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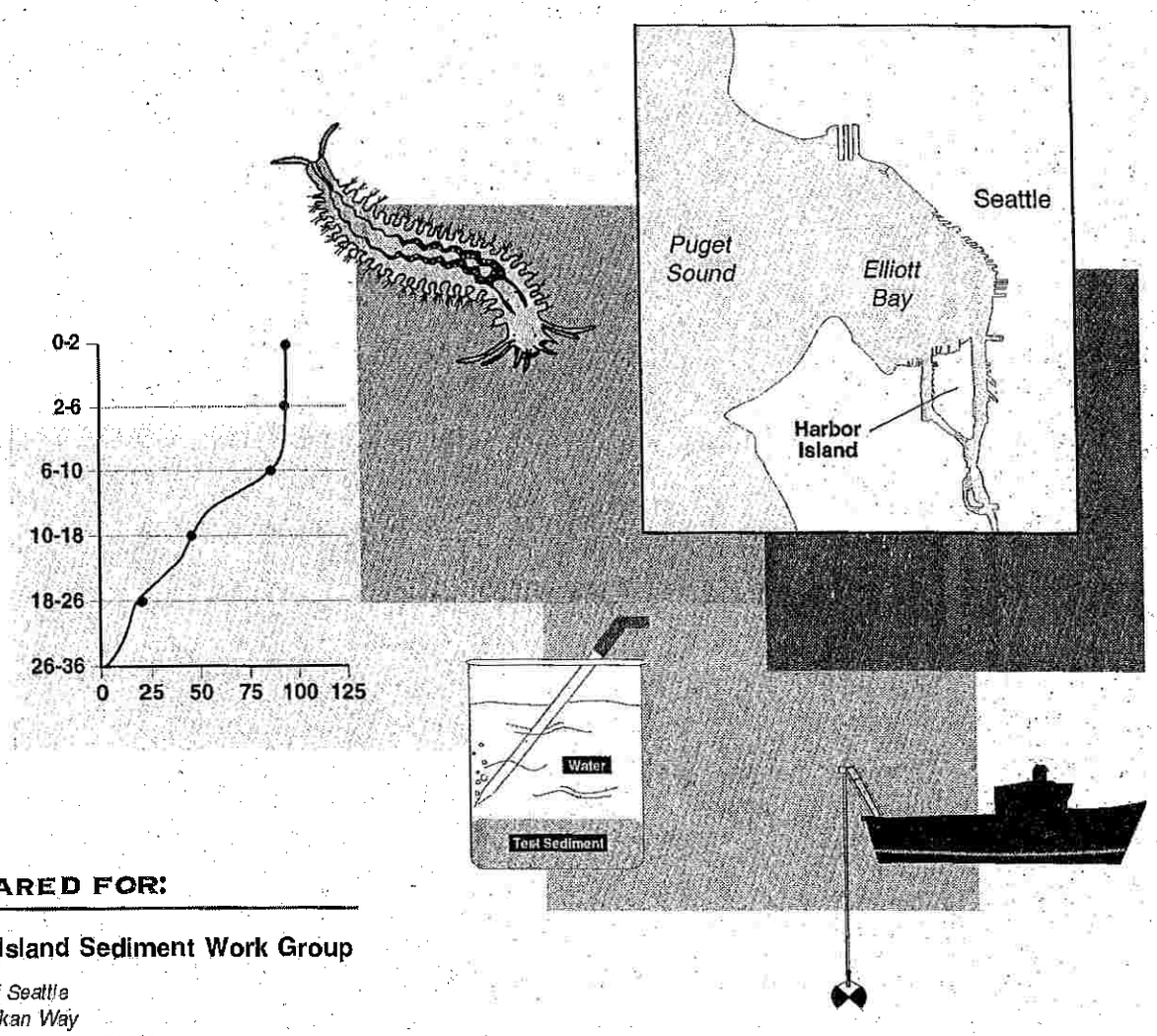
July 1995

HARBOR ISLAND SEDIMENT OPERABLE UNIT

SUPPLEMENTARY REMEDIAL INVESTIGATION –

Chemical Data Summary Report



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HARBOR ISLAND SEDIMENT OPERABLE UNIT
SUPPLEMENTARY REMEDIAL INVESTIGATION

CHEMICAL DATA SUMMARY REPORT

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
ARI	Analytical Resources, Inc.
CLP	Contract Laboratory Program
CSL	cleanup screening level
FSP	field sampling plan
HPAH	high molecular weight polycyclic aromatic hydrocarbon
IDCS	impact-driven coring device
LAP	laboratory analysis plan
LCS	laboratory control sample
LPAH	low molecular weight polycyclic aromatic hydrocarbon
OC	organic carbon
PCB	polychlorinated biphenyl
%RSD	percent relative standard deviation
QA/QC	quality assurance/qnality control
QAPP	quality assurance project plan
RPD	relative percent difference
SEM/AVS	simultaneously extracted metals/acid volatile sulfides
SMS	Sediment Management Standards
SOP	standard operating procedure
TDL	targeted detection limit
TOC	total organic carbon
U.S.EPA	U.S. Environmental Protection Agency

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EXECUTIVE SUMMARY

As part of the supplementary remedial investigation of the Harbor Island Sediment Operable Unit, a field sampling program was begun on March 10, 1995, to collect samples and data that meet the requirements of the Administrative Order on Consent (AOC) between several potentially responsible parties (PRPs) for the Harbor Island Superfund site and the U.S. Environmental Protection Agency. For this investigation, surface sediment samples were collected from 61 stations around Harbor Island and from 3 reference stations in Carr Inlet, subsurface sediment cores were collected at 10 stations, high-resolution subsurface cores were collected at 4 stations, sediment traps were deployed at 5 stations, and current meters were collocated with 4 of the 5 sediment traps. This data report presents a brief overview of the methods used in the field collections and provides summaries of the data, as well as tabulations of the measurements made for this investigation.

Surface sediments were analyzed for the constituents of interest listed in Table 1 of the AOC. The list of analytes for subsurface sediment cores and sediment trap samples contained fewer parameters for analysis, as described in the field sampling plan (EVS and Hart Crowser, 1995a). Following validation of the analytical data, the results were tabulated, qualified according to validation results, and summarized. The overall completeness of the surface sediment data is 99 percent, which exceeds the project goal of 95 percent. The completeness of the metals data is 93 percent, due to the rejection of antimony results for 44 samples. A total of 120 data points were reported for the subsurface core samples, with no data rejected; thus the overall completeness of these data is 100 percent. For the high-resolution subsurface core samples, none of the 392 data points were rejected, yielding a data completeness of 100 percent. None of the 335 sediment trap sample data points were rejected.

For those metals, metalloids, and organic compounds with criteria listed in the State of Washington Sediment Management Standards, concentrations measured in sediment samples were compared against their respective cleanup screening level (CSL) concentrations. Of the constituents of interest in surface sediments, mercury was most often detected at concentrations exceeding the CSL (31 of 61 stations around Harbor Island). Other constituents of interest measured at concentrations exceeding CSLs were arsenic (1 of 61 stations), copper (4 of 61 stations), lead (1 of 61 stations), zinc (3 of 61 stations), one or

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more polycyclic aromatic hydrocarbons (2 of 61 stations), and total polychlorinated biphenyls (9 of 61 stations).

While other parameters were analyzed for in subsurface core samples, mercury was the only constituent of interest that had a CSL. Mercury exceeded the CSL in 7 of 30 subsurface core samples. These seven samples were from six stations, and all but one were from composites of the upper portions of the cores.

Sedimentation rates measured by accumulation in the five sediment traps ranged from approximately 11 cm/yr to 39 cm/yr. Concentrations of mercury, 4-methylphenol, and bis(2-ethylhexyl)phthalate exceeded CSLs in two of five sediment trap samples. Concentrations of phenol and benzoic acid exceeded CSLs in four of five sediment trap samples.

In the East Waterway, 99 percent of the current speeds were less than 10 em/s, and in the West Waterway, 90-94 percent were less than 10 cm/s. Mean speeds in the West Waterway were approximately 1.5-2 times those in the East Waterway. Maximum speeds in the East Waterway were approximately 87 em/s and 130 em/s. Maximum speeds measured by the two West Waterway current meters were 228 em/s and 329 em/s.

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1.0 INTRODUCTION

As part of the supplementary remedial investigation of the Harbor Island Sediment Operable Unit, a field sampling program was begun on March 10, 1995, to collect samples and data that meet the requirements of the Administrative Order on Consent (AOC) between several potentially responsible parties for the Harbor Island Superfund site and the U.S. Environmental Protection Agency (U.S. EPA). Samples collected in the waters adjacent to Harbor Island included surface sediments, subsurface sediment cores, and sediments collected in sediment traps. Figure 1-1 shows the locations of field sampling stations and natural recovery stations around Harbor Island, and Table 1-1 lists the corresponding northing and easting coordinates. Current meters were deployed to record current speed and direction. Surface sediment samples were also collected at three reference stations in Carr Inlet.

Details of the field sampling program are outlined in the field sampling plan (FSP; EVS and Hart Crowser, 1995a) and the cruise report (EVS and Hart Crowser, 1995b). The cruise report also summarizes deviations from the FSP with respect to additional stations, upgrades from chemistry only to chemistry and bioassay analyses at some stations, and stations at which additional sediment was collected. In all, surface sediment samples were collected at 61 stations around Harbor Island and 3 stations in Carr Inlet. Subsurface core samples were collected at 10 of the 61 field stations and at 4 of the 5 natural recovery stations. Sediment traps were deployed at all 5 natural recovery stations. Current meters were deployed at 4 of the 5 natural recovery stations.

Surface sediment samples, subsurface core samples from the field stations and natural recovery stations, and materials collected in sediment traps were submitted for chemical analysis, grain size analysis, and analysis for other parameters, including: total solids, total volatile solids, total organic carbon, total sulfides, simultaneously extracted metals/acid volatile sulfides (SEM/AVS), ammonia, and pH. In addition, natural recovery station subsurface cores were analyzed for lead-210 and cesium-137 radiochemistry.

Table 1-2 lists the analyses requested for each type of sample. Table 1-3 lists the individual analytes and the method used for each analysis. The analytes listed are the same as those in Table III of WAC 173-204-520(2) and in Table 1 of the AOC statement of work for the project.

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This report presents a summary of the chemical analytical results, grain size results, results of analyses for other parameters, and quality assurance/quality control (QA/QC) of the analyses, as well as a comparison of results with the State of Washington Sediment Management Standards (SMS) chemical concentration criteria for marine sediments. Separate sections present the results for each type of sediment sample collected and for sediment trap and current meter data. The intention is to simplify the organization of the report by making each section largely independent of the others. Figures and tables are provided at the end of the section in which they are cited. The tables provided with each section present a summary of the analytical data; tables that contain the raw analytical data extracted from the laboratory reports are provided in appendices at the end of the report.

Interpretation of the analytical results is not within the scope of this data submittal. Interpretation will be provided in the base-level data interpretation report, which is a subsequent deliverable that addresses toxicity testing, chemical analysis, radiochemistry, and analysis of other parameters.

Because of the large number of pages, laboratory data reports are not included in this report, but rather are maintained on file at the Seattle offices of EVS Environment Consultants and Hart Crowser, Inc. Laboratory data reports are available for review on request. Laboratory data reports will ultimately be transferred to the custody of the Harbor Island Sediment Work Group.

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SECTION 1.0

FIGURES AND TABLES

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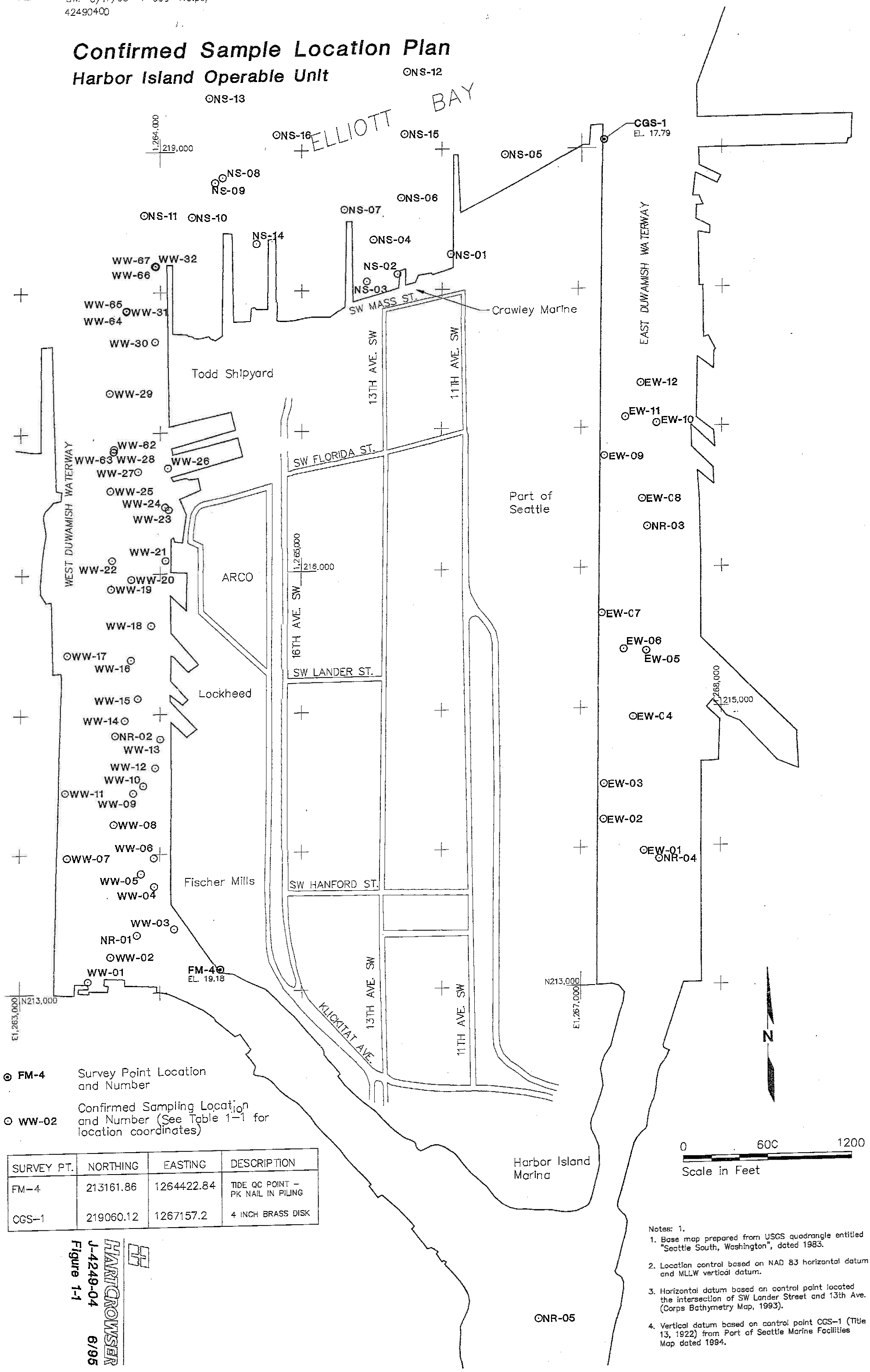
Confirmed Sample Location Plan

Harbor Island Operable Unit



FM-4 Survey Point Location and Number

WW-02 Confirmed Sampling Location and Number (See Table 1-1 for location coordinates)

SURVEY PT.	NORTHING	EASTING	DESCRIPTION
FM-4	213161.86	1264422.84	TIDE QC POINT – PK NAIL IN PILING
CGS-1	219060.12	1267157.2	4 INCH BRASS DISK

Notes: 1.

1. Base map prepared from USGS quadrangle entitled "Seattle South, Washington", dated 1983.
2. Location control based on NAD 83 horizontal datum and MLLW vertical datum.
3. Horizontal datum based on control point located the intersection of SW Lander Street and 13th Ave. SW (Corps Bathymetry Map, 1993).
4. Vertical datum based on control point CGS-1 (Title 13, 1922) from Port of Seattle Marine Facilities Map dated 1994.

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Figure 1-1

Table 1-1. Summary of Sample Locations

Station ID	Date Collected	Position[a]	
		Northing	Easting
HI-WW-01	03-14-95	213,084	1,263,485
HI-WW-02	03-17-95	213,269	1,263,647
HI-WW-03	03-17-95	213,462	1,264,099
HI-WW-04	03-15-95	213,769	1,263,957
HI-WW-05	03-16-95	213,861	1,263,867
HI-WW-06	03-17-95	213,973	1,263,958
HI-WW-07	03-16-95	213,980	1,263,337
HI-WW-08	03-17-95	214,219	1,263,669
HI-WW-09	03-15-95	214,436	1,263,809
HI-WW-10	03-16-95	214489	1263879
HI-WW-11	03-17-95	214,443	1,263,323
HI-WW-12	03-16-95	214,614	1,263,964
HI-WW-13	03-16-95	214,820	1,264,001
HI-WW-14	03-16-95	214,957	1,263,750
HI-WW-15	03-16-95	215,114	1,263,842
HI-WW-16	03-16-95	215,389	1,263,793
HI-WW-17	03-15-95	215,429	1,263,335
HI-WW-18	03-20-95	215,632	1,263,945
HI-WW-18B	03-23-95	215,639	1,263,917
HI-WW-19	03-21-95	215,897	1,263,651
HI-WW-20	03-21-95	215,962	1,263,794
HI-WW-21	03-21-95	216,095	1,264,036
HI-WW-22	03-21-95	216,100	1,263,659
HI-WW-23	03-21-95	216,460	1,264,060
HI-WW-24	03-21-95	216,480	1,264,033
HI-WW-25	03-22-95	216,598	1,263,648
HI-WW-26	03-17-95	216,754	1,264,054
HI-WW-27	03-16-95	216,731	1,263,843
HI-WW-28	03-20-95	216,893	1,263,673

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Table 1-1. continued

Station ID	Date Collected	Position[a]	
		Northing	Easting
HI-WW-29	03-23-95	217,287	1,263,642
HI-WW-30	03-16-95	217,649	1,263,962
HI-WW-31	03-22-95	217,865	1,263,759
HI-WW-32	03-23-95	218,188	1,263,966
HI-EW-01	03-16-95	213,969	1,267,451
HI-EW-02	03-17-95	214,198	1,267,159
HI-EW-03	03-14-95	214,455	1,267,161
HI-EW-04	03-14-95	214,933	1,267,370
HI-EW-05	03-15-95	215,400	1,267,466
HI-EW-06	03-16-95	215,409	1,267,304
HI-EW-07	03-17-95	215,675	1,267,149
HI-EW-08	03-17-95	216,497	1,267,432
HI-EW-09	03-15-95	216,799	1,267,164
HI-EW-10	03-17-95	217,031	1,267,532
HI-EW-11	03-16-95	217,075	1,267,307
HI-EW-12	03-15-95	217,318	1,267,420
HI-NS-01	03-23-95	218,253	1,266,063
HI-NS-02	03-23-95	218,114	1,265,680
HI-NS-03	03-23-95	218,064	1,265,462
HI-NS-04	03-16-95	218,366	1,265,511
HI-NS-05	03-17-95	218,966	1,266,449
HI-NS-06	03-17-95	218,672	1,265,707
HI-NS-07	03-14-95	218,581	1,265,302
HI-NS-08	03-16-95	218,825	1,264,438
HI-NS-09	03-23-95	218,791	1,264,387
HI-NS-10	03-23-95	218,541	1,264,220
HI-NS-11	03-22-95	218,559	1,263,883
HI-NS-12	03-22-95	219,564	1,265,757
HI-NS-13	03-20-95	219,394	1,264,348

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Table 1-1. continued

Station ID	Date Collected	Position[a]	
		Northing	Easting
HI-NS-14	03-22-95	218,339	1,264,676
HI-NS-15	03-22-95	219,112	1,265,730
HI-NS-16	03-23-95	219,123	1,264,820
HI-RF-01	03-10-95	47°20.150'N[b]	122°39.856'W[b]
HI-RF-02	03-10-95	47°19.995'N[b]	122°40.243'W[b]
HI-RF-03	03-10-95	47°19.981'N[b]	122°40.564'W[b]
HI-NR-01	03-22-95	213,418	1,263,834
HI-ST-01	03-28-95	213,421	1,263,834
HI-NR-02	03-22-95	214,848	1,263,679
HI-ST-02	03-28-95	214,848	1,263,682
HI-NR-03	03-22-95	216,302	1,267,466
HI-ST-03	03-27-95	216,294	1,267,476
HI-NR-04	03-22-95	213,915	1,267,557
HI-ST-04	03-27-95	213,902	1,267,563
HI-ST-05	03-28-95	210,626	1,266,682

[a] Position (in ft) relative to NAD 83 State Plane Coordinate System.

[b] Standard reference station locations in Carr Inlet were identified in terms of latitude and longitude coordinates.

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Table 1-2. Summary of Analyses for Surface and Subsurface Sediment Samples

Analysis	Surface Sediment Samples	Collocated Surface Sediment Samples[a]	Subsurface Sediment Core Samples	Natural Recovery Sediment Core Samples	Natural Recovery Sediment Trap Samples
CHEMICAL PARAMETERS					
Metals and metalloids	X	X			
Mercury	X	X	X	X	X
Semivolatile organic compounds	X	X			
Pesticides	X	X			
Polychlorinated biphenyls	X	X		X	X
Organotin compounds	X	X			
RADIOCHEMISTRY					
Lead-210 and cesium-137				X	
GRAIN SIZE	X	X	X		X
OTHER PARAMETERS					
Total solids	X	X	X	X	X
Total volatile solids	X	X			
Total organic carbon	X	X			X
Total sulfides	X	X	X		
Simultaneously extracted metals/ acid volatile sulfides	X				
Ammonia	X	X	X		
pH	X	X			

[a] Surface samples from collocated subsurface sediment core stations.

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Table 1-3. Analyte List

ANALYTES	METHOD
Metals in mg/kg (ppm)	
Antimony	U.S. EPA Method 6010
Arsenic	U.S. EPA Method 7060
Cadmium	U.S. EPA Method 6010
Chromium	U.S. EPA Method 6010
Copper	U.S. EPA Method 6010
Lead	U.S. EPA Method 7421
Mercury	U.S. EPA Method 7471
Nickel	U.S. EPA Method 6010
Silver	U.S. EPA Method 6010
Zinc	U.S. EPA Method 6010
Tributyltin (as tin) in μg/kg (ppb)	Krone et al. 1989
Phenol in μg/kg (ppb)	
Phenol	U.S. EPA Method 8270
2-Methylphenol	U.S. EPA Method 8270
4-Methylphenol	U.S. EPA Method 8270
2,4-Dimethylphenol	U.S. EPA Method 8270
Pentachlorophenol	U.S. EPA Method 8270
LPAHs in μg/kg (ppb)	
Naphthalene	U.S. EPA Method 8270
2-Methylnaphthalene	U.S. EPA Method 8270
Acenaphthylene	U.S. EPA Method 8270
Acenaphthene	U.S. EPA Method 8270
Fluorene	U.S. EPA Method 8270
Phenanthrene	U.S. EPA Method 8270
Anthracene	U.S. EPA Method 8270
HPAHs in μg/kg (ppb)	
Fluoranthene	U.S. EPA Method 8270
Pyrene	U.S. EPA Method 8270
Benz(a)anthracene	U.S. EPA Method 8270
Chrysene	U.S. EPA Method 8270
Total benzofluoranthenes	U.S. EPA Method 8270
Benzo(a)pyrene	U.S. EPA Method 8270
Indeno(1,2,3-cd)pyrene	U.S. EPA Method 8270

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Table 1-3. continued

ANALYTES	METHOD
Dibenz(a,h)anthracene	U.S. EPA Method 8270
Benzo(g,h,i)perylene	U.S. EPA Method 8270
Chlorinated Aromatics in μg/kg (ppb)	
1,2-Dichlorobenzene	U.S. EPA Method 8270
1,3-Dichlorobenzene	U.S. EPA Method 8270
1,4-Dichlorobenzene	U.S. EPA Method 8270
1,2,4-Trichlorobenzene	U.S. EPA Method 8270
Hexachlorobenzene	U.S. EPA Method 8081
Chlorinated Aliphatics in μg/kg (ppb)	
Hexachlorobutadiene	U.S. EPA Method 8270
Phthalate Esters in μg/kg (ppb)	
Dimethyl phthalate	U.S. EPA Method 8270
Diethyl phthalate	U.S. EPA Method 8270
Di-*n*-butyl phthalate	U.S. EPA Method 8270
Butylbenzylphthalate	U.S. EPA Method 8270
Bis(2-ethylhexyl)phthalate	U.S. EPA Method 8270
Di-*n*-octyl phthalate	U.S. EPA Method 8270
Miscellaneous Oxygenated Compounds in μg/kg (ppb)	
Benzyl alcohol	U.S. EPA Method 8270
Benzoic acid	U.S. EPA Method 8270
Dibenzofuran	U.S. EPA Method 8270
N-Nitrosodiphenylamine	U.S. EPA Method 8270
Pesticides/PCBs in μg/kg (ppb)	
Total PCBs	U.S. EPA Method 8081
4,4'-DDE	U.S. EPA Method 8081
4,4'-DDD	U.S. EPA Method 8081
4,4'-DDT	U.S. EPA Method 8081
Chlordane (alpha, gamma)	U.S. EPA Method 8081
Aldrin	U.S. EPA Method 8081
Dieldrin	U.S. EPA Method 8081
Heptachlor	U.S. EPA Method 8081
Lindane	U.S. EPA Method 8081

HI-SHELL000300

Table 1-3. continued

ANALYTES	METHOD
Radioisotopes in dpm/g	
Lead-210	U.S. EPA Method (EMSL-LV-0539-17)
Cesium-137	U.S. EPA Method 901.1
GRAIN SIZE	PSEP
Other Parameters	
Percent solids	PSEP
Total volatile solids	PSEP
Total organic carbon	PSEP/SM 5310B[a]
Total sulfides	U.S. EPA Method 376.2
Simultaneously extracted metals/acid volatile sulfides	Allen et al. 1991
Ammonia	U.S. EPA Method 350
pH	U.S. EPA Method 9045

NOTE: PSEP - Puget Sound Estuary Program

[a] If the total organic carbon content is below 2.0 percent, only Standard Method 5310B will be used.

HI-SHELL000301

2.0 SURFACE SEDIMENT SAMPLE DATA SUMMARY

This section presents a brief discussion of methods for the collection, handling, and analysis of surface sediments. Following the discussion of methods is a presentation of the analytical results and comparison with the SMS chemical concentration criteria. Discussions of results are organized according to sampling location as follows: Carr Inlet, West Waterway, East Waterway, and the North Shore of Harbor Island (North Shore). Figures and tables that summarize the analytical results for surface sediments are provided at the end of this section. Raw data tables containing the validated analytical results for all stations are provided in Appendix A. Results for the sediment grain size analyses, both in tabular and graphical form, are provided in Appendix E.

2.1 METHODS

2.1.1 Field Methods

Surface sediment samples were collected, handled, and documented in accordance with methods and procedures presented in the FSP and the quality assurance project plan/laboratory analysis plan (QAPP/LAP; EVS and Hart Crowser, 1995a,d), with modifications as detailed in the cruise report (EVS and Hart Crowser, 1995b). Surface sediment sample collection was conducted between March 10 and March 23, 1995. Figure 2-1 shows the locations near Harbor Island where surface sediment samples were collected. Samples for chemical analysis were transported directly to the laboratory, Analytical Resources Inc. (ARI), in Seattle, Washington, by field personnel at the end of each field sampling day. Samples for grain size analysis were transported directly to Hart Crowser, Inc.

2.1.2 Analytical Methods

Surface sediment samples submitted for analysis are as follows:

- Carr Inlet—HI-RF-01 through HI-RF-03
- West Waterway—HI-WW-01 through HI-WW-32, plus HI-WW-18B
- East Waterway—HI-EW-01 through HI-EW-12
- North Shore —HI-NS-01 through HI-NS-14, HI-NS-16

HI-SHELL000302

Samples were analyzed for grain size, chemical parameters (metals and metalloids, organotin compounds, semivolatile organic compounds, pesticides, and polychlorinated biphenyls [PCBs]), and other parameters (total solids, total volatile solids, total organic carbon [TOC], total sulfides, SEM, AVS, ammonia, and pH). Reported concentrations of total PCBs comprise the concentrations of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. Table 1-2 contains a complete list of analytical parameters. Results of the analyses for grain size, chemical parameters, and other parameters, organized by sampling location, are discussed in Sections 2.2.1 through 2.2.4.

Chemical analyses were conducted in accordance with protocols outlined in the QAPP/LAP. Laboratory standard operating procedures (SOPs) for ARI and for Hart Crowser, Inc. are included in the QAPP/LAP.

2.1.3 Data Handling and Presentation

Data resulting from the analyses were entered into a relational database for ease of storage and manipulation. The analytical results were extracted from the database and formulated into tables of results for the respective analytes and stations. These tables are provided in appendices at the end of this report.

Summary tables provided at the end of each section show different information for each category of analytes. For grain size distribution, the results are reported in percent fraction of gravel, sand, silt, and clay. The fractions were defined by the following grain size ranges:

Gravel	>2.0 mm
Sand	0.0625 – 1.9 mm
Silt	0.004 – 0.0624 mm
Clay	<0.004 mm

For the constituents of concern, the tables show frequencies of detection; minimum, maximum, and median values; the cleanup screening levels (CSLs) established in WAC 173-204-520 for chemical concentrations in marine sediments; and a count of the number of stations exceeding CSLs on an analyte-by-analyte basis. In tables presenting results for other parameters, comparison with CSLs is not applicable, and therefore those columns are not included.

HI-SHELL000303

Measurements of SEM/AVS were performed to provide information on the potential bioavailability of metals in the sediments. Summary tables presenting the SEM/AVS results show the concentrations of each metal after conversion from dry weight to molar basis, the sum of individual SEM concentrations, and the ∑SEM/AVS ratios.

2.1.3.1 Data Reporting and Detection Limits

The number of significant figures reported in the analytical results follow the U.S. EPA Contract Laboratory Program (CLP) protocol. According to this protocol, if a value is less than 10, it is reported to 2 significant figures. If a value is equal to or greater than 10, it is reported to 3 significant figures. In the data summary tables, concentrations that were less than the achieved detection limit were entered as "ND." Actual detection limits may vary from sample to sample for the same analyte. In the raw data tables in the appendices, concentrations not detected are indicated by the detection limit and a "U" qualifier.

2.1.3.2 CSL Comparisons

CSL enrichment ratios were reported to indicate the degree to which a contaminant exceeds the SMS chemical criteria. For each sampling station, comparisons were made between chemical analytical results and the CSL values for all analytes contained in the CSL chemical criteria list. Results of comparisons between analytical results and chemical criteria were then summarized in CSL enrichment ratio tables that detail exceedences on a station-by-station basis. No cross reference between surface sediment chemical results and toxicity test results has been made in this document. There were nine occurrences in which the achieved detection limits for organic compounds exceeded the respective CSL. Reporting protocols require that these occurrences be reported as exceedences. Therefore, in the data summary tables for organic compounds and in the CSL enrichment ratio tables, these occurrences are indicated and explained with footnotes.

2.2 RESULTS

Results of the various analyses conducted on the surface sediment samples are presented separately for Carr Inlet, West and East Waterways, and the North Shore.

HI-SHELL000304

2.2.1 Carr Inlet Reference Stations

2.2.1.1 Grain Size

Three reference stations were sampled to provide a range of fine-grained sediments for comparison with sediment bioassays conducted on selected stations. Table 2-1 summarizes the grain size analysis results for the reference stations. The grain size in reference sediments ranged from 51 to 86 percent fines (sum of silt and clay).

2.2.1.2 Metals, Metalloids, and Tributyltin

The concentrations of metals, metalloids, and tributyltin in reference station sediments are summarized in Table 2-2. Mercury and tributyltin were the only analytes in this group that were not detected at any of the reference stations. Concentrations of the other metals were approximately 10 percent or less than the CSLs.

2.2.1.3 Organic Compounds

Concentrations of the organic compounds in reference station sediments are summarized in Table 2-3. Few organic compounds were detected in sediments from the reference stations. Detected compounds included fluoranthene and high molecular weight polycyclic aromatic hydrocarbons (HPAHs) at one of three stations, phenol at two of three stations, and 4-methylphenol at all three stations. None of these compounds exceeded the CSL values, but the detection limits of two chlorobenzene compounds did exceed their CSLs.

2.2.1.4 SEM/AVS

The concentrations of SEM and AVS for reference station sediments are summarized in Table 2-4. The ∑SEM/AVS ratio exceeded 1.0 for surface sediments at all three reference stations. None of the metals were detected at concentrations of concern.

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2.2.1.5 Other Parameters

Results of analyses for other parameters in reference station sediments are summarized in Table 2-5.

2.2.1.6 CSL Enrichment Ratios

The detection limit for the organic compound 1,2-dichlorobenzene (3,111 μg/kg-organic carbon [OC]) exceeded the CSL (2,300 μg/kg-OC) at one reference station. At two stations, detection limits for 1,2-dichlorobenzene (3,111 μg/kg-OC at one and 2,273 μg/kg-OC at the second) exceeded the CSL (1,800 μg/kg-OC). According to SMS guidelines, these results must be reported as exceedences. No enrichment ratios can be calculated because the actual (undetected) concentrations are unknown.

2.2.2 West Waterway

2.2.2.1 Grain Size

Table 2-6 summarizes the results of grain size analyses for West Waterway stations. For these stations, the percentage of fine-grained sediments ranged from 25 to 79 percent, with a mean of 50 percent.

2.2.2.2 Metals, Metalloids, and Tributyltin

Table 2-7 summarizes the results for metals, metalloids, and tributyltin. All of the stations in the West Waterway had detectable concentrations of metals, metalloids, and tributyltin. With the exception of antimony (5 of 11 stations) and cadmium (30 of 33 stations), the analytes in this group were detected at all 33 stations. Analytical results for antimony were rejected for 22 of 33 stations during data validation (see Section 2.3).

2.2.2.3 Organic Compounds

Table 2-8 summarizes results for organic compounds in the West Waterway. Thirty-four of the 49 analytes in this group were detected at at least one station in the West Waterway; however, there were few exceedences of the CSLs. One PAH (benzo(g,h,i)perylene)

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exceeded the CSL at Station HI-WW-18B. Concentrations of total PCBs also exceeded the CSL at Station HI-WW-25.

2.2.2.4 SEM/AVS

Table 2-9 summarizes the SEM and AVS data and presents the ∑SEM/AVS ratios. Seven stations in the West Waterway had ∑SEM/AVS ratios greater than 1.0. The maximum ratio was 37 for Station HI-WW-29. The next highest was 9.0 for Station HI-WW-28. The remaining five ratios that exceeded 1.0 were less than 4.0.

2.2.2.5 Other Parameters

Table 2-10 summarizes results for other parameters for stations in the West Waterway.

2.2.2.6 CSL Enrichment Ratios

Table 2-11 presents a complete listing of West Waterway CSL enrichment ratios greater than 1.0, by station. Twenty of 33 stations in the West Waterway had CSL exceedences. Concentrations of mercury exceeded the CSL at all 20 of those stations and constituted the only exceedence at 14 of the 20 stations. Exceedences at the other 6 stations included arsenic (1), copper (2), lead (1), zinc (3), benzo(g,h,i)perylene (1), and total PCBs (1). Some stations had multiple exceedences. Figures 2-2 through 2-8 show the stations around Harbor Island where CSL exceedences occurred, along with the corresponding analytes.

2.2.3 East Waterway

2.2.3.1 Grain Size

Table 2-12 summarizes the grain size data for the East Waterway. At the East Waterway stations, the percentage of fine-grained sediments ranged from 39 percent to 82 percent, with a mean of 68 percent.

HI-SHELL000307

2.2.3.2 Metals, Metalloids, and Tributyltin

Table 2-13 summarizes the data for metals, metalloids, and tributyltin. All analytes in this group were detected at all stations in the East Waterway. Analytical results for antimony were rejected during data validation. Mercury was the only analyte to exceed the CSL in the East Waterway (3 of 12 stations). Concentrations of the other analytes in this group were well below the CSLs.

2.2.3.3 Organic Compounds

Table 2-14 summarizes the data for organic compounds. Thirty-two of the 49 compounds from this group of analytes were detected at at least one station in the East Waterway. Only one parameter, total PCBs, was detected at concentrations greater than the CSL (at 5 of 12 stations).

2.2.3.4 SEM/AVS

The results of the SEM and AVS analyses are summarized in Table 2-15. None of the ∑SEM/AVS ratios in the East Waterway were greater than 1.0.

2.2.3.5 Other Parameters

Table 2-16 summarizes results for analyses of other parameters in the East Waterway.

2.2.3.6 CSL Enrichment Ratios

Table 2-17 lists the CSL enrichment ratios greater than 1.0 found in the East Waterway. Mercury and total PCBs were the only substances with enrichment ratios greater than 1.0 in the East Waterway. Concentrations of mercury exceeded the CSL at 3 of 12 stations, and exceedence ratios ranged from 1.0 to 3.2. Total PCBs exceeded the CSL at 5 of 12 stations, and the exceedence ratio ranged from 1.4 to 2.0. Figures 2-2 through 2-8 show the stations around Harbor Island where CSL exceedences occurred, along with the corresponding analytes.

HI-SHELL000308

Three cross-contamination blanks and one filter blank were prepared for the surface sediment samples. Di-*n*-butyl phthalate, butylbenzyl phthalate, diethyl phthalate, and bis(2-ethylhexyl)phthalate were found in the cross-contamination and filter blanks. As discussed in the previous section, associated samples with phthalate levels less than the action level were qualified as not detected. Sources of phthalates in the field would be the high-density polyethylene buckets used for homogenizing the samples. Phthalates were also found in the filter blank, which could be due to the filter papers being stored in a clean polyethylene bag.

2.3.2.2 Field Replicates

Field replicates provide information that is used to assess the variability of parameters measured in the field. Field replicates were prepared by collecting two samples alongside the original sampling station (for a total of three samples from the same station). These replicates were prepared separately in the field and submitted blind to the laboratory as discrete samples.

Four sets of field replicates were collected for the surface sediment samples. The percent relative standard deviation (%RSD) for each replicate set is presented in Tables 2-24, 2-25, 2-26, and 2-27. All %RSDs fell below the advisory limit of 50 percent with the exception of the %RSD values printed in bold type in the tables.

Sample HI-EW-06 was extracted and analyzed for semivolatile organic compounds using the medium-level procedure, while the remaining two, Samples HI-EW-60 and HI-EW-61, were analyzed using the low-level technique. The medium-level procedure is designed for samples that have medium to high levels of semivolatile organic compounds present, and will result in a higher detection limit for all compounds. The low-level procedure is designed for samples that have low levels of semivolatile organic compounds present, and will result in a lower detection limit than can be obtained by using the medium-level procedure. Aldrin, 4,4′-DDD, and PCB Aroclor 1242 were not detected in Sample HI-EW-06 due to the elevated detection limits resulting from the medium-level preparation, but were detected in Samples HI-EW-60 and HI-EW-61. The %RSD values for these compounds in this replicate set were not calculable due to the compounds not being detected in Sample HI-EW-06. However, the RPD values for aldrin, 4,4′-DDD, and PCB Aroclor 1242 for Samples HI-EW-60 and HI-EW-61 were 85 percent, 109 percent, and 99 percent, respectively, which were greater than the advisory control limit of 50 percent.

HI-SHELL000309

The field replicate results for Station HI-WW-32 varied up to a high of 87 %RSD. All of the high RSD values are for HPAHs (such as chrysene). Although no data were qualified on the basis of the triplicate analysis alone, the field variability should be considered during data interpretation.

2.3.3 Targeted Detection Limits

The targeted detection limits (TDLs) for this project were met by the laboratory for all analyses with the following exceptions:

- Samples HI-EW-11, HI-EW-06, HI-EW-01, and HI-NS-08 did not meet the TDLs specified in the QAPP for pesticide/PCBs, because they were extracted and analyzed using the medium-level procedure
- Samples HI-NS-04 and HI-WW-30 did not meet the TDLs specified in the QAPP for total sulfides

No sample detection limits were qualified based on these outliers.

2.3.4 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. The completeness objective of 95 percent was met for all analyses, except for metals with 93 percent completeness. Forty-four antimony results (7 percent of the metals results) were rejected due to poor matrix spike recoveries. The overall measurement of completeness for surface sediment samples is 99 percent.

HI-SHELL000310

SECTION 2.0

FIGURES AND TABLES

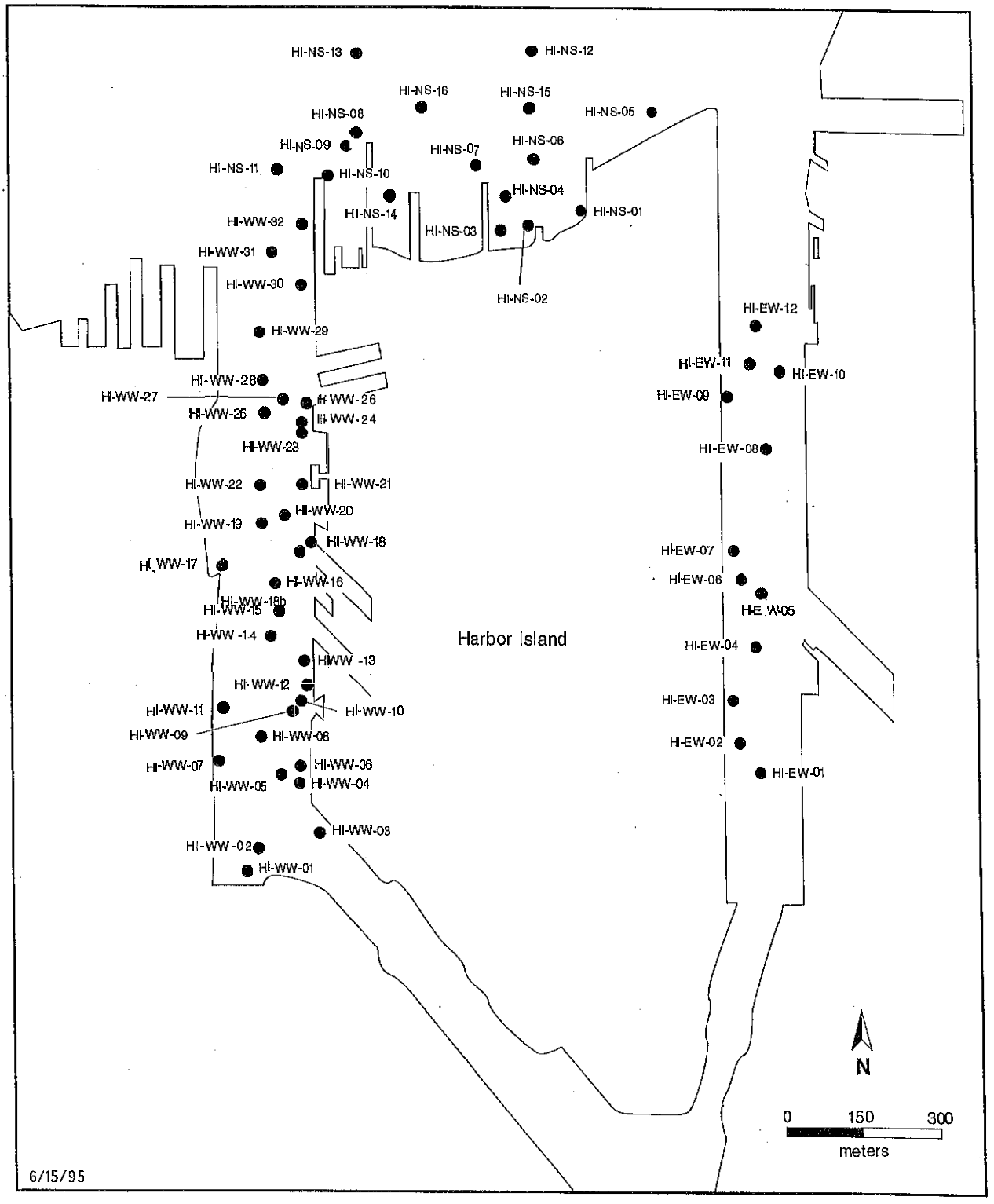

Figure 2-1. Locations of surface sediment sampling stations – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000312

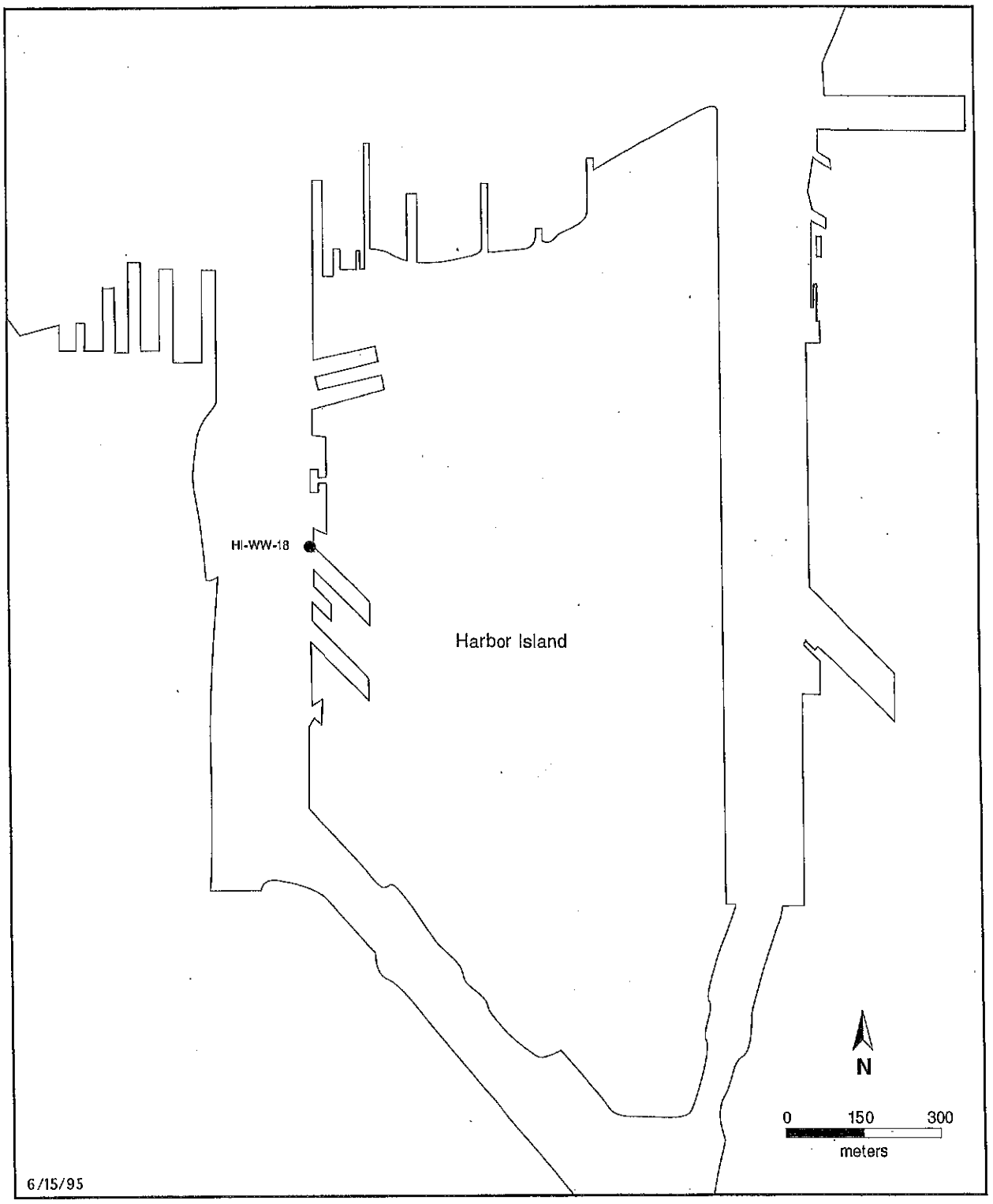

Figure 2-2. Locations where arsenic concentrations in surface sediments exceeded the CSL – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000313

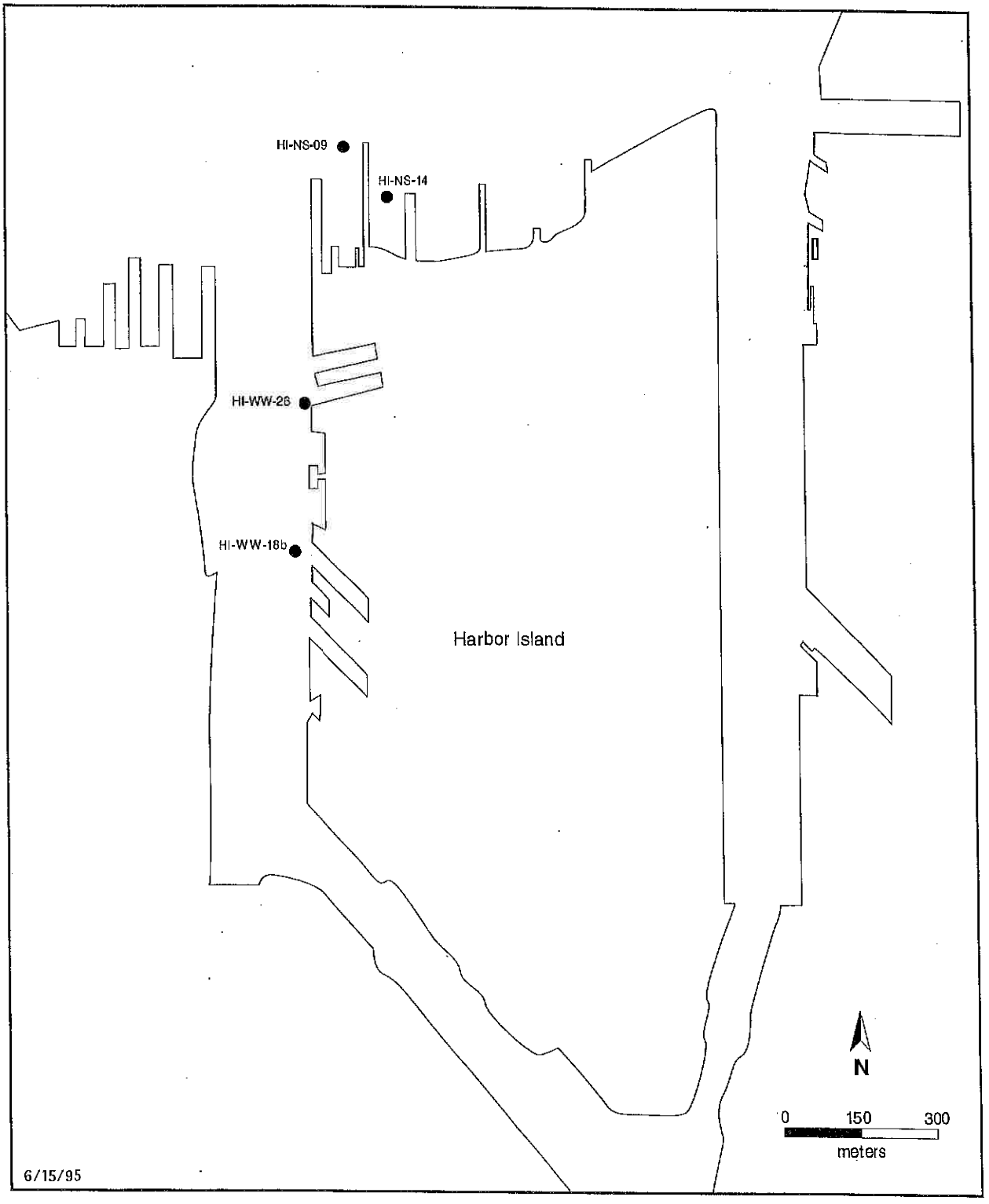

Figure 2-3. Locations where copper concentrations in surface sediments exceeded the CSL–Harbor Island Supplementary Remedial Investigation.

HI-SHELL000314

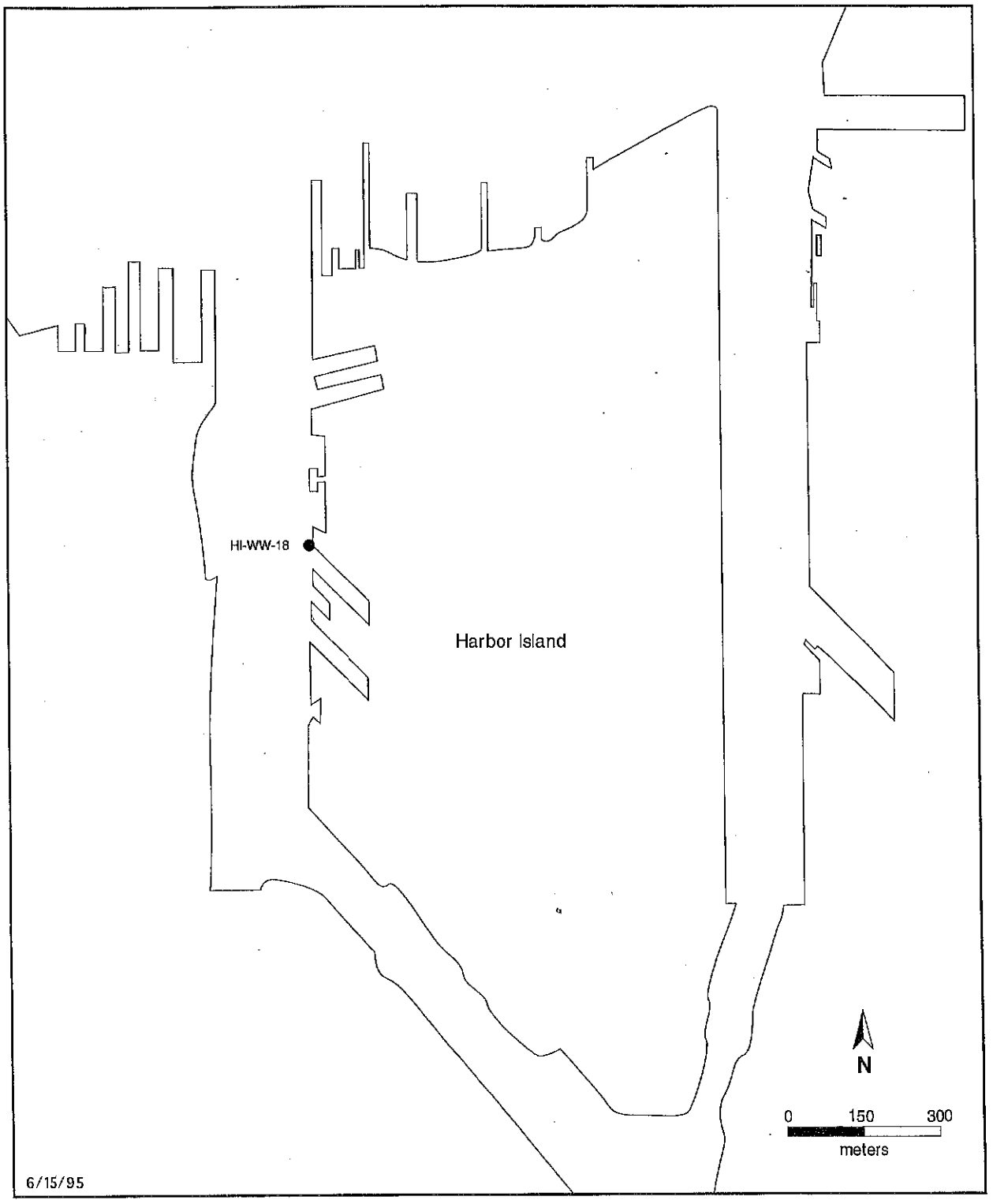

Figure 2-4. Locations where lead concentrations in surface sediments exceeded the CSL–Harbor Island Supplementary Remedial Investigation.

HI-SHELL000315

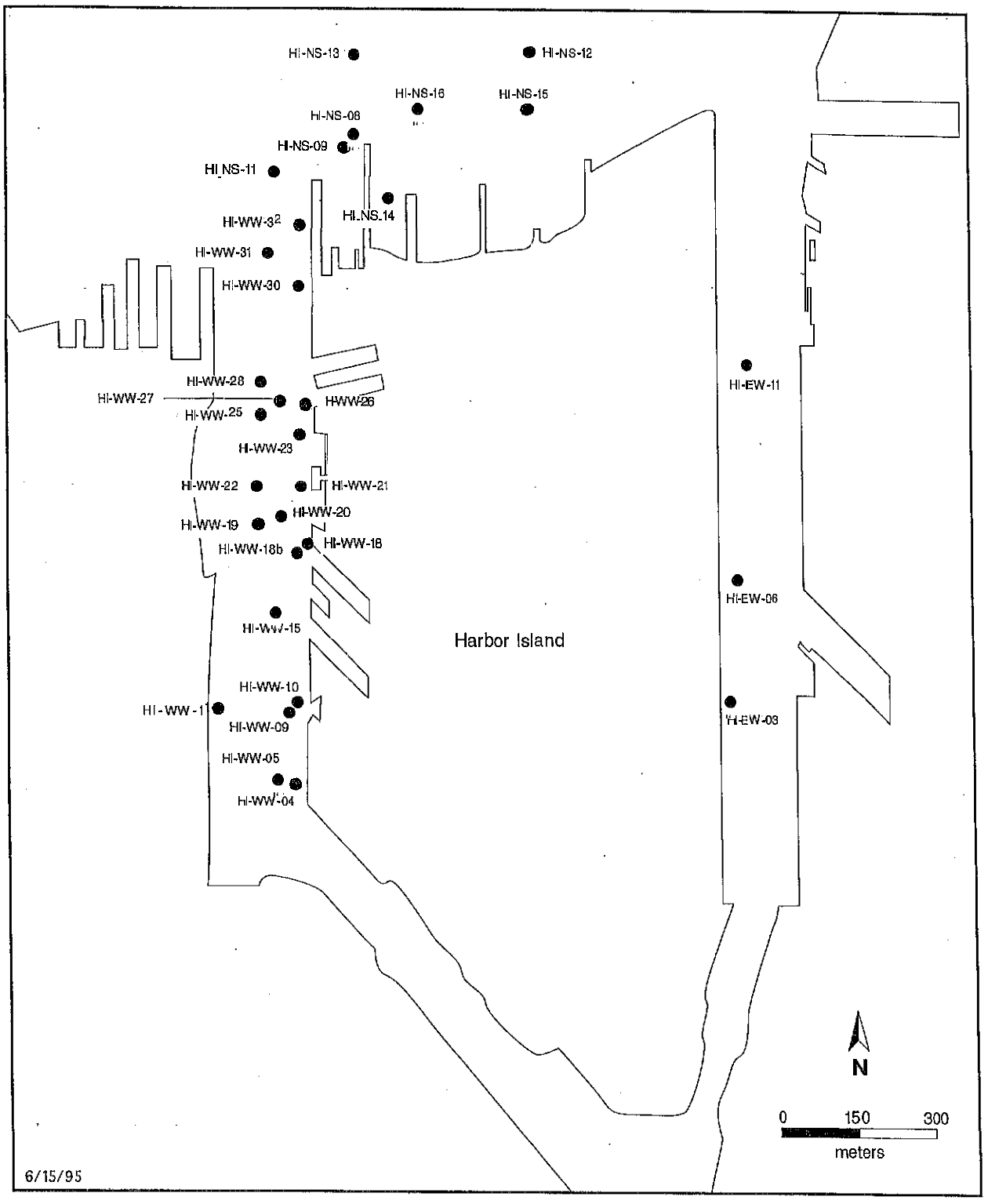

Figure 2-5. Locations where mercury concentrations in surface sediments exceeded the CSL – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000316

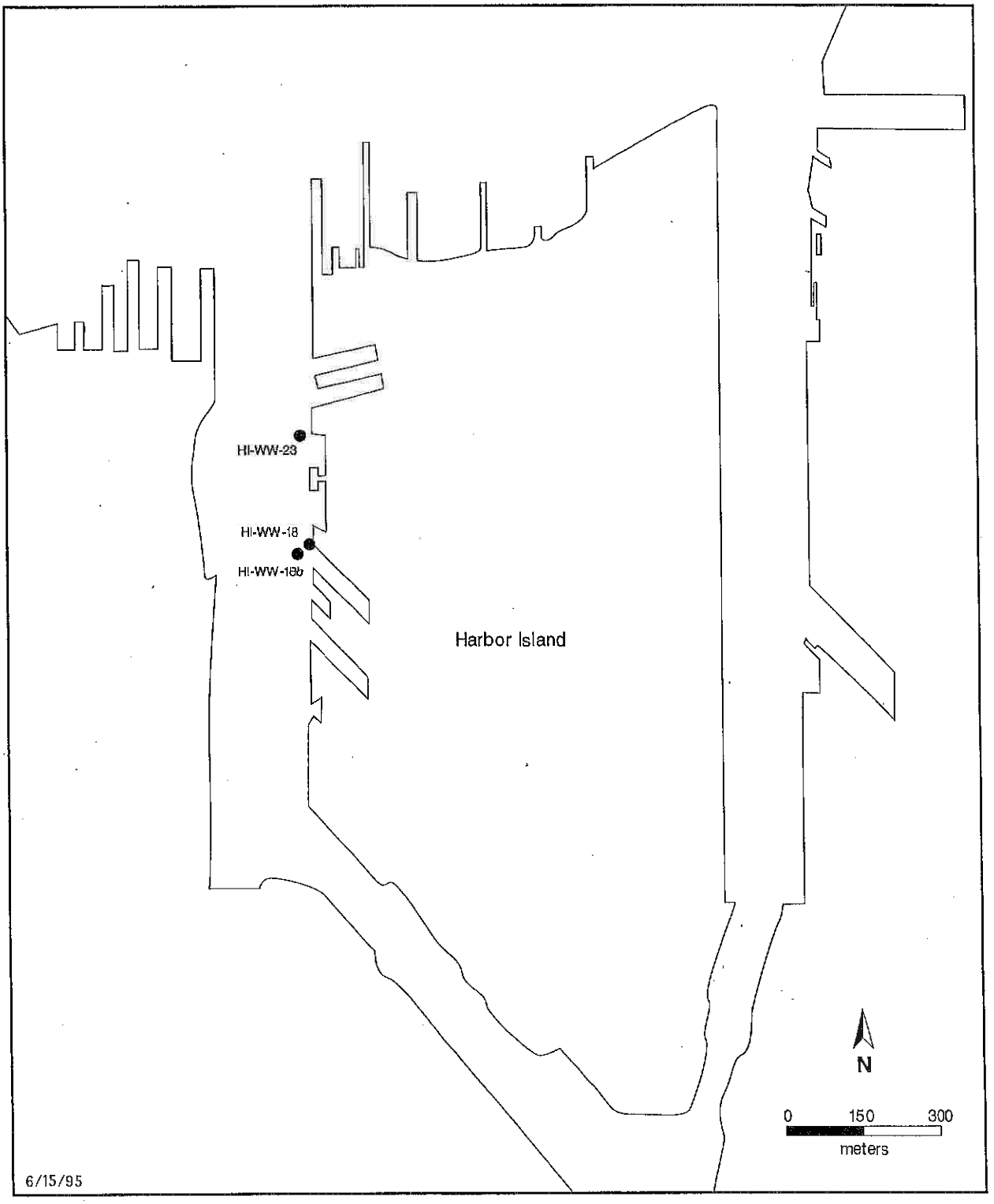

Figure 2-6. Locations where zinc concentrations in surface sediments exceeded the CSL – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000317

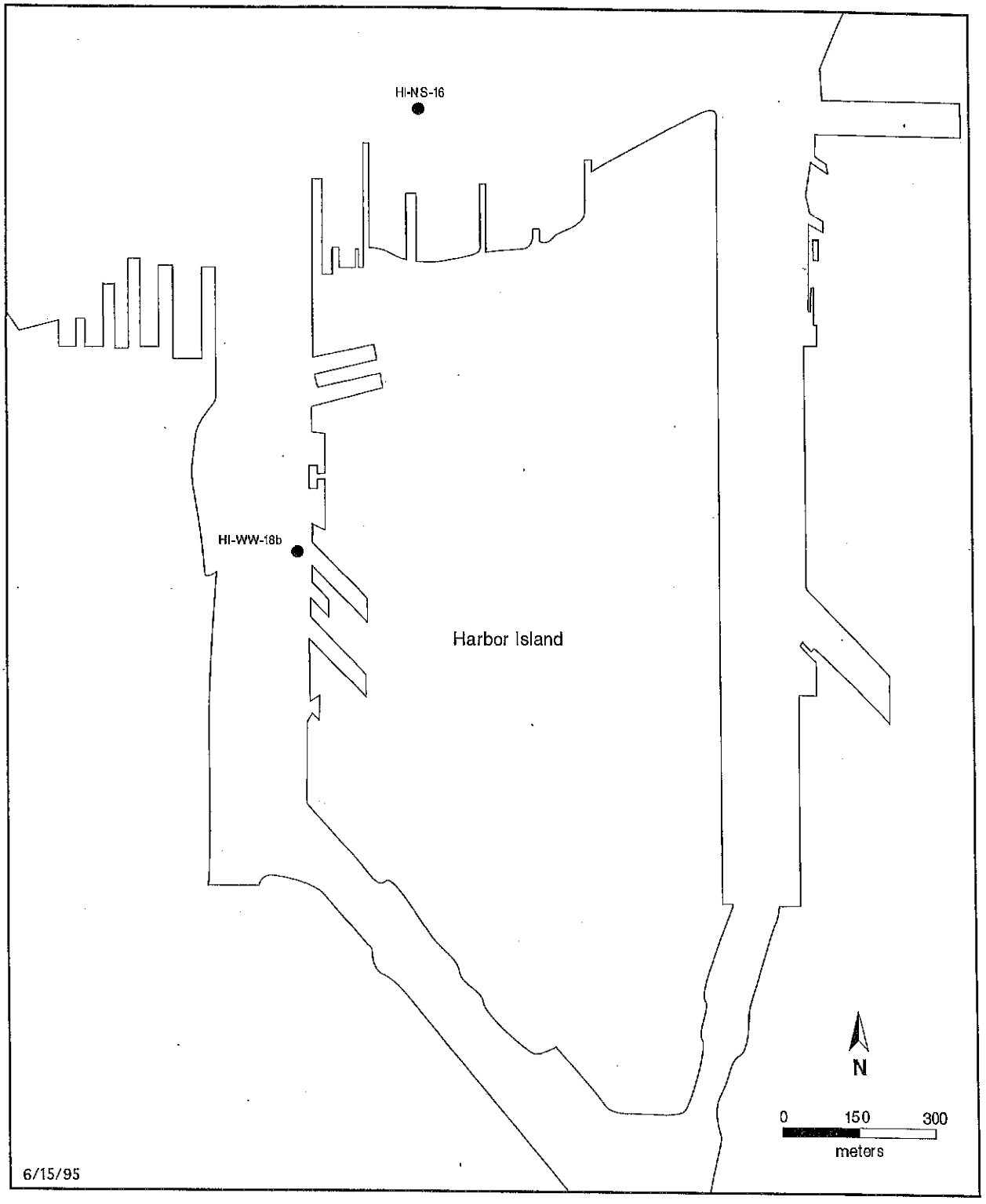

Figure 2-7. Locations where PAH concentrations in surface sediments exceeded the CSL – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000318

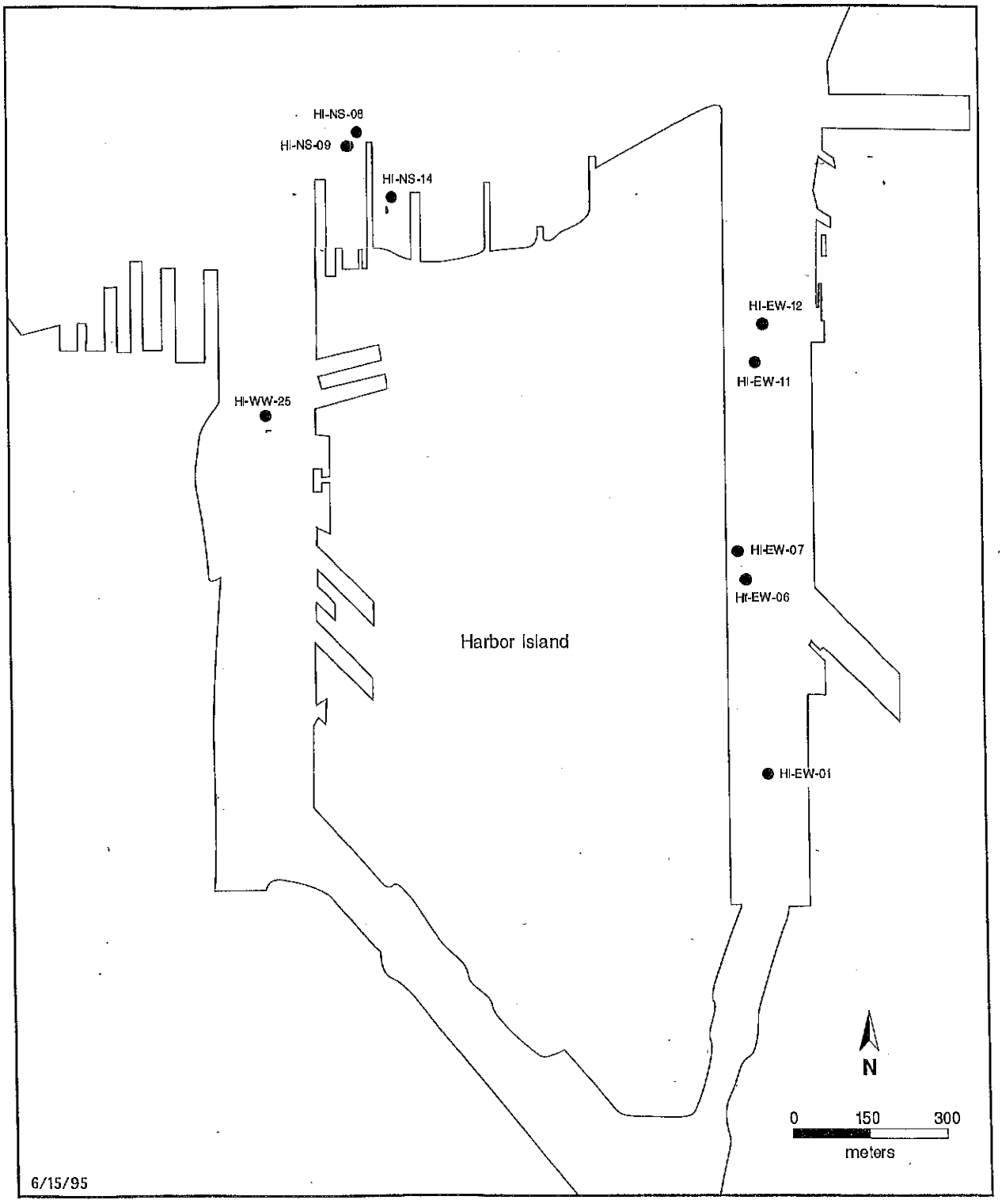

Figure 2-8. Locations where total PCB concentrations in surface sediments exceeded the CSL – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000319

Table 2-1. Grain Size Distribution for Carr Inlet Reference Stations

Station	Percent Gravel	Percent Sand	Percent Silt	Percent Clay
HI-RF-01	0	14	73	13
HI-RF-02	0	17	75	8
HI-RF-03	0	49	45	6

HI-SHELL000320

Table 2-2. Summary of Concentrations of Metals, Metalloids, and Tributyltin in Surface Sediments of Carr Inlet Reference Stations

Parameter	No. Stations Detected/Total	Minimum Concentration Detected (mg/kg dry wt)	Maximum Concentration Detected (mg/kg dry wt)	Median Concentration Detected (mg/kg dry wt)	CSL (mg/kg dry wt)	No. Stations Exceeding CSL
Arsenic	3/3	4.1	6.1	4.8	93.0	0
Cadmium	1/3	0.50	0.50	0.50	6.7	0
Chromium	3/3	26.9	39.7	36.8	270	0
Copper	3/3	11.2	21.3	17.2	390	0
Lead	3/3	4.4	8.2	5.2	530	0
Mercury	0/3	ND	ND	ND	0.59	0
Nickel	3/3	26.0	34.0	33.0	NA	NA
Silver	1/3	0.50	0.50	0.50	6.1	0
Zinc	3/3	32.6	52.3	43.5	960	0
Tributyltin[a]	0/3	ND	ND	ND	NA	NA

NOTE: CSL - Cleanup screening level.
NA - Not applicable; no criteria established.
ND - Below detection limit; detection limits given in Appendix A.

[a] Tributyltin is an organometal complex. Tributyltin concentrations are in μg/kg dry wt.

