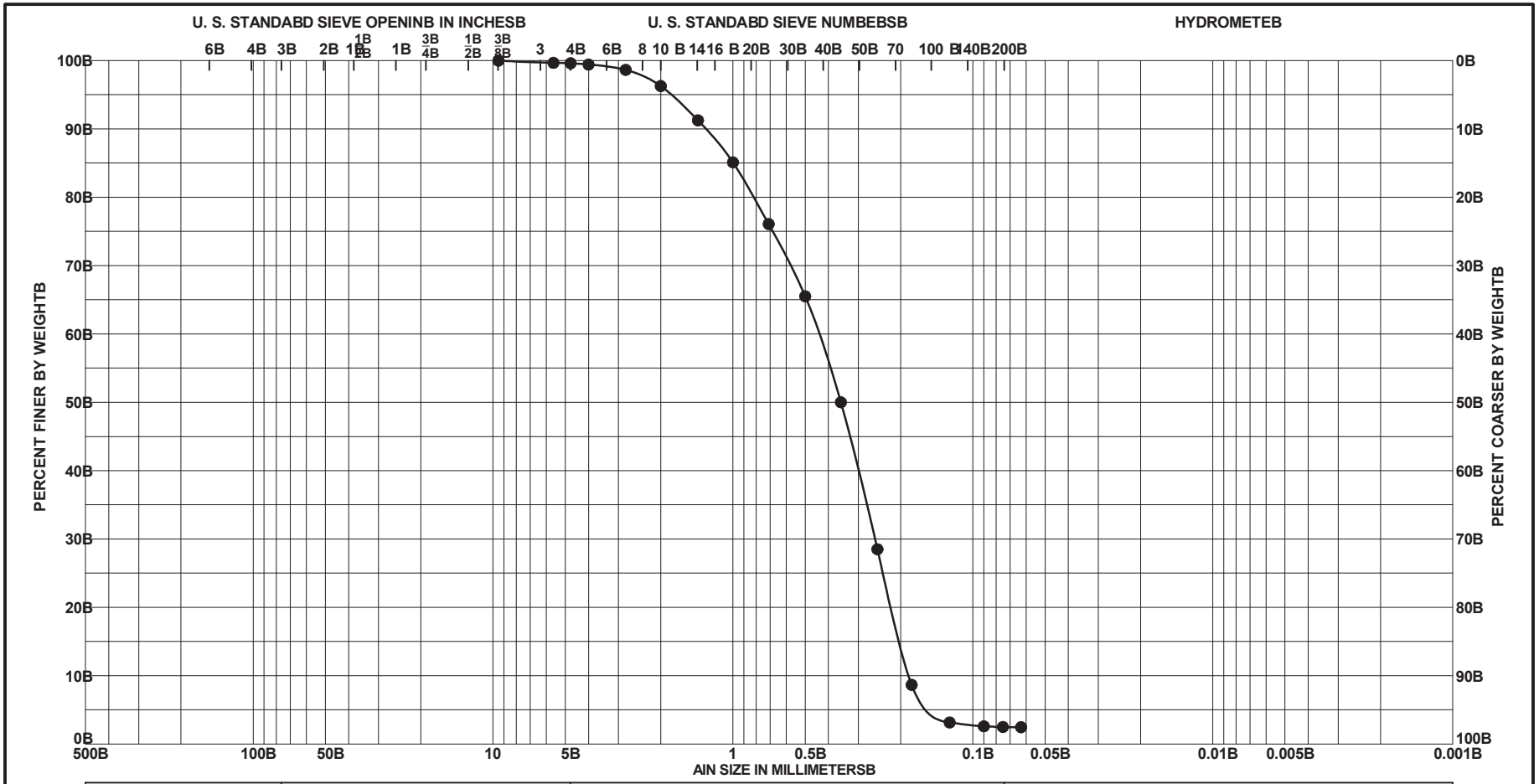


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	4.0 to 4.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	5s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

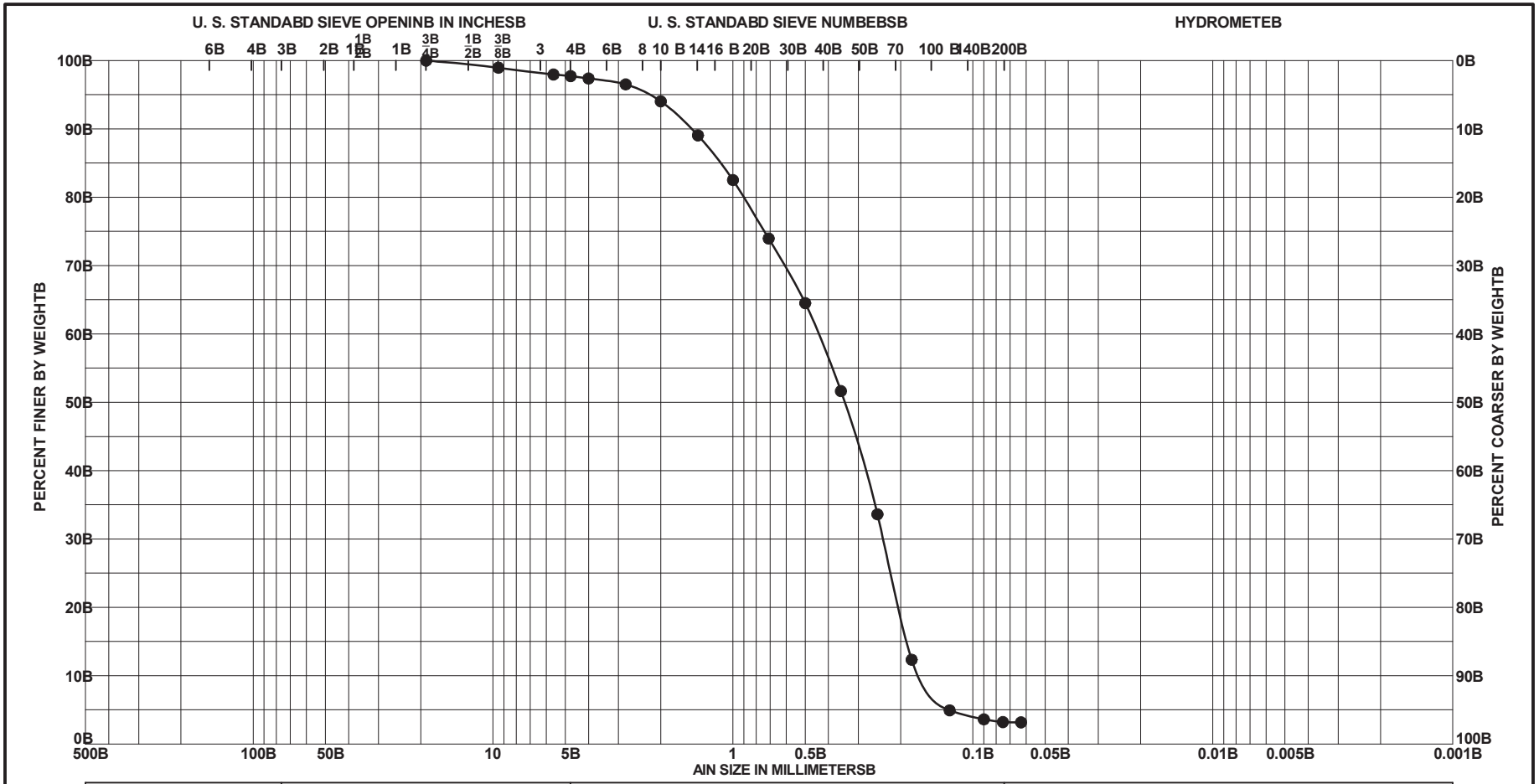
PROJECT Dade SAND Study 2014s

BORING NO. VB-SLC14-62Bs

BORING ELEV. 6.0 Ft., NAVD88s

DATE 7/8/2014s

SAJ FORM 2087B
JUN 02B

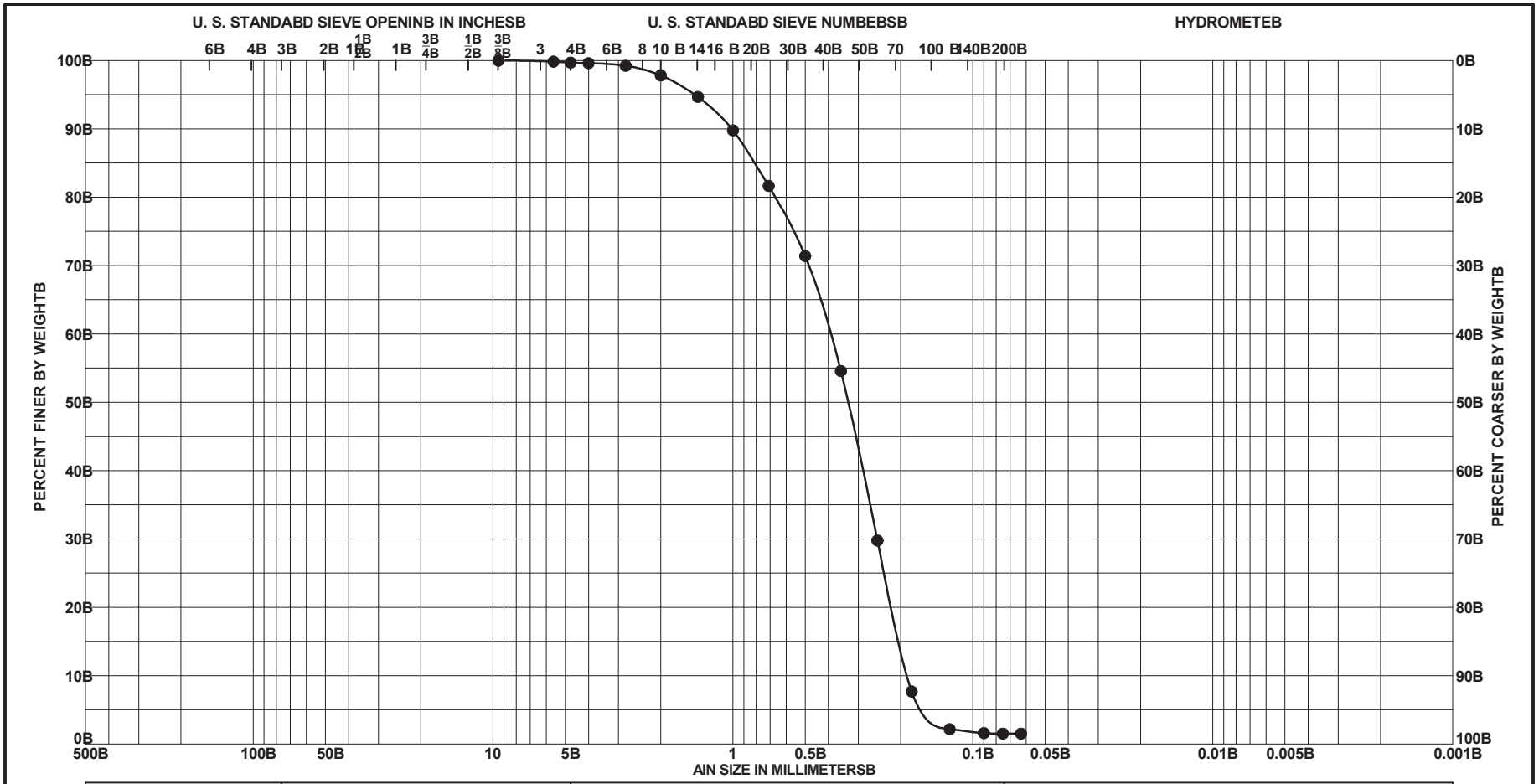


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 3s	.0 to 6.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	77s							
		coarse-grained sand-sized shell,s									
		little fine-grained sands sized quartz,s									
		trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-62Bs
BORING ELEV.	6.0 Ft., NAVD88s
DATE	7/8/2014s

SAJ FORM 2087B
JUN 02B

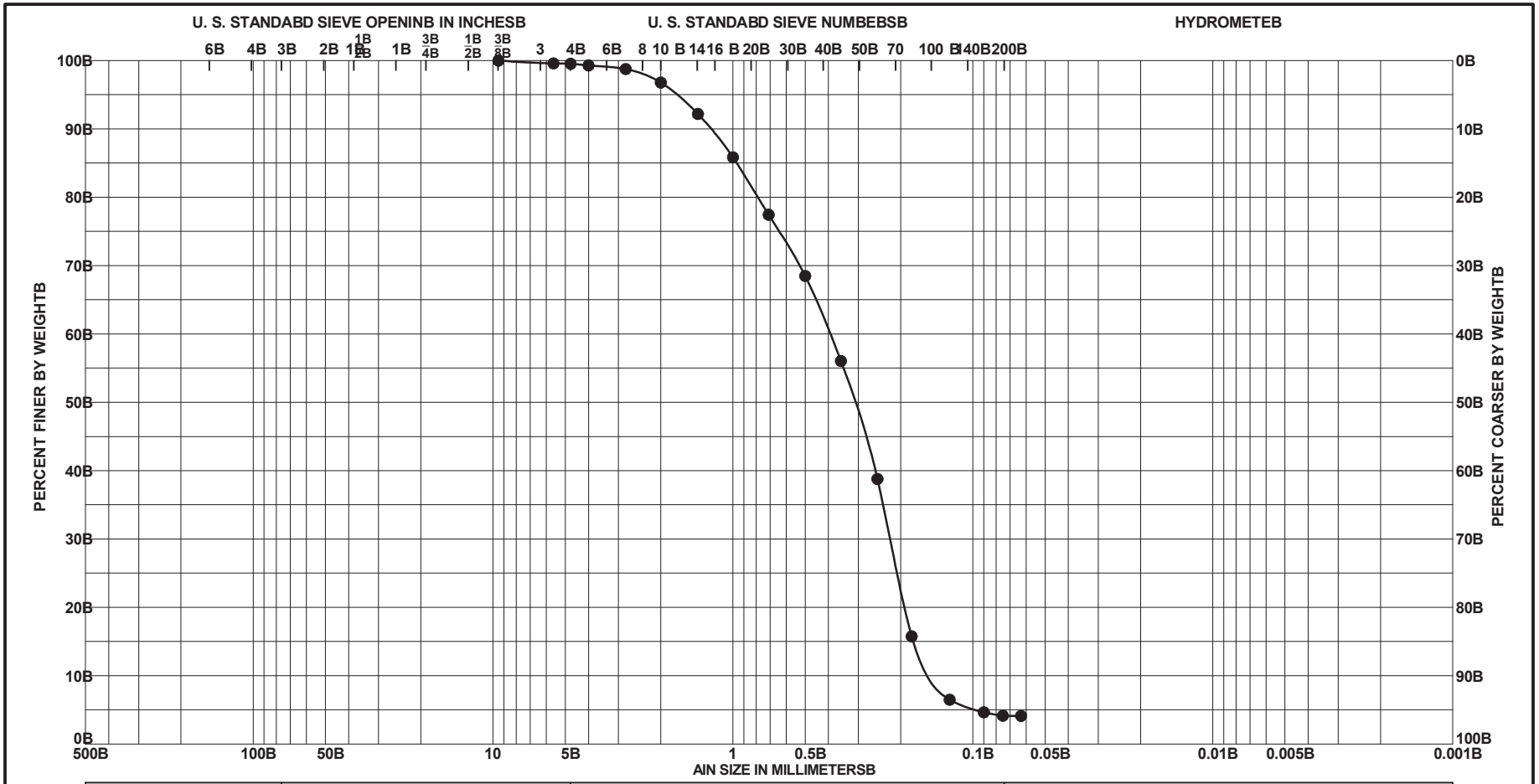


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	8.0 to 8.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s								
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-62Bs
BORING ELEV.	6.0 Ft., NAVD88s
DATE	7/8/2014s

SAJ FORM 2087B
JUN 02B

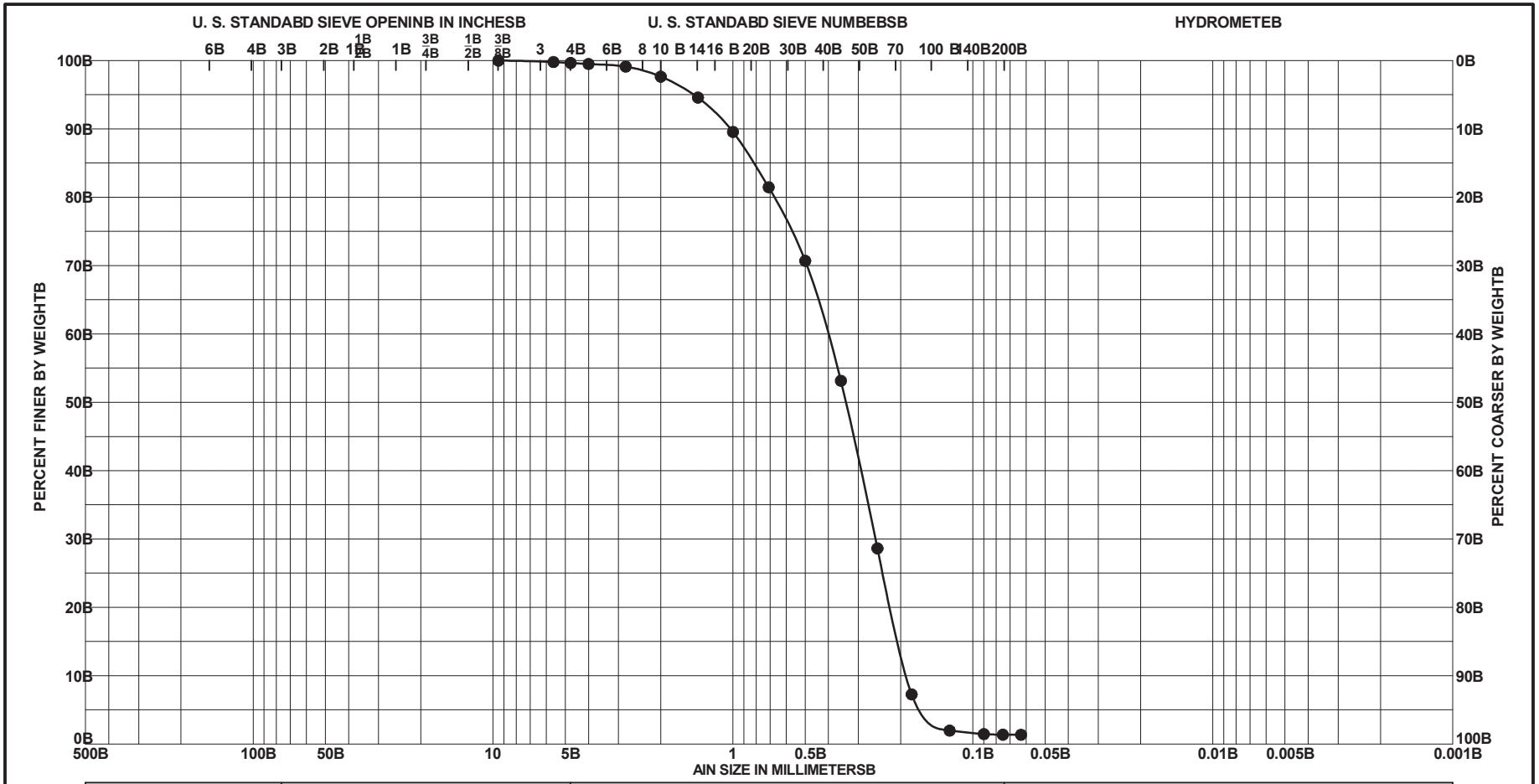


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	10.0 to 10.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 5/1s	4s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-62Bs
BORING ELEV.	6.0 Ft., NAVD88s
DATE	7/8/2014s

SAJ FORM 2087B
JUN 02B

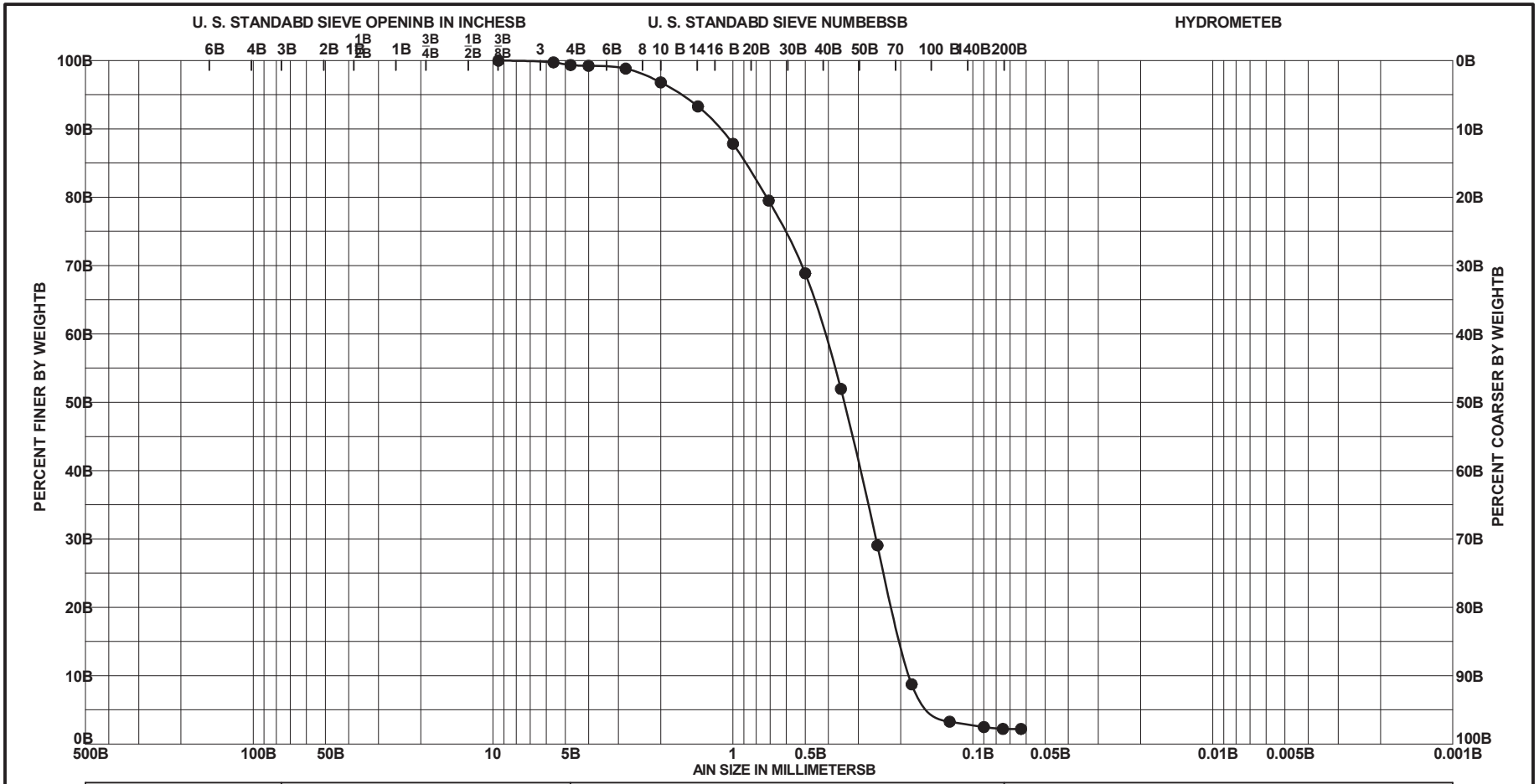


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	2.0 to 2.3 Ft.s	SAND, poorlys graded, mostly fine to s	5Y 6/1s	4s	85s						
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-03s
BORING ELEV.	0.5 Ft., NAVD88s
DATE	7/8/2014s

SAJ FORM 2087B
JUN 02B



Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	5.0 to 5.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	4s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