HI-SHELL000321

Table 2-3. Summary of Concentrations of Organic Compounds in Surface Sediments of Carr Inlet Reference Stations

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
LPAHs									
2-Methylnaphthalene	0/3	ND	ND	ND	ND	ND	ND	64,000	0
Acenaphthene	0/3	ND	ND	ND	ND	ND	ND	57,000	0
Acenaphthylene	0/3	ND	ND	ND	ND	ND	ND	66,000	0
Anthracene	0/3	ND	ND	ND	ND	ND	ND	1,200,000	0
Fluorene	0/3	ND	ND	ND	ND	ND	ND	79,000	0
Naphthalene	0/3	ND	ND	ND	ND	ND	ND	170,000	0
Phenanthrene	0/3	ND	ND	ND	ND	ND	ND	480,000	0
Total LPAHs	0/3	ND	ND	ND	ND	ND	ND	780,000	0
HPAHs									
Benz(a)anthracene	0/3	ND	ND	ND	ND	ND	ND	270,000	0
Benzo(a)pyrene	0/3	ND	ND	ND	ND	ND	ND	210,000	0
Benzo(g,h,i)perylene	0/3	ND	ND	ND	ND	ND	ND	78,000	0
Chrysene	0/3	ND	ND	ND	ND	ND	ND	460,000	0
Dibenz(a,h)anthracene	0/3	ND	ND	ND	ND	ND	ND	33,000	0
Fluoranthene	1/3	18	18	18	1,837	1,837	1,837	1,200,000	0
Indeno(1,2,3-c,d)pyrene	0/3	ND	ND	ND	ND	ND	ND	88,000	0
Pyrene	0/3	ND	ND	ND	ND	ND	ND	1,400,000	0
Total benzofluoranthenes	0/3	ND	ND	ND	ND	ND	ND	450,000	0

Table 2-3. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
Total HPAHs	1/3	171	171	171	17,449	17,449	17,449	5,300,000	0
Miscellaneous Oxygenated Compounds									
Benzoic acid	0/3	ND	ND	ND	NA	NA	NA	650[a]	0
Benzyl alcohol	0/3	ND	ND	ND	NA	NA	NA	73[a]	0
Dibenzofuran	0/3	ND	ND	ND	ND	ND	ND	58,000	0
N-Nitrosodiphenylamine	0/3	ND	ND	ND	ND	ND	ND	11,000	0
Phenols and Subphenols									
2-Methylphenol	0/3	ND	ND	ND	NA	NA	NA	63[a]	0
2,4-Dimethylphenol	0/3	ND	ND	ND	NA	NA	NA	29[a]	0
4-Methylphenol	3/3	41	210	110	NA	NA	NA	670[a]	0
Pentachlorophenol	0/3	ND	ND	ND	NA	NA	NA	690[a]	0
Phenol	2/3	27	34	30.5	NA	NA	NA	1,200[a]	0
Chlorinated Aromatic Compounds									
1,2-Dichlorobenzene	0/3	ND	ND	ND	ND	ND	ND	2,300	1[b]
1,2,4-Trichlorobenzene	0/3	ND	ND	ND	ND	ND	ND	1,800	2[b]
1,3-Dichlorobenzene	0/3	ND	ND	ND	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	0/3	ND	ND	ND	ND	ND	ND	9,000	0
Chlorinated Aliphatic Compounds									
Hexachlorobutadiene	0/3	ND	ND	ND	ND	ND	ND	6,200	0
Phthalate Esters									
Di-*n*-octyl phthalate	0/3	ND	ND	ND	ND	ND	ND	4,500,000	0

Table 2-3. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
Bis(2-ethylhexyl)phthalate	0/3	ND	ND	ND	ND	ND	ND	78,000	0
Butylbenzyl phthalate	0/3	ND	ND	ND	ND	ND	ND	64,000	0
Diethyl phthalate	0/3	ND	ND	ND	ND	ND	ND	110,000	0
Dimethyl phthalate	0/3	ND	ND	ND	ND	ND	ND	53,000	0
Di-*n*-butyl phthalate	0/3	ND	ND	ND	ND	ND	ND	1,700,000	0
Pesticides/PCBs									
Gamma-HCH (lindane)	0/3	ND	ND	ND	NA	NA	NA	NA	NA
Hexachlorobenzene	0/3	ND	ND	ND	ND	ND	ND	2,300	0
Aldrin	0/3	ND	ND	ND	NA	NA	NA	NA	NA
Alpha-chlordane	0/3	ND	ND	ND	NA	NA	NA	NA	NA
Gamma-chlordane	0/3	ND	ND	ND	NA	NA	NA	NA	NA
Dieldrin	0/3	ND	ND	ND	NA	NA	NA	NA	NA
Heptachlor	0/3	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDD	0/3	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDE	0/3	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDT	0/3	ND	ND	ND	NA	NA	NA	NA	NA
Total PCBs	0/3	ND	ND	ND	ND	ND	ND	65,000	0

NOTE: CSL - Cleanup screening level.
HPAH - High molecular weight polycyclic aromatic hydrocarbon.
LPAH - Low molecular weight polycyclic aromatic hydrocarbon.
NA - Not applicable; no criteria established.
ND - Below detection limit; detection limits given in Appendix A.
OC - Organic-carbon normalized.

[a] CSL is in µg/kg dry weight.

[b] The detection limit for this analyte exceeded the CSL.

2-4. Summary of Concentrations of Simultaneously Extracted Metals/Acid Volatile Sulfides in Surface Sediments of Carr Inlet Reference Stations

Station	Cadmium µmole/g	Copper µmole/g	Lead µmole/g	Mercury µmole/g	Nickel µmole/g	Zinc µmole/g	∑ SEM µmole/g	AVS µmole/g	∑ SEM/AVS Ratio
HI-RF-01	0.004	0.167	0.039	0.000050 U	0.204	0.525	0.939	0.053 U	17.706
HI-RF-02	0.002	0.083	0.034	0.000040 U	0.073	1.110	1.302	0.047 U	27.833
HI-RF-03	0.002	0.120	0.024	0.000035 U	0.191	0.294	0.630	0.084	7.483

NOTE: U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 2-5. Summary of Measurements of Other Parameters in Surface Sediments of Carr Inlet Reference Stations

Parameter	Units	No. Stations Detected/Total	Minimum Concentration Detected	Maximum Concentration Detected	Median Concentration Detected
Ammonia-Nitrogen	mg/kg	3/3	5.9	8.8	7.9
Total Sulfide	mg/kg	0/3	ND	ND	ND
Acid Volatile Sulfide	mg/kg	1/3	2.7	2.7	2.7
Total Volatile Solids	mg/kg	3/3	17,000	20,000	18,000
Total Solids	%	3/3	54.4	68.1	63.4
Total Organic Carbon[a]	%	3/3	0.45	0.98	0.70
Sediment pH	pH	3/3	7.5	7.7	7.6

NOTE: ND - Below detection limit; detection limits given in Appendix A.
[a] Analyzed at 104°C.

HI-SHELL000326

Table 2-6. Grain Size Distribution for West Waterway Stations

Station	Percent Gravel	Percent Sand	Percent Silt	Percent Clay
HI-WW-01	2	66	21	11
HI-WW-02	0	44	38	18
HI-WW-03	0	45	35	20
HI-WW-04	0	36	32	32
HI-WW-05	1	34	47	18
HI-WW-06	1	40	39	20
HI-WW-07	3	50	36	11
HI-WW-08	0	72	20	8
HI-WW-09	0	48	37	15
HI-WW-10	0	38	41	21
HI-WW-11	6	48	29	17
HI-WW-12	3	58	27	12
HI-WW-13	1	20	46	33
HI-WW-14	1	54	30	15
HI-WW-15	0	45	38	17
HI-WW-16	1	63	24	12
HI-WW-17	2	63	25	10
HI-WW-18	0	39	40	21
HI-WW-18B	0	49	35	16
HI-WW-19[a]	1	28	51	20
HI-WW-20	1	52	30	17
HI-WW-21	2	56	27	15
HI-WW-22	1	40	44	15
HI-WW-23	0	57	24	19
HI-WW-24	0	57	26	17
HI-WW-25	1	58	26	15
HI-WW-26	2	59	28	11
HI-WW-27	0	64	24	12
HI-WW-28	2	68	21	9
HI-WW-29	0	75	18	7

HI-SHELL000327

Table 2-6. continued

STATION	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT	PERCENT CLAY
HI-WW-30	1	55	34	10
HI-WW-31	0	53	31	16
HI-WW-32	0	44	44	12
MEAN	1.0	52.4	33.4	16.3

[a] The percent fractions reported for this station represent the mean values of triplicate analyses performed on the sample as part of quality control protocol.

HI-SHELL000328

Table 2-7. Summary of Concentrations of Metals, Metalloids, and Tributyltin in Surface Sediments of the West Waterway

Parameter	No. Stations Detected/Total	Minimum Concentration Detected (mg/kg dry wt)	Maximum Concentration Detected (mg/kg dry wt)	Median Concentration Detected (mg/kg dry wt)	CSL (mg/kg dry wt)	No. Stations Exceeding CSL
Antimony	5/11	12.0	17.0	13.0	NA	NA
Arsenic	33/33	9.3	99.0	20.0	93.0	1
Cadmium	30/33	0.30	1.2	0.60	6.7	0
Chromium	33/33	20.8	235	44.8	270	0
Copper	33/33	64.8	408	177	390	2
Lead	33/33	52.0	651	163	530	1
Mercury	33/33	0.18	4.6	0.80	0.59	20
Nickel	33/33	12.0	58.0	23.0	NA	NA
Silver	33/33	0.40	1.8	0.90	6.1	0
Zinc	33/33	83.0	2,280	233	960	3
Tributyltin[a]	33/33	280	3,300	1,000	NA	NA

NOTE: CSL - Cleanup screening level.
NA - Not applicable; no criteria established.

[a] Tributyltin is an organometal complex. Tributyltin concentrations are in μg/kg dry wt.

HI-SHELL000329

HI-SHELL000330

Table 2-8. Summary of Concentrations of Organic Compounds in Surface Sediments of the West Waterway

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected	CSL (µg/kg OC)	No. Stations Exceeding CSL
LPAHs									
2-Methylnaphthalene	32/33	20	240	35	750	9,231	1,749	64,000	0
Acenaphthene	33/33	26	420	74	1,536	16,154	3,765	57,000	0
Acenaphthylene	31/33	23	200	48	1,038	10,526	3,095	66,000	0
Anthracene	33/33	76	3,100	270	6,071	119,231	17,619	1,200,000	0
Fluorene	33/33	30	2,000	98	1,929	76,923	5,176	79,000	0
Naphthalene	33/33	24	140	55	1,214	10,000	2,792	170,000	0
Phenanthrene	33/33	190	9,800	680	13,571	376,923	35,625	480,000	0
Total LPAHs	33/33	<371[a]	15,424	1,224	25,929	593,231	65,625	780,000	0
HPAHs									
Benz(a)anthracene	33/33	170	2,700	700	13,929	122,727	38,824	270,000	0
Benzo(a)pyrene	33/33	250	2,000	710	17,273	118,182	38,125	210,000	0
Benzo(g,h,i)perylene	33/33	53	1,400	270	2,409	100,000	15,200	78,000	1
Chrysene	33/33	220	3,500	960	18,929	159,091	52,381	460,000	0
Dibenz(a,h)anthracene	33/33	41	520	160	2,818	23,636	8,947	33,000	0
Fluoranthene	33/33	370	9,400	1,100	26,071	361,538	62,500	1,200,000	0
Indeno(1,2,3-c,d)pyrene	33/33	110	1,200	440	8,182	78,571	23,571	88,000	0
Pyrene	33/33	450	6,700	1,300	34,091	304,545	70,000	1,400,000	0
Total benzofluoranthenes	33/33	560	3,900	1,550	47,273	271,818	93,333	450,000	0
Total HPAHs	33/33	2291	27,890	7,670	188,929	1,307,273	420,000	5,300,000	0

HI-SHELL000331

Table 2-8. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected	CSL (µg/kg OC)	No. Stations Exceeding CSL
Miscellaneous Oxygenated Compounds									
Benzoic acid	0/33	ND	ND	ND	NA	NA	NA	650[b]	0
Benzyl alcohol	1/33	29	29	29	NA	NA	NA	73[b]	0
Dibenzofuran	33/33	18	590	53	964	22,692	2,944	58,000	0
N-Nitrosodiphenylamine	0/33	ND	ND	ND	ND	ND	ND	11,000	0
Phenols and Subphenols									
2-Methylphenol	0/33	ND	ND	ND	NA	NA	NA	63[b]	0
2,4-Dimethylphenol	0/33	ND	ND	ND	NA	NA	NA	29[b]	0
4-Methylphenol	8/33	17	50	21	NA	NA	NA	670[b]	0
Pentachlorophenol	2/33	120	120	120	NA	NA	NA	690[b]	0
Phenol	30/33	22	240	67.5	NA	NA	NA	1,200[b]	0
Chlorinated Aromatic Compounds									
1,2-Dichlorobenzene	0/33	ND	ND	ND	ND	ND	ND	2,300	0
1,2,4-Trichlorobenzene	0/33	ND	ND	ND	ND	ND	ND	1,800	1[c]
1,3-Dichlorobenzene	0/33	ND	ND	ND	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	0/33	ND	ND	ND	ND	ND	ND	9,000	0
Chlorinated Aliphatic Compounds									
Hexachlorobutadiene	0/33	ND	ND	ND	ND	ND	ND	6,200	0
Phthalate Esters									
Di-*n*-octyl phthalate	0/33	ND	ND	ND	ND	ND	ND	4,500,000	0
Bis (2-ethylhexyl)phthalate	16/33	190	1,200	550	11,176	47,500	29,412	78,000	0
Butylbenzyl phthalate	3/33	33	280	67	2,357	16,471	2,680	64,000	0

Table 2-8. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (μg/kg dry wt)	Maximum Concentration Detected (μg/kg dry wt)	Median Concentration Detected (μg/kg dry wt)	Minimum Concentration Detected (μg/kg OC)	Maximum Concentration Detected (μg/kg OC)	Median Concentration Detected	CSL (μg/kg OC)	No. Stations Exceeding CSL
Diethyl phthalate	0/33	ND	ND	ND	ND	ND	ND	110,000	0
Dimethyl phthalate	0/33	ND	ND	ND	ND	ND	ND	53,000	0
Di-*n*-butyl phthalate	0/33	ND	ND	ND	ND	ND	ND	1,700,000	0
Pesticides/PCBs									
Gamma-HCH (lindane)	0/33	ND	ND	ND	NA	NA	NA	NA	NA
Hexachlorobenzene	1/33	5.2	5.2	5.2	248	248	248	2,300	0
Aldrin	22/33	2	18	4.6	NA	NA	NA	NA	NA
Alpha-chlordane	0/33	ND	ND	ND	NA	NA	NA	NA	NA
Gamma-chlordane	9/33	2.7	11	4.5	NA	NA	NA	NA	NA
Dieldrin	0/33	ND	ND	ND	NA	NA	NA	NA	NA
Heptachlor	0/33	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDD	30/33	1.7	31	5.6	NA	NA	NA	NA	NA
p,p'-DDE	3/33	4	6.5	6.4	NA	NA	NA	NA	NA
p,p'-DDT	1/33	66	66	66	NA	NA	NA	NA	NA
Total PCBs	33/33	<194[a]	<1,705[a]	<425[a]	<11,1436[a]	<94,722[a]	<21,7985[a]	65,000	1

NOTE: CSL - Cleanup screening level.
HPAH - High molecular weight polycyclic aromatic hydrocarbon.
LPAH - Low molecular weight polycyclic aromatic hydrocarbon.
NA - Not applicable; no criteria established.
ND - Below detection limit; detection limits given in Appendix A.
OC - Organic-carbon normalized.

[a] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

[b] CSL is in μg/kg dry weight.

[c] The detection limit for this analyte exceeded the CSL.

HI-SHELL000333

Table 2-9. Summary of Concentrations of Simultaneously Extracted Metals/Acid Volatile Sulfides in Surface Sediments of the West Waterway

Station	Cadmium µmole/g	Copper µmole/g	Lead µmole/g	Mercury µmole/g	Nickel µmole/g	Zinc µmole/g	∑ SEM µmole/g	AVS µmole/g	∑ SEM/AVS Ratio
HI-WW-01	0.004	0.708	0.270	0.000	0.133	1.575	2.690	16.8	0.160
HI-WW-02	0.003	1.057	0.396	0.00010 U	0.170	2.095	3.722	14.7 J	0.254
HI-WW-03	0.003	1.415	0.381	0.00010 U	0.170	1.927	3.896	31.2 J	0.125
HI-WW-04	0.003	0.368	0.357	0.000045 U	0.087	1.621	2.437	46.800	0.052
HI-WW-06	0.004	1.668	0.743	0.00010 U	0.222	3.227	5.864	14.7 J	0.400
HI-WW-07	0.001	0.189	0.130	0.000040 U	0.039	0.870	1.230	10.300	0.119
HI-WW-08	0.002	2.109	0.183	0.000045 U	0.102	1.505	3.901	14.0 J	0.278
HI-WW-09	0.001	0.159	0.203	0.000045 U	0.037	0.996	1.396	3.700	0.373
HI-WW-10	0.001	0.198	0.145	0.000040 U	0.034	0.841	1.219	1.300	0.909
HI-WW-11	0.005	1.471	0.560	0.00010 U	0.239	2.156	4.431	25.0 J	0.178
HI-WW-12	0.001	0.164	0.169	0.000040 U	0.026	1.058	1.417	1.800	0.797
HI-WW-13	0.002	0.258	0.309	0.000045 U	0.070	1.529	2.168	4.700	0.463
HI-WW-14	0.001	0.194	0.174	0.000040 U	0.027	0.774	1.169	1.800	0.682
HI-WW-15	0.001	0.670	0.676	0.000035 U	0.075	1.850	3.272	10.600	0.309
HI-WW-16	0.001	0.216	0.237	0.000035 U	0.027	0.792	1.273	3.400	0.371
HI-WW-17	0.001	0.201	0.111	0.000035 U	0.037	0.682	1.033	1.300	0.789
HI-WW-18	0.006	2.880	2.133	0.000050 U	0.733	12.005	17.756	4.7 J	3.795
HI-WW-18B	0.00071 U	1.9 J	0.18 J	0.000	0.051 J	2.7 J	4.737	27.100	0.175
HI-WW-19	0.001	0.33 J	0.12 J	0.000	0.047 J	0.85 J	1.354	1.100	1.206

Table 2-9. continued

Station	Cadmium µmole/g	Copper µmole/g	Lead µmole/g	Mercury µmole/g	Nickel µmole/g	Zinc µmole/g	∑ SEM µmole/g	AVS µmole/g	∑ SEM/AVS Ratio
HI-WW-20	0.002	1.0 J	0.47 J	0.000	0.10 J	1.9 J	3.532	6.000	0.596
HI-WW-21	0.006	2.800	1.313	0.000	0.204	5.612	9.937	5.3 J	1.874
HI-WW-22	0.001	0.18 J	0.090 J	0.000	0.030 J	0.55 J	0.853	1.100	0.781
HI-WW-23	0.005	2.219	0.807	0.000050 U	0.153	4.664	7.842	22.8 J	0.344
HI-WW-24	0.002	1.400	0.425	0.000040 U	0.073	30.739	32.639	26.500	1.231
HI-WW-25	0.00036 U	0.13 J	0.12 J	0.000040 U	0.032 J	0.77 J	1.000	13.700	0.077
HI-WW-26	0.002	3.651	0.864	0.000050 U	0.170	4.404	9.091	53.0 J	0.171
HI-WW-28	0.001	1.304	0.343	0.000050 U	0.119	2.156	3.924	0.44 J	8.986
HI-WW-29	0.00071 U	0.56 J	0.15 J	0.000	0.041 J	0.99 J	1.744	0.047	37.271
HI-WW-31	0.002	2.2 J	0.74 J	0.000	0.12 J	3.4 J	6.504	6.900	0.948
HI-WW-32	0.001	0.47 J	0.14 J	0.000	0.034 J	1.4 J	2.020	1.400	1.408

NOTE: J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 2-10. Summary of Measurements of Other Parameters in Surface Sediments of the West Waterway

Parameter	Units	No. Stations Detected/Total	Minimum Concentration Detected	Maximum Concentration Detected	Median Concentration Detected
Ammonia-Nitrogen	mg/kg	33/33	2.7	19.0	6.1
Total Sulfide	mg/kg	29/33	14.0	1,500	230
Acid Volatile Sulfide	mg/kg	30/30	1.5	1,700	205
Total Volatile Solids	mg/kg	33/33	16,000	34,000	25,000
Total Solids	%	33/33	49.6	72.0	60.1
Total Organic Carbon[a]	%	33/33	0.89	2.8	1.8
Sediment pH	pH	33/33	7.5	7.9	7.7

[a] Analyzed at 104°C.

HI-SHELL000335

Table 2-11. Cleanup Screening Level Enrichment Ratios in Surface Sediments of the West Waterway

Station	Parameter	Concentration	Units	CSL	Enrichment Ratio
HI-WW-04	Mercury	1.47	mg/kg	0.59	2.5
HI-WW-05[a]	Mercury	0.61	mg/kg	0.59	1.0
HI-WW-09	Mercury	0.65	mg/kg	0.59	1.1
HI-WW-10	Mercury	0.82	mg/kg	0.59	1.4
HI-WW-11	Mercury	0.69 J	mg/kg	0.59	1.2
HI-WW-15	Mercury	1.09	mg/kg	0.59	1.8
HI-WW-18	Arsenic	99	mg/kg	93	1.1
	Lead	651	mg/kg	530	1.2
	Mercury	1.93 J	mg/kg	0.59	3.3
	Zinc	1,160	mg/kg	960	1.2
HI-WW-18B	Copper	394	mg/kg	390	1.0
	Mercury	2.23	mg/kg	0.59	3.8
	Zinc	1,050 J	mg/kg	960	1.1
	Benzo(g,h,i)perylene	100,000 J	µg/kg OC	78,000	1.3
HI-WW-19	Mercury	1.34	mg/kg	0.59	2.3
HI-WW-20	Mercury	0.84	mg/kg	0.59	1.4
HI-WW-21	Mercury	0.87 J	mg/kg	0.59	1.5
HI-WW-22	Mercury	0.85	mg/kg	0.59	1.4

HI-SHELL000336

Table 2-11. continued

Station	Parameter	Concentration	Units	CSL	Enrichment Ratio
HI-WW-23	Mercury	1.22 J	mg/kg	0.59	2.1
	Zinc	2,280	mg/kg	960	2.4
HI-WW-25	Mercury	1.03	mg/kg	0.59	1.8
	Total PCBs	<94,722[b]	µg/kg OC	65,000	1.5
HI-WW-26	Copper	408	mg/kg	390	1.0
	Mercury	1.01 J	mg/kg	0.59	1.7
HI-WW-27[a]	Mercury	0.87	mg/kg	0.59	1.5
HI-WW-28	Mercury	1.23 J	mg/kg	0.59	2.1
HI-WW-29	1,2,4-Trichlorobenzene	1,910 U	µg/kg OC	1,800	NA[c]
HI-WW-30[a]	Mercury	4.6	mg/kg	0.59	7.8
HI-WW-31	Mercury	1.37	mg/kg	0.59	2.3
HI-WW-32	Mercury	1.14	mg/kg	0.59	1.9

NOTE: CSL - Cleanup screening level.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
OC - Organic-carbon normalized.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

[a] Sample collected by Hart Crowser, Inc.

[b] The "<" sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the "<" sign signifies that the concentration could be lower than reported.

[c] NA - Not applicable; the detection limit for this analyte exceeded the CSL.

HI-SHELL000337

Table 2-12. Grain Size Distribution for East Waterway Stations

STATION	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT	PERCENT CLAY
HI-EW-01	0	25	53	22
HI-EW-02	0	38	41	21
HI-EW-03	0	43	35	22
HI-EW-04	0	18	52	30
HI-EW-05	0	18	50	32
HI-EW-06	0	20	52	28
HI-EW-07	2	41	36	21
HI-EW-08	0	21	53	26
HI-EW-09	0	41	36	23
HI-EW-10	0	27	46	27
HI-EW-11	1	31	40	28
HI-EW-12	0	61	25	14
MEAN	0.25	32.00	43.25	24.50

HI-SHELL000338

Table 2-13. Summary of Concentrations of Metals, Metalloids, and Tributyltin in Surface Sediments of the East Waterway

Parameter	No. Stations Detected/Total (mg/kg dry wt)	Minimum Concentration Detected (mg/kg dry wt)	Maximum Concentration Detected (mg/kg dry wt)	Median Concentration Detected (mg/kg dry wt)	CSL (mg/kg dry wt)	No. Stations Exceeding CSL
Arsenic	12/12	8.5	16.0	10.8	93.0	0
Cadmium	12/12	0.40	2.6	1.0	6.7	0
Chromium	12/12	33.6	62.7	44.3	270	0
Copper	12/12	51.3	144	91.9	390	0
Lead	12/12	44.0	162	88.0	530	0
Mercury	12/12	0.29	1.9	0.40	0.59	3
Nickel	12/12	24.0	43.0	30.5	NA	NA
Silver	12/12	0.80	2.6	1.5	6.1	0
Zinc	12/12	88.2	239	150	960	0
Tributyltin[a]	12/12	290	4,000	430	NA	NA

NOTE: CSL - Cleanup screening level.
NA - Not applicable; no criteria established.
[a] Tributyltin is an organometal complex. Tributyltin concentrations are in μg/kg dry wt.

HI-SHELL000339

Table 2-14. Summary of Concentrations of Organic Compounds in Surface Sediments of the East Waterway

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
LPAHs									
2-Methylnaphthalene	12/12	22	48	30	846	2,000	1,448	64,000	0
Acenaphthene	12/12	24	76	36	1,083	3,800	1,650	57,000	0
Acenaphthylene	9/12	20	74	35	1,000	3,083	1,833	66,000	0
Anthracene	12/12	110	390	185	5,789	21,667	8,050	1,200,000	0
Fluorene	12/12	33	95	54.5	1,583	4,444	2,462	79,000	0
Naphthalene	12/12	34	130	52.5	1,458	5,417	2,638	170,000	0
Phenanthrene	12/12	230	500	290	9,583	25,556	13,196	480,000	0
Total LPAHs	12/12	<459[a]	1,079	670	20,917	<56,611[a]	31,193	780,000	0
HPAHs									
Benz(a)anthracene	12/12	210	550	325	10,000	27,500	15,019	270,000	0
Benzo(a)pyrene	12/12	260	810	390	10,000	33,750	18,038	210,000	0
Benzo(g,h,i)perylene	12/12	95	590	180	3,654	24,583	8,998	78,000	0
Chrysene	12/12	360	950	510	17,692	42,000	24,881	460,000	0
Dibenz(a,h)anthracene	12/12	73	190	115	2,923	9,474	5,340	33,000	0
Fluoranthene	12/12	380	870	480	17,917	43,500	23,559	1,200,000	0
Indeno(1,2,3-c,d)pyrene	12/12	190	530	285	7,308	22,083	13,246	88,000	0
Pyrene	12/12	580	2,700	845	25,769	112,500	37,589	1,400,000	0
Total benzofluoranthenes	12/12	590	1,820	1,015	22,692	75,833	47,500	450,000	0
Total HPAHs	12/12	3,081	8,550	4,193	118,500	356,250	197,932	5,300,000	0

Table 2-14. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
Miscellaneous Oxygenated Compounds									
Benzoic acid	0/12	ND	ND	ND	NA	NA	NA	650[b]	0
Benzyl alcohol	0/12	ND	ND	ND	NA	NA	NA	73[b]	0
Dibenzofuran	12/12	23	67	36	958	3,000	1,643	58,000	0
N-Nitrosodiphenylamine	0/12	ND	ND	ND	ND	ND	ND	11,000	0
Phenols and Subphenols									
2-Methylphenol	0/12	ND	ND	ND	NA	NA	NA	63[b]	0
2,4-Dimethylphenol	0/12	ND	ND	ND	NA	NA	NA	29[b]	0
4-Methylphenol	3/12	20	44	20	NA	NA	NA	670[b]	0
Pentachlorophenol	0/12	ND	ND	ND	NA	NA	NA	690[b]	0
Phenol	6/12	19	44	23	NA	NA	NA	1,200[b]	0
Chlorinated Aromatic Compounds									
1,2-Dichlorobenzene	0/12	ND	ND	ND	ND	ND	ND	2,300	0
1,2,4-Trichlorobenzene	0/12	ND	ND	ND	ND	ND	ND	1,800	0
1,3-Dichlorobenzene	1/12	21	21	21	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	6/12	20	97	31.5	1,000	3,731	1,541	9,000	0
Chlorinated Aliphatic Compounds									
Hexachlorobutadiene	0/12	ND	ND	ND	ND	ND	ND	6,200	0
Phthalate Esters									
Di-*n*-octyl phthalate	0/12	ND	ND	ND	ND	ND	ND	4,500,000	0
Bis(2-ethylhexyl)phthalate	8/12	130	1,000	675	6,500	48,000	32,014	78,000	0
Butylbenzyl phthalate	1/12	31	31	31	1,550	1,550	1,550	64,000	0

Table 2-14. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
Diethyl phthalate	0/12	ND	ND	ND	ND	ND	ND	110,000	0
Dimethyl phthalate	0/12	ND	ND	ND	ND	ND	ND	53,000	0
Di-*n*-butyl phthalate	0/12	ND	ND	ND	ND	ND	ND	1,700,000	0
Pesticides/PCBs									
Gamma-HCH (lindane)	0/12	ND	ND	ND	NA	NA	NA	NA	NA
Hexachlorobenzene	0/12	ND	ND	ND	ND	ND	ND	2,300	0
Aldrin	5/12	2.1	3.2	2.6	NA	NA	NA	NA	NA
Alpha-chlordane	0/12	ND	ND	ND	NA	NA	NA	NA	NA
Gamma-chlordane	4/12	2.5	5.7	5.3	NA	NA	NA	NA	NA
Dieldrin	0/12	ND	ND	ND	NA	NA	NA	NA	NA
Heptachlor	0/12	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDD	8/12	2.7	11	6.0	NA	NA	NA	NA	NA
p,p'-DDE	3/12	4.6	5.5	5.2	NA	NA	NA	NA	NA
p,p'-DDT	0/12	ND	ND	ND	NA	NA	NA	NA	NA
Total PCBs	12/12	<481[a]	<3,170[a]	<934[a]	<21,375[a]	<132,083[a]	<47,928[a]	65,000	5

NOTE: CSL - Cleanup screening level.
HPAH - High molecular weight polycyclic aromatic hydrocarbon.
LPAH - Low molecular weight polycyclic aromatic hydrocarbon.
NA - Not applicable; no criteria established.
ND - Below detection limit; detection limits given in Appendix A.
OC - Organic-carbon normalized.

[a] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

[b] CSL is in µg/kg dry weight.

Table 2-15. Summary of Concentrations of Simultaneously Extracted Metals/Acid Volatile Sulfides in Surface Sediments of the East Waterway

STATION	CADMIUM µmole/g	COPPER µmole/g	LEAD µmole/g	MERCURY µmole/g	NICKEL µmole/g	ZINC µmole/g	∑ SEM µmole/g	AVS µmole/g	∑ SEM/AVS RATIO
HI-EW-02	0.006	1.383	0.386	0.000045 U	0.177	1.575	3.528	27.1 J	0.130
HI-EW-03	0.007	0.650	0.338	0.000045 U	0.169	1.667	2.830	8.100	0.349
HI-EW-04	0.007	0.644	0.299	0.000050 U	0.119	1.382	2.452	8.400	0.291
HI-EW-05	0.004	0.186	0.212	0.000050 U	0.068	1.100	1.541	7.500	0.206
HI-EW-07	0.006	0.741	0.285	0.000045 U	0.160	2.080	3.272	14.7 J	0.223
HI-EW-08	0.005	0.633	0.304	0.00010 U	0.187	5.276	6.405	43.7 J	0.147
HI-EW-09	0.002	0.082	0.097	0.000045 U	0.037	0.532	0.750	5.000	0.150
HI-EW-10	0.008	0.546	0.386	0.000050 U	0.204	1.743	2.888	26.8 J	0.108
HI-EW-12	0.002	0.157	0.101	0.000035 U	0.063	0.589	0.913	7.800	0.127

NOTE: U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 2-16. Summary of Measurements of Other Parameters in Surface Sediments of the East Waterway

Parameter	Units	No. Stations Detected/Total	Minimum Concentration Detected	Maximum Concentration Detected	Median Concentration Detected
Ammonia-Nitrogen	mg/kg	12/12	6.5	17.0	12.5
Total Sulfide	mg/kg	11/12	68.0	1,600.0	280
Acid Volatile Sulfide	mg/kg	9/9	160	1,400	270
Total Volatile Solids	mg/kg	12/12	24,000	36,000	27,500
Total Solids	%	12/12	47.0	60.9	53.7
Total Organic Carbon[a]	%	12/12	1.8	2.6	2.1
Sediment pH	pH	12/12	7.4	8.0	7.7

[a] Analyzed at 104°C.

HI-SHELL000344

Table 2-17. Cleanup Screening Level Enrichment Ratios in Surface Sediments of the East Waterway

Station	Parameter	Concentration	Units	CSL	Enrichment Ratio
HI-EW-01	Total PCBs	<132,083[a] J	µg/kg OC	65,000	2.0
HI-EW-03	Mercury	0.85	mg/kg	0.59	1.4
HI-EW-06[b]	Mercury	0.6	mg/kg	0.59	1.0
	Total PCBs	<132,083[a] J	µg/kg OC	65,000	2.0
HI-EW-07	Total PCBs	<123,182[a] J	µg/kg OC	65,000	1.9
HI-EW-11[b]	Mercury	1.92	mg/kg	0.59	3.2
	Total PCBs	<131,500[a] J	µg/kg OC	65,000	2.0
HI-EW-12	Total PCBs	<87,962[a]	µg/kg OC	65,000	1.4

NOTE: CSL - Cleanup screening level.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
OC - Organic-carbon normalized.

[a] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

[b] Sample collected by Hart Crowser, Inc.

HI-SHELL000345

Table 2-18 Grain Size Distribution for North Shore Stations

Station	Percent Gravel	Percent Sand	Percent Silt	Percent Clay
HI-NS-01	1	29	52	18
HI-NS-02	0	73	20	7
HI-NS-03	0	64	26	10
HI-NS-04	0	67	26	7
HI-NS-05[a]	0	70	23	7
HI-NS-06	0	58	32	10
HI-NS-07	0	75	19	6
HI-NS-08	1	64	27	8
HI-NS-09	0	64	26	10
HI-NS-10	0	65	28	7
HI-NS-11	0	68	22	10
HI-NS-12	0	45	39	16
HI-NS-13	0	70	21	9
HI-NS-14	0	43	40	17
HI-NS-15	0	42	41	17
HI-NS-16	1	85	9	5
MEAN	0.19	61.4	28.2	10.2

[a] The percent fractions reported for this station represent the mean values of triplicate analyses performed on the sample as part of quality control protocol.

HI-SHELL000346

Table 2-19. Summary of Concentrations of Metals, Metalloids, and Tributyltin in Surface Sediments of the North Shore

Parameter	No. Stations Detected/Total (mg/kg dry wt)	Minimum Concentration Detected (mg/kg dry wt)	Maximum Concentration Detected (mg/kg dry wt)	Median Concentration Detected (mg/kg dry wt)	CSL (mg/kg dry wt)	No. Stations Exceeding CSL
Antimony	1/10	6.0	6.0	6.0	NA	NA
Arsenic	15/15	2.8	40.0	10.2	93.0	0
Cadmium	6/15	0.40	0.70	0.50	6.7	0
Chromium	15/15	18.7	75.0	26.7	270	0
Copper	15/15	43.4	909	87.3	390	2
Lead	15/15	25.0	277	43.0	530	0
Mercury	16/16	0.18	4.4	0.50	0.59	8
Nickel	15/15	11.0	32.0	16.0	NA	NA
Silver	13/15	0.40	1.1	0.60	6.1	0
Zinc	15/15	66.8	671	111	960	0
Tributyltin[a]	15/15	41	15,000	440	NA	NA

NOTE: CSL - Cleanup screening level.
NA - Not applicable; no criteria established.

[a] Tributyltin is an organometal complex. Tributyltin concentrations are in μg/kg dry wt.

HI-SHELL000347

Table 2-20. Summary of Concentrations of Organic Compounds in Surface Sediments of the North Shore

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
LPAHs									
2-Methylnaphthalene	11/15	20	81	33	1,667	8,049	2,750	64,000	0
Acenaphthene	15/15	20	200	44	1,429	13,000	4,917	57,000	0
Acenaphthylene	12/15	18	530	45.5	1,714	68,831	3,739	66,000	1
Anthracene	15/15	77	1,200	320	8,280	146,341	32,000	1,200,000	0
Fluorene	15/15	31	500	93	2,214	60,976	7,750	79,000	0
Naphthalene	13/15	21	190	41	1,909	10,556	3,800	170,000	0
Phenanthrene	15/15	200	2,000	450	14,286	243,902	50,649	480,000	0
Total LPAHs	15/15	<414[a]	3,825	954	<29,571[a]	466,463	84,286	780,000	0
HPAHs									
Benz(a)anthracene	15/15	200	7,100	400	14,286	922,078	39,796	270,000	1
Benzo(a)pyrene	15/15	230	12,000	480	17,143	1,558,442	48,980	210,000	1
Benzo(g,h,i)perylene	15/15	61	5,400	220	4,857	701,299	20,000	78,000	1
Chrysene	15/15	300	7,800	630	23,571	1,012,987	57,143	460,000	1
Dibenz(a,h)anthracene	15/15	40	1,700	78	2,857	220,779	6,071	33,000	1
Fluoranthene	15/15	380	5,600	910	27,143	727,273	82,727	1,200,000	0
Indeno(1,2,3-c,d)pyrene	15/15	99	4,300	240	7,857	558,442	20,833	88,000	1
Pyrene	15/15	380	22,000	970	27,143	2,857,143	98,980	1,400,000	1
Total benzofluoranthenes	15/15	550	19,700	930	39,286	2,558,442	89,796	450,000	1
Total HPAHs	15/15	2,298	85,600	4,478	164,143	11,116,883	456,939	5,300,000	1

Table 2-20. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
Miscellaneous Oxygenated Compounds									
Benzoic acid	0/15	ND	ND	ND	NA	NA	NA	650[b]	1[c]
Benzyl alcohol	0/15	ND	ND	ND	NA	NA	NA	73[b]	0
Dibenzofuran	14/15	20	140	36.5	1,818	17,073	3,388	58,000	0
N-Nitrosodiphenylamine	0/15	ND	ND	ND	ND	ND	ND	11,000	0
Phenols and Subphenols									
2-Methylphenol	0/15	ND	ND	ND	NA	NA	NA	63[b]	1[c]
2,4-Dimethylphenol	0/15	ND	ND	ND	NA	NA	NA	29[b]	2[c]
4-Methylphenol	3/15	18	42	26	NA	NA	NA	670[b]	0
Pentachlorophenol	0/15	ND	ND	ND	NA	NA	NA	690[b]	0
Phenol	9/15	24	140	73	NA	NA	NA	1,200[b]	0
Chlorinated Aromatic Compounds									
1,2-Dichlorobenzene	0/15	ND	ND	ND	ND	ND	ND	2,300	3[c]
1,2,4-Trichlorobenzene	0/15	ND	ND	ND	ND	ND	ND	1,800	6[c]
1,3-Dichlorobenzene	0/15	ND	ND	ND	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2/15	19	25	22	1,939	2,083	2,011	9,000	0
Chlorinated Aliphatic Compounds									
Hexachlorobutadiene	0/15	ND	ND	ND	ND	ND	ND	6,200	0
Phthalate Esters									
Di-*n*-octyl phthalate	1/15	27	27	27	2,755	2,755	2,755	4,500,000	0
Bis(2-ethylhexyl)phthalate	4/15	100	500	220	6,667	60,976	20,000	78,000	2[c]
Butylbenzyl phthalate	2/15	26	28	27	2,167	2,800	2,484	64,000	0

Table 2-20. continued

Parameter	No. Stations Detected/ Total	Minimum Concentration Detected (µg/kg dry wt)	Maximum Concentration Detected (µg/kg dry wt)	Median Concentration Detected (µg/kg dry wt)	Minimum Concentration Detected (µg/kg OC)	Maximum Concentration Detected (µg/kg OC)	Median Concentration Detected (µg/kg OC)	CSL (µg/kg OC)	No. Stations Exceeding CSL
Diethyl phthalate	0/15	ND	ND	ND	ND	ND	ND	110,000	0
Dimethyl phthalate	0/15	ND	ND	ND	ND	ND	ND	53,000	0
Di-*n*-butyl phthalate	0/15	ND	ND	ND	ND	ND	ND	1,700,000	0
Pesticides/PCBs									
Gamma-HCH (lindane)	0/15	ND	ND	ND	NA	NA	NA	NA	NA
Hexachlorobenzene	0/15	ND	ND	ND	ND	ND	ND	2,300	0
Aldrin	4/15	1.9	9.4	2.4	NA	NA	NA	NA	NA
Alpha-chlordane	0/15	ND	ND	ND	NA	NA	NA	NA	NA
Gamma-chlordane	1/15	2.9	2.9	2.9	NA	NA	NA	NA	NA
Dieldrin	0/15	ND	ND	ND	NA	NA	NA	NA	NA
Heptachlor	0/15	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDD	12/15	2.7	29	4.2	NA	NA	NA	NA	NA
p,p'-DDE	0/15	ND	ND	ND	NA	NA	NA	NA	NA
p,p'-DDT	0/15	ND	ND	ND	NA	NA	NA	NA	NA
Total PCBs	15/15	<172[a]	<2,130[a]	<354[a]	<16.500[a]	<177,500[a]	<35,806[a]	65,000	3

NOTE: CSL - Cleanup screening level.
HPAH - High molecular weight polycyclic aromatic hydrocarbon.
LPAH - Low molecular weight polycyclic aromatic hydrocarbon.
NA - Not applicable; no criteria established.
ND - Below detection limit; detection limits given in Appendix A.

a The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

b CSL is in µg/kg dry weight.

c The detection limit for this analyte exceeded the CSL.

Table 2-21. Summary of Concentrations of Simultaneously Extracted Metals/Acid Volatile Sulfides in Surface Sediments of the North Shore

STATION	CADMIUM µmole/g	COPPER µmole/g	LEAD µmole/g	MERCURY µmole/g	NICKEL µmole/g	ZINC µmole/g	∑SEM µmole/g	AVS µmole/g	∑SEM/AVS RATIO
HI-NS-01	0.001	0.050 J	0.039 J	0.000040 U	0.017 J	0.24 J	0.349	0.047 U	7.455
HI-NS-02	0.001	0.42 J	0.092 J	0.000	0.056 J	0.61 J	1.182	2.059	0.574
HI-NS-03	0.001	0.65 J	0.12 J	0.000	0.051 J	0.86 J	1.685	4.991	0.338
HI-NS-05	0.002	0.390	0.121	0.000050 U	0.140	0.745	1.389	0.24 J	5.784
HI-NS-06	0.001	0.850	0.150	0.000040 U	0.099	0.930	2.034	0.59 J	3.432
HI-NS-07	0.001	0.590	0.140	0.000035 U	0.046	0.774	1.549	0.041 U	38.197
HI-NS-09	0.001	0.67 J	0.14 J	0.000	0.055 J	2.8 J	3.636	17.779	0.205
HI-NS-10	0.00045 U	1.7 J	0.15 J	0.000	0.037 J	1.3 J	3.152	1.871	1.684
HI-NS-11	0.00071 U	0.57 J	0.14 J	0.000	0.043 J	0.79 J	1.542	1.778	0.867
HI-NS-12	0.002	0.94 J	0.28 J	0.000	0.14 J	1.3 J	2.632	0.237	11.102
HI-NS-13	0.002	1.200	0.270	0.000	0.099	2.952	4.484	1.1 J	4.228
HI-NS-14	0.006	4.8 J	3.9 J	0.00010 U	0.48 J	29.5 J	38.623	53.026	0.728
HI-NS-15	0.001	0.14 J	0.10 J	0.000045 U	0.034 J	0.43 J	0.705	1.809	0.390
HI-NS-16	0.001	0.58 J	0.16 J	0.000	0.039 J	0.79 J	1.555	0.374	4.156

NOTE: J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Table 2-22. Summary of Measurements of Other Parameters in Surface Sediments of the North Shore

Parameter	Units	No. Stations Detected/Total	Minimum Concentration Detected	Maximum Concentration Detected	Median Concentration Detected
Ammonia-Nitrogen	mg/kg	16/16	2.3	12.0	3.6
Total Sulfide	mg/kg	12/15	5.0	1,800	35.5
Acid Volatile Sulfide	mg/kg	12/14	7.6	1,700	57.5
Total Volatile Solids	mg/kg	16/16	14,000	26,000	21,500
Total Solids	%	16/16	46.6	69.8	65.0
Total Organic Carbon[a]	%	16/16	0.77	1.8	1.2
Sediment pH	pH	16/16	6.9	8.0	7.6

[a] Analyzed at 104 °C.

HI-SHELL000352

Table 2-23. Cleanup Screening Level Enrichment Ratios in Surface Sediments of the North Shore

Station	Parameter	Concentration	Units	CSL	Enrichment Ratio
HI-NS-04[a]	1,2,4-Trichlorobenzene	1,800 U	µg/kg OC	1,800	NA[b]
HI-NS-08[a]	Mercury	0.99	mg/kg	0.59	1.7
	Total PCBs	<177,500[c] J	µg/kg OC	65,000	2.7
HI-NS-09	Copper	434	mg/kg	390	1.1
	Mercury	0.94	mg/kg	0.59	1.6
	Total PCBs	<134,400[c]	µg/kg OC	65,000	2.1
	2,4-Dimethylphenol	49.00 U	µg/kg dry	29	NA[b]
	1,2-Dichlorobenzene	4,900 U	µg/kg OC	2,300	NA[b]
	1,2,4-Trichlorobenzene	4,900 U	µg/kg OC	1,800	NA[b]
	Bis(2-ethylhexyl)phthlate	140,000 U	µg/kg OC	78,000	NA[b]
HI-NS-10	1,2,4-Trichlorobenzene	1,935 U	µg/kg OC	1,800	NA[b]
HI-NS-11	Mercury	0.97	mg/kg	0.59	1.6
	1,2,4-Trichlorobenzene	1,939 U	µg/kg OC	1,800	NA[b]
HI-NS-12	Mercury	0.59	mg/kg	0.59	1.0
HI-NS-13	Mercury	1.29	mg/kg	0.59	2.2
HI-NS-14	Copper	909	mg/kg	390	2.3
	Mercury	4.4	mg/kg	0.59	7.5
	Total PCBs	<94,722[c]	µg/kg OC	65,000	1.5
	Benzoic Acid	670 U	µg/kg dry	650	NA[b]
	2-Methylphenol	67 U	µg/kg dry	63	NA[b]
	2,4-Dimethylphenol	67 U	µg/kg dry	29	NA[b]
	1,2-Dichlorobenzene	3,722 U	µg/kg OC	2,300	NA[b]
	1,2,4-Trichlorobenzene	3,722 U	µg/kg OC	1,800	NA[b]
	Bis(2-ethylhexyl)phthlate	94,444 U	µg/kg OC	78,000	NA[b]
HI-NS-15	Mercury	0.74	mg/kg	0.59	1.2

HI-SHELL000353

Table 2-23. continued

STATION	PARAMETER	CONCENTRATION	UNITS	CSL	ENRICHMENT RATIO
HI-NS-16	Mercury	0.67	mg/kg	0.59	1.1
	Acenaphthylene	68,831	µg/kg OC	66,000	1.0
	Dibenz(a,h)anthracene	220,779 M	µg/kg OC	33,000	6.7
	Benz(a)anthracene	922,078	µg/kg OC	270,000	3.4
	Benzo(a)pyrene	1,558,442	µg/kg OC	210,000	7.4
	Benzo(g,h,i)perylene	701,299 J	µg/kg OC	78,000	9.0
	Chrysene	1,012,987	µg/kg OC	460,000	2.2
	Total HPAHs	11,116,883 M	µg/kg OC	5,300,000	2.1
	Indeno(1,2,3-c,d)pyrene	558,442	µg/kg OC	88,000	6.4
	Pyrene	2,857,143	µg/kg OC	1,400,000	2.0
	Total Benzofluoranthenes	2,558,447	µg/kg OC	450,000	5.7
	1,2-Dichlorobenzene	2,338 U	µg/kg OC	2,300	NA[b]
	1,2,4-Trichlorobenzene	2,338 U	µg/kg OC	1,800	NA[b]

NOTE: CSL - Cleanup screening level.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

M - The spectral match between the detected compound spectra and the standard reference spectra did not meet all of the acceptance criteria; but the compound is presumed present.

OC - Organic-carbon normalized.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

[a] Sample collected by Hart Crowser, Inc.

[b] NA - Not applicable, the detection limit for this analyte exceeded the CSL.

[c] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

HI-SHELL000354

Table 2-24. Percent Relative Standard Deviation for HI-EW-06 Field Replicate Results

PARAMETER	UNITS	HI-EW-06 CONCENTRATION	REPLICATE 1 CONCENTRATION	REPLICATE2 CONCENTRATION	MEAN	% RSD
Metals/Metalloids						
Antimony	mg/kg					
Arsenic	mg/kg	14.8	18	17	16.6	10
Cadmium	mg/kg	2.6	2.7	2.8	2.7	4
Chromium	mg/kg	62.7	58.2	64	61.6	5
Copper	mg/kg	144	179	129	151	17
Lead	mg/kg	162	147	170	160	7
Mercury	mg/kg	0.6	0.66	0.7	0.65	8
Nickel	mg/kg	40	36	39	38	5
Silver	mg/kg	2.6	2	2.8	2.5	17
Zinc	mg/kg	239	236	262	246	6
Butyltin	µg/kg	20 U	23 Y	20 U	NA	NA
Dibutyltin	µg/kg	110	37	73	73.3	50
Tributyltin	µg/kg	300 J	180 J	330 J	270	29
LPAHs						
2-Methylnaphthalene	µg/kg	48	45	39	44	10
Acenaphthene	µg/kg	60	95	57	71	30
Acenaphthylene	µg/kg	74	81	65	73	11
Anthracene	µg/kg	370	400	300	357	14
Fluorene	µg/kg	95	100	62	85.7	24
Naphthalene	µg/kg	130	200	95	142	38
Phenanthrene	µg/kg	350	310	270	310	13
Total LPAHs	µg/kg	1,127	1,231	888	1,082	16
HPAHs						
Benz(a)anthracene	µg/kg	480 J	790	530	600	28
Benzo(a)pyrene	µg/kg	810 J	840	650	767	13
Benzo(g,h,i)perylene	µg/kg	590 J	560	540	563	4
Chrysene	µg/kg	950 J	1,100	810	953	15
Dibenz(a,h)anthracene	µg/kg	190 J	180	170	180	6
Fluoranthene	µg/kg	480	870	780	710	29
Indeno(1,2,3-c,d)pyrene	µg/kg	530 J	450	440	473	10
Pyrene	µg/kg	2,700	4,200	2,200	3,033	34

HI-SHELL000355

Table 2-24. continued

Parameter	Units	HI-EW-06 Concentration	Replicate 1 Concentration	Replicate2 Concentration	Mean	%RSD
Total benzofluoranthenes	µg/kg	1,820 J	1,870	1,350	1,680	17
Total HPAHs	µg/kg	8,550 J	10,860	7,470	8,960	19
Miscellaneous Oxygenated Compounds						
Benzoic acid	µg/kg	200 U	180 U	190 U	NA	NA
Benzyl alcohol	µg/kg	20 U	18 U	19 U	NA	NA
Dibenzofuran	µg/kg	67	86	45	66	31
N-Nitrosodiphenylamine	µg/kg	20 U	18 U	19 U	NA	NA
Phenols and Subphenols						
2-Methylphenol	µg/kg	19.5 U	18.5 U	19 U	NA	NA
2,4-Dimethylphenol	µg/kg	20 U	18 U	19 U	NA	NA
4-Methylphenol	µg/kg	20 U	18 U	19 U	NA	NA
Pentachlorophenol	µg/kg	98 U	92 U	95 U	NA	NA
Phenol	µg/kg	20 U	18 U	19 U	NA	NA
Chlorinated Aromatic Compounds						
1,2-Dichlorobenzene	µg/kg	20 U	18 U	19 U	NA	NA
1,2,4-Trichlorobenzene	µg/kg	20 U	18 U	19 U	NA	NA
1,3-Dichlorobenzene	µg/kg	20 U	18 U	19 U	NA	NA
1,4-Dichlorobenzene	µg/kg	20 U	18 U	19 U	NA	NA
Chlorinated Aliphatic Compounds						
Hexachlorobutadiene	µg/kg	20 U	18 U	19 U	NA	NA
Phthalate Esters						
Di-*n*-octyl phthalate	µg/kg	20 UJ	18 U	19 U	NA	NA
Bis(2-ethylhexyl)phthalate	µg/kg	870 J	330	860	687	45
Butylbenzyl phthalate	µg/kg	20 UJ	36	49	NC	NC
Diethyl phthalate	µg/kg	20 U	18 U	19 U	NA	NA
Dimethyl phthalate	µg/kg	20 U	18 U	19 U	NA	NA
Di-*n*-butyl phthalate	µg/kg	20 U	18 U	19 U	NA	NA
Pesticides/PCBs						
Gamma-HCH (lindane)	µg/kg	21 U	0.88 U	0.95 U	NA	NA
Hexachlorobenzene (HCB)	µg/kg	21 U	0.88 U	0.95 U	NA	NA
Aldrin	µg/kg	21 U	2.5	6.2	NC	NC
Alpha-chlordane	µg/kg	21 U	0.88 U	0.95 U	NA	NA
Gamma-chlordane	µg/kg	21 U	4.6 Y	10 Y	NA	NA

HI-SHELL000356

Table 2-24. continued

PARAMETER	UNITS	HI-EW-06 CONCENTRATION	REPLICATE1 CONCENTRATION	REPLICATE2 CONCENTRATION	MEAN	%RSD
Dieldrin	µg/kg	41 U	1.8 U	1.9 U	NA	NA
Heptachlor	µg/kg	21 U	0.88 U	0.95 U	NA	NA
p,p'-DDD	µg/kg	41 U	7.9	19	NC	NC
p,p'-DDE	µg/kg	41 U	5.2 Y	11 Y	NA	NA
p,p'-DDT	µg/kg	41 U	4.6 Y	91 Y	NA	NA
Total PCBs	µg/kg	< 3,170[a] J	< 493[a]	< 795[a]	1,486	99
Conventionals						
Ammonia-nitrogen	mg/kg	17	19	24	20	18
Soil pH	pH	7.5	8	8.1	7.9	4
Total organic carbon[b]	%	2.4	2.4	2.6	2.5	5
Sulfide	mg/kg	1,600 J	1,200 J	2,100 J	1,633	28
Total solids	%	47	52.8	47.5	49.1	7
Preserved total solids	%	50.6	44.9	45	46.8	7
Total volatile solids	mg/kg	29,000	29,000	30,000	29,333	2

NOTE: NA - Not applicable because all replicate results were not detected.

NC - Not calculated because one or more of the replicate results were not detected.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U and Y - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Shaded Value - % RSD exceeds the advisory limit of 50 percent.

a The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

b Analyzed at 104°C.

HI-SHELL000357

Table 2-25. Percent Relative Standard Deviation for HI-WW-28 Field Replicate Results

Parameter	Unit	HI-WW-28 Concentration	Replicate 1 Concentration	Replicate 2 Concentration	Mean	%RSD
Metals/Metalloids						
Antimony	mg/kg					
Arsenic	mg/kg	17.2	10.3	9.5	12.3	34
Cadmium	mg/kg	0.2 U	0.3 U	0.2 U	NA	NA
Chromium	mg/kg	88.7	25.3	26.3	46.8	78
Copper	mg/kg	116	81.7	66.2	88.0	29
Lead	mg/kg	317	48	36	134	119
Mercury	mg/kg	1.2 J	0.43 J	0.16 J	0.61	92
Nickel	mg/kg	17	16	17	16.7	3
Silver	mg/kg	0.6	0.4	0.4	0.5	25
Zinc	mg/kg	157	116	106	126	21
SEM-Cadmium	mg/kg	0.14	0.13	0.16	0.14	11
SEM-Copper	mg/kg	82.9	45.9	33.7	54.2	47
SEM-Lead	mg/kg	71	41	32	48	43
SEM-Mercury	mg/kg	0.01 U	0.008 U	0.02 U	NA	NA
SEM-Nickel	mg/kg	7	5.1	7	6.4	17
SEM-Zinc	mg/kg	141	82.9	75.6	99.8	36
Butyltin	µg/kg	120 J	82 J	35 J	79	54
Dibutyltin	µg/kg	350 J	270 J	140 J	253	42
Tributyltin	µg/kg	1,100	1,100	380	860	48
LPAHs						
2-Methylnaphthalene	µg/kg	20	19 U	18 U	NC	NC
Acenaphthene	µg/kg	54	28	25	36	45
Acenaphthylene	µg/kg	44	26	19	30	44
Anthracene	µg/kg	170	100	91	120	36
Fluorene	µg/kg	67	36	30	44	45
Naphthalene	µg/kg	40	36	21	32	31
Phenanthrene	µg/kg	450	240	230	307	41
Total LPAHs	µg/kg	845	< 485[a]	< 434[a]	588	38
HPAHs						
Benz(a)anthracene	µg/kg	410	240	240	297	33
Benzo(a)pyrene	µg/kg	500	260	280	347	38

HI-SHELL000358

Table 2-25. continned

Parameter	Unit	HI-WW-28 Concentration	Replicate 1 Concentration	Replicate2 Concentration	Mean	%RSD
Benzo(g,h,i)perylene	µg/kg	190	92	100	127	43
Chrysene	µg/kg	620	370	350	447	34
Dibenz(a,h)anthracene	µg/kg	100 M	44 M	48	64	49
Fluoranthene	µg/kg	840	460	490	597	35
Indeno(1,2,3-c,d)pyrene	µg/kg	270	150	160	193	34
Pyrene	µg/kg	880	490	490	620	36
Total benzofluoranthenes	µg/kg	1,070	630	630	777	33
Total HPAHs	µg/kg	4,880 M	2,736 M	2,788	3,468	35
Miscellaneous Oxygenated Compounds						
Benzoic acid	µg/kg	190 U	190 U	180 U	NA	NA
Benzyl alcohol	µg/kg	19 U	19 U	18 U	NA	NA
Dibenzofuran	µg/kg	39	22	18 U	NC	NC
N-Nitrosodiphenylamine	µg/kg	19 U	19 U	18 U	NA	NA
Phenols and Subphenols						
2-Methylphenol	µg/kg	19 U	19	18 U	NA	NA
2,4-Dimethylphenol	µg/kg	19 U	19 U	18 U	NA	NA
4-Methylphenol	µg/kg	19 U	19 U	18 U	NA	NA
Pentachlorophenol	µg/kg	95 U	93 U	90 U	NA	NA
Phenol	µg/kg	45	57	73	58	24
Chlorinated Aromatic Compounds						
1,2-Dichlorobenzene	µg/kg	19 U	19 U	18 U	NA	NA
1,2,4-Trichlorobenzene	µg/kg	19 U	19 U	18 U	NA	NA
1,3-Dichlorobenzene	µg/kg	19 U	19 U	18 U	NA	NA
1,4-Dichlorobenzene	µg/kg	19 U	19 U	18 U	NA	NA
Chlorinated Aliphatic Compounds						
Hexachlorobutadiene	µg/kg	19 U	19 U	18 U	NA	NA
Phthalate Esters						
Di-*n*-octyl phthalate	µg/kg	19 U	19 U	18 U	NA	NA
Bis(2-ethylhexyl)phthalate	µg/kg	330 U	190 U	190 U	NA	NA
Butylbenzyl phthalate	µg/kg	45 U	26 U	46 U	NA	NA
Diethyl phthalate	µg/kg	19 U	19 U	18 U	NA	NA
Dimethyl phthalate	µg/kg	19 U	19 U	18 U	NA	NA
Di-*n*-butyl phthalate	µg/kg	19 U	19 U	18 U	NA	NA

HI-SHELL000359

Table 2-25. continued

Parameter	Unit	HI-WW-28 Concentration	Replicate 1 Concentration	Replicate2 Concentration	Mean	% RSD
Pesticides/PCBs						
Gamma-HCH (lindane)	µg/kg	0.95 U	0.93 U	0.9 U	NA	NA
Hexachlorobenzene (HCB)	µg/kg	0.95 U	0.93 U	0.9 U	NA	NA
Aldrin	µg/kg	2.5	0.93 U	0.9 U	NC	NC
Alpha-chlordane	µg/kg	0.95 U	0.93 U	0.9 U	NA	NA
Gamma-chlordane	µg/kg	2.6 Y	1.7 Y	2 Y	NA	NA
Dieldrin	µg/kg	1.9 U	1.9 U	1.8 U	NA	NA
Heptachlor	µg/kg	0.95 U	0.93 U	0.9 U	NA	NA
p,p'-DDD	µg/kg	4.5	2.4	2.2	3.0	42
p,p'-DDE	µg/kg	3 Y	1.9 U	1.8 U	NA	NA
p,p'-DDT	µg/kg	4.7 Y	2 Y	3.1 Y	NA	NA
Total PCBs	µg/kg	< 280[a]	< 207[a]	< 229[a]	239	16
Conventionals						
Ammonia-nitrogen	mg/kg	4	3.7	3.8	3.8	4
Acid volatile sulfide	mg/kg	14 J	140 J	740 J	298	130
Salinity, pore water	ppt					
Soil pH	pH	7.7	7.6	7.6	7.6	<1
Total organic carbon[b]	%	1.6	2.2	2	1.9	16
Sulfide	mg/kg	68 J	1.6 J	250 J	107	121
Total solids	%	65.6	65.1	65.6	65.4	<1
Preserved total solids	%	57.2	67.3	61.2	61.9	8
Total volatile solids	mg/kg	22,000	30,000	23,000	25,000	17
Clay	%	9	8	7	8	12
Gravel	%	2	1	2	1.7	34
Moisture	%	54	47.4	53.9	51.8	7
Sand	%	68	74	71	71	4
Silt	%	21	17	20	19	11

HI-SHELL000360

Table 2-25. continued

NOTE: NA - Not applicable because all replicate results were not detected.
NC - Not calculated because one or more of the replicate results were not detected.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U and Y - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
Shaded value - % RSD exceeds the advisory limit of 50 percent.

[a] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

[b] Analyzed at 104 °C.

HI-SHELL000361

Table 2-26. Percent Relative Standard Deviation for HI-WW-31 Field Replicate Results

Parameter	Units	HI-WW-31 Concentration	Replicate 1 Concentration	Replicate2 Concentration	Mean	% RSD
Metals/Metalloids						
Antimony	mg/kg	6 UJ	5 U	7 UJ	NA	NA
Arsenic	mg/kg	20	16	18	18	11
Cadmium	mg/kg	0.4	0.2 U	0.3 U	NC	NC
Chromium	mg/kg	41.4	33.8	38.8	38.0	10
Copper	mg/kg	231	173	203	202	14
Lead	mg/kg	155	99	123	126	22
Mercury	mg/kg	1.4	1.1	1	1.2	14
Nickel	mg/kg	22	14	18	18	22
Silver	mg/kg	0.9 J	0.5 J	0.7 J	0.7	29
Zinc	mg/kg	242 J	169 J	206 J	206	18
SEM-Cadmium	mg/kg	0.24	0.18 U	0.14	NC	NC
SEM-Copper	mg/kg	141 J	111 J	49.4 J	100	46
SEM-Lead	mg/kg	153 J	96 J	66 J	105	42
SEM-Mercury	mg/kg	0.06	0.055	0.01	0.04	64
SEM-Nickel	mg/kg	7 J	6.8 J	3.5 J	5.8	34
SEM-Zinc	mg/kg	224 J	154 J	112 J	163	35
Butyltin	µg/kg	85 J	81 J	56 J	74	21
Dibutyltin	µg/kg	690	500	300	497	39
Tributyltin	µg/kg	2,000	2,500	1,300	1,933	31
LPAHs						
2-Methylnaphthalene	µg/kg	58	49	41	49	17
Acenaphthene	µg/kg	140	120	97	119	18
Acenaphthylene	µg/kg	44	37	34	38	13
Anthracene	µg/kg	270	250	230	250	8
Fluorene	µg/kg	140	130	110	127	12
Naphthalene	µg/kg	110	90	86	95.3	13
Phenanthrene	µg/kg	1,000	930	810	913	11
Total LPAHS	µg/kg	1,762	1,606	1,408	1,592	11
HPAHs						
Benz(a)anthracene	µg/kg	780	780	640	733	11
Benzo(a)pyrene	µg/kg	1,000	990	840	943	10

HI-SHELL000362

Table 2-26. continued

Parameter	Units	HI-WW-31 Concentration	Replicate 1 Concentration	Replicate2 Concentration	Mean	%RSD
Benzo(g,h,i)perylene	µg/kg	490	420	280	397	27
Chrysene	µg/kg	1,100	1,000	880	993	11
Dibenz(a,h)anthracene	µg/kg	160	150	110	140	19
Fluoranthene	µg/kg	1,600	1,000	1,000	1,200	29
Indeno(1,2,3-c,d)pyrene	µg/kg	580	500	370	483	22
Pyrene	µg/kg	1,900	1,600	1,400	1,633	15
Total benzofluoranthenes	µg/kg	1,660	1,590	1,540	1,597	4
Total HPAHs	µg/kg	9,270	8,030	7,060	8,120	14
Miscellaneous Oxygenated Compounds						
Benzoic acid	µg/kg	180 U	180 U	180 U	NA	NA
Benzyl alcohol	µg/kg	18 U	18 U	18 U	NA	NA
Dibenzofuran	µg/kg	92	82	70	81	14
N-Nitrosodiphenylamine	µg/kg	18 U	18 U	18 U	NA	NA
Phenols and Subphenols						
2-Methylphenol	µg/kg	18 U	18 U	18 U	NA	NA
2,4-Dimethylphenol	µg/kg	18 U	18 U	18 U	NA	NA
4-Methylphenol	µg/kg	19	18 U	20	NC	NC
Pentachlorophenol	µg/kg	91 U	91 U	88 U	NA	NA
Phenol	µg/kg	80	95	74	83	13
Chlorinated Aromatic Compounds						
1,2-Dichlorobenzene	µg/kg	18 U	18 U	18 U	NA	NA
1,2,4-Trichlorobenzene	µg/kg	18 U	18 U	18 U	NA	NA
1,3-Dichlorobenzene	µg/kg	18 U	18 U	18 U	NA	NA
1,4-Dichlorobenzene	µg/kg	18 U	18 U	18 U	NA	NA
Chlorinated Aliphatic Compounds						
Hexachlorobutadiene	µg/kg	18 U	18 U	18 U	NA	NA
Phthalate Esters						
Di-*n*-octyl phthalate	µg/kg	18 U	18 U	18 U	NA	NA
Bis(2-ethylhexyl)phthalate	µg/kg	440 U	560 U	440 U	NA	NA
Butylbenzyl phthalate	µg/kg	48 U	64 U	71 U	NA	NA
Diethyl phthalate	µg/kg	18 U	18 U	18 U	NA	NA
Dimethyl phthalate	µg/kg	18 U	18 U	18 U	NA	NA
Di-*n*-butyl phthalate	µg/kg	25 U	27 U	23 U	NA	NA

HI-SHELL000363

Table 2-26. continued

PARAMETER	UNITS	HI-WW-31 CONCENTRATION	REPLICATE 1 CONCENTRATION	REPLICATE2 CONCENTRATION	MEAN	% RSD
Pesticides/PCBs						
Gamma-HCH (lindane)	µg/kg	0.91 U	0.91 U	0.88 U	NA	NA
Hexachlorobenzene (HCB)	µg/kg	0.91 U	0.91 U	0.88 U	NA	NA
Aldrin	µg/kg	4	4.9	3.9	4.3	13
Alpha-chlordane	µg/kg	0.91 U	0.91 U	0.88 U	NA	NA
Gamma-chlordane	µg/kg	5.3 Y	6.7 Y	4.9 Y	NA	NA
Dieldrin	µg/kg	1.8 U	1.8 U	1.8 U	NA	NA
Heptachlor	µg/kg	0.91 U	0.91 U	0.88 U	NA	NA
p,p'-DDD	µg/kg	11	13	9	11	18
p,p'-DDE	µg/kg	13 Y	17 Y	12 Y	NA	NA
p,p'-DDT	µg/kg	10 Y	18 Y	11 Y	NA	NA
Total PCBs	µg/kg	< 566[a]	< 706[a]	< 524[a]	599	16
Conventionals						
Ammonia-nitrogen	mg/kg	7	5	4.6	5.5	23
Acid volatile sulfide	mg/kg	220	430	220	290	42
SdpH	pH	7.7	7.7	7.6	7.7	<1
Total organic carbon[b]	%	1.1	1.3	1.2	1.2	8
Sulfide	mg/kg	73	200	43	105	79
Total solids	%	60.8	62.2	62.9	62.0	2
Preserved total solids	%	62.1	59.7	63.9	62.0	3
Total volatile solids	mg/kg	24,000 J	35,000 J	23,000 J	27,333	24
Clay	%	16	15	12	14	15
Moisture	%	64.2	60.3	59.6	61.4	4
Sand	%	53	54	57	55	4
Silt	%	31	31	31	31	<1

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Table 2-26. continued

NOTE: NA - Not applicable because all replicate results were not detected.
NC - Not calculated because one or more of the replicate results were not detected.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U and Y - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
Shaded value - % RSD exceeds the advisory limit of 50 percent.

[a] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

[b] Analyzed at 104°C.

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Table 2-27. Percent Relative Standard Deviation for HI-WW-32 Field Replicate Results

Parameter	Units	HI-WW-32 Concentration	Replicate1 Concentration	Replicate2 Concentration	Mean	% RSD
Metals/Metalloids						
Antimony	mg/kg	15 J	6 UJ	7 J	NC	NC
Arsenic	mg/kg	52	26	34	37	36
Cadmium	mg/kg	0.4	0.2 U	0.3 U	NC	NC
Chromium	mg/kg	40.7	30.7	30.4	33.9	17
Copper	mg/kg	357	205	242	268	30
Lead	mg/kg	191	58	73	107	68
Mercury	mg/kg	1.14	0.53	0.29	0.65	67
Nickel	mg/kg	21	19	17	19	11
Silver	mg/kg	0.6 J	0.5 J	0.5 J	0.5	11
Zinc	mg/kg	804 J	250 J	457 J	504	56
SEM-Cadmium	mg/kg	0.09	0.05 U	0.08 U	NC	NC
SEM-Copper	mg/kg	29.6 J	24.1 J	19.4 J	24.4	21
SEM-Lead	mg/kg	30 J	13 J	16 J	19.7	46
SEM-Mercury	mg/kg	0.014	0.008 U	0.008 U	NC	NC
SEM-Nickel	mg/kg	2 J	1.3 J	2.4 J	1.9	29
SEM-Zinc	mg/kg	89.9 J	44.8 J	68.8 J	67.8	33
Butyltin	µg/kg	60	34 J	48 J	47	27
Dibutyltin	µg/kg	240	160	200	200	20
Tributyltin	µg/kg	920	630	1,000	850	23
LPAHs						
2-Methylnaphthalene	µg/kg	29	24	35	29	19
Acenaphthene	µg/kg	88	38	87	71	40
Acenaphthylene	µg/kg	47	34	26	36	30
Anthracene	µg/kg	390	180	200	257	45
Fluorene	µg/kg	110	53	89	84	34
Naphthalene	µg/kg	47	49	33	43	20
Phenanthrene	µg/kg	990	310	620	640	53
Total LPAHs	µg/kg	1,701	688	1,090	1,160	44
HPAHs						
Benz(a)anthracene	µg/kg	1,200	240	460	633	79
Benzo(a)pyrene	µg/kg	1,300	280	470	683	79

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Table 2-27. continued

Parameter	Units	HI-WW-32 Concentration	Replicate 1 Concentration	Replicate2 Concentration	Mean	% RSD
Benzo(g,h,i)perylene	µg/kg	530	100	190	273	83
Chrysene	µg/kg	1,400	320	550	757	75
Dibenz(a,h)anthracene	µg/kg	140 M	27 M	53 M	73.3	81
Fluoranthene	µg/kg	3,200	530	1,100	1,610	87
Indeno(1,2,3-c,d)pyrene	µg/kg	520	96	180	265	85
Pyrene	µg/kg	3,100	620	960	1,560	86
Total benzofluoranthenes	µg/kg	2,990	670	990	1,550	81
Total HPAHs	µg/kg	14,380 M	2,883 M	4,953 M	7,405	83
Miscellaneous Oxygenated Compounds						
Benzoic acid	µg/kg	190 U	200 U	190 U	NA	NA
Benzyl alcohol	µg/kg	29 M	46	61	45	35
Dibenzofuran	µg/kg	53	33	57	48	27
N-Nitrosodiphenylamine	µg/kg	19 U	20 U	19 U	NA	NA
Phenols and Subphenols						
2-Methylphenol	µg/kg	19 U	20 U	19 U	NA	NA
2,4-Dimethylphenol	µg/kg	19 U	20 U	19 U	NA	NA
4-Methylphenol	µg/kg	19 U	20 U	19 U	NA	NA
Pentachlorophenol	µg/kg	120 J	99 U	95 U	NA	NA
Phenol	µg/kg	85	89	150	108	34
Chlorinated Aromatic Compounds						
1,2-Dichlorobenzene	µg/kg	19 U	20 U	19 U	NA	NA
1,2,4-Trichlorobenzene	µg/kg	19 U	20 U	19 U	NA	NA
1,3-Dichlorobenzene	µg/kg	19 U	20 U	19 U	NA	NA
1,4-Dichlorobenzene	µg/kg	19 U	20 U	19 U	NA	NA
Chlorinated Aliphatic Compounds						
Hexachlorobutadiene	µg/kg	19 U	20 U	19 U	NA	NA
Phthalate Esters						
Di-*n*-octyl phthalate	µg/kg	19 U	20 U	19 U	NA	NA
Bis(2-ethylhexyl)phthalate	µg/kg	400 U	320 U	380 U	NA	NA
Butylbenzyl phthalate	µg/kg	420 U	380 U	250 U	NA	NA
Diethyl phthalate	µg/kg	19 U	20 U	19 U	NA	NA
Dimethyl phthalate	µg/kg	19 U	20 U	19 U	NA	NA
Di-*n*-butylphthalate	µg/kg	19 U	20 U	45 U	NA	NA

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Table 2-27. continued

Parameter	Units	HI-WW-32 Concentration	Replicate1 Concentration	Replicate2 Concentration	Mean	% RSD
Pesticides/PCBs						
Gamma-HCH (Lindane)	µg/kg	0.97 U	0.99 U	0.95 U	NA	NA
Hexachlorobenzene (HCB)	µg/kg	0.97 U	0.99 U	0.95 U	NA	NA
Aldrin	µg/kg	3.5	3.2	2.3	3.0	21
Alpha-chlordane	µg/kg	0.97 U	0.99 U	0.95 U	NA	NA
Gamma-chlordane	µg/kg	4.1 Y	3.2 Y	2.5 Y	NA	NA
Dieldrin	µg/kg	1.9 U	2 U	1.9 U	NA	NA
Heptachlor	µg/kg	0.97 U	0.99 U	0.95 U	NA	NA
p,p'-DDD	µg/kg	5.6	2 U	3	NC	NC
p,p'-DDE	µg/kg	11 Y	9.9 Y	6.3 Y	NA	NA
p,p'-DDT	µg/kg	8.4 Y	4.1 Y	5.1 Y	NA	NA
Total PCBs	µg/kg	< 445[a]	< 350[a]	< 271[a]	355	25
Conventionals						
Ammonia-nitrogen	mg/kg	2.8	2.6	1.9	2.4	19
Acid volatile sulfide	mg/kg	46	1.6 U	87	NC	NC
Soil pH	pH	7.7	7.7	7.5	7.6	2
Total organic carbon[b]	%	1.1	1.4	0.99	1.2	18
Sulfide	mg/kg	48	21	130	66.3	86
Total solids	%	66.6	65.9	66.4	66.3	<1
Preserved total solids	%	60.8	60.4	52	57.7	9
Total volatile solids	mg/kg	22,000 J	24,000 J	20,000 J	22,000	9
Clay	%	12	12	9	11	16
Moisture	%	50.7	53.4	52.9	52.3	3
Sand	%	44	31	44	40	19
Silt	%	44	52	47	48	8

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Table 2-27. continued

NOTE: NA - Not applicable because all replicate results were not detected.

NC - Not calculated because one or more of the replicate results were not detected.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

M - The compound is presumed present; the spectral match between the detected compound spectra and the standard reference spectra did not meet all of the acceptance criteria.

U and Y - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

Shaded value - %RSD exceeds the advisory limit of 50 percent.

[a] The " < " sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the " < " sign signifies that the concentration could be lower than reported.

[b] Analyzed at 104 °C.

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3.0 SUBSURFACE CORE SAMPLE DATA SUMMARY

This section summarizes the field methods used to collect the subsurface cores, the laboratory methods used to analyze the subsurface sediment samples, the analytical results, the QA/QC review of the sample testing, and the core log data. All figures and tables for this section are provided at the end of the section.

3.1 METHODS

A brief summary of field methods used to collect and process the subsurface core samples and laboratory methods used to analyze the composite samples for selected constituents is provided below. The project FSP (EVS and Hart Crowser, 1995a) and QAPP/LAP (EVS and Hart Crowser, 1995d) provide details regarding these procedures. Deviations from the project plans not included in the cruise report (EVS and Hart Crowser, 1995b) are described below.

3.1.1 Field Methods

Ten subsurface cores were collected from the East and West Waterways and the North Shore of Harbor Island on March 20 and 21, 1995 (Figure 3-1). Cores were advanced using an impact-driven coring device (IDCS) deployed from the *U.S. Retriever*. Sampling and location control were conducted in accordance with protocols outlined in the project FSP.

The cores were advanced approximately 10 ft below mudline at stations HI-EW-01, HI-EW-06, HI-EW-11, HI-NS-04, HI-NS-08, HI-WW-05, HI-WW-10, HI-WW-18B, HI-WW-27, and HI-WW-30 (Figure 3-1). A description of the sample identification system is presented in Figure 2-3 of the FSP. Collocated surface samples were also collected at these stations and are discussed in Section 2.0.

After retrieval, core tubes were stored vertically in the dark at 4°C in Hart Crowser's custody until processed. Core tubes were cut open longitudinally using a circular saw and logged by a qualified geologist. Each sediment core was segmented into three depth composite samples (S-1, S-2, S-3) based on the observed stratigraphy. Each depth composite sample was placed

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into a stainless-steel bowl and homogenized prior to filling pre-labeled jars. Generally, the composite intervals for S-1 ranged from 0- to 2-ft depths, S-2 ranged from 2- to 5-ft depths, and S-3 ranged from 5-ft depths to the bottom of the core. Percent compaction over the length of the core ranged from 6 to 46 percent with an average of 21 percent compaction. Specific composite intervals and core logs are presented in Figures 3-2 to 3-12.

Thirty subsurface sediment samples plus two homogenized duplicates were submitted to the ARI and Hart Crowser laboratories for analysis as outlined in the project QAPP/LAP.

Deviations from the FSP included:

- Impact cores from stations HI-WW-10 and HI-WW-30 exhibited high compaction and difficult penetration, resulting in 6.5 ft of recovered sediment. Repeated core advancement attempts did not improve sample recovery.

- Station location HI-WW-18 was moved 25 ft west to avoid bathymetric slopes that prevented successful core advancement. Surface grab samples were collected from the proposed location (HI-WW-18) and the actual core station location (HI-WW-18B), as discussed in Section 2.1 and the cruise report (EVS and Hart Crowser, 1995b).

- Proposed sampling stations were presented in NAD 27 horizontal datum consistent with the FSP. However, it was necessary to convert these stations to NAD 83 datum to support field activities. Consequently, all final coordinates for sampling stations are presented in NAD 83 north zone datum.

- Lead-line readings could not be measured off the bow of the sampling vessel during core advancement because of strong currents in the waterways. Depth to sediment readings were recorded from the vessel electronic depth sounder.

Refer to the cruise report (EVS and Hart Crowser, 1995b) for additional descriptions of field activities.

3.1.2 Laboratory Methods

Thirty composite subsurface sediment core samples plus two homogenized field duplicates were submitted to ARI for chemical analyses of mercury, sulfide, ammonia, and total solids as specified in the QAPP/LAP. Remaining sediment samples were archived at ARI (frozen). The associated sample information (e.g., sample IDs, depths) is presented in Table 3-1.

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Sample preparation and chemical analyses were conducted in accordance with the methods and protocols outlined in the QAPP/LAP.

3.1.3 Data Handling and Comparison

Analysis results were entered into the project database. The grain size results were reviewed by Hart Crowser, and the chemical analysis results were validated by EcoChem, Inc., in accordance with the QAPP/LAP. Qualified data resulting from the review of chemical analysis results were entered in the project database.

Chemical concentrations of the sediment samples were compared to the CSL chemical concentration criteria. These results and a statistical analysis of these data are summarized in Tables 3-2 and 3-3 and discussed in Section 3.2.

3.2 RESULTS

Forty-five sediment samples (30 subsurface, 11 collocated surface, 2 surface triplicates, and 2 subsurface homogenized duplicates) were submitted for grain size distribution and moisture content analysis in accordance with the QAPP/LAP. Grain size data for subsurface sediment samples from the East and West Waterways and the North Shore of Harbor Island are compiled in Table 3-1. The field sediment descriptions can be found in the summary core logs (Figures 3-2 to 3-12) and the original grain size curve plots presented in Appendix F. The 11 collocated surface samples are discussed in Section 2.0 and the grain size curve plots are included in Appendix E.

Validated chemical analysis results for the subsurface core sediment samples are presented for each waterway in Appendix B. Basic statistical analyses were conducted for the samples in each waterway. The results are summarized in Table 3-2. Mercury concentrations of the sediment samples were also compared to the CSL. The detailed exceedences on a sample-by-sample basis and associated enrichment ratios are presented in Table 3-3. There are no CSL criteria for sulfide and ammonia. The following subsections provide summaries of grain size, mercury, sulfide, and ammonia data for each waterway. Total solids were also determined; results are shown in Table 3-2.

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3.2.1 West Waterway

3.2.1.1 Grain Size

Overall, the subsurface samples in the West Waterway are comprised of silty sands and sandy silts, although considerable variation was observed. Generally, the sediments grade sandier (coarser) toward the mouth of the West Waterway. The overall sediment composition of the samples was assessed based on the mean values in each of the grain size classes (gravel, sand, silt, and clay). The average composition of subsurface sediments in the West Waterway includes 11 percent clay, 34 percent silt, and 55 percent sand, and represents a slightly clayey, very silty sand.

3.2.1.2 Mercury

Mercury was detected in 8 of 15 samples, and the concentrations ranged from 0.06 U to 3.8 mg/kg, with a median of 0.15 mg/kg. The maximum concentration was detected at a depth of 1.7 ft in sample HI-WW-18-S1. A total of four mercury results, which were all in upper composite samples, exceeded the mercury CSL of 0.59 mg/kg. Additional information on the vertical distribution of mercury is discussed in Section 4.2. Detailed information on exceedences is presented in Table 3-3.

3.2.1.3 Sulfide

Sulfide was detected in 14 of 15 samples, and the concentrations ranged from 1.4 to 1,200 mg/kg with a median of 60 mg/kg. The maximum concentration was detected at depths of 1.7 ft and 3.8 ft in samples HI-WW-18-S1 and HI-WW-10-S2, respectively.

3.2.1.4 Ammonia

Ammonia was detected in all 15 samples analyzed. The concentrations ranged from 2.7 to 64 mg/kg with a median of 9.9 mg/kg. The maximum concentration was detected at a depth of 9.1 ft in sample HI-WW-27-S3.

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3.2.2 East Waterway

3.2.2.1 Grain Size

The sediment samples in the East Waterway are comprised mostly of slightly sandy to sandy silts with varying amounts of clay. The average composition of subsurface sediments in the East Waterway includes 24 percent clay, 27 percent sand, and 49 percent silt, and represents a clayey, sandy silt.

3.2.2.2 Mercury

Mercury was detected in 7 of 9 samples analyzed, and the concentrations ranged from 0.05 U to 1.73 mg/kg with a median of 0.21 mg/kg. The maximum concentration was detected at a depth of 1.7 ft in sample HI-EW-06-S1. Only two mercury results exceeded the mercury CSL of 0.59 mg/kg and both were from the same core station. The detailed exceedence information is presented in Table 3-3. Additional information on the vertical distribution of mercury is discussed in Section 4.0.

3.2.2.3 Sulfide

Sulfide was detected in all 9 samples analyzed, and the concentrations ranged from 8.7 to 720 mg/kg with a median of 22 mg/kg. The maximum concentration was detected at a depth of 1.7 ft in sample HI-EW-06-S 1.

3.2.2.4 Ammonia

Ammonia was detected in all 9 samples analyzed. The concentrations ranged from 23 to 160 mg/kg with a median of 62 mg/kg. The maximum concentration was detected at a depth of 1.7 ft in sample HI-EW-06-S1.

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3.2.3 North Shore

3.2.3.1 Grain Size

The average grain size for the North Shore stations includes 7 percent clay, 29 percent silt, and 64 percent sand, and represents a non-clayey to slightly clayey, silty sand.

3.2.3.2 Mercury

Mercury was detected in 3 of 6 samples analyzed, and the concentrations ranged from 0.06 U to 0.82 mg/kg with a median of 0.07 mg/kg. The maximum concentration was detected at a depth of 2.1 ft in sample HI-NS-08-S1, which exceeded the mercury CSL of 0.59 mg/kg. The detailed exceedence information is presented in Table 3-3.

3.2.3.3 Sulfide

Sulfide was detected in all 6 samples, and the concentrations ranged from 1.8 to 130 mg/kg with a median of 55.5 mg/kg. The maximum concentration was detected at a depth of 8.3 ft in sample HI-NS-08-S3.

3.2.3.4 Ammonia

Ammonia was detected in all 6 samples analyzed. The concentrations ranged from 2.1 to 47 mg/kg with a median of9.55 mg/kg. The maximum concentration was detected at a depth of 8.3 ft in sample HI-NS-08-S3.

3.3 QA/QC SUMMARY OF THE SUBSURFACE CORE SAMPLE DATA

3.3.1 QA/QC of Grain Size Results

Thirty subsurface core sediment samples plus 2 homogenized field duplicates and 11 collocated surface sediment samples were submitted to the Hart Crowser Physical Laboratory for grain size testing. The laboratory analyzed the samples consecutively with other surface samples collected from the site during the Harbor Island supplementary remedial

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investigation. Following the method outlined in the QAPP/LAP, a total of five sets of laboratory triplicates were analyzed. Two sets of laboratory triplicates were performed for the subsurface core samples. Their %RSDs ranged from 0 to 15, with one exception. Because of very low clay content (1 percent) in the selected sample, the %RSD for one clay triplicate set (1 percent, 0 percent, 2 percent) was 100. The relative percent differences (RPDs) for the homogenized composite duplicates ranged from 0 to 40 percent. Detailed results of laboratory triplicate and field duplicate analyses are presented in Table 3-4. Based on the QA/QC review, the data quality objectives were met for physical testing.

3.3.2 QA/QC of Chemical Results

Thirty subsurface core sediment samples and two homogenized field duplicates were analyzed for mercury, sulfides, ammonia, and total solids by ARI. Table 3-5 presents comparisons in terms of RPDs between analytical results for field samples and corresponding replicates. One rinsate blank and one field blank were also analyzed.

Validation of the subsurface core data was performed by EcoChem. Based on a review of the laboratory data reports, the project data quality objectives were met for these samples. A total of 120 data points were reported for the subsurface core samples, and none were rejected. The completeness of the data is 100 percent. However, some minor deficiencies were found during the data validation and resulted in qualification of some results. These qualifications are briefly explained below, and all data qualifications are reflected in Table 3-2 and in Appendix B. The detailed discussions are presented in the final data validation report, which is on file at Hart Crowser and available upon request. The following discussion addresses the individual analytical parameters.

3.3.2.1 Mercury

Two sets of field duplicates (HI-NS-04-S3/HI-NS-04-80 and HI-NS-08-S2/HI-NS-08-80) were submitted for analysis. Mercury was not detected in either field duplicate set, therefore sampling and analysis precision was not assessable. Analysis of laboratory duplicates was conducted on two subsurface core samples. Their RPDs were less than 18.6 percent. All matrix spikes and laboratory control sample (LCS) recoveries were within control limits. Mercury was not detected above the method detection limit in any blank samples; therefore, no qualifiers were assigned to the results.

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SECTION 3.0

FIGURES AND TABLES

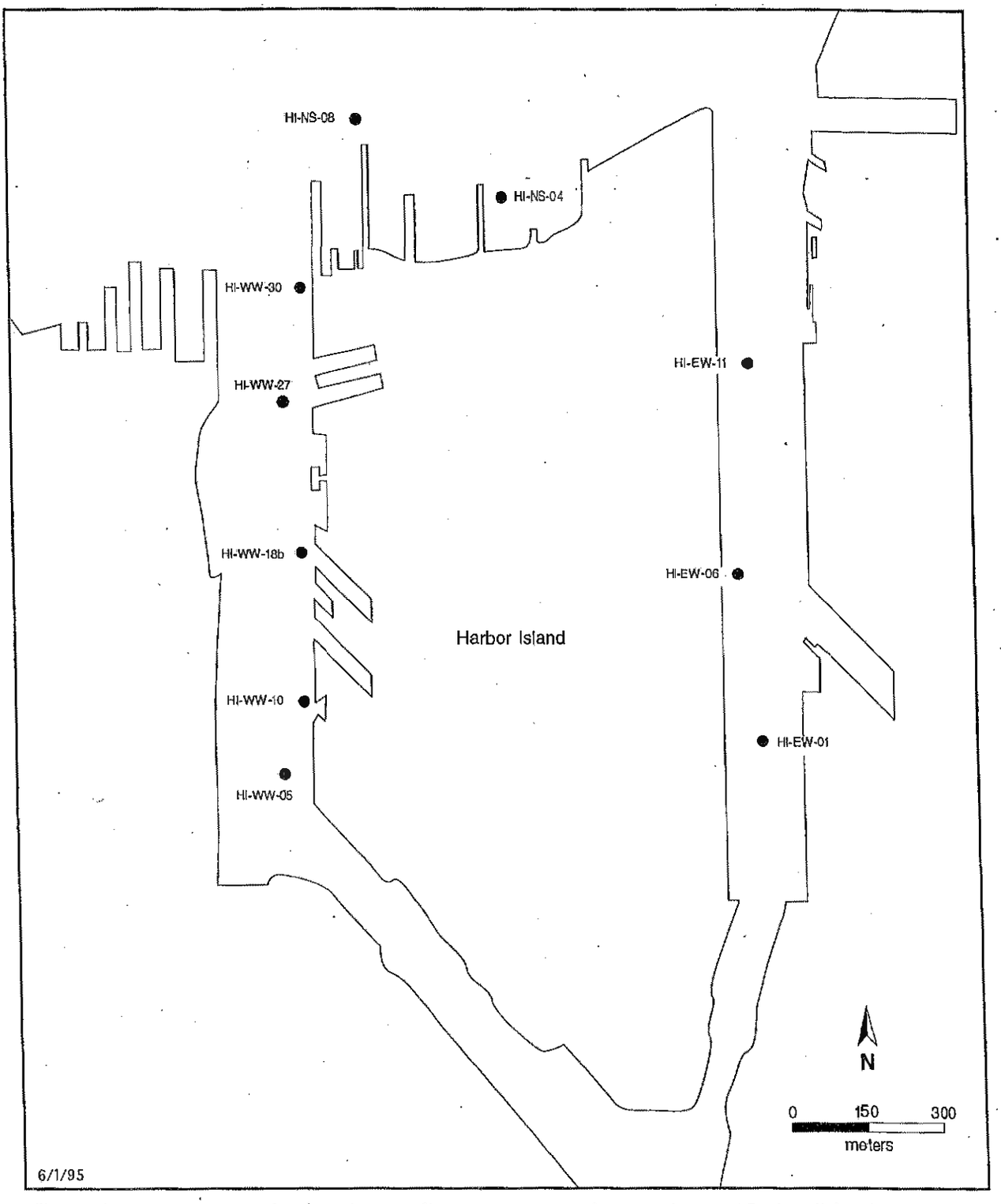

Figure 3-1. Locations of subsurface sediment core sampling stations – Harbor Island Supplementary Remedial Investigation.

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Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual–manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following (the Munsell Soil Color Chart was used for visual color descriptions): Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 – 4	Very soft	0 – 2	<0.125
Loose	4 – 10	Soft	2 – 4	0.125 – 0.25
Medium dense	10 – 30	Medium stiff	4 – 8	0.25 – 0.5
Dense	30 – 50	Stiff	8 – 15	0.5 – 1.0
Very dense	>50	Very stiff	15 – 30	1.0 – 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptable moisture
Damp	Some perceptable moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptable moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

Legends

Sampling Test Symbols

BORING SAMPLES

- ☒ Split Spoon
- ⧅ Push Tube
- * No Sample Recovery
- P Tube Pushed, Not Driven

CORING SAMPLES

- ☒ Surface Sample
- ⧅ Core Section/Composite Sample
- Natural Recovery Core Sample (2cm)

Non-Soil Components

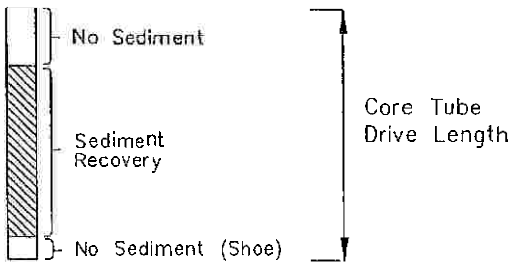
	Estimated Percentage
trace, scattered	< 5%
occasional	5 to 15%
moderate	15 to 30%
substantial	30 to 50%

Test Symbols

GS	Grain Size Classification
TUU	Triaxial Unconsolidated Undrained
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
AL	Atterberg Limits

Water Content in Percent
Liquid Limit
Natural
Plastic Limit

Core Tube and Sediment Recovery



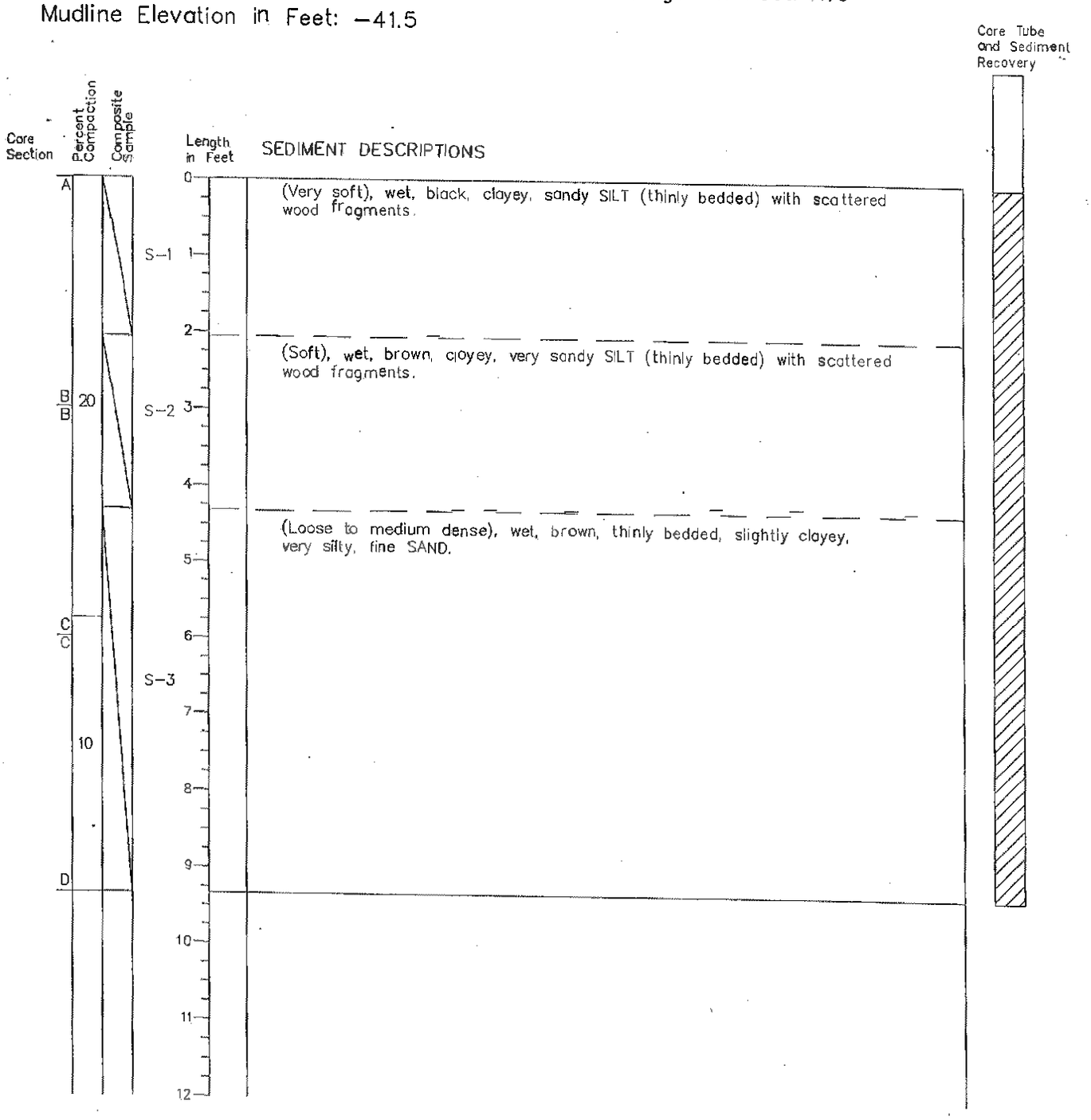
HARTCROWSER
J-4249-04 6/95
Figure 3-2

cvd 6/13/95 1=1 hc-pcp
424904 a1

Sediment Core Log HI-EW-01

Type of Sample: Impact Core
Date/Time: 3/20/95 09:15
Recovery Length in Feet: 9.3
Mudline Elevation in Feet: −41.5

Northing: 213,969
Easting: 1,267,447
Drive Length in Feet: 11.0



Note:
1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.
4. This station was located on a bathymetric slope resulting in difficult sediment recovery.

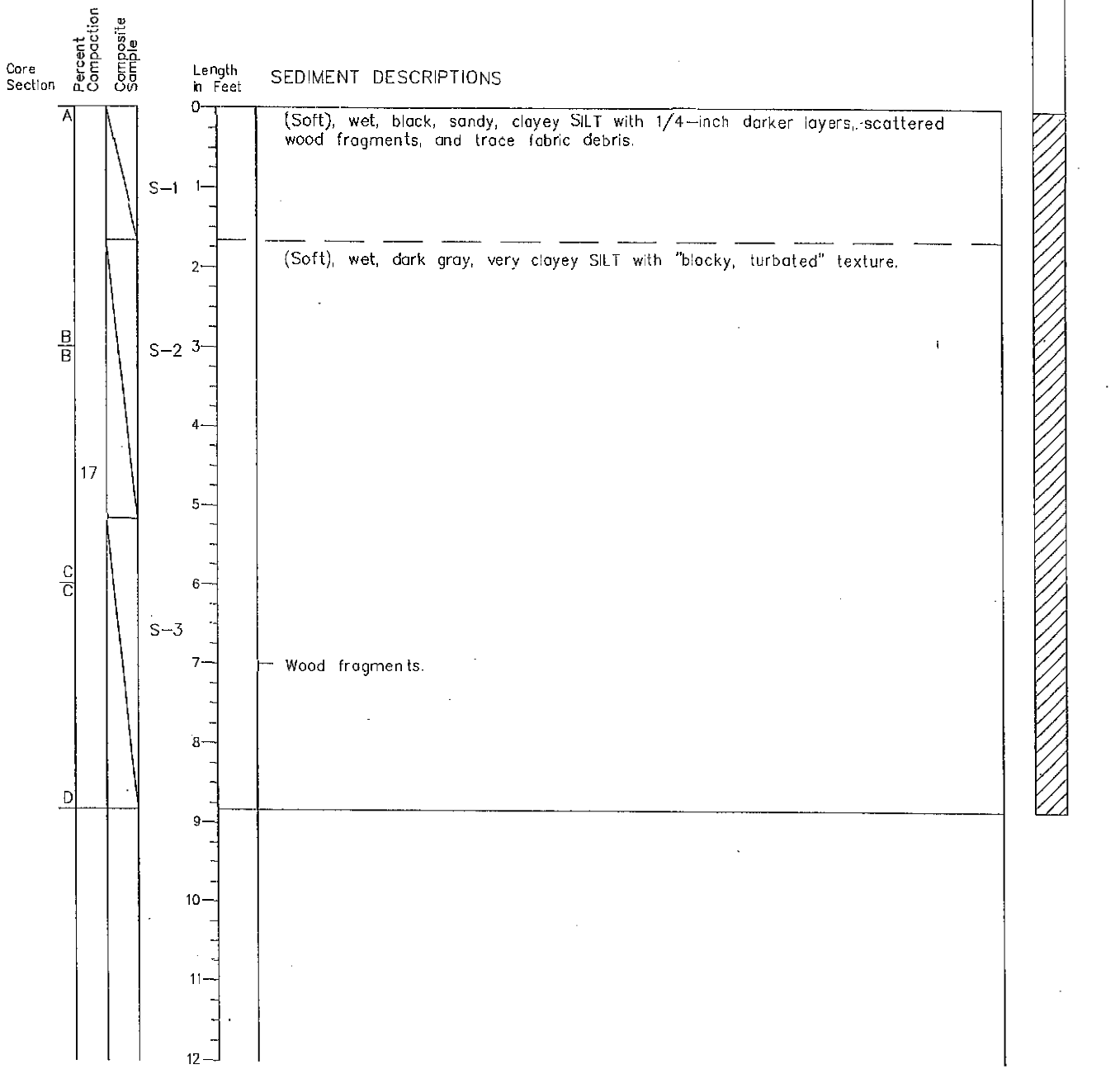
cvd 6/13/95 1=1 hc-pap
HIEW01

HARTCROWSER
J-4249-04 6/95
Figure 3-3

Sediment Core Log HI-EW-06

Type of Sample: Impact Core
Date/Time: 3/20/95 11: 24
Recovery Length in Feet: 8.8
Mudline Elevation in Feet: −48.0

Northing: 215,410
Easting: 1,267,306
Drive Length in Feet: 11.0



Note: 1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.

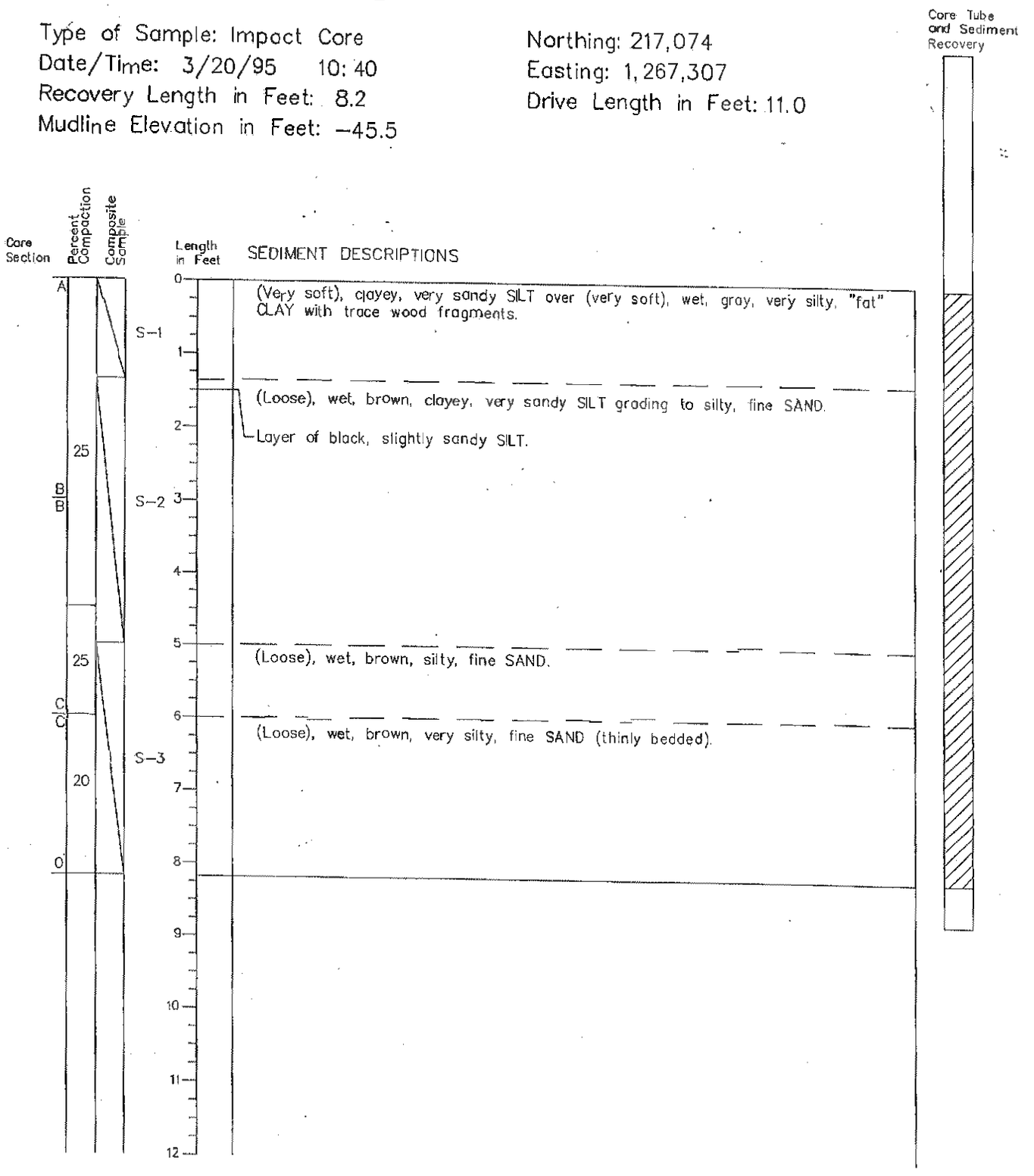
cvd 6/13/95 1=1 hc−pcp
HIEW06

HARTCROWSER
J-4249-04 6/95
Figure 3-4

Sediment Core Log HI-EW-11

Type of Sample: Impact Core
Date/Time: 3/20/95 10:40
Recovery Length in Feet: 8.2
Mudline Elevation in Feet: −45.5

Northing: 217,074
Easting: 1,267,307
Drive Length in Feet: 11.0



Note: 1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.

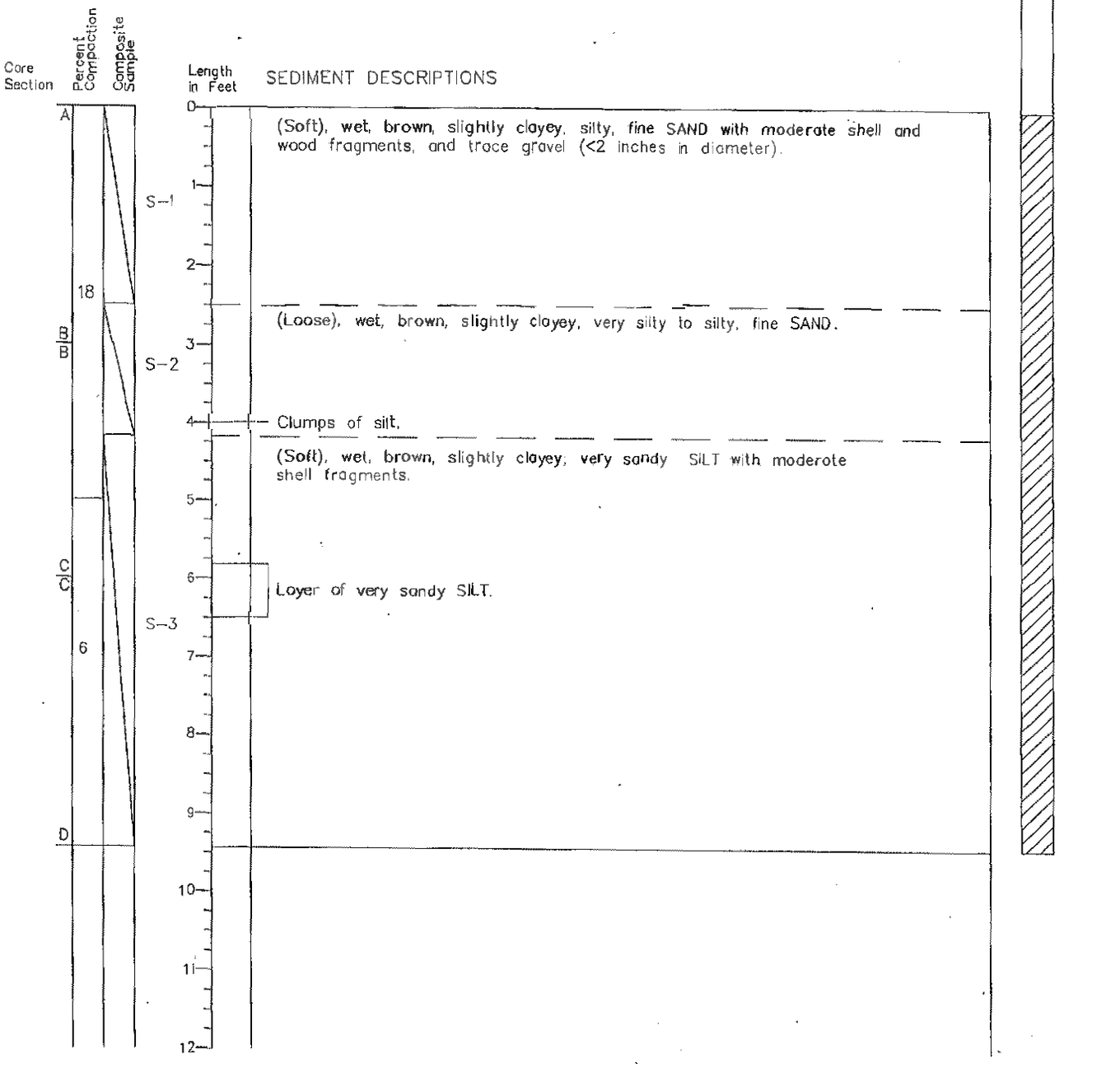
HARTCROWSER
J-4249-04 6/95
Figure 3-5

cvd 6/13/95 1=1 hc-pcp
HIEW11

Sediment Core Log HI-NS-04

Type of Sample: Impact Core
Date/Time: 3/20/95 12:14
Recovery Length in Feet: 9.4
Mudline Elevation in Feet: −46.5

Northing: 218,364
Easting: 1,265,512
Drive Length in Feet: 11.0



Note:
1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.
4. A homogenized duplicate of HI−NS−04 − S−3 was collected and labeled HI−NS−04−80.

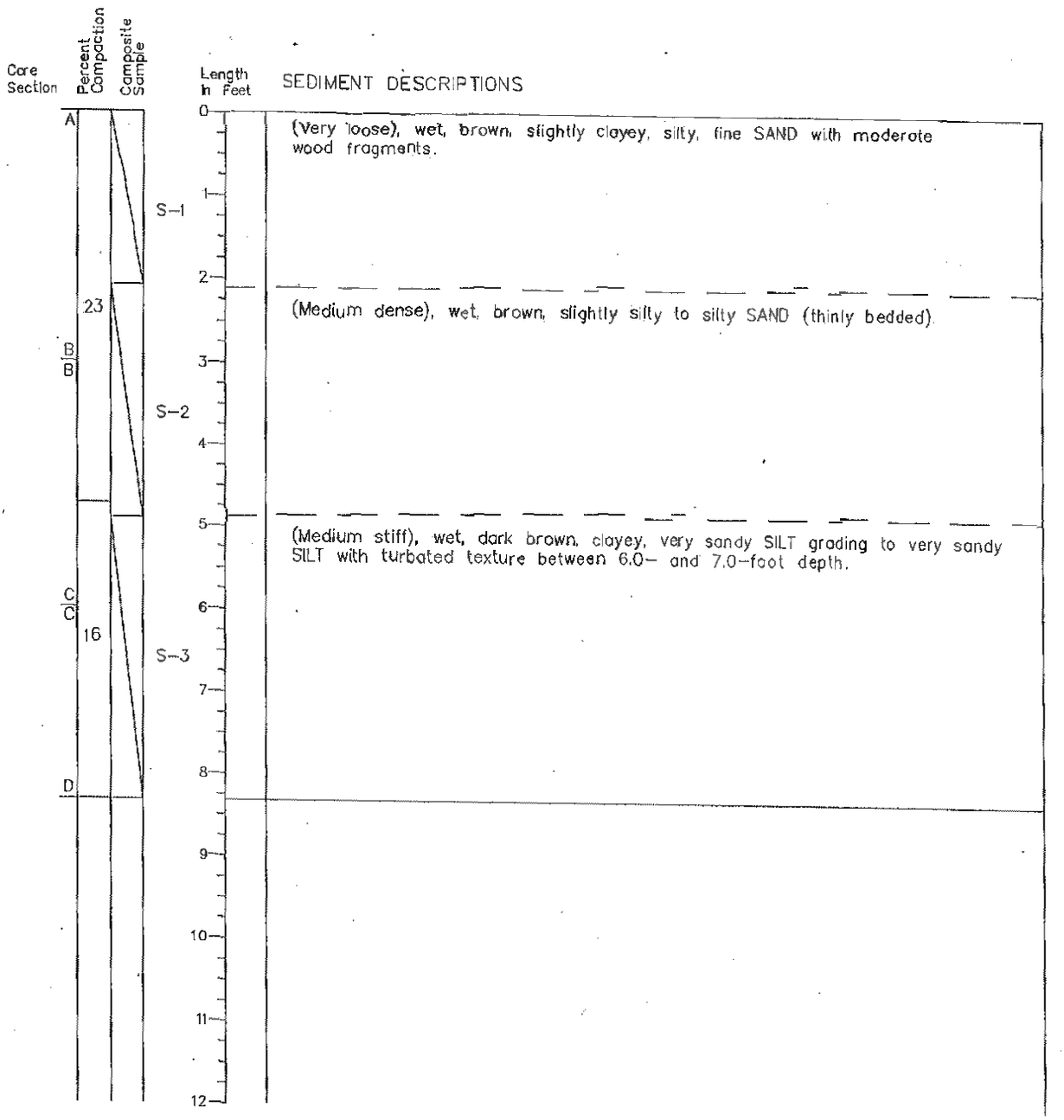
HARTCROWSER
J-4249-04 6/95
Figure 3-6

cvd 6/13/95 1=1 hc-pap
Hins04

Sediment Core Log HI-NS-08

Type of Sample: Impact Core
Date/Time: 3/20/95 13:15
Recovery Length in Feet: 8.3
Mudline Elevation in Feet: −96.5

Northing: 218,821
Easting: 1,264,440
Drive Length in Feet: 11.0



Note:
1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.
4. A homogenized duplicate of HI−NS−08 was collected and labeled HI−NS−08−80.

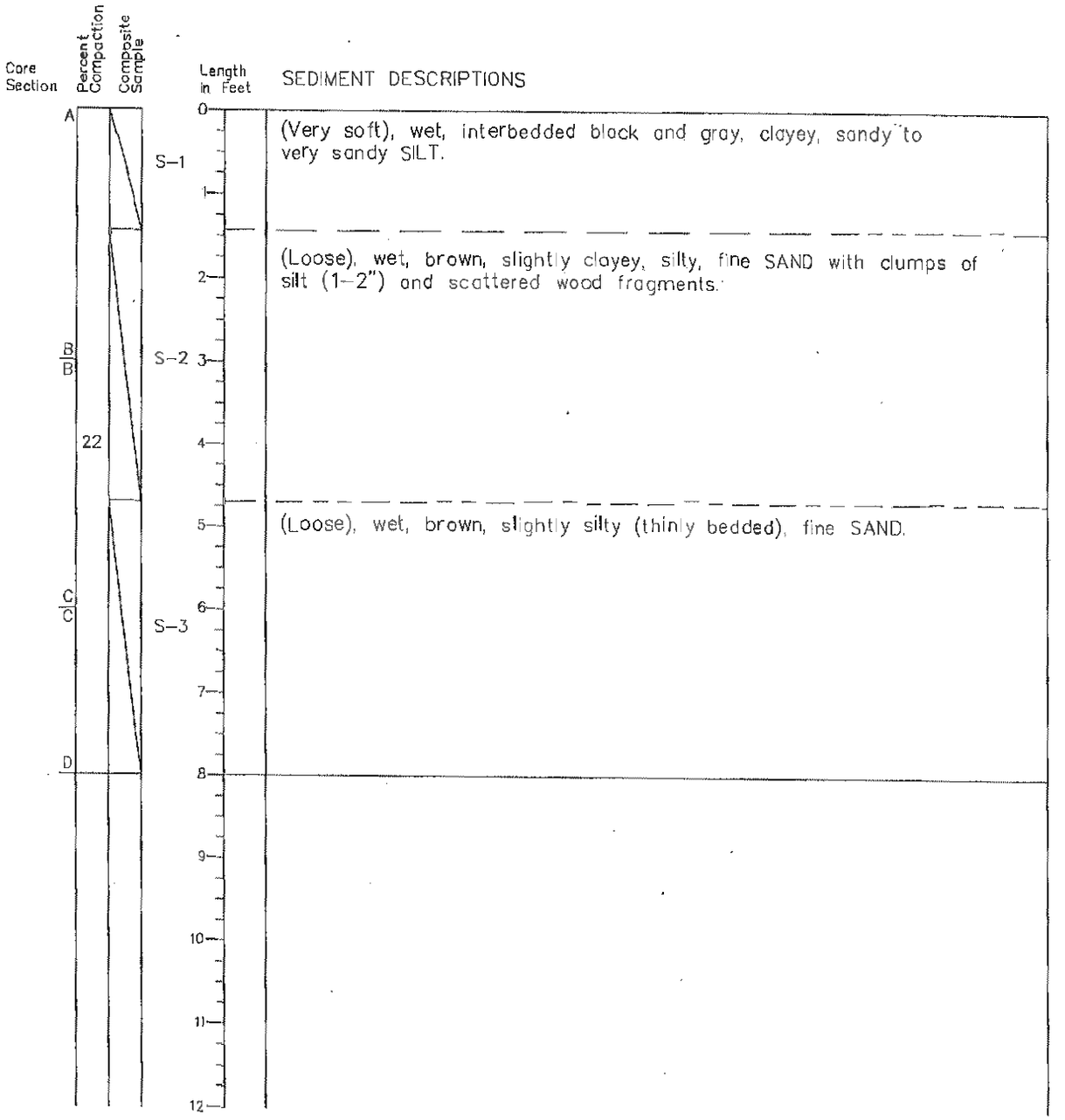
cvd 8/13/95 1=1 hc−pcp
HINS08

HARTCROWSER
J-4249-04 6/95
Figure 3-7

Sediment Core Log HI-WW-05

Type of Sample: Impact Core
Date/Time: 3/21/95 13:40
Recovery Length in Feet: 8.0
Mudline Elevation in Feet: −54.0

Northing: 213,862
Easting: 1,263,868
Drive Length in Feet: 11.0



Note:
1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.

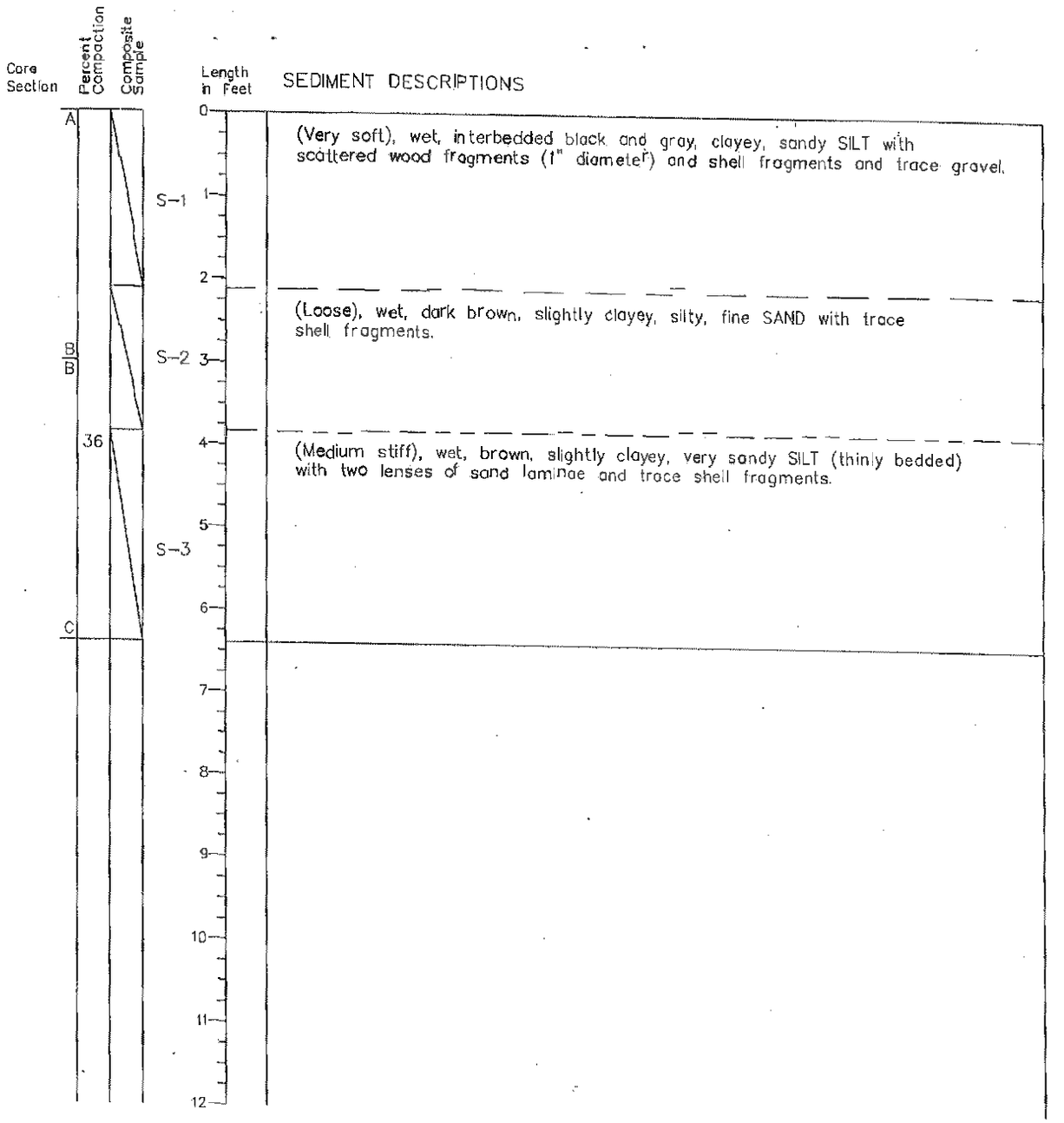
HARTCROWSER
J-4249-04 6/95
Figure 3-8

cvd 6/13/95 1=1 hc-pcp
hiww05

Sediment Core Log HI-WW-10

Type of Sample: Impact Core
Date/Time: 3/22/95 13:35
Recovery Length in Feet: 6.4
Mudline Elevation in Feet: −46.0

Northing: 214,485
Easting: 1,263,882
Drive Length in Feet: 11.0



Note:
1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.
4. This station was located on a bathymetric slope resulting in difficult sediment recovery.

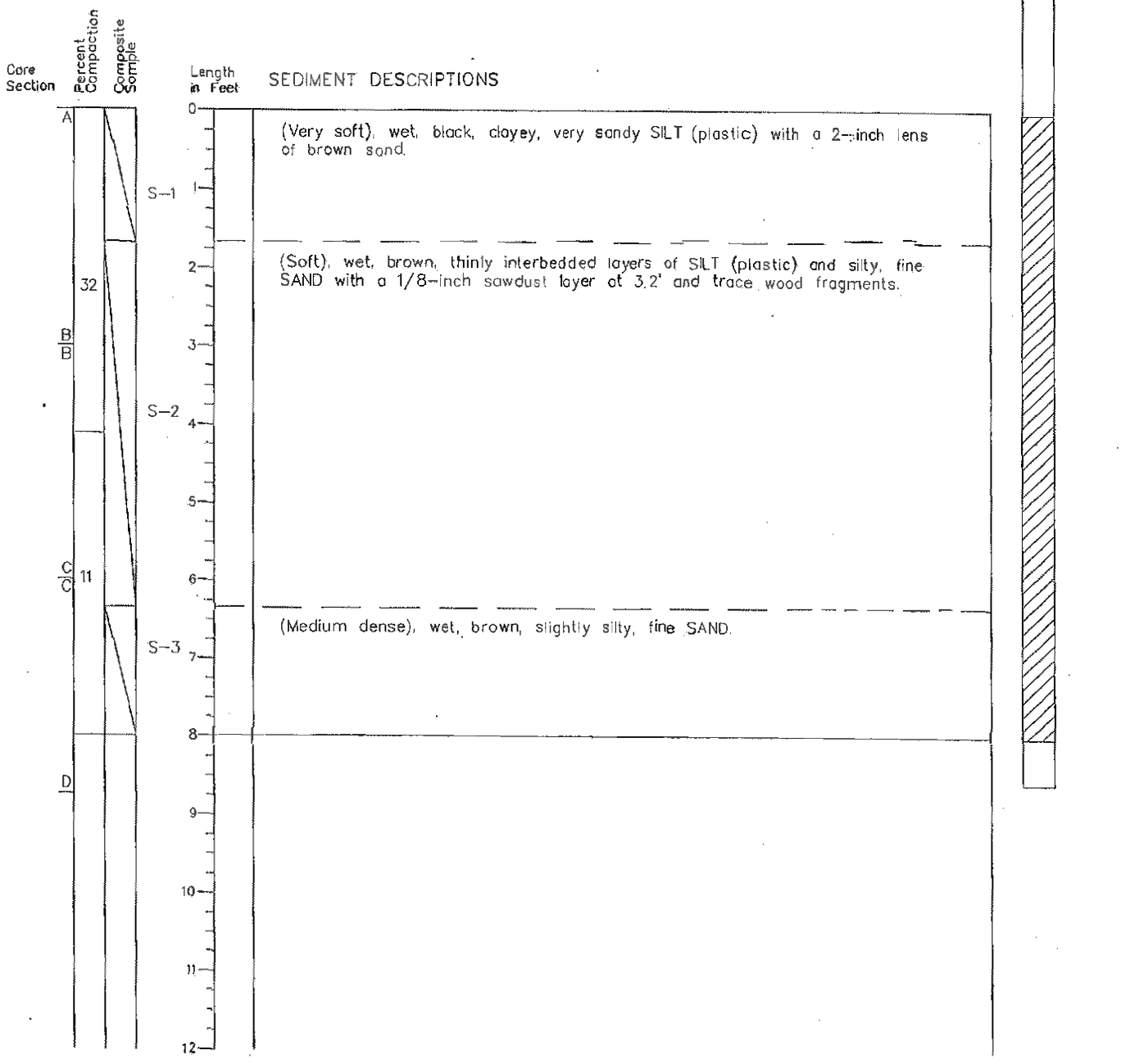
HARTCROWSER
J-4249-04 6/95
Figure 3-9

evd 6/13/95 1=1 hc-pcp
hiww10

Sediment Core Log HI-WW-18

Type of Sample: Impact Core
Date/Time: 3/21/95 15:08
Recovery Length in Feet: 8.0
Mudline Elevation in Feet: −49.0

Northing: 1,263,921
Easting: 215,636
Drive Length in Feet: 11.0



Note: 1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.

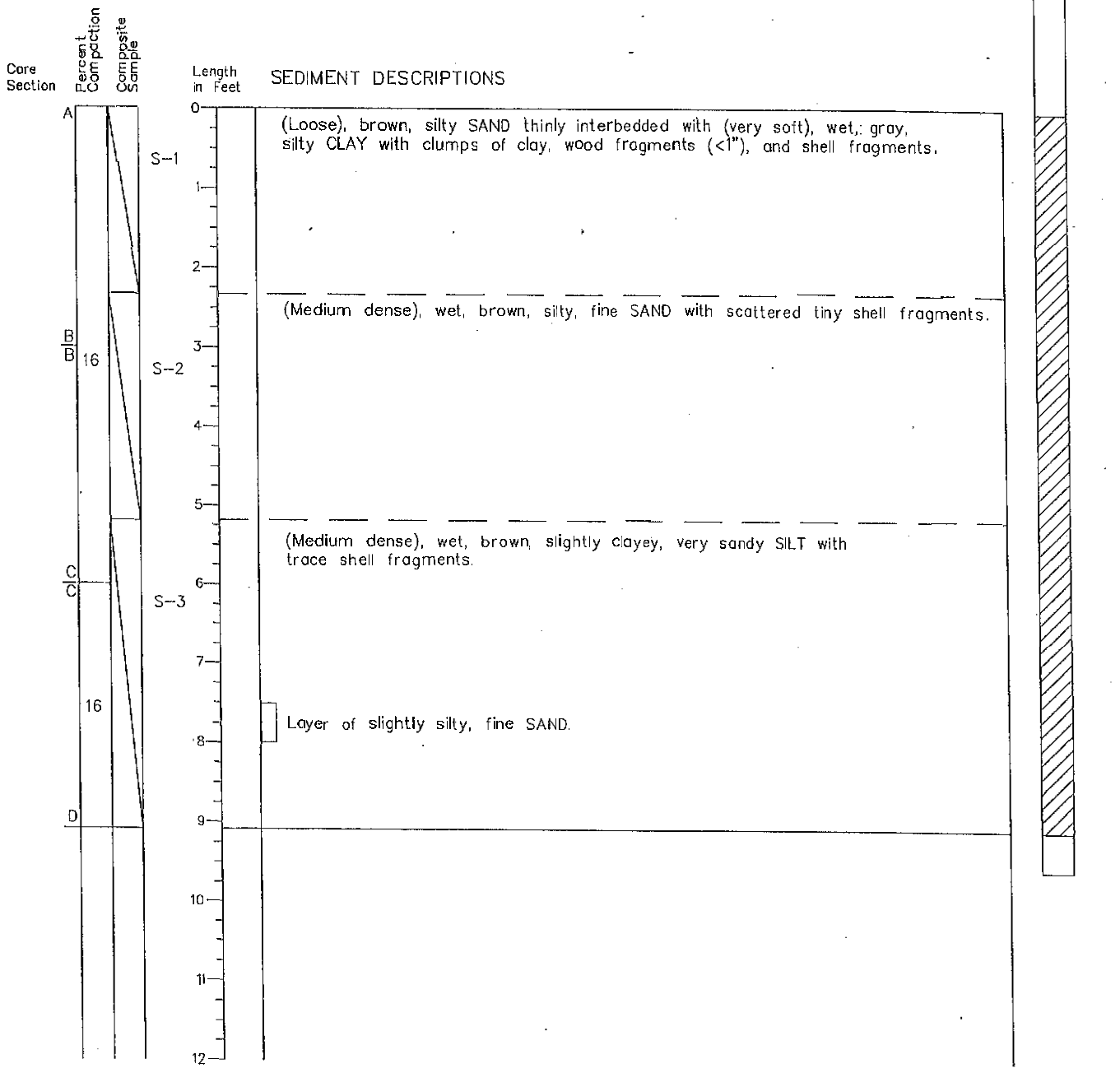
HARTCROWSER
J-4249-04 6/95
Figure 3-10

cad 6/13/95 1=1 hc-pcb
hiww10

Sediment Core Log HI-WW-27

Type of Sample: Impact Core
Date/Time: 3/21/95 16:15
Recovery Length in Feet: 9.1
Mudline Elevation in Feet: −52.5

Northing: 216,732
Easting: 1,263,846
Drive Length in Feet: 11.0



Note: 1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.

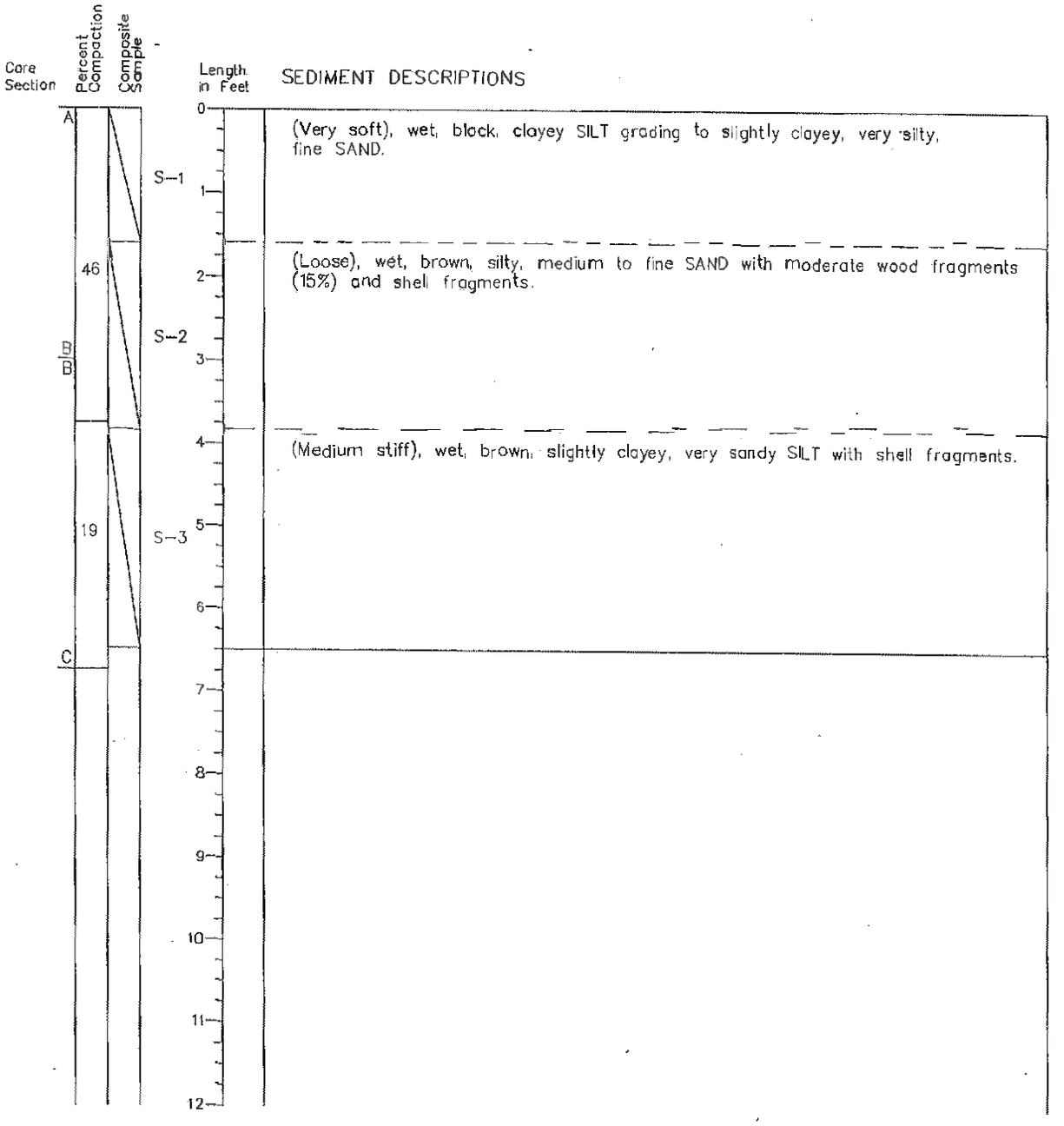
cvd 6/13/95 1=1 hc-psp
hiww05

HARTCROWSER
J-4249-04 6/95
Figure 3-11

Sediment Core Log HI-WW-30

Type of Sample: Impact Core
Date/Time: 3/21/95 16:51
Recovery Length in Feet: 6.5
Mudline Elevation in Feet: −50.7

Northing: 217,646
Easting: 1,263,961
Drive Length in Feet: 11.0



Note:
1. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
2. Length of core tubes is 12 feet.
3. Collocated surface samples were collected with van Veen grab samplers.
4. This station was located on a bathymetric slope resulting in difficult sediment recovery.

cvd 6/13/95 1=1 hc-pcp
hiwwt0

HARTCROWSER
J-4249-04 6/95
Figure 3-12

Table 3-1. Summary of Analytical Results for Grain Size

Sample ID	Sampling Date	Depth Interval (ft)	Percent Gravel	Percent Sand	Percent Silt	Percent Clay
HI-EW-01	03/16/95	0.0 to 0.3	0	25	53	22
HI-EW-01-S1	03/20/95	0.0to2.1	1	23	55	21
HI-EW-01-S2	03/20/95	2.1 to 4.3	0	40	46	14
HI-EW-01-S3	03/20/95	4.3 to 9.3	0	60	33	7
HI-EW-06	03/16/95	0.0 to 0.3	0	20	52	28
HI-EW-06-S1	03/20/95	0.0to1.7	0	13	60	27
HI-EW-06-S2	03/20/95	1.7to5.2	0	3	62	35
HI-EW-06-S3	03/20/95	5.2 to 8.8	0	3	62	35
HI-EW-11	03/16/95	0.0 to 0.3	1	31	40	28
HI-EW-11-S1	03/20/95	0.0to 1.3	0	5	40	55
HI-EW-11-S2	03/20/95	1.3 to 5.0	0	43	40	17
HI-EW-11-S3	03/20/95	5.0 to 8.2	0	76	21	3
HI-EW-60	03/16/95	0.0 to 0.3	0	24	55	21
HI-EW-61	03/16/95	0.0 to 0.3	0	17	64	19
HI-NS-04	03/16/95	0.0 to 0.3	0	67	26	7
HI-NS-04-80[a]	03/20/95	4.2 to 9.4	0	40	52	8
HI-NS-04-S1	03/20/95	0.0 to 2.5	0	63	29	8
HI-NS-04-S2	03/20/95	2.5 to 4.2	0	80	15	5
HI-NS-04-S3	03/20/95	4.2 to 9.4	0	40	49	11
HI-NS-08	03/16/95	0.0to 0.3	1	64	27	8
HI-NS-08-80[b]	03/20/95	2.1 to 4.9	0	85	12	3
HI-NS-08-S1	03/20/95	0.0 to 2.1	0	65	28	7
HI-NS-08-S2	03/20/95	2.1 to 4.9	0	87	11	2
HI-NS-08-S3	03/20/95	4.9to 8.3	0	49	38	13
HI-WW-05	03/16/95	0.0 to 0.3	1	34	47	18
HI-WW-05-S1	03/21/95	0.0 to 1.4	1	30	46	23
HI-WW-05-S2	03/21/95	1.4to4.7	0	62	29	9
HI-WW-05-S3	03/21/95	4.7 to 8.0	0	90	8	2
HI-WW-10	03/16/95	0.0 to 0.3	0	38	41	21
HI-WW-10-S1	03/22/95	0.0 to 2.1	6	25	52	17
HI-WW-10-S2	03/22/95	2.1 to 3.8	0	78	17	5

HI-SHELL000390

Table 3-1. continued

Sample ID	Sampling Date	Depth Interval (ft)	Percent Gravel	Percent Sand	Percent Silt	Percent Clay
HI-WW-10-S3	03/22/95	3.8 to 6.3	0	41	49	10
HI-WW-18	03/20/95	0.0 to 0.3	0	39	40	21
HI-WW-18-S1	03/21/95	0.0 to 1.7	0	42	45	13
HI-WW-18-S2	03/21/95	1.7 to 6.3	0	42	47	11
HI-WW-18-S3	03/21/95	6.3 to 8.0	0	91	8	1
HI-WW-18-S3T1[c]	03/21/95	6.3 to 8.0	0	91	9	0
HI-WW-18-S3T2[c]	03/21/95	6.3 to 8.0	0	90	8	2
HI-WW-18B	03/23/95	0.0 to 0.3	0	49	35	16
HI-WW-27	03/16/95	0.0 to 0.3	0	64	24	12
HI-WW-27-S1	03/21/95	0.0 to 2.3	0	59	31	10
HI-WW-27-S2	03/21/95	2.3 to 5.2	0	84	13	3
HI-WW-27-S3	03/21/95	5.2 to 9.1	0	49	41	10
HI-WW-27-S1T1[d]	03/21/95	0.0 to 2.3	0	59	32	9
HI-WW-27-S1T2[d]	03/21/95	0.0 to 2.3	0	59	31	10
HI-WW-30	03/16/95	0.0 to 0.3	1	55	34	10
HI-WW-30-S1	03/21/95	0.0 to 1.6	0	56	32	12
HI-WW-30-S2	03/21/95	1.6 to 3.8	1	79	17	3
HI-WW-30-S3	03/21/95	3.8 to 6.5	0	43	48	9

[a] Duplicate of NS-04-S3.
[b] Duplicate of NS-08-S2.
[c] Laboratory triplicate of WW-18-S3.
[d] Laboratory triplicate of WW-27-S1.

HI-SHELL000391

Table 3-2. Summary of Concentrations of Mercury, Sulfide, and Ammonia in Subsurface Core Sediments of the West, East, and North Shore Waterways

Parameter	Unit	No. Samples Detected/ Total	Mimimum Concentration	Maximum Concentration	Location of Maximum Detection	Depth Interval of Maximum Detection (ft)	Median	CSL Chemical Criteria[a]	No. Samples Exceeding CSL
West Waterway									
N-Ammonia	mg-N/kg	15/15	2.7	64	HI-WW-27-S3	5.2 to 9.1	9.9	NA	NA
Sulfide	mg/kg	14/15	1.4 J	1200 J	HI-WW-10-S2, HI-WW-18-S1	2.1 to 3.8 0 to 1.7	60	NA	NA
Mercury	mg/kg	8/15	0.06 U	3.8	HI-WW-18-S1	0 to 1.7	0.15	0.59	4
Total Solids	percent	15/15	52	79	HI-WW-05-S3	4.7 to 8	69.73	NA	NA
East Waterway									
N-Ammonia	mg-N/kg	9/9	23	160	HI-EW-06-S1	0 to 1.7	62	NA	NA
Sulfide	mg/kg	9/9	8.7 J	720 J	HI-EW-06-S1	0 to 1.7	22	NA	NA
Mercury	mg/kg	7/9	0.05 U	1.73	HI-EW-06-S1	0 to 1.7	0.21	0.59	2
Total Solids	percent	9/9	44	78	HI-EW-11-S3	5 to 8.2	NA	NA	NA
North Shore									
N-Ammonia	mg-N/kg	6/6	2.1	47	HI-NS-08-S3	4.9 to 8.3	9.55	NA	NA
Sulfide	mg/kg	6/6	1.8 J	130 J	HI-NS-08-S3	4.9 to 8.3	55.5	NA	NA
Mercury	mg/kg	3/6	0.06 U	0.82	HI-NS-08-S1	0 to 2.1	0.07	0.59	1
Total Solids	percent	6/6	66	79	HI-NS-08-S2	2.1 to 4.9		NA	NA

NOTE: J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

NA - Not applicable.

[a] Chapter 173-204 WAC.

Table 3-3. Cleanup Screening Level Exceedences and Enrichment Ratios of Subsurface Core Sediment Quality Resnlts

SAMPLE ID	PARAMETER	CONCENTRATION	UNITS	CSL	ENRICHMENT RATIO
HI-WW-05-S1	Mercury	0.79	mg/kg	0.59	1.34
HI-WW-10-S1	Mercury	0.77	mg/kg	0.59	1.31
HI-WW-18-S1	Mercury	3.8	mg/kg	0.59	6.44
HI-WW-30-S1	Mercury	3	mg/kg	0.59	5.08
HI-EW-06-S1	Mercury	1.73	mg/kg	0.59	2.93
HI-EW-06-S2	Mercury	0.69	mg/kg	0.59	1.17
HI-NS-08-S1	Mercury	0.82	mg/kg	0.59	1.39

HI-SHELL000393

Table 3-4. Percent Relative Standard Deviation of Matrix Triplicates and Relative Percent Difference for Field Duplicates for the Grain Size Analysis

SAMPLE ID	GRAVEL	SAND	SILT	CLAY
Laboratory Triplicates				
HI-WW-19	1	29	51	19
HI-WW-19 T1	1	28	51	20
HI-WW-19T2	1	28	51	20
Percent RSD	0	2.04	0	2.94
HI-NS-05	0	70	23	7
HI-NS-05 T1	0	70	23	7
HI-NS-05 T2	0	70	23	7
Percent RSD	0	0	0	0
HI-WW-65	0	57	31	12
HI-WW-65 T1	0	57	30	13
HI-WW-65T2	0	57	30	13
Percent RSD	0	0	1.89	4.61
Field Duplicates				
HI-NS-04-S3	0	40	49	11
HI-NS-04-80	0	40	52	8
Percent RPD	0	0.00	-5.94	31.58
HI-NS-08-S2	0	87	11	2
HI-NS-08-80	0	85	12	3
Percent RPD	0	2.33	-8.70	-40.00
Field Triplicates				
HI-WW-18	0	91	8	1
HI-WW-18 T1	0	91	9	0
HI-WW-18 T2	0	90	8	2
Percent RSD	0	0.64	6.93	100
HI-WW-27	0	49	41	10
HI-WW-27T1	0	59	32	9
HI-WW-27T2	0	59	31	10
Percent RSD	0	10.69	15.09	6.08

HI-SHELL000394

Table 3-5. Subsurface Core Sample Field QA/QC Summary Table

QA/QC Parameter	Sample Sets and Identification	Relative Percent Difference
Duplicates	HI-NS-04-S3 HI-NS-04-80	Mercury = ND Ammonia= 12% Sulfide= 60% Total solids = 0.0%
Duplicates	HI-NS-08-S2 HI-NS-08-80	Mercury= ND Ammonia=0% Sulfide= 116% Total solids = 1.3%
Field blank[a]	HI-WW-00-FB	Metals: Zinc = .009 ppm All others= ND Pest/PCBs = All ND Semivolatiles = All ND
Rinsate blank[b]	HI-NS-04-RB	Metals: Lead = .002 ppm All others= ND Pest/PCBs = All ND Semivolatiles = All ND

NOTE: ND - not detected.

[a] Field blank consisted of deionized water and water collected in the Hart Crowser core processing laboratory on March 22, 1995.

[b] Rinsate blank consisted of deionized water collected from stainless-steel bowls on March 22, 1995.

HI-SHELL000395

4.0 NATURAL RECOVERY STATION SUBSURFACE CORE SAMPLE DATA SUMMARY

This section presents a summary of the field and analytical methods and data results to support the natural recovery evaluation. The interpretation of the natural recovery data will be discussed in the base-level data interpretation report.

The scope of the field sampling tasks for the natural recovery evaluation included the collection of high-resolution cores to evaluate vertical profiles of mercury, PCBs, lead-210, and cesium-137 within the upper 90 cm of each core, and deployment of sediment traps and current meters to characterize the gross sedimentation rates in the East and West Waterways. The sediment trap and current meter data are discussed in Section 5.0. All figures and tables for this section are provided at the end of the section.

4.1 METHODS

This section provides a brief summary of field methods used to collect and process the natural recovery cores and laboratory methods used to analyze the samples for selected constituents.

4.1.1 Field Methods

Four high-resolution natural recovery cores were advanced in the East and West Waterways on March 22, 1995, at stations NR-01, NR-02, NR-03, and NR-04 using an IDCS deployed from the *U.S. Retriever* (Figure 4-1). Cores were advanced approximately 10 ft below mudline to ensure adequate sample recovery in the core tube as specified in the FSP (EVS and Hart Crowser, 1995a). However, after core tube acceptance, only the upper 4 ft of the core was capped and sealed for further processing at the Hart Crowser laboratory. The samples were collected in general accordance with protocols outlined in the FSP.

After retrieval, core tubes were stored vertically in the dark at 4° C in Hart Crowser's custody until processed. Core tubes were cut open longitudinally using a circular saw and logged by a qualified geologist. The upper 3 ft (90 cm) of the core was segmented into 2-cm sample intervals using a stainless-steel spatula. Each 2-cm section was placed in a pre-weighed 8-oz

HI-SHELL000396

jar and weighed again. The wet weight of the jar and sample was recorded. The jar was then capped and stored in a cooled ice chest (4° C) until transport to the ARI laboratory at the end of each day. Wet weights for the 2-cm increment samples ranged from 141 to 325 g.

Twenty-one of the 2-cm sediment samples and two split duplicates from each core were submitted to ARI for analyses (a total of 92 samples). Because of limited sample volumes, several samples used for laboratory QA/QC analyses were split and analyzed for either radioisotopes or PCBs and mercury. Therefore, for each natural recovery sediment core, a total of 18 sediment composite samples plus one homogenized duplicate were analyzed for lead-210, cesium-137, mercury, PCBs, and total solids, as specified in the QAPP/LAP (EVS and Hart Crowser, 1995d). The remaining samples were archived (frozen) in the laboratory for possible future analysis.