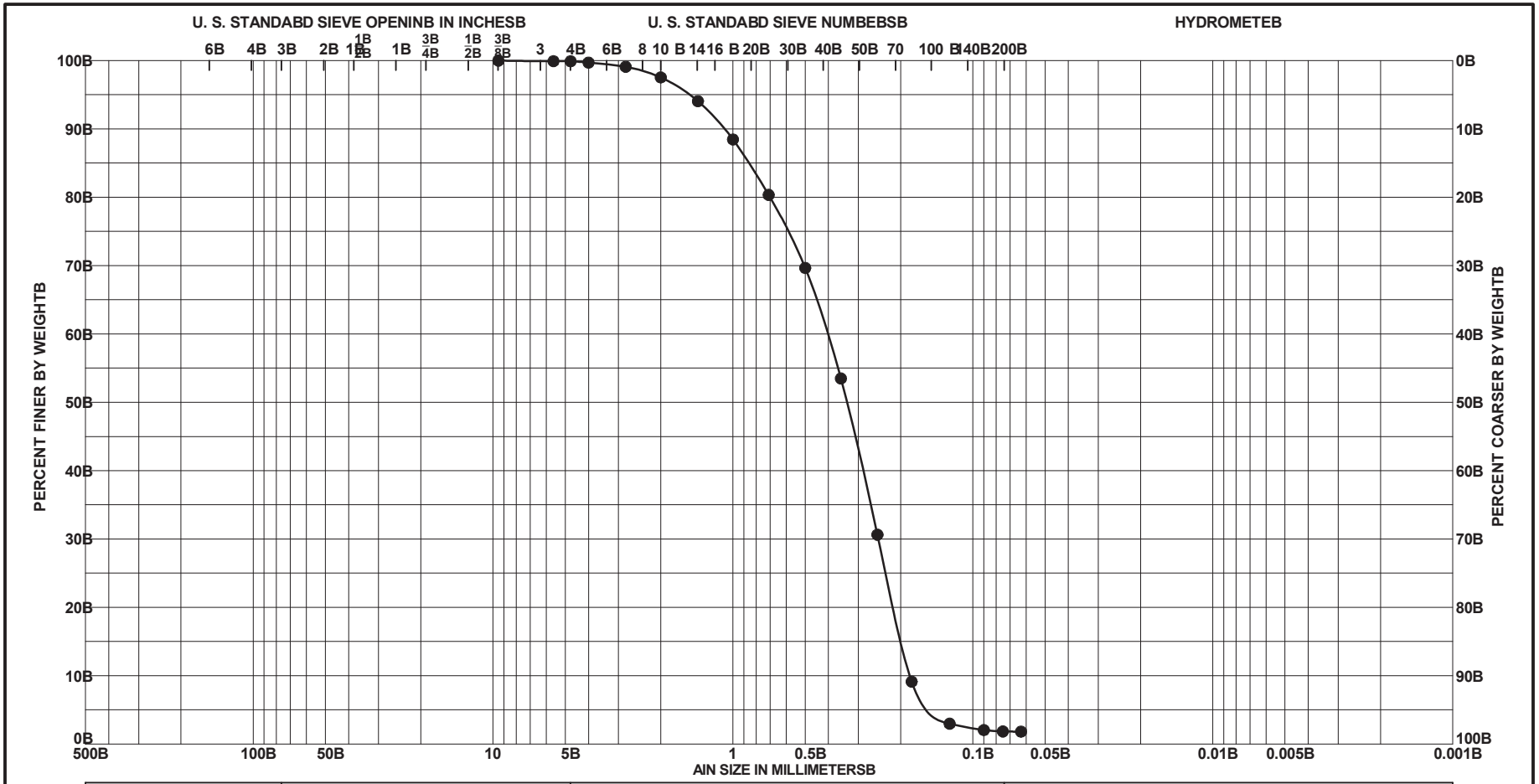
PROJECT Dade SAND Study 2014s

BORING NO. VB-SLC14-03s

BORING ELEV. 0.5 Ft., NAVD88s

DATE 7/8/2014s

SAJ FORM 2087B
JUN 02B



Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 3s	8.0 to 8.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	79s							
		mediums grained sands sized shell,s									
		little fine-grained sands sized quartz,s									
		trace silt, gray (SP)s									

GRADATION CURVES

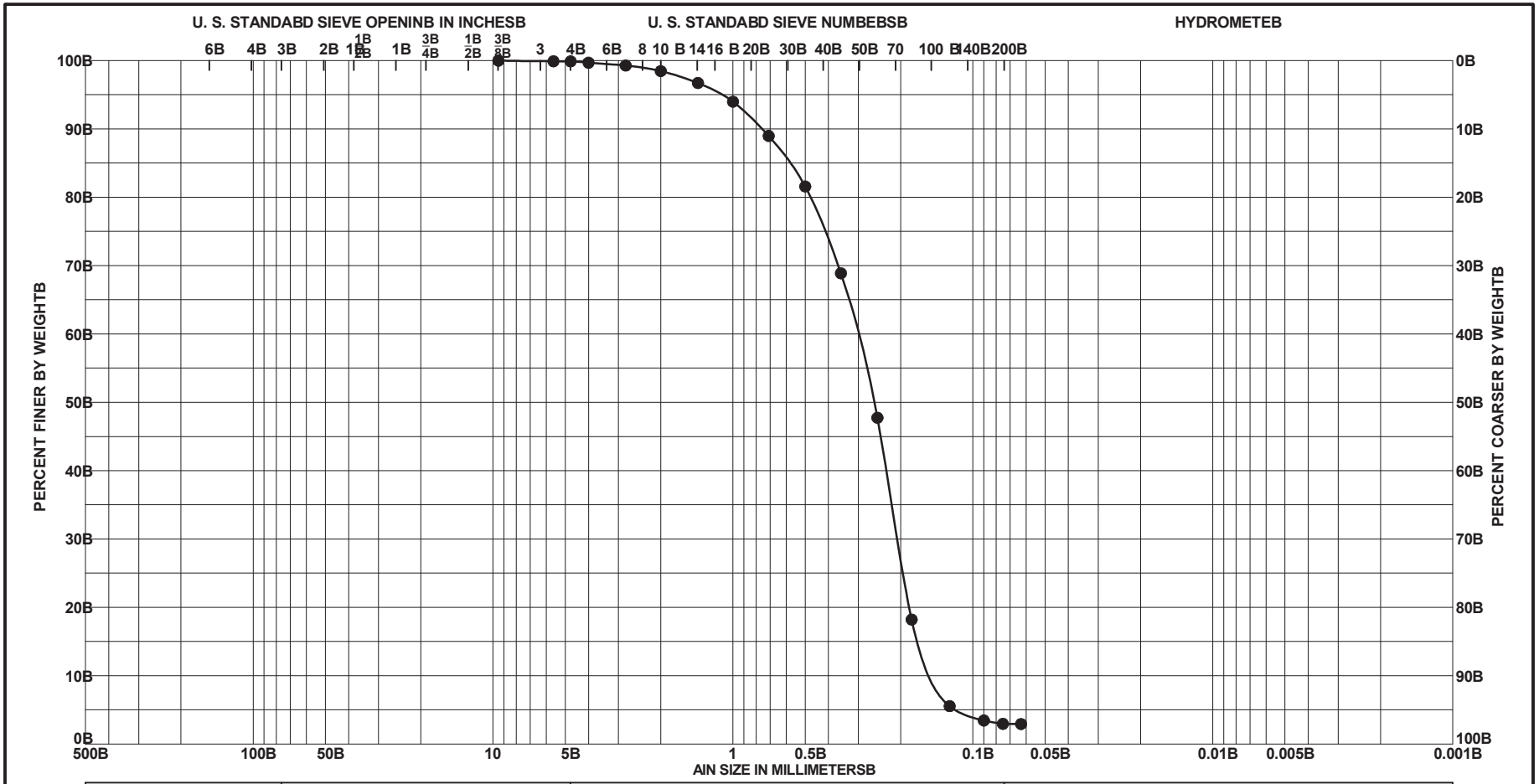
PROJECT Dade SAND Study 2014s

BORING NO. VB-SLC14-03s

BORING ELEV. 0.5 Ft., NAVD88s

DATE 7/8/2014s

SAJ FORM 2087B
JUN 02B



Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	11.0 to 11.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	53s							
		mediums grained sands sized shell,									
		some fine-grained sand-sized shell,s									
		trace silt, gray (SP)s									

GRADATION CURVES

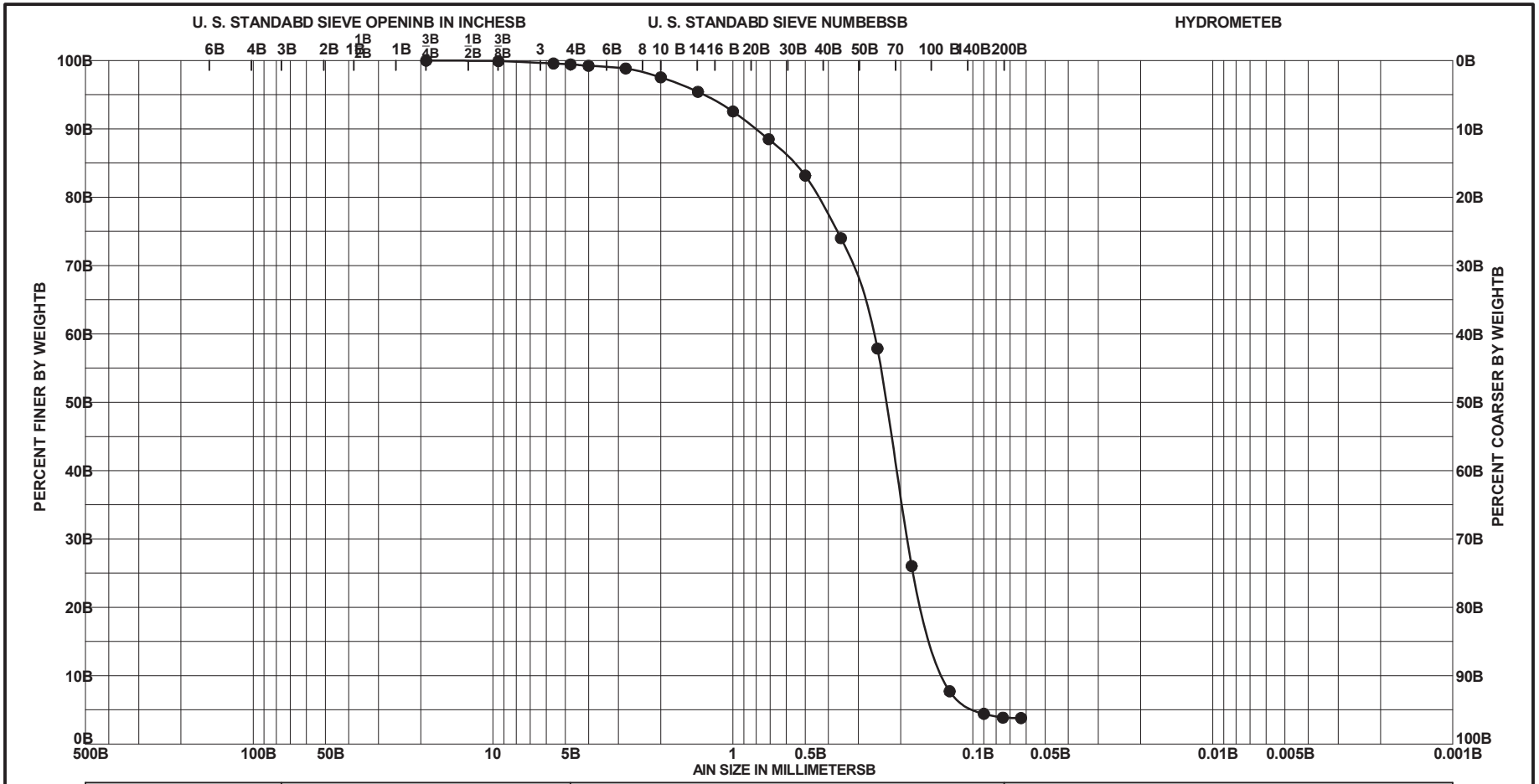
PROJECT Dade SAND Study 2014s

BORING NO. VB-SLC14-03s

BORING ELEV. 0.5 Ft., NAVD88s

DATE 7/8/2014s

SAJ FORM 2087B
JUN 02B

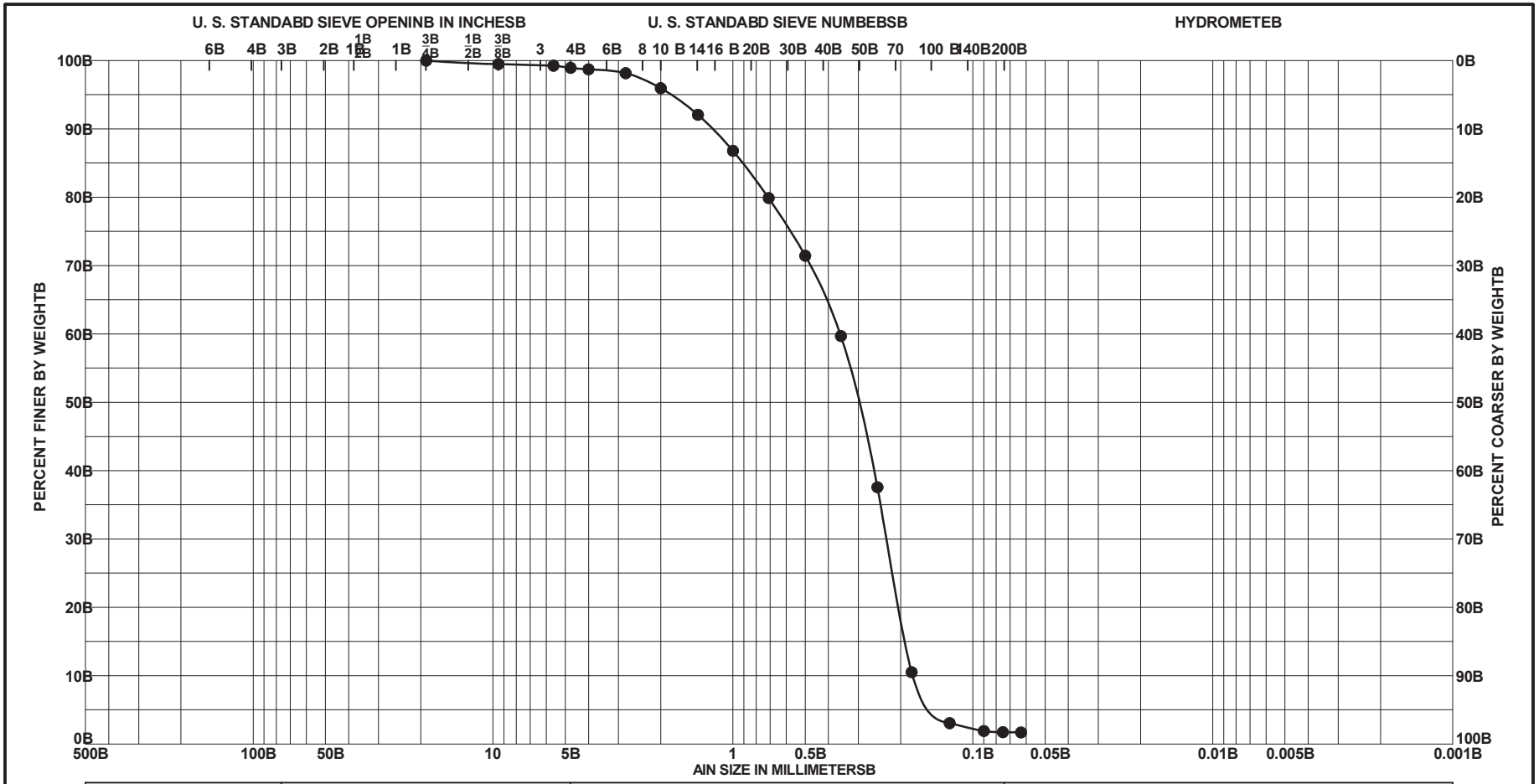


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	14.0 to 14.3 Ft.s	SAND, poorlysgraded, some fine tos	5Y 6/1s	49s							
		mediumsgrained sandssized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-03s
BORING ELEV.	0.5 Ft., NAVD88s
DATE	7/8/2014s

SAJ FORM 2087B
JUN 02B

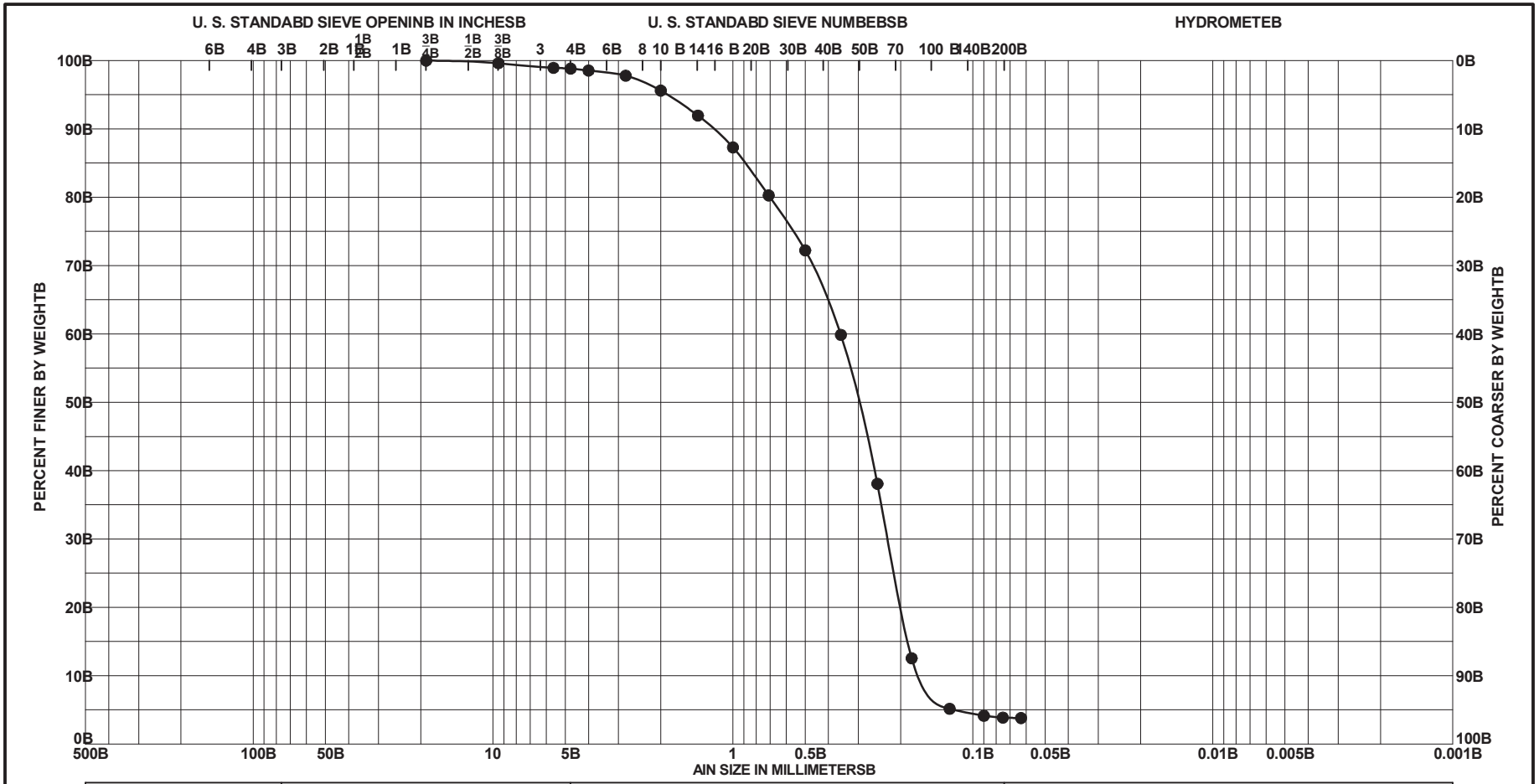


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	2.0 to 2.3 Ft.s	SAND, poorlys graded, mostly fine to s	5Y 6/1s	3s	83s						
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-05s
BORING ELEV.	5.5 Ft., NAVD88s
DATE	7/9/2014s

SAJ FORM 2087B
JUN 02B



Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	5.0 to 5.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	58s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

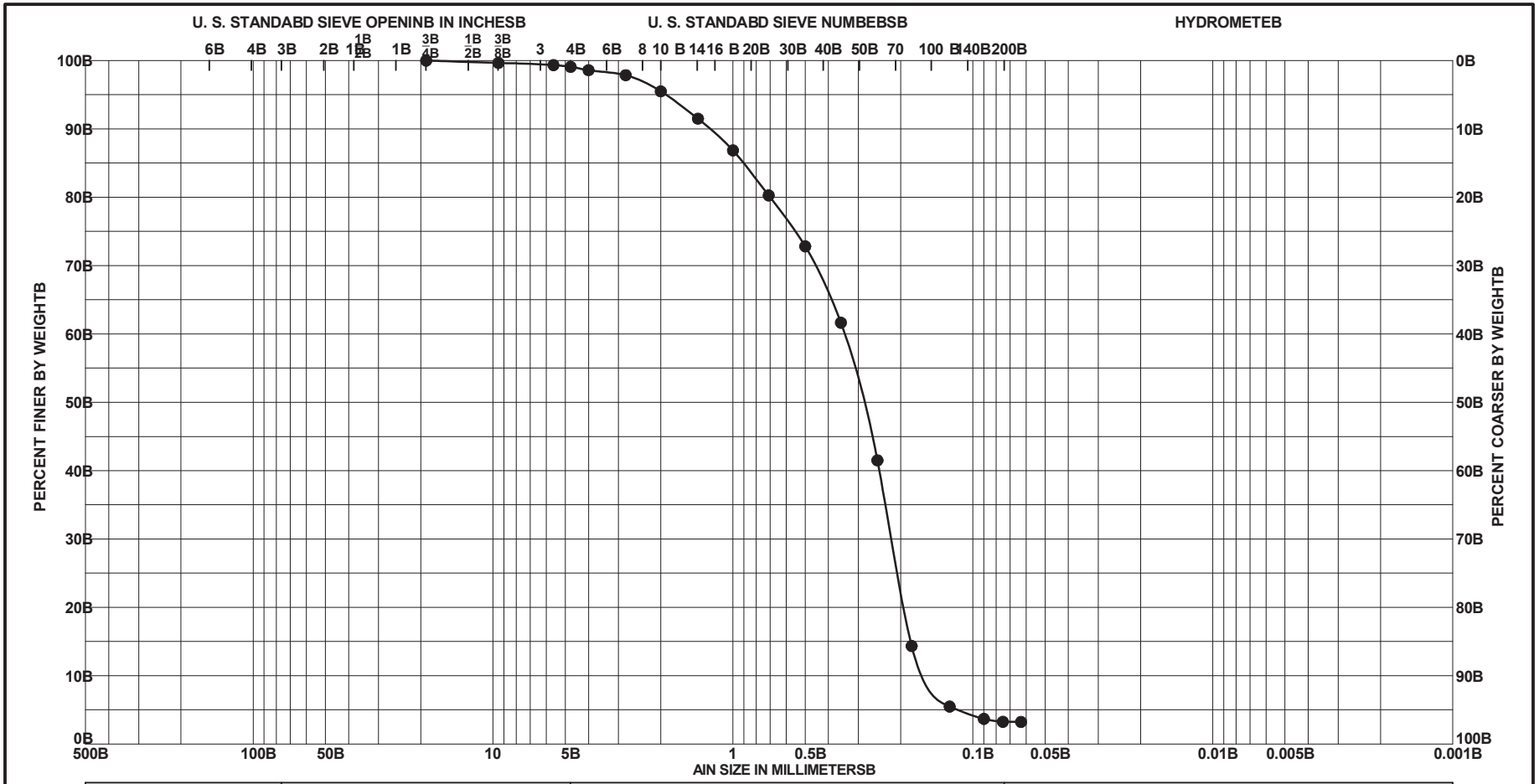
PROJECT Dade SAND Study 2014s

BORING NO. VB-SLC14-05s

BORING ELEV. 5.5 Ft., NAVD88s

DATE 7/9/2014s

SAJ FORM 2087B
JUN 02B

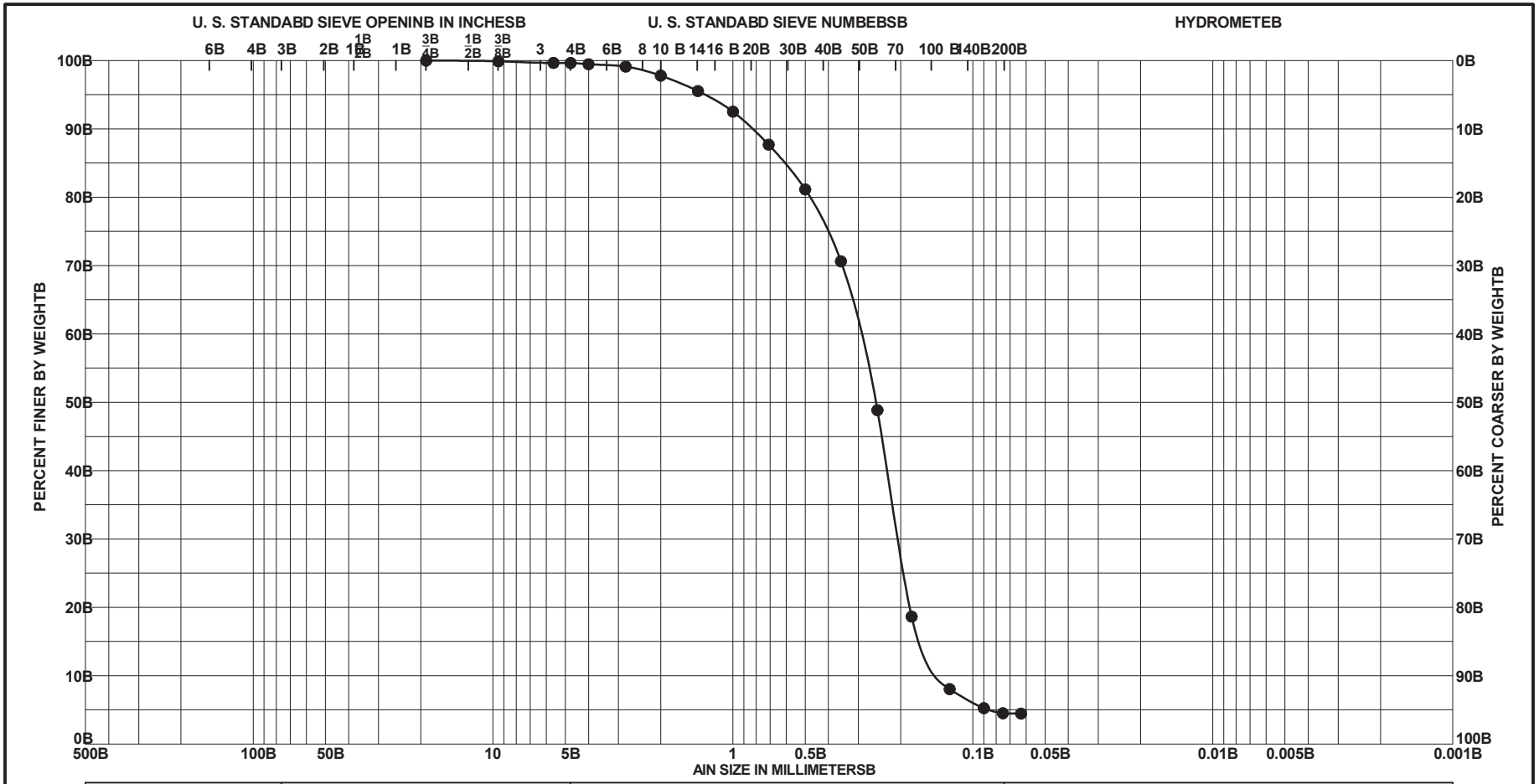


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 3s	8.0 to 8.3 Ft.s	SAND, poorlys graded, mostly fine to s	5Y 6/1s	2s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-05s
BORING ELEV.	5.5 Ft., NAVD88s
DATE	7/9/2014s