No deviations from the FSP were required during natural recovery core sampling and processing.

4.1.2 Chemical and Radiochemical Analysis Methods

Seventy-two 2-cm composite natural recovery sediment core samples plus four field duplicates from each core were analyzed for lead-210, cesium-137, mercnry, PCBs, and total solids. In addition, five samples from the 0- to 10-cm depth intervals of each core were analyzed for TOC. The associated sample information (e.g., sample IDs, depths) is presented in Table 4-1. Sample preparation and analyses were conducted in accordance with the methods and protocols outlined in the QAPP/LAP, with the exception of mercury analysis. Because of very limited sample volumes, a modified mercury sample handling procedure was devised to accomplish the analysis. A detailed discussion of the mercury procedure is presented in Section 4.3.

4.1.3 Data Handling and Calculation

Radioisotope and chemical analysis results were entered into the project database. The data were validated by EcoChem and the database was checked against the validated Form 1s.

The wet weight of each sample was also entered into the project database. Sample wet density, dry density, and lead-210 data calculations were conducted for each natural recovery

HI-SHELL000397

sediment core sample analyzed. The results are summarized in Table 4-2 and discussed in Section 4.2.

4.2 RESULTS

Because of limited sample volumes from the 2-cm increment samples and the priority for chemical analysis, none of the high-resolution cores were submitted for grain size analysis. Based on visual classifications (Figures 4-3 through 4-6), the sediment descriptions ranged from soft, silty clay to clayey silt with varying amounts of organic material to medium dense, silty, fine sand. Moderate hydrogen sulfide-like odors were noted in cores HI-NR-03 and HI-NR-04 during processing.

Samples were analyzed for radioisotopes (lead-210, cesium-137), mercury, PCBs, TOC, and total solids. Validated chemical and radioisotope analysis results of the natural recovery core sediment samples are presented by waterway in Appendix C. Figures that show the isotope and chemical depth profile for each natural recovery core are presented in Figures 4-7 through Figure 4-14. The midpoint of each 2-cm depth interval sample was used in the data tables and the depth profile figures.

The cesium-137, mercury, and PCB profiles were generated from the sample depths and analytical results and are shown graphically as distance with depth (cm). The lead-210 concentration-with-depth profiles are presented as excess lead-210 vs. mass-based sediment depth (g/cm^2). A supported lead-210 activity value of 0.5 DPM/g was used for calculating excess lead-210. The calculation results are presented in Table 4-2. The sedimentation rates and natural recovery modeling data will be presented and discussed in the base-level data interpretation report.

4.3 QA/QC REVIEW OF NATURAL RECOVERY SUBSURFACE CORE SAMPLE DATA

Eighty-four natural recovery core sediment samples and eight sets of field duplicates were submitted to ARI for chemical and radioisotope analyses. Among these samples, 72 sediment samples and 4 sets of field duplicates were analyzed for PCBs and mercury, and the same number of the samples were analyzed for cesium-137 and lead-210. Twenty

HI-SHELL000398

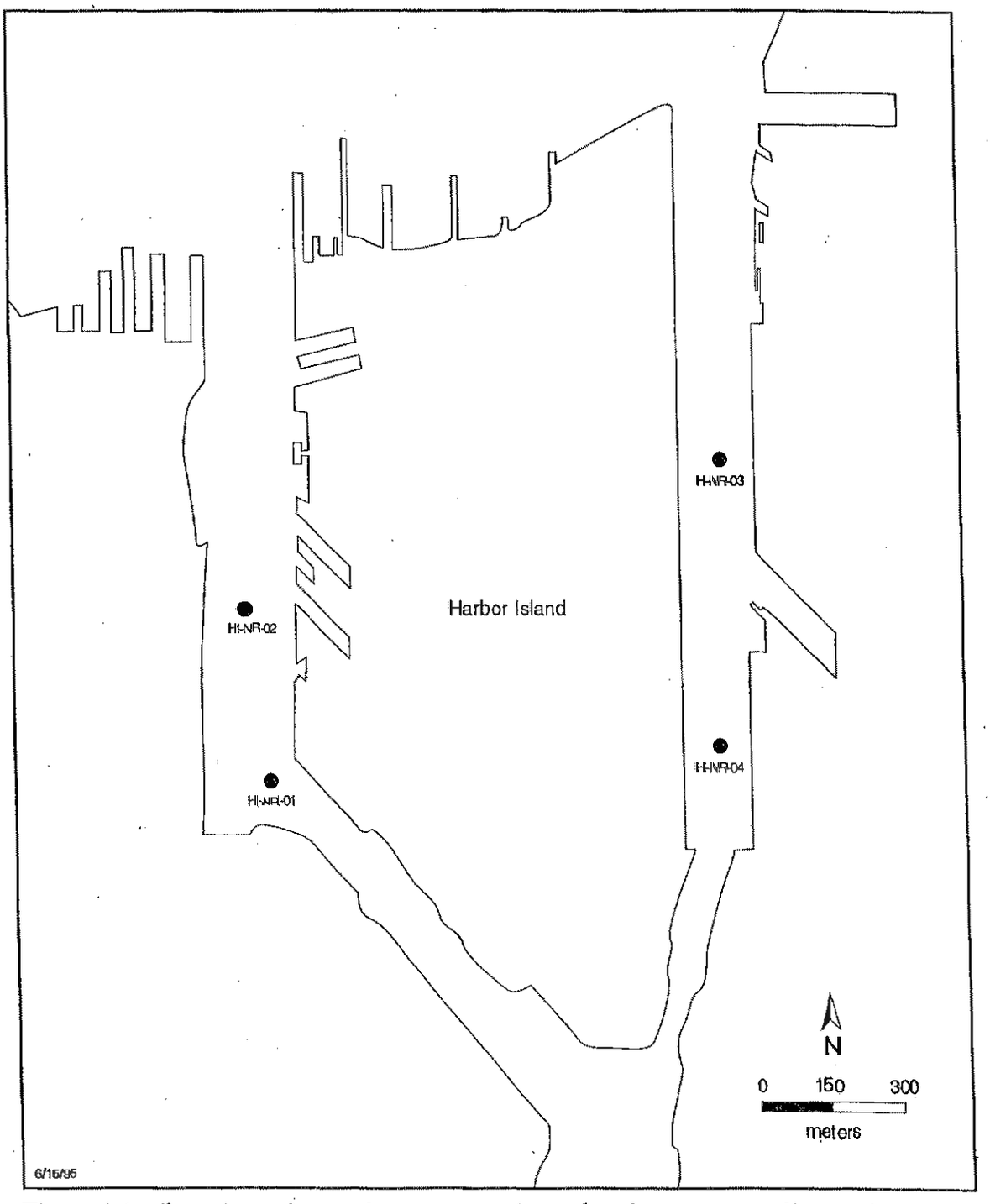


Figure 4-1. Locations of natural recovery station subsurface core sampling stations – Harbor Island Supplementary Remedial Investigation.

HI-SHELL000399

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual–manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following (the Munsell Soil Color Chart was used for visual color descriptions): Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 – 4	Very soft	0 – 2	<0.125
Loose	4 – 10	Soft	2 – 4	0.125 – 0.25
Medium dense	10 – 30	Medium stiff	4 – 8	0.25 – 0.5
Dense	30 – 50	Stiff	8 – 15	0.5 – 1.0
Very dense	>50	Very stiff	15 – 30	1.0 – 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptable moisture
Damp	Some perceptable moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptable moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

Legends

Sampling Test Symbols

BORING SAMPLES

- ☒ Split Spoon
- ⧅ Push Tube
- * No Sample Recovery
- P Tube Pushed, Not Driven

CORING SAMPLES

- ☒ Surface Sample
- ⧅ Core Section/Composite Sample
- ▤ Natural Recovery Core Sample (2cm)

Non-Soil Components

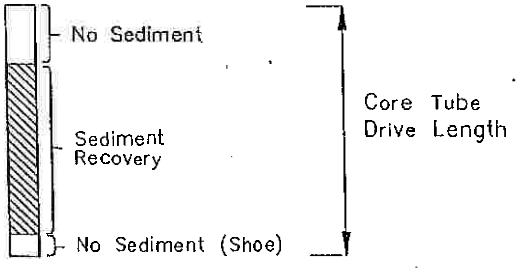
	Estimated Percentage
trace, scattered	< 5%
occasional	5 to 15%
moderate	15 to 30%
substantial	30 to 50%

Test Symbols

GS	Grain Size Classification
TUU	Triaxial Unconsolidated Undrained
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
AL	Atterberg Limits

Water Content in Percent
Liquid Limit
Natural
Plastic Limit

Core Tube and Sediment Recovery



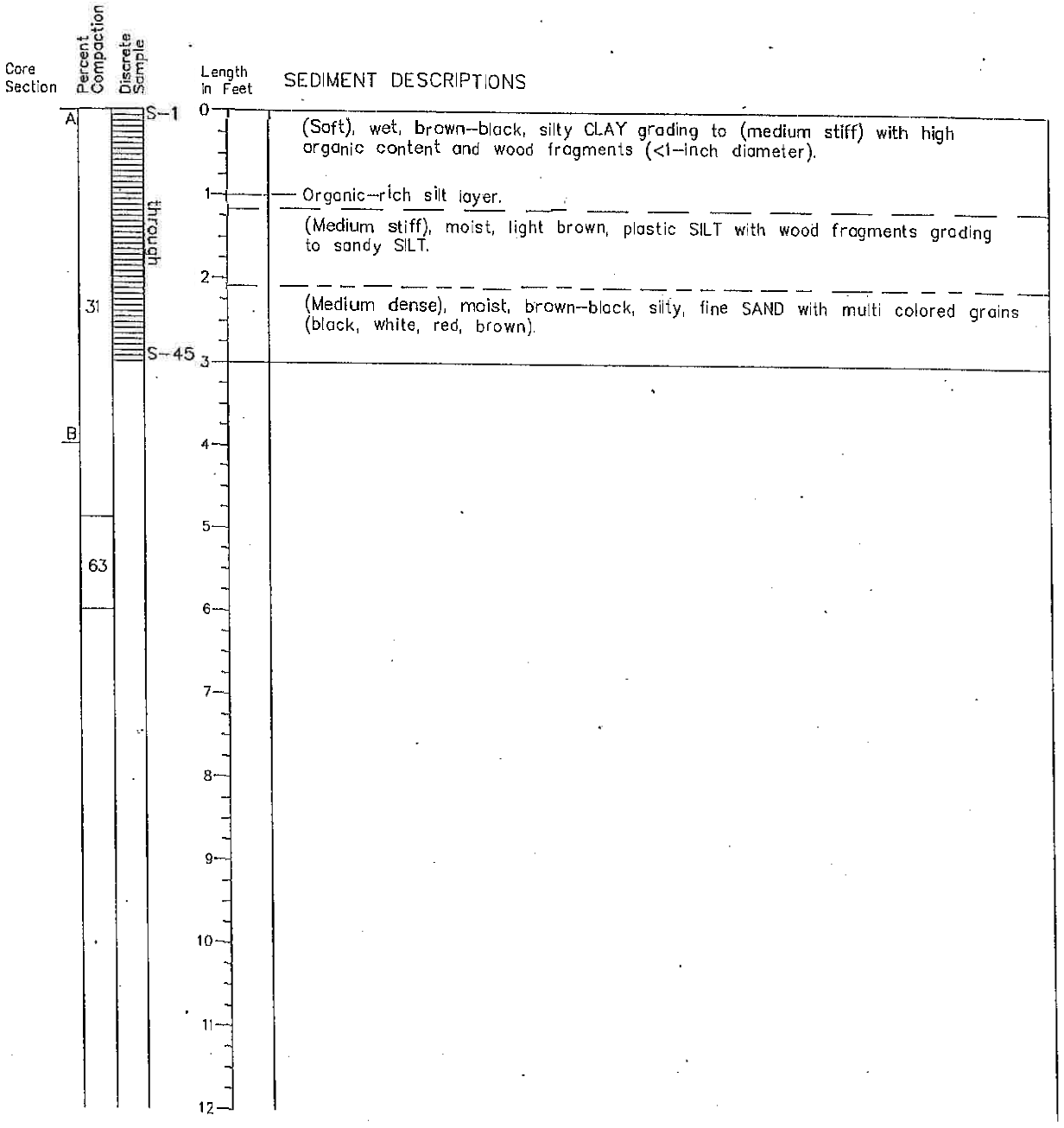
HARTCROWSER
J-4249-04 6/95
Figure 4-2

cvd 6/13/95 1=1 hc-pcp
424904 a1

Sediment Core Log HI-NR-01

Type of Sample: Impact Core
Date/Time: 3/22/95 09:46
Recovery Length in Feet: 5.9
Mudline Elevation in Feet: −48.0

Northing: 213,418
Easting: 1,263,834
Drive Length in Feet: 10.0



Notes:
1. This high resolution core was subsectioned into 45 − 2 centimeter increment samples to a depth of 90 centimeters (3ft).
2. Refer to text and tables for sample nomenclature and list of samples submitted for analyses.
3. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
4. Conversion : 1 cm = 0.39 inches = 0.033 foot.
5. Duplicates of S−16 and S−19 were collected and labeled S−46 and S−47 respectively.

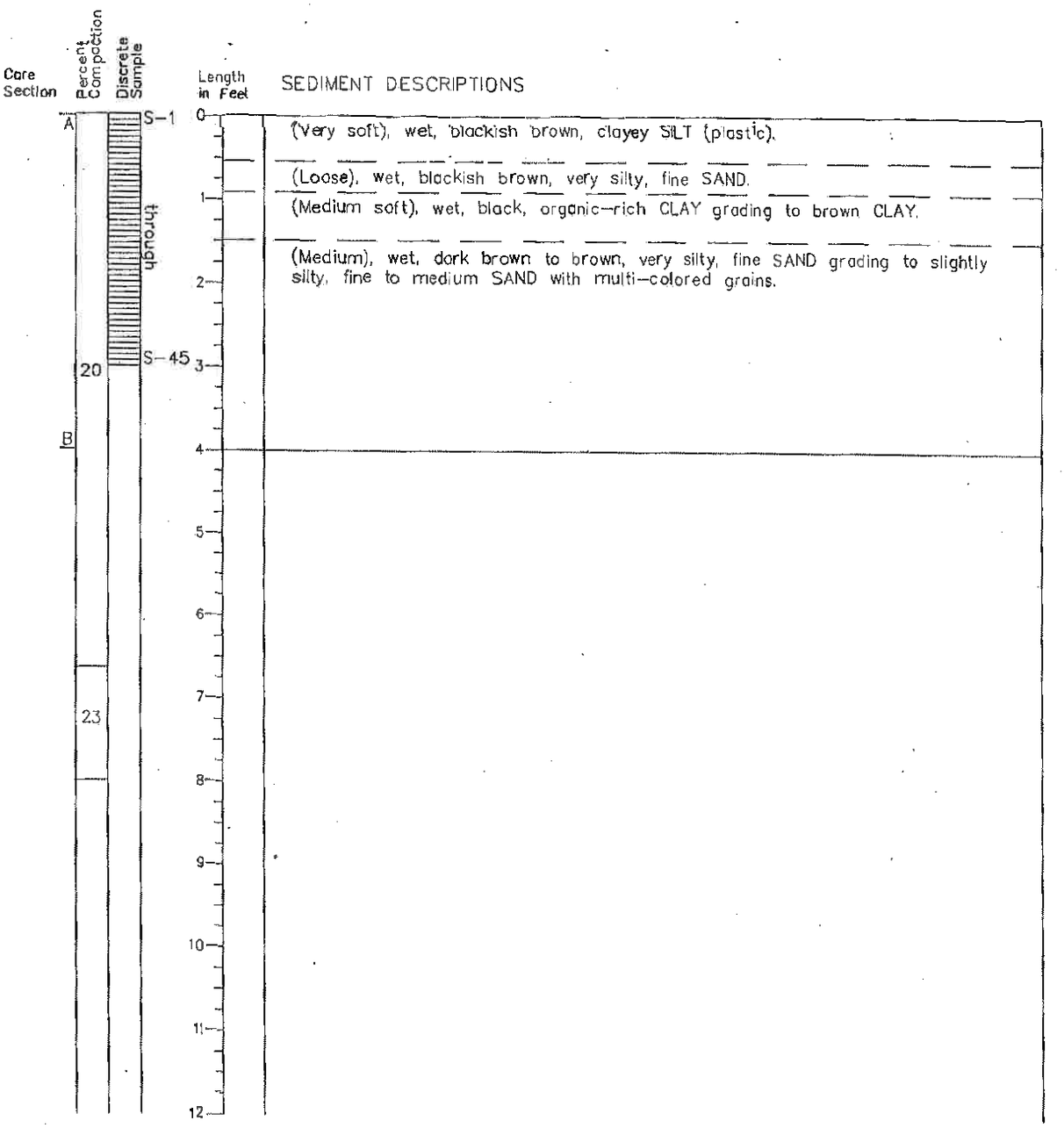
cvd 6/13/95 1=1 hc−pcp
HINR01

HARTCROWSER
J-4249-04 6/95
Figure 4-3

Sediment Core Log HI-NR-02

Type of Sample: Impact Core
Date/Time: 3/22/95 10: 21
Recovery Length in Feet: 7.9
Mudline Elevation in Feet: −62.0

Northing: 214,848
Easting: 1,263,679
Drive Length in Feet: 10.0



Notes:
1. This high resolution core was subsectioned into 45 – 2 centimeter increment samples to a depth of 90 centimeters (3ft).
2. Refer to text and tables for sample nomenclature and list of samples submitted for analyses.
3. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
4. Conversion : 1 cm = 0.39 inches = 0.033 foot.
5. Duplicates of S-15 and S-16 were collected and labeled S-46 and S-47 respectively.

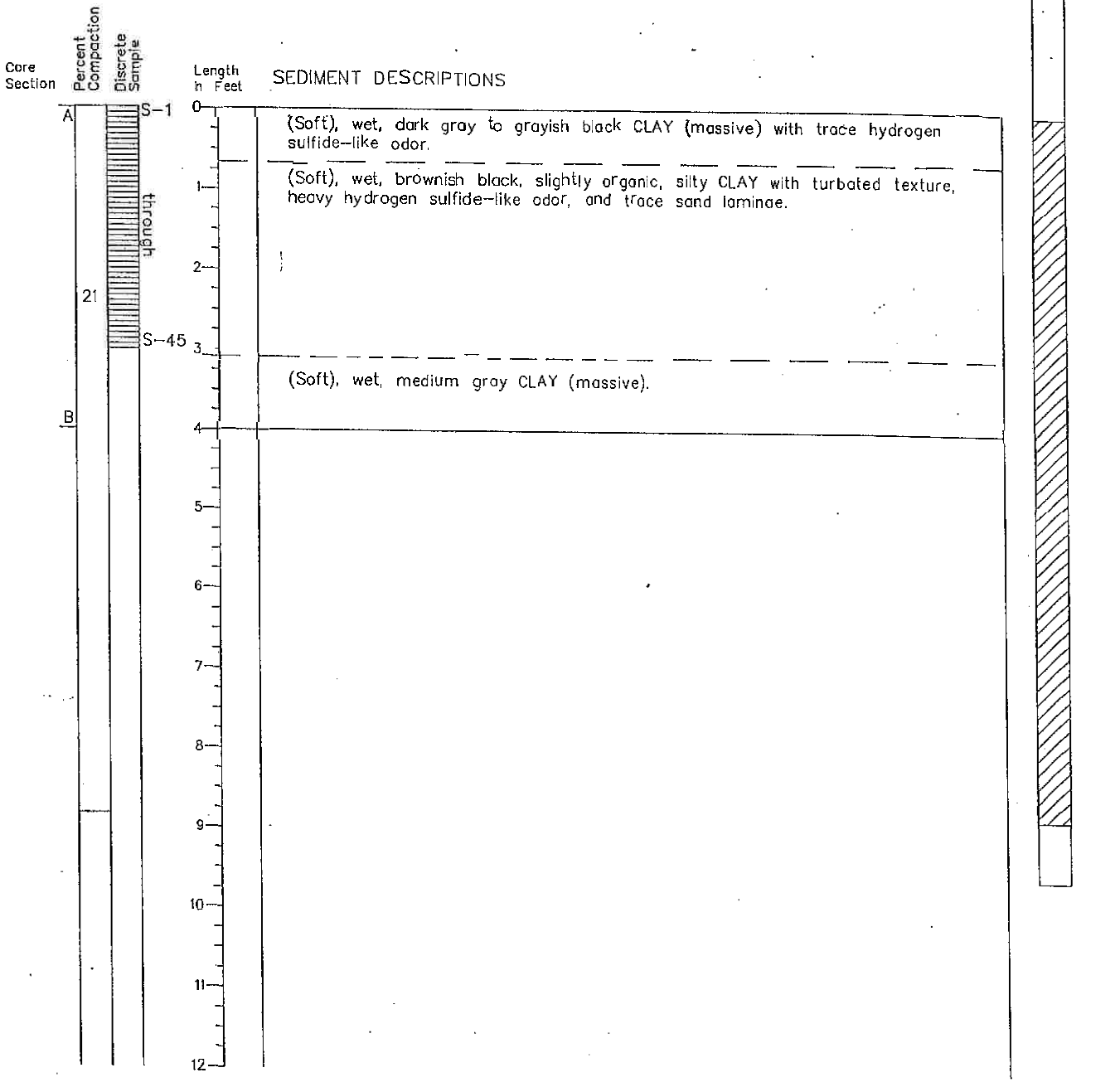
HARTCROWSER
J-4249-04 6/95
Figure 4-4

cvd 6/13/95 1=1 hc-pcp
HINR02

Sediment Core Log HI-NR-03

Type of Sample: Impact Core
Date/Time: 3/22/95 11:23
Recovery Length in Feet: 8.8
Mudline Elevation in Feet: −51.5

Northing: 216,302
Easting: 1,267,466
Drive Length in Feet: 11.0



Notes:
1. This high resolution core was subsectioned into 45 − 2 centimeter increment samples to a depth of 90 centimeters (3ft).
2. Refer to text and tables for sample nomenclature and list of samples submitted for analyses.
3. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
4. Conversion : 1 cm = 0.39 inches = 0.033 foot.
5. Duplicates of S−15 and S−16 were collected and labeled S−46 and S−47 respectively.

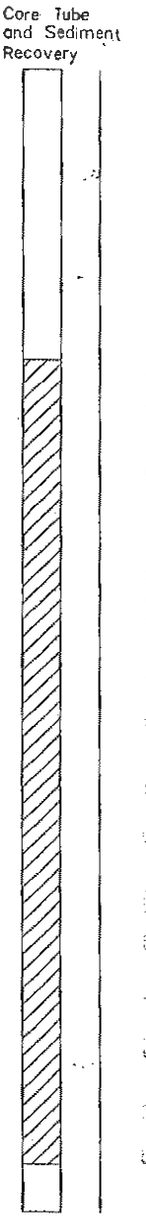
cvd 6/13/95 1=1 hc−pap
HINR03

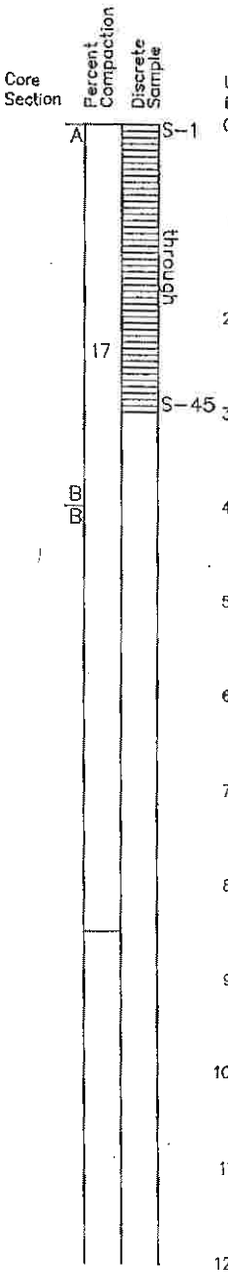
HARTCROWSER
J-4249-04 6/95
Figure 4-5

Sediment Core Log HI-NR-04

Type of Sample: Impact Core
Date/Time: 3/22/95 12:05
Recovery Length in Feet: 8.3
Mudline Elevation in Feet: −43.0

Northing: 213,915
Easting: 1,267,557
Drive Length in Feet: 10.0





SEDIMENT DESCRIPTIONS

1 inch of (very soft), brown SILT over (soft), wet, black to gray CLAY.

(Soft), wet, dark brown grading brown, silty CLAY with moderate wood fragments.

(Very soft), wet, black, slightly organic, clayey SILT with moderate hydrogen sulfide-like odor, trace sheen, and turbated texture.

(Soft), wet, medium gray to dark gray, silty CLAY with slightly mottled texture.

(Medium stiff), wet, black, thinly bedded SILT with moderate sheen and odor.

Notes:
1. This high resolution core was subsectioned into 45 – 2 centimeter increment samples to a depth of 90 centimeters (3ft).
2. Refer to text and tables for sample nomenclature and list of samples submitted for analyses.
3. Horizontal control is based on NAD 83 datum (DGPS) and vertical control is based on MLLW datum.
4. Conversion : 1 cm = 0.39 inches = 0.033 foot.
5. Duplicates of S-15 and S-16 were collected and labeled S-46 and S-47 respectively.

HARTCROWSER
J-4249-04 6/95
Figure 4-6

cvd 6/13/95 1=1 hc-pap
HINR04

Figure 4-7 - Cesium-137 and Lead-210 Profiles of HI-NR-01

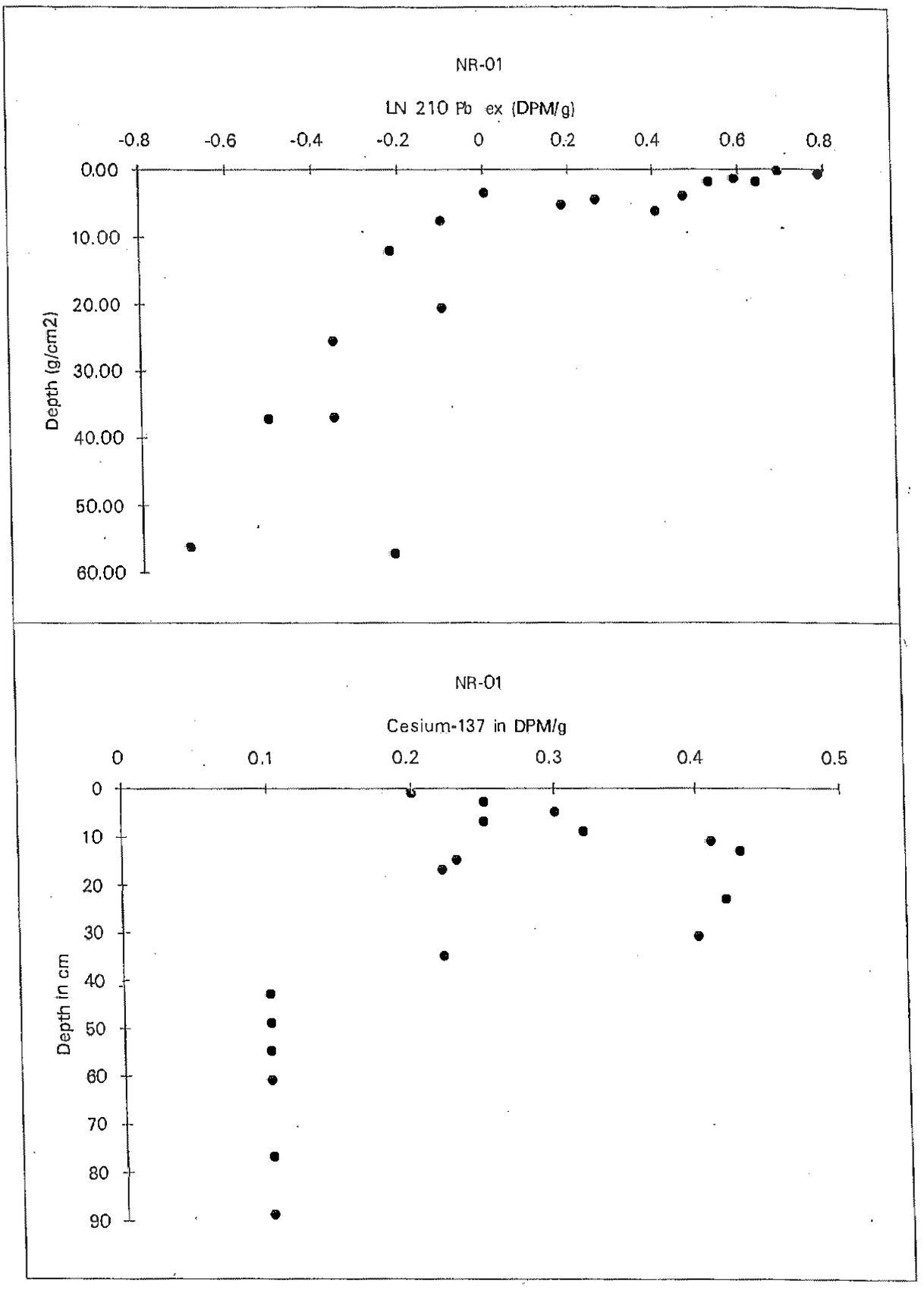
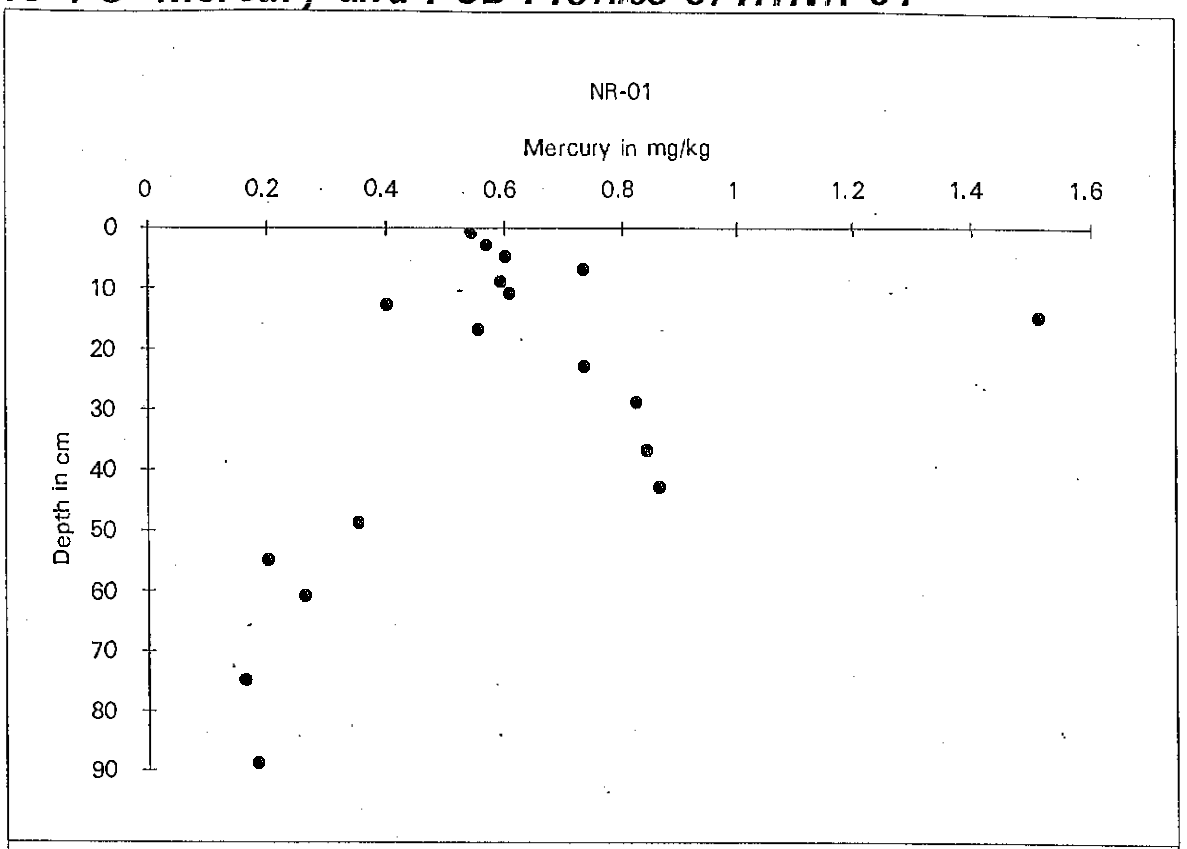


Figure 4-8 -Mercury and PCB Profiles of HI-NR-01



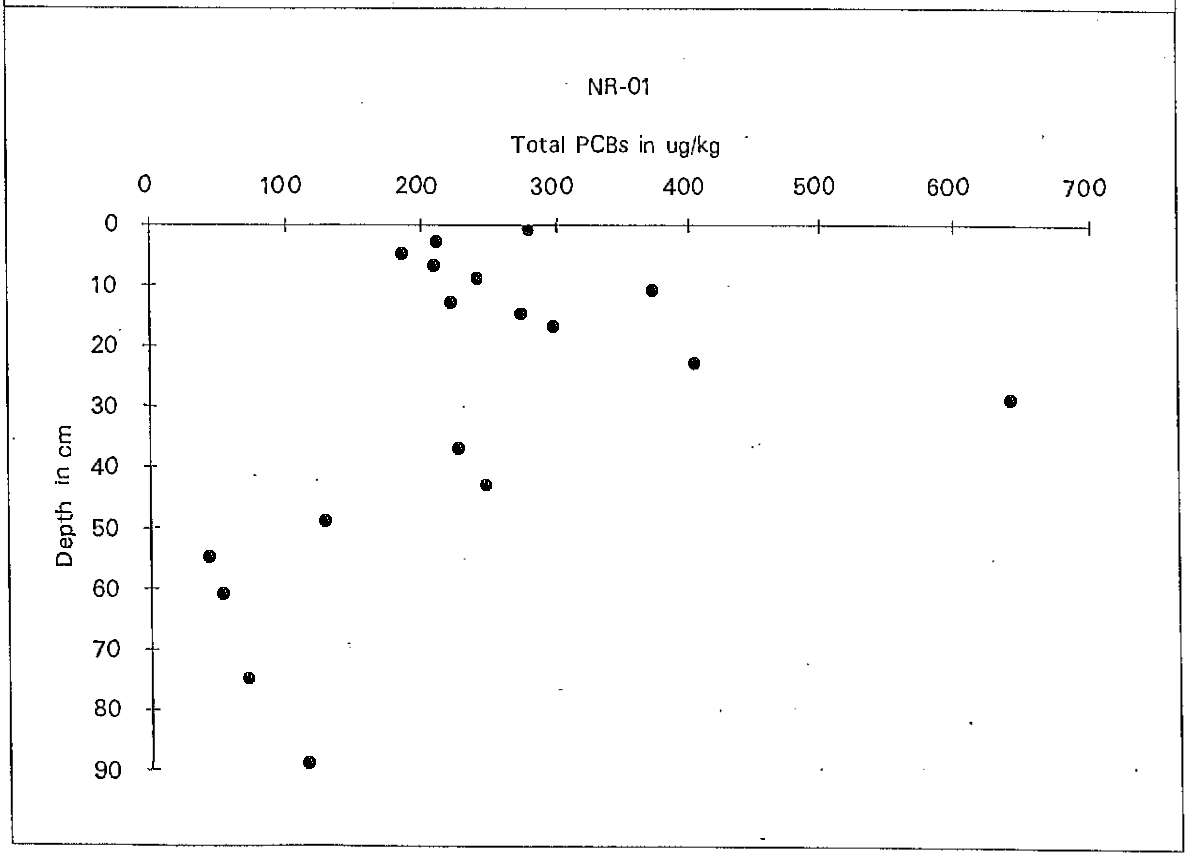


Figure 4-9 - Cesium-137 and Lead-210 Profiles of HI-NR-02

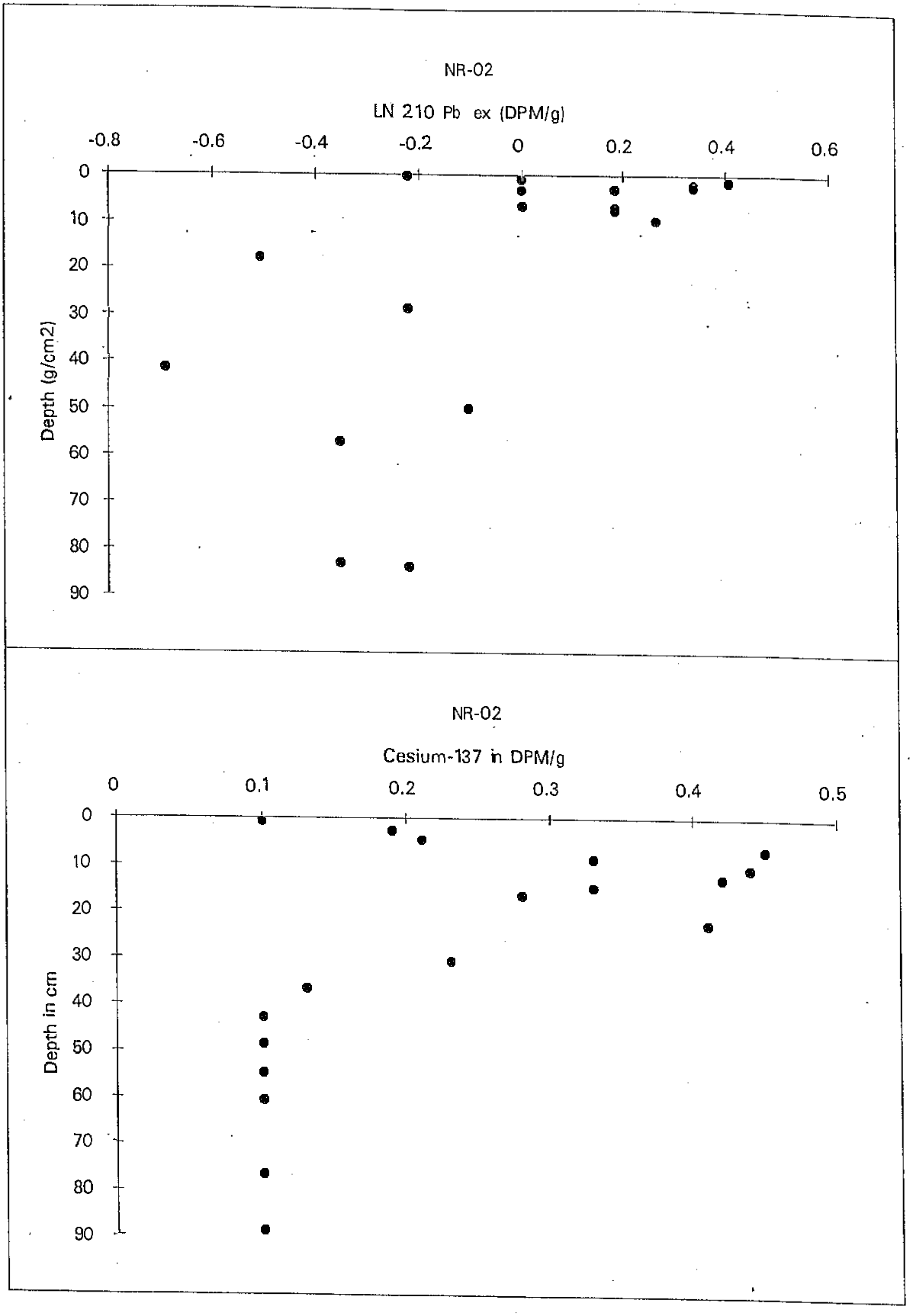
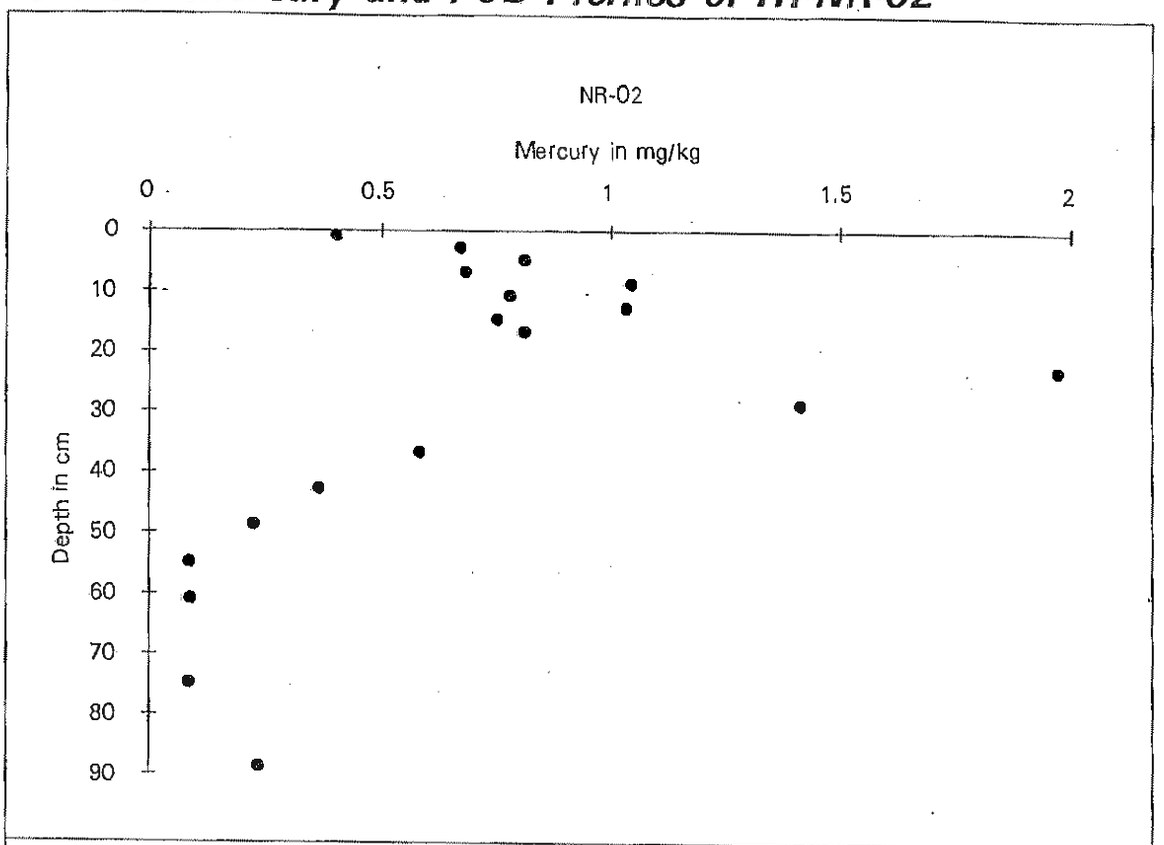


Figure 4-10 -Mercury and PCB Profiles of HI-NR-02



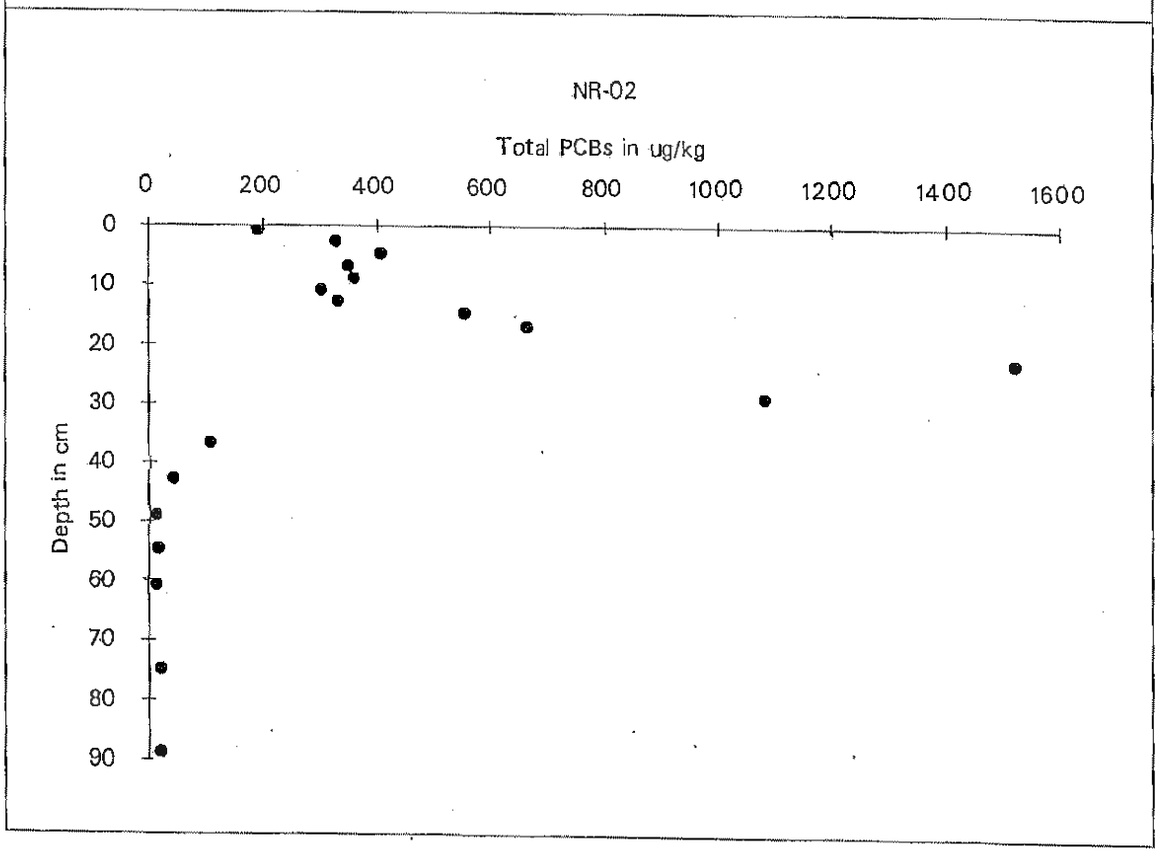


Figure 4-11 - Cesium-137 and Lead-210 Profiles of HI-NR-03

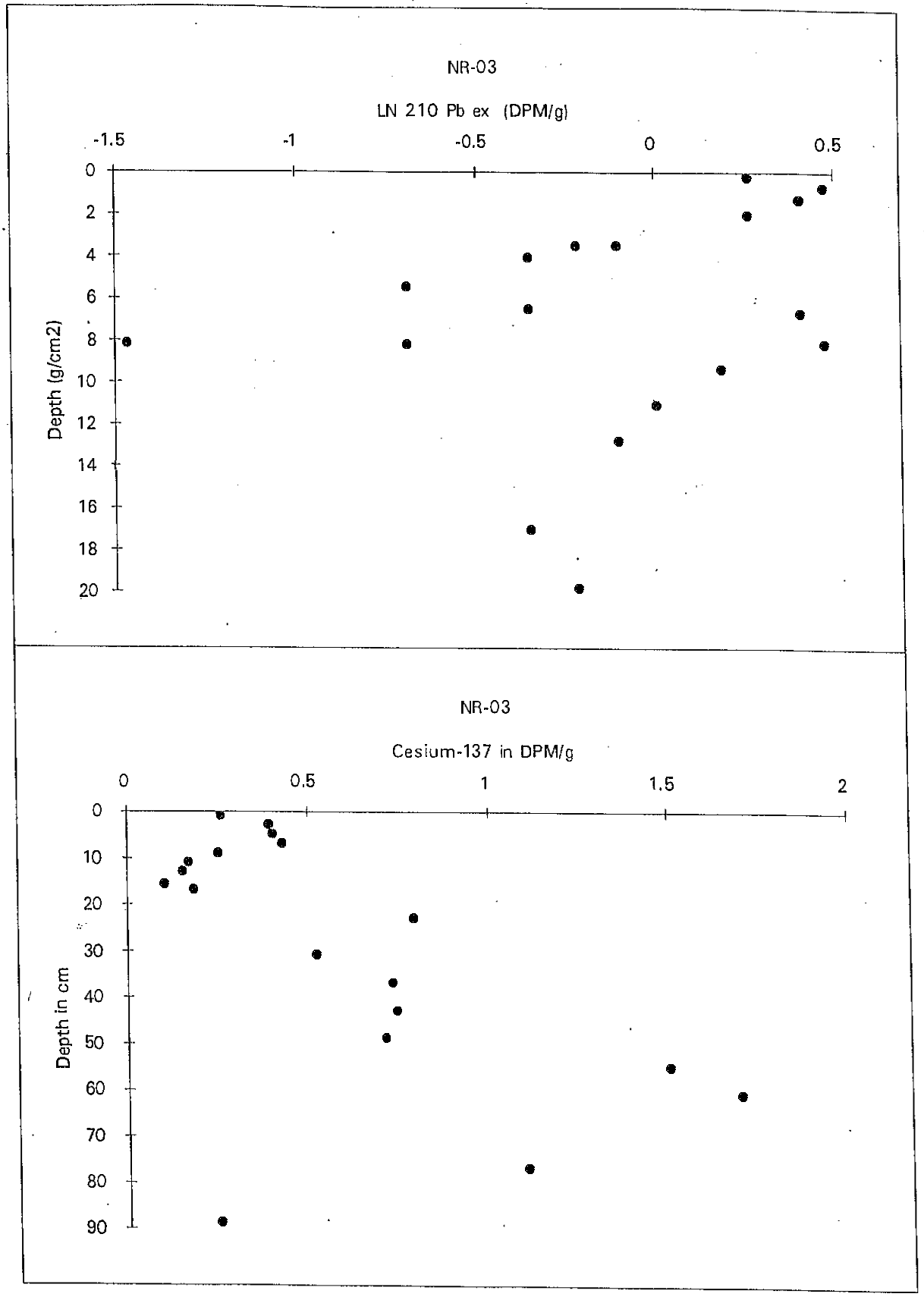


Figure 4-12 -Mercury and PCB Profiles of HI-NR-03

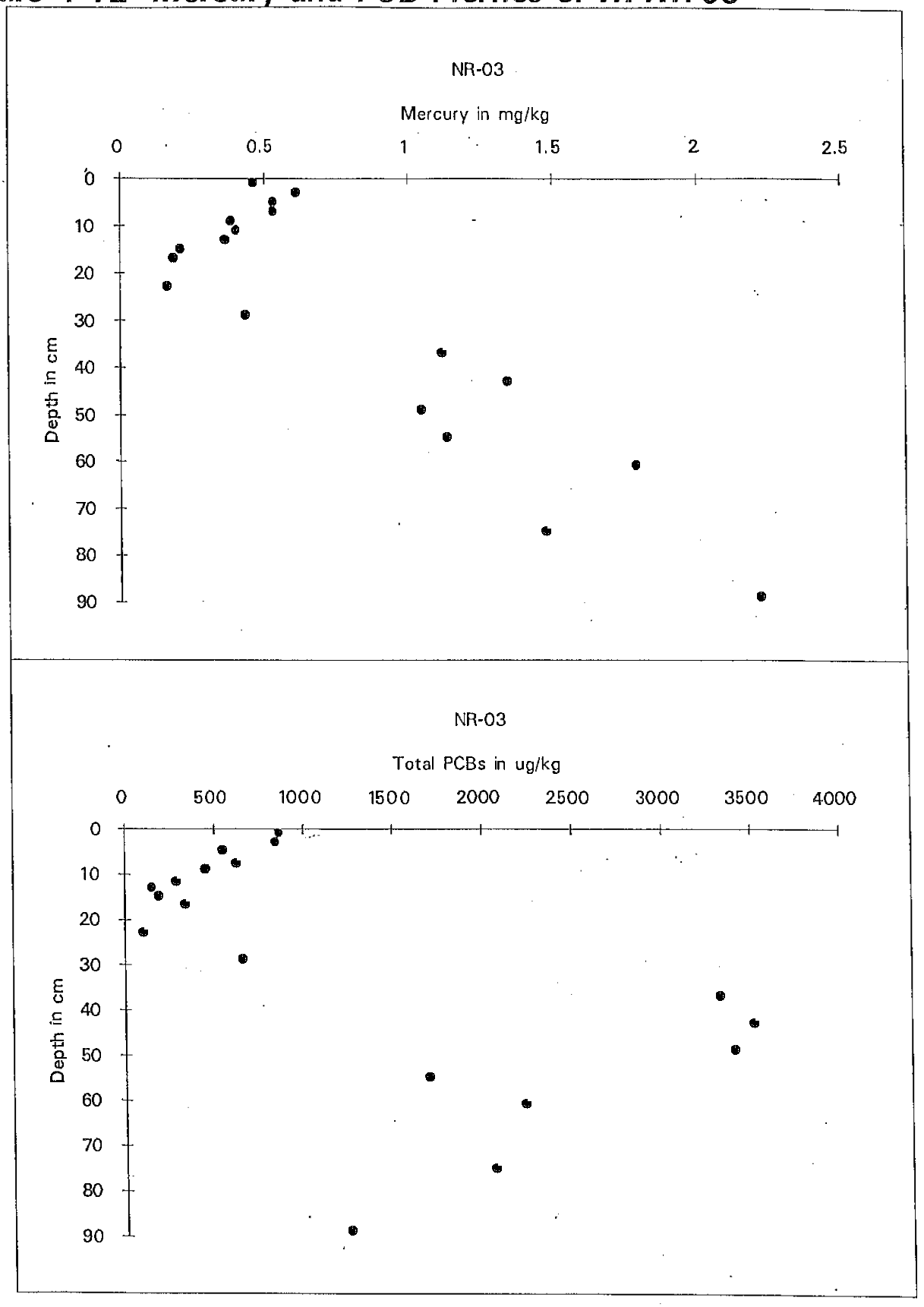


Figure 4-13 - Cesium-137 and Lead-210 Profiles of HI-NR-04

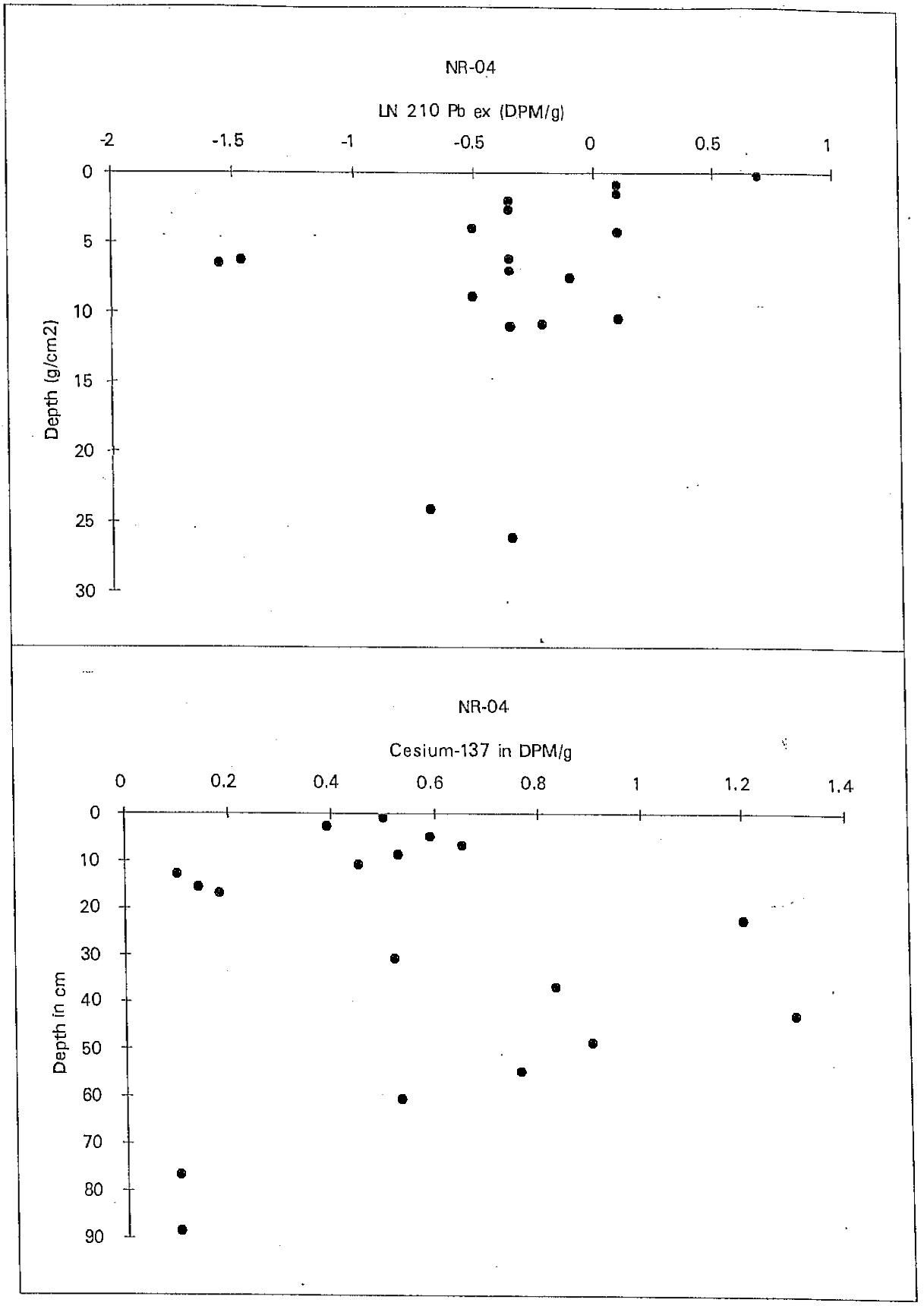
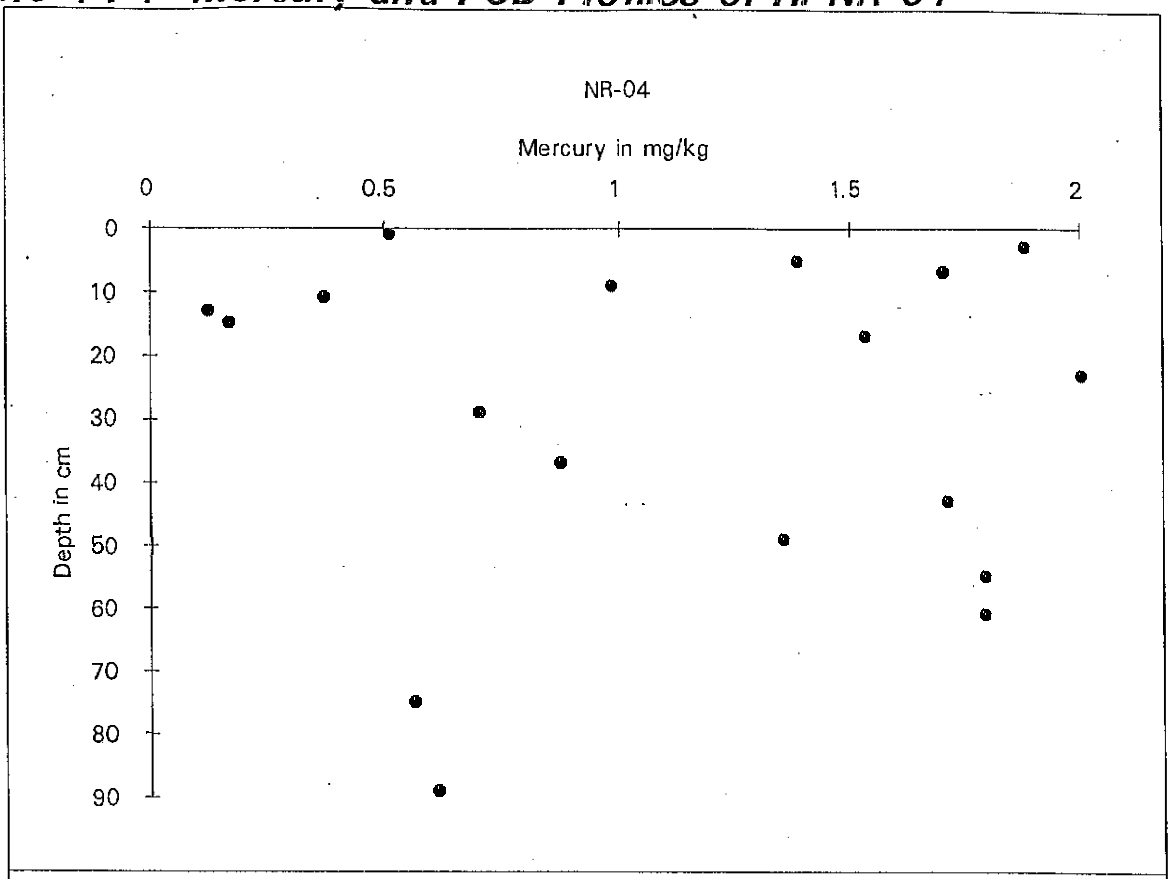


Figure 4-14 -Mercury and PCB Profiles of HI-NR-04



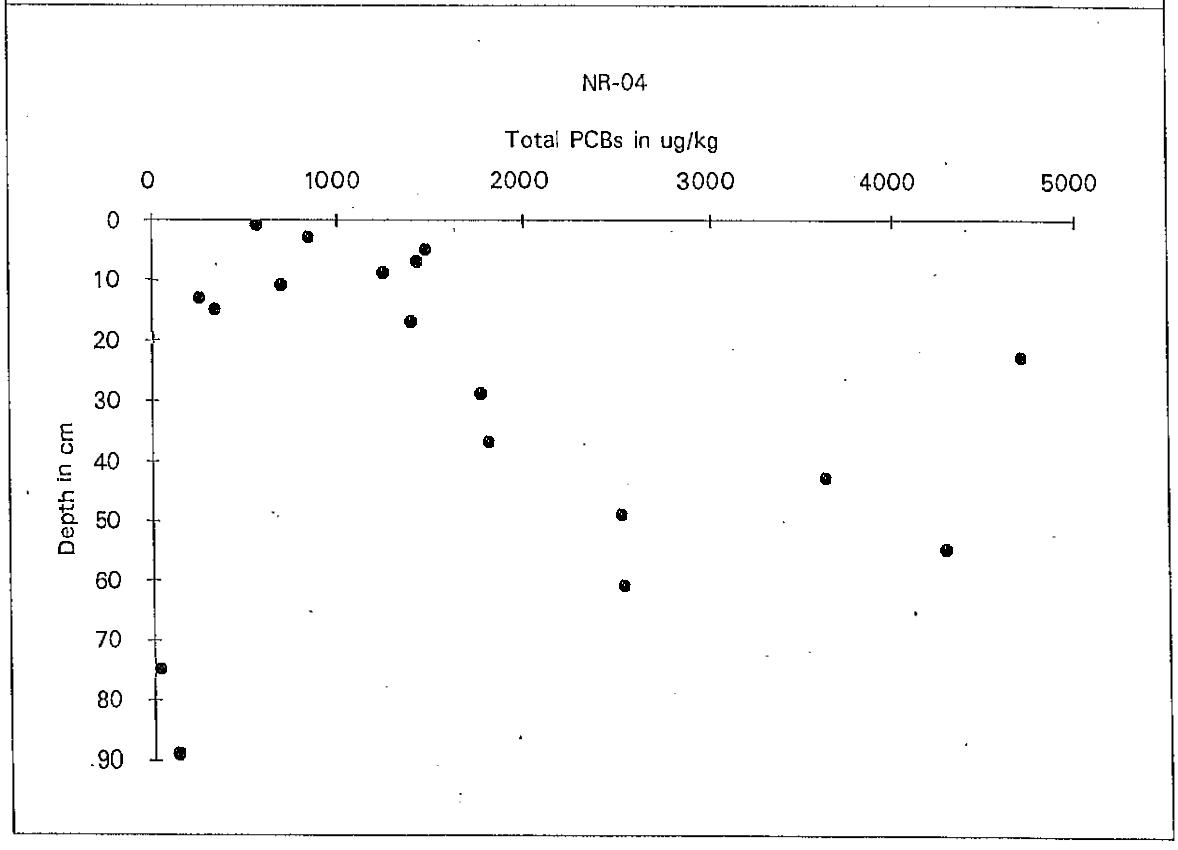


Table 4-1. Summary of Natural Recovery Subsurface Core Sample Data

Sample ID	Sampling Date	Depth Interval (cm)	Analyses
HI-NR-01-S-1	3/22/95	0 to 2	C, I
HI-NR-01-S-2	3/22/95	2 to 4	C, I
HI-NR-01-S-3	3/22/95	4 to 6	C, I
HI-NR-01-S-4	3/22/95	6 to 8	C, I
HI-NR-01-S-5	3/22/95	8 to 10	C, I
HI-NR-01-S-6	3/22/95	10 t012	C, I
HI-NR-01-S-7	3/22/95	12 to 14	C, I
HI-NR-01-S-8	3/22/95	14 to 16	C, I
HI-NR-01-S-9	3/22/95	16 to 18	C, I
HI-NR-01-S-10	3/22/95	18 to 20	A
HI-NR-01-S-11	3/22/95	20 to 22	A
HI-NR-01-S-12	3/22/95	22 to 24	C, I
HI-NR-01-S-13	3/22/95	24 to 26	A
HI-NR-01-S-14	3/22/95	26 to 28	A
HI-NR-01-S-15	3/22/95	28 to 30	C
HI-NR-01-S-16	3/22/95	30 to 32	I
HI-NR-01-S-17	3/22/95	32 to 34	A
HI-NR-01-S-18	3/22/95	34 to 36	I
HI-NR-01-S-19	3/22/95	36 to 38	C
HI-NR-01-S-20	3/22/95	38 to 40	A
HI-NR-01-S-21	3/22/95	40 to 42	A
HI-NR-01-S-22	3/22/95	42 to 44	C, I
HI-NR-01-S-23	3/22/95	44 to 46	A
HI-NR-01-S-24	3/22/95	46 to 48	A
HI-NR-01-S-25	3/22/95	48 to 50	C, I
HI-NR-01-S-26	3/22/95	50 to 52	A
HI-NR-01-S-27	3/22/95	52 to 54	A
HI-NR-01-S-28	3/22/95	54 to 56	C, I
HI-NR-01-S-29	3/22/95	56 to 58	A
HI-NR-01-S-30	3/22/95	58 to 60	A
HI-NR-01-S-31	3/22/95	60 to 62	C, I

HI-SHELL000413

Table 4-1. continued

Sample ID	Sampling Date	Depth Interval (cm)	Analyses
HI-NR-01-S-32	3/22/95	62 to 64	A
HI-NR-01-S-33	3/22/95	64 to 66	A
HI-NR-01-S-34	3/22/95	66 to 68	A
HI-NR-01-S-35	3/22/95	68 to 70	A
HI-NR-01-S-36	3/22/95	70 to 72	A
HI-NR-01-S-37	3/22/95	72 to 74	A
HI-NR-01-S-38	3/22/95	74 to 76	C
HI-NR-01-S-39	3/22/95	76 to 78	I
HI-NR-01-S-40	3/22/95	78 to 80	A
HI-NR-01-S-41	3/22/95	80 to 82	A
HI-NR-01-S-42	3/22/95	82 to 84	A
HI-NR-01-S-43	3/22/95	84 to 86	A
HI-NR-01-S-44	3/22/95	86 to 88	A
HI-NR-01-S-45	3/22/95	88 to 90	C, I
HI-NR-01-S-46[a]	3/22/95	36 to 38	C
HI-NR-01-S-47[b]	3/22/95	30t0 32	I
HI-NR-02-S-1	3/22/95	0to 2	C, I
HI-NR-02-S-2	3/22/95	2 to 4	C,I
HI-NR-02-S-3	3/22/95	4to 6	C, I
HI-NR-02-S-4	3/22/95	6to 8	C,I
HI-NR-02-S-5	3/22/95	8 to 10	C,I
HI-NR-02-S-6	3/22/95	1o to 12	C, I
HI-NR-02-S-7	3/22/95	12 to 14	C,I
HI-NR-02-S-8	3/22/95	14to16	C, I
HI-NR-02-S-9	3/22/95	16 to 18	C,I
HI-NR-02-S-10	3/22/95	18 to 20	A
HI-NR-02-S-11	3/22/95	20t022	A
HI-NR-02-S-12	3/22/95	22to24	C,I
HI-NR-02-S-13	3/22/95	24to26	A
HI-NR-02-S-14	3/22/95	26to 28	A
HI-NR-02-S-15	3/22/95	28to 30	C

HI-SHELL000414

Table 4-1. continued

Sample ID	Sampling Date	Depth Interval (cm)	Analyses
HI-NR-02-S-16	3/22/95	30 to 32	I
HI-NR-02-S-17	3/22/95	32 to 34	A
HI-NR-02-S-18	3/22/95	34 to 36	A
HI-NR-02-S-19	3/22/95	36 to 38	C, I
HI-NR-02-S-20	3/22/95	38 to 40	A
HI-NR-02-S-21	3/22/95	40 to 42	A
HI-NR-02-S-22	3/22/95	42 to 44	C, I
HI-NR-02-S-23	3/22/95	44 to 46	A
HI-NR-02-S-24	3/22/95	46 to 48	A
HI-NR-02-S-25	3/22/95	48 to 50	C, I
HI-NR-02-S-26	3/22/95	50 to 52	A
HI-NR-02-S-27	3/22/95	52 to 54	A
HI-NR-02-S-28	3/22/95	54 to 56	C, I
HI-NR-02-S-29	3/22/95	56 to 58	A
HI-NR-02-S-30	3/22/95	58 to 60	A
HI-NR-02-S-31	3/22/95	60 to 62	C, I
HI-NR-02-S-32	3/22/95	62 to 64	A
HI-NR-02-S-33	3/22/95	64 to 66	A
HI-NR-02-S-34	3/22/95	66 to 68	A
HI-NR-02-S-35	3/22/95	68 to 70	A
HI-NR-02-S-36	3/22/95	70 to 72	A
HI-NR-02-S-37	3/22/95	72 to 74	A
HI-NR-02-S-38	3/22/95	74 to 76	C
HI-NR-02-S-39	3/22/95	76 to 78	I
HI-NR-02-S-40	3/22/95	78 to 80	A
HI-NR-02-S-41	3/22/95	80 to 82	A
HI-NR-02-S-42	3/22/95	82 to 84	A
HI-NR-02-S-43	3/22/95	84 to 86	A
HI-NR-02-S-44	3/22/95	86 to 88	A
HI-NR-02-S-45	3/22/95	88 to 90	C, I
HI-NR-02-S-46[c]	3/22/95	28 to 30	C

HI-SHELL000415

Table 4-1. continued

Sample ID	Sampling Date	Depth Interval (cm)	Analyses
HI-NR-02-S-47[d]	3/22/95	30 to 32	I
HI-NR-03-S-1	3/22/95	0 to 2	C, I
HI-NR-03-S-2	3/22/95	2 to 4	C, I
HI-NR-03-S-3	3/22/95	4 to 6	C, I
HI-NR-03-S-4	3/22/95	6 to 8	C, I
HI-NR-03-S-5	3/22/95	8 to 10	C, I
HI-NR-03-S-6	3/22/95	10 to 12	C, I
HI-NR-03-S-7	3/22/95	12 to 14	C, I
HI-NR-03-S-8	3/22/95	14 to 16	C, I
HI-NR-03-S-9	3/22/95	16 to 18	C, I
HI-NR-03-S-10	3/22/95	18 to 20	A
HI-NR-03-S-11	3/22/95	20 to 22	A
HI-NR-03-S-12	3/22/95	22 to 24	C, I
HI-NR-03-S-13	3/22/95	24 to 26	A
HI-NR-03-S-14	3/22/95	26 to 28	A
HI-NR-03-S-15	3/22/95	28 to 30	C
HI-NR-03-S-16	3/22/95	30 to 32	I
HI-NR-03-S-17	3/22/95	32 to 34	A
HI-NR-03-S-18	3/22/95	34 to 36	A
HI-NR-03-S-19	3/22/95	36 to 38	C, I
HI-NR-03-S-20	3/22/95	38 to 40	A
HI-NR-03-S-21	3/22/95	40 to 42	A
HI-NR-03-S-22	3/22/95	42 to 44	C, I
HI-NR-03-S-23	3/22/95	44 to 46	A
HI-NR-03-S-24	3/22/95	46 to 48	A
HI-NR-03-S-25	3/22/95	48 to 50	C, I
HI-NR-03-S-26	3/22/95	50 to 52	A
HI-NR-03-S-27	3/22/95	52 to 54	A
HI-NR-03-S-28	3/22/95	54 to 56	C, I
HI-NR-03-S-29	3/22/95	56 to 58	A
HI-NR-03-S-30	3/22/95	58 to 60	A

HI-SHELL000416

Table 4-1. continued

SAMPLE ID	SAMPLING DATE	DEPTH INTERVAL (cm)	ANALYSES
HI-NR-03-S-31	3/22/95	60 to 62	C, I
HI-NR-03-S-32	3/22/95	62 to 64	A
HI-NR-03-S-33	3/22/95	64 to 66	A
HI-NR-03-S-34	3/22/95	66 to 68	A
HI-NR-03-S-35	3/22/95	68 to 70	A
HI-NR-03-S-36	3/22/95	70 to 72	A
HI-NR-03-S-37	3/22/95	72 to 74	A
HI-NR-03-S-38	3/22/95	74 to 76	C
HI-NR-03-S-39	3/22/95	76 to 78	I
HI-NR-03-S-40	3/22/95	78 to 80	A
HI-NR-03-S-41	3/22/95	80 to 82	A
HI-NR-03-S-42	3/22/95	82 to 84	A
HI-NR-03-S-43	3/22/95	84 to 86	A
HI-NR-03-S-44	3/22/95	86 to 88	A
HI-NR-03-S-45	3/22/95	88 to 90	C, I
HI-NR-03-S-46[e]	3/22/95	28 to 30	C
HI-NR-03-S-47[f]	3/22/95	30 to 32	I
HI-NR-04-S-1	3/22/95	0 to 2	C, I
HI-NR-04-S-2	3/22/95	2 to 4	C, I
HI-NR-04-S-3	3/22/95	4 to 6	C, I
HI-NR-04-S-4	3/22/95	6 to 8	C, I
HI-NR-04-S-5	3/22/95	8 to 10	C, I
HI-NR-04-S-6	3/22/95	10 to 12	C, I
HI-NR-04-S-7	3/22/95	12 to 14	C, I
HI-NR-04-S-8	3/22/95	14 to 16	C, I
HI-NR-04-S-9	3/22/95	16 to 18	C, I
HI-NR-04-S-10	3/22/95	18 to 20	A
HI-NR-04-S-11	3/22/95	20 to 22	A
HI-NR-04-S-12	3/22/95	22 to 24	C, I
HI-NR-04-S-13	3/22/95	24 to 26	A
HI-NR-04-S-14	3/22/95	26 to 28	A

HI-SHELL000417

Table 4-1. continued

Sample ID	Sampling Date	Depth Interval (cm)	Analyses
HI-NR-04-S-15	3/22/95	28 to 30	C
HI-NR-04-S-16	3/22/95	30 to 32	I
HI-NR-04-S-17	3/22/95	32 to 34	A
HI-NR-04-S-18	3/22/95	34 to 36	A
HI-NR-04-S-19	3/22/95	36 to 38	C,I
HI-NR-04-S-20	3/22/95	38 to 40	A
HI-NR-04-S-21	3/22/95	40 to 42	A
HI-NR-04-S-22	3/22/95	42 to 44	C, I
HI-NR-04-S-23	3/22/95	44 to 46	A
HI-NR-04-S-24	3/22/95	46 to 48	A
HI-NR-04-S-25	3/22/95	48 to 50	C,I
HI-NR-04-S-26	3/22/95	50 to 52	A
HI-NR-04-S-27	3/22/95	52 to 54	A
HI-NR-04-S-28	3/22/95	54 to 56	C,I
HI-NR-04-S-29	3/22/95	56 to 58	A
HI-NR-04-S-30	3/22/95	58 to 60	A
HI-NR-04-S-31	3/22/95	60 to 62	C, I
HI-NR-04-S-32	3/22/95	62 to 64	A
HI-NR-04-S-33	3/22/95	64 to 66	A
HI-NR-04-S-34	3/22/95	66 to 68	A
HI-NR-04-S-35	3/22/95	68 to 70	A
HI-NR-04-S-36	3/22/95	70 to 72	A
HI-NR-04-S-37	3/22/95	72 to 74	A
HI-NR-04-S-38	3/22/95	74 to 76	C
HI-NR-04-S-39	3/22/95	76 to 78	I
HI-NR-04-S-40	3/22/95	78 to 80	A
HI-NR-04-S-41	3/22/95	80 to 82	A
HI-NR-04-S-42	3/22/95	82 to 84	A
HI-NR-04-S-43	3/22/95	84 to 86	A
HI-NR-04-S-44	3/22/95	86 to 88	A
HI-NR-04-S-45	3/22/95	88 to 90	C,I

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Table 4-1. continued

SAMPLE ID	SAMPLING DATE	DEPTH INTERVAL (cm)	ANALYSES
HI-NR-04-S-46[g]	3/22/95	28 to 30	C
HI-NR-04-S-47[h]	3/22/95	30 to 32	I

NOTE: C - Analyzed for PCBs, mercury, total organic carbon (selected samples only), and total solids.
I - Analyzed for lead-210, cesium-137, and total solids.
A - Archived (frozen) and not analyzed.

[a] Duplicate of HI-NR-01-S19.
[b] Duplicate of HI-NR-01-S16.
[c] Duplicate of HI-NR-02-S15.
[d] Duplicate of HI-NR-02-S16.
[e] Duplicate of HI-NR-03-S15.
[f] Duplicate of HI-NR-03-S16.
[g] Duplicate of HI-NR-04-S15.
[h] Duplicate of HI-NR-04-S16.

HI-SHELL000419

Table 4-2. Summary of Lead-210 Data Calculations for Natural Recovery Core Samples

Sample ID	Wet Weight (g)	Wet Density (g/cm^3)	Percent Moisture	Dry Density (g/cm^3)	Depth (cm midpoint)	Mass Based Depth (g/cm^3)	Lead-210 (DPM/g)	Excess Lead-210[a] (DPM/g)	LN[b] Excess Lead-210 (DPM/g)
HI-NR-01-S-1	185.67	1.30	48	0.68	1	-41.40	2.5	2	0.693
HI-NR-01-S-2	243.42	1.70	43	0.97	3	-210.15	2.7	2.2	0.788
HI-NR-01-S-3	168.34	1.18	46	0.64	5	-168.94	2.3	1.8	0.588
HI-NR-01-S-4	197.42	1.38	45	0.76	7	-324.89	2.2	1.7	0.531
HI-NR-01-S-5	207.76	1.45	44	0.81	9	-460.77	2.4	1.9	0.642
HI-NR-01-S-6	234.84	1.64	41	0.97	11	-706.97	1.5	1	0.000
HI-NR-01-S-7	201.48	1.41	41	0.83	13	-613.46	1.8	1.3	0.262
HI-NR-01-S-8	221.24	1.55	44	0.87	15	-871.69	2.1	1.6	0.470
HI-NR-01-S-9	217.97	1.52	42	0.88	17	-947.13	1.7	1.2	0.182
HI-NR-01-S-12	227.18	1.59	44	0.89	23	-1409.87	2	1.5	0.405
HI-NR-01-S-16	239.59	1.68	44	0.94	31	-2115.13	1.4	0.9	-0.105
HI-NR-01-S-18	199.43	1.39	41	0.82	35	-1617.89	1.3	0.8	-0.223
HI-NR-01-S-22	226.52	1.58	34	1.05	43	-2376.25	1.4	0.9	-0.105
HI-NR-01-S-25	248.88	1.74	32	1.18	49	-3171.71	1.2	0.7	-0.357
HI-NR-01-S-28	269.08	1.88	27	1.37	55	-3762.76	1.2	0.7	-0.357
HI-NR-01-S-31	239.52	1.67	29	1.19	61	-3451.15	1.1	0.6	-0.511
HI-NR-01-S-39	240.58	1.68	25	1.26	77	-3989.22	1	0.5	-0.693
HI-NR-01-S-45	257.72	1.80	28	1.30	89	-5712.31	1.3	0.8	-0.223
HI-NR-02-S-1	205.67	1.44	36	0.92	1	-46.74	1.3	0.8	-0.223
HI-NR-02-S-2	227.34	1.59	39	0.97	3	-177.47	1.5	1	0.000
HI-NR-02-S-3	192.44	1.35	43	0.77	5	-218.10	2	1.5	0.405

Table 4-2. continued

Sample ID	Wet Weight (g)	Wet Density (g/cm³)	Percent Moisture	Dry Density (g/cm³)	Depth (cm midpoint)	Mass Based Depth (g/cm²)	Lead-210 (DPM/g)	Excess Lead-210[a] (DPM/g)	LN[b] Excess Lead-210 (DPM/g)
HI-NR-02-S-4	194.6	1.36	44	0.76	7	-314.08	1.9	1.4	0.336
HI-NR-02-S-5	174.54	1.22	45	0.67	9	-325.80	1.9	1.4	0.336
HI-NR-02-S-6	166.45	1.16	46	0.63	11	-363.29	1.7	1.2	0.182
HI-NR-02-S-7	221.07	1.55	45	0.85	13	-757.91	1.5	1	0.000
HI-NR-02-S-8	212.31	1.48	35	0.97	15	-737.74	1.7	1.2	0.182
HI-NR-02-S-9	200.68	1.40	36	0.90	17	-756.11	1.7	1.2	0.182
HI-NR-02-S-12	220.9	1.54	43	0.88	23	-1324.96	1.5	1	0.000
HI-NR-02-S-16	220.05	1.54	42	0.89	31	-1760.51	1.8	1.3	0.262
HI-NR-02-S-19	209.29	1.46	34	0.97	37	-1742.74	1.1	0.6	-0.511
HI-NR-02-S-22	242.39	1.70	27	1.24	43	-2381.87	1.3	0.8	-0.223
HI-NR-02-S-25	261.62	1.83	22	1.43	49	-2744.46	1	0.5	-0.693
HI-NR-02-S-28	280.36	1.96	21	1.55	55	-3422.08	1.4	0.9	-0.105
HI-NR-02-S-31	325.45	2.28	21	1.80	61	-5132.03	1.2	0.7	-0.357
HI-NR-02-S-39	306.23	2.14	18	1.76	77	-5076.74	1.2	0.7	-0.357
HI-NR-02-S-45	249.37	1.74	19	1.41	89	-4039.57	1.3	0.8	-0.223
HI-NR-03-S-1	177.67	1.24	50	0.62	1	-37.97	1.8	1.3	0.262
HI-NR-03-S-2	138.27	0.97	50	0.48	3	-68.67	2.1	1.6	0.470
HI-NR-03-S-3	162.47	1.14	48	0.59	5	-158.14	2	1.5	0.405
HI-NR-03-S-4	191.72	1.34	45	0.74	7	-306.25	1.8	1.3	0.262
HI-NR-03-S-5	171.4	1.20	39	0.73	9	-301.02	1.3	0.8	-0.223
HI-NR-03-S-6	175.6	1.23	40	0.74	11	-389.99	1.2	0.7	-0.357
HI-NR-03-S-7	174.92	1.22	37	0.77	13	-443.39	1	0.5	-0.693

Table 4-2. continued

Sample ID	Wet Weight (g)	Wet Density (g/cm³)	Percent Moisture	Dry Density (g/cm³)	Depth (cm midpoint)	Mass Based Depth (g/cm²)	Lead-210 (DPM/g)	Excess Lead-210[a] (DPM/g)	LN[b] Excess Lead-210 (DPM/g)
HI-NR-03-S-8	195.73	1.37	31	0.94	15	-586.93	0.73	0.23	-1.470
HI-NR-03-S-9	199.5	1.40	34	0.92	17	-726.83	1	0.5	-0.693
HI-NR-03-S-12	155.26	1.09	60	0.43	23	-640.72	1.4	0.9	-0.105
HI-NR-03-S-16	209.51	1.47	49	0.75	31	-1639.73	1.2	0.7	-0.357
HI-NR-03-S-19	166.67	1.17	52	0.56	37	-1233.85	2.1	1.6	0.470
HI-NR-03-S-22	159.11	1.11	59	0.46	43	-1268.12	2	1.5	0.405
HI-NR-03-S-25	174.6	1.22	54	0.56	49	-1787.01	1.7	1.2	0.182
HI-NR-03-S-28	175.61	1.23	53	0.58	55	-2034.41	1.5	1	0.000
HI-NR-03-S-31	147.19	1.03	54	0.47	61	-1576.45	1.4	0.9	-0.105
HI-NR-03-S-39	164.14	1.15	52	0.55	77	-2489.74	1.2	0.7	-0.357
HI-NR-03-S-45	162.26	1.13	52	0.54	89	-2811.65	1.3	0.8	-0.223
HI-NR-04-S-1	142.91	1.00	52	0.48	1	-24.45	2.5	2	0.693
HI-NR-04-S-2	151.14	1.06	46	0.57	3	-81.53	1.6	1.1	0.095
HI-NR-04-S-3	148.01	1.04	45	0.57	5	-129.73	1.6	1.1	0.095
HI-NR-04-S-4	166.97	1.17	46	0.63	7	-232.64	1.2	0.7	-0.357
HI-NR-04-S-5	203.04	1.42	44	0.80	9	-439.91	1.2	0.7	-0.357
HI-NR-04-S-6	200.38	1.40	40	0.84	11	-509.12	1.1	0.6	-0.511
HI-NR-04-S-7	223.37	1.56	33	1.05	13	-687.70	0.71	0.21	-1.561
HI-NR-04-S-8	183.8	1.29	37	0.81	15	-565.49	0.73	0.23	-1.470
HI-NR-04-S-9	208.2	1.46	40	0.87	17	-850.02	1.2	0.7	-0.357
HI-NR-04-S-12	169.3	1.18	55	0.53	23	-785.64	1.6	1.1	0.095
HI-NR-04-S-16	201.47	1.41	41	0.83	31	-1462.72	1.3	0.8	-0.223

Table 4-2. continued

Sample ID	Wet Weight (g)	Wet Density (g/cm³)	Percent Moisture	Dry Density (g/cm³)	Depth (cm midpoint)	Mass Based Depth (g/cm²)	Lead-210 (DPM/g)	Excess Lead-210[a] (DPM/g)	LN[b] Excess Lead-210 (DPM/g)
HI-NR-04-S-19	181.82	1.27	45	0.70	37	-1454.56	1.2	0.7	-0.357
HI-NR-04-S-22	177	1.24	55	0.56	43	-1606.54	1.4	0.9	-0.105
HI-NR-04-S-25	186.21	1.30	57	0.56	49	-2009.01	1.2	0.7	-0.357
HI-NR-04-S-28	146.86	1.03	56	0.45	55	-1404.50	1.6	1.1	0.095
HI-NR-04-S-31	175.94	1.23	58	0.52	61	-2217.87	1.1	0.6	-0.511
HI-NR-04-S-39	179.78	1.26	44	0.70	77	-2944.55	1	0.5	-0.693
HI-NR-04-S-45	187.91	1.31	45	0.72	89	-3739.26	1.2	0.7	-0.357

[a] Excess lead-210 = measured lead-210 minus supported lead-210, based on a supported lead-210 value of 0.5 DPM/g.

[b] LN - natural logarithm.

Table 4-3. Natural Recovery Subsurface Core Sample Field QA/QC Summary

QA/QC Parameter	Sample Sets and Identification	Relative Percent Difference
Duplicates	HI-NR-01-S16 HI-NR-01-S47	Cesium-137 = 14% Lead-210 = 7.1% Total Solids = 1.8%
Duplicates	HI-NR-02-S16 HI-NR-02-S47	Cesium-137 = 4.4% Lead-210 = 33% Total Solids = 3.4%
Duplicates	HI-NR-03-S16 HI-NR-03-S47	Cesium-137 = 7.4% Lead-210 = 15% Total Solids = 0.0%
Duplicates	HI-NR-04-S16 HI-NR-04-S47	Cesium-137 = 16% Lead-210 = 14% Total Solids= 1.7%
Duplicates	HI-NR-01-S19 HI-NR-01-S46	Mercury= 18% PCBs= 12% Total Solids = 3.0%
Duplicates	HI-NR-02-S15 HI-NR-02-S46	Mercury= 4.4% PCBs=35% Total Solids= 0.1%
Duplicates	HI-NR-03-S15 HI-NR-03-S46	Mercury= 10% PCBs=36% Total Solids = 0.7%
Duplicates	HI-NR-04-S15 HI-NR-04-S46	Mercury = 7.4% PCBs = 19% Total Solids = 2.6%

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Table 4-4. Concentration of Mercury Analyzed in Sediments Prepared at Different Temperatures

	Mercury Concentration (mg/kg)			Relative Percent Difference		
Sample ID	As Received	At60° C	At105° C	As Received vs. At60° C	As Received vs. At105° C	At60° C vs. At 105° C
HI-EW-01	0.44	0.43	0.43	2.30	2.30	0.00
HI-EW-06	0.69	0.54	0.66	24.39	4.44	-20.00
HI-EW-60	0.60	0.83	0.59	-32.17	1.68	33.80
HI-EW-61	0.83	0.67	0.66	21.33	22.82	1.50
HI-EW-11	0.55	NA	0.59	NC	-7.02	NC
HI-NS-04	0.20	NA	0.4	NC	-66.67	NC
HI-NS-08	1.79	1.04	1.18	53.00	41.08	-12.61
HI-WW-30	5.5	NA	5.0	NC	9.52	NC
HI-WW-27	0.63	NA	0.66	NC	-4.65	NC
HI-WW-05	0.62	NA	0.55	NC	11.97	NC
				Average RPD		
				13.77	1.55	0.54

	Mercury Concentration in Replicate Samples (mg/kg)		
	As Received	At60° C	At105° C
HI-EW-06	0.69	0.66	0.54
HI-EW-60	0.60	0.59	0.83
HI-EW-61	0.83	0.66	0.67
	PercentRSD		
	16.40	6.35	21.36

NOTE: NA - Not analyzed at this temperature.
NC - Calculation not possible.

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5.0 NATURAL RECOVERY SEDIMENT TRAP AND CURRENT METER DATA SUMMARY

This section presents a summary of field and analytical methods used to collect and analyze sediment trap samples and current meter data, the analytical results, and a QA/QC review of the sediment trap data. The interpretation of these data relative to the potential for natural recovery will be presented in the base-level data interpretation report.

5.1 METHODS

Five sediment traps were moored approximately 1 m off the sediment bottom for 4 to 6 weeks at locations NR-01, NR-02, NR-03, NR-04, and NR-05 (Samples ST-01 through ST-05). Four S4 InterOcean current meters were attached to the mooring frames of the sediment traps at locations NR-01 through NR-04 for the same time period. The locations of the frames are presented in Figure 5-1. A current meter was not placed at NR-05, which is located south of Harbor Island. The current meter data acquisition and sediment trap sampling were conducted in accordance with the project FSP; any deviations from the FSP are discussed in the following sections.

5.1.1 Field Methods

The mooring frames were constructed of anodized aluminum angle iron in a tripod formation approximately 6 ft high and 8 ft in diameter. The InterOcean S4 current meter was secured to the center of the tripod frame, and six sediment traps were secured to the support arms of the tripod around the current meter. The sediment traps consisted of straight-sided glass cylinders 20 in. long and 4.5 in. in diameter, with a collection area of 79 cm^2 and a height-to-width ratio of 5.

5.1.1.1 Current Meter/Sediment Trap Deployment

The current meters/sediment traps were deployed from the *U.S. Retriever* on March 27 and 28, 1995. Station locations were confirmed at the time of deployment using a differential global positioning system (DGPS) with an accuracy of +/- 3 m as specified in

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the FSP. Frames were lowered overboard to the proposed coordinates after the current meters were checked and the sediment trap cylinders were decontaminated. Two liters of a dense salt solution (4 percent sodium chloride), which contained a sodium azide preservative (2 percent), was added to each trap cylinder and the cylinder was topped with tap water prior to deployment to reduce microbial degradation of the samples. Sheathed electronic cables interfaced the current meters to the data acquisition computer secured in onsite buildings.

Shortly after deployment, it was discovered that three of the five frames (at locations NR-01, NR-02, and NR-04) had tipped over, and that NR-04 had a faulty current meter. The cause of this occurrence is unresolved, but it appears that the frames tipped when the cable was deployed to shore. At location NR-01, however, the frame may have been tipped over by passing barges dragging their tow cables. On April 11 and 13, 1995, the current meter/sediment trap frames at locations NR-01, NR-02, and NR-04 were redeployed from the *U.S. Retriever,* and all five locations were checked by divers.

5.1.1.2 Sample Retrieval

The current meters/sediment traps were retrieved on May 16 and May 17, 1995, using the *R/V Kittiwake* vessel and DGPS location control methods. The current meters were removed from the mooring frames and the suspended particulate material (SPM) in the traps was transferred to glass containers. The traps were redeployed at the same locations.

After retrieval of the sediment traps, the height of SPM in each trap was recorded. The amount of accumulated SPM collected in each sediment trap ranged from 0.5 to 3 cm in height with an average of 1.5 cm. If the standing water inside the cylinder appeared non-turbid, water was siphoned off and the remaining slurry was transferred to 1-gallon priority pollutant-cleaned glass jars with Teflon®-lined lids (two jars per station). Jars were stored in cooled ice chests until transport to ARI for processing.

After the current meters were removed from the frames, the sediment traps were decontaminated, filled with new preservative, and deployed again within 10 ft of the original locations. DGPS location control methods were used to confirm the horizontal coordinates of the new deployments, as described in Section 2.4 of the FSP. The traps will remain in place for 3 months and will be retrieved during the week of August 14, 1995.

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5.1.1.3 Sample Processing

At ARI, the water/sediment slurry contained in the jars settled overnight and additional standing water (supernatant) was siphoned off before centrifuging. All samples were centrifuged within 36 hours of collection to isolate the particulate fraction. Material was placed in 250-mL borosilicate glass tubes and centrifuged at 1,500 revolutions per minute for 15 minutes. The material for each sample filled six tubes, so multiple centrifuges were necessary to accommodate each sample. Remaining supernatant was decanted from the centrifuged tube, and remaining SPM was transferred to a clean 16-oz jar for compositing using stainless-steel spatulas. After compositing the SPM for each sample, a final wet weight in grams was recorded (average weight of 300 g). A total of five samples were immediately submitted for analysis as outlined in the FSP.

Deviations from the FSP included:

- Sediment trap location NR-05 was moved approximately 50 ft west of the proposed location to place the trap in what was determined to be the center of the Duwamish River, based on field observations.

- No dye was added to the dense salt and preservative solution that was placed in the sediment traps because it might have interfered with selected analyses. Instead, a salinity meter was used to measure the presence of the dense salt solution in the sediment traps during retrieval. Fresh solution has an approximate salinity of 35 parts per thousand (ppt). The salinity of ambient sea water approximately 1 m off the sediment bottom ranged from 28 to 29 ppt. Salinity measurements in the traps after 6 weeks ranged from 17 percent near the top of the trap to 21 percent near the bottom. Although the salinity measurements were lower than expected, the SPM accumulated in the traps appeared to be intact, the standing water was non-turbid, and dead crabs were observed in some of the traps.

- The current meter at location NR-03 lost power on two occasions, from April 10 (mid-day) to April 17 (mid-day) and from April 26 (late afternoon) to June 1 (mid-morning). Therefore, no data were collected during these time periods. These gaps in data collection do not compromise the overall data quality at this station because of the extended 7-week data collection period and minimal variation of current speeds.

- During retrieval it was discovered that the current meter/sediment trap frame at location NR-01 was covered with sediment on one side of the frame, indicating that the frame had been tipped over or at least tilted. It is probable that the

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sheathed cable running to shore for current data acquisition was snagged by tow cables from passing barges. Only four of the six cylinders appeared intact and were collected for SPM chemical analyses. According to the data acquisition readings evaluated by Evans-Hamilton, Inc., the NR-01 mooring frame apparently tipped over on May 16, 1995, the day of retrieval. Site conditions may prevent adequate data acquisition from this location because of the amount of ship traffic passing through this area.

Table 5-1 summarizes the deployment details for the sediment traps at the five natural recovery stations.

5.1.2 Chemical and Radiochemical Analysis Methods

Five sediment trap samples were analyzed for lead-210, mercury, pesticides/PCBs, organotin compounds, semivolatile organic compounds, TOC, and total solids; three samples were also analyzed for ammonia and other total metals (antimony, arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc). Sample preparation and analyses were conducted in accordance with the methods and protocols outlined in the QAPP/LAP, with the exception of mercury. To be consistent with the natural recovery data, mercury was analyzed using the same procedure that was used for natural recovery samples.

5.1.3 Data Handling and Calculation

Analytical results were entered into the project database. The grain size results were reviewed by Hart Crowser, and the radioisotope and chemical analysis results were validated by EcoChem, Inc., in accordance with the approved QAPP/LAP. The database was checked against the validated Form 1s.

Chemical concentrations of the sediment samples were compared to the CSLs. These results are discussed in Section 5.2.

The wet weight of each sample was also entered into the project database. Gross sedimentation rates were calculated for the sediment trap locations.

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5.2 RESULTS

This section summarizes the analytical results of the five sediment trap samples for grain size, lead-210, mercury and other total metals, PCBs/pesticides, organotin compounds, semivolatile organic compounds, TOC, ammonia, and total solids. Validated chemical and radioisotope analysis results of the sediment trap samples are presented in Appendix D.

5.2.1 Grain Size

Table 5-2 summarizes grain size data for sediment trap samples. The sediment traps from the West Waterway (ST-01 and ST-02) yielded SPM with an average of 32 percent sand, 52 percent silt, and 16 percent clay, which represents a clayey, very sandy silt. The sediment traps from the East Waterway (ST-03 and ST-04) yielded a slightly finer grained material with an average of 25 percent sand, 51 percent silt, and 24 percent clay fractions, which represents a clayey, sandy silt. The SPM from the sediment trap located at the south end of Harbor Island (ST-05) consisted of 19 percent sand, 61 percent silt, and 20 percent clay, which represents a sandy, clayey silt. The grain size curve plots for these five samples are presented in Appendix D.

Adequate sample volume was recovered from each sampling station to perform physical testing using Puget Sound Estuary Program protocols as outlined in the QAPP/LAP.

5.2.2 Metals, Metalloids, and Butyltins

Table 5-3 summarizes the data for metals, metalloids, and butyltins. Mercury was detected in all five samples analyzed, and the concentrations ranged from 0.38 to 2.25 mg/kg, with a median of 0.46 mg/kg (Table 5-3). The maximum concentration was detected in Sample ST-04. Two mercury results exceeded the mercury CSL of 0.59 mg/kg.

Among the other metals, antimony was undetected in the three samples analyzed. The remaining metals were detected at concentrations ranging from 0.61 to 202 mg/kg. The maximum concentrations of metals were detected in Sample ST-04, however, none of the results exceeded associated CSLs.

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Tributyltin was detected in all five samples, and the concentrations ranged from 470 to 1,100 μg/kg, with a median of 580 μg/kg. The maximum concentration was detected in Sample ST-02. There is no CSL for tributyltin.

5.2.3 Organic Compounds

Table 5-4 summarizes the data for pesticides/PCBs and semivolatile organic compounds. Among the pesticides, only 4,4'-DDD was detected in four of five samples analyzed, and the concentrations ranged from 0.10 to 0.52 mg/kg OC, with a median of 0.19 mg/kg OC. The maximum concentration was detected in Sample ST-04. There are no CSL criteria for pesticides.

For PCBs, Aroclors 1254 and 1260 were detected in three and two of five samples analyzed, respectively. Total PCB concentrations ranged from less than 8.34 to less than 55.65 mg/kg OC, with a median of 16.92 mg/kg OC. The maximum concentration was detected in Sample ST-04; however, none of the results exceeded the PCB CSL of 65 mg/kg OC.

Eleven of the semivolatile oganic compounds were undetected in all five samples analyzed. Bis(2-ethylhexyl)phthalate was detected at concentrations that exceeded the CSL of 78 mg/kg OC in two samples (ST-01 and ST-04). Phenol and benzoic acid exceeded their CSLs (1,200 and 650 mg/kg, respectively) in four of five samples.

5.2.4 Other Parameters

Table 5-5 summarizes the data for TOC, ammonia, total solids, and lead-210. TOC was detected in all five samples analyzed, at concentrations ranging from 2.3 to 2.9 percent, with a median of 2.7 percent. The maximum concentration was detected in Sample ST-05. Ammonia was detected in all three samples analyzed. The concentrations ranged from 93 to 350 mg-N/kg, with a median of 340 mg-N/kg. The maximum concentration was detected in Sample ST-01. Total solids ranged from 37.9 to 51.2 percent, with a median of 47.1 percent. The highest total solids content was found in Sample ST-03. Lead-210 was detected in all five samples analyzed at concentrations ranging from 1.9 to 2.6 DPM/g with a median of 2.2 DPM/g. The highest lead-210 activity was found in Sample ST-05.

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5.2.5 CSL Enrichment Ratios

Table 5-6 lists the CSL enrichment ratios greater than 1.0 found in the sediment trap samples.

5.2.6 Gross Sedimentation Rates

The calculation results of gross sedimentation rates from sediment trap data are presented in Table 5-7. Two types of accumulation rates are listed: mass accumulation (g/cm^2-yr), which is the measured sediment flux into the traps, and accumulation rate (cm/yr), which is calculated to represent the actual thickness of new sediment once the particulates have consolidated on the bottom. The calculations used to generate the reported sedimentation rates are show below:

$$\textit{Mass Accumulation } (g/cm^2\text{-}yr) = [(P/A)/D] \times Y$$

where: P = amount of material collected (dry grams)
A = collection area of cylinder (cm^2)
D = number of days sediment trap was deployed
Y = number of days in a year

$$\textit{Accumulation Rate } (cm/yr) = \textit{Mass Accumulation } (g/cm^2\text{-}yr)/\textit{Dry Density } (g/cm^3)$$

where: Dry density= [wet density x (bottom sediment% solids/100)]
Wet density= Estimated from Puget Sound Density Model using% solids data from *in situ* bottom sediments (Crecelius, 1989)

The mass accumulation ranged from 8.9 to 26.5 g/cm^2-yr, and the accumulation rate ranged from 11.09 to 38.82 cm/yr. The maximum gross sedimentation rate was found at Station NR-04. The sediment trap data will be discussed along with other natural recovery modeling data in the base-level data interpretation report.

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5.3 CURRENT METER RESULTS

Bottom currents in the West and East Waterways result from a number of physical processes, including tidal action, wind-generated waves, vessel-generated waves, propeller wash, and discharge from the Duwamish River.

The objectives of the current meter deployment were to characterize the bottom current velocities in the East and West Waterways and to evaluate the potential for resuspension of bottom sediments.

Four InterOcean S4 current meters were deployed 1 m off the bottom in four midchannel locations (two in the West Waterway and two in the East Waterway; Figure 5-1). These current meters were designed to measure current speed and direction at 1-second intervals for a period of 1 month. Data were relayed to an onshore computer for storage prior to processing. Current meter deployment methods and current velocity measurement results will be presented in the base-level data interpretation report, which is the next scheduled project deliverable.

In general, current speeds were slow, with 90-94 percent of the speeds in the West Waterway less than 10 em/s and more than 99 percent of the speeds in the East Waterway less than 10 em/s. Mean speeds in the West Waterway were approximately 1.5-2 times the mean speeds in the East Waterway. Similarly, total variance of West Waterway currents was approximately 3-5 times more than the variance in the East Waterway. Net speeds and directions are similar for both waterways with a net motion to the south, except at Station NR-01 (125° True), which is in alignment with the upper river channel (Harbor Island Reach).

5.3.1 West Waterway

Current meter NR-01 measured a mean speed of 5.3 cm/s with a maximum speed of 228.0 cm/s. Approximately 46 percent of the directions measured were between 100 and 160° True with an even distribution of directions around the remainder of the compass. A total of 2,528 1-second observations (42.1 minutes) exceeded 25 em/s. Similarly, current meter NR-02 measured a mean current velocity of 3.8 cm/s with a maximum speed of 329.1 cm/s. In contrast, the currents at Station NR-02 were generally north/south, with 44

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percent of the directions between 140 and 200° True and 18 percent between 340 and 20° True. Only 319 1-second measurements (5.3 minutes) were greater than 25 em/s.

5.3.2 East Waterway

Current meter NR-03 measured a mean speed of 2.0 cm/s with a maximum of 129.7 em/s. Currents were generally north/south, with 37 percent of the directions between 160-200° True and 20 percent between 340 and 20° True. A total of 650 1-second observations (10.8 minutes) exceeded 25 cm/s. Similarly, current meter NR-04 measured a mean current velocity of 2.5 em/s, with a maximum speed of 86.5 cm/sec. In contrast, 61 percent of the current directions at Station NR-04 were between 100 and 200°, and 1,872 1-second measurements (31.2 minutes) were greater than 25 cm/s.

5.4 QA/QC REVIEW OF SEDIMENT TRAP SAMPLE DATA

Five sediment trap samples were composited and submitted to ARI for analysis of semivolatile organic compounds, pesticides/PCBs, total metals (including mercury), organotin compounds, lead-210, and other parameters (total solids, TOC, and ammonia as nitrogen). Hexachlorobenzene was added to the pesticide/PCB target compound list, as required by the QAPP. Because of limited sample quantity, Samples ST-02-A and ST-05-A were not analyzed for ammonia and total metals (except mercury). A cursory level validation of the sediment trap sample results was performed by EcoChem, Inc. Based on the review of the laboratory data reports, the overall project data quality objectives were met for these samples. A total of 335 data points were reported for the sediment trap samples, and none were rejected. The completeness of the data is 100 percent.

5.4.1 Summary of Qualified Data

5.4.1.1 Semivolatile Organic Compunds

In one continuing calibration run, phenol and 2,4-dimethylphenol had percent difference values greater than the 25 percent upper control limit at 26.2 and 26.7 percent, respectively.

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All phenol results were qualified as estimates (J), and the detection limits were judged as not significantly affected. 2,4-Dimethylphenol was not detected in any sample, and the detection limits were judged as not significantly affected; therefore, no action was taken. All other calibration requirements were met. Bis (2-ethylhexyl)phthalate was detected in the method blank; however, concentrations in associated samples were greater than the qualification action level, therefore, no qualifiers were needed. All surrogate and LCS recoveries were acceptable. The reported detection limits met the QAPP requirements. Matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed because of insufficient sample volume. No standard reference material results were analyzed for the sediment trap sample batch; however, the laboratory met the requirement of one standard reference material per 20 samples for the entire project. No qualification of data was performed based on the absence of MS/MSD and standard reference material results. All other QAPP requirements were met.

5.4.1.2 Pesticides/PCBs

All calibration requirements were met. All LCS recoveries ranged between 67 and 94.6 percent, which is within control limits. MS/MSD analyses were not performed because of insufficient sample volume. The surrogate recoveries were within the laboratory control limits of 60 to 150 percent except for tetrachlorometaxylene (0 percent on one column) for the LCS sample. The sample detection limits met the target detection limit goals with the exception of several target compounds in samples that had elevated detection limits because of suspected matrix interference. The highest elevated PCB detection limits were 100 ppb for Aroclor 1260 in Sample ST-02-A, and 99 ppb for Aroclor 1260 in ST-01-AB. The other elevated PCB detection limits ranged from 40 to 50 ppb, approximately double the target detection limit. The highest elevated pesticide detection limits were 20 ppb for 4,4'-DDT in Sample ST-02-A, and 13 ppb for 4,4'-DDT in Sample ST-04-AB. The other elevated detection limits were 9 ppb or less. All other QAPP requirements were met.

5.4.1.3 Mercury and Other Total Metals

All required laboratory quality control limits were met for the analysis of mercury. Accuracy and precision for the remaining target metals could not be evaluated because of a lack of sample material. Zinc was detected in the preparation blank at 0.7 mg/kg. However, zinc

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concentrations in associated samples were greater than the qualification action level, so no qualifiers were necessary. All other quality control requirements were met for total metals.

5.4.1.4 Organotin Compounds

One initial calibration relative response factor for butyltin (0.03) was less than the acceptable limit of 0.05. All other control limits for initial and continuing calibration were within project control limits. The surrogate and LCS recoveries were also acceptable. MS/MSD analyses were not performed because of insufficient sample volume. The sample detection limits met the target detection limits specified in the QAPP. All other QAPP requirements were met.

5.4.1.5 Other Parameters

Laboratory triplicate analyses were performed for total solids and TOC on Sample ST-04-AB. The %RSD values for TOC and total solids were 10.2 and 1.3 percent, respectively, which is within the required control limit. MS/MSD analyses were completed for TOC only. Matrix spike recoveries were within acceptance limits of 75 to 125 percent. MS/MSD and triplicate analyses were not performed for ammonia as nitrogen because of a lack of sufficient sample volume. All other data parameters met the QAPP requirements.

5.4.1.6 Lead-210

MS/MSD analyses were not performed for lead-210 because of a lack of sufficient sample volume. A LCS sample yielded a recovery of 86.2 percent, which is within the laboratory control limit of 70 to 130 percent. All other QAPP requirements were met for lead-210.

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SECTION 5.0

FIGURES AND TABLES

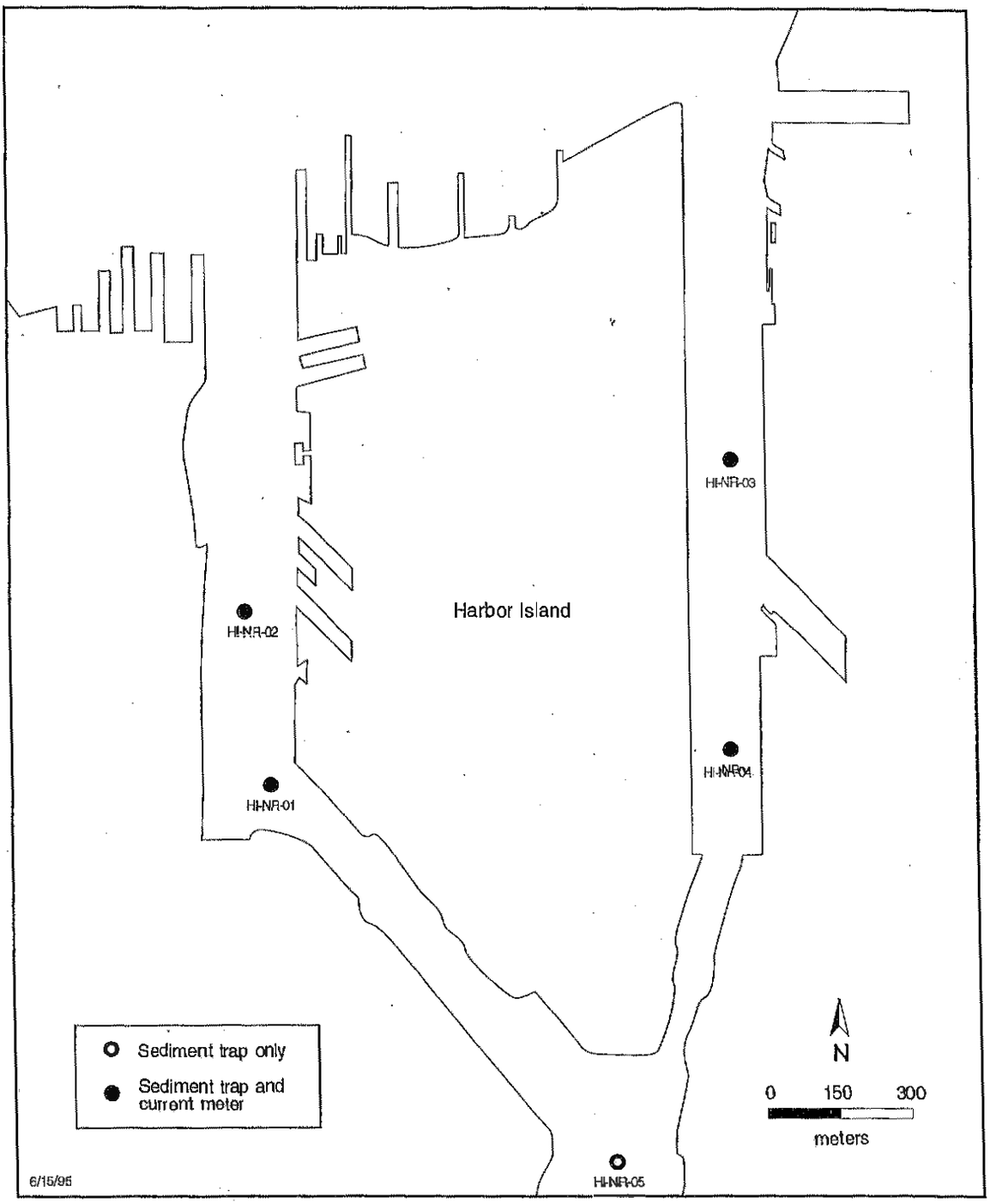

Figure 5-1. Locations of natural recovery station sediment traps and current meters – Harbor Island Supplementary Remedial Investigation.

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Table 5-1. Sediment Trap Recovery Information

Sample ID	Dates of Deployment	Duration	Elevation of Top of Trap (ft)	Wet Weight in Grams of Recovered Sediment for Chemical Analyses
HI-ST-01	April 11 through May 16, 1995	33 days	-45	294.26
HI-ST-02	April 11 through May 16, 1995	33 days	-60	237.27
HI-ST-03	March 27 through May 16, 1995	50 days	-42	295.01
HI-ST-04	April 13 through May 17, 1995	31 days	-34.6	359.42
HI-ST-05	March 28 through May 17, 1995	49 days	-38.2	202.92

NOTES: Sediment traps at each location consisted of six glass cylinders with a surface area of 79 cm^2.

Traps were moored approximately 1 m off the bottom.

Mooring frames were located at the same locations as the subsurface natural recovery cores.

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Table 5-2. Analytical Results for Grain Size in Sediment Trap Samples

Sample ID	Sampling Date	Percent Solids	Percent Gravel	Percent Sand	Percent Silt	Percent Clay
HI-ST-01	5/16/95	47.9	0	31	53	16
HI-ST-02	5/16/95	37.9	0	33	51	16
HI-ST-03	5/16/95	51.2	0	26	50	24
HI-ST-04	5/17/95	49.4	0	24	52	24
HI-ST-05	5/17/95	46.5	0	19	61	20

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Table 5-3. Summary of Concentrations of Metals, Metalloids, and Butyltins in Sediment Trap Samples

Parameter	Unit	No. Samples Detected/Total	Minimum Concentration Detected	Maximum Concentration Dectected	Sample with Maximum Detected Concentration	Median	CSL	No. Samples Exceeding CSL
Antimony	mg/kg	0/3	9 U	10 U	—	10 U	NA	NA
Arsenic	mg/kg	3/3	10.9	15	ST-01, ST-04	15	93	0
Cadmium	mg/kg	3/3	0.61	1.38	ST-04	1.32	6.7	0
Chromium	mg/kg	3/3	40.7	47	ST-04	41	270	0
Copper	mg/kg	3/3	85.2	132	ST-04	109	390	0
Lead	mg/kg	3/3	84	113	ST-04	95	530	0
Mercury	mg/kg	5/5	0.38	2.25	ST-04	0.46	0.59	2
Nickel	mg/kg	3/3	24	29	ST-04	27	NA	NA
Silver	mg/kg	3/3	0.81	1.39	ST-04	0.92	6.1	0
Zinc	mg/kg	3/3	153	202	ST-04	173	960	0
Tributyltin	µg/kg	5/5	470	1,100	ST-02	600	NA	NA

NOTES: CSL - Cleanup screening level.
NA - Not applicable; no criteria established.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

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Table 5-4. Summary of Concentrations of Organic Compounds in Sediment Trap Samples

Parameter	Unit	No. Samples Detected/ Total	Minimum Concentration Detected	Maximum Concentration Detected	Sample With Maximum Detected Concentration	Median Concentration	CSL	No. Samples Exceeding CSL
Pesticides/PCBs								
4,4'-DDD	mg/kg OC	4/5	0.10	0.52	ST-04	0.19	NA	NA
4,4'-DDE	mg/kg OC	0/5	0.07 U	0.21 U	—	0.10 U	NA	NA
4,4'-DDT	mg/kg OC	0/5	0.31 U	0.77 U	—	0.52 U	NA	NA
Aldrin	mg/kg OC	0/5	0.04 U	0.10 U	—	0.04 U	NA	NA
Dieldrin	mg/kg OC	0/5	0.07 U	0.09 U	—	0.07 U	NA	NA
Alpha-chlordane	mg/kg OC	0/5	0.03 U	0.04 U	—	0.04 U	NA	NA
Gamma-chlordane	mg/kg OC	0/5	0.06 U	0.30 U	—	0.12 U	NA	NA
Gamma-BHC	mg/kg OC	0/5	0.03 U	0.04 U	—	0.04 U	NA	NA
Heptachlor	mg/kg OC	0/5	0.03 U	0.04 U	—	0.04 U	NA	NA
Total PCBs	mg/kg OC	5/5	< 8.35[a]	< 55.65 [a]	—	16.92	65	0
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	1.8	0
1,2-Dichlorobenzene	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	2.3	0
1,3-Dichlorobenzene	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	NA	0
1,4-Dichlorobenzene	mg/kg OC	1/5	0.69 U	2.13	ST-04	0.74 U	9	0
2-Methylnaphthalene	mg/kg OC	4/5	0.71 U	1.43	ST-04	1.10	64	0
Acenaphthene	mg/kg OC	5/5	2.17	3.70	ST-01	2.50	57	0
Acenaphthylene	mg/kg OC	4/5	0.71 U	1.41	ST-01	1.14	66	0
Anthracene	mg/kg OC	5/5	8.21	14.83	ST-05	13.33	1,200	0

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Table 5-4. continued

Parameter	Unit	No. Samples Detected/ Total	Minimum Concentration Detected	Maximum Concentration Detected	Sample With Maximum Detected Concentration	Median Concentration	CSL	No. Samples Exceeding CSL
Benz(a)anthracene	mg/kg OC	5/5	13.21	32.96	ST-01	28.28	2,700	0
Benzo(a)pyrene	mg/kg OC	5/5	14.64	31.11	ST-01	26.55	210	0
Benzo(g,h,i)perylene	mg/kg OC	5/5	5.71	11.30	ST-04	10.77	78	0
Bis(2-ethylhexyl)phthalate	mg/kg OC	5/5	21.07	86.96	ST-04	37.93	78	2
Butylbenzyl phthalate	mg/kg OC	4/5	0.69 U	10.38	ST-02	6.09	64	0
Chrysene	mg/kg OC	5/5	23.21	59.26	ST-01	53.85	460	0
Di-*n*-butyl phthalate	mg/kg OC	5/5	0.79	9.57	ST-04	1.55	1,700	0
Di-*n*-octyl phthalate	mg/kg OC	4/5	1.31	2.34	ST-05	1.93	4,500	0
Dibenz(a,h)anthracene	mg/kg OC	5/5	2.55	5.56	ST-01	3.61	33	0
Dibenzofuran	mg/kg OC	5/5	1.87	3.04	ST-01	2.04	58	0
Diethyl phthalate	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	110	0
Dimethyl phthalate	mg/kg OC	1/5	0.71 U	0.83	ST-05	0.77 U	53	0
Fluoranthene	mg/kg OC	5/5	30.00	77.78	ST-01	72.41	1,200	0
Fluorene	mg/kg OC	5/5	3.39	6.67	ST-01	3.79	79	0
Hexachlorobutadiene	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	6.2	0
Indeno(1,2,3-c,d) pyrene	mg/kg OC	5/5	6.07	11.48	ST-01	10.87	88	0
N-Nitrosodiphenylamine	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	11	0
Naphthalene	mg/kg OC	5/5	0.93	1.96	ST-04	1.30	170	0
Phenanthrene	mg/kg OC	5/5	16.79	37.04	ST-01	27.59	480	0
Pyrene	mg/kg OC	5/5	20.71	59.26	ST-01	37.93	1,400	0
Total benzofluoranthenes	mg/kg OC	5/5	30.71	67.93	ST-05	61.48	450	0

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Table 5-4. continued

Parameter	Unit	No. Samples Detected/ Total	Minimum Concentration Detected	Maximum Concentration Detected	Sample With Maximum Detected Concentration	Median Concentration	CSL	No. Samples Exceeding CSL
Hexachlorobenzene	mg/kg OC	0/5	0.69 U	0.87 U	—	0.74 U	2,300	0
Total HPAHs	mg/kg OC	5/5	147.4[a]	350[a]	ST-01	314.6	5,300	0
Total LPAHs	mg/kg OC	5/5	33.3[a]	64.6[a]	ST-01	52.1	780	0
2,4-Dimethylphenol	µg/kg	0/5	20 U	20 U	—	20 U	29	0
2-Methylphenol	µg/kg	0/5	20 U	20 U	—	20 U	63	0
4-Methylphenol	µg/kg	5/5	25	3,500	ST-02	340	670	2
Pentachlorophenol	µg/kg	0/5	99 U	100 U	—	100 U	690	0
Phenol	µg/kg	5/5	110 J	9,700 J	ST-01	6,200 J	1,200	4
Benzoic acid	µg/kg	5/5	250	1,100	ST-05	920	650	4
Benzyl alcohol	µg/kg	0/5	20 U	24 U	ST-04	20 U	73	0

NOTES: OC - Organic-carbon normalized.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

[a] The "<" sign indicates that there are non-detected data in the total. Totals are calculated using the detection limit, and the "<" sign signifies that the concentration could be lower than reported.

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Table 5-5. Summary of Concentrations of Radioactive Chemistry in Sediment Trap Samples

Parameter	Unit	No. Samples Detected/ Total	Minimum Concentration Detected	Maximum Concentration Detected	Sample with Maximum Detected Concentration	Median Concentration
Total Organic Carbon	%	5/5	2.3	2.9	ST-05	2.7
Total Solids	%	5/5	37.9	51.2	ST-03	47.1
Ammonia-Nitrogen	mg-N/kg	3/3	93	350	ST-01	340
Lead-210	DPM/g	5/5	1.9	2.6	ST-05	2.2

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Table 5-6. Cleanup Screening Level Enrichment Ratios for Sediment Trap Samples

SAMPLE ID	ANALYTE	CONCENTRATION	UNITS	CSL	ENRICHMENT RATIO
HI-ST-01	Benzoic acid	680	µg/kg-dry	650	1.0
HI-ST-01	Bis(2-ethylhexyl)phthalate	85.19	mg/kg-OC	78	1.1
HI-ST-01	Phenol	9,700 J	µg/kg-dry	1,200	8.1
HI-ST-02	Mercury	1	mg/kg-dry	0.59	1.7
HI-ST-02	Phenol	1,900	µg/kg-dry	1,200	1.6
HI-ST-03	Benzoic acid	920	µg/kg-dry	650	1.4
HI-ST-03	Phenol	6,200 J	µg/kg-dry	1,200	5.2
HI-ST-04	Benzoic acid	950	µg/kg-dry	650	1.5
HI-ST-04	Mercury	2.25	mg/kg-dry	0.59	3.8
HI-ST-04	Bis(2-ethylhexyl)phthalate	86.96	mg/kg-OC	78	1.1
HI-ST-05	Benzoic acid	1,100	µg/kg-dry	650	1.7
HI-ST-05	Phenol	7,400 J	µg/kg-dry	1,200	6.2

NOTES: CSL - Cleanup screening level.
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
OC - Organic-carbon normalized.

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Table 5-7. Gross Sedimentation Rates for Sediment Trap Data

Sample ID	Waterway	Number of Days Deployed	Gross Sedimentation	
			Mass Accumulation (g/cm^2 yr)	Accumulation Rate (cm/yr)
HI-ST-01	West Waterway	33	19.4	25.74
HI-ST-02	West Waterway	33	12.6	11.57
HI-ST-03	East Waterway	50	14.0	19.52
HI-ST-04	East Waterway	31	26.5	38.82
HI-ST-05	South End	49	8.9	11.09

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6.0 SUMMARY

During the Harbor Island Supplementary Remedial Investigation, surface sediments, subsurface sediments, and suspended sediments were collected around Harbor Island and analyzed. In addition, current meters were deployed in the West and East Waterways. Surface sediments were also collected at reference stations in Carr Inlet and analyzed.

Sample collection, handling, and analysis were conducted as specified in the project plans (EVS and Hart Crowser, 1995a,d), with deviations as documented in the project cruise report (EVS and Hart Crowser, 1995b) and appropriate sections of this report. Analytical data were validated, and data summaries were revised to incorporate any qualifications of the data. The overall data completeness was between 99 and 100 percent, which exceeds the data quality objective for the project of 95 percent completeness.

For analytes on the SMS CSL list, measured concentrations were compared with CSL guideline values, and exceedences were noted. In surface sediments, mercury was the analyte most often detected at concentrations exceeding the CSL (31 of 61 stations). The CSL was exceeded for total PCBs at 9 of 61 stations, copper at 4 stations, zinc at 3 stations, one or more PAHs at 2 stations, and arsenic and lead at 1 station each. Tables 2-11, 2-17, and 2-23 provide a summary of the exceedences.

In subsurface core sediments, mercury was the only analyte with a corresponding CSL and was detected at concentrations exceeding the CSL in 7 of 30 samples. The seven samples were from six stations, and all but one were from upper-level composites. Table 3-3 provides a summary of the exceedences.

Sedimentation rates measured by accumulation in the five sediment traps ranged from approximately 11 cm/yr to 39 cm/yr. Concentrations of mercury, 4-methylphenol, and bis(2-ethylhexyl)phthalate exceeded CSLs in two of five sediment trap samples. Concentrations of phenol and benzoic acid exceeded CSLs in four of five sediment trap samples.

In the East Waterway, 99 percent of the current speeds were less than 10cm/s, and in the West Waterway, 90-94 percent were less than 10cm/s. Mean speeds in the West Waterway were approximately 1.5-2 times those in the East Waterway. Maximum speeds in the East

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Waterway were approximately 87 cm/sand 130 cm/s. Maximum speeds measured by the two West Waterway current meters were 228 cm/sand 329 cm/s.

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APPENDIX A

ANALYTICAL RESULTS FOR SURFACE SEDIMENT SAMPLES

DATA VALIDATION QUALIFIER CODES

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

QUALIFIER	DEFINITION
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M	The spectral match between the detected compound spectra and the standard reference spectra did not meet all of the acceptance criteria; but the compound is presumed present.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U and Y	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

HI-SHELL000454

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of Carr Inlet (mg/kg dry weight) - Harbor Island Supplementary RI
1995

STATION	ANTIMONY		ARSENIC		CADMIUM		CHROMIUM		COPPER		LEAD		MERCURY		NICKEL		SILVER		ZINC	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01			6.1		0.5		39.7		21.3		8.2		0.07	U	33		0.5	U	52.3	
RF-02			4.8		0.3	U	36.8		17.2		5.2		0.06	U	34		0.5		43.5	
RF-03			4.1		0.3	U	26.9		11.2		4.4		0.05	U	26		0.4	U	32.6	

HI-SHELL000455

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of Carr Inlet (mg/kg dry weight) - Harbor Island Supplementary RI
1995

STATION	CADMIUM (SEM)		COPPER (SEM)		LEAD (SEM)		MERCURY (SEM)		NICKEL (SEM)		ZINC (SEM)	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	0.5		10.6		8		0.01	U	12		34.3	
RF-02	0.17		5.3		7		0.008	U	4.3		72.6	
RF-03	0.22		7.6		5		0.007	U	11.2		19.2	

HI-SHELL000456

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins In Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	2-METHYLNAPTHALENE		ACENAPHTHENE		ACENAPHTHYLENE		ANTHRACENE		FLUORENE		NAPHTHALENE		PHENANTHRENE		TOTAL LPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	17	U	17	U	17	U	17	U	17	U	17	U	17	U	<119	
RF-02	15	U	15	U	15	U	15	U	15	U	15	U	15	U	<105	
RF-03	14	U	14	U	14	U	14	U	14	U	14	U	14	U	<98	

HI-SHELL000457

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIBENZ(A,H)ANTHRACENE		BENZO(A)ANTHRACENE		BENZO(A)PYRENE		BENZO(B)FLUORANTHENE		BENZO(K)FLUORANTHENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	17	U	17	U	17	U	17	U	17	U
RF-02	15	U	15	U	15	U	15	U	15	U
RF-03	14	U	14	U	14	U	14	U	14	U

HI-SHELL000458

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	TOTAL BENZOFLUORANTHENES		BENZO(G,H,I)PERYLENE		CHRYSENE		FLUORANTHENE		INDENO(1,2,3-C,D)PYRENE		PYRENE		TOTAL HPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	<34		17	U	17	U	18		17	U	17	U	<171	
RF-02	<30		15	U	15	U	15	U	15	U	15	U	<150	
RF-03	<28		14	U	14	U	14	U	14	U	14	U	<140	

HI-SHELL000459

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins In Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	BENZOIC ACID		BENZYL ALCOHOL		DIBENZOFURAN		N-NITROSODIPHENYLAMINE		2-METHYLPHENOL		2,4-DIMETHYLPHENOL		4-METHYLPHENOL	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	170	U	17	U	17	U	17	U	17	U	17	U	41	
RF-02	150	U	15	U	15	U	15	U	15	U	15	U	210	
RF-03	140	U	14	U	14	U	14	U	14	U	14	U	110	

HI-SHELL000460

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	PENTACHLOROPHENOL		PHENOL		1,2-DICHLOROBENZENE		1,2,4-TRICHLOROBENZENE		1,3-DICHLOROBENZENE		1,4-DICHLOROBENZENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	85	U	17	U	17	U	17	U	17	U	17	U
RF-02	73	U	27		15	U	15	U	15	U	15	U
RF-03	69	U	34		14	U	14	U	14	U	14	U

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	HEXACHLOROBUTADIENE		DI-N-OCTYL PHTHALATE		BIS(2-ETHYLHEXYL)PHTHALATE		BUTYLBENZYLPHTHALATE		DIETHYL PHTHALATE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	17	U	17	U	31	U	17	U	17	U
RF-02	15	U	15	U	15	U	15	U	15	U
RF-03	14	U	14	U	14	U	14	U	14	U

HI-SHELL000461

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	DIMETHYL PHTHALATE		DI-N-BUTYL PHTHALATE		GAMMA-HCH (LINDANE)		HEXACHLOROBENZENE		ALDRIN		ALPHA-CHLORDANE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	17	U	17	U	0.85	U	0.85	U	0.85	U	0.85	U
RF-02	15	U	15	U	0.73	U	0.73	U	0.73	U	0.73	U
RF-03	14	U	14	U	0.69	U	0.69	U	0.69	U	0.69	U

HI-SHELL000462

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins In Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	GAMMA-CHLORDANE		DIELDRIN		HEPTACHLOR		AROCLOR-1016		AROCLOR-1221		AROCLOR-1232		AROCLOR-1242		AROCLOR-1248	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	0.85	U	1.7	U	0.85	U	17	U	34	U	17	U	17	U	17	U
RF-02	0.73	U	1.5	U	0.73	U	15	U	29	U	15	U	15	U	15	U
RF-03	0.69	U	1.4	U	0.69	U	14	U	27	U	14	U	14	U	14	U

HI-SHELL000463

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of Carr Inlet (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	AROCLOR-1254		AROCLOR-1260		PCBS, TOTAL		P,P'-DDD		P,P'-DDE		P,P'-DDT		BUTYLTIN		DIBUTYLTIN		TRIBUTYLTIN	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	17	U	17	U	<136		1.7	U	1.7	U	1.7	U	17	U	17	U	17	U
RF-02	15	U	15	U	<119		1.5	U	1.5	U	1.5	U	14	U	14	U	14	U
RF-03	14	U	14	U	<111		1.4	U	1.4	U	1.4	U	14	U	14	U	14	U

HI-SHELL000464

Measurements of Conventional Parameters in Surface Sediments of Carr Inlet - Harbor Island Supplementary RI 1995

STATION	AMMONIA-NITROGEN		AVS		PERCENT MOISTURE		SALINITY, PORE WATER		SOIL PH		PERCENT TOC		SULFIDE	
	mg-N/kg		mg/kg				ppt		pH				mg/kg	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	5.9		1.7	U	78.8		30		7.7		0.98		2.2	U
RF-02	8.8		1.5	U	55.7		30		7.6		0.66		1.7	U
RF-03	7.9		2.7		45.5		30		7.5		0.45		1.4	U

HI-SHELL000465

Measurements of Conventional Parameters in Surface Sediments of Carr Inlet - Harbor Island Supplementary RI 1995

STATION	TOTAL SOLIDS		PRESERVED TOTAL SOLIDS		TOTAL VOLATILE SOLIDS		PERCENT GRAVEL		PERCENT SAND		PERCENT SILT		PERCENT CLAY	
	%		%		mg/kg									
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
RF-01	54.4		46.5		18000				14		73		13	
RF-02	63.4		57.3		20000				17		75		8	
RF-03	68.1		64.7		17000				49		45		6	

HI-SHELL000466

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of the West Waterway (mg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	ANTIMONY		ARSENIC		CADMIUM		CHROMIUM		COPPER		LEAD		MERCURY		NICKEL		SILVER		ZINC	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01			10		0.6		41.2		77.3		59		0.26		27		0.6		145	
WW-02			12.2		0.6		42		126		92		0.36	J	26		0.9		175	
WW-03			13.1		0.4		37.5		124		86		0.38	J	26		0.8		157	
WW-04			27		1.2		81.2		208		235		1.47		30		1.7		350	
WW-05-HC			14.6		0.6		45		149		109		0.61		27		0.8		185	
WW-06			15.4		0.6		47.9		165		197		0.56	J	30		1		392	
WW-07			14		0.5		41.6		214		68		0.37		29		0.8		171	
WW-08			9.3		0.3		28		86		52		0.18	J	19		0.6		121	
WW-09			14.3		0.5		41.1		144		102		0.65		22		0.8		190	
WW-10			25		0.7		61.7		186		245		0.82		29		1.1		278	
WW-11			17.3		1		59.9		230		161		0.69	J	31		1.4		220	
WW-12			20		0.4		35.6		125		124		0.38		23		0.7		230	
WW-13			30		0.8		93.6		268		330		0.57		37		1.3		501	
WW-14			16.4		0.5		38.8		163		206		0.45		22		1.8		211	
WW-15			27		0.7		63.5		207		294		1.09		27		1.3		366	
WW-16			20		0.6		44.8		156		168		0.52		21		1.4		204	
WW-17			14.9		0.3		31		95.8		72		0.37		17		0.7		122	
WW-18	12	J	99		0.9		235		275		651		1.93	J	58		1.3		1160	
WW-18B	17	J	79		1		160		394		400		2.23		44		1.3	J	1050	J
WW-19	7	UJ	27		0.9		51		183		124		1.34		27		1	J	328	J
WW-20	8	UJ	23		0.6		53		177		163		0.84		24		1.1	J	251	J
WW-21			20.9		0.4		52.4		298		336		0.87	J	21		0.9		253	
WW-22	7	UJ	19		0.4		36.9		111		82		0.85		21		0.8	J	167	J
WW-23			29		0.7		55.5		209		194		1.22	J	22		1.4		2280	
WW-24			21		0.3	U	45.3		237		189		0.52	J	22		0.9		278	
WW-25	7	UJ	35		0.4		43.9		169		121		1.03		22		0.9	J	233	J
WW-26			52		0.5		53		408		240		1.01	J	30		1.1		402	
WW-27-HC	13	J	18		0.4		40.3		177		121		0.87		21		0.6		226	
WW-28			17.2		0.2	U	88.7		116		317		1.23	J	17		0.6		157	
WW-29	5	UJ	10.2		0.2	U	20.8		64.8		56		0.31		12		0.4	J	83	J
WW-30-HC	12	J	30		0.7		37.1		277		212		4.6		22		0.6		326	
WW-31	6	UJ	20		0.4		41.4		231		155		1.37		22		0.9	J	242	J
WW-32	15	J	52		0.4		40.7		357		191		1.14		21		0.6	J	804	J

HI-SHELL000467

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of the West Waterway (mg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	CADMIUM (SEM)		COPPER (SEM)		LEAD (SEM)		MERCURY (SEM)		NICKEL (SEM)		ZINC (SEM)	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	0.42		45		56		0.012		7.8		103	
WW-02	0.39		67.2		82		0.02	U	10		137	
WW-03	0.32		89.9		79		0.02	U	10		126	
WW-04	0.37		23.4		74		0.009	U	5.1		106	
WW-05-HC												
WW-06	0.5		106		154		0.02	U	13		211	
WW-07	0.14		12		27		0.008	U	2.3		56.9	
WW-08	0.17		134		38		0.009	U	6		98.4	
WW-09	0.14		10.1		42		0.009	U	2.2		65.1	
WW-10	0.11		12.6		30		0.008	U	2		55	
WW-11	0.58		93.5		116		0.02	U	14		141	
WW-12	0.1		10.4		35		0.008	U	1.5		69.2	
WW-13	0.2		16.4		64		0.009	U	4.1		100	
WW-14	0.1		12.3		36		0.008	U	1.6		50.6	
WW-15	0.1		42.6		140		0.007	U	4.4		121	
WW-16	0.11		13.7		49		0.007	U	1.6		51.8	
WW-17	0.11		12.8		23		0.007	U	2.2		44.6	
WW-18	0.64		183		442		0.01	U	43		785	
WW-18B	0.08	U	116	J	38	J	0.01		3	J	175	J
WW-19	0.161		21.1	J	24.6	J	0.01		2.75	J	55.9	J
WW-20	0.265		64.5	J	98	J	0.013		5.84	J	127	J
WW-21	0.72		178		272		0.03		12		367	
WW-22	0.115		11.3	J	18.7	J	0.01		1.75	J	36.2	J
WW-23	0.51		141		166		0.01	U	9		305	
WW-24	0.22		89		88		0.008	U	4.3		2010	
WW-25	0.04	U	8.4	J	24	J	0.008	U	1.9	J	50.6	J
WW-26	0.22		232		179		0.01	U	10		288	
WW-27-HC												
WW-28	0.14		82.9		71		0.01	U	7		141	
WW-29	0.08	U	35.5	J	32	J	0.009		2.4	J	64.7	J
WW-30-HC												
WW-31	0.24		141	J	153	J	0.06		7	J	224	J
WW-32	0.09		29.6	J	30	J	0.014		2	J	89.9	J

HI-SHELL000468

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	2-METHYLNAPTHALENE		ACENAPHTHENE		ACENAPHTHYLENE		ANTHRACENE		FLUORENE		NAPHTHALENE		PHENANTHRENE		TOTAL LPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	240		420		27		3100		2000		77		9800		15664	
WW-02	36		64		76		370		98		54		620		1318	
WW-03	26		38		65		370		74		32		430		1035	
WW-04	81		130		68		910		210		140		1100		2639	
WW-05-HC	64		93		120		810		180		63		960		2290	
WW-06	39		91		110		460		120		75		840		1735	
WW-07	20		41		17	U	200		56		31		360		<725	
WW-08	23		48		44		220		73		53		420		881	
WW-09	20		52		74		310		88		24		560		1128	
WW-10	33		65		29		260		83		43		570		1013	
WW-11	21		43		45		170		54		34		380		747	
WW-12	40		64		27		210		74		130		440		985	
WW-13	37		68		57		380		110		50		720		1422	
WW-14	30		74		27		220		90		46		680		1167	
WW-15	34		110		23		280		120		64		860		1491	
WW-16	28		82		15	U	180		87		48		640		<1080	
WW-17	39		72		26		170		80		91		470		948	
WW-18	37		90		120		470		110		58		880		1765	
WW-18B	45		94		130		370		140		87		820		1686	
WW-19	26		58		25		150		63		55		440		817	
WW-20	36		98		28		200		100		58		740		1260	
WW-21	36		91		150		570		110		65		820		1842	
WW-22	26		54		26		130		66		60		410		772	
WW-23	38		110		160		580		170		67		830		1955	
WW-24	38		89		140		500		130		58		790		1745	
WW-25	31		98		64		240		110		50		810		1403	
WW-26	49		120		200		770		200		87		1100		2526	
WW-27-HC	27		58		48		260		76		31		580		1080	
WW-28	20		54		44		170		67		40		450		845	
WW-29	17	U	26		24		76		30		25		190		<388	
WW-30-HC	30		45		55		180		60		45		350		765	
WW-31	58		140		44		270		140		110		1000		1762	
WW-32	29		88		47		390		110		47		990		1701	

HI-SHELL000469

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIBENZ(A,H)ANTHRACENE		BENZO(A)ANTHRACENE		BENZO(A)PYRENE		BENZO(B)FLUORANTHENE		BENZO(K)FLUORANTHENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	120		1600		670		920		620	
WW-02	160	M	740		790		1300		660	
WW-03	130	M	640		570		1100		450	
WW-04	520		2700		2000		2800		1100	
WW-05-HC	180	M	1000		1100		1500		750	
WW-06	290	M	1100		1100		1700		920	
WW-07	62		440		380		710		330	
WW-08	88		470		460		640		460	
WW-09	130	M	660		710		1100		640	
WW-10	210		710		610		930		410	
WW-11	130	M	390		540		830		560	
WW-12	160		470		480		680		390	
WW-13	280		990		1200		1700		600	
WW-14	170		610		630		910		470	
WW-15	200		750		770		1000		760	
WW-16	100		560		520		750		600	
WW-17	130		380		380		550		280	
WW-18	260	J	940		720	J	1500		910	J
WW-18B	330	J	890		1100	J	1600	J	660	J
WW-19	91		420		600		710		440	
WW-20	140		640		770		880		670	
WW-21	210	M	940		790		1500		900	
WW-22	76	M	300		450		440		360	
WW-23	250	M	1000		1100		1900		1100	
WW-24	220	M	1100		920		1800		850	
WW-25	250	M	700		930		1300		580	
WW-26	280	M	1200		760		2400		920	
WW-27-HC	120		530		680		790		600	
WW-28	100	M	410		500		640		430	
WW-29	41	M	170		250		330		230	
WW-30-HC	130		350		680		780		540	
WW-31	160		780		1000		1100		560	
WW-32	140	M	1200		1300		2000		990	

HI-SHELL000470

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	TOTAL BENZOFLUORANTHENES		BENZO(G,H,I)PERYLENE		CHRYSENE		FLUORANTHENE		INDENO(1,2,3-C,D)PYRENE		PYRENE		TOTAL HPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	1540		190		1900		9400		330		5200		20950	
WW-02	1960		270		1100		1100		460		1300		7880	M
WW-03	1550		190		900		1100		360		940		6380	M
WW-04	3900		570		3500		6800		1200		6700		27890	
WW-05-HC	2250		640		1500		1400		630		1800		10500	M
WW-06	2620		480		1400		1700		710		1700		11100	M
WW-07	1040		53		680		700		180		750		4285	
WW-08	1100		170		780		850		260		760		4938	
WW-09	1740		410		1000		960		370		1100		7080	M
WW-10	1340		230		960		1500		510		1600		7670	
WW-11	1390		220		530		730		360		1000		5290	
WW-12	1070		190		730		720		390		1200		5410	
WW-13	2300		270		1600		1200		740		2000		10580	
WW-14	1380		180		900		1300		440		1100		6710	
WW-15	1760		98		1100		1200		420		1500		7798	
WW-16	1350		75		740		930		280		1100		5655	
WW-17	830		160		570		790		330		930		4500	
WW-18	2410	J	430	J	1400		1500		710	J	1400		9770	J
WW-18B	2260	J	1400	J	990		1100		1100	J	1800		10970	J
WW-19	1150		200		560		630		270		1000		4921	
WW-20	1550		360		850		990		460		1300		7060	
WW-21	2400		380		1600		2100		590		2700		11710	M
WW-22	800		240		420		510		250		810		3856	M
WW-23	3000		590		1200		2000		860		2000		12000	M
WW-24	2650		400		1400		1600		630		1600		10520	M
WW-25	1880		640		750		1200		590		1400		8340	M
WW-26	3320		600		2200		2600		920		2300		14180	M
WW-27-HC	1390		340		700		900		340		980		5980	
WW-28	1070		190		620		840		270		880		4880	M
WW-29	560		120		220		370		110		450		2291	M
WW-30-HC	1320		430		500		530		400		890		5230	
WW-31	1660		490		1100		1600		580		1900		9270	
WW-32	2990		530		1400		3200		520		3100		14380	M

HI-SHELL000471

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	BENZOIC ACID		BENZYL ALCOHOL		DIBENZOFURAN		N-NITROSODIPHENYLAMINE		2-METHYLPHENOL		2,4-DIMETHYLPHENOL		4-METHYLPHENOL	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	150	U	15	U	590		15	U	15	U	15	U	15	U
WW-02	180	U	18	U	55		18	U	18	U	18	U	22	M
WW-03	180	U	18	U	38		18	U	18	U	18	U	18	U
WW-04	200	U	20	U	130		20	U	20	U	20	U	50	
WW-05-HC	190	U	19	U	78		19	U	19.5	U	19	U	19	U
WW-06	180	U	18	U	70		18	U	18	U	18	U	30	
WW-07	170	U	17	U	36		17	U	17	U	17	U	17	U
WW-08	190	U	19	U	40		19	U	19	U	19	U	19	U
WW-09	170	U	17	U	34		17	U	17	U	17	U	17	U
WW-10	180	U	18	U	52		18	U	18	U	18	U	18	U
WW-11	190	U	19	U	27		19	U	19	U	19	U	20	
WW-12	150	U	15	U	50		15	U	15	U	15	U	15	U
WW-13	200	U	20	U	62		20	U	20	U	20	U	20	U
WW-14	170	U	17	U	49		17	U	17	U	17	U	17	U
WW-15	170	U	17	U	69		17	U	17	U	17	U	17	U
WW-16	150	U	15	U	53		15	U	15	U	15	U	15	U
WW-17	150	U	15	U	52		15	U	15	U	15	U	15	U
WW-18	190	U	19	U	53		19	U	19	U	19	U	19	U
WW-18B	200	U	20	U	66		20	U	20	U	20	U	20	U
WW-19	190	U	19	U	42		19	U	19	U	19	U	19	U
WW-20	190	U	19	U	63		19	U	19	U	19	U	19	U
WW-21	200	U	20	U	54		20	U	20	U	20	U	20	U
WW-22	180	U	18	U	44		18	U	18	U	18	U	18	U
WW-23	200	U	20	U	88		20	U	20	U	20	U	20	U
WW-24	180	U	18	U	67		18	U	18	U	18	U	19	M
WW-25	170	U	17	U	53		17	U	17	U	17	U	17	M
WW-26	180	U	18	U	91		18	U	18	U	18	U	31	M
WW-27-HC	190	U	19	U	46		19	U	19	U	19	U	19	U
WW-28	190	U	19	U	39		19	U	19	U	19	U	19	U
WW-29	170	U	17	U	18		17	U	17	U	17	U	17	U
WW-30-HC	190	U	19	U	35		19	U	19	U	19	U	19	U
WW-31	180	U	18	U	92		18	U	18	U	18	U	19	
WW-32	190	U	29	M	53		19	U	19	U	19	U	19	U