SAJ FORM 2087B
JUN 02B

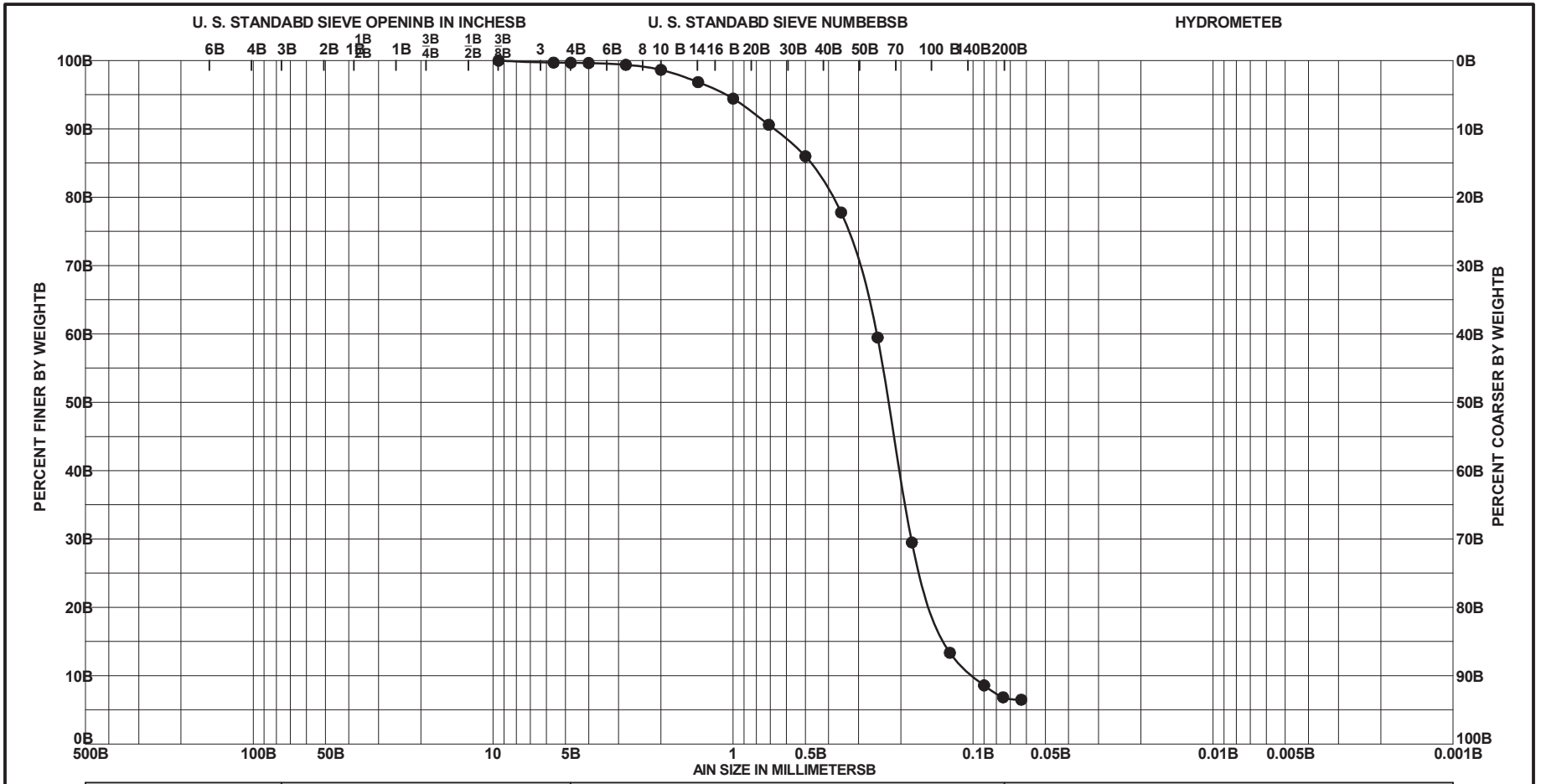


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	12.0 to 12.3 Ft.s	SAND, poorlys graded, mostly s	5Y 3/1s	44s							
		fine-grained sand-sized quartz,									
		some fine to medium s grained									
		sand s sized shell, trace silt, very s									
		dark gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-05s
BORING ELEV.	5.5 Ft., NAVD88s
DATE	7/9/2014s

SAJ FORM 2087B
JUN 02B

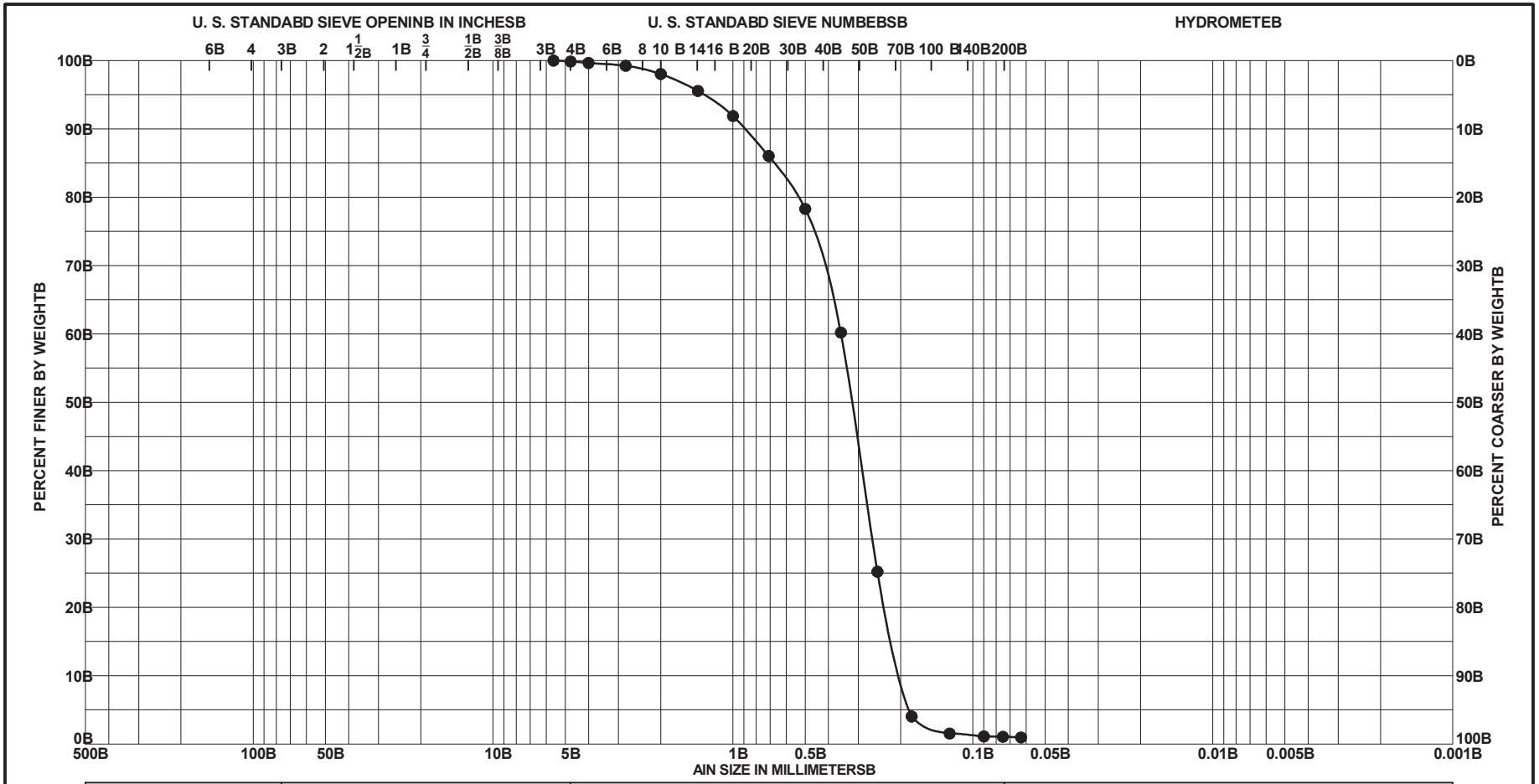


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	15.0 to 15.3 Ft.s	SAND, poorlys graded with silt,s	2.5Y 5/1s								
		mostly fine to mediums grained									
		sands sized shell, some fine-grained									
		sands sized quartz, few silt, grays									
		(SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-05s
BORING ELEV.	5.5 Ft., NAVD88s
DATE	7/9/2014s

SAJ FORM 2087
JUN 02

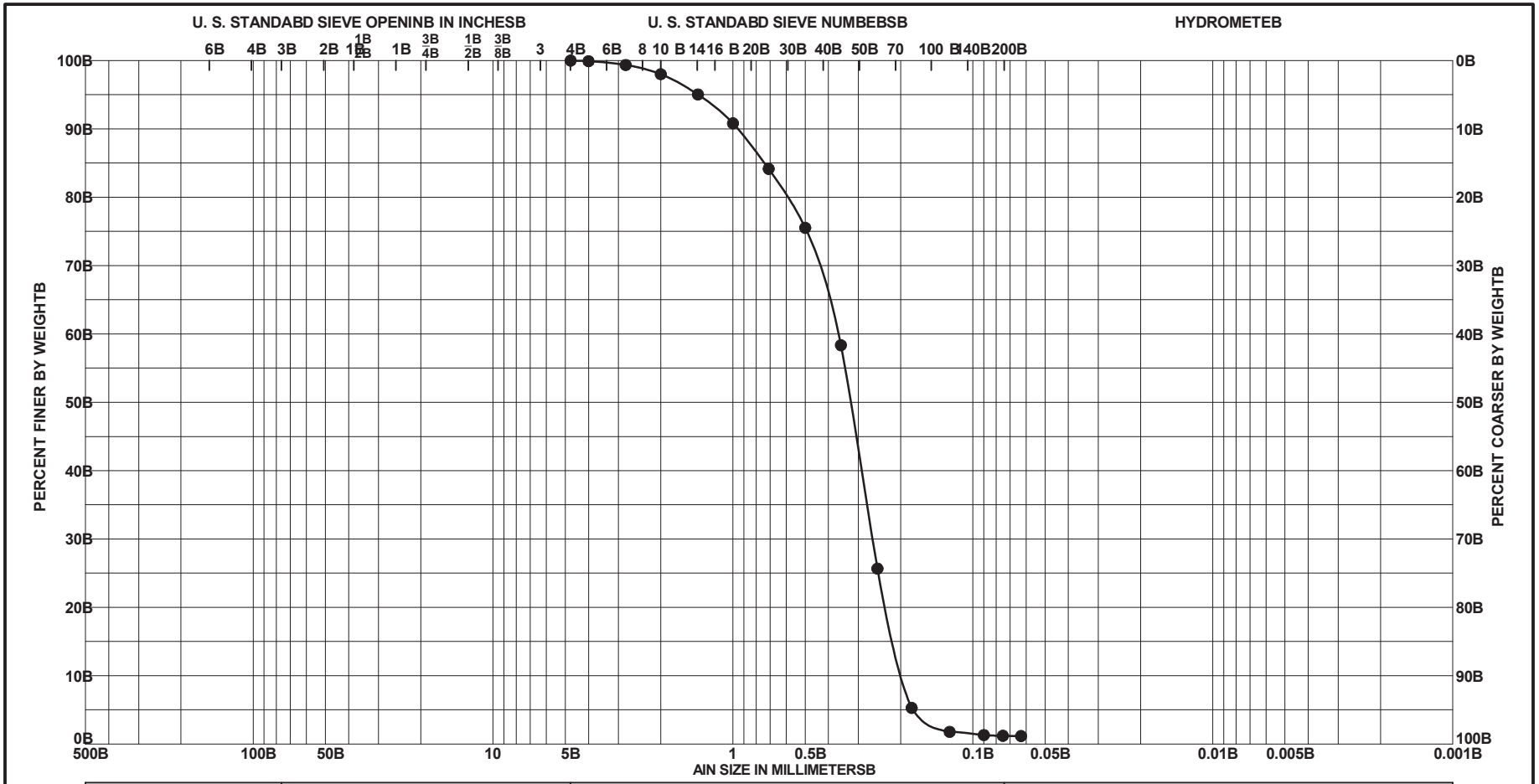


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	1.0 to 1.3 Ft.s	SAND, poorlysgraded, mostlys fine-grained sand-sized quartz, some fine to mediumsgrained ands-sized shell, trace silt, grays (SP)s	5Y 6/1s	46s	80s						

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-$2s
BORING ELEV.	1.0 Ft., NAVD88s
DATE	6/11/2014s

SAJ FORM 2087B
JUN 02B

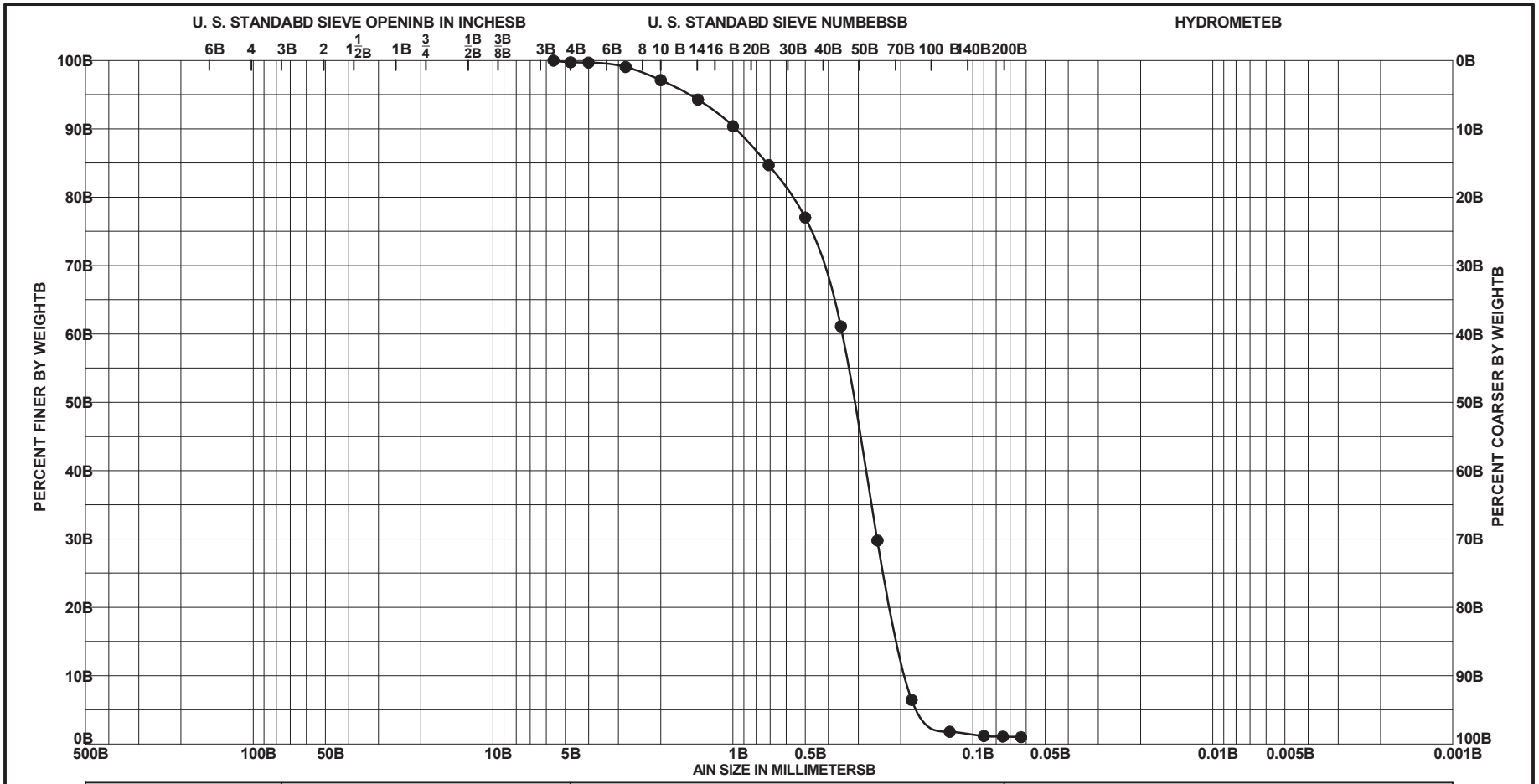


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	4.0 to 4.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	56s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-12s
BORING ELEV.	1.0 Ft., NAVD88s
DATE	6/11/2014s

SAJ FORM 2087B
JUN 02B

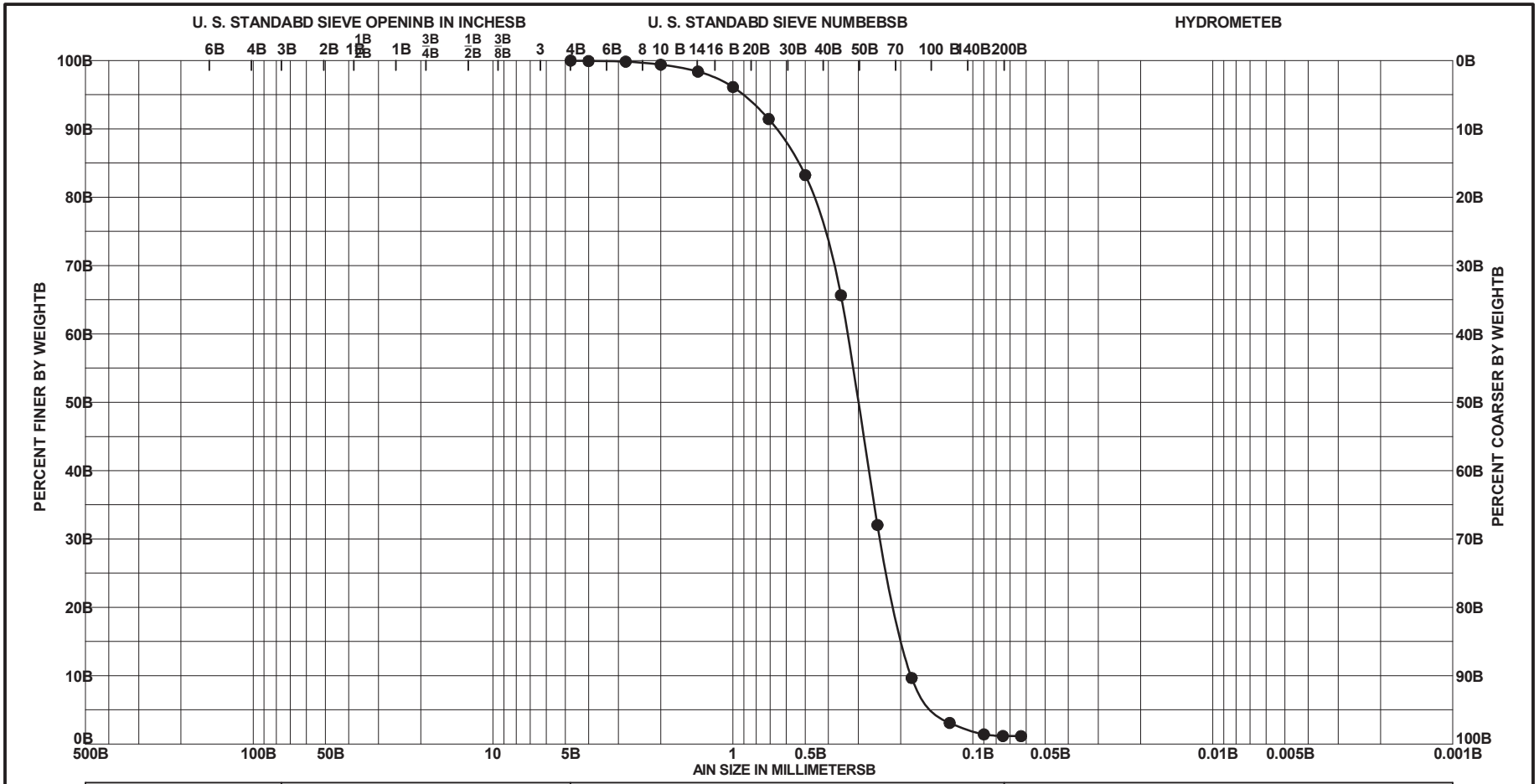


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 3s	7.0 to 7.3 Ft.s	SAND, poorlys graded, mostly fine tos	5Y 6/1s	52s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-$2s
BORING ELEV.	1.0 Ft., NAVD88s
DATE	6/11/2014s

SAJ FORM 2087B
JUN 02B

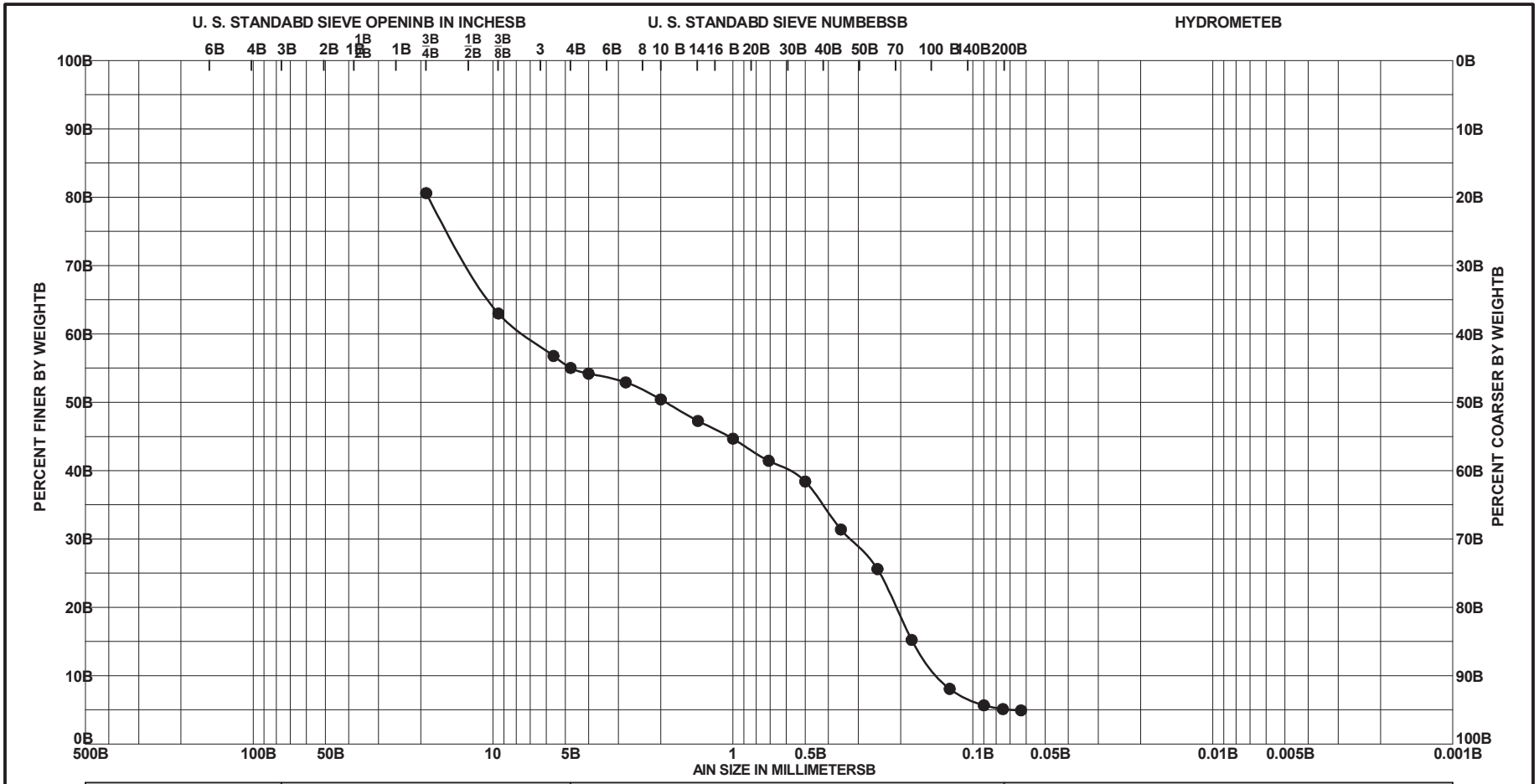


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	10.0 to 10.3 Ft.s	SAND, poorlys graded, mostly s fine-grained sand-sized quartz, some fine to medium s grained sand s sized shell, trace silt, very s dark gray (SP) s	2.5Y 3/1s	41s							

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-12s
BORING ELEV.	1.0 Ft., NAVD88s
DATE	6/11/2014s

SAJ FORM 2087
JUN 02



Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	13.0 to 13.3 Ft.s	SAND, poorlys graded with silt,s	2.5Y 3/1s	72s							
		mostly sand to gravel-sized shell,s									
		little fine-grained sands sized quartz,s									
		few silt, very dark gray (SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-SLC14-12s
BORING ELEV.	1.0 Ft., NAVD88s
DATE	6/11/2014s

SAJ FORM 2087B
JUN 02B

Borrow Area

M4-R105

Boring Designationl VB-MC12-45l

DRILLING LOG	DIVISION	INSTALLATION	SHEET 1l OF 2l SHEETS
	South Atlanticl	Jacksonvil e Districtl	

1. PROJE Southeast Florida SAND Studyl St. Lucie, Martin and Palm Beach Countiesl		9. SIZE A TYPE OF BIT See Remarksl	
		10. COORDI ATE SYSTEM/DATUM State Plane, FLE (U.S. Ft.)l	HORIZONT NAD83
			VERTICA NAVD88l
2. BORING ESI NA TION VB-MC12-4l	LOCATION COOR INATES X = 973,827 Y = 98l ,118l	11. MANUFACTURER'S DESIGNA ION OF DRILL ICE Model 2 Hydraulic Vibracorel	☒ AUTO HAMME ☐ MANUAL HAMME
3. DRILLIN ENCY Corps of Engineers - CESAJl	CONTRACTOR F E NO.	12. TOTAL AMPLE	DISTURB D 4
			UNDISTUR D (UD)
4. NAME O DRILLER Joe Feithl		13. TOTAL MBER CORE BOXES 1l	
5. DIREC I N F B R ING ☒ VERTICA ☐ INCLINED	DEG. FRO VERTICA	BEARING	14. ELEVA ON GROUND WA ER
		15. DATE RING	STARTED 4-l 6- 12l COMPLETED 4-l 6- 12l
6. THICK SS O F OV RBURD N/Al		16. ELEVA ON OP OF BOR NG -73.l Ft.l	
7. DEPTH D LLED NTO OCK N/Al		17. TOTAL COV Y FO BO I NG 100 %l	
8. TOTAL D TH OF BORING 13.4 Ft.l		18. SIGN URE ND TI LE OF INSPECTOR J. Ousley, Geologistl	

ELEV.	DEPTH	LEGEND	CLASSIFICATI F MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 1 FT.	N-VALUE
-73.l	.l						-73.l		
-74.3l	1.3l		SAND, we l-graded with silt, mostly fine tol medium-grained sand-sized shel , fewl fine-grained sand-sized she l, few silt,l Y 5l1 gray (SW-SM)l	100l	1l		Vibracorel -74.l		
			SAND, poorly-graded, mostly fine-grainedl sand-sized quartz, l Y 4/1 dark gray (SP)l	100l	2l		Vibracorel -7l .l		
			At El. -77.0lFt., some fine to medium-grainedl sand-sized shel , some fine to medium-grainedl sand-sized quartz, l Y l /1 grayl	100l	3l		Vibracorel -78.l		
			At El. -79.6 Ft., l Y 6/1 grayl	100l	4l		Vibracorel -81.l		
-83.2l	10.2l		SAND, poorly-graded, mostly medium tol coarse-grained sand-sized she l, little finel gravel-sized limestone (SP)l	100l			Vibracorel		
-84.2l	11.2l		LIMESTONE, moderately weathered,l calcarenitel						
-86.4l	13.4l	Mod. Weathered	BORING TERMINATED IN REFUSALl NOTES:l 1. USACE Jacksonvil e is the custodian forl				-86.4		

10l

15

SAJ RM 1836
JUN 02

(Continued)

DRILLING LOG (Cont. Sheet)	INSTALLATION	SHEET 2l
	Jacksonville Districtl	OF 2l SHEETS

PROJECT	COORDINATE SYSTEM/DATUM	HORIZONT	VERTICA
Southeast Florida SAND Studyl	State Plane, FLE (U.S. Ft.)l	NAD83l	NAVD88l

LOCATION COOR INATES	ELEVATIO TOP OF BORI G
X = 973,827 Y = 98l ,118l	-73.l Ft.l

ELEV.	DEPTH	LEGEND	CLASSIFICATI F MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 1 FT.	N-VALUE

these original files.l

2. Soils are field visual y classified inl accordance with the Unified Soils Classificationl System.l

3. Laboratory Testing Resultsl

SAMPLEl IDl	SAMPLEl DEPTHl	LABORATORYl CLASSIFICATIONl
1l	1.0l1.2l	SW-SM*l
2l	2.5l2.7l	SP*l
3l	.5/5.7l	SP*l
4l	8.0l8.2l	SW-SM*l

*Lab visual classification based on gradationl curve. No Atterberg limits.l

15l
20l
25l
30l
35l

SAJ RM 1836-A
JUN 02

Boring DesignationmVB-MC14-301m

DRILLING LOG	DIVISION	INSTALLATION	SHEET
	South Atlanticm	Jacksonville Districtm	OF 2m SHEETS

1. PROJE Dade SAND Study 20m4m		9. SIZE AND TYPE OF BIT See Remarksm	
		10. COORDI AT E SYSTEM/DATUM State Plane, FLE (U.S. Ft.)m	HORIZONT NAD83
			VERTICAL NAVD88m
2. BORING DESI NAT ION VB-MCm4-30m	LOCATION COORDINATES X = 974,333 Y = 978,83m	11. MANUFACTURER'S DESIGNATION OF DRILL D.B. Snellm	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY Corps of Engineers - CESAJm	CONTRACTOR FI E NO. 6738-14-m337m	12. TOTAL SAMPLES	DISTURBED UNDISTURBED (UD) 0m
4. NAME OF DRILLER		13. TOTAL NUMBER CORE BOXES 0m	
5. DIREC I N OF BORI NG ☒ VERTICAL ☐ INCLINED	DEG. FROM E RTICAL BEARING	14. ELEVA ON GROUND WATER	
		15. DATE RI NG	STARTED 04-23-m4m COMPLETE 04-23-m4m
6. THICKNESS OF OVERBURD N/Am		16. ELEVA ON TOP OF BORING -76.2 Ft.m	
7. DEPTH DRILLED NTO ROCK N/Am		17. TOTAL RECOV Y FOR BORING 83 %m	
8. TOTAL DEPTH OF BORING 20.0 Ft.m		18. SIGNATURE AND TI LE OF INSPEC OR Stephanie A. Setser, P.E., Geotechnical Engineerm	

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-76.2m	0.0						-76.2m		
			SAND, poorly-graded with silt, mostly fine-grained sand-sized quartz, some fine to edium-grained sand-sized shell, few silt, trace limestone, strong reaction with HCl, oist, 5Y 4/m dark gray (SP-SM)m	6m0m			Vibracorem -77.2m		
							-79.2m		
					2m				
			At El. -81m6 Ft., 5Y 7/2 light graym				-82.2m		
			At El. -82.2 Ft., mostly fine tom edium-grained sand-sized quartz, little sand to gravel-sized shell, littlem edium-grained sand-sized limestonem		3m				
			At El. -83.5 Ft., some medium tom coarse-grained sand-sized limestone, somem fine-grained sand-sized quartz, little fine to edium-grained sand-sized shellm				-84.2m		
					4m				
			At El. -87.5 Ft., mostly fine tom edium-grained sand-sized quartz, little sand to gravel-sized limestone, littlem edium-grained sand-sized shellm				-88.2m		

0m

0m

(Continued)

DRILLING LOG (ont. Sheet)	INSTALLATION Jacksonville Districtm	SHEET 2m OF 2m SHEETS

PROJECT	COORDINAT SYS M/DATUM	HORIZONT	VERTICAL
Dade SAND Study 20m4m	State Plane, FLE (U.S. Ft.)m	NAD83m	NAVD88m

LOCATION COORDINATES	ELEVATION TOP OF BORI G
X = 974,333 Y = 978,83m	-76.2 Ft.m

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/ 1 .	N-VALUE
-92.7m	6.m								
		NO RECOVERY							
-96.2m	20.0m						-96.2m		

NOTES:m

1. USACE Jacksonville is the custodian form these original files.m

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
	.0/1.3m	SP-SM*m
2m	3.0/3.3m	SP-SM*m
3m	6.0/6.3m	SP-SM*m
4m	8.0/8.3m	SP-SM*m
	2.0/12.3m	SP-SM*m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

Abbreviations:m
NR = Not Recorded.m

20m
25m
30m
35

SAJ RM 1836-A
JUN 02

Boring DesignationmVB-MC14-321m

DRILLING LOG	DIVISION: South Atlanticm	INSTALLATION: Jacksonville Districtm	SHEET OF 2m SHEETS

1. PROJE: Dade SAND Study 20m4m		9. SIZE AND TYPE OF BIT: See Remarksm	
		10. COORDI AT E SYSTEM/DATUM: State Plane, FLE (U.S. Ft.)m	HORIZONT: NAD83 / VERTICAL: NAVD88m
2. BORING DESI NAT ION: VB-MCm4-32m	LOCATION COORDINATES: X = 974,350m Y = 976,849m	11. MANUFACTURER'S DESIGNATION OF DRILL: D.B. Snellm	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY: Corps of Engineers - CESAJm	CONTRACTOR FI E NO.: 6738-14-m337m	12. TOTAL SAMPLES	DISTURBED: / UNDISTURBED (UD): 0m
4. NAME OF DRILLER		13. TOTAL NUMBER CORE BOXES: 0m	
5. DIREC I N OF BORI NG: ☒ VERTICAL ☐ INCLINED	DEG. FROM E RTICAL: / BEARING:	14. ELEVA ON GROUND WATER	
		15. DATE RI NG	STARTED: 04-24-m4m / COMPLETE: 04-24-m4m
6. THICKNESS OF OVERBURD: N/Am		16. ELEVA ON TOP OF BORING: -63.2 Ft.m	
7. DEPTH DRILLED NTO ROCK: N/Am		17. TOTAL RECOV Y FOR BORING: 93 %m	
8. TOTAL DEPTH OF BORING: 20.0 Ft.m		18. SIGNATURE AND TI LE OF INSPEC OR: Stephanie A. Setser, P.E., Geotechnical Engineerm	

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-63.2m	0.0						-63.2m		
			SAND, poorly-graded, mostly fine-grainedm sand-sized quartz, little fine to coarse-grained sand-sized shell, strongm reaction with HCl, moist, N 6/ gray (SP)m	620m			Vibracorem		
-66.2m	3.0m		SAND, poorly-graded, mostly fine tom coarse-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt (SP)m				-66.2m		
			At El. -71m2 Ft., mostly sand to gravel-sizedm shell, few fine-grained sand-sized quartzm		2m		-7m.2m		
			At El. -75m2 Ft., mostly fine tom edium-grained sand-sized shell, littlem fine-grained sand-sized quartzm		3m		-7m.2m		
							-78.2m		

0m

0m

SAJ RM 1836
JUN 02

(Continued)

DRILLING LOG (ont. Sheet)	INSTALLATION Jacksonville Districtm	SHEET 2m OF 2m SHEETS

PROJECT	COORDINAT SYS M/DATUM	HORIZONT	VERTICAL
Dade SAND Study 20m4m	State Plane, FLE (U.S. Ft.)m	NAD83m	NAVD88m

LOCATION COORDINATES	ELEVATION TOP OF BORI G
X = 974,350m Y = 976,849m	-63.2 Ft.m

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
			At El. -78.2 Ft., some fine-grainedm sand-sized quartz, some fine to edium-grained sand-sized shellm		4m				
			At El. -79.2 Ft., little sand to gravel-sizedm shell, 5Y 6/1 graym						
			At El. -79.5 Ft., 2" silt seam						
			At El. -80.0 Ft., mostly fine tom edium-grained sand-sized shell, tracem limestone, 5Y 7/1 light graym						
			At El. -80.9 Ft., N 5/ graym				-8m.2m		
-8m.8m	8.6m								
		NR							
-83.2m	20.0m						-83.2m		

NOTES:m

1. USACE Jacksonville is the custodian form these original files.m

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
	3.0/3.3m	SP*m
2m	8.0/8.3m	SP*m
3m	2.0/12.3m	SP*m
4m	.0/15.3m	SP*m
	8.0/18.3m	SP*m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

Abbreviations:m
NR = Not Recorded.m

20m
25m
30m
35

SAJ RM 1836-A
JUN 02

Boring DesignationmVB-MC14-331m

DRILLING LOG	DIVISION: South Atlanticm	INSTALLATION: Jacksonville Districtm	SHEET OF 2m SHEETS

1. PROJE: Dade SAND Study 20m4m		9. SIZE AND TYPE OF BIT: See Remarksm	
		10. COORDI AT E SYSTEM/DATUM: State Plane, FLE (U.S. Ft.)m	HORIZONT: NAD83 / VERTICAL: NAVD88m
2. BORING DESI NAT ION: VB-MCm4-33m	LOCATION COORDINATES: X = 976,330 Y = 97m,85m	11. MANUFACTURER'S DESIGNATION OF DRILL: D.B. Snellm	☐ AUTO HAMMER ☐ MANUAL HAMMER
3. DRILLING AGENCY: Corps of Engineers - CESAJm	CONTRACTOR FI E NO.: 6738-14-m337m	12. TOTAL SAMPLES	DISTURBED: / UNDISTURBED (UD): 0m
4. NAME OF DRILLER		13. TOTAL NUMBER CORE BOXES: 0m	
5. DIREC I N OF BORI NG: ☒ VERTICAL ☐ INCLINED	DEG. FROM E RTICAL: / BEARING:	14. ELEVA ON GROUND WATER	
		15. DATE RI NG	STARTED: 04-17-m4m / COMPLETE: 04-17-m4m
6. THICKNESS OF OVERBURD: N/Am		16. ELEVA ON TOP OF BORING: -7m.2 Ft.m	
7. DEPTH DRILLED NTO ROCK: N/Am		17. TOTAL RECOV Y FOR BORING: 90 %m	
8. TOTAL DEPTH OF BORING: 20.0 Ft.m		18. SIGNATURE AND TI LE OF INSPEC OR: Stephanie A. Setser, P.E., Geotechnical Engineerm	

ELEV.	DEPTH	LEGEND	CLASSIFICATI OF M ATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1' N-VALUE
-7m2m	0.0						-7m.2m	
			SAND, poorly-graded, mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt, strong reaction with HCl, moist, N 4/ dark gray (SP)m	80m			Vibracorem -72.2m	
							-76.2m	
					2m		-80.2m	
					3m		-83.2m	
					4m			
-86.2m	.0m		At El. -86.0 Ft., 1/2" thick silt seam.m					

0m 0m

SAJ RM 1836
JUN 02

(Continued)

DRILLING LOG (ont. Sheet)

INSTALLATION	SHEET 2m
Jacksonville Districtm	OF 2m SHEETS

PROJECT	COORDINAT SYS M/DATUM	HORIZONT	VERTICAL
Dade SAND Study 20m4m	State Plane, FLE (U.S. Ft.)m	NAD83m	NAVD88m

LOCATION COORDINATES	ELEVATION TOP OF BORI G
X = 976,330 Y = 975,857m	-7m.2 Ft.m

ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% REC.	BOX OR SAMPLE	RQD OR UD	REMARKS	BLOWS/1 .	N-VALUE
-86.6m	.4m		5Y 4/1 dark gray1m						
			SILT, inorganic-H, some fine to1m edium-grained sand-sized quartz, little fine to coarse-grained sand-sized shell, strongm reaction with HCl, moist, 10Y 5/1 greenish gray (MH)m				-87.2m		
-89.2m	8.0m		SAND, poorly-graded, mostly fine tom edium-grained sand-sized shell, somem fine-grained sand-sized quartz, trace silt, strong reaction with HCl, moist, N 4/ dark gray (SP)m						
		NR							
-9m.2m	20.0m						-9m.2m		

NOTES:m

1. USACE Jacksonville is the custodian form these original files.m

2. Soils are field visually classified inm accordance with the Unified Soils Classification System.m

3. Laboratory Testing Resultsm

SAMPLEm IDm	SAMPLEm DEPTHm	LABORATORYm CLASSIFICATIONm
	.0/1.3m	SP*1m
2m	.0/5.3m	SP*1m
3m	9.0/9.3m	SP*1m
4m	2.0/12.3m	SP*1m
	6.0/16.3m	SP*m

*Lab visual classification based on gradationm curve. No Atterberg limits.m

Abbreviations:m
NR = Not Recorded.m

20m
25m
30m
35

SAJ RM 1836-A
JUN 02


SAND Study
VB-MC12-40
0.0'—13.4'

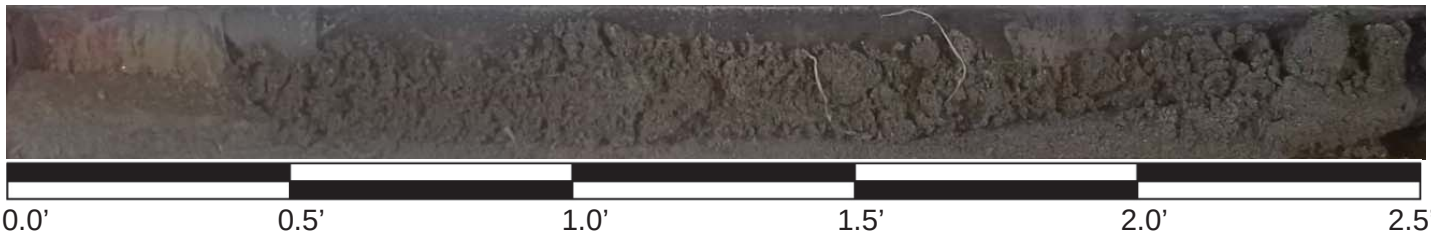

SAND Study
VB-MC12-40
0.0'—5.0'
19 Jun 12


SAND Study
VB-MC12-40
5.0'—10.0'
19 Jun 12

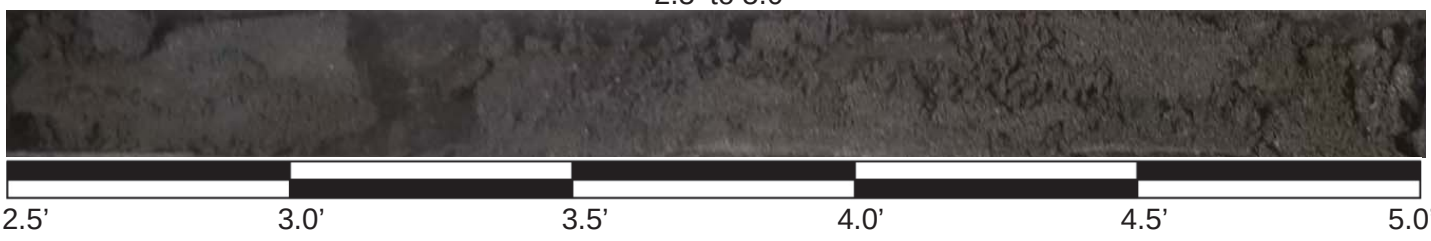

SAND Study
VB-MC12-40
10.0'—13.4'
19 Jun 12

Dade SAND Study 2014
Vibracore and Lab Analysis
AMEC Project No. 6738-14-5337
Contract No. W912EP-11-D-0002, TO 0086

VB-MC14-30
0.0’ to 2.5’

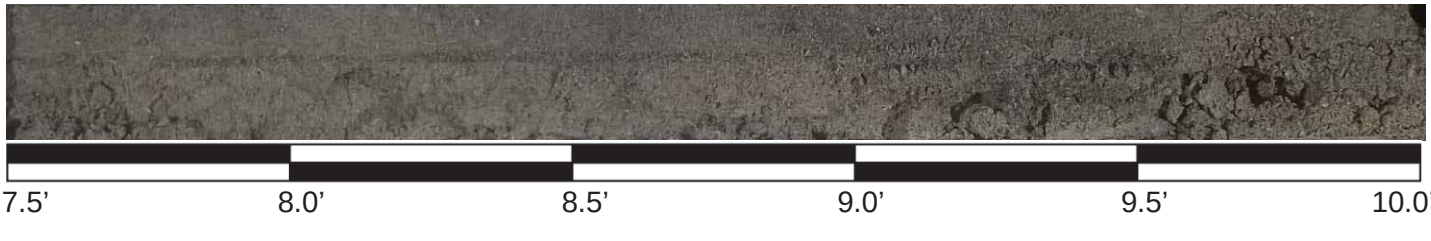


VB-MC14-30
2.5’ to 5.0’



VB-MC14-30
5.0’ to 7.5’

VB-MC14-30
7.5’ to 10.0’