HI-SHELL000472

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	PENTACHLOROPHENOL		PHENOL		1,2-DICHLOROBENZENE		1,2,4-TRICHLOROBENZENE		1,3-DICHLOROBENZENE		1,4-DICHLOROBENZENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	76	U	240		15	U	15	U	15	U	15	U
WW-02	90	U	24	M	18	U	18	U	18	U	18	U
WW-03	89	U	71	M	18	U	18	U	18	U	18	U
WW-04	100	U	140		20	U	20	U	20	U	20	U
WW-05-HC	97	U	19	U	19	U	19	U	19	U	19	U
WW-06	91	U	150		18	U	18	U	18	U	18	U
WW-07	85	U	140		17	U	17	U	17	U	17	U
WW-08	97	U	19	U	19	U	19	U	19	U	19	U
WW-09	84	U	17	U	17	U	17	U	17	U	17	U
WW-10	89	U	150		18	U	18	U	18	U	18	U
WW-11	96	U	61		19	U	19	U	19	U	19	U
WW-12	77	U	110		15	U	15	U	15	U	15	U
WW-13	99	U	180		20	U	20	U	20	U	20	U
WW-14	85	U	62		17	U	17	U	17	U	17	U
WW-15	85	U	22		17	U	17	U	17	U	17	U
WW-16	76	U	24		15	U	15	U	15	U	15	U
WW-17	75	U	50		15	U	15	U	15	U	15	U
WW-18	96	U	40		19	U	19	U	19	U	19	U
WW-18B	98	U	50		20	U	20	U	20	U	20	U
WW-19	97	U	64		19	U	19	U	19	U	19	U
WW-20	95	U	90		19	U	19	U	19	U	19	U
WW-21	98	U	110		20	U	20	U	20	U	20	U
WW-22	91	U	41		18	U	18	U	18	U	18	U
WW-23	99	U	100		20	U	20	U	20	U	20	U
WW-24	90	U	31		18	U	18	U	18	U	18	U
WW-25	84	U	120		17	U	17	U	17	U	17	U
WW-26	120		47	M	18	U	18	U	18	U	18	U
WW-27-HC	95	U	61		19	U	19	U	19	U	19	U
WW-28	95	U	45		19	U	19	U	19	U	19	U
WW-29	87	U	150		17	U	17	U	17	U	17	U
WW-30-HC	95	U	55		19	U	19	U	19	U	19	U
WW-31	91	U	80		18	U	18	U	18	U	18	U
WW-32	120	J	85		19	U	19	U	19	U	19	U

HI-SHELL000473

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	HEXACHLOROBUTADIENE		DI-N-OCTYL PHTHALATE		BIS(2-ETHYLHEXYL)PHTHALATE		BUTYLBENZYLPHTHALATE		DIETHYL PHTHALATE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	15	U	15	U	780		15	U	15	U
WW-02	18	U	18	U	520	U	78	U	18	U
WW-03	18	U	18	U	360	U	54	U	18	U
WW-04	20	U	42	Y	820		20	U	20	U
WW-05-HC	19	U	19	U	420		67	C	19	U
WW-06	18	U	18	U	1200		73	U	18	U
WW-07	17	U	17	U	420		51	U	17	U
WW-08	19	U	19	U	420	U	52	U	19	U
WW-09	17	U	17	U	490		67	U	17	U
WW-10	18	U	18	U	740		18	U	18	U
WW-11	19	U	19	U	470	U	40	U	19	U
WW-12	15	U	15	U	360		15	U	15	U
WW-13	20	U	49	Y	950		20	U	20	U
WW-14	17	U	17	U	650		69	U	17	U
WW-15	17	U	17	U	610		45	U	17	U
WW-16	15	U	15	U	450		37	U	15	U
WW-17	15	U	15	U	390		79	U	15	U
WW-18	19	U	19	UJ	590	U	86	U	19	U
WW-18B	20	U	20	UJ	580	U	60	U	20	U
WW-19	19	U	19	U	420	U	19	U	19	U
WW-20	19	U	19	U	710	U	85	U	19	U
WW-21	20	U	20	U	560	U	67	U	20	U
WW-22	18	U	18	U	270	U	18	U	18	U
WW-23	20	U	20	U	430	U	61	U	20	U
WW-24	18	U	18	U	500	U	73	U	18	U
WW-25	17	U	17	U	340	U	25	U	17	U
WW-26	18	U	18	U	840		130	U	18	U
WW-27-HC	19	U	19	U	280		33	C	19	U
WW-28	19	U	19	U	330	U	45	U	19	U
WW-29	17	U	17	U	100	U	17	U	17	U
WW-30-HC	19	U	19	U	190	C	280	C	19	U
WW-31	18	U	18	U	440	U	48	U	18	U
WW-32	19	U	19	U	400	U	420	U	19	U

HI-SHELL000474

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIMETHYL PHTHALATE		DI-N-BUTYL PHTHALATE		GAMMA-HCH (LINDANE)		HEXACHLOROBENZENE		ALDRIN		ALPHA-CHLORDANE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	15	U	24	Y	0.76	U	0.76	U	0.76	U	0.76	U
WW-02	18	U	18	U	0.9	U	0.9	U	3.2		0.9	U
WW-03	18	U	24	U	0.89	U	0.89	U	0.89	U	0.89	U
WW-04	20	U	31	U	0.99	U	0.99	U	3.3		0.99	U
WW-05-HC	19	U	19	U	0.97	U	0.97	U	0.97	U	0.97	U
WW-06	18	U	18	U	0.91	U	0.91	U	0.91	U	0.91	U
WW-07	17	U	17	U	0.85	U	0.85	U	2.2		0.85	U
WW-08	19	U	19	U	0.97	U	0.97	U	0.97	U	0.97	U
WW-09	17	U	17	U	0.84	U	0.84	U	0.84	U	0.84	U
WW-10	18	U	33	U	0.89	U	0.89	U	3.1		0.89	U
WW-11	19	U	19	U	0.95	U	0.95	U	7		0.95	U
WW-12	15	U	15	U	0.77	U	0.77	U	8.7	P	0.77	U
WW-13	20	U	31	U	0.99	U	0.99	U	3.3		0.99	U
WW-14	17	U	33	U	0.85	U	0.85	U	2.9		0.85	U
WW-15	17	U	32	U	0.85	U	0.85	U	5.6		0.85	U
WW-16	15	U	18	U	0.76	U	0.76	U	4.9		0.76	U
WW-17	15	U	20	U	0.69	U	0.69	U	2		0.69	U
WW-18	19	U	23	U	0.96	U	0.96	U	5.4		0.96	U
WW-18B	20	U	20	U	2.9	U	2.9	U	6.3		2.9	U
WW-19	19	U	37	U	0.97	U	0.97	U	7.6		0.97	U
WW-20	19	U	25	U	0.95	U	0.95	U	7.6		0.95	U
WW-21	20	U	23	U	0.98	U	0.98	U	0.98	U	0.98	U
WW-22	18	U	25	U	0.91	U	0.91	U	4.4		0.91	U
WW-23	20	U	20	U	0.98	U	0.98	U	5.3		0.98	U
WW-24	18	U	27	U	0.9	U	5.2		0.9	U	0.9	U
WW-25	17	U	20	U	2.4	U	2.4	U	18		2.4	U
WW-26	18	U	18	U	0.9	U	0.9	U	0.9	U	0.9	U
WW-27-HC	19	U	19	U	0.95	U	0.95	U	0.95	U	0.95	U
WW-28	19	U	19	U	0.95	U	0.95	U	2.5		0.95	U
WW-29	17	U	17	U	0.87	U	0.87	U	17		0.87	U
WW-30-HC	19	U	19	U	0.95	U	0.95	U	0.95	U	0.95	U
WW-31	18	U	25	U	0.91	U	0.91	U	4		0.91	U
WW-32	19	U	19	U	0.97	U	0.97	U	3.5		0.97	U

HI-SHELL000475

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	GAMMA-CHLORDANE		DIELDRIN		HEPTACHLOR		AROCLOR-1016		AROCLOR-1221		AROCLOR-1232		AROCLOR-1242		AROCLOR-1248	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	3	P	1.5	U	0.76	U	15	U	30	U	60	Y	42		15	U
WW-02	4	Y	1.8	U	0.9	U	18	U	36	U	18	U	45	Y	18	U
WW-03	2.5	Y	1.8	U	0.89	U	18	U	36	U	18	U	18	U	18	U
WW-04	11		2	U	0.99	U	20	U	40	U	20	U	50	Y	20	U
WW-05-HC	4.2	Y	1.9	U	0.97	U	19	U	39	U	19	U	33		19	U
WW-06	5.3	Y	1.8	U	0.91	U	18	U	36	U	18	U	18	U	18	U
WW-07	2.7	P	1.7	U	0.85	U	17	U	34	U	17	U	30	Y	17	U
WW-08	0.97	U	1.9	U	0.97	U	19	U	39	U	19	U	19	U	19	U
WW-09	3	Y	1.7	U	0.84	U	17	U	34	U	17	U	17	U	17	U
WW-10	4.5		1.8	U	0.89	U	18	U	36	U	18	U	42		18	U
WW-11	9.7	Y	1.9	U	0.95	U	19	U	38	U	19	U	82		19	U
WW-12	9.7	Y	1.5	U	0.77	U	15	U	31	U	15	U	40	Y	15	U
WW-13	4.5	P	2	U	0.99	U	20	U	40	U	20	U	45	Y	20	U
WW-14	4.9	P	1.7	U	0.85	U	17	U	34	U	17	U	50	Y	17	U
WW-15	8.1	P	1.7	U	0.85	U	17	U	34	U	17	U	66		17	U
WW-16	6.7	P	1.5	U	0.76	U	15	U	30	U	15	U	56		15	U
WW-17	2.7	P	1.4	U	0.69	U	14	U	27	U	14	U	14	U	14	U
WW-18	7.3	Y	1.9	U	0.96	U	19	U	38	U	19	U	54		19	U
WW-18B	8	Y	5.7	U	2.9	U	57	U	110	U	57	U	57	U	57	U
WW-19	10	Y	1.9	U	0.97	U	19	U	39	U	19	U	120		19	U
WW-20	9.8	Y	1.9	U	0.95	U	19	U	38	U	19	U	85		19	U
WW-21	5.5	Y	2	U	0.98	U	20	U	39	U	20	U	39	Y	20	U
WW-22	5.2	Y	1.8	U	0.91	U	18	U	36	U	18	U	52		18	U
WW-23	6.9	Y	2	U	0.98	U	20	U	39	U	20	U	61		20	U
WW-24	5	Y	1.8	U	0.9	U	18	U	36	U	18	U	18	U	18	U
WW-25	24	Y	4.9	U	2.4	U	49	U	98	U	49	U	200		49	U
WW-26	6.5	Y	1.8	U	0.9	U	18	U	36	U	18	U	18	U	18	U
WW-27-HC	0.95	U	1.9	U	0.95	U	19	U	38	U	19	U	19	U	19	U
WW-28	2.6	Y	1.9	U	0.95	U	19	U	38	U	19	U	19	U	19	U
WW-29	1.9	Y	1.7	U	0.87	U	17	U	35	U	17	U	17	U	17	U
WW-30-HC	0.95	U	1.9	U	0.95	U	19	U	38	U	19	U	19	U	19	U
WW-31	5.3	Y	1.8	U	0.91	U	18	U	36	U	18	U	36	Y	18	U
WW-32	4.1	Y	1.9	U	0.97	U	19	U	39	U	19	U	19	U	19	U

HI-SHELL000476

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the West Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	AROCLOR-1254		AROCLOR-1260		PCBS, TOTAL		P,P'-DDD		P,P'-DDE		P,P'-DDT		BUTYLTIN		DIBUTYLTIN		TRIBUTYLTIN	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	66		76		<304	Y	1.5	U	1.5	U	1.5	U	44	J	110		360	
WW-02	120		85		<340	Y	4.3		3.6	Y	4.3	Y	160	J	240	J	1400	
WW-03	72		54		<234		2.2		1.8	U	2.5	Y	61	J	200	J	720	
WW-04	210		190		<550	Y	31		6.5	P	66		78	J	180		610	
WW-05-HC	97		99		<325		3.7		2.3	Y	6.3	Y	100		300		700	J
WW-06	100		82		<290		7.6		3.4	Y	10	Y	85	J	200	J	810	
WW-07	88		73		<276	Y	1.7	U	1.7	U	1.7	U	77	J	200		910	
WW-08	82		97		<294		1.9	U	2.3	Y	2.9	Y	79	J	230	J	890	
WW-09	120		110		<332		3.4		1.7	U	4	Y	120	J	280		1000	
WW-10	150		140		<422		4.8		1.8	U	6	Y	120	J	260		1000	
WW-11	280		140		<597		5.9		7.6	Y	7	Y	44	J	180	J	500	
WW-12	580		160		<856	Y	5.5		13	Y	8.1	Y	52	J	120		320	
WW-13	140		140		<425	Y	4.8		2	U	6.5	Y	95	J	290		1000	
WW-14	150		140		<425	Y	4.7		4	P	5.8	Y	140	J	530		1600	
WW-15	260		230		<641		7.7		6.4	P	8.7	Y	200	J	450		1500	
WW-16	250		160		<541		5.6		6	Y	7.6	Y	120	J	360		1300	
WW-17	94		96		<273		3.4	J	1.4	U	1.4	U	110	J	370		1500	
WW-18	230		210		<589		7.7		14	Y	9	Y	110	J	380	J	1500	
WW-18B	270		230		<838		14		15	Y	10	Y	84	J	320		1200	
WW-19	290		190		<696		6.6		18	Y	8.5	Y			120		280	
WW-20	320		210		<710		8.9		21	Y	11	Y	57	J	310		1100	
WW-21	150		140		<428	Y	12		4.5	Y	27	Y	93	J	290	J	1700	
WW-22	150		92		<384		4.9		8.9	Y	4.5	Y	21	J	120		320	
WW-23	200		180		<540		8.9		12	Y	8.5	Y	120	J	300	J	1700	
WW-24	120		150		<378		5		2.9	Y	6.8	Y	150	J	480	J	2200	
WW-25	780		480		<1705		28		49	Y	28	Y	46	J	320		1000	
WW-26	110		220		<438		5.6		2.9	Y	7.7	Y	230	J	930	J	3300	
WW-27-HC	79		93		<286		9.6		1.9	Y	3.4	Y	140		480		1600	J
WW-28	100		66		<280		4.5		3	Y	4.7	Y	120	J	350	J	1100	
WW-29	58		33		<194		2.6		4	Y	3.1	Y	48	J	190		410	
WW-30-HC	38		48	Y	<200	Y	1.7	J	1.9	U	1.9	U	71		200		610	J
WW-31	240		200		<566	Y	11		13	Y	10	Y	85	J	690		2000	
WW-32	180		150		<445		5.6		11	Y	8.4	Y	60	J	240		920	

HI-SHELL000477

Measurements of Conventional Parameters in Surface Sediments of the West Waterway - Harbor Island Supplementary RI 1995

STATION	AMMONIA-NITROGEN		AVS		PERCENT MOISTURE		SALINITY, PORE WATER		SOIL PH		PERCENT TOC		SULFIDE	
	mg-N/kg		mg/kg				ppt		pH				mg/kg	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	6.8		540		54.2		30		7.6		2.6		120	
WW-02	12		470	J	75.9				7.6		2.1		130	J
WW-03	17		1000	J	75.1				7.6		2.1		930	J
WW-04	19		1500		97.7		28		7.7		2.2		1000	
WW-05-HC	10								7.8		2.5		1100	J
WW-06	16		470	J	75.4				7.6		2.6		60	J
WW-07	15		330		71.9		28		7.7		2.2		300	
WW-08	8.4		450	J	53.4				7.5		1.8		42	J
WW-09	9.3		120		71.1		30		7.8		1.7		320	
WW-10	10		43				30		7.7		1.6		280	
WW-11	7.4		800	J	66.9				7.5		2.8		670	J
WW-12	7.8		57		57		29		7.7		1.7		210	
WW-13	16		150		87.5		29		7.8		2		1500	
WW-14	6.1		55		70.3		29		7.9		1.9		790	
WW-15	6		340		76.2		28		7.8		1.8		330	
WW-16	4		110		56.8		29		7.9		1.7		5.4	U
WW-17	7.3		42		54.5		30		7.9		1.4		5.2	U
WW-18	16		150	J			28		7.8		2.4		230	J
WW-18B	4.6		870				28		7.6		1.4		630	
WW-19	3.6		36		66.8		28		7.8		1.7		14	
WW-20	3.4		190		64.9		28		7.7		1.4		21	
WW-21	5.8		170	J	69.2		28		7.7		2.5		100	J
WW-22	2.7		35		57.2		28		7.7		1.5		48	
WW-23	5.8		730	J	68.4		28		7.8		2.4		340	J
WW-24	5.2		850		77.7		28		7.8		2.1		560	J
WW-25	3.4		440		56		27.5		7.6		1.8		310	
WW-26	8		1700	J	77.5				7.7		1.9		96	J
WW-27-HC	5.2								7.8		1.4		190	J
WW-28	4		14	J	54				7.7		1.6		68	J
WW-29	3.3		1.5		39.4		29		7.5		0.89		1.5	U
WW-30-HC	4.6								7.7		1.7		5.5	UJ
WW-31	3.5		220		64.2		28		7.7		1.1		73	
WW-32	2.8		46		50.7				7.7		1.1		48	

HI-SHELL000478

Measurements of Conventional Parameters in Surface Sediments of the West Waterway - Harbor Island Supplementary RI 1995

STATION	TOTAL SOLIDS		PRESERVED TOTAL SOLIDS		TOTAL VOLATILE SOLIDS		PERCENT GRAVEL		PERCENT SAND		PERCENT SILT		PERCENT CLAY	
	%		%		mg/kg									
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
WW-01	63.9		61.6		34000		2		66		21		11	
WW-02	57.2		56.3		28000				44		38		18	
WW-03	57.4		52.8		28000				45		35		20	
WW-04	49.6		50.3		34000	J			36		32		32	
WW-05-HC	51.9		51.5		31000									
WW-06	56.6		54.8		28000		1		40		39		20	
WW-07	57.4		58.6		31000	J	3		50		36		11	
WW-08	65.2		67.2		22000				72		20		8	
WW-09	58.4		56.1		32000	J			48		37		15	
WW-10	55.5		52.5		28000	J								
WW-11	60.9		59.1		30000		6		48		29		17	
WW-12	62.9		57.2		23000	J	3		58		27		12	
WW-13	49.6		49.2		32000	J	1		20		46		33	
WW-14	57.4		58.6		26000	J	1		54		30		15	
WW-15	55.5		59.7		26000	J			45		38		17	
WW-16	63.5		62.2		23000	J	1		63		24		12	
WW-17	63.8		59.7		21000	J	2		63		25		10	
WW-18	54.4		51.8		29000									
WW-18B	55.3		53		27000	J								
WW-19	58		60.6		24000		1		29		51		19	
WW-20	60.4		58		22000		1		52		30		17	
WW-21	60.4		58.9		25000		2		56		27		15	
WW-22	63.9		54		22000		1		40		44		15	
WW-23	60.1		59.2		25000				57		24		19	
WW-24	57.3		55.4		24000				57		26		17	
WW-25	63.5		62.7		23000	J	1		58		26		15	
WW-26	56.6		56.5		25000		2		59		28		11	
WW-27-HC	61.8		63		20000									
WW-28	65.6		57.2		22000		2		68		21		9	
WW-29	72		71.2		16000	J			75		18		7	
WW-30-HC	63.6		64.1		23000									
WW-31	60.8		62.1		24000	J			53		31		16	
WW-32	66.6		60.8		22000	J			44		44		12	

HI-SHELL000479

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of the East Waterway (mg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	ANTIMONY		ARSENIC		CADMIUM		CHROMIUM		COPPER		LEAD		MERCURY		NICKEL		SILVER		ZINC	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC			13.1		1.3		47.5		99.6		121		0.41		34		1.9		177	
EW-02			9		1		40.7		113		88		0.39	J	26		1.4		144	
EW-03			11.3		0.9		40.8		92.6		92		0.85		26		1.6		147	
EW-04			16		1.4		52		113		99		0.4		32		1.9		201	
EW-05			14.5		1.6		51.9		110		104		0.45		34		2.1		194	
EW-06-HC			14.8		2.6		62.7		144		162		0.6		40		2.6		239	
EW-07			8.9		0.6		36.2		79.2		66		0.29	J	27		1.1		136	
EW-08			11		0.6		42.1		83.2		87		0.39	J	29		1.3		142	
EW-09			10.6		0.6		36.5		75.8		62		0.42		26		1.3		125	
EW-10			10.1		1		46.4		91.1		88		0.44	J	33		1.6		153	
EW-11-HC			9.6		1.1		48.1		67.1		71		1.92		43		1		152	
EW-12			8.5		0.4		33.6		51.3		44		0.34		24		0.8		88.2	

HI-SHELL000480

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of the East Waterway (mg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	CADMIUM (SEM)		COPPER (SEM)		LEAD (SEM)		MERCURY (SEM)		NICKEL (SEM)		ZINC (SEM)	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC												
EW-02	0.71		87.9		80		0.009	U	10.4		103	
EW-03	0.78		41.3		70		0.009	U	9.9		109	
EW-04	0.8		40.9		62		0.01	U	7		90.4	
EW-05	0.5		11.8		44		0.01	U	4		70	
EW-06-HC												
EW-07	0.71		47.1		59		0.009	U	9.4		136	
EW-08	0.55		40.2		63		0.02	U	11		345	
EW-09	0.21		5.2		20		0.009	U	2.2		34.8	
EW-10	0.9		34.7		80		0.01	U	12		114	
EW-11-HC												
EW-12	0.23		10		21		0.007	U	3.7		38.5	

HI-SHELL000481

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	2-METHYLNAPTHALENE		ACENAPHTHENE		ACENAPHTHYLENE		ANTHRACENE		FLUORENE		NAPHTHALENE		PHENANTHRENE		TOTAL LPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	26		26		33		140		38		35		230		528	
EW-02	24		43		44		190		61		45		500		907	
EW-03	36		76		20		190		81		95		380		878	
EW-04	39		44		22		190		57		84		370		806	
EW-05	27		24		18	U	110		33		44		230		<486	
EW-06-HC	48		60		74		370		95		130		350		1127	
EW-07	29		37		45		180		43		71		260		665	
EW-08	24		24		35		150		38		48		230		549	
EW-09	35		37		18	U	390		80		34		460		<1054	
EW-10	31		34		48		210		50		61		300		734	
EW-11-HC	32		27		35		120		52		55		230		551	
EW-12	22		35		16	U	160		60		50		280		<623	

HI-SHELL000482

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIBENZ(A,H)ANTHRACENE		BENZO(A)ANTHRACENE		BENZO(A)PYRENE		BENZO(B)FLUORANTHENE		BENZO(K)FLUORANTHENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	85	M	300		380		540		360	
EW-02	130		350		400		650		430	
EW-03	140		550		570		810		400	
EW-04	180	M	480		560		820		370	
EW-05	180	M	270		340		590		220	
EW-06-HC	190	J	480	J	810	J	1100	J	720	J
EW-07	89		340		400		680		420	
EW-08	100		270		360		630		320	
EW-09	87		320		320		460		260	
EW-10	150	M	330		460		820		440	
EW-11-HC	73		210		290		300		350	
EW-12	76		260		260		400		190	

HI-SHELL000483

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	TOTAL BENZOFLUORANTHENES		BENZO(G,H,I)PERYLENE		CHRYSENE		FLUORANTHENE		INDENO(1,2,3-C,D)PYRENE		PYRENE		TOTAL HPAHS	
	CONC	OUAL	CONC	QUAL	CONC	OUAL	CONC	OUAL	CQNC	QUAL	CONC	OUAL	CONC	QUAL
EW-01-HC	900		330		500		430		310		710		3945	M
EW-02	1080		160		600		810		260		890		4680	
EW-03	1210		210		840		870		400		1300		6090	
EW-04	1190		200		720		730		360		800		5220	M
EW-05	810		170		390		420		330		580		3490	M
EW-06-HC	1820	J	590	J	950	J	480		530	J	2700		8550	J
EW-07	1100		140		580		620		220		930		4419	
EW-08	950		150		450		470		250		640		3640	
EW-09	720		140		470		760		240		910		3967	
EW-10	1260		190		520		470		340		1000		4720	M
EW-11-HC	650		230		360		380		210		700		3103	
EW-12	590		95		460		480		190		670		3081	

HI-SHELL000484

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	BENZOIC ACID		BENZYL ALCOHOL		DIBENZOFURAN		N-NITROSODIPHENYLAMINE		2-METHYLPHENOL		2,4-DIMETHYLPHENOL		4-METHYLPHENOL	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	190	U	19	U	23		19	U	19.5	U	19	U	19	U
EW-02	190	U	19	U	35		19	U	19	U	19	U	19	U
EW-03	180	U	18	U	60		18	U	18	U	18	U	20	
EW-04	190	U	19	U	51		19	U	19	U	19	U	20	
EW-05	180	U	18	U	30		18	U	18	U	18	U	18	U
EW-06-HC	200	U	20	U	67		20	U	19.5	U	20	U	20	U
EW-07	180	U	18	U	36		18	U	18	U	18	U	18	U
EW-08	190	U	19	U	26		19	U	19	U	19	U	19	U
EW-09	180	U	18	U	42		18	U	18	U	18	U	18	U
EW-10	190	U	19	U	36		19	U	19	U	19	U	19	U
EW-11-HC	190	U	19	U	33		19	U	19	U	19	U	44	
EW-12	160	U	16	U	36		16	U	16	U	16	U	16	U

HI-SHELL000485

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	PENTACHLOROPHENOL		PHENOL		1,2-DICHLOROBENZENE		1,2,4-TRICHLOROBENZENE		1,3-DICHLOROBENZENE		1,4-DICHLOROBENZENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	97	U	19	U	19	U	19	U	19	U	27	
EW-02	94	U	20		19	U	19	U	19	U	19	U
EW-03	88	U	19		18	U	18	U	18	U	20	M
EW-04	94	U	23		19	U	19	U	19	U	26	Y
EW-05	91	U	18	U	18	U	18	U	18	U	18	U
EW-06-HC	98	U	20	U	20	U	20	U	20	U	20	U
EW-07	90	U	18	U	18	U	18	U	18	U	18	U
EW-08	96	U	19	U	19	U	19	U	19	U	26	
EW-09	92	U	18	U	18	U	18	U	18	U	18	U
EW-10	95	U	44		19	U	19	U	19	U	36	
EW-11-HC	95	U	23		19	U	19	U	19	U	41	
EW-12	82	U	24		16	U	16	U	21		97	

HI-SHELL000486

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	HEXACHLOROBUTADIENE		DI-N-OCTYL PHTHALATE		BIS(2-ETHYLHEXYL)PHTHALATE		BUTYLBENZYLPHTHALATE		DIETHYL PHTHALATE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	19	U	19	U	480		75	U	19	U
EW-02	19	U	19	U	370	U	51	U	19	U
EW-03	18	U	31	Y	960		49	U	18	U
EW-04	19	U	51	Y	1000		19	U	19	U
EW-05	18	U	22	Y	850		18	U	18	U
EW-06-HC	20	U	20	UJ	870	J	20	UJ	20	U
EW-07	18	U	18	U	410	U	51	U	18	U
EW-08	19	U	19	U	390	U	56	U	19	U
EW-09	18	U	18	U	500		39	U	18	U
EW-10	19	U	19	U	400	U	54	U	19	U
EW-11-HC	19	U	19	U	130	C	31	C	19	U
EW-12	16	U	16	U	400		61	U	16	U

HI-SHELL000487

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIMETHYL PHTHALATE		DI-N-BUTYL PHTHALATE		GAMMA-HCH (LINDANE)		HEXACHLOROBENZENE		ALDRIN		ALPHA-CHLORDANE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	19	U	19	U	20	U	20	U	20	U	20	U
EW-02	19	U	19	U	0.94	U	0.94	U	0.94	U	0.94	U
EW-03	18	U	38	U	0.88	U	0.88	U	2.6	P	0.88	U
EW-04	19	U	47	Y	0.94	U	0.94	U	3.2	P	0.94	U
EW-05	18	U	31	U	1	U	1	U	2.8		1	U
EW-06-HC	20	U	20	U	21	U	21	U	21	U	21	U
EW-07	18	U	18	U	17	U	17	U	17	U	17	U
EW-08	19	U	19	U	0.96	U	0.96	U	2.3		0.96	U
EW-09	18	U	28	U	0.92	U	0.92	U	0.92	U	0.92	U
EW-10	19	U	19	U	0.95	U	0.95	U	2.1		0.95	U
EW-11-HC	19	U	19	U	18	U	18	U	18	U	18	U
EW-12	16	U	20	U	0.82	U	0.82	U	0.82	U	0.82	U

HI-SHELL000488

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	GAMMA-CHLORDANE		DIELDRIN		HEPTACHLOR		AROCLOR-1016		AROCLOR-1221		AROCLOR-1232		AROCLOR-1242		AROCLOR-1248	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	20	U	40	U	20	U	400	U	810	U	400	U	400	U	400	U
EW-02	3.8	Y	1.9	U	0.94	U	19	U	37	U	19	U	19	U	19	U
EW-03	5.6	P	1.8	U	0.88	U	18	U	35	U	18	U	36		18	U
EW-04	5.7	P	1.9	U	0.94	U	19	U	37	U	19	U	60	Y	19	U
EW-05	4.9	P	2	U	1	U	20	U	40	U	20	U	40	Y	20	U
EW-06-HC	21	U	41	U	21	U	410	U	820	U	410	U	410	U	410	U
EW-07	17	U	34	U	17	U	340	U	680	U	340	U	340	U	340	U
EW-08	2.3	Y	1.9	U	0.96	U	19	U	38	U	19	U	19	U	19	U
EW-09	2.5	P	1.8	U	0.92	U	18	U	37	U	18	U	40	Y	18	U
EW-10	3.8	Y	1.9	U	0.95	U	19	U	38	U	19	U	19	U	19	U
EW-11-HC	18	U	36	U	18	U	360	U	720	U	360	U	360	U	360	U
EW-12	4.7	Y	1.6	U	0.82	U	16	U	33	U	16	U	16	U	16	U

HI-SHELL000489

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the East Waterway (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	AROCLOR-1254		AROCLOR-1260		PCBS, TOTAL		P,P'-DDD		P,P'-DDE		P,P'-DDT		BUTYLTIN		DIBUTYLTIN		TRIBUTYLTIN	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	400	U	360	J	<3170	J	40	U	40	U	40	U	20	U	20	U	370	J
EW-02	140		260		<513		6.2		3.4	Y	4.7	Y	35	J	75	J	350	
EW-03	190	Y	640		<955	Y	11	P	5.2	P	8.8	Y	42	J	76		290	
EW-04	200		500		<854	Y	9.8	P	5.5	P	8.4	Y	20	U	83		420	
EW-05	150		290		<580	Y	7.2	P	4.6	P	4.3	Y	20	U	93		640	
EW-06-HC	340	J	370	J	<3170	J	41	U	41	U	41	U	20	U	110		300	J
EW-07	340	U	330	J	<2710	J	34	U	34	U	34	U	54	J	130	J	4000	
EW-08	190	Y	610		<914	Y	5.4		3.6	Y	8.2	Y			70	J	540	
EW-09	100		250		<481	Y	2.7	J	1.8	U	1.8	U	61	J	120		1200	
EW-10	180		420		<714		5.9		3.6	Y	5.9	Y			82	J	440	
EW-11-HC	220	J	250	J	<2630	J	36	U	36	U	36	U	18	U	53		320	J
EW-12	390		1800		<2287		5.7		1.6	U	17	Y	24	J	89		670	

HI-SHELL000490

Measurements of Conventional Parameters in Surface Sediments of the East Waterway - Harbor Island Supplementary RI 1995

STATION	AMMONIA-NITROGEN		AVS		PERCENT MOISTURE		SALINITY, PORE WATER		SOIL PH		PERCENT TOC		SULFIDE	
	mg-N/kg		mg/kg				ppt		pH				mg/kg	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	8.6								7.4		2.4		700	J
EW-02	12		870	J	82.1				7.6		2.4		150	J
EW-03	7.3		260		78.9		29		7.7		2		2.6	U
EW-04	13		270		108.5		29		7.8		2.1		150	
EW-05	16		240		100.7		31		7.8		1.9		1100	
EW-06-HC	17								7.5		2.4		1600	J
EW-07	8.7		470	J	74.6				7.4		2.2		68	J
EW-08	14		1400	J	102.7				7.8		1.9		1000	J
EW-09	10		160		79.6		31		7.4		1.8		410	
EW-10	13		860	J	82.7				7.7		2.1		180	J
EW-11-HC	17								8		2		230	J
EW-12	6.5		230		61.8		31		7.8		2.6		280	

HI-SHELL000491

Measurements of Conventional Parameters in Surface Sediments of the East Waterway - Harbor Island Supplementary RI 1995

STATION	TOTAL SOLIDS		PRESERVED TOTAL SOLIDS		TOTAL VOLATILE SOLIDS		PERCENT GRAVEL		PERCENT SAND		PERCENT SILT		PERCENT CLAY	
	%		%		mg/kg									
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
EW-01-HC	48.7		51.4		28000									
EW-02	55.2		49		27000				38		41		21	
EW-03	55.4		45.2		33000				43		35		22	
EW-04	47.4		46.3		36000				18		52		30	
EW-05	49.8		45.6		29000	J			18		50		32	
EW-06-HC	47		50.6		29000									
EW-07	57.5		53.4		26000		2		41		36		21	
EW-08	48.8		47.9		26000				21		53		26	
EW-09	53.8		52.5		25000	J			41		36		23	
EW-10	53.5		53.1		28000				27		46		27	
EW-11-HC	54.4		56.8		27000									
EW-12	60.9		58.3		24000	J			61		25		14	

HI-SHELL000492

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of the North Shore (mg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	ANTIMONY		ARSENIC		CADMIUM		CHROMIUM		COPPER		LEAD		MERCURY		NICKEL		SILVER		ZINC	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	6	UJ	8.1		0.5		31.7		48.8		27		0.42		23		0.6	J	71.7	J
NS-02	6	UJ	7.3		0.4		21.7		51.3		25		0.18		14		0.4	J	66.9	J
NS-03	6	UJ	8.9		0.2	U	25.1		84.2		39		0.35		16		0.5	J	95.2	J
NS-04-HC	6	J	2.8		0.2	U	19.7		61.8		26		0.22		14		0.4	U	69.2	
NS-05			5.8		0.2	U	24.4		43.4		25		0.18	J	19		0.5		66.8	
NS-06			6.4		0.3	U	26.7		82.2		43		0.5	J	19		0.8		86.2	
NS-07			7.3		0.3	U	21.7		87.3		32		0.39		14		0.4		86.9	
NS-08-HC			12.2		0.4		30.1		192		62		0.99		18		0.5		205	
NS-09	7	UJ	21.4		0.3	U	50.6		434		108		0.94		32		0.8	J	333	J
NS-10	6	UJ	10.2		0.2	U	22.2		136		28		0.35		13		0.3	UJ	162	J
NS-11	5	UJ	14.2		0.2	U	31		145		82		0.97		16		0.7	J	158	J
NS-12	6	UJ	12.5		0.5		32.8		66.5		59		0.59		23		0.8	J	111	J
NS-13			33		0.5		28		114		93		1.29	J	15		0.7		403	
NS-14	10	UJ	40		0.7		75		909		277		4.4		30		1.1	J	671	J
NS-15													0.74							
NS-16	5	UJ	14.1		0.2	U	18.7		115		50		0.67		11		0.5	J	122	J

HI-SHELL000493

Concentrations of Metals and Simultaneously Extracted Metals in Surface Sediments of the North Shore (mg/kg dry weight) - Harbor Island
Supplementary RI 1995

STATION	CADMIUM (SEM)		COPPER (SEM)		LEAD (SEM)		MERCURY (SEM)		NICKEL (SEM)		ZINC (SEM)	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	0.13		3.2	J	8	J	0.008	U	1	J	15.8	J
NS-02	0.12		26.7	J	19	J	0.007		3.3	J	40.1	J
NS-03	0.1		41.2	J	25	J	0.022		3	J	56.5	J
NS-04-HC												
NS-05	0.21		24.5		25		0.01	U	8		48.7	
NS-06	0.14		54.3		31		0.008	U	5.8		60.8	
NS-07	0.06		37.4		29		0.007	U	2.7		50.6	
NS-08-HC												
NS-09	0.15		42.4	J	30	J	0.026		3.2	J	181	J
NS-10	0.05	U	108	J	32	J	0.022		2.2	J	82.4	J
NS-11	0.08	U	36.3	J	29	J	0.037		2.5	J	51.5	J
NS-12	0.24		60	J	57	J	0.03		8	J	83.3	J
NS-13	0.17		73.8		56		0.045		5.8		193	
NS-14	0.67		303	J	799	J	0.02	U	28	J	1930	J
NS-15	0.15		8.9	J	21	J	0.009	U	2	J	28	J
NS-16	0.08		36.7	J	33	J	0.076		2.3	J	50.9	J

HI-SHELL000494

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	2-METHYLNAPTHALENE		ACENAPHTHENE		ACENAPHTHYLENE		ANTHRACENE		FLUORENE		NAPHTHALENE		PHENANTHRENE		TOTAL LPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	32		22		38		480		93		31		290		986	
NS-02	44		140		94		500		180		130		750		1838	
NS-03	33		59		77		460		140		31		700		1500	
NS-04-HC	33		94		52		720		210		22		950		2081	
NS-05	18	U	24		28		120		37		21		200		<448	
NS-06	19	U	20		24		120		31		19	U	200		<433	
NS-07	66		59		18		1200		500		48		2000		3891	
NS-08-HC	20		44		33		180		64		23		450		814	
NS-09	63		130		72		320		160		79		1100		1924	
NS-10	18	U	31		18	U	77		36		18	U	280		<478	
NS-11	25		56		19	U	140		67		44		500		<851	
NS-12	27		40		59		130		52		57		310		675	
NS-13	22		24		39		100		35		41		220		481	
NS-14	81		200		67	U	600		260		190		1600		<2998	
NS-16	18	U	43		530		1000		94		30		390		2105	

HI-SHELL000495

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIBENZ(A,H)ANTHRACENE		BENZO(A)ANTHRACENE		BENZO(A)PYRENE		BENZO(B)FLUORANTHENE		BENZO(K)FLUORANTHENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	40	M	330		280		440		250	
NS-02	85	M	890		730		1400		650	
NS-03	67	M	700		680		1200		560	
NS-04-HC	78		660		490		610		530	
NS-05	45	J	290		230	J	340	J	220	J
NS-06	40		200		240		340		210	
NS-07	93	M	770		440		780		290	
NS-08-HC	100		400		490		520		390	
NS-09	130	M	790		1100		1200		980	
NS-10	42	M	220		270		320		260	
NS-11	88		390		480		530		350	
NS-12	57	M	380		480		550		380	
NS-13	64	M	270		420		450		380	
NS-14	410		1900		3000		3400		3000	
NS-16	1700	M	7100		12000		12000		7700	

HI-SHELL000496

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	TOTAL BENZOFLUORANTHENES		BENZO(G,H,I)PERYLENE		CHRYSENE		FLUORANTHENE		INDENO(1,2,3-C,D)PYRENE		PYRENE		TOTAL HPAHS	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	690		130		630		860		110		650		3720	M
NS-02	2050		220		1200		2400		240		3100		10915	M
NS-03	1760		260		1100		1800		240		1400		8007	M
NS-04-HC	1140		200		890		2000		220		1100		6778	
NS-05	560	J	61	J	380		910		99	J	530		3105	J
NS-06	550		68		330		380		110		380		2298	
NS-07	1070		150		1000		2300		260		1300		7383	M
NS-08-HC	910		260		520		720		250		740		4390	
NS-09	2180		570		1100		1600		500		2000		9970	M
NS-10	580		130		300		510		120		540		2712	M
NS-11	880		250		560		580		280		970		4478	
NS-12	930		300		460		680		260		900		4447	M
NS-13	830		160		380		420		230		570		3344	M
NS-14	6400		1200		2600		2900		1500		6900		26810	
NS-16	19700		5400	J	7800		5600		4300		22000		85600	M

HI-SHELL000497

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	BENZOIC ACID		BENZYL ALCOHOL		DIBENZOFURAN		N-NITROSODIPHENYLAMINE		2-METHYLPHENOL		2,4-DIMETHYLPHENOL		4-METHYLPHENOL	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	180	U	18	U	36		18	U	18	U	18	U	18	U
NS-02	190	U	19	U	110		19	U	19	U	19	U	19	U
NS-03	190	U	19	U	58		19	U	19	U	19	U	19	U
NS-04-HC	180	U	18	U	86		18	U	18.5	U	18	U	18	U
NS-05	180	U	18	U	20		18	U	18	U	18	U	18	U
NS-06	190	U	19	U	19	U	19	U	19	U	19	U	19	U
NS-07	140	U	14	U	140		14	U	14	U	14	U	26	
NS-08-HC	150	U	15	U	33		15	U	14.5	U	15	U	15	U
NS-09	490	U	49	U	94		49	U	49	U	49	U	49	U
NS-10	180	U	18	U	21		18	U	18	U	18	U	18	
NS-11	190	U	19	U	37		19	U	19	U	19	U	19	U
NS-12	190	U	19	U	33		19	U	19	U	19	U	19	U
NS-13	190	U	19	U	20		19	U	19	U	19	U	19	U
NS-14	670	U	67	U	140		67	U	67	U	67	U	67	U
NS-16	180	U	18	U	22		18	U	18	U	18	U	42	

HI-SHELL000498

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	PENTACHLOROPHENOL		PHENOL		1,2-DICHLOROBENZENE		1,2,4-TRICHLOROBENZENE		1,3-DICHLOROBENZENE		1,4-DICHLOROBENZENE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	90	U	73		18	U	18	U	18	U	25	
NS-02	97	U	140		19	U	19	U	19	U	19	U
NS-03	93	U	80		19	U	19	U	19	U	19	U
NS-04-HC	92	U	18	U	18	U	18	U	18	U	18	U
NS-05	91	U	18	U	18	U	18	U	18	U	18	U
NS-06	96	U	19	U	19	U	19	U	19	U	19	U
NS-07	69	U	130		14	U	14	U	14	U	14	U
NS-08-HC	73	U	15	U	15	U	15	U	15	U	15	U
NS-09	250	U	57	M	49	U	49	U	49	U	49	U
NS-10	89	U	24	M	18	U	18	U	18	U	18	U
NS-11	95	U	60		19	U	19	U	19	U	19	
NS-12	96	U	19	U	19	U	19	U	19	U	19	U
NS-13	93	U	39		19	U	19	U	19	U	19	U
NS-14	340	U	67	U	67	U	67	U	67	U	67	U
NS-16	88	U	140		18	U	18	U	18	U	18	U

HI-SHELL000499

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	HEXACHLOROBUTADIENE		DI-N-OCTYL PHTHALATE		BIS(2-ETHYLHEXYL)PHTHALATE		BUTYLBENZYLPHTHALATE		DIETHYL PHTHALATE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	18	U	18	U	120	U	18	U	18	U
NS-02	19	U	19	U	140	U	19	U	27	U
NS-03	19	U	19	U	240	U	36	U	19	U
NS-04-HC	18	U	18	U	200	C	28	C	18	U
NS-05	18	U	18	U	110	U	18	U	18	U
NS-06	19	U	19	U	110	U	20	U	19	U
NS-07	14	U	14	U	500		74	U	14	U
NS-08-HC	15	U	15	U	240		26	C	15	U
NS-09	49	U	49	U	1400	U	120	U	49	U
NS-10	18	U	18	U	190	U	51	U	18	U
NS-11	19	U	27		280	U	66	U	19	U
NS-12	19	U	19	U	100		19	U	19	U
NS-13	19	U	19	U	98	U	21	U	19	U
NS-14	67	U	67	U	1700	U	140	U	67	U
NS-16	18	U	18	U	360	U	56	U	18	U

HI-SHELL000500

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins In Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	DIMETHYL PHTHALATE		DI-N-BUTYL PHTHALATE		GAMMA-HCH (LINDANE)		HEXACHLOROBENZENE		ALDRIN		ALPHA-CHLORDANE	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	18	U	18	U	0.9	U	0.9	U	2.2		0.9	U
NS-02	19	U	19	U	0.97	U	0.97	U	0.97	U	0.97	U
NS-03	19	U	19	U	0.93	U	0.93	U	0.93	U	0.93	U
NS-04-HC	18	U	18	U	0.92	U	0.92	U	0.92	U	0.92	U
NS-05	18	U	18	U	0.91	U	0.91	U	0.91	U	0.91	U
NS-06	19	U	19	U	0.96	U	0.96	U	0.96	U	0.96	U
NS-07	14	U	17	U	0.68	U	0.68	U	0.68	U	0.68	U
NS-08-HC	15	U	15	U	14	U	14	U	14	U	14	U
NS-09	49	U	49	U	2.5	U	2.5	U	2.5	U	2.5	U
NS-10	18	U	18	U	0.89	U	0.89	U	0.89	U	0.89	U
NS-11	19	U	19	U	0.95	U	0.95	U	2.6		0.95	U
NS-12	19	U	19	U	0.96	U	0.96	U	1.9		0.96	U
NS-13	19	U	19	U	0.93	U	0.93	U	0.93	U	0.93	U
NS-14	67	U	67	U	3.4	U	3.4	U	9.4		3.4	U
NS-16	18	U	18	U	0.88	U	0.88	U	0.88	U	0.88	U

HI-SHELL000501

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	GAMMA-CHLORDANE		DIELDRIN		HEPTACHLOR		AROCLOR-1016		AROCLOR-1221		AROCLOR-1232		AROCLOR-1242		AROCLOR-1248	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	3.4	Y	1.8	U	0.9	U	18	U	36	U	18	U	41		18	U
NS-02	3.3	Y	1.9	U	0.97	U	19	U	39	U	19	U	19	U	19	U
NS-03	3.5	Y	1.9	U	0.93	U	19	U	37	U	19	U	19	U	19	U
NS-04-HC	0.92	U	1.8	U	0.92	U	18	U	37	U	18	U	18	U	18	U
NS-05	1.6	Y	1.8	U	0.91	U	18	U	36	U	18	U	18	U	18	U
NS-06	0.96	U	1.9	U	0.96	U	19	U	38	U	19	U	19	U	19	U
NS-07	2.9		1.4	U	0.68	U	14	U	27	U	14	U	25		14	U
NS-08-HC	14	U	28	U	14	U	280	U	560	U	280	U	280	U	280	U
NS-09	5.9	Y	4.9	U	2.5	U	49	U	99	U	49	U	49	U	49	U
NS-10	4.1	Y	1.8	U	0.89	U	18	U	36	U	18	U	23	Y	18	U
NS-11	2.8	Y	1.9	U	0.95	U	19	U	38	U	19	U	19	U	19	U
NS-12	3.3	Y	1.9	U	0.96	U	19	U	38	U	19	U	21		19	U
NS-13	2.2	Y	1.9	U	0.93	U	19	U	37	U	19	U	19	U	19	U
NS-14	11	Y	6.7	U	3.4	U	67	U	130	U	67	U	94		67	U
NS-16	3.3	Y	1.8	U	0.88	U	18	U	35	U	18	U	19	Y	18	U

HI-SHELL000502

Concentration of Semivolatile Organic Compounds, Pesticides, PCBs, and Butyl Tins in Surface Sediments of the North Shore (µg/kg dry weight) - Harbor Island Supplementary RI 1995

STATION	AROCLOR-1254		AROCLOR-1260		PCBS, TOTAL		P,P'-DDD		P,P'-DDE		P,P'-DDT		BUTYLTIN		DIBUTYLTIN		TRIBUTYLTIN	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	18	U	400		<549		2.7		3.4	Y	7.2	Y			15	U	41	
NS-02	66		97		<278		3.1		2.7	Y	2.9	Y	16	J	87		320	
NS-03	69		93		<275		4.3		3.4	Y	3.9	Y	20	J	120		360	
NS-04-HC	33		30		<172		1.8	U	1.8	U	1.8	U	46		150		440	J
NS-05	130		140		<378		2.7		1.8	U	4.7	Y	26	J	100	J	180	
NS-06	54		63		<231		2.9		1.9	U	4.2	Y	80	J	210	J	730	
NS-07	67		79		<240		2.7	J	1.4	U	1.4	U	67	J	210		590	
NS-08-HC	170	J	280	U	<2130	J	28	U	28	U	28	U	150		460		1700	J
NS-09	49	U	1000		<1344		7.9		13	Y	21	Y	590	J	2100		8400	
NS-10	100		120		<333	Y	4.1		5.5	Y	5	Y	230	J	990		2300	
NS-11	140		100		<354		4.9		7.4	Y	6.3	Y	65	J	330		1300	
NS-12	150		330		<596		6		5.6	Y	6.9	Y			66		160	
NS-13	72		58		<243		14		2.2	Y	2.2	Y	26	J	83	J	170	
NS-14	540		740		<1705		29		28	Y	28	Y	600	J	2200		15000	
NS-16	88	Y	230		<426	Y	14	Y	1.8	U	16	Y	34	J	130		230	

HI-SHELL000503

Measurements of Conventional Parameters in Surface Sediments of the North Shore - Harbor Island Supplementary RI 1995

STATION	AMMONIA-NITROGEN		AVS		PERCENT MOISTURE		SALINITY, PORE WATER		SOIL PH		PERCENT TOC		SULFIDE	
	mg-N/kg		mg/kg				ppt		pH				mg/kg	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
NS-01	2.9		1.5	U	57.9				7.5		1.2		5	
NS-02	3.5		66		54.2				7.6		1.4		92	
NS-02	5.5						28.5							
NS-03	5.9		160		47.6		28		7.7		1.2		420	
NS-04-HC	6.4								7.8		1		5.7	UJ
NS-05	3.5		7.7	J	48.4				6.9		1.1		32	J
NS-06	5.6		19	J	56.2				7.6		1.4		10	J
NS-07	3.2		1.3	U	49.2		30		7.7		0.82		1.5	U
NS-08-HC	6								7.8		1.2		39	J
NS-09	2.7		570		59.1		29		7.7		1		270	
NS-10	2.3		60		44.3				7.5		0.93		32	
NS-11	3.6		57		51.4		28		7.6		0.98		44	
NS-12	2.7		7.6		73.2				7.5		1.5		11	
NS-13	2.7		34	J	49.3		30		7.6		1.1		11	J
NS-14	12		1700		116.6		25		8		1.8		1800	
NS-15	3.9		58		69.8				7.6		1.4			
NS-16	3.6		12		46.5				7.5		0.77		1.5	U

HI-SHELL000504

Measurements of Conventional Parameters in Surface Sediments of the North Shore - Harbor Island Supplementary RI 1995

TOTAL SOLIDS		PRESERVED TOTAL SOLIDS		TOTAL VOLATILE SOLIDS		PERCENT GRAVEL		PERCENT SAND		PERCENT SILT		PERCENT CLAY	
%		%		mg/kg									
CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
63		57.1		23000	J	1		29		52		18	
65.6		62.1		24000	J			73		20		7	
67.9		61.2		20000	J			64		26		10	
63.5		66.1		18000									
67.2		63.2		16000				70		23		7	
64.2		61		21000				58		32		10	
66.8		64.2		23000				75		19		6	
64.4		64.4		26000									
63.6		63.6		22000	J			64		26		10	
69.4		68.2		17000	J			65		28		7	
66.7		64.8		20000	J			68		22		10	
58.7		55		23000	J			45		39		16	
67.7		63.7		17000				70		21		9	
46.6		42.7		24000	J			43		40		17	
59				24000	J			42		41		17	
69.8		67.4		14000	J	1		85		9		5	

HI-SHELL000505

APPENDIX B

ANALYTICAL RESULTS FOR SUBSURFACE CORE SAMPLES

DATA VALIDATION QUALIFIER CODES

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

QUALIFIER	DEFINITION
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M	The spectral match between the detected compound spectra and the standard reference spectra did not meet all of the acceptance criteria; but the compound is presumed present.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U and Y	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table B-1 - Concentrations of Conventionals in Subsurface Sediment Core Sample

Sample ID	Depth Interval in Feet	N-Ammonia in mg/kg		Total Solids in Percent		Sulfide in mg/kg	
		CONC	QUAL	CONC	QUAL	CONC	QUAL
East Waterway							
HI-EW-01-S1	0 to 2.1	23		63		8.7	J
HI-EW-01-S2	2.1 to 4.3	23		72		25	J
HI-EW-01-S3	4.3 to 9.3	77		73		22	J
HI-EW-06-S1	0 to 1.7	160		44		720	J
HI-EW-06-S2	1.7 to 5.2	150		61		210	J
HI-EW-06-S3	5.2 to 8.8	130		59		22	J
HI-EW-11-S1	0 to 1.3	62		54		20	J
HI-EW-11-S2	1.3 to 5	120		64		54	J
HI-EW-11-S3	5 to 8.2	42		78		22	J
West Waterway							
HI-WW-05-S1	0 to 1.4	14		52		420	J
HI-WW-05-S2	1.4 to 4.7	9.9		72		6.4	J
HI-WW-05-S3	4.7 to 8	7.6		79		1.6	UJ
HI-WW-10-S1	0 to 2.1	7		55		230	J
HI-WW-10-S2	2.1 to 3.8	3.4		76		1200	J
HI-WW-10-S3	3.8 to 6.3	12		73		74	J
HI-WW-18-S1	0 to 1.7	5		59		1200	J
HI-WW-18-S2	1.7 to 6.3	25		73		3	J
HI-WW-18-S3	6.3 to 8	38		76		1.4	J
HI-WW-27-S1	0 to 2.3	7.2		73		32	J
HI-WW-27-S2	2.3 to 5.2	36		76		24	J
HI-WW-27-S3	5.2 to 9.1	64		72		7.6	J
HI-WW-30-S1	0 to 1.6	2.7		67		120	J
HI-WW-30-S2	1.6 to 3.8	6.2		68		60	J
HI-WW-30-S3	3.8 to 6.5	20		75		120	J
North Shore							
HI-NS-04-80 (1)	4.2 to 9.4	36		75		45	J
HI-NS-04-S1	0 to 2.5	3.4		75		8.6	J
HI-NS-04-S2	2.5 to 4.2	8.1		66		66	J
HI-NS-04-S3	4.2 to 9.4	32		75		84	J
HI-NS-08-80 (2)	2.1 to 4.9	11		80		6	J
HI-NS-08-S1	0 to 2.1	2.1		70		1.8	J
HI-NS-08-S2	2.1 to 4.9	11		79		45	J
HI-NS-08-S3	4.9 to 8.3	47		70		130	J

(1) HI-NS-04-80 is the duplicate of HI-NS-04-S3
(2) HI-NS-08-80 is the duplicate of HI-NS-08-S2
U Not detected at indicated detection limit.
J Estimated value.

Table B-2 - Concentrations of Mercury in Subsurface Sediment Core Samples

Sample ID	Depth Interval in Feet	Mercury in mg/kg	
		CONC	QUAL
East Waterway			
HI-EW-01-S1	0 to 2.1	0.22	
HI-EW-01-S2	2.1 to 4.3	0.1	
HI-EW-01-S3	4.3 to 9.3	0.06	U
HI-EW-06-S1	0 to 1.7	1.73	
HI-EW-06-S2	1.7 to 5.2	0.69	
HI-EW-06-S3	5.2 to 8.8	0.47	
HI-EW-11-S1	0 to 1.3	0.44	
HI-EW-11-S2	1.3 to 5	0.21	
HI-EW-11-S3	5 to 8.2	0.05	U
West Waterway			
HI-WW-05-S1	0 to 1.4	0.79	
HI-WW-05-S2	1.4 to 4.7	0.26	
HI-WW-05-S3	4.7 to 8	0.06	U
HI-WW-10-S1	0 to 2.1	0.77	
HI-WW-10-S2	2.1 to 3.8	0.15	
HI-WW-10-S3	3.8 to 6.3	0.06	U
HI-WW-18-S1	0 to 1.7	3.8	
HI-WW-18-S2	1.7 to 6.3	0.16	
HI-WW-18-S3	6.3 to 8	0.06	U
HI-WW-27-S1	0 to 2.3	0.35	
HI-WW-27-S2	2.3 to 5.2	0.06	U
HI-WW-27-S3	5.2 to 9.1	0.06	U
HI-WW-30-S1	0 to 1.6	3	
HI-WW-30-S2	1.6 to 3.8	0.07	U
HI-WW-30-S3	3.8 to 6.5	0.06	U
North Shore			
HI-NS-04-80	4.2 to 9.4	0.06	U
HI-NS-04-S1	0 to 2.5	0.26	
HI-NS-04-S2	2.5 to 4.2	0.06	U
HI-NS-04-S3	4.2 to 9.4	0.06	U
HI-NS-08-80	2.1 to 4.9	0.06	U
HI-NS-08-S1	0 to 2.1	0.82	
HI-NS-08-S2	2.1 to 4.9	0.06	U
HI-NS-08-S3	4.9 to 8.3	0.08	

U Not detected at indicated detection limit.
J Estimated value.

APPENDIX C

ANALYTICAL RESULTS FOR NATURAL RECOVERY STATION SUBSURFACE CORE SAMPLES

DATA VALIDATION QUALIFIER CODES

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

QUALIFIER	DEFINITION
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M	The spectral match between the detected compound spectra and the standard reference spectra did not meet all of the acceptance criteria; but the compound is presumed present.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U and Y	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table C-1 - Concentrations of Conventionals in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Total Organic Carbon in Percent		Total Solids in Percent	
		CONC	QUAL	CONC	QUAL
West Waterway					
HI-NR-01-S-1	0 to 2	2.7		52	
HI-NR-01-S-2	2 to 4	2		57	
HI-NR-01-S-3	4 to 6	2		54	
HI-NR-01-S-4	6 to 8	2.2		55	
HI-NR-01-S-5	8 to 10	2.1		56	
HI-NR-01-S-6	10 to 12	NA		59	
HI-NR-01-S-7	12 to 14	NA		59	
HI-NR-01-S-8	14 to 16	NA		56	
HI-NR-01-S-9	16 to 18	NA		58	
HI-NR-01-S-12	22 to 24	NA		56	
HI-NR-01-S-15	28 to 30	NA		46	
HI-NR-01-S-16	30 to 32	NA		56	
HI-NR-01-S-18	34 to 36	NA		59	
HI-NR-01-S-19	36 to 38	NA		60	
HI-NR-01-S-22	42 to 44	NA		66	
HI-NR-01-S-25	48 to 50	NA		68	
HI-NR-01-S-28	54 to 56	NA		73	
HI-NR-01-S-31	60 to 62	NA		71	
HI-NR-01-S-38	74 to 76	NA		75	
HI-NR-01-S-39	76 to 78	NA		75	
HI-NR-01-S-45	88 to 90	NA		72	
HI-NR-01-S-46	36 to 38	NA		61.8	
HI-NR-01-S-47	30 to 32	NA		45	
HI-NR-02-S-1	0 to 2	1.4		64	
HI-NR-02-S-2	2 to 4	1.8		61	
HI-NR-02-S-3	4 to 6	1.9		57	
HI-NR-02-S-4	6 to 8	1.7		56	
HI-NR-02-S-5	8 to 10	2.2		55	
HI-NR-02-S-6	10 to 12	NA		54	
HI-NR-02-S-7	12 to 14	NA		55	
HI-NR-02-S-8	14 to 16	NA		65	
HI-NR-02-S-9	16 to 18	NA		64	
HI-NR-02-S-12	22 to 24	NA		57	
HI-NR-02-S-15	28 to 30	NA		58.4	
HI-NR-02-S-16	30 to 32	NA		58	
HI-NR-02-S-19	36 to 38	NA		66	
HI-NR-02-S-22	42 to 44	NA		73	
HI-NR-02-S-25	48 to 50	NA		78	
HI-NR-02-S-28	54 to 56	NA		79	
HI-NR-02-S-31	60 to 62	NA		79	
HI-NR-02-S-38	74 to 76	NA		79	

Table C-1 - Concentrations of Conventionals in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Total Organic Carbon in Percent		Total Solids in Percent	
		CONC	QUAL	CONC	QUAL
HI-NR-02-S-39	76 to 78	NA		82	
HI-NR-02-S-45	88 to 90	NA		81	
HI-NR-02-S-46	28 to 30	NA		58.5	
HI-NR-02-S-47	30 to 32	NA		40	
East Waterway		NA			
HI-NR-03-S-1	0 to 2	2.2		50	
HI-NR-03-S-2	2 to 4	1.8		50	
HI-NR-03-S-3	4 to 6	2		52	
HI-NR-03-S-4	6 to 8	1.7		55	
HI-NR-03-S-5	8 to 10	1.5		61	
HI-NR-03-S-6	10 to 12	NA		60	
HI-NR-03-S-7	12 to 14	NA		63	
HI-NR-03-S-8	14 to 16	NA		69	
HI-NR-03-S-9	16 to 18	NA		66	
HI-NR-03-S-12	22 to 24	NA		40	
HI-NR-03-S-15	28 to 30	NA		57.2	
HI-NR-03-S-16	30 to 32	NA		51	
HI-NR-03-S-19	36 to 38	NA		48	
HI-NR-03-S-22	42 to 44	NA		41	
HI-NR-03-S-25	48 to 50	NA		46	
HI-NR-03-S-28	54 to 56	NA		47	
HI-NR-03-S-31	60 to 62	NA		46	
HI-NR-03-S-38	74 to 76	NA		38	
HI-NR-03-S-39	76 to 78	NA		48	
HI-NR-03-S-45	88 to 90	NA		48	
HI-NR-03-S-46	28 to 30	NA		57.6	
HI-NR-03-S-47	30 to 32	NA		49	
HI-NR-04-S-1	0 to 2	2.3		48	
HI-NR-04-S-2	2 to 4	2.2		54	
HI-NR-04-S-3	4 to 6	2.7		55	
HI-NR-04-S-4	6 to 8	2.5		54	
HI-NR-04-S-5	8 to 10	2.7		56	
HI-NR-04-S-6	10 to 12	NA		60	
HI-NR-04-S-7	12 to 14	NA		67	
HI-NR-04-S-8	14 to 16	NA		63	
HI-NR-04-S-9	16 to 18	NA		60	
HI-NR-04-S-12	22 to 24	NA		45	
HI-NR-04-S-15	28 to 30	NA		56.7	
HI-NR-04-S-16	30 to 32	NA		59	
HI-NR-04-S-19	36 to 38	NA		55	
HI-NR-04-S-22	42 to 44	NA		45	
HI-NR-04-S-25	48 to 50	NA		43	
HI-NR-04-S-28	54 to 56	NA		44	

Table C-1 - Concentrations of Conventionals in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Total Organic Carbon in Percent		Total Solids in Percent	
		CONC	QUAL	CONC	QUAL
HI-NR-04-S-3 1	60 to 62	NA		42	
HI-NR-04-S-3 8	74 to 76	NA		54	
HI-NR-04-S-39	76 to 78	NA		56	
HI-NR-04-S-45	88 to 90	NA		55	
HI-NR-04-S-46	28 to 30	NA		58.2	
HI-NR-04-S-47	30 to 32	NA		60	
		NA			

NA Not analyzed.

Table C-2 - Concentrations of Cesium-137 and Lead-210 in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Cesium-137 inDPM/g		Lead-210 in DPM/g	
		CONC	QUAL	CONC	QUAL
West Waterway					
HI-NR-01-S-1	0 to 2	0.2		2.5	
HI-NR-01-S-2	2 to 4	0.25		2.7	
HI-NR-01-S-3	4 to 6	0.3		2.3	
HI-NR-01-S-4	6 to 8	0.25		2.2	
HI-NR-01-S-5	8 to 10	0.32		2.4	
HI-NR-01-S-6	10 to 12	0.41		1.5	
HI-NR-01-S-7	12 to 14	0.43		1.8	
HI-NR-01-S-8	14 to 16	0.23		2.1	
HI-NR-01-S-9	16 to 18	0.22		1.7	
HI-NR-01-S-12	22 to 24	0.42		2	
HI-NR-01-S-16	30 to 32	0.4		1.4	
HI-NR-01-S-18	34 to 36	0.22		1.3	
HI-NR-01-S-22	42 to 44	0.1	U	1.4	
HI-NR-01-S-25	48 to 50	0.1	U	1.2	
HI-NR-01-S-28	54 to 56	0.1	U	1.2	
HI-NR-01-S-31	60 to 62	0.1	U	1.1	
HI-NR-01-S-39	76 to 78	0.1	U	1	
HI-NR-01-S-45	88 to 90	0.1	U	1.3	
HI-NR-01-S-47	30 to 32	0.46		1.3	
HI-NR-02-S-1	0 to 2	0.1		1.3	
HI-NR-02-S-2	2 to 4	0.19		1.5	
HI-NR-02-S-3	4 to 6	0.21		2	
HI-NR-02-S-4	6 to 8	0.45		1.9	
HI-NR-02-S-5	8 to 10	0.33		1.9	
HI-NR-02-S-6	10 to 12	0.44		1.7	
HI-NR-02-S-7	12 to 14	0.42		1.5	
HI-NR-02-S-8	14 to 16	0.33		1.7	
HI-NR-02-S-9	16 to 18	0.28		1.7	
HI-NR-02-S-12	22 to 24	0.41		1.5	
HI-NR-02-S-16	30 to 32	0.23		1.8	
HI-NR-02-S-19	36 to 38	0.13		1.1	
HI-NR-02-S-22	42 to 44	0.1	U	1.3	
HI-NR-02-S-25	48 to 50	0.1	U	1	
HI-NR-02-S-28	54 to 56	0.1	U	1.4	
HI-NR-02-S-31	60 to 62	0.1	U	1.2	
HI-NR-02-S-39	76 to 78	0.1	U	1.2	
HI-NR-02-S-45	88 to 90	0.1	U	1.3	
HI-NR-02-S-47	30 to 32	0.22		1.3	
East Waterway					
HI-NR-03-S-1	0 to 2	0.26		1.8	
HI-NR-03-S-2	2 to 4	0.39		2.1	
HI-NR-03-S-3	4 to 6	0.4		2	
HI-NR-03-S-4	6 to 8	0.43		1.8	

Table C-2 - Concentrations of Cesium-137 and Lead-210 in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Cesium-137 in DPM/g		Lead-210 in DPM/g	
		CONC	QUAL	CONC	QUAL
HI-NR-03-S-5	8 to 10	0.25		1.3	
HI-NR-03-S-6	10 to 12	0.17		1.2	
HI-NR-03-S-7	12 to 14	0.15		1	
HI-NR-03-S-8	14 to 16	0.1	U	0.73	
HI-NR-03-S-9	16 to 18	0.18		1	
HI-NR-03-S-12	22 to 24	0.79		1.4	
HI-NR-03-S-16	30 to 32	0.52		1.2	
HI-NR-03-S-19	36 to 38	0.73		2.1	
HI-NR-03-S-22	42 to 44	0.74		2	
HI-NR-03-S-25	48 to 50	0.71		1.7	
HI-NR-03-S-28	54 to 56	1.5		1.5	
HI-NR-03-S-31	60 to 62	1.7		1.4	
HI-NR-03-S-39	76 to 78	1.1		1.2	
HI-NR-03-S-45	88 to 90	0.25		1.3	
HI-NR-03-S-47	30 to 32	0.56		1.4	
HI-NR-04-S-I	0 to 2	0.5		2.5	
HI-NR-04-S-2	2 to 4	0.39		1.6	
HI-NR-04-S-3	4 to 6	0.59		1.6	
HI-NR-04-S-4	6 to 8	0.65		1.2	
HI-NR-04-S-5	8 to 10	0.53		1.2	
HI-NR-04-S-6	10 to 12	0.45		1.1	
HI-NR-04-S-7	12 to 14	0.1	U	0.71	
HI-NR-04-S-8	14 to 16	0.14		0.73	
HI-NR-04-S-9	16 to 18	0.18		1.2	
HI-NR-04-S-12	22 to 24	1.2		1.6	
HI-NR-04-S-16	30 to 32	0.52		1.3	
HI-NR-04-S-19	36 to 38	0.83		1.2	
HI-NR-04-S-22	42 to 44	1.3		1.4	
HI-NR-04-S-25	48 to 50	0.9		1.2	
HI-NR-04-S-28	54 to 56	0.76		1.6	
HI-NR-04-S-31	60 to 62	0.53		1.1	
HI-NR-04-S-39	76 to 78	0.1	U	1	
HI-NR-04-S-45	88 to 90	0.1	U	1.2	
HI-NR-04-S-47	30 to 32	0.44		1.5	

U Not detected at indicated detection limit.

Table C-3 - Concentrations of Mercury and Total PCBs in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Mercury in mg/kg		Aroclor 1016 in µg/kg		Aroclor 1242 in µg/kg		Aroclor 1248 in µg/kg		Aroclor 1254 in µg/kg		Aroclor 1260 in µg/kg		Total PCBs in µg/kg	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
West Waterway															
HI-NR-01-S-1	0 to 2	0.54		17	U	24	U	50	U	130		76		< 297	
HI-NR-01-S-2	2 to 4	0.57		17	U	17	U	34	U	120		57		< 245	
HI-NR-01-S-3	4 to 6	0.6		18	U	18	U	29	U	100		56		< 221	
HI-NR-01-S-4	6 to 8	0.73		18	U	18	U	25	U	110		74		< 245	
HI-NR-01-S-5	8 to 10	0.59		18	U	18	U	20	U	140		81		< 277	
HI-NR-01-S-6	10 to 12	0.61		17	U	37	U	25	U	120		190		< 389	
HI-NR-01-S-7	12 to 14	0.41		17	U	32	U	32	U	86		71		< 238	
HI-NR-01-S-8	14 to 16	1.51		18	U	36	U	43	U	130		64		< 291	
HI-NR-01-S-9	16 to 18	0.55		17	U	40	U	43	U	130		84		< 314	
HI-NR-01-S-12	22 to 24	0.73		18	U	81	U	60	U	170		92		< 421	
HI-NR-01-S-15	28 to 30	0.82		20	U	41	U	120	U	320		160		< 661	
HI-NR-01-S-19	36 to 38	0.84		17	U	17	U	76	U	100		50		< 260	
HI-NR-01-S-22	42 to 44	0.86		19	U	27	U	88	U	89		42		< 265	
HI-NR-01-S-25	48 to 50	0.35		18	U	18	U	55	U	52		20		< 163	
HI-NR-01-S-28	54 to 56	0.2	U	17	U	17	U	22	U	20		17	U	< 93	
HI-NR-01-S-31	60 to 62	0.26	U	17	U	17	U	26	U	26		17	U	< 103	
HI-NR-01-S-38	74 to 76	0.16	U	16	U	16	U	39	U	31		16	U	< 118	
HI-NR-01-S-45	88 to 90	0.18		17	U	17	U	50	U	44		20		< 148	
HI-NR-01-S-46	36 to 38	1.01		18	U	32	U	94	U	120		50		< 314	
HI-NR-02-S-1	0 to 2	0.4		19	U	36	U	19	U	100		51		< 225	
HI-NR-02-S-2	2 to 4	0.67		18	U	67	U	40	U	130		86		< 341	
HI-NR-02-S-3	4 to 6	0.81		19	U	67	U	75	U	150		110		< 421	
HI-NR-02-S-4	6 to 8	0.68		19	U	82	U	25	U	130		110		< 366	
HI-NR-02-S-5	8 to 10	1.04		18	U	79	U	18	U	160		99		< 374	
HI-NR-02-S-6	10 to 12	0.78		18	U	71	U	18	U	140		89		< 336	
HI-NR-02-S-7	12 to 14	1.03		18	U	73	U	43	U	130		83		< 347	
HI-NR-02-S-8	14 to 16	0.75		19	U	62	U	70	U	260		160		< 571	
HI-NR-02-S-9	16 to 18	0.81		19	U	46	U	95	U	350		170		< 680	
HI-NR-02-S-12	22 to 24	1.97		19	U	38	U	230	U	830		420		< 1537	

HI-SHELL000518

Table C-3 - Concentrations of Mercury and Total PCBs in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Mercury in mg/kg		Aroclor 1016 in µg/kg		Aroclor 1242 in µg/kg		Aroclor 1248 in µg/kg		Aroclor 1254 in µg/kg		Aroclor 1260 in µg/kg		Total PCBs in µg/kg	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
HI-NR-02-S-15	28 to 30	1.41		19	U	100	U	280	U	440		260		< 1099	
HI-NR-02-S-19	36 to 38	0.58		19	U	19	U	22	U	49		34		< 143	
HI-NR-02-S-22	42 to 44	0.36		17	U	17	U	17	U	28		12	J	< 91	J
HI-NR-02-S-25	48 to 50	0.22	U	16	U	16	U	16	U	12	J	16	U	< 76	J
HI-NR-02-S-28	54 to 56	0.08	U	16	U	16	U	16	U	16	U	16	U	< 80	
HI-NR-02-S-31	60 to 62	0.08	U	16	U	16	U	16	U	16	U	16	U	< 80	
HI-NR-02-S-38	74 to 76	0.08	U	18	U	18	U	18	U	18	U	18	U	< 90	
HI-NR-02-S-45	88 to 90	0.23	U	17	U	17	U	17	U	17	U	17	U	< 85	
HI-NR-02-S-46	28 to 30	1.35		19	U	320		410	U	710		440		< 1899	
East Waterway															
HI-NR-03-S-1	0 to 2	0.46		18	U	18	U	18	U	280		580		< 914	
HI-NR-03-S-2	2 to 4	0.61		18	U	18	U	29	U	250		560		< 875	
HI-NR-03-S-3	4 to 6	0.53		17	U	17	U	31	U	190		320		< 575	
HI-NR-03-S-4	6 to 8	0.53		16	U	41	U	26	U	180		370		< 633	
HI-NR-03-S-5	8 to 10	0.38		15	U	15	U	24	U	140		280		< 474	
HI-NR-03-S-6	10 to 12	0.4		18	U	18	U	18	U	78		200		< 332	
HI-NR-03-S-7	12 to 14	0.36		17	U	17	U	17	U	56		88		< 195	
HI-NR-03-S-8	14 to 16	0.21	U	16	U	16	U	16	U	71		110		< 229	
HI-NR-03-S-9	16 to 18	0.18	U	17	U	20	U	39	U	130		140		< 346	
HI-NR-03-S-12	22 to 24	0.16	U	19	U	19	U	19	U	49		45		< 151	
HI-NR-03-S-15	28 to 30	0.43		19	U	38	U	50	U	210		350		< 667	
HI-NR-03-S-19	36 to 38	1.11		19	U	640		640	U	1200		840		< 3339	
HI-NR-03-S-22	42 to 44	1.34		18	U	290	U	420	U	1800		1000		< 3528	
HI-NR-03-S-25	48 to 50	1.04		20	U	330	U	570	U	1300		1200		< 3420	
HI-NR-03-S-28	54 to 56	1.13		19	U	110	U	250	U	550		780		< 1709	
HI-NR-03-S-31	60 to 62	1.78		20	U	180	U	390	U	660		1000		< 2250	
HI-NR-03-S-38	74 to 76	1.47		19	U	570	U	47	U	700		740		< 2076	
HI-NR-03-S-45	88 to 90	2.21		19	U	47	U	51	U	380		770		< 1267	
HI-NR-03-S-46	28 to 30	0.39		19	U	38	U	44	U	140		250		< 491	

HI-SHELL000519

Table C-3 - Concentrations of Mercury and Total PCBs in Natural Recovery Subsurface Core Samples

Sample ID	Depth Interval in cm	Mercury in mg/kg		Aroclor 1016 in µg/kg		Aroclor 1242 in µg/kg		Aroclor 1248 in µg/kg		Aroclor 1254 in µg/kg		Aroclor 1260 in µg/kg		Total PCBs in µg/kg	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
HI-NR-04-S-1	0 to 2	0.51		19	U	27	U	44	U	170		320		580	<
HI-NR-04-S-2	2 to 4	1.88		17	U	68	U	75	U	220		480		860	<
HI-NR-04-S-3	4 to 6	1.38		17	U	170	U	220	U	420		670		1497	<
HI-NR-04-S-4	6 to 8	1.7		17	U	170	U	190	U	400		660		1437	<
HI-NR-04-S-5	8 to 10	0.98		20	U	160	U	160	U	370		550		1260	<
HI-NR-04-S-6	10 to 12	0.37		19	U	93	U	110	U	200		290		712	<
HI-NR-04-S-7	12 to 14	0.12		17	U	38	U	37	U	70		100		262	<
HI-NR-04-S-8	14 to 16	0.17		17	U	59	U	63	U	100		120		359	<
HI-NR-04-S-9	16 to 18	1.53		19	U	280	U	280	U	380		450		1409	<
HI-NR-04-S-12	22 to 24	2		16	U	1000	U	1100	U	1200		1400		4716	<
HI-NR-04-S-15	28 to 30	0.7		20	U	180	U	170	U	560		850		1780	<
HI-NR-04-S-19	36 to 38	0.87		17	U	220	U	220	U	570		790		1817	<
HI-NR-04-S-22	42 to 44	1.71		460	U	460	U	460	U	1300		1400		4080	<
HI-NR-04-S-25	48 to 50	1.35		620	U	620	U	16	U	1300		590		3146	<
HI-NR-04-S-28	54 to 56	1.79		520	U	520	U	360	U	1400		2000		48	<
HI-NR-04-S-31	60 to 62	1.79		190	U	190	U	110	U	620		1600		2700	<
HI-NR-04-S-38	74 to 76	0.56		15	U	15	U	15	U	15	U	30		10	<
HI-NR-04-S-45	88 to 90	0.61		23	U	23	U	23	U	14	U	69		90	<
HI-NR-04-S-46	28 to 30	0.65		52	U	52	U	120	U	520		640		152	<
														1384	<

Notes:

< Total PCBs includes the full reporting limits of nondetected aroclors.