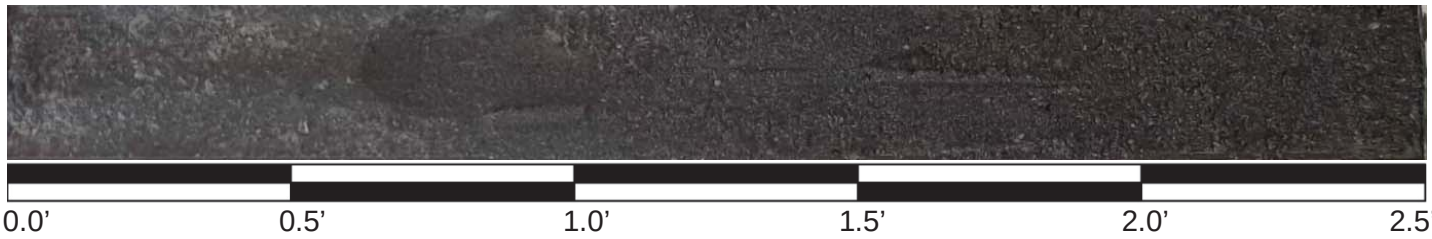
VB-MC14-30
10.0’ to 12.5’

VB-MC14-30
12.5’ to 15.0’

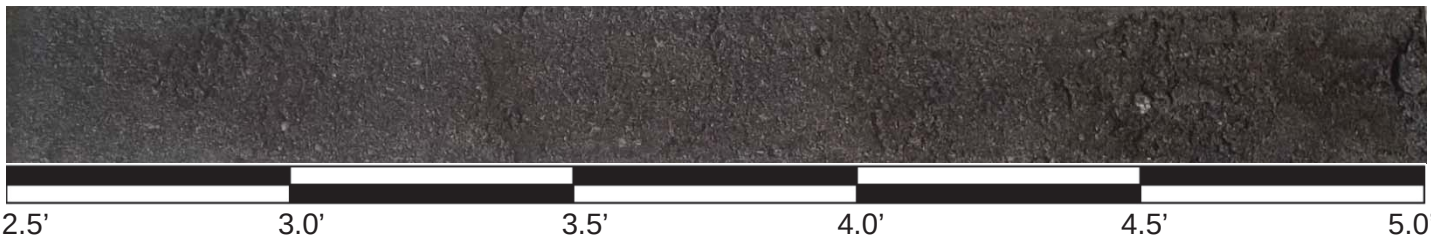
VB-MC14-30
15.0’ to 17.0’

Dade SAND Study 2014
Vibracore and Lab Analysis
AMEC Project No. 6738-14-5337
Contract No. W912EP-11-D-0002, TO 0086

VB-MC14-32
0.0’ to 2.5’

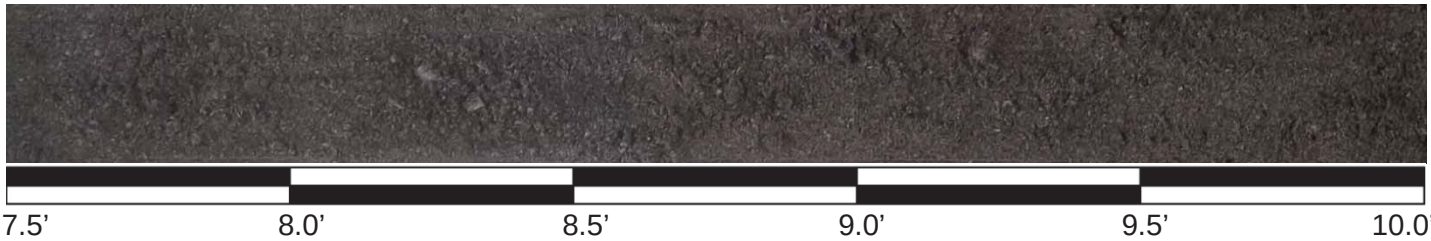


VB-MC14-32
2.5’ to 5.0’

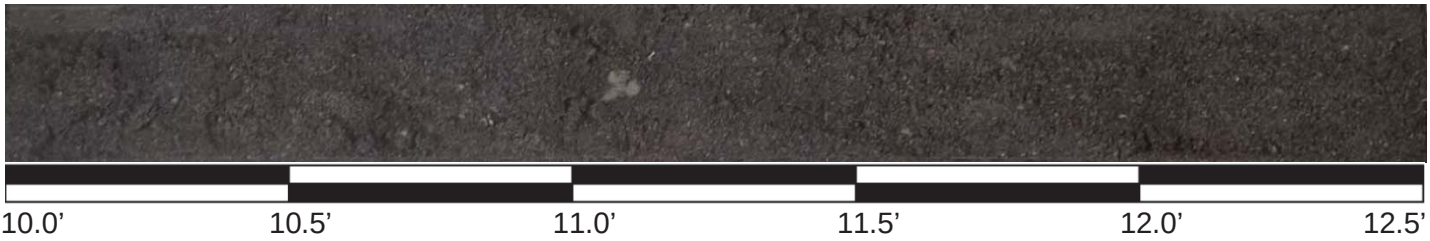


VB-MC14-32
5.0’ to 7.5’

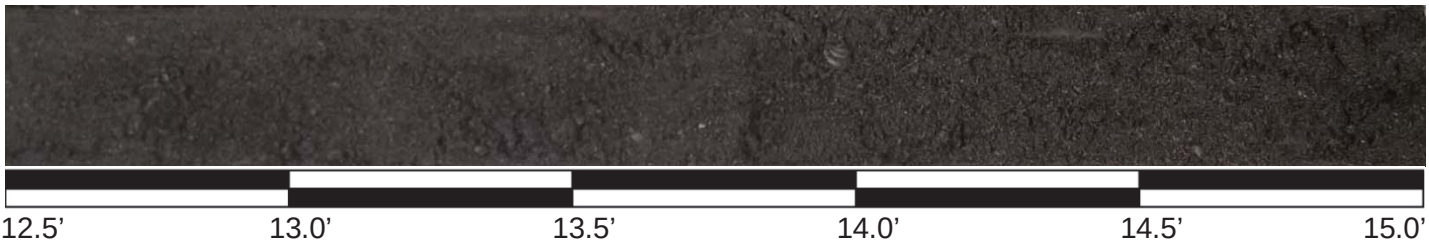
VB-MC14-32
7.5’ to 10.0’



VB-MC14-32
10.0’ to 12.5’



VB-MC14-32
12.5’ to 15.0’

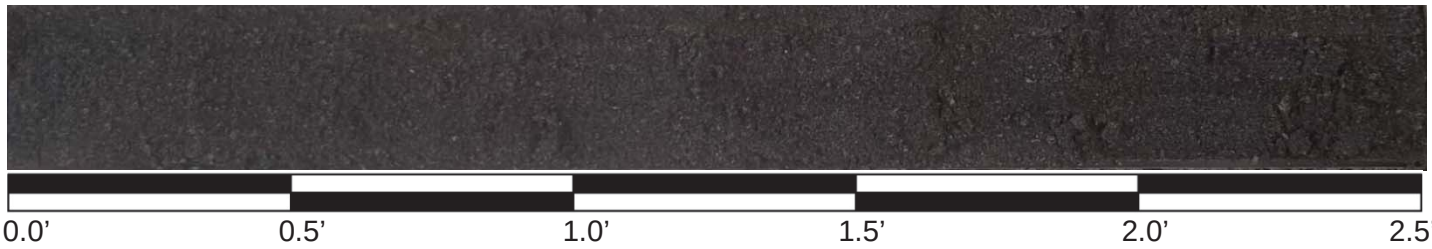


VB-MC14-32
15.0’ to 17.5’

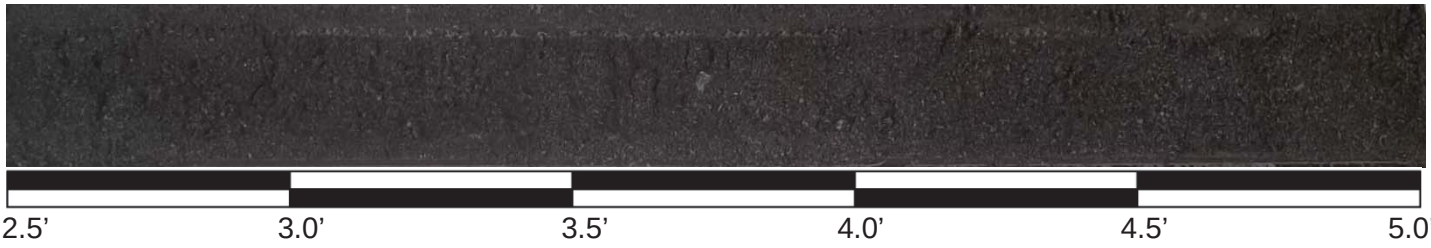
VB-MC14-32
17.5’ to 19.1’

Dade SAND Study 2014
Vibracore and Lab Analysis
AMEC Project No. 6738-14-5337
Contract No. W912EP-11-D-0002, TO 0086

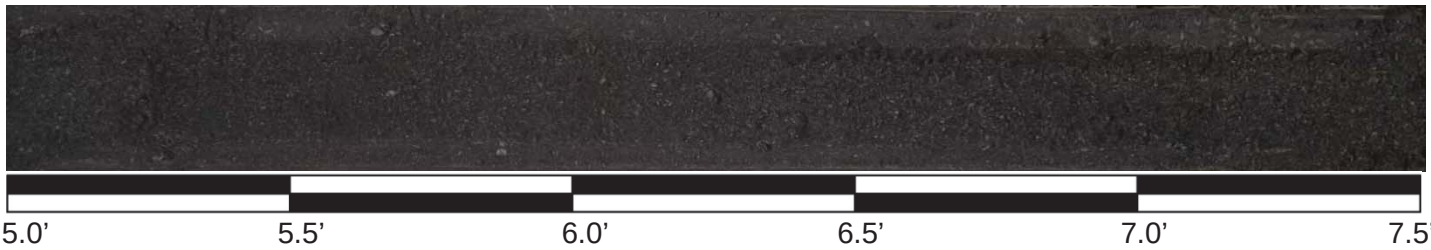
VB-MC14-33
0.0’ to 2.5’



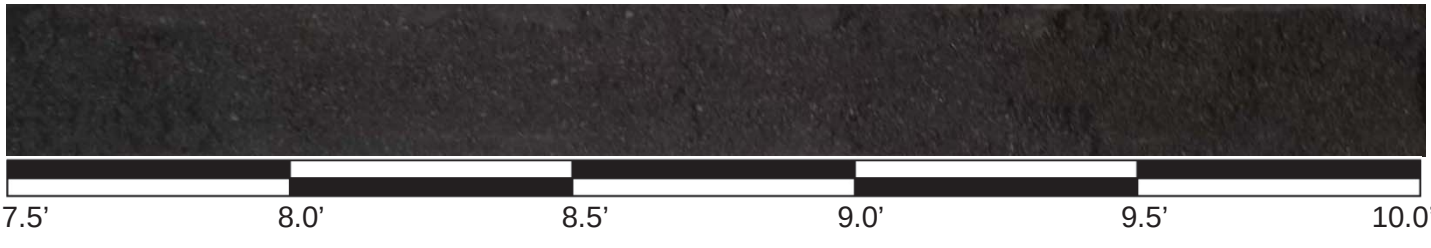
VB-MC14-33
2.5’ to 5.0’



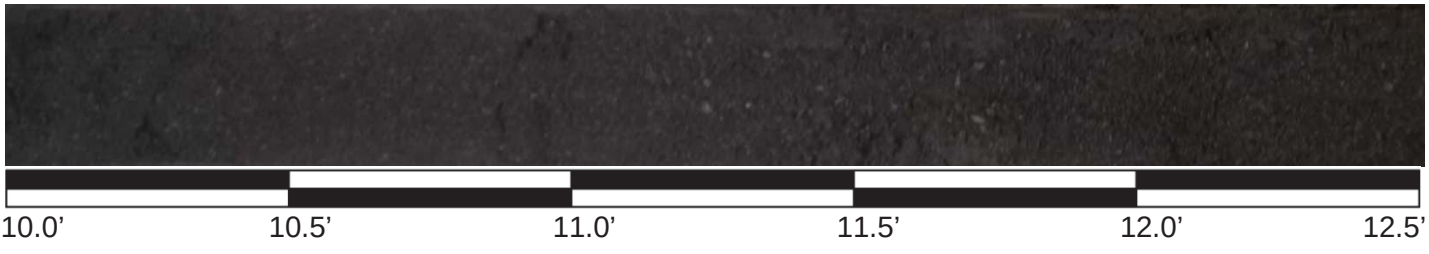
VB-MC14-33
5.0’ to 7.5’



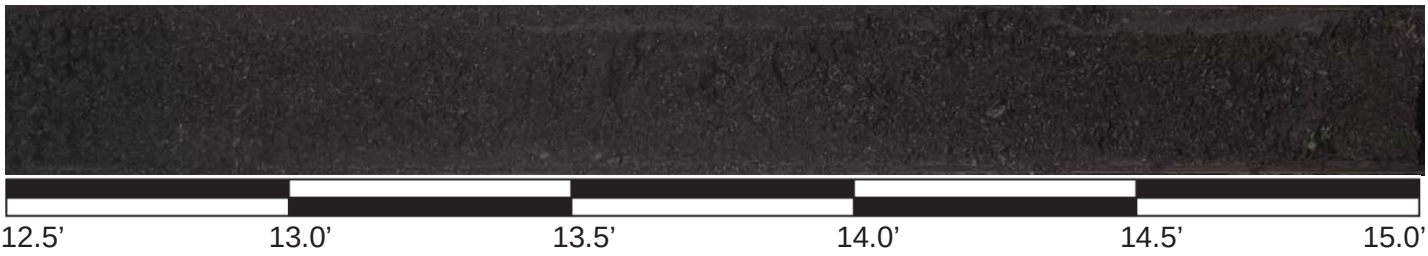
VB-MC14-33
7.5’ to 10.0’



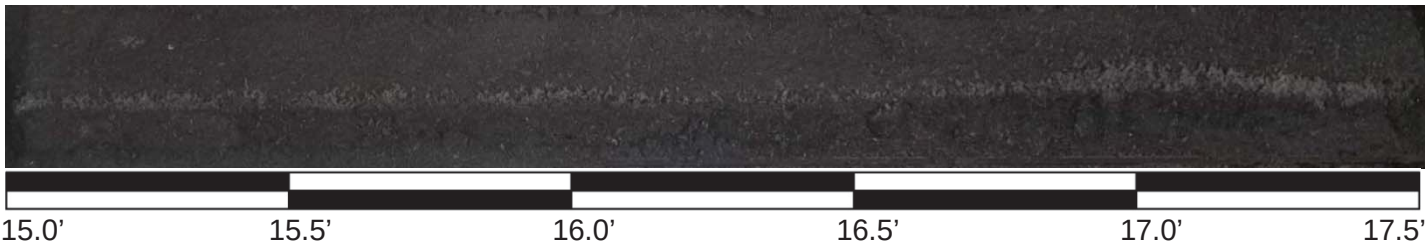
VB-MC14-33
10.0’ to 12.5’



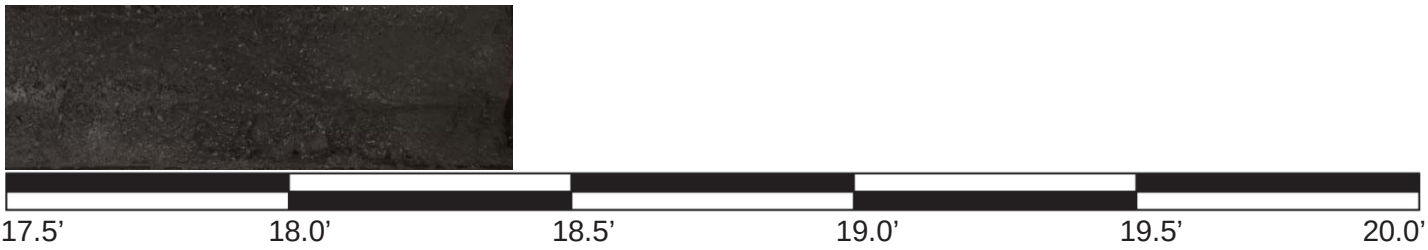
VB-MC14-33
12.5’ to 15.0’

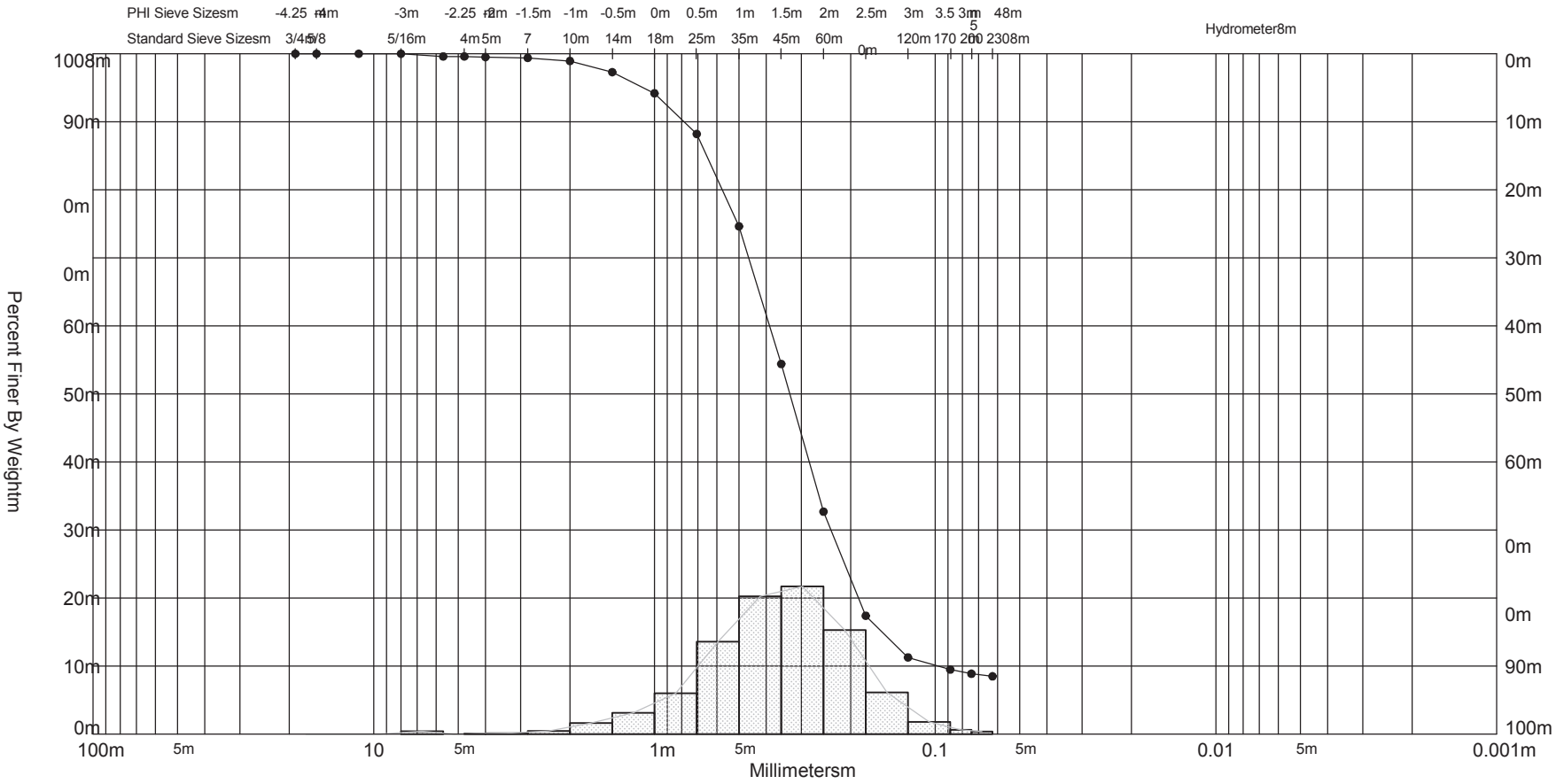


VB-MC14-33
15.0’ to 17.5’



VB-MC14-33
17.5’ to 18.4’





Samplem	Symbolm	Elev. (ft)m	USCSm	% Finesm	% Organicsm	% Carbonatesm	Medianm	Meanm	Skewm	Kurtm	Sortm
VB-MC12-40 #1m			SW-SMm	#200 - 6m87 #230 - 6m49m		6m	1.6m	1.44m	-0.65m	4.77m	0.93m

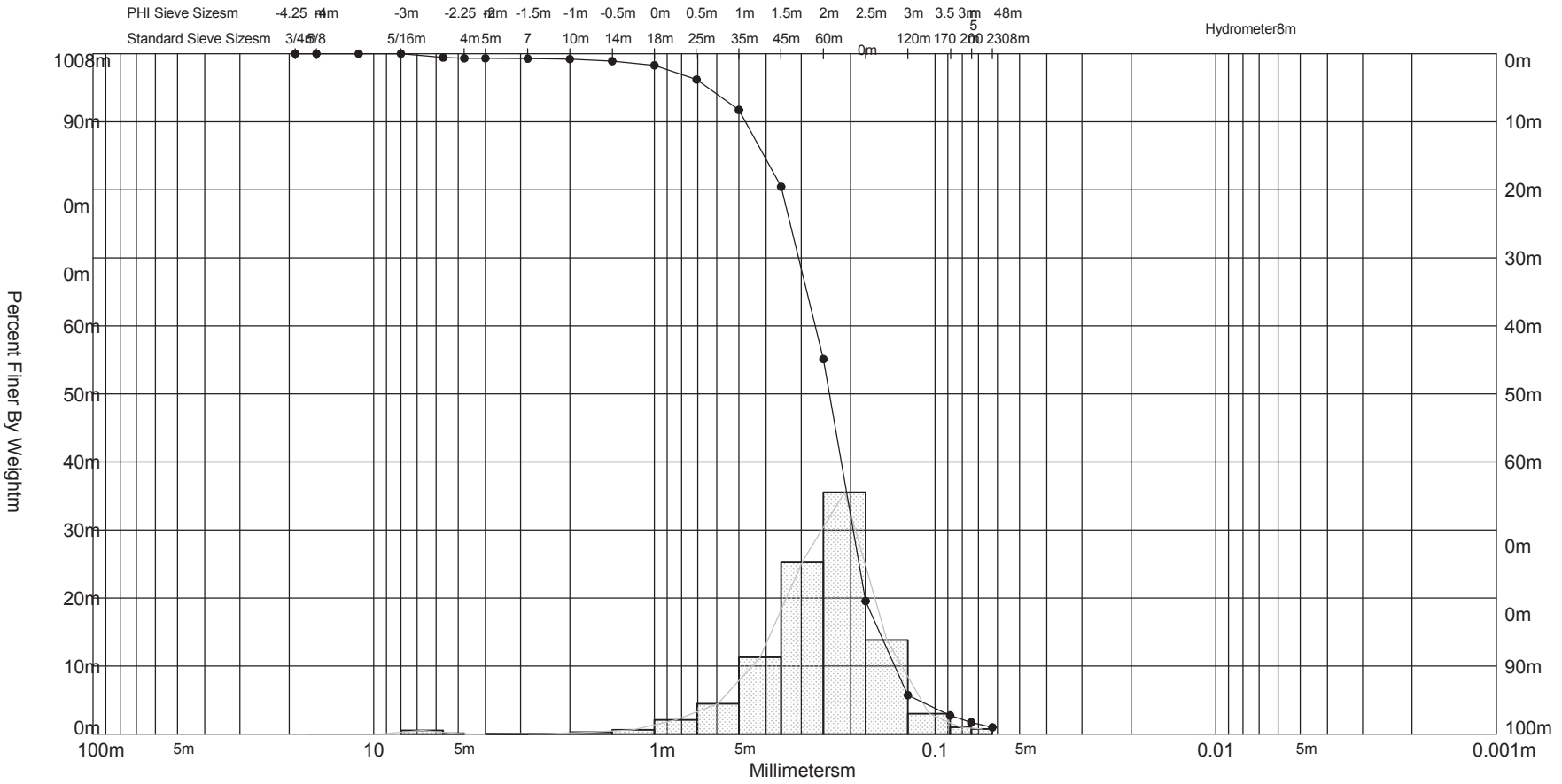
Sample Informationm	
Project Name:m	Southeast Florida SAND Studym
Analysis Date:m	08m17m12m
Analyzed By:m	KGm
Easting (X, ft):m	
Northing (Y, ft):m	
Horizontal System:m	NAD 1983m
Vertical System:m	NAVD 88m

Comments:m

Depths and elevations based on measured valuesm

Coastal Planning & Engineeringm
2481 NW Boca Raton Blvd.m
Boca Raton, FL 33431
ph (561) 391-8102m
fax (561) 391-9116m

SIEVE ANALYSIS FDEP_2012.GPJ JPBRAZIL.GDT 9/20/12



Samplem	Symbolm	Elev. (ft)m	USCSm	% Finesm	% Organicsm	% Carbonatesm	Medianm	Meanm	Skewm	Kurtm	Sortm
VB-MC12-40 #2m			SPm	#200 - 1.m #230 - 0.99m			2.07m	1.96m	-1.69m	10.m	0.79m

Sample Informationm	
Project Name:m	Southeast Florida SAND Studym
Analysis Date:m	08/17/12m
Analyzed By:m	BFm
Easting (X, ft):m	
Northing (Y, ft):m	
Horizontal System:m	NAD 1983m
Vertical System:m	NAVD 88m

Comments:m

Depths and elevations based on measured valuesm

Coastal Planning & Engineeringm
2481 NW Boca Raton Blvd.m
Boca Raton, FL 33431
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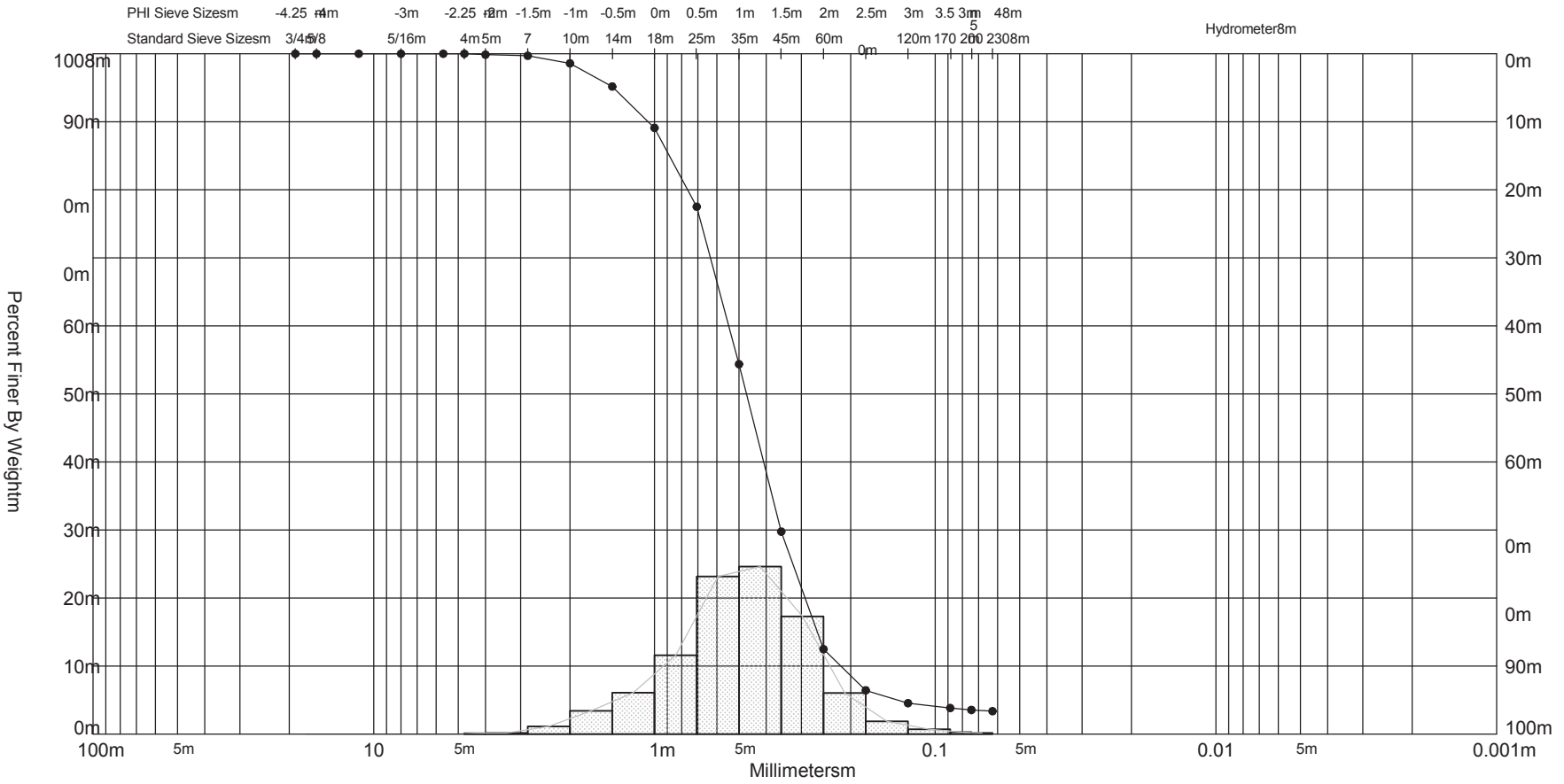
fax (561) 391-9116m

SIEVE ANALYSIS FDEP_2012.GPJ JPBRAZIL.GDT 9/20/12



Samplem	Symbolm	Elev. (ft)m	USCSm	% Finesm	% Organicsm	% Carbonatesm	Medianm	Meanm	Skewm	Kurtm	Sortm
VB-MC12-40 #3m			SPm	#200 - 3.55m #230 - 3.37m		9m	1.09m	1.01m	-0.2m	3.67m	0.85m

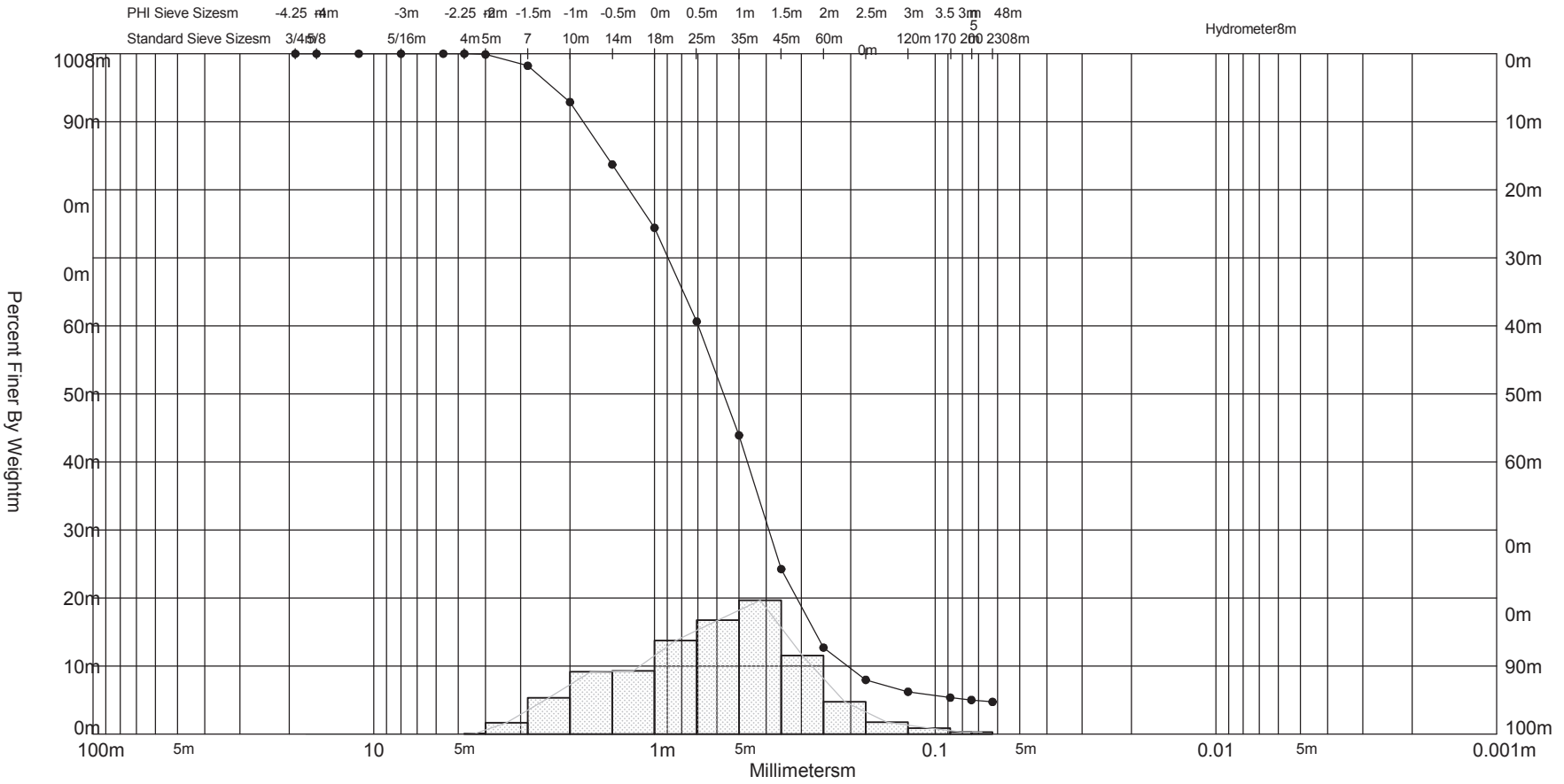
Sample Informationm	
Project Name:m	Southeast Florida SAND Studym
Analysis Date:m	08-17-12m
Analyzed By:m	KGm
Easting (X, ft):m	
Northing (Y, ft):m	
Horizontal System:m	NAD 1983m
Vertical System:m	NAVD 88m

Comments:m

Depths and elevations based on measured valuesm

Coastal Planning & Engineeringm
2481 NW Boca Raton Blvd.m
Boca Raton, FL 33431
ph (561) 391-8102m
fax (561) 391-9116m

SIEVE ANALYSIS FDEP_2012.GPJ JPBRAZIL.GDT 9/20/12



Samplem	Symbolm	Elev. (ft)m	USCSm	% Finesm	% Organicsm	% Carbonatesm	Medianm	Meanm	Skewm	Kurtm	Sortm
VB-MC12-40 #4m			SW-SMm	#200 - 5.01m #230 - 4.4m			0.82m	0.65m	-0.06m	2.78m	1.08m

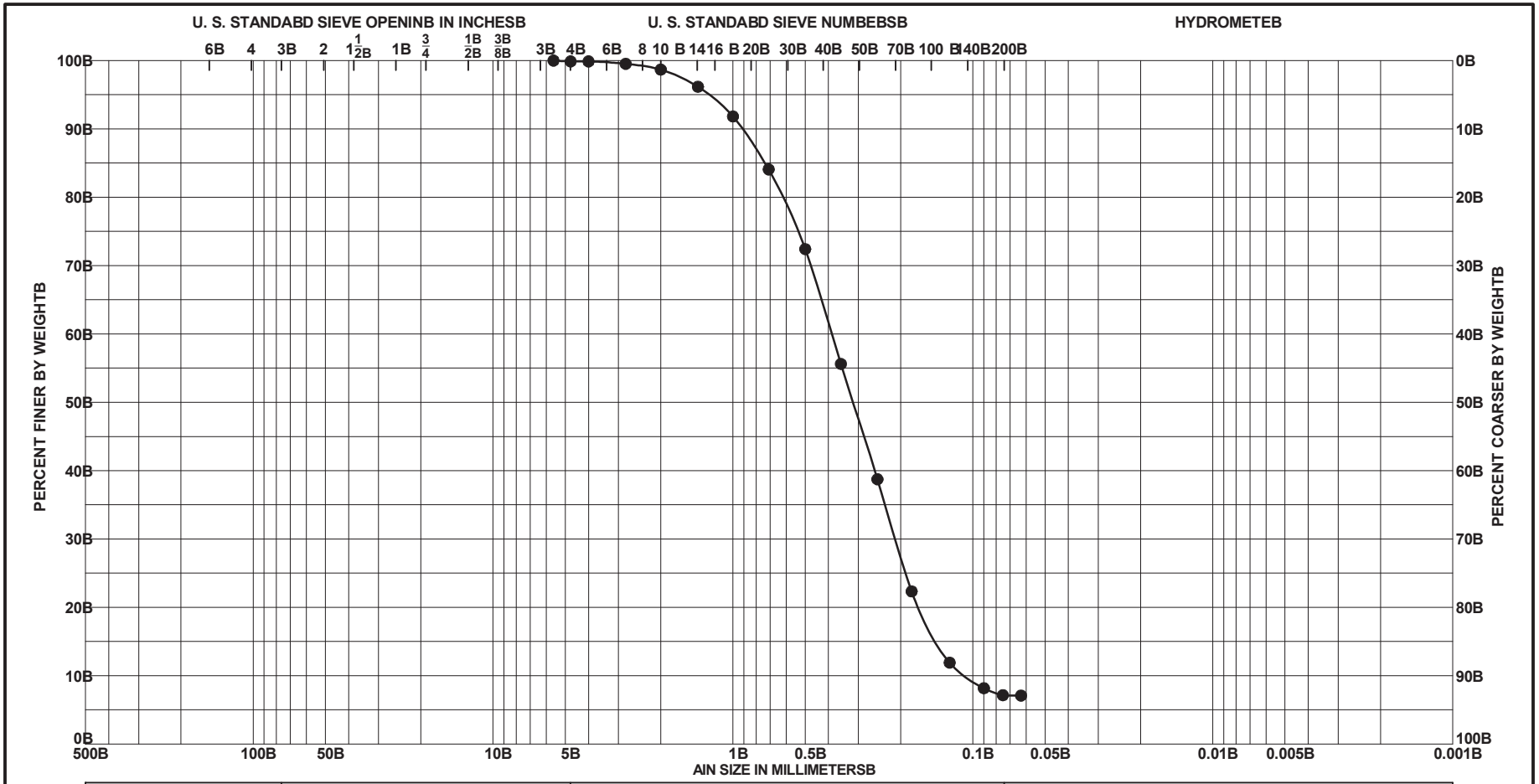
Sample Informationm	
Project Name:m	Southeast Florida SAND Studym
Analysis Date:m	08-17-12m
Analyzed By:m	KGm
Easting (X, ft):m	
Northing (Y, ft):m	
Horizontal System:m	NAD 1983m
Vertical System:m	NAVD 88m

Comments:m

Depths and elevations based on measured valuesm

Coastal Planning & Engineeringm
2481 NW Boca Raton Blvd.m
Boca Raton, FL 33431
ph (561) 391-8102m
fax (561) 391-9116m

SIEVE ANALYSIS FDEP_2012.GPJ JPBRAZIL.GDT 9/20/12

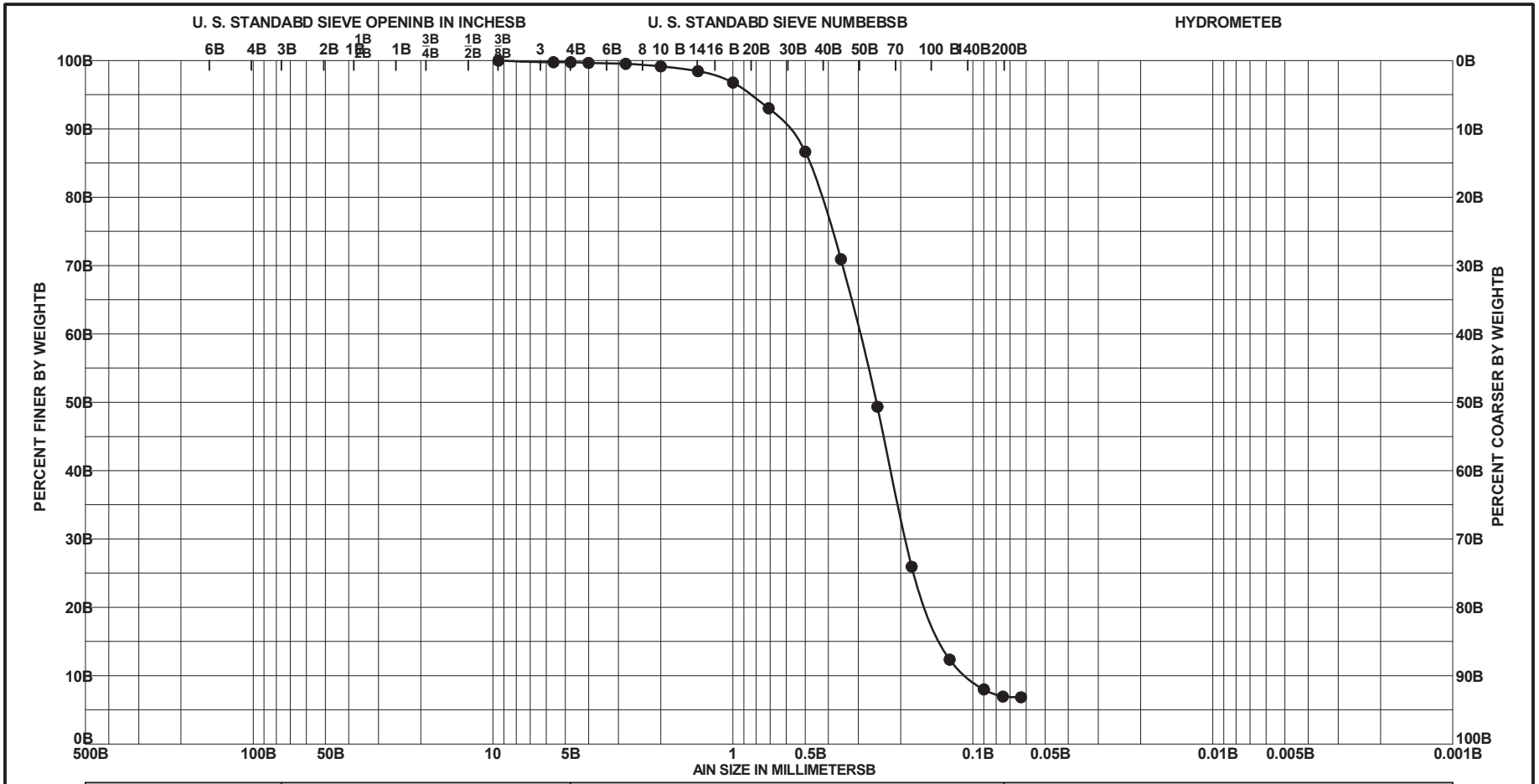


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	1.0 to 1.3 Ft.s	SAND, p-g with silt, mostly fsgrained	5Y 4/1s	5s	79s						
		ands-sized quartz, some fine tos									
		mediumsgrained sandssized shell,s									
		few silt, trace limestone, dark grays									
		(SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 0s
BORING ELEV.	-76.2 Ft., NAVD88s
DATE	6/23/2014s

SAJ FORM 2087B
JUN 02B

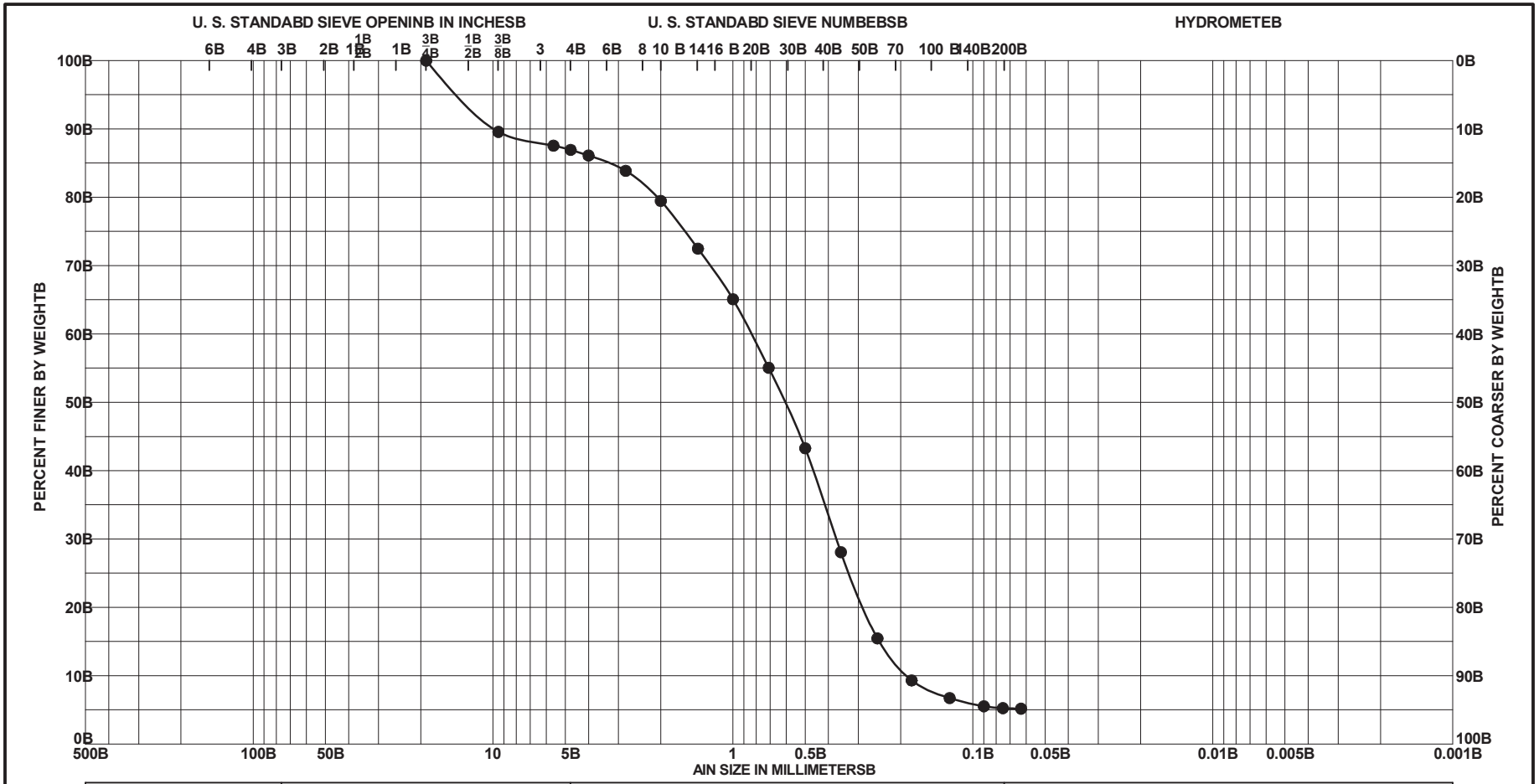


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	.0 to 3.3 Ft.s	SAND, p-g with silt, mostly fs grained	5Y 4/1s	29s							
		sands sized quartz, somes									
		f-ms grained sands sized shell, few									
		silt, trace limestone, dark grays									
		(SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 0s
BORING ELEV.	-76.2 Ft., NAVD88s
DATE	6/23/2014s