U Not detected at the indicated detection limit.

APPENDIX D

ANALYTICAL RESULTS FOR NATURAL RECOVERY STATIONS SEDIMENT TRAP SAMPLES

DATA VALIDATION QUALIFIER CODES

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

QUALIFIER	DEFINITION
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
M	The spectral match between the detected compound spectra and the standard reference spectra did not meet all of the acceptance criteria; but the compound is presumed present.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U and Y	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

HI-SHELL000522

Table D-1 - Total Metal Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Sampling Date	Concentrations in mg/kg (ppm) Antimony		Arsenic		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Silver		Zinc	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	05/16/95	10	U	15		0.61		41		132		95		0.46		24		0.81		173	
ST-02	05/16/95													1							
ST-03	05/16/95	9	U	10.9		1.32		40.7		85.2		84		0.39		27		0.92		153	
ST-04	05/17/95	10	U	15		1.38		47		109		113		2.25		29		1.39		202	
ST-05	05/17/95													0.38							

Notes:

U Not detected at indicated detection limit.

HI-SHELL000523

Table D-2 - Conventionals and Radioactive Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Sampling Date	N-Ammonia in mg/kg	Total Organic Carbon in Percent	Total Solids in Percent	Lead-210 in DPM/g
ST-01	05/16/95	350	2.7	47.1	2.2
ST-02	05/16/95		2.6	37.9	1.9
ST-03	05/16/95	340	2.8	51.2	1.9
ST-04	05/17/95	93	2.3	49.4	2.3
ST-05	05/17/95		2.9	46.5	2.6

Notes:
U Not detected at indicated detection limit.

HI-SHELL000524

Table D-3 - OCPesticide Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Sampling Date	Concentrations in µg/kg (ppb)																			
		4,4'-DDD		4,4'-DDE		4,4'-DDT		Aldrin		Dieldrin		Heptachlor		Hexachlorobenzene		Alpha Chlordane		Gamma Chlordane		Gamma-BHC	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	05/16/95	5.1		2.7	U	14	U	0.99	U	2	U	0.99	U	0.99	U	0.99	U	4.6	U	0.99	U
ST-02	05/16/95	5	U	5.4	U	20	U	2.7	U	2	U	1	U	1	U	1	U	1.6	U	1	U
ST-03	05/16/95	2.7		2	U	9	U	1	U	2	U	1	U	1	U	1	U	2.2	U	1	U
ST-04	05/17/95	12		3	U	13	U	1.8	U	2	U	0.99	U	0.99	U	0.99	U	6.9	U	0.99	U
ST-05	05/17/95	3.3		2	U	9	U	1	U	2	U	1	U	1	U	1	U	3.6	U	1	U

Notes:
U Not detected at indicated detection limit.

HI-SHELL000525

Table D-4 - PCB Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Sampling Date	Concentrations in µg/kg (ppb) Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260		Total PCBs	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	QUAL	CONC
ST-01	05/16/95	50	U	40	U	20	U	50	U	50	U	110		99	U	<	419
ST-02	05/16/95	20	U	40	U	20	U	20	U	20	U	220		100	U	<	440
ST-03	05/16/95	20	U	40	U	20	U	20	U	20	U	20	U	780		<	920
ST-04	05/17/95	40	U	40	U	20	U	40	U	20	U	20	U	1100		<	1280
ST-05	05/17/95	26	U	40	U	20	U	26	U	20	U	90		20	U	<	242

Notes:
U Not detected at indicated detection limit.
Total PCBs includes nondetected values at full detection limit.

HI-SHELL000526

Table D-5 - Semivolatile Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Sampling Date	Concentrations in µg/kg													
		1,2,4-Trichlorobenzene		1,2-Dichlorobenzene		1,3-Dichlorobenzene		1,4-Dichlorobenzene		2,4-Dimethylphenol		2-Methylnaphthalene		2-Methylphenol	
		CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	05/16/95	20	U	20	U	20	U	20	U	20	U	30		20	U
ST-02	05/16/95	20	U	20	U	20	U	20	U	20	U	28		20	U
ST-03	05/16/95	20	U	20	U	20	U	20	U	20	U	20	U	20	U
ST-04	05/17/95	20	U	20	U	20	U	49		20	U	33		20	U
ST-05	05/17/95	20	U	20	U	20	U	20	U	20	U	32		20	U

HI-SHELL000527

Table D-5 - Semivolatile Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	4-Methylphenol		Acenaphthene		Acenaphthylene		Anthracene		Benzo(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(g,h,i)perylene	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	1100		100		38		360		890		840		970		300	
ST-02	3500		88		34		360		770		770		1000		280	
ST-03	500		70		20	U	230		370		410		540		160	
ST-04	25		50		26		260		500		610		780		260	
ST-05	340		66		33		430		820		770		1100		300	

HI-SHELL000528

Table D-5 - Semivolatile Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Benzo(k)fluoranthene		Total Benzofluoranthene		Benzoic Acid		Benzyl Alcohol		Butylbenzylphthalate		Chrysene		Di-n-Butylphthalate		Di-n-Octyl phthalate	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	690		1660		680		20	U	200		1600		46		45	
ST-02	670		1670		250		20	U	270		1400		37		34	
ST-03	320		860		920		20	U	100		650		22		54	
ST-04	580		1360		950		24	U	140		870		220		84	U
ST-05	870		1970		1100		20	U	20	U	1700		45		68	

HI-SHELL000529

Table D-5 - Semivolatile Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Dibenz(a,h)anthracene		Dibenzofuran		Diethylphthalate		Dimethylphthalate		Fluoranthene		Fluorene		Hexachlorobenzene		Hexachlorobutadiene	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	150		82		20	U	20	U	2100		180		20	U	20	U
ST-02	140		64		20	U	20	U	1900		140		20	U	20	U
ST-03	86		57		20	U	20	U	840		95		20	U	20	U
ST-04	83		43		20	U	20	U	1000		79		20	U	20	U
ST-05	74		56		20	U	24		2100		110		20	U	20	U

HI-SHELL000530

Table D-5 - Semivolatile Analytical Results for Natural Recovery Sediment Trap Samples

Sample ID	Indeno(1,2,3-cd)pyrene		N-Nitrosodiphenylamine		Naphthalene		Pentachlorophenol		Phenanthrene		Phenol		Pyrene		Bis(2-Ethylhexyl)phthalate	
	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	310		20	U	35		99	U	1000		9700	J	1600		2300	
ST-02	290		20	U	28		100	U	850		1900	J	1400		820	
ST-03	170		20	U	26		100	U	470		6200	J	580		590	
ST-04	250		20	U	45		99	U	490		110	J	860		2000	
ST-05	290		20	U	40		100	U	800		7400	J	1100		1100	

Notes:

U Not detected at indicated detection limit.

J Estimated value.

Table D-6 - TBT Analytical Results for Natural Recovery Sediment Trap Samples

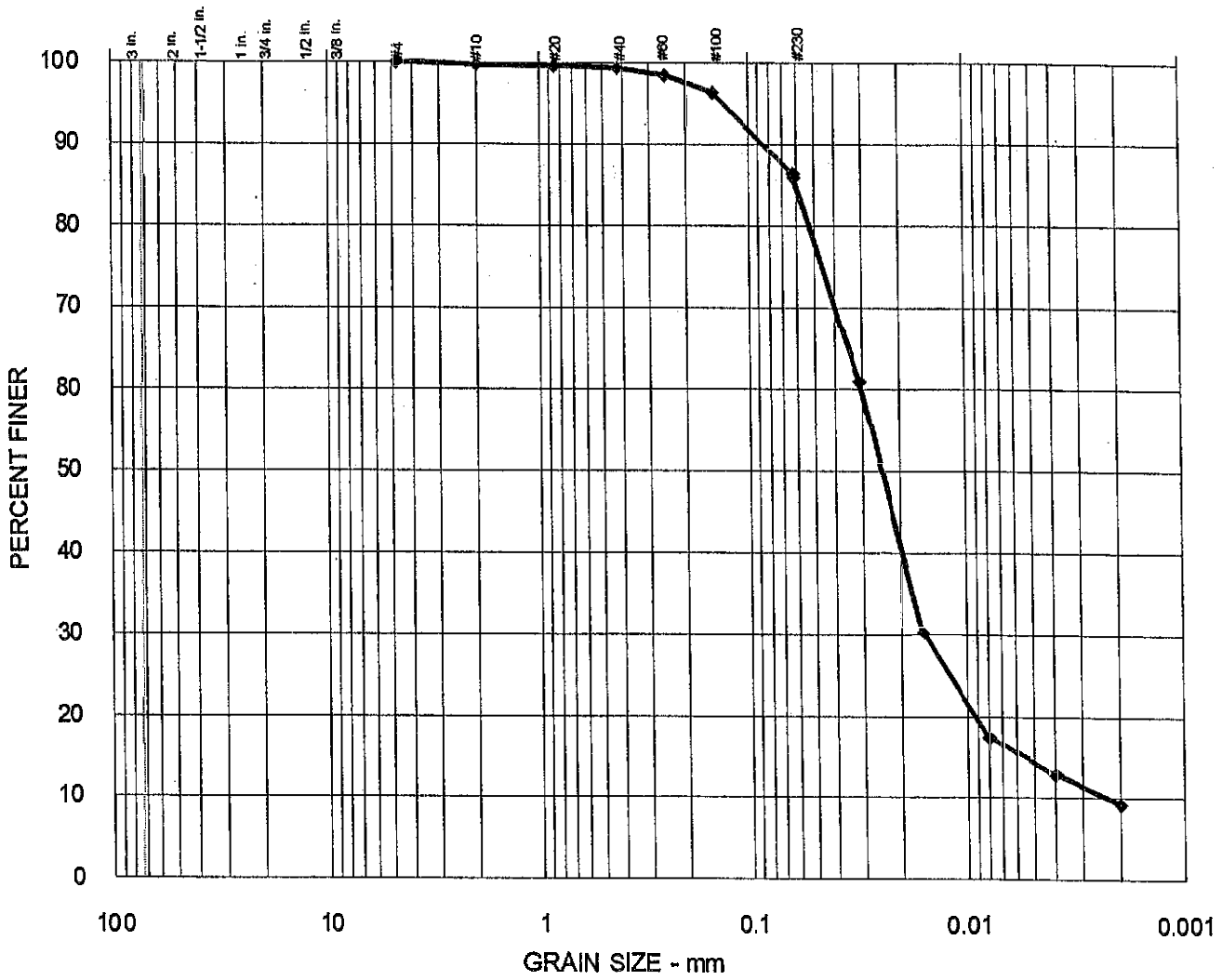
Sample ID	Sampling Date	Concentrations in µg/kg (ppb) Butyl Tin		Dibutyl Tin		Tributyl Tin	
		CONC	QUAL	CONC	QUAL	CONC	QUAL
ST-01	05/16/95	86		260		860	
ST-02	05/16/95	120		420		1100	
ST-03	05/16/95	130	U	290		600	
ST-04	05/17/95	69		120		580	
ST-05	05/17/95	120		180		470	

Notes:
U Not detected at indicated detection limit.

APPENDIX E

SURFACE SEDIMENT GRAIN SIZE DISTRIBUTION PLOTS

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	14%	73%	13%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-RF-01	0 - 10 cm	Sediment		78.77%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

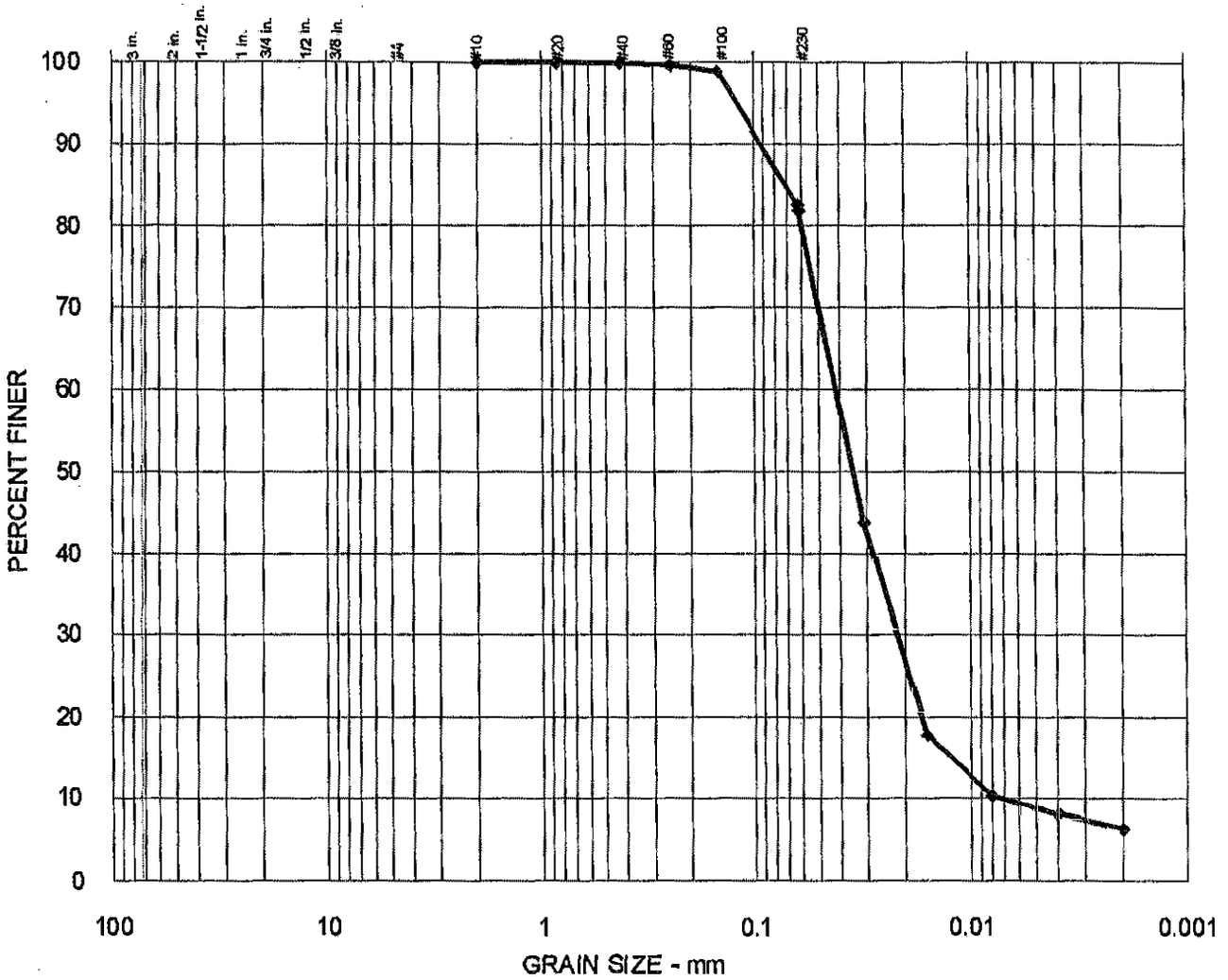
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 26

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	% SAND	%SILT	%CLAY
	0%	17%	75%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-RF-02	0 - 10 cm	Sediment		55.72%

	MATERIAL DESCRIPTION	
	Slightly clayey, sandy SILT	

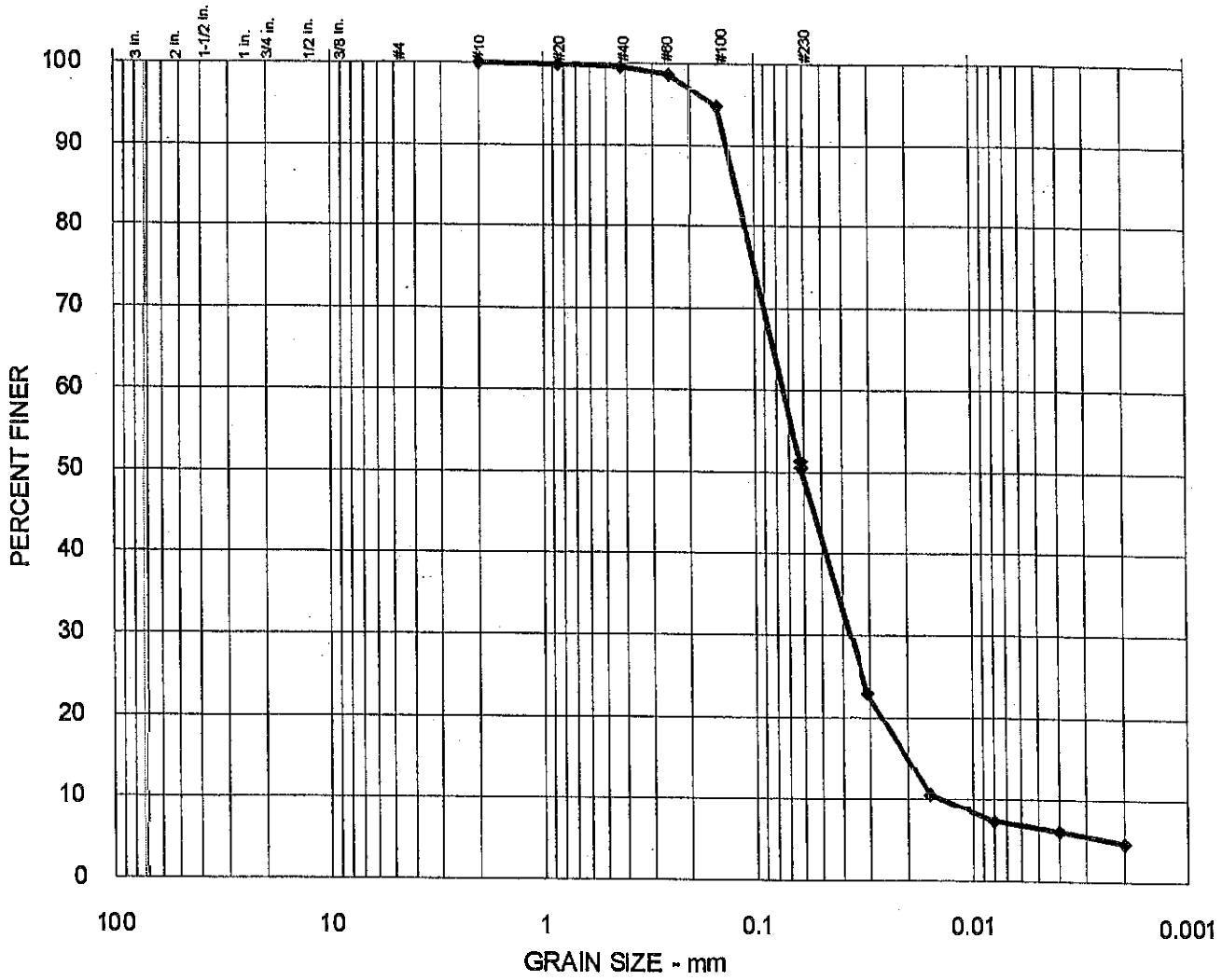
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 27

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	49%	45%	6%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-RF-03	0 - 10 cm	Sediment		45.48%

	MATERIAL DESCRIPTION	
	Slightly clayey, very sandy SILT	

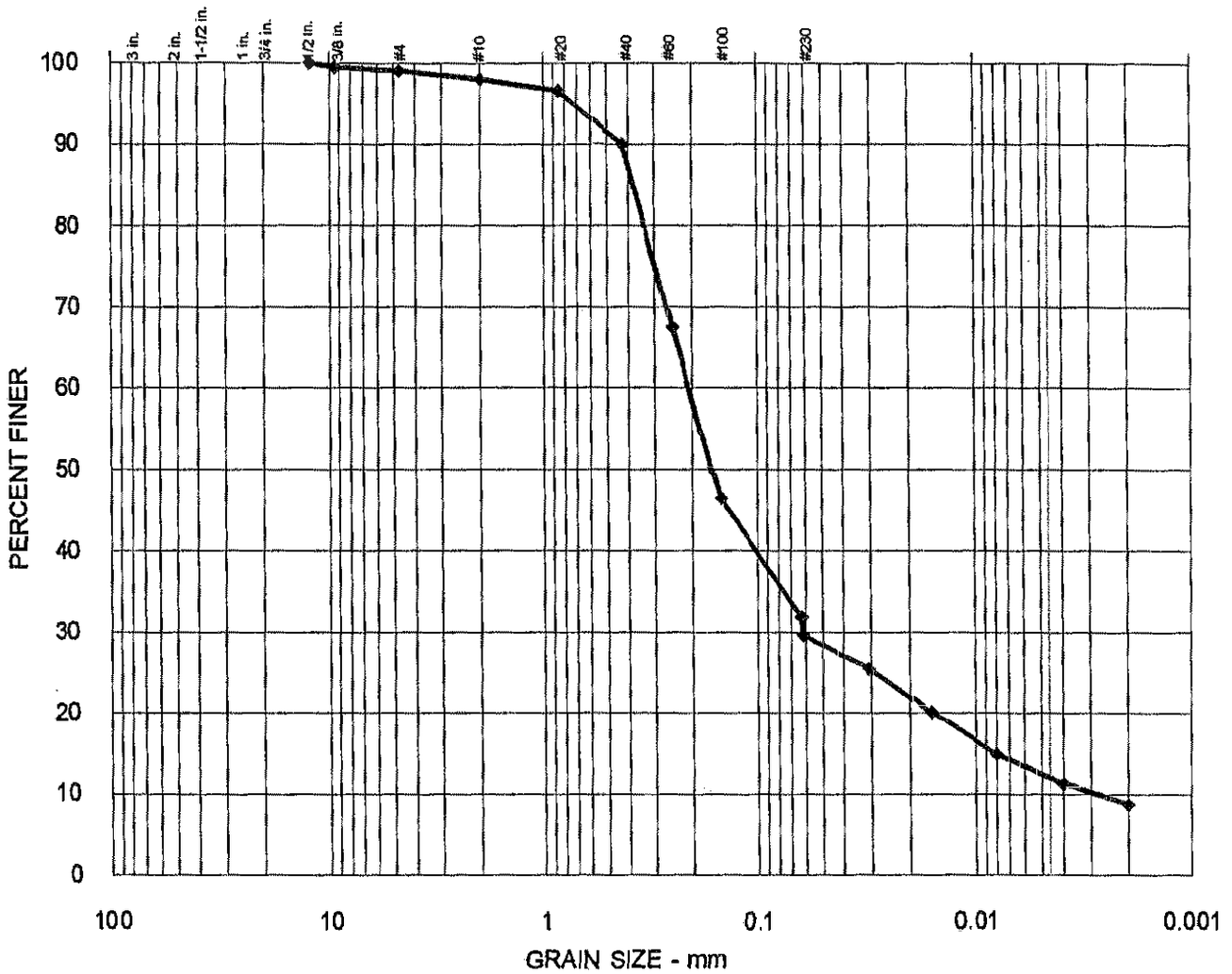
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 28

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	2%	66%	21%	11%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-01	0-10 cm	Sediment		54.24%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

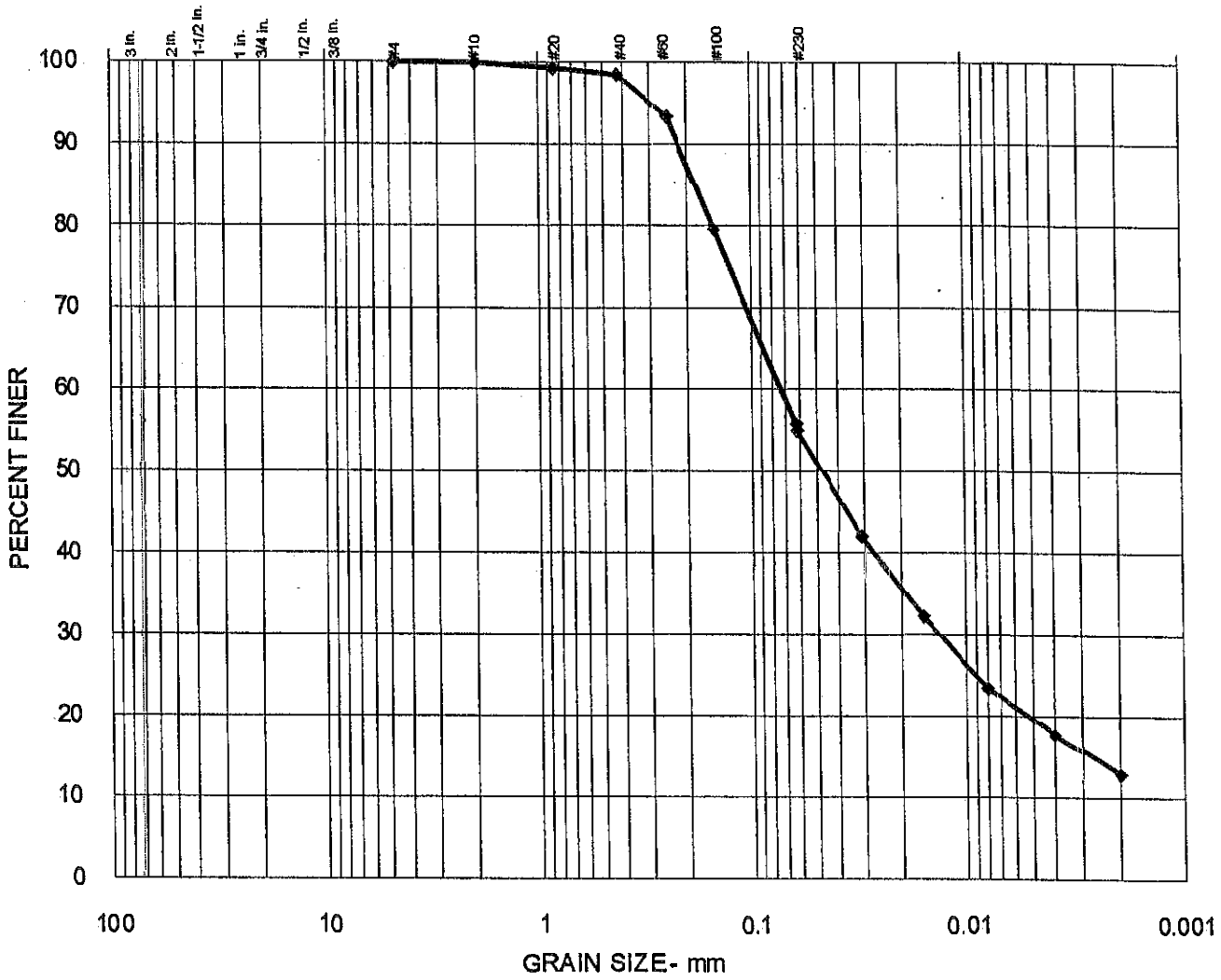
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 29

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	44%	38%	18%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-02	0 - 10 cm	Sediment		75.91%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

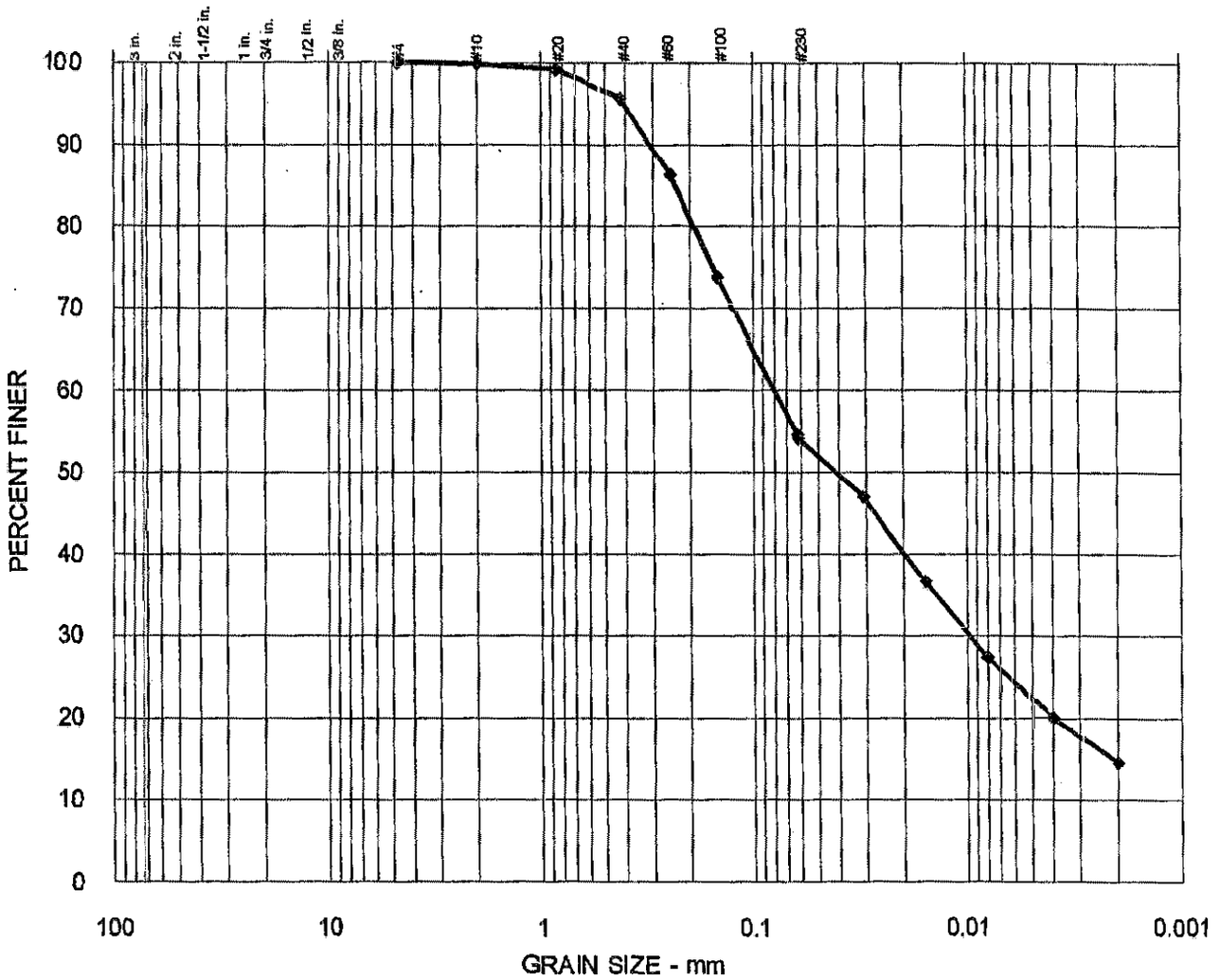
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 30

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	45%	35%	20%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-03	0 - 10 cm	Sediment		75.05%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

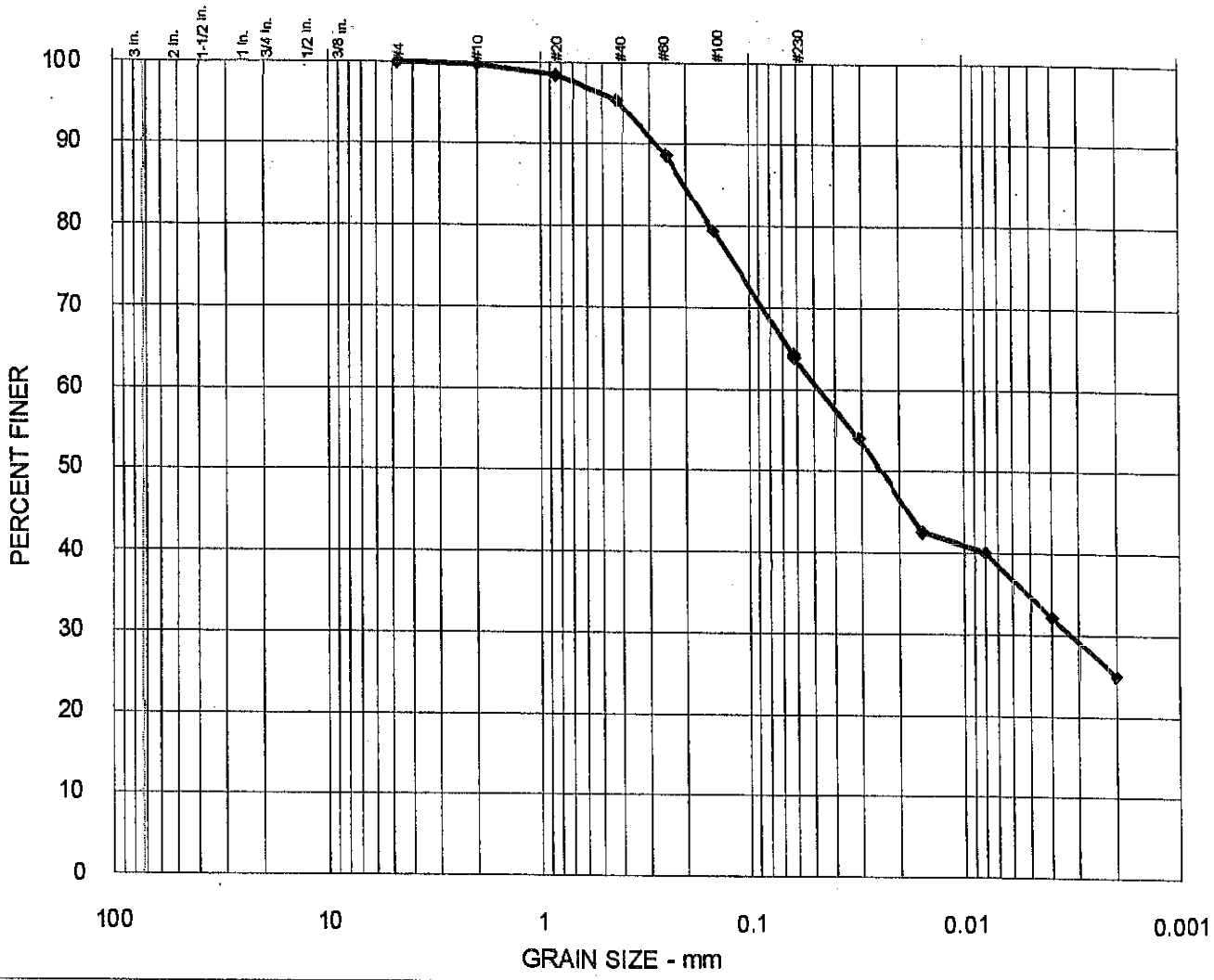
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 31

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	36%	32%	32%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-04	0 - 10 cm	Sediment		97.67%

	MATERIAL DESCRIPTION	
	Very clayey, very sandy SILT	

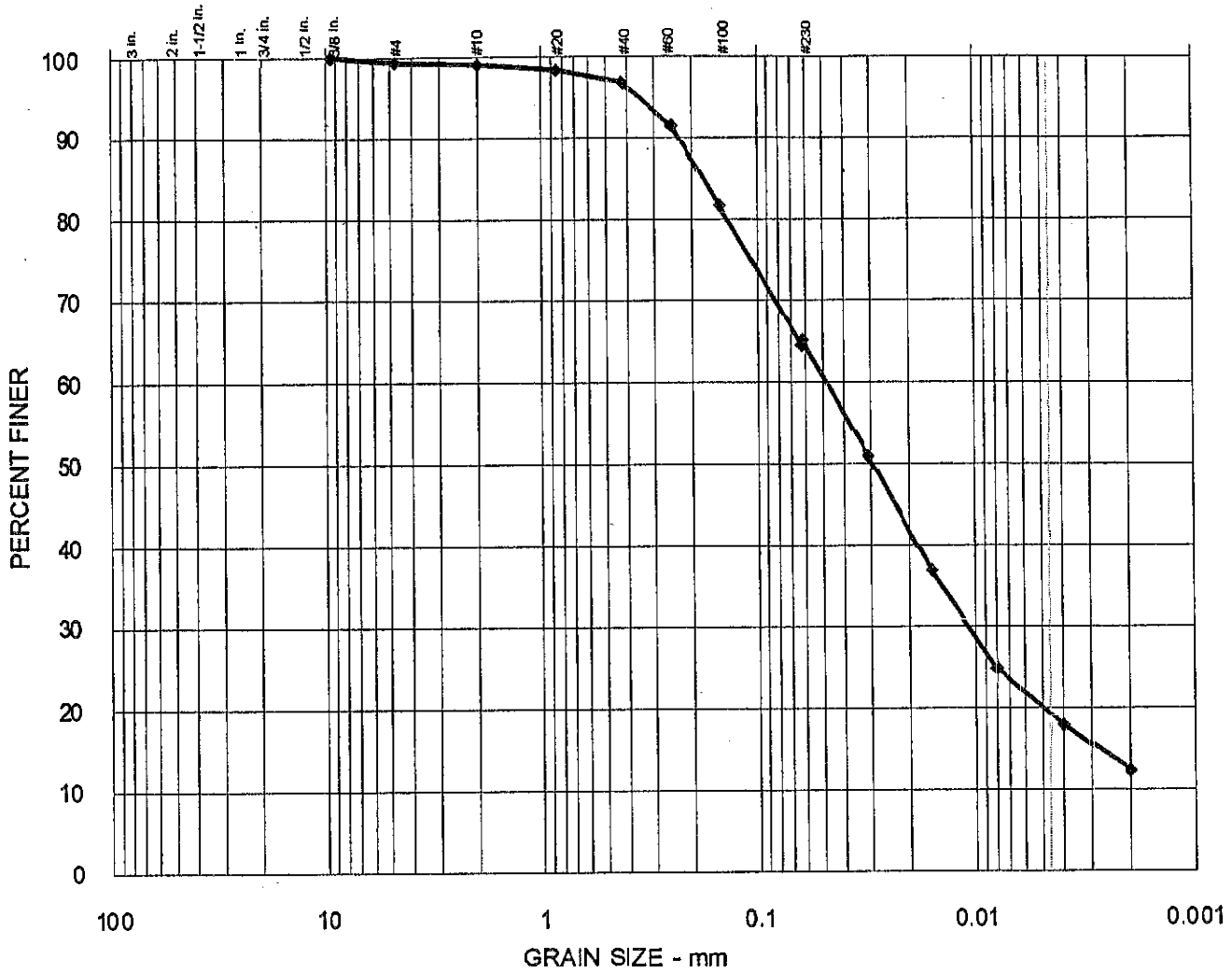
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 32

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	34%	47%	18%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-05	0 - 10 cm	Sediment		90.49%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

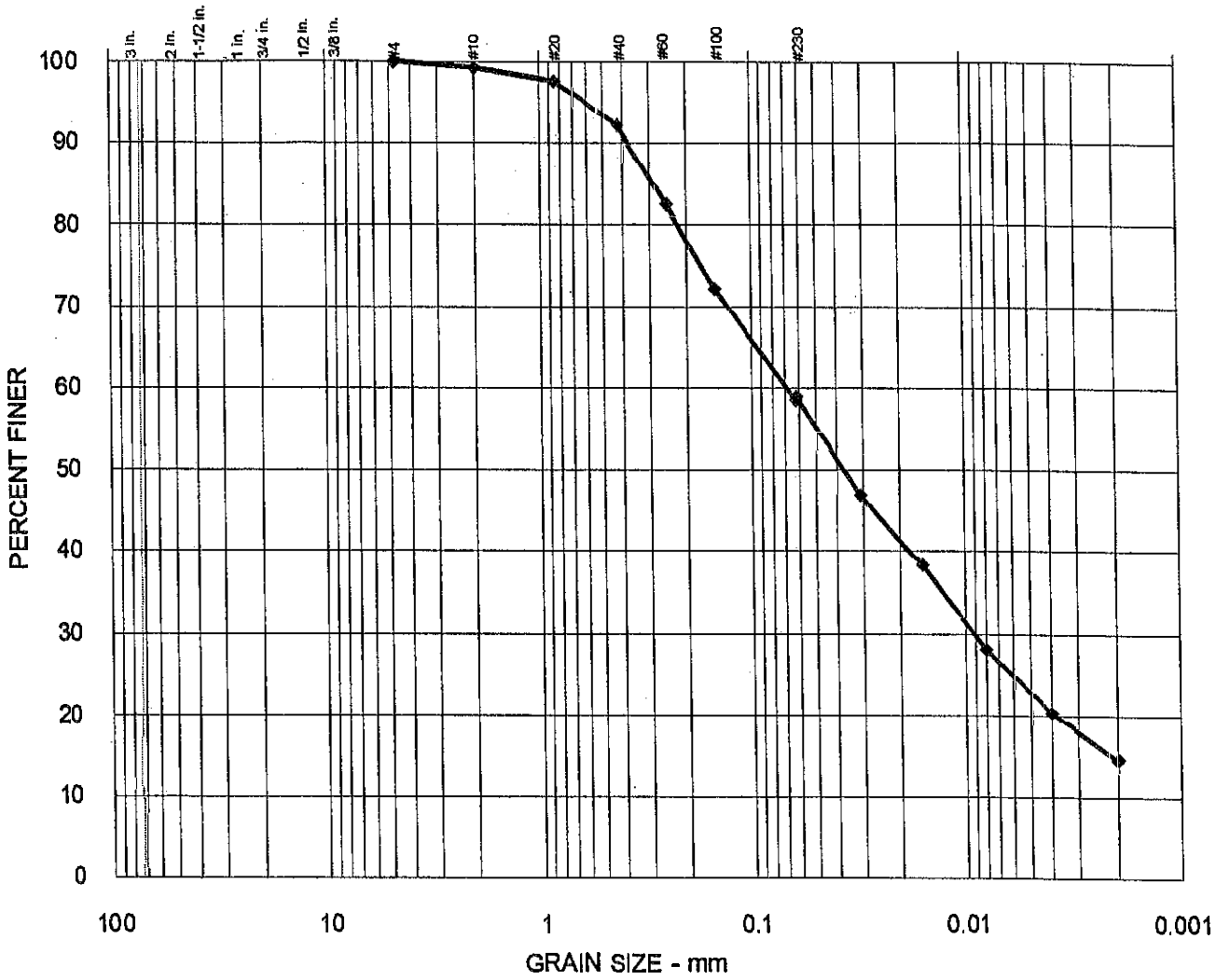
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 25

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	% SILT	%CLAY
	1%	40%	39%	20%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-06	0 - 10 cm	Sediment		75.44%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

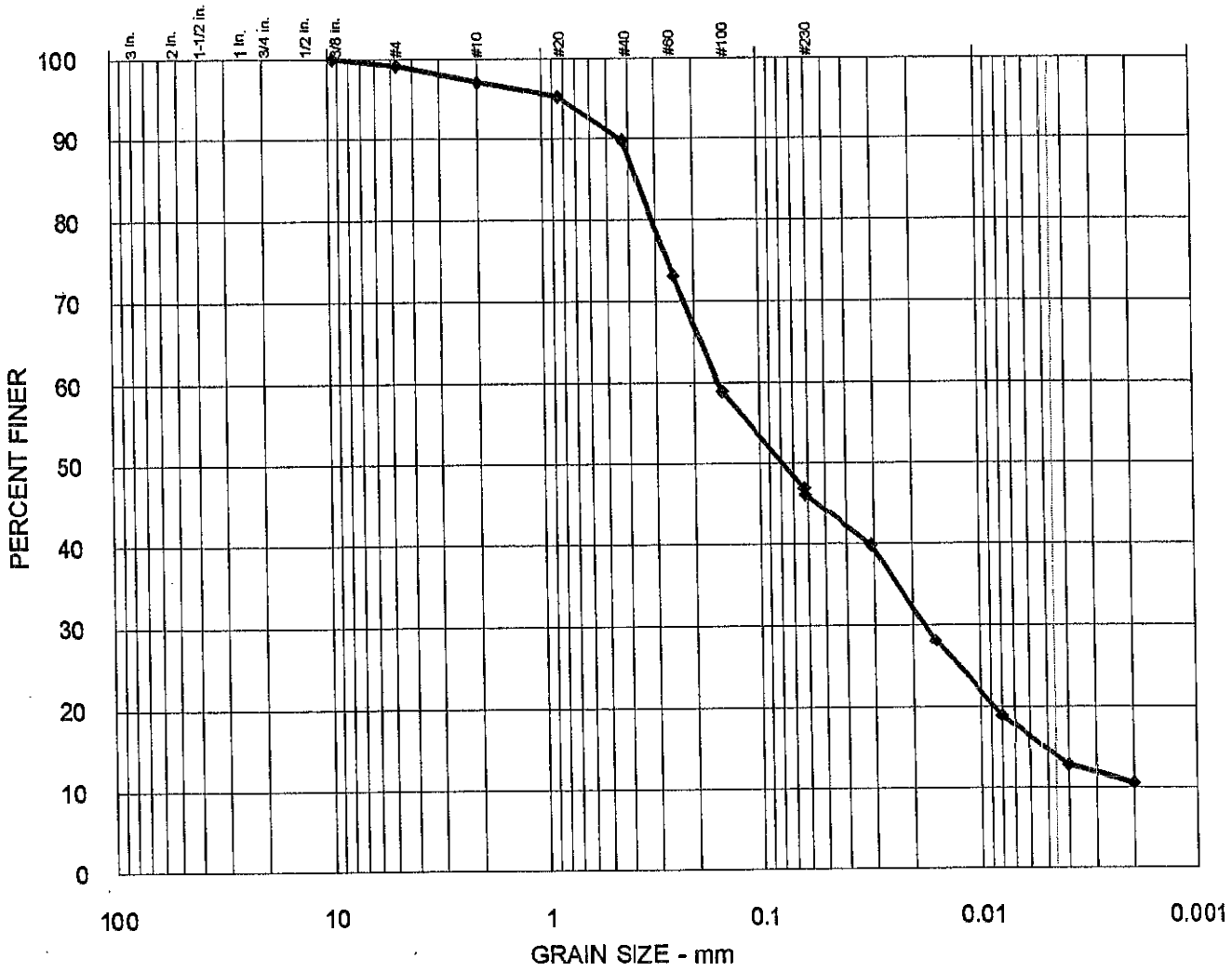
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 33

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	3%	50%	36%	11%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-07	0-10 cm	Sediment		71.88%

	MATERIAL DESCRIPTION	
	Slightly clayey , very silty SAND	

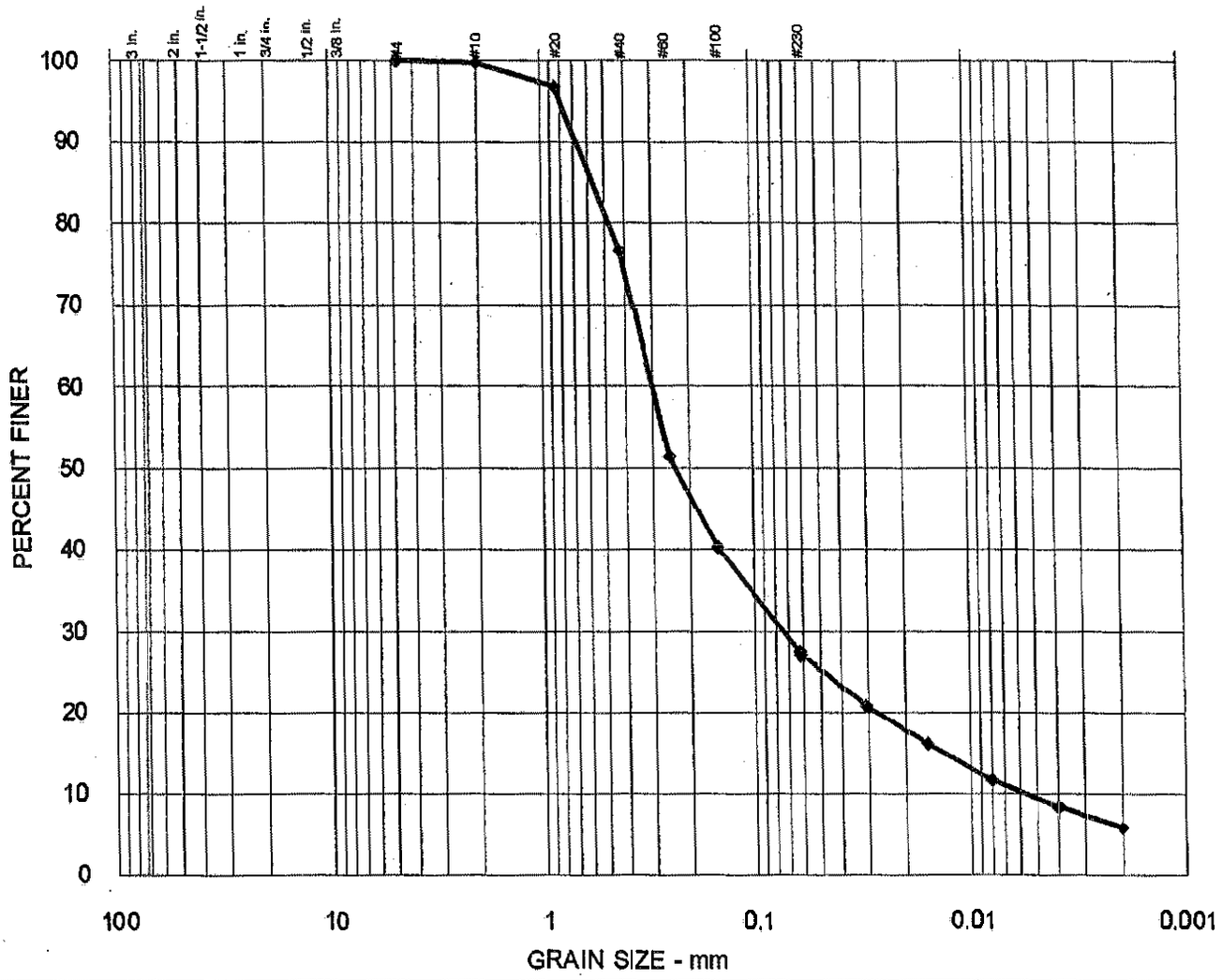
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 34

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	72%	20%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-08	0 - 10 cm	Sediment		53.41%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

Remarks:

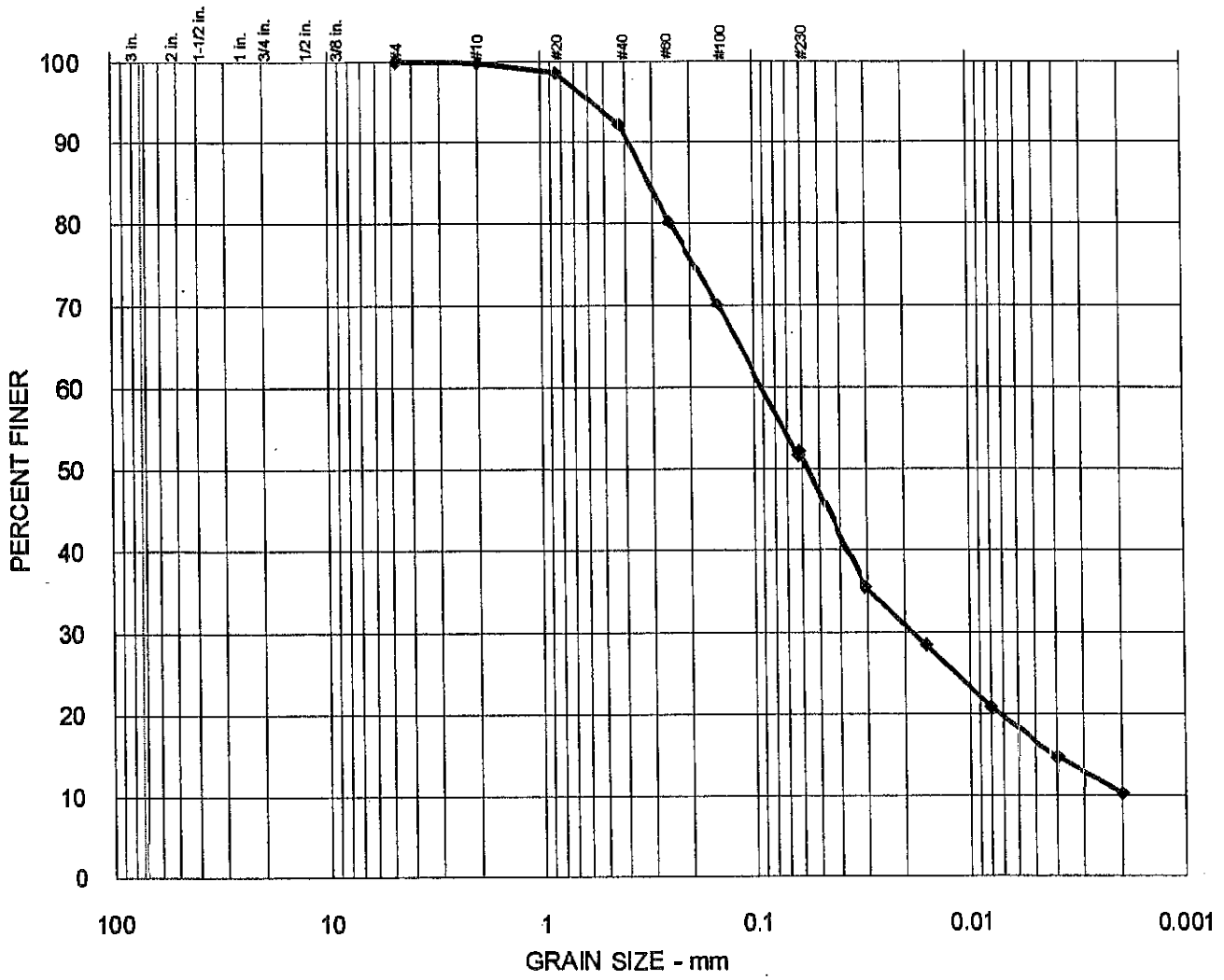
Project: Harbor Island Sediments

HARTCROWSER

J-4300

Figure 35

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	48%	37%	15%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-09	0 - 10 cm	Sediment		71.07%

MATERIAL DESCRIPTION
Clayey very sandy SILT

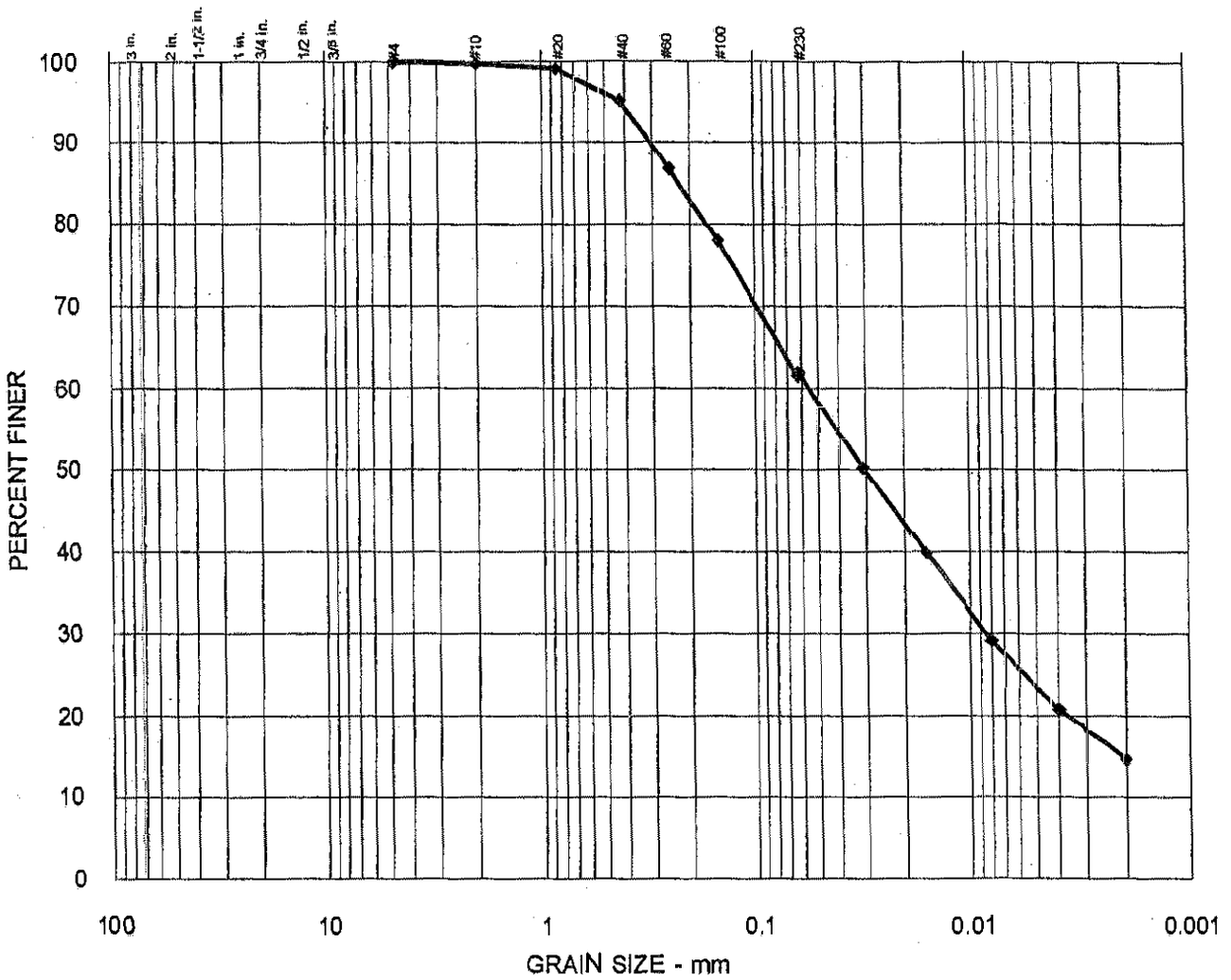
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 36

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	38%	41%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-10	0 - 10 cm	Sediment		77.90%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

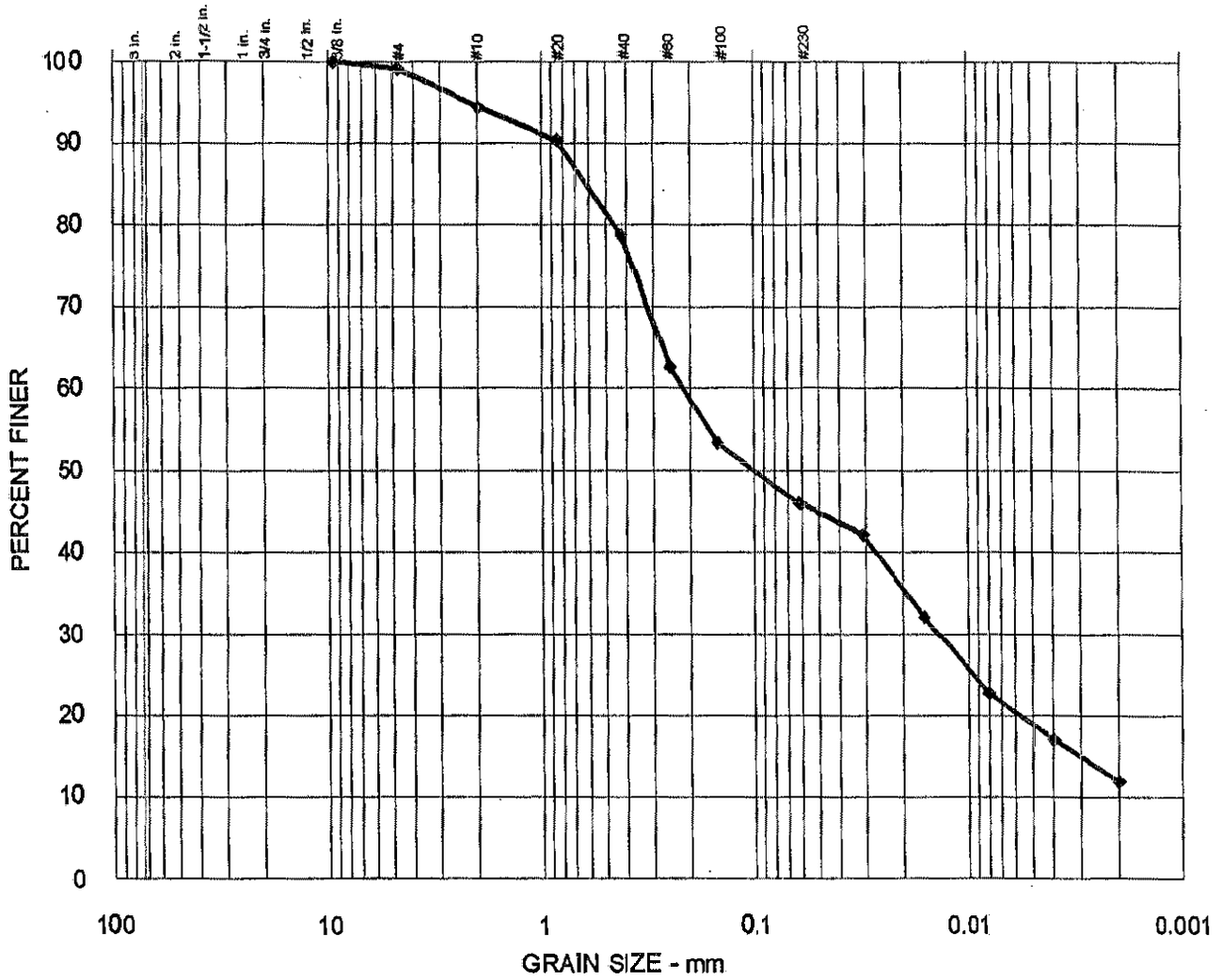
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 29

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	6%	48%	29%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-11	0-10 cm	Sediment		66.87%

	MATERIAL DESCRIPTION	
	Slightly gravelly, clayey, very silty SAND	

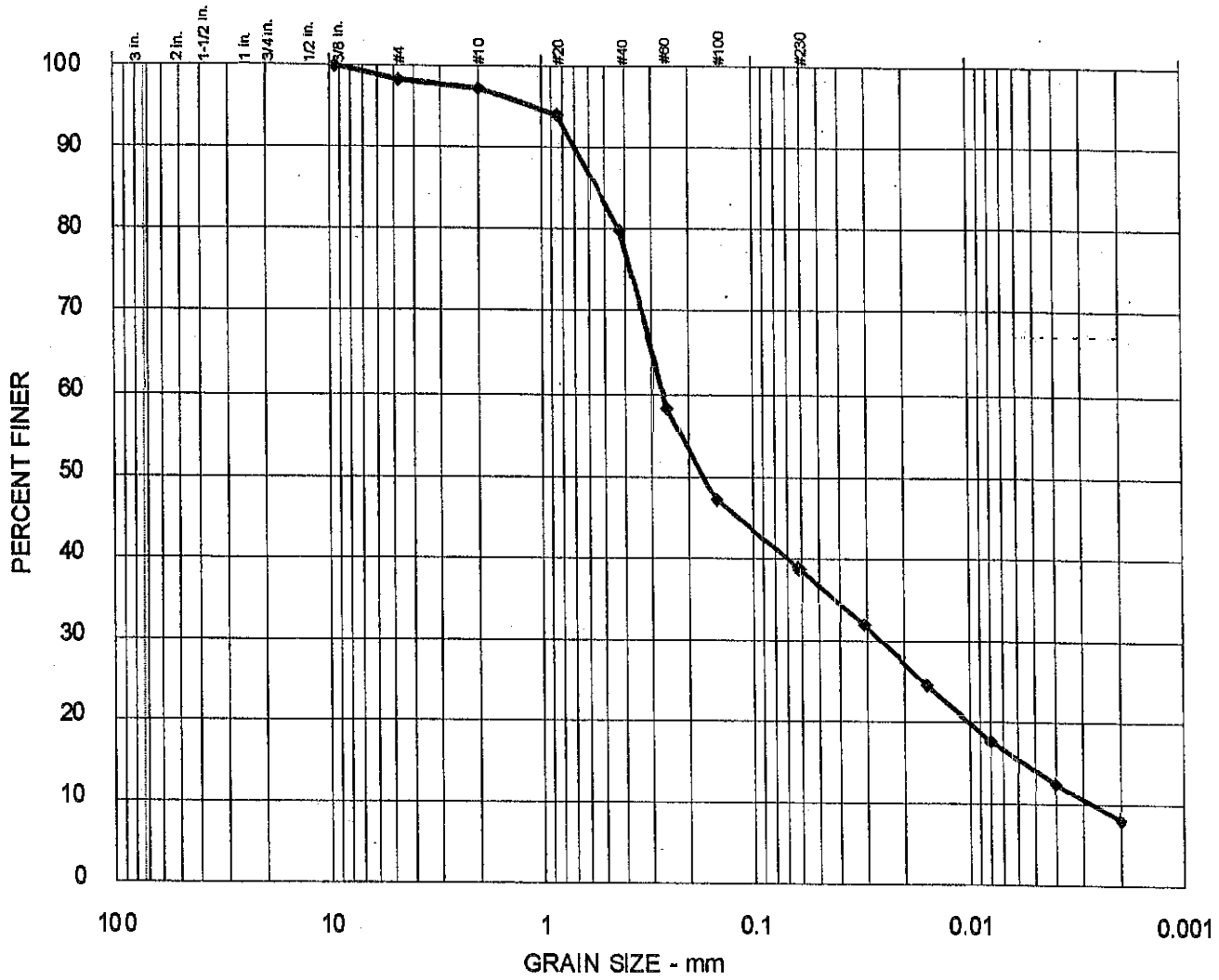
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 37

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	3%	58%	27%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-12	0 - 10 cm	Sediment		57.02%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

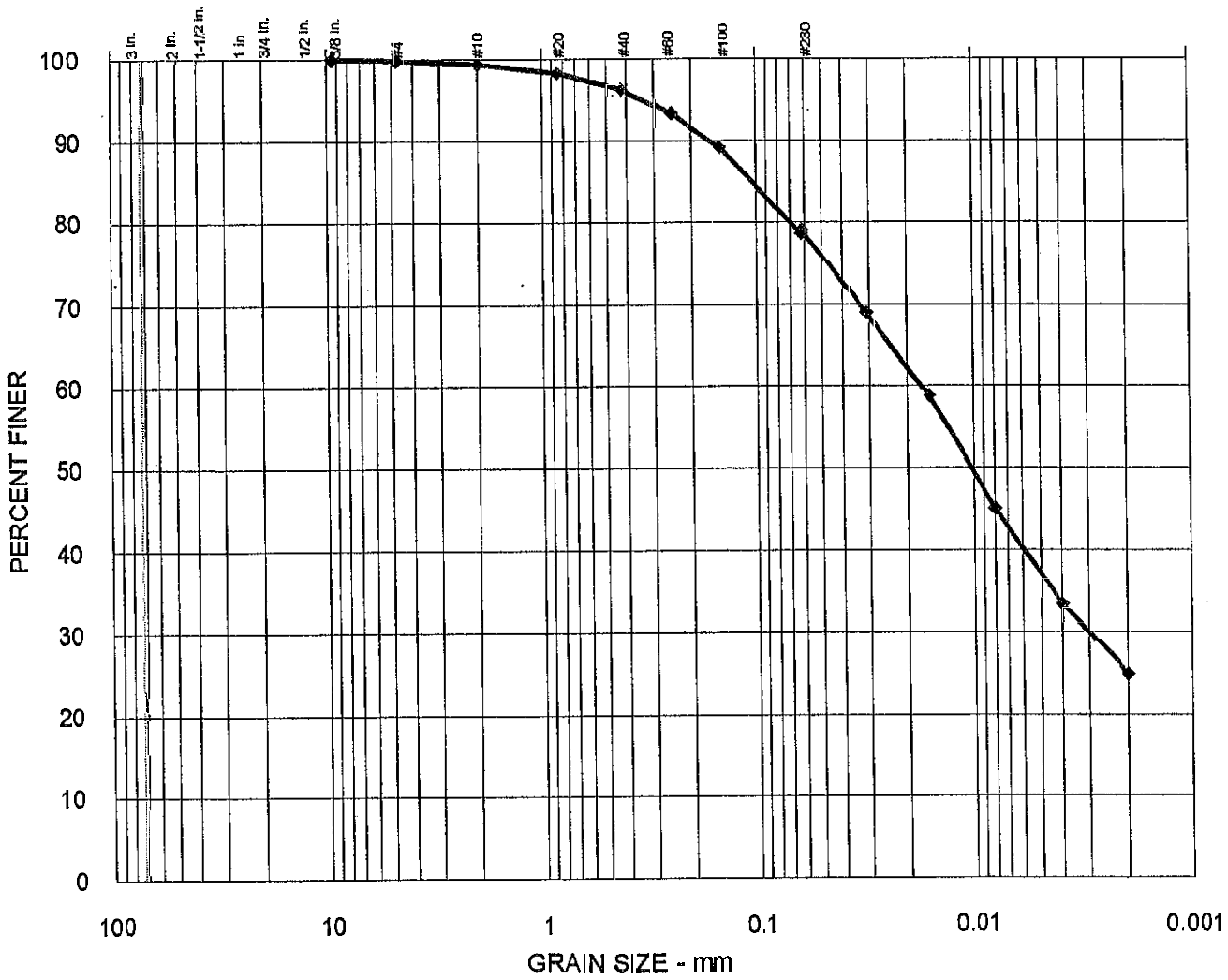
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 38

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	20%	46%	33%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-13	0 - 10 cm	Sediment		87.52%

	MATERIAL DESCRIPTION	
	Sandy, very clayey SILT	

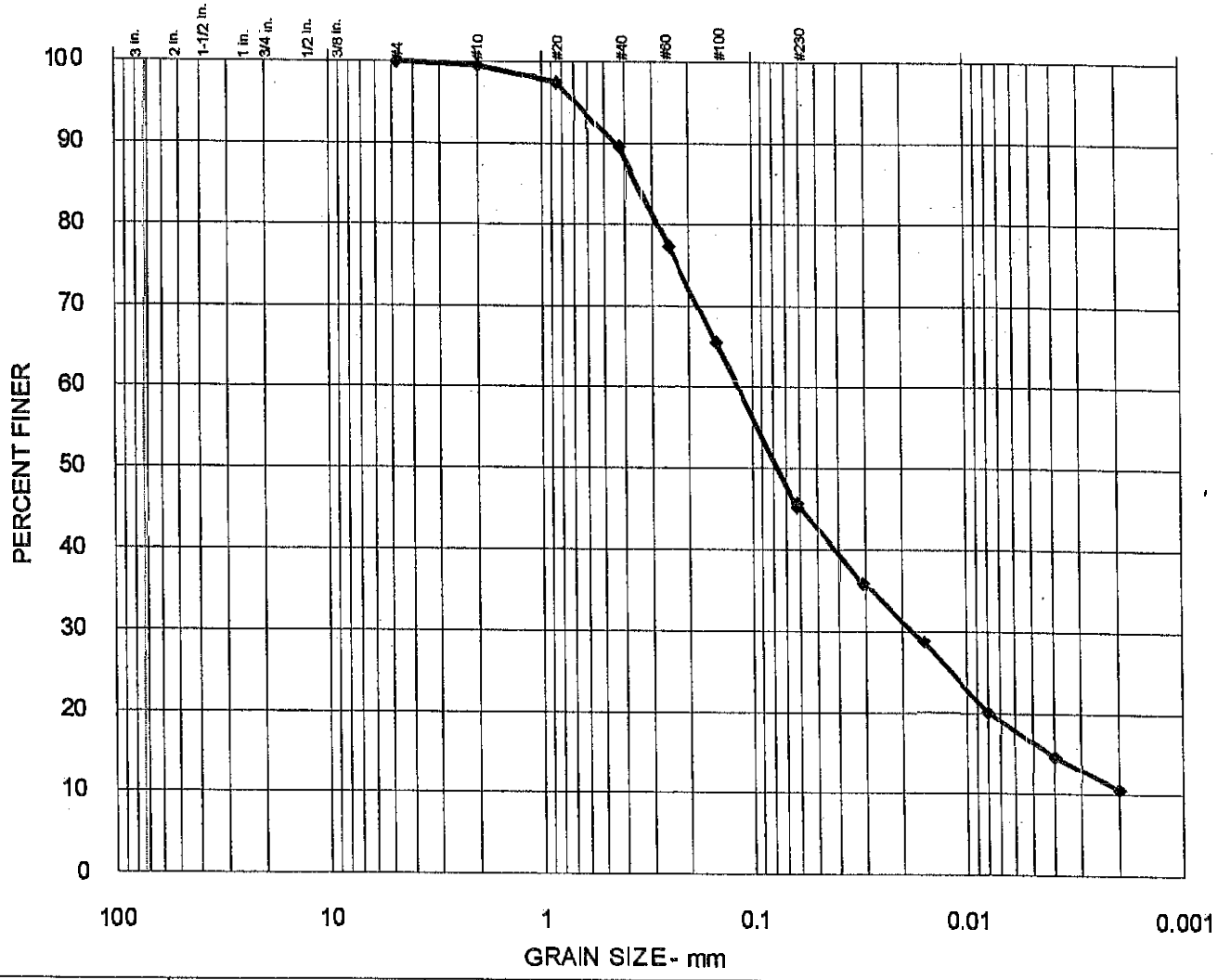
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 39