SAJ FORM 2087
JUN 02

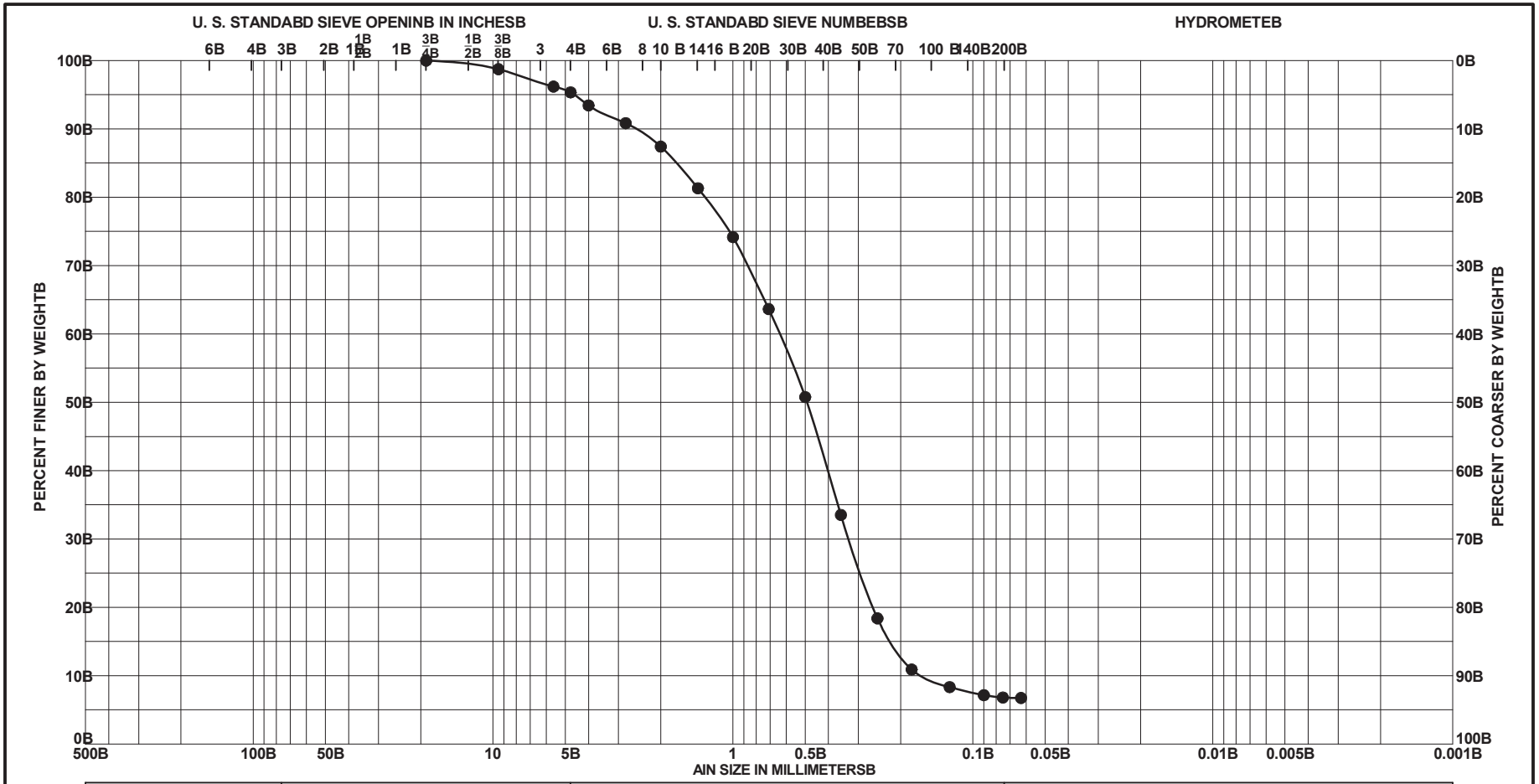


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
●	6.0 to 6.3 Ft.s	SAND, p-g with silt, mostlys	5Y 7/2s	24s							
		f-msgrained sandssized quartz, little									
		sand to grssized shell, littles									
		msgrained s-sized limestone, few									
		silt, light gray (SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 0s
BORING ELEV.	-76.2 Ft., NAVD88s
DATE	6/23/2014s

SAJ FORM 2087B
JUN 02

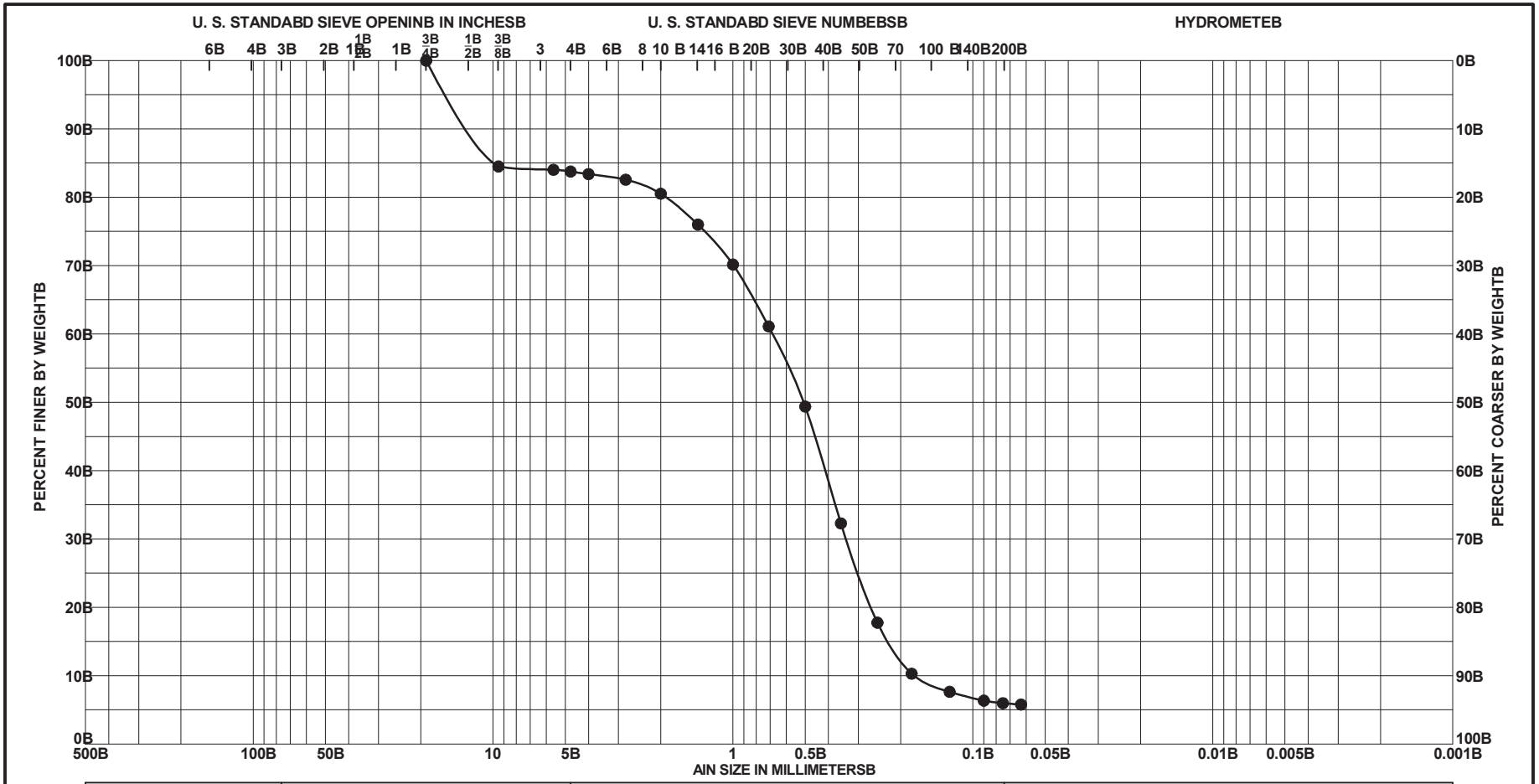


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	8.0 to 8.3 Ft.s	SAND, p-g with silt, some f-grained	5Y 7/2s	16s							
		s-sized quartz, some msc-grained									
		s-sized limestone, little fsm-grained									
		s-sized shell, few silt, light grays									
		(SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 0s
BORING ELEV.	-76.2 Ft., NAVD88s
DATE	6/23/2014s

SAJ FORM 2087B
JUN 02B

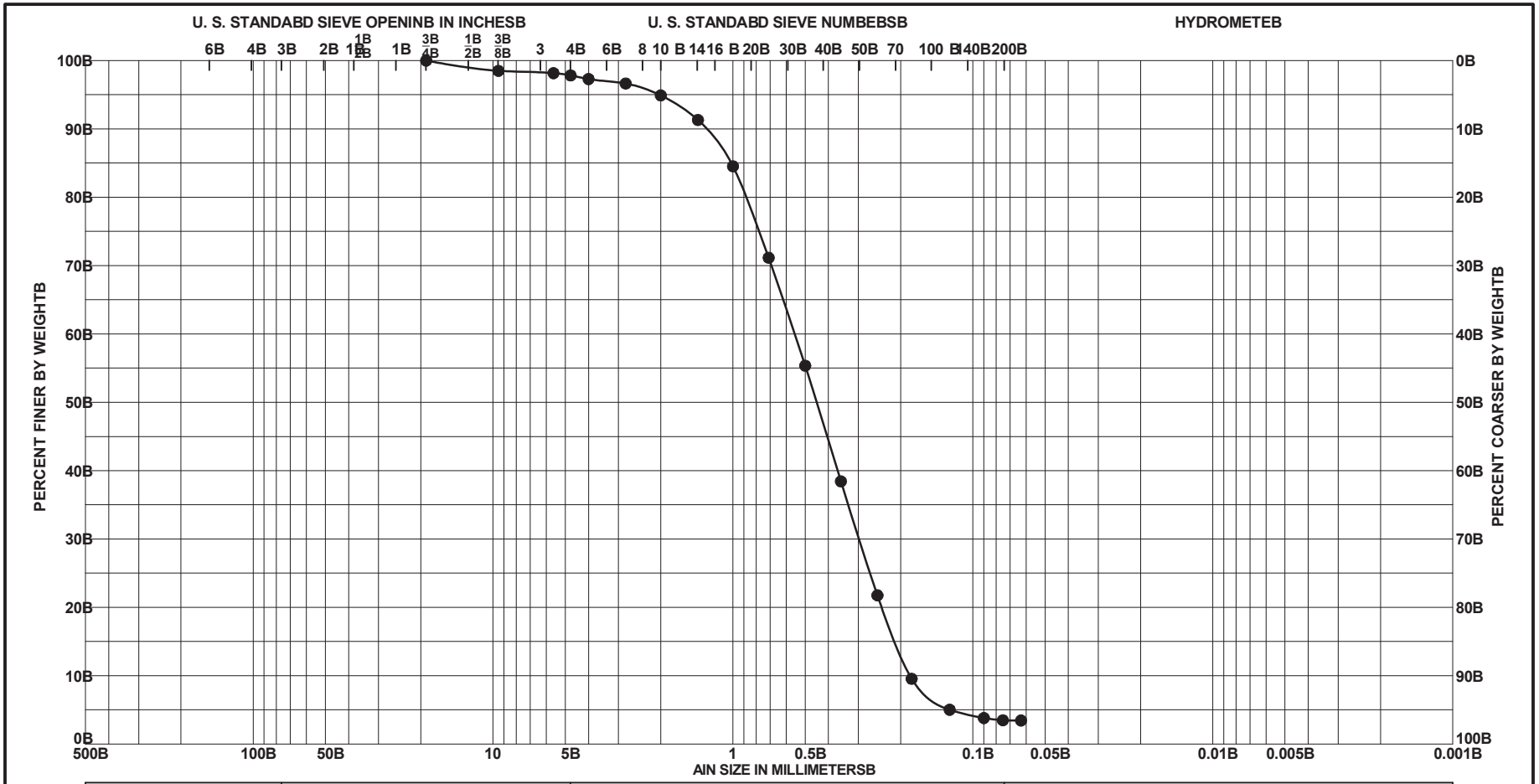


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	12.0 to 12.3 Ft.s	SAND, p-g with silt, mostlys	5Y 7/2s	16s							
		f-msgrained s-sized quartz, little									
		sand to grssized limestone, littles									
		msgrained s-sized shell, few silt,s									
		light gray (SP-SM)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 0s
BORING ELEV.	-76.2 Ft., NAVD88s
DATE	6/23/2014s

SAJ FORM 2087B
JUN 02B

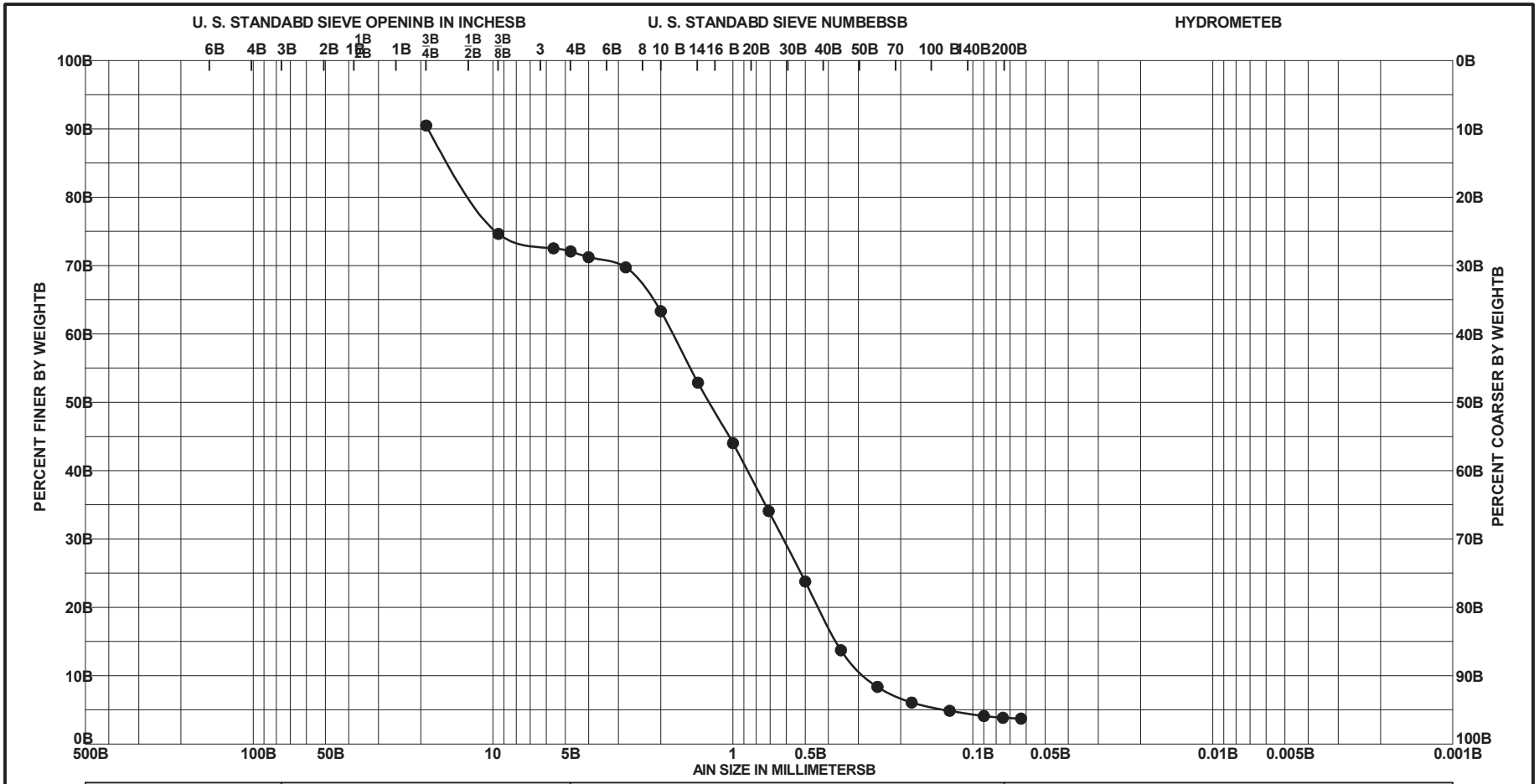


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	.0 to 3.3 Ft.s	SAND, poorlys graded, mostly fine tos	N 6/s	51s	67s						
		coarse-grained sand-sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 2s
BORING ELEV.	6s3.2 Ft., NAVD88s
DATE	6/23s2014s

SAJ FORM 2087B
JUN 02B

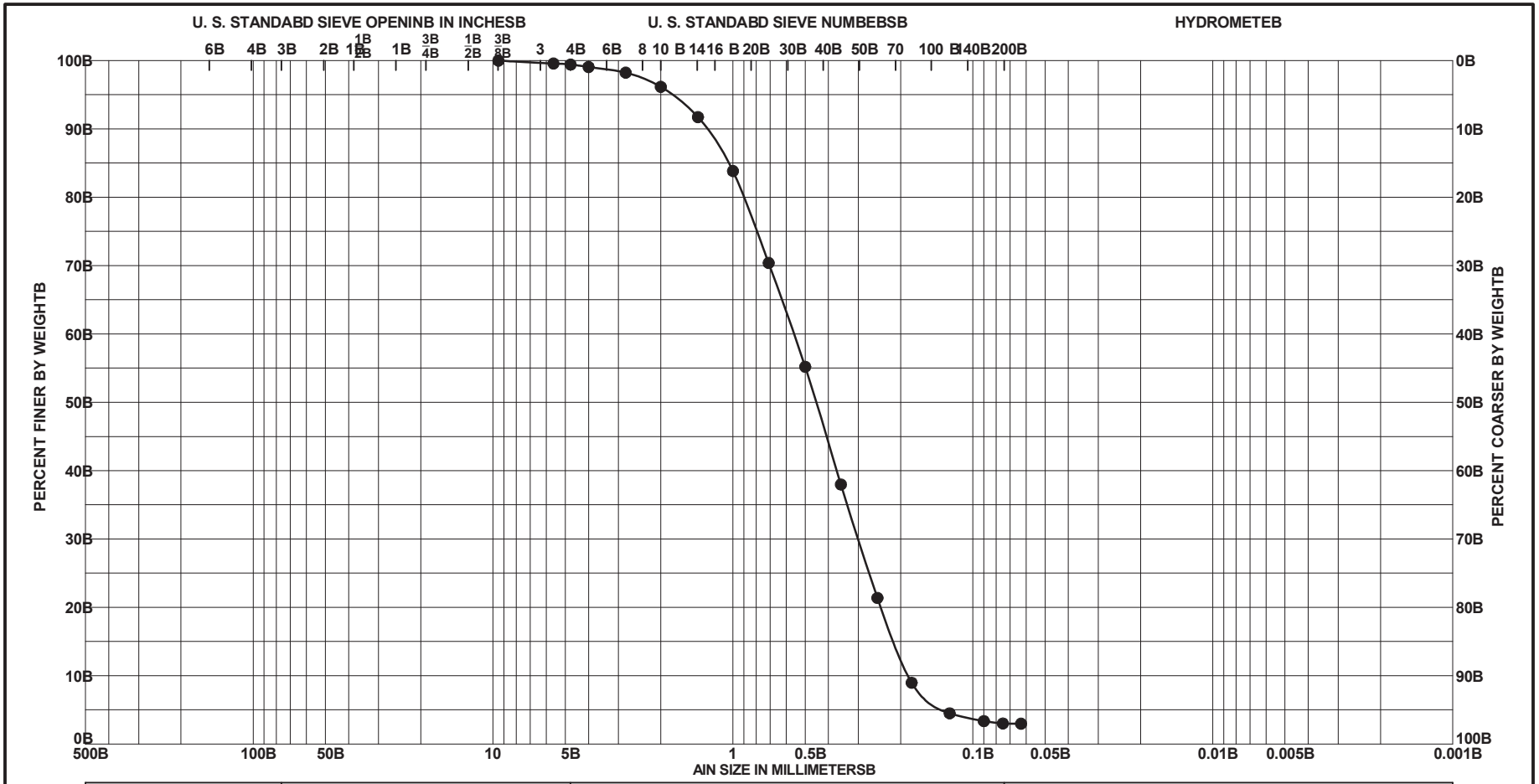


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	8.0 to 8.3 Ft.s	SAND, poorlysgraded, mostly sands	N 6/s	84s							
		to gravel-sized shell, fews									
		fine-grained sand-sized quartz,s									
		trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 2s
BORING ELEV.	6s3.2 Ft., NAVD88s
DATE	6/23s2014s

SAJ FORM 2087B
JUN 02B

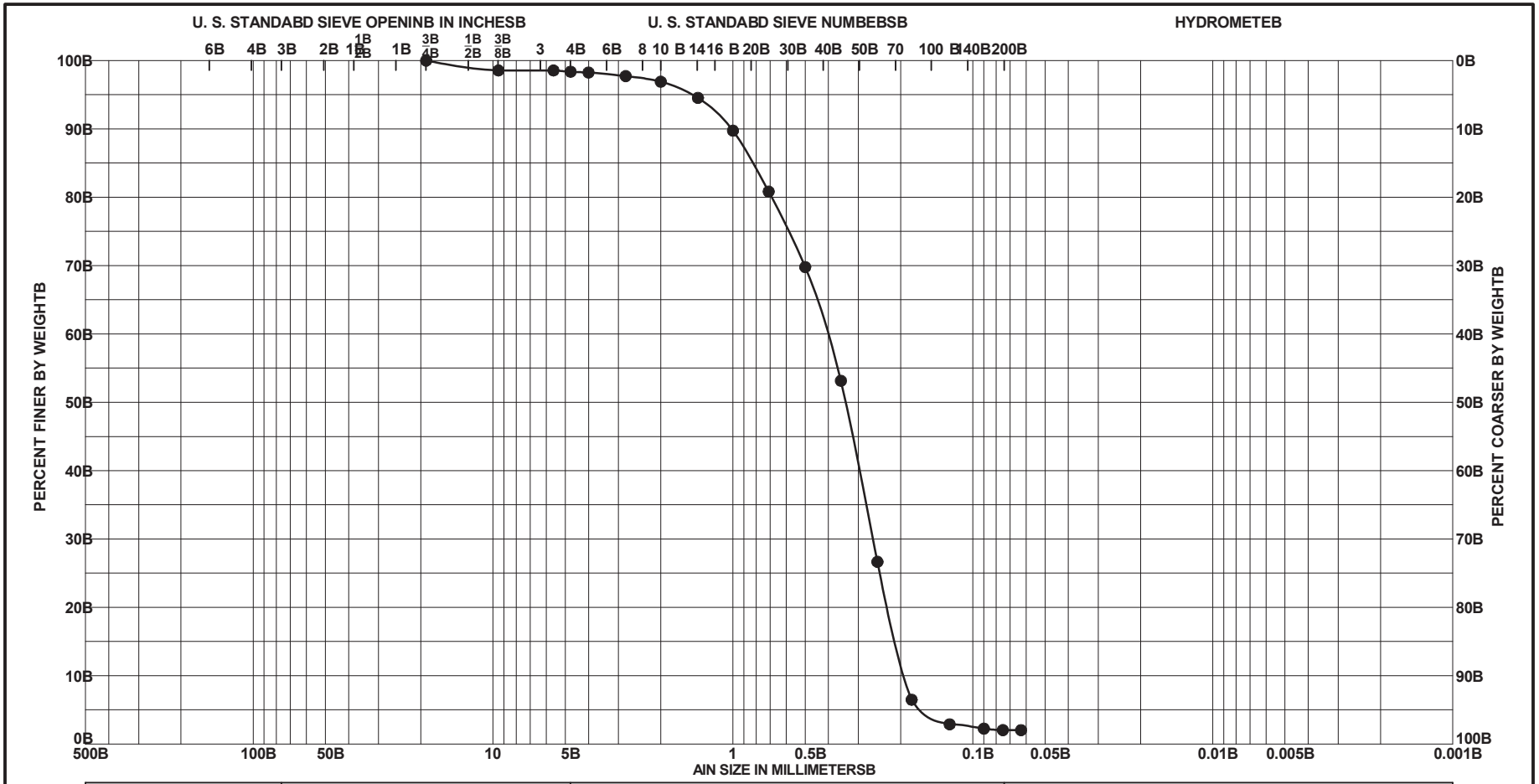


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
●	12.0 to 12.3 Ft.s	SAND, poorlys graded, mostly fine tos	N 6/s	65s							
		mediums grained sands sized shell,s									
		little fine-grained sands sized quartz,s									
		trace silt, gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 2s
BORING ELEV.	6s3.2 Ft., NAVD88s
DATE	6/23s2014s

SAJ FORM 2087B
JUN 02B

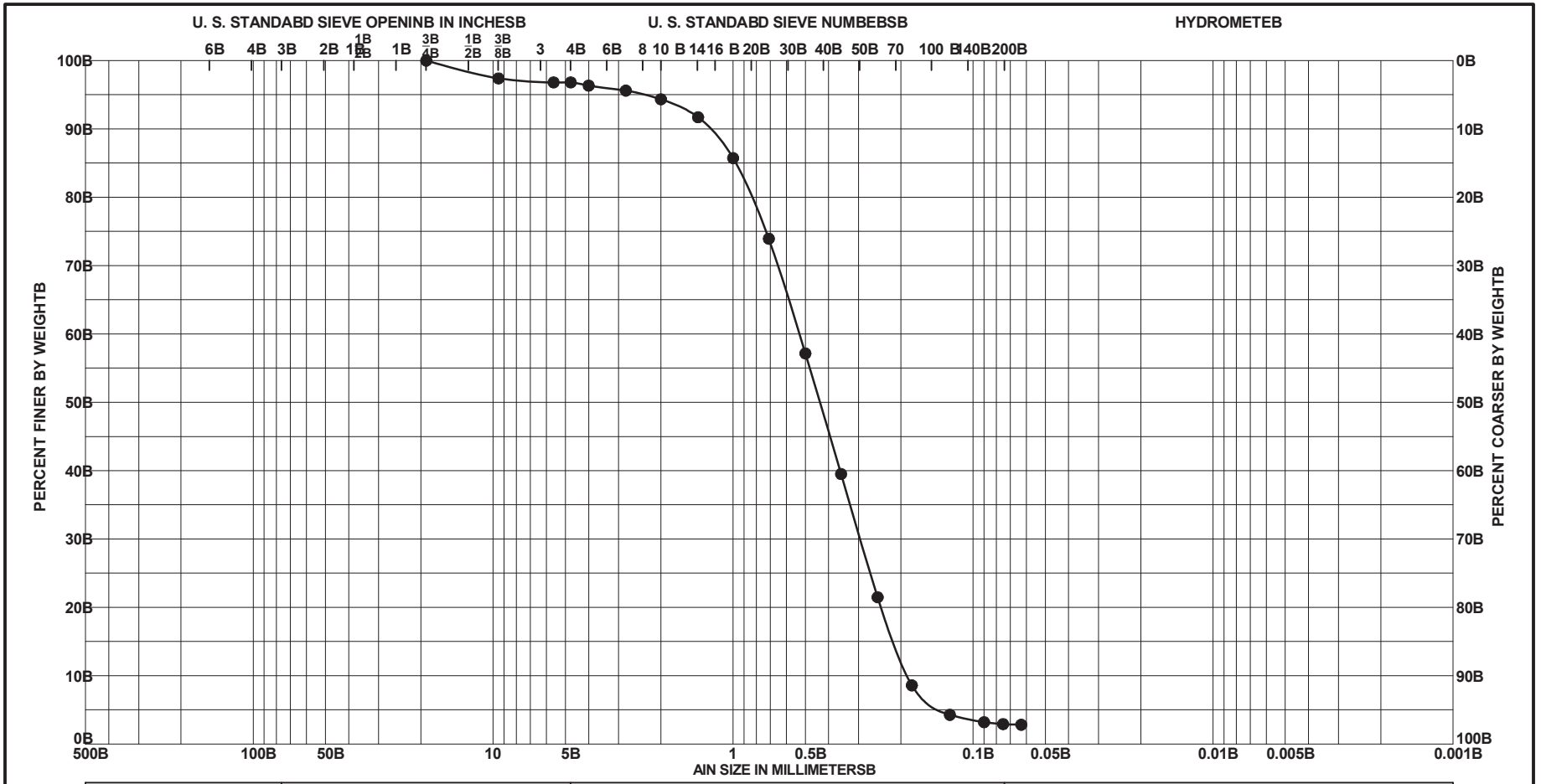


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	15.0 to 15.3 Ft.s	SAND, poorly-graded, somes	N 6/s	48s							
		fine-grained sand-sized quartz,									
		some fine to medium grained									
		sand sized shell, trace silt, grays									
		(SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 2s
BORING ELEV.	6s3.2 Ft., NAVD88s
DATE	6/23s2014s

SAJ FORM 2087B
JUN 02

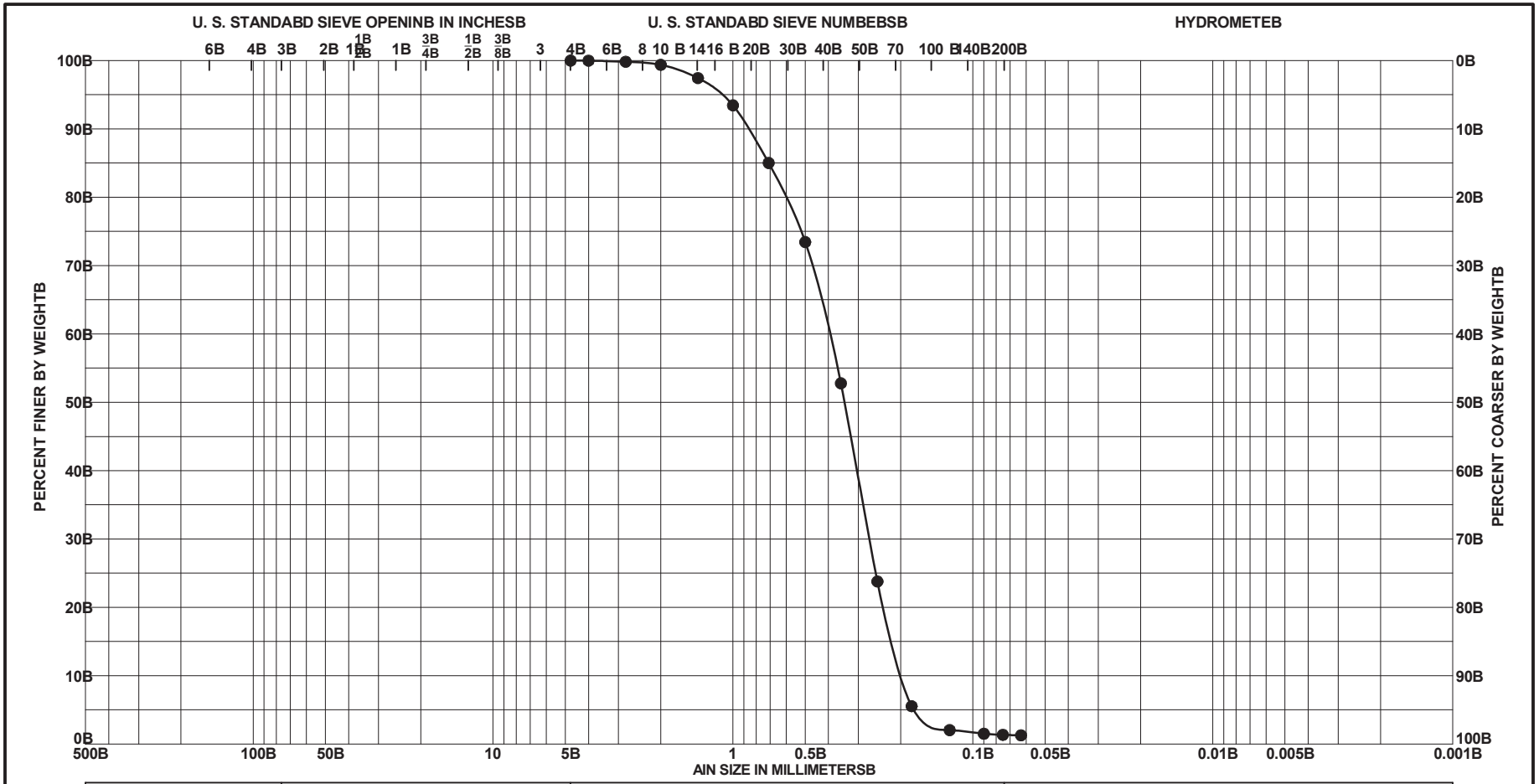


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	18.0 to 18.3 Ft.s	SAND, p-g, mostly fine tos	N 5/s	64s							
		mediumsgrained sandssized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, trace limestone,s									
		gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s 2s
BORING ELEV.	6s3.2 Ft., NAVD88s
DATE	6/23s2014s

SAJ FORM 2087B
JUN 02B

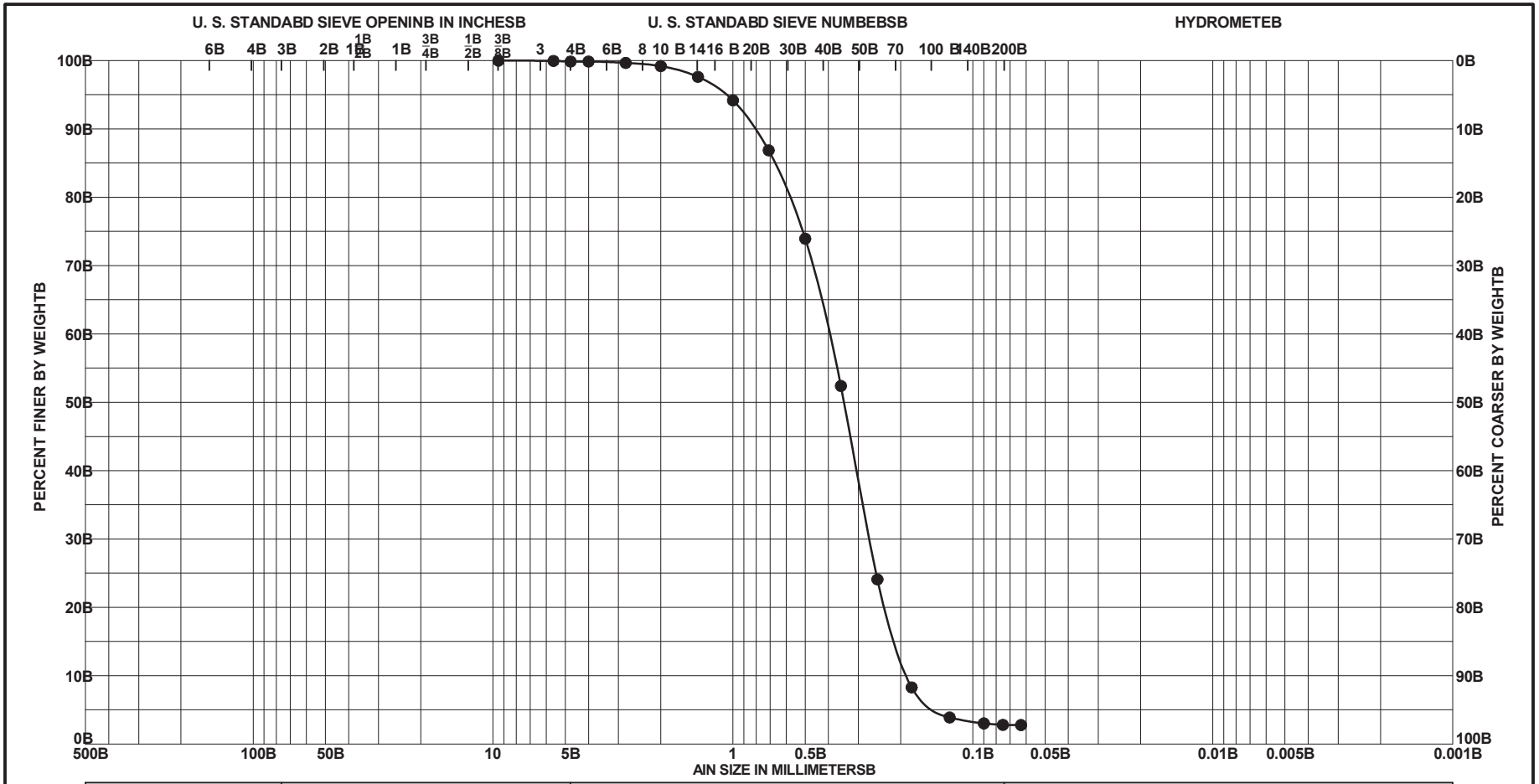


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 1s	1.0 to 1.3 Ft.s	SAND, poorlys graded, mostly fine to s	N 4/s	58s	76s						
		medium s grained sand s sized shell,									
		some fine-grained sand-sized s									
		quartz, trace silt, dark gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s
BORING ELEV.	-71.2 Ft., NAVD88s
DATE	6/30/2014s

SAJ FORM 2087B
JUN 02B

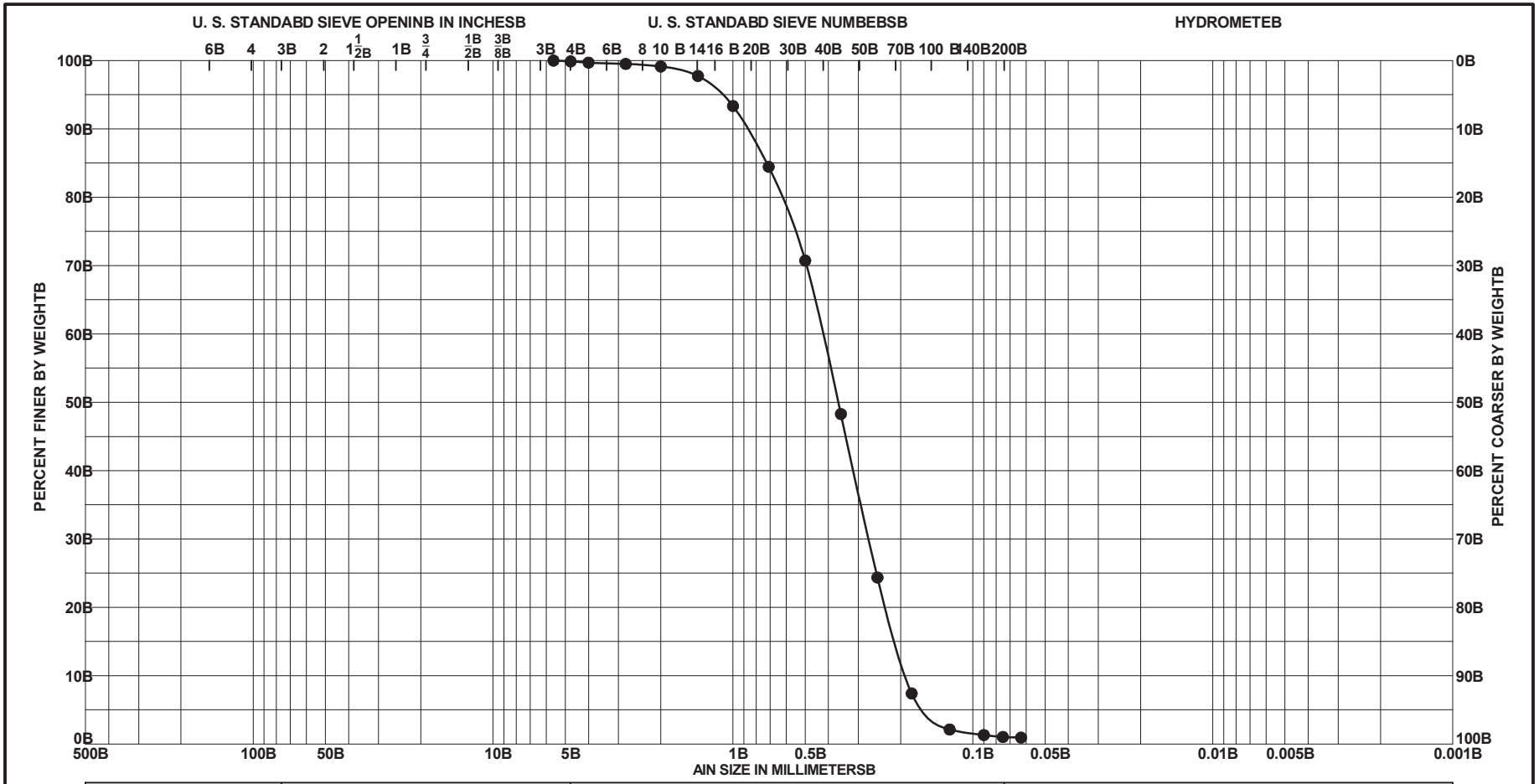


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 2s	5.0 to 5.3 Ft.s	SAND, poorlys graded, mostly fine to s	N 4/s	59s							
		medium s grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, dark gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s
BORING ELEV.	-71.2 Ft., NAVD88s
DATE	6/30/2014s

SAJ FORM 2087B
JUN 02B

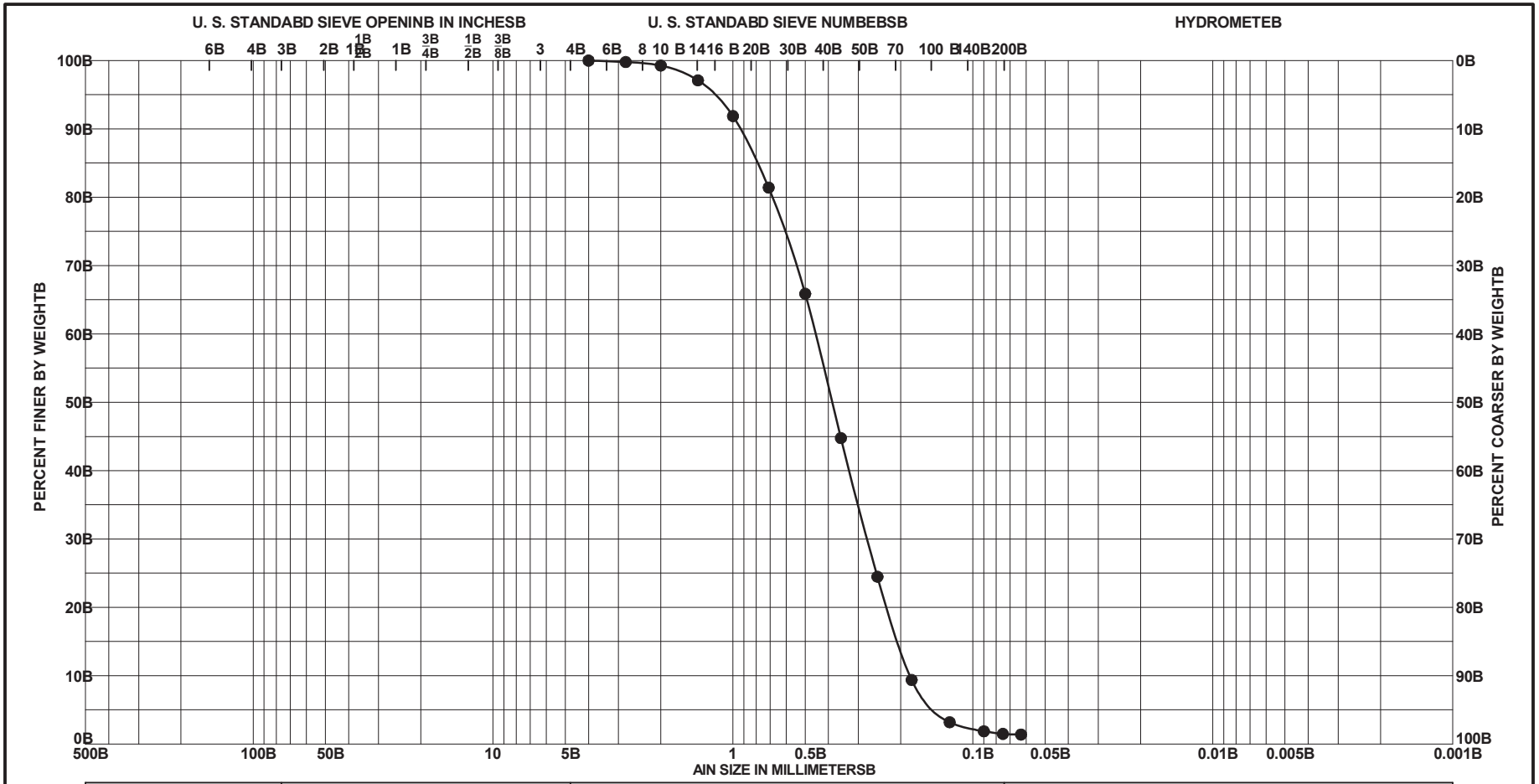


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
●	9.0 to 9.3 Ft.s	SAND, poorlys graded, mostly fine tos	N 4/s	54s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, dark gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s
BORING ELEV.	-71.2 Ft., NAVD88s
DATE	6/30/2014s

SAJ FORM 2087B
JUN 02B

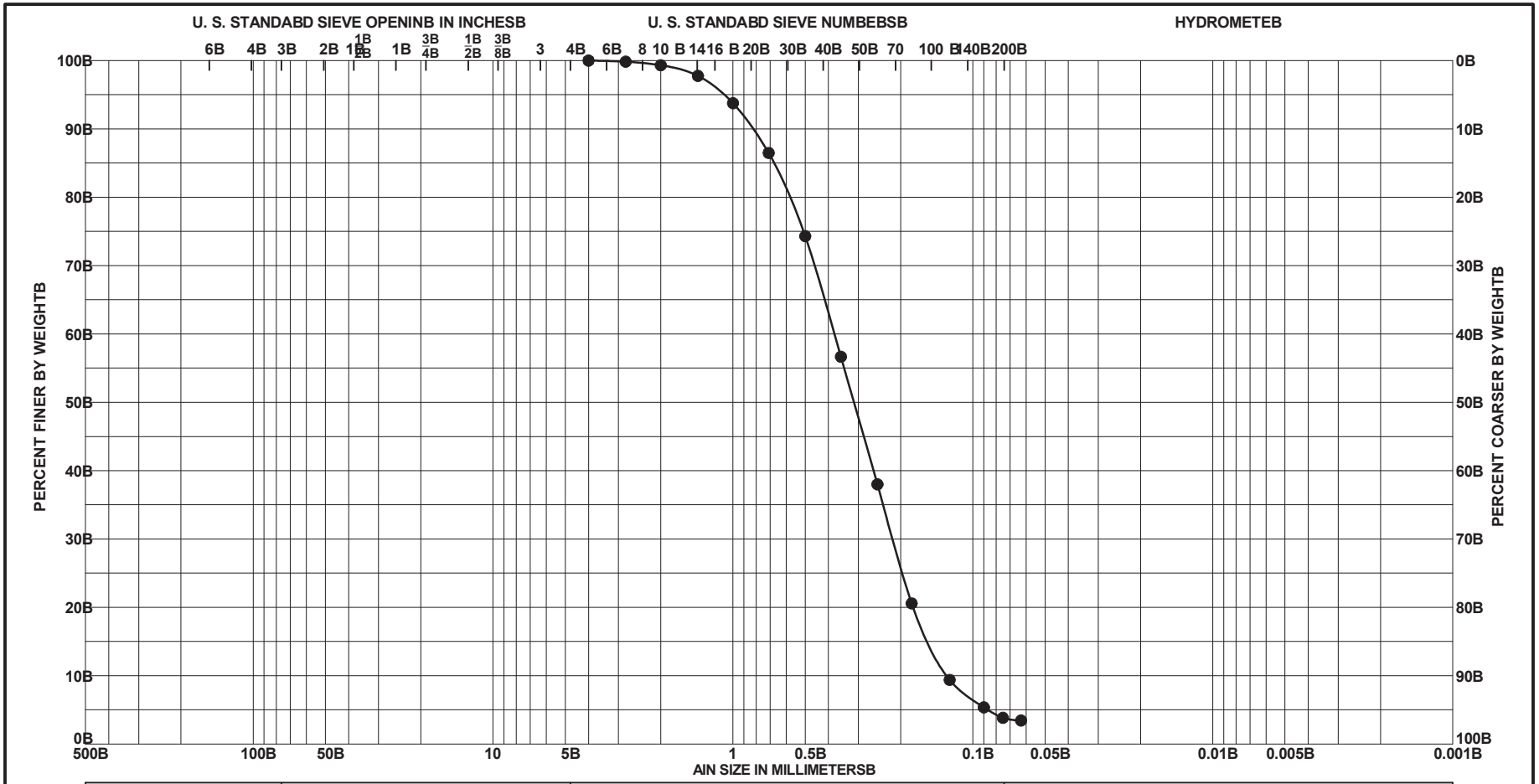


Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 4s	12.0 to 12.3 Ft.s	SAND, poorlys graded, mostly fine tos	N 4/s	60s							
		mediums grained sands sized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, dark gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s
BORING ELEV.	-71.2 Ft., NAVD88s
DATE	6/30/2014s

SAJ FORM 2087B
JUN 02B



Sample No	Depth	Classification	Munsell	Visual % Shell (est)	%CO_3	G_s	Org %	w_n	LL	PL	PI
● 5s	16.0 to 16.3 Ft.s	SAND, poorlysgraded, mostly fine tos	N 4/s	52s							
		mediumsgrained sandssized shell,									
		some fine-grained sand-sizeds									
		quartz, trace silt, dark gray (SP)s									

GRADATION CURVES

PROJECT	Dade SAND Study 2014s
BORING NO.	VB-MC14s
BORING ELEV.	-71.2 Ft., NAVD88s
DATE	6/30/2014s

SAJ FORM 2087B
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