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	54%	30%	15%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-14	0 - 10 cm	Sediment		70.27%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

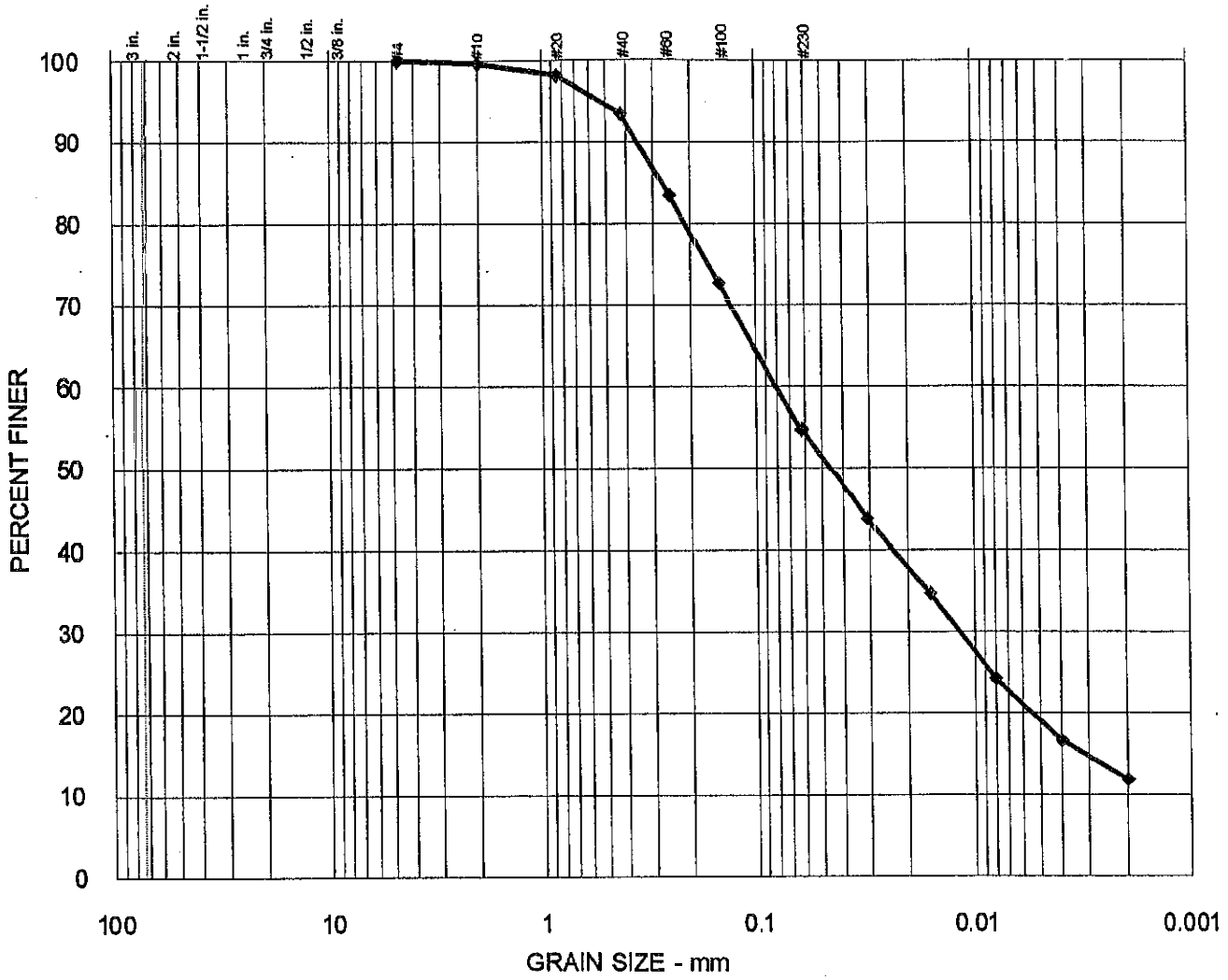
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 40

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	45%	38%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-15	0 - 10 cm	Sediment		76.17%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

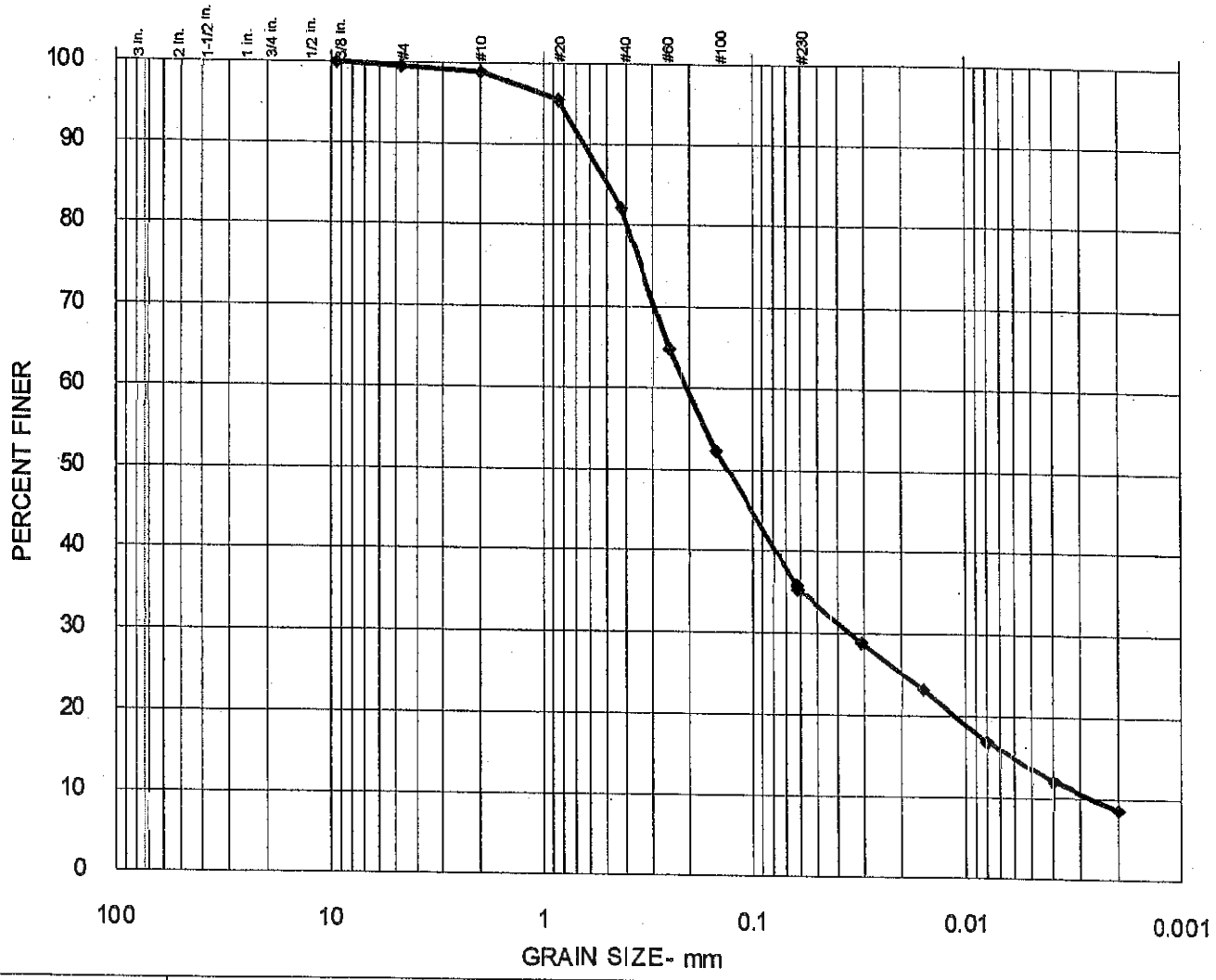
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 41

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	63%	24%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-16	0 - 10 cm	Sediment		56.77%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

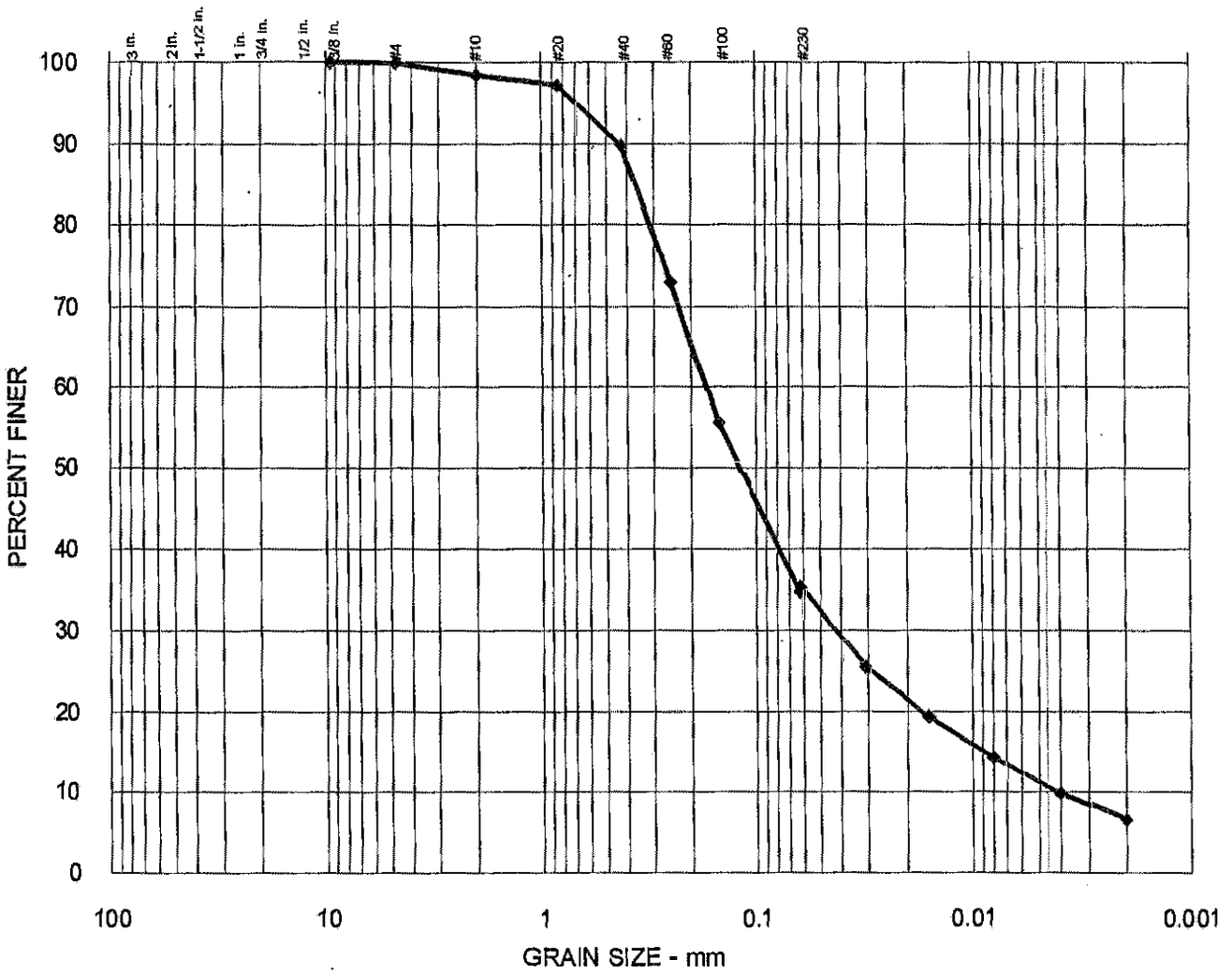
Remarks:

Project Harbor Island Sediments

HARTCROWSER

J-4300
Figure 42

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	2%	63%	25%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-17	0 - 10 cm	Sediment		54.54%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

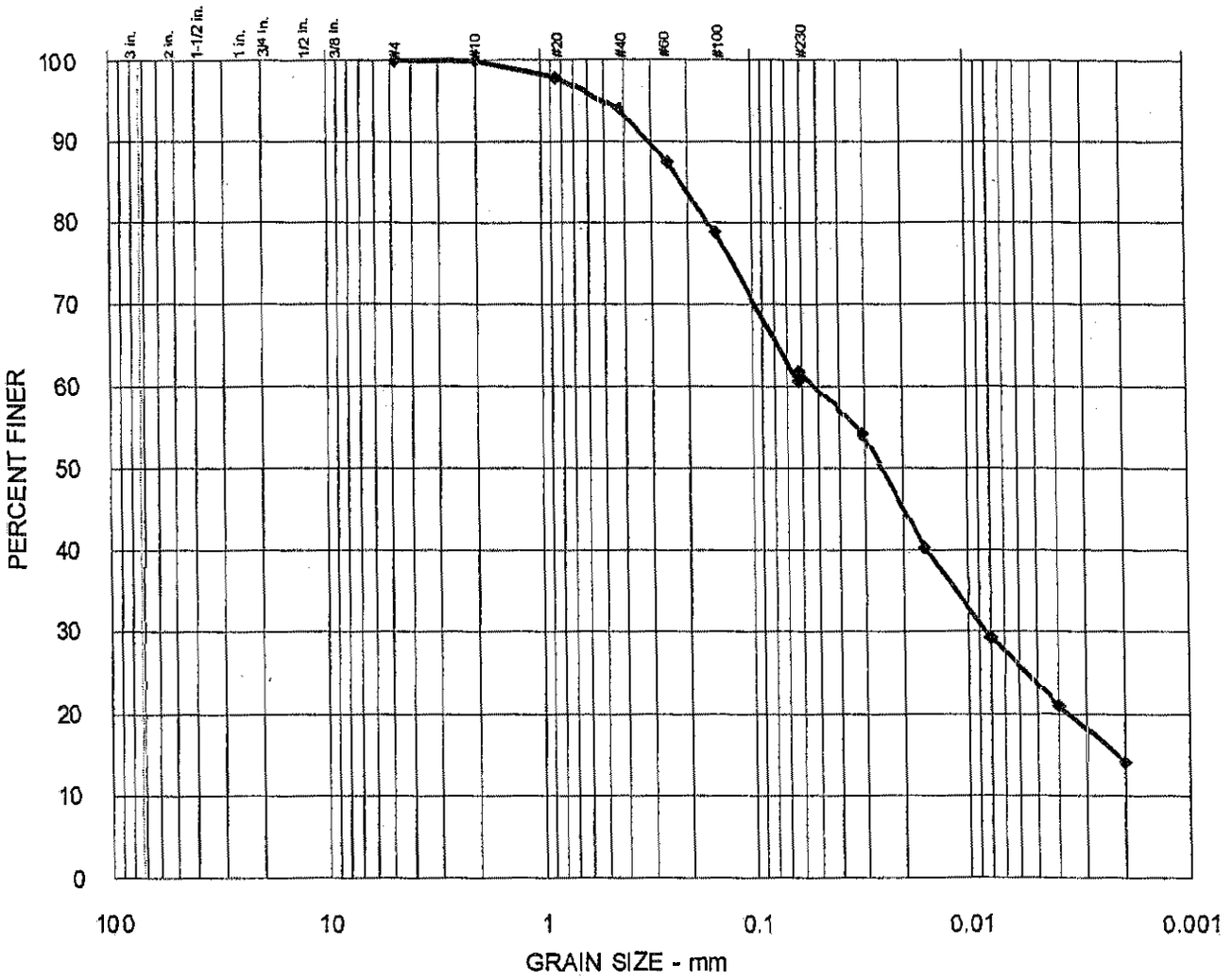
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-02
Figure 43

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	39%	40%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18	0 - 10 cm	Sediment		86.46%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

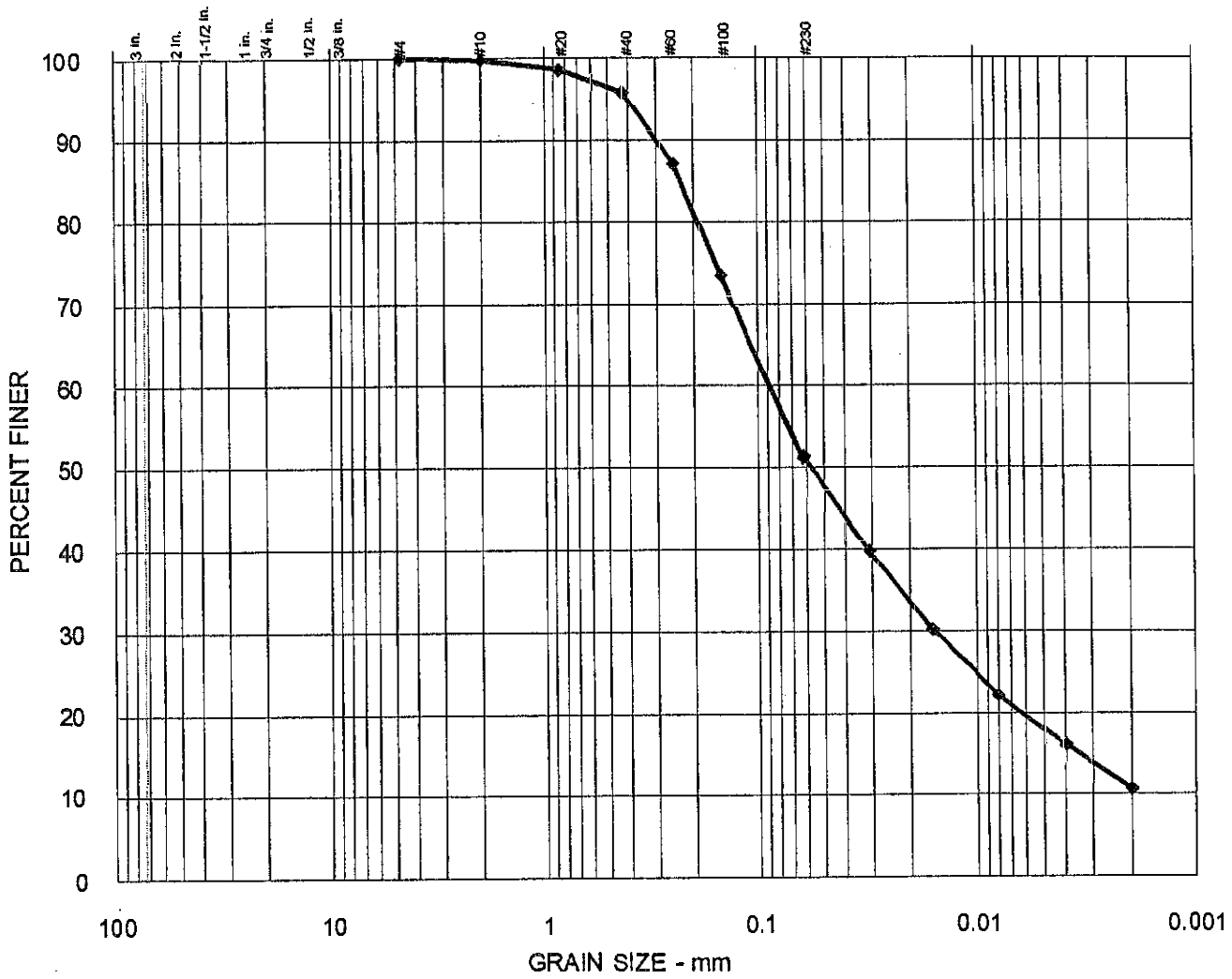
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 33

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	49%	35%	16%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18B	0 - 10 cm	Sediment		82.39%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

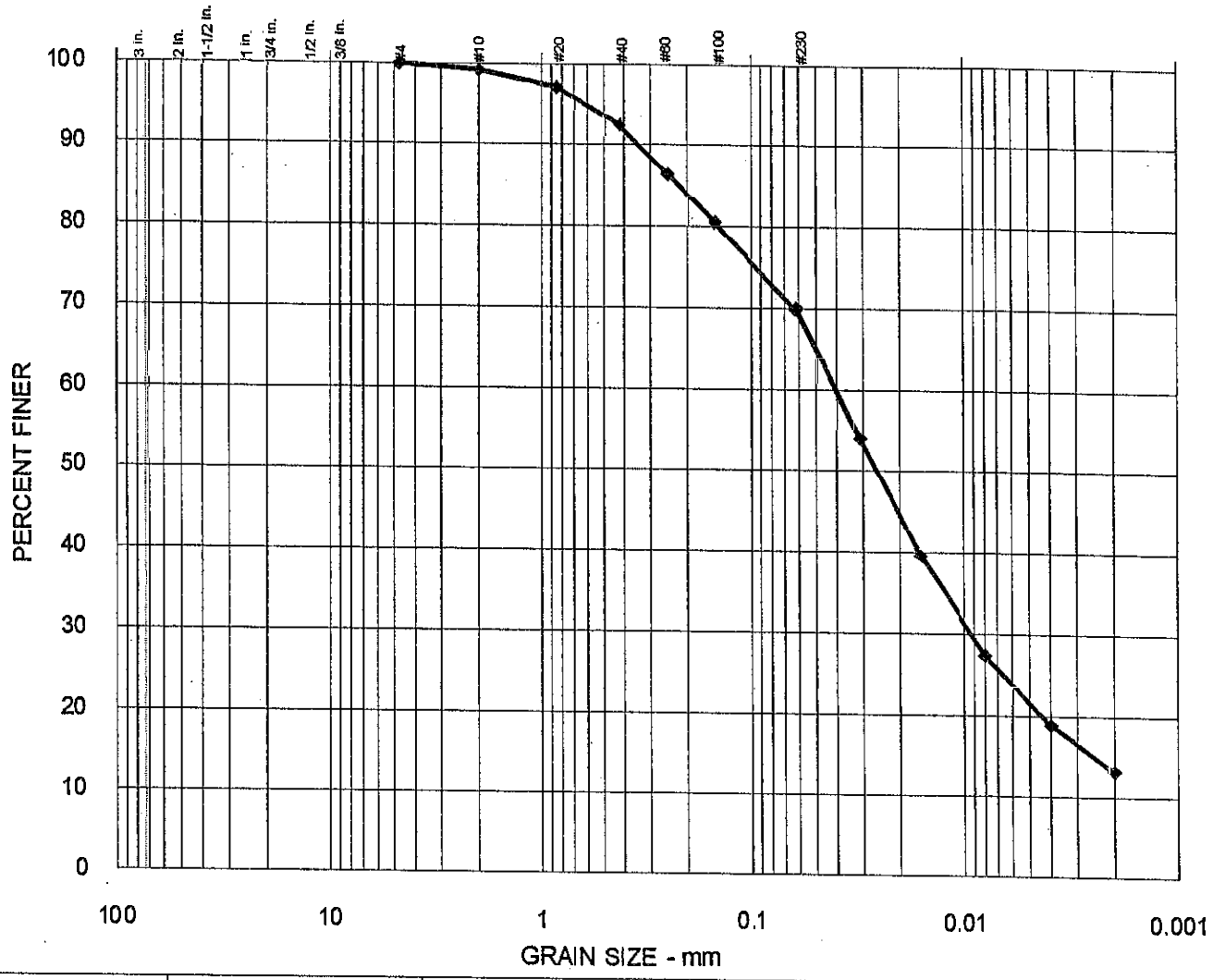
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 39

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	1%	29%	51%	19%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-19	0 - 10 cm	Sediment		66.83%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

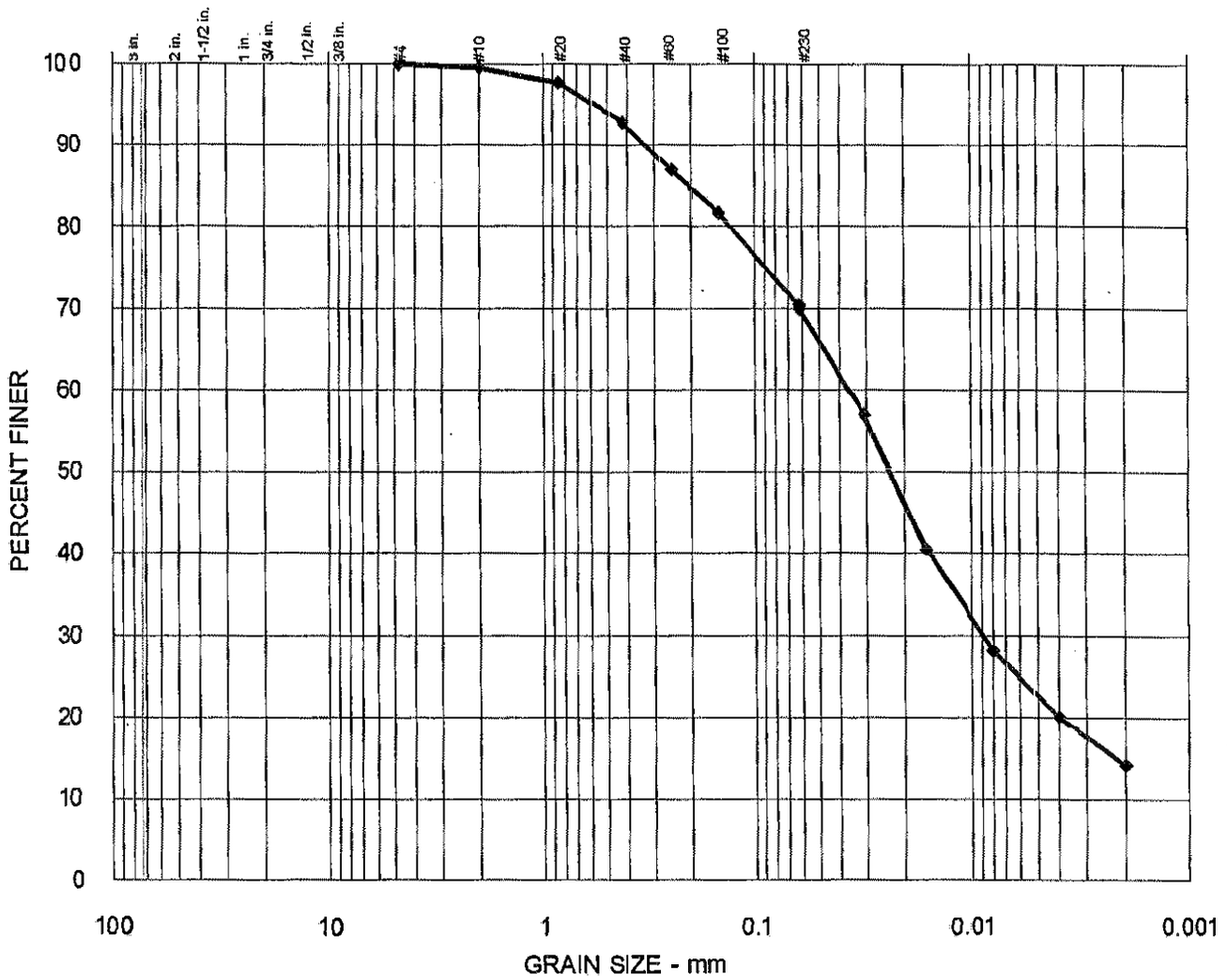
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 44

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	28%	51%	20%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-19T1	0 - 10 cm	Sediment		66.83%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

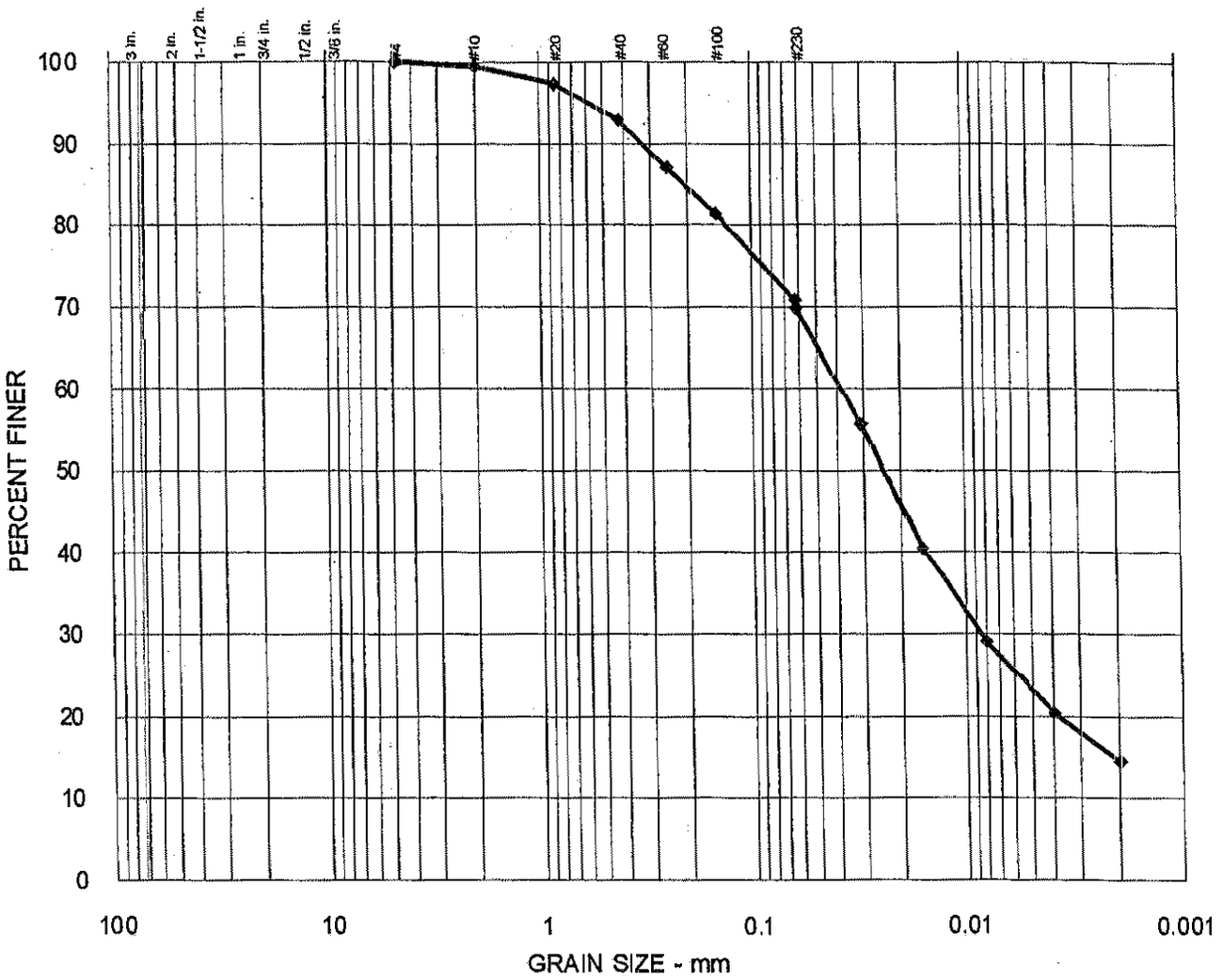
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 45

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1 %	28%	51%	20%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-19T2	0 - 10 cm	Sediment		66.83%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

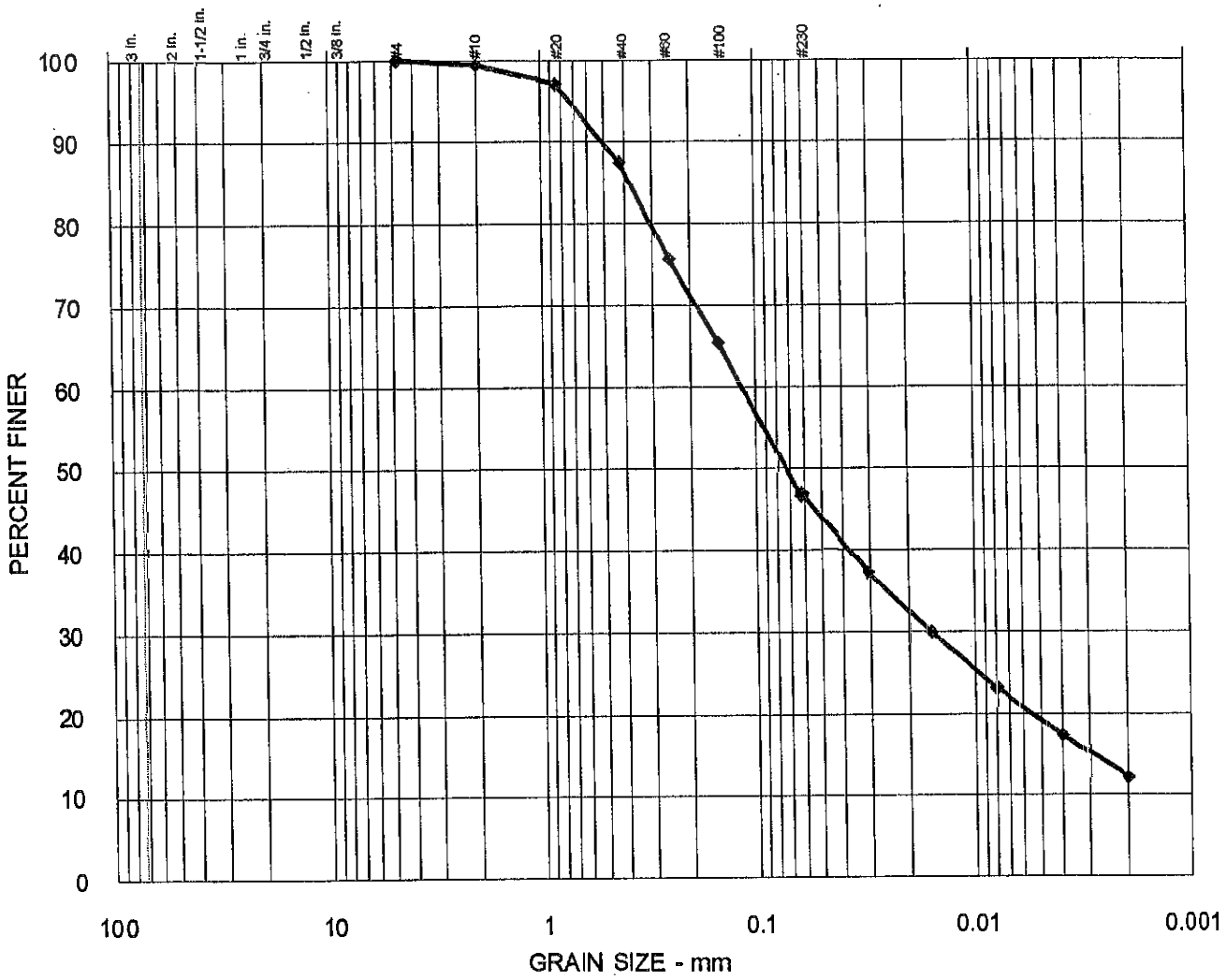
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 46

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	52%	30%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-20	0 - 10 cm	Sediment		64.88%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

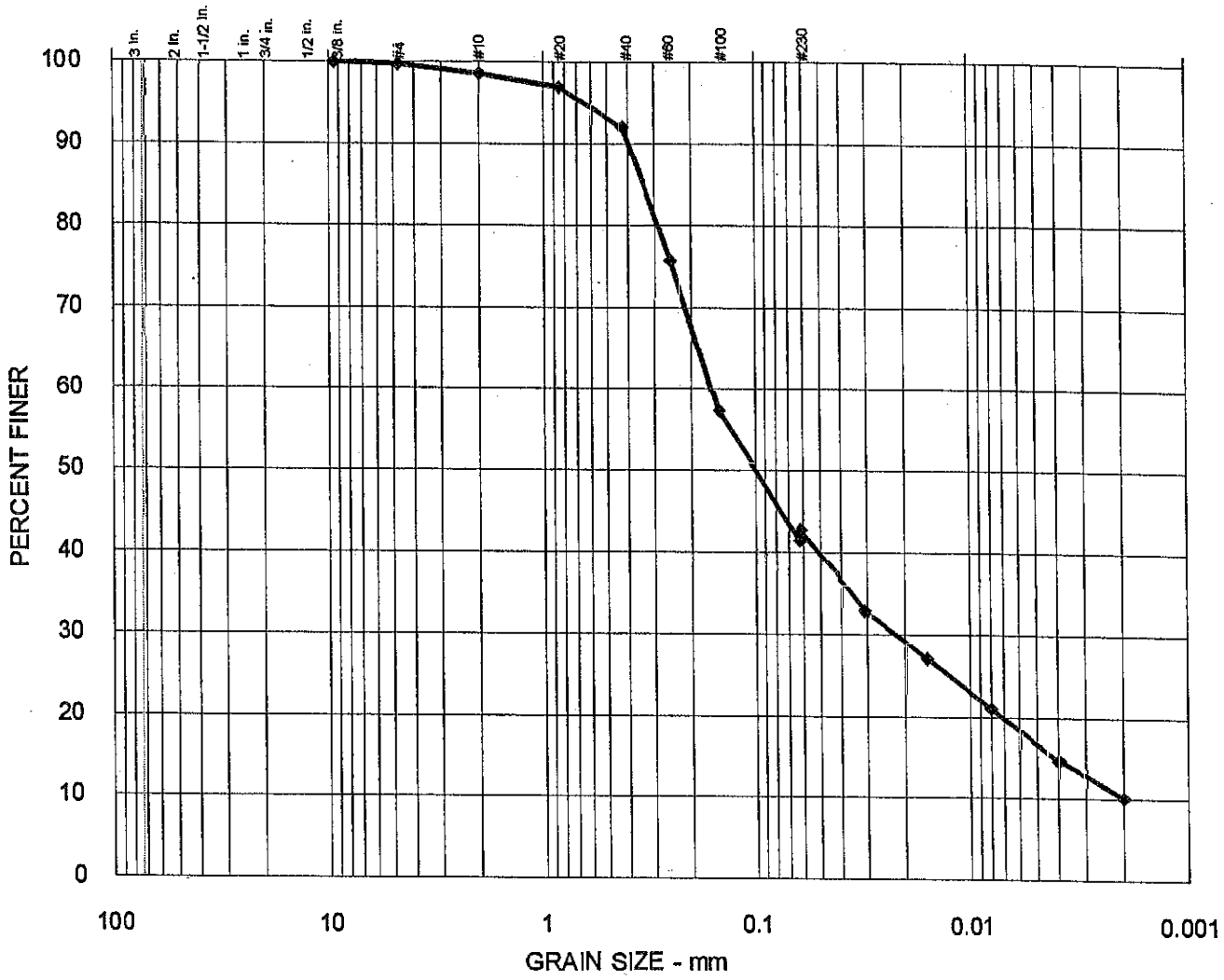
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 47

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	2%	56%	27%	15%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-21	0 - 10 cm	Sediment		69.23%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

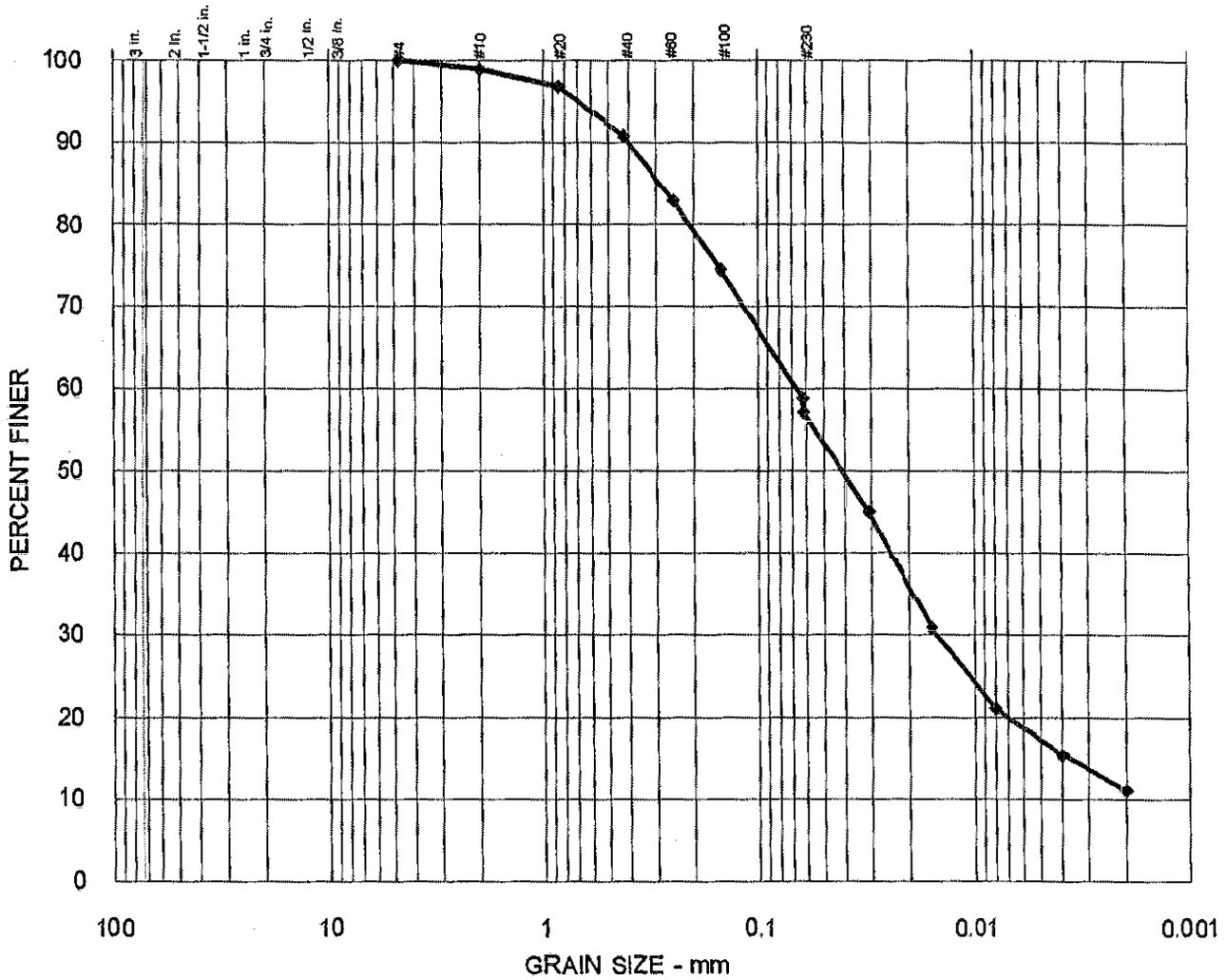
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 48

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	1%	40%	44%	15%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-22	0 - 10 cm	Sediment		57.18%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

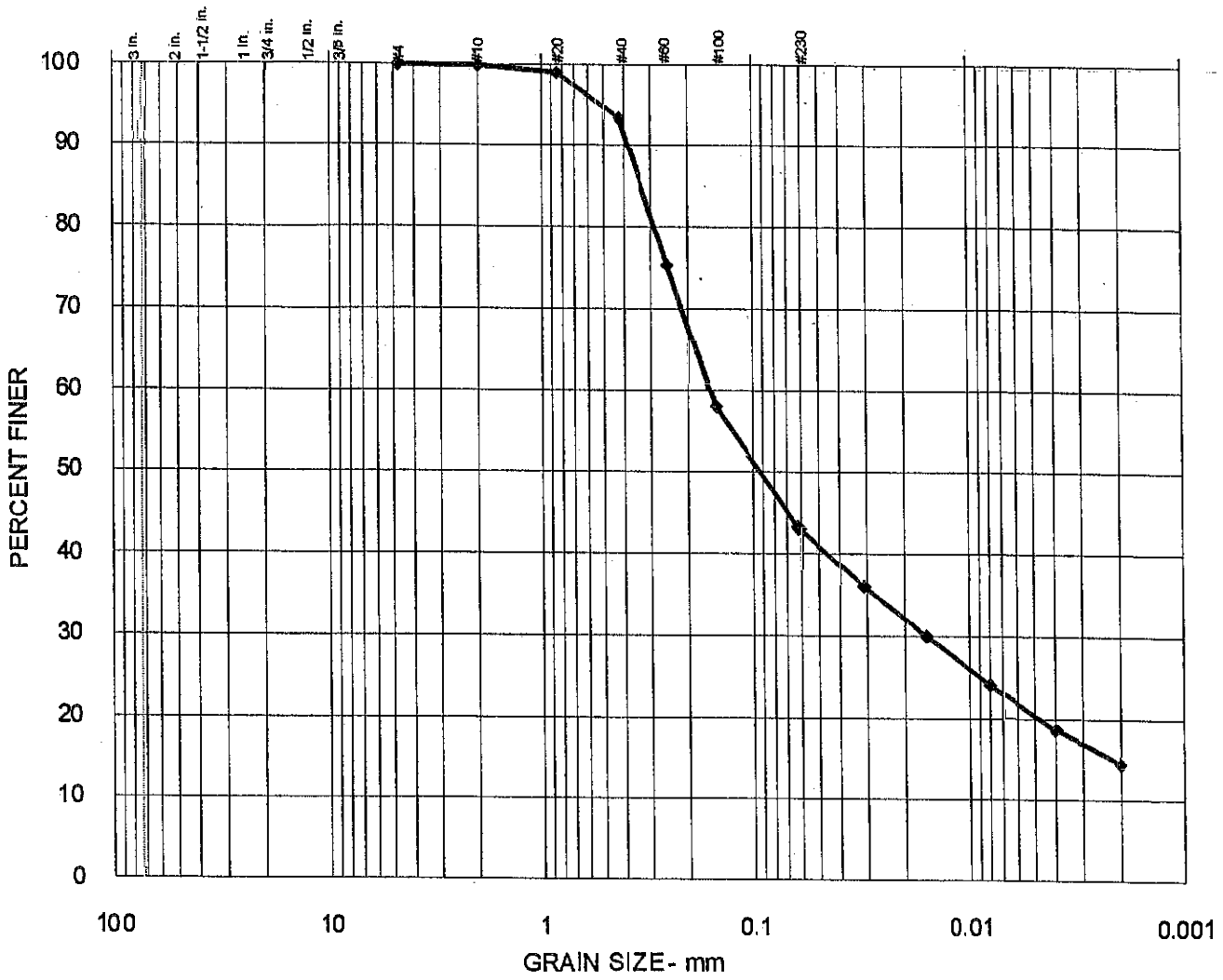
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 49

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	57%	24%	19%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-23	0 - 10 cm	Sediment		68.38%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

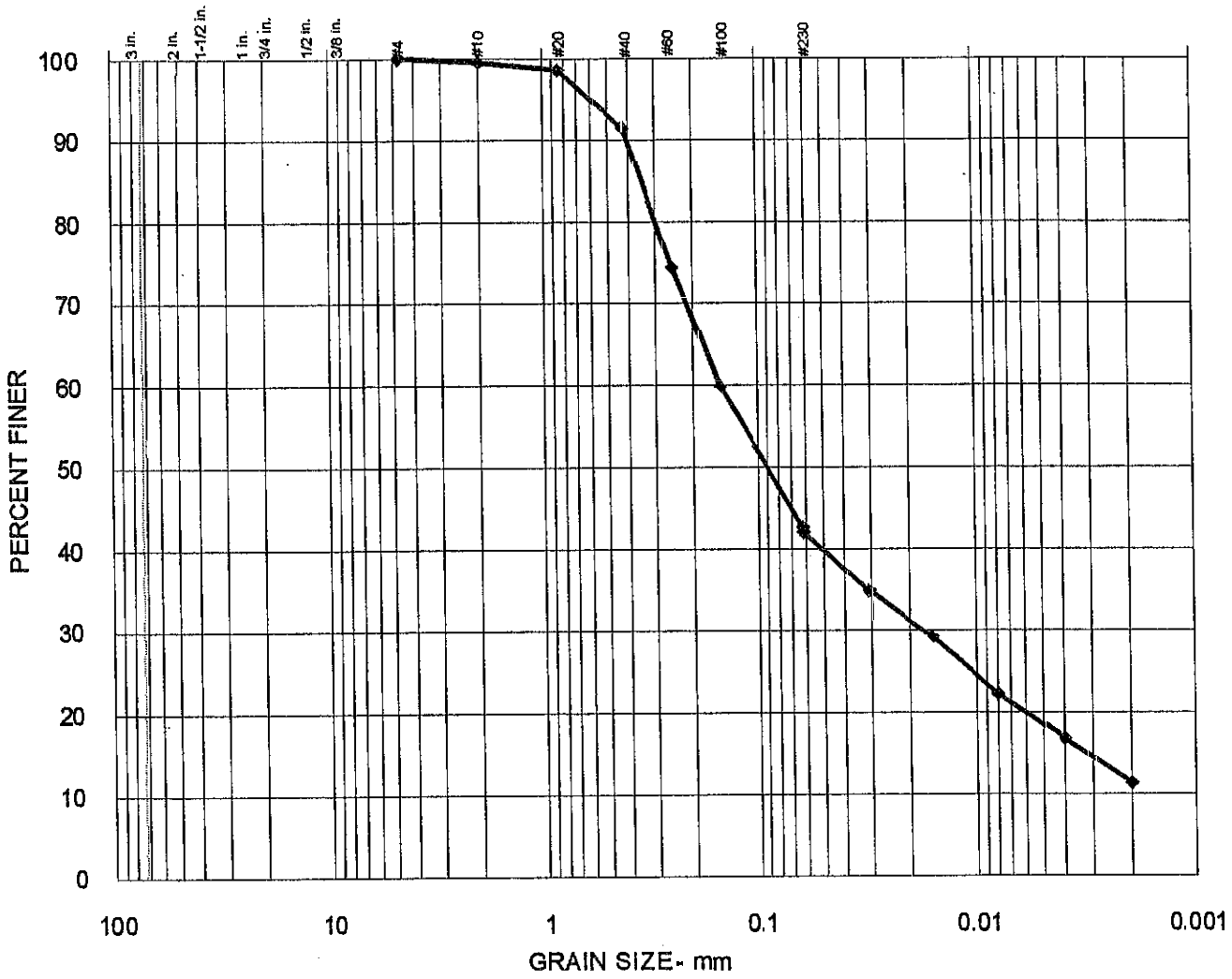
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 50

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	57%	26%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-24	0 - 10 cm	Sediment		77.74%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

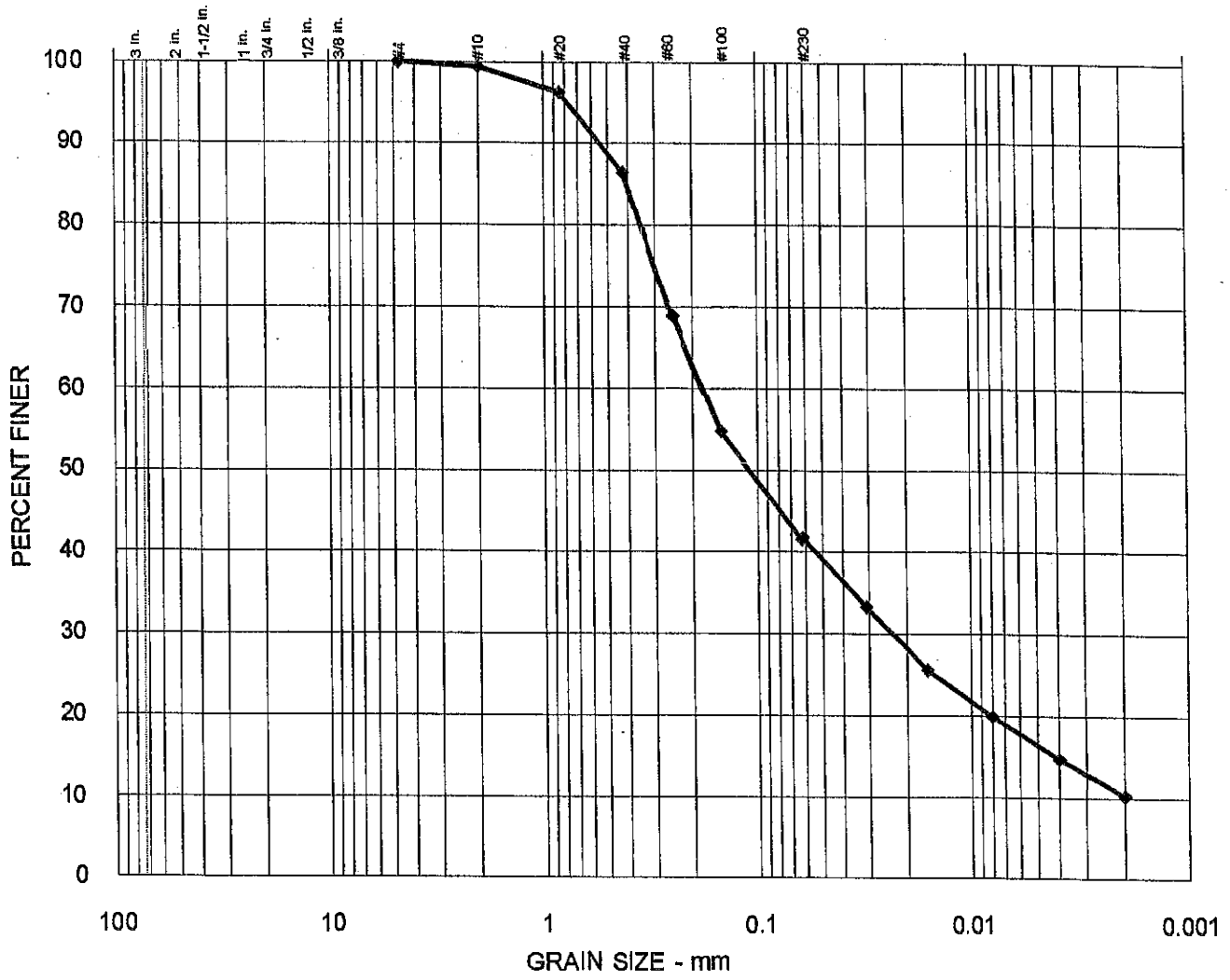
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 51

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	58%	26%	15%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-25	0-10 cm	Sediment		55.95%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

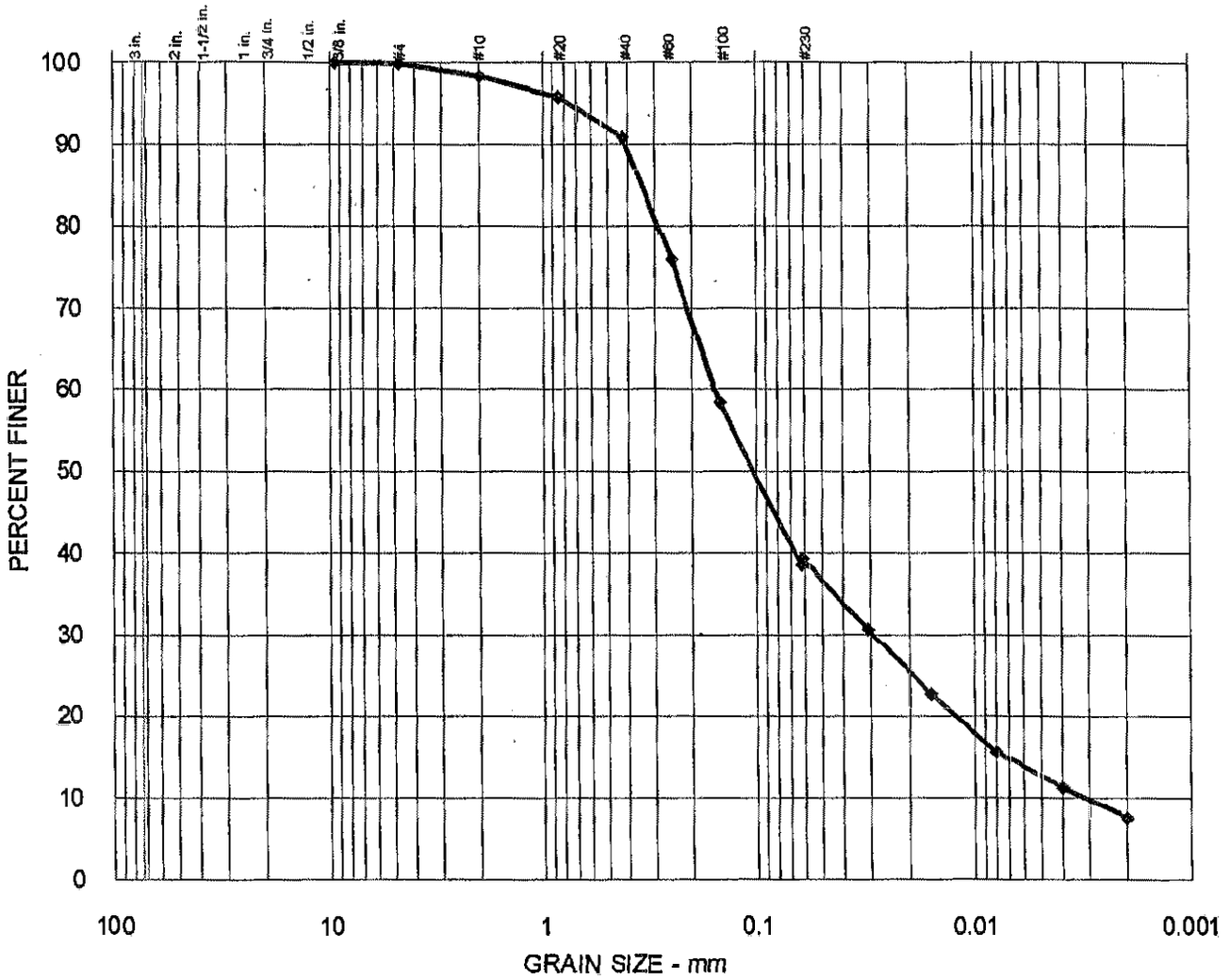
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 52

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	2%	59%	28%	11%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-26	0 - 10 cm	Sediment		77.54%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

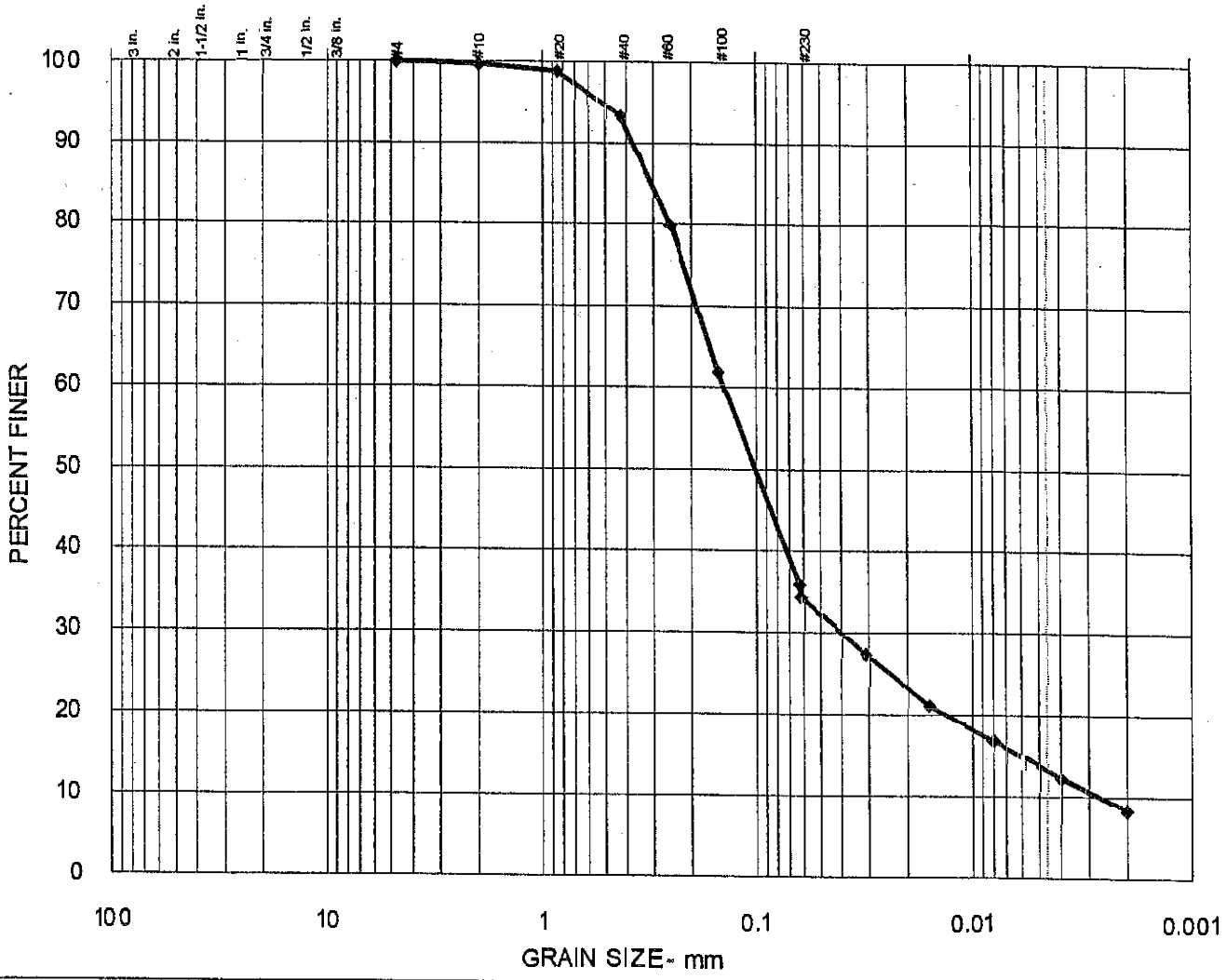
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 53

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	64%	24%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-27	0 - 10 cm	Sediment		60.50%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

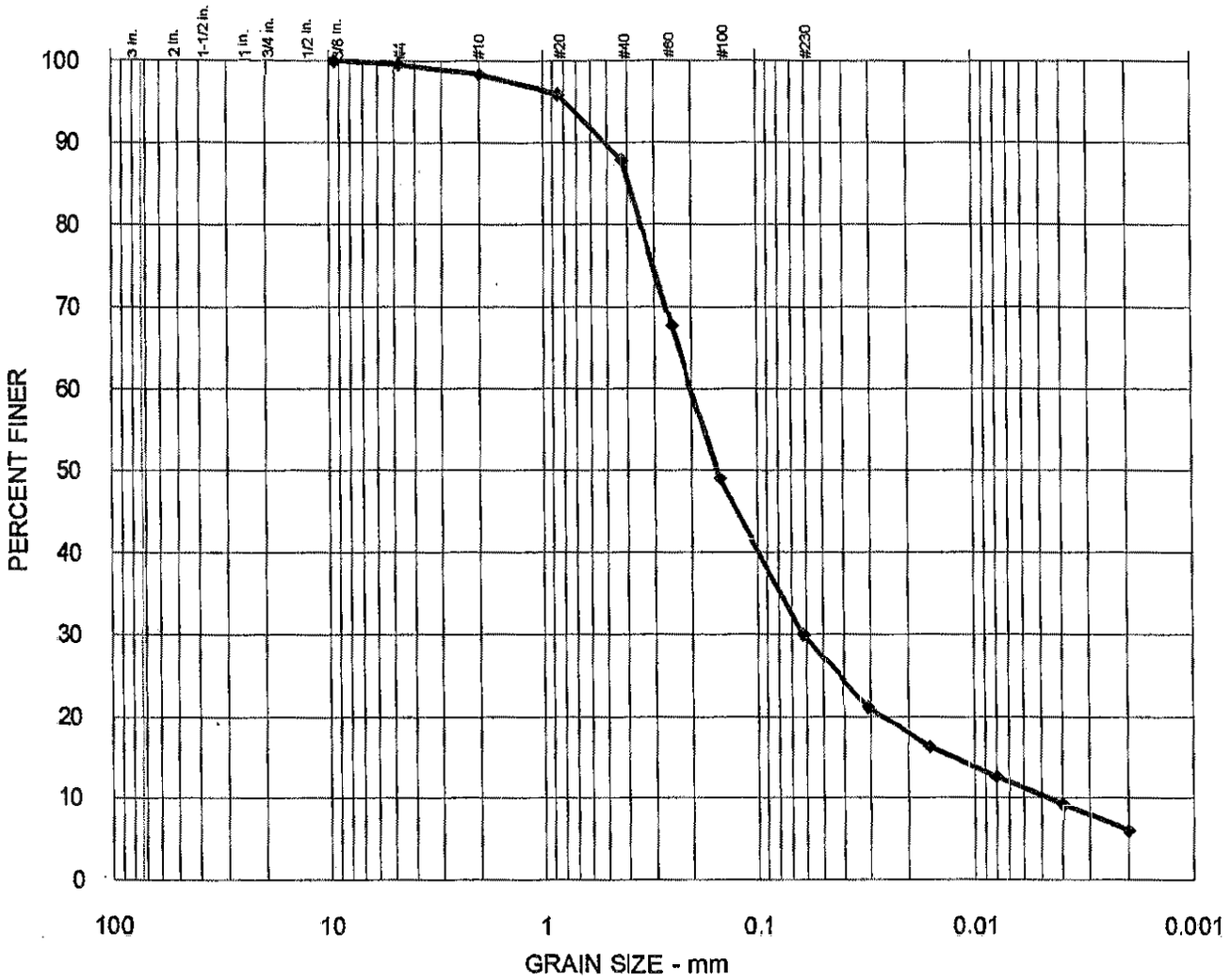
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 40

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	2%	68%	21%	9%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-28	0 - 10 cm	Sediment		53.97%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

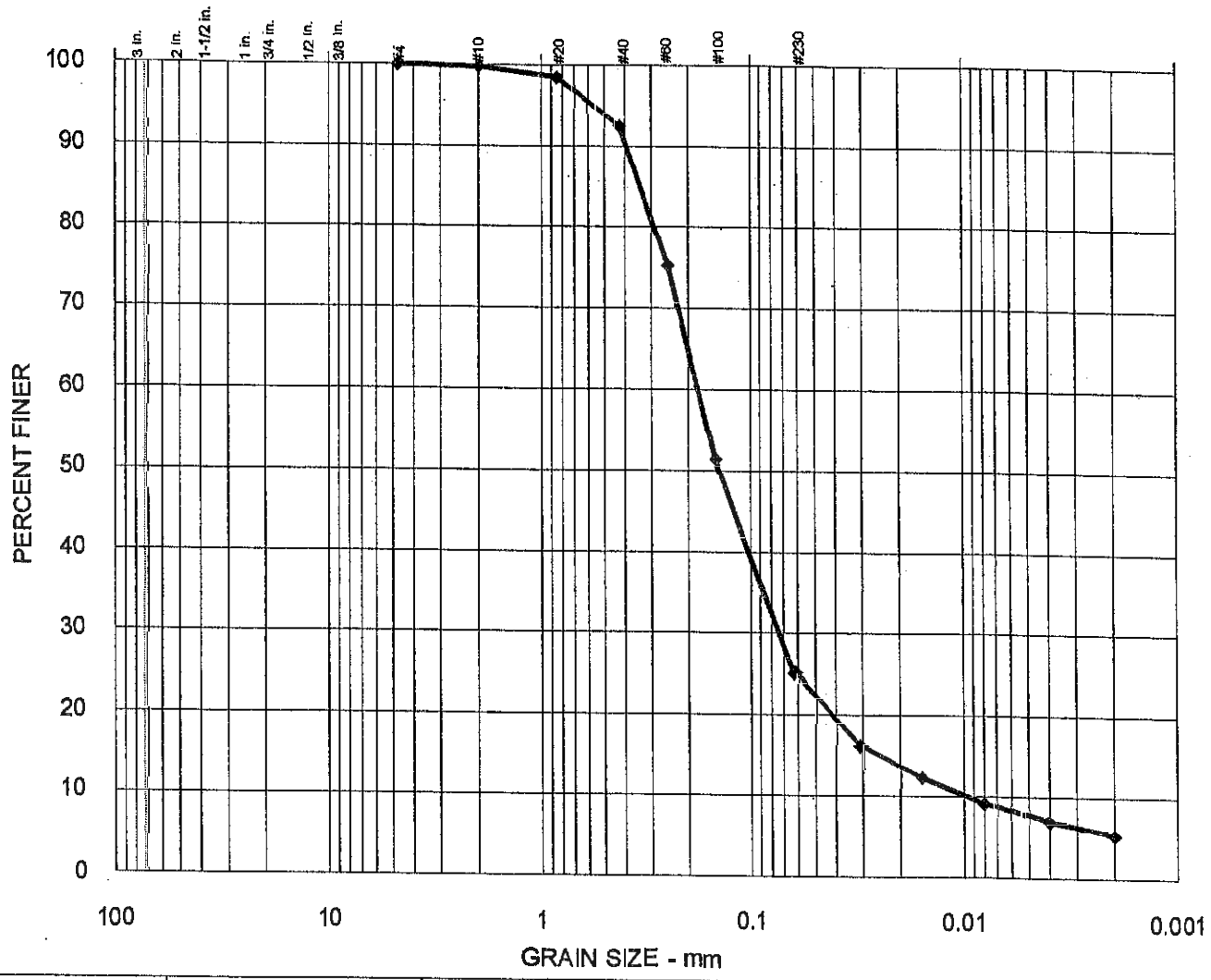
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 54

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	75%	18%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-29	0 - 10 cm	Sediment		39.42%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

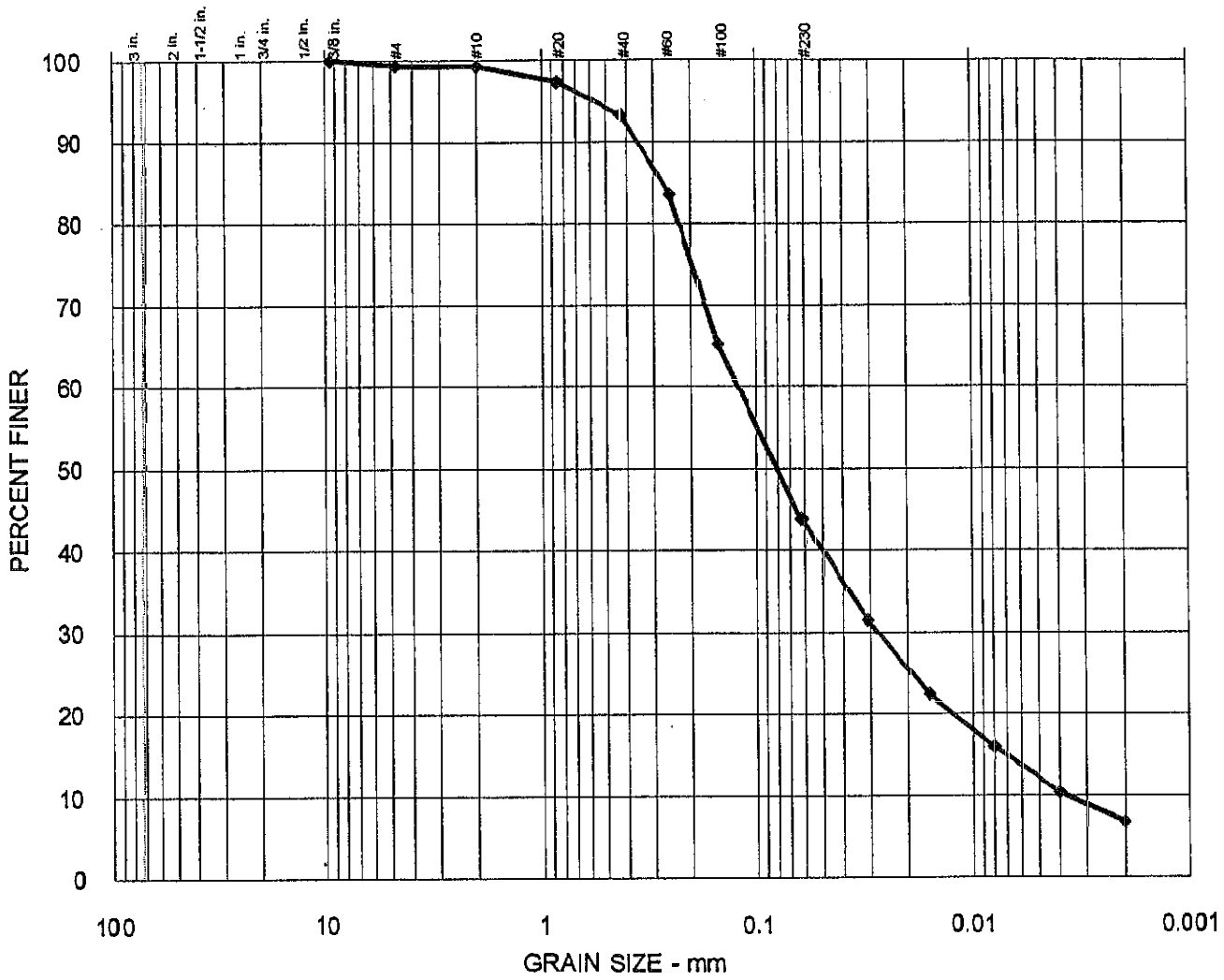
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 55

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	% CLAY
	1%	55%	34%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-30	0 - 10 cm	Sediment		58.79%

	MATERIAL DESCRIPTION	
	Slightly clayey, very silty SAND	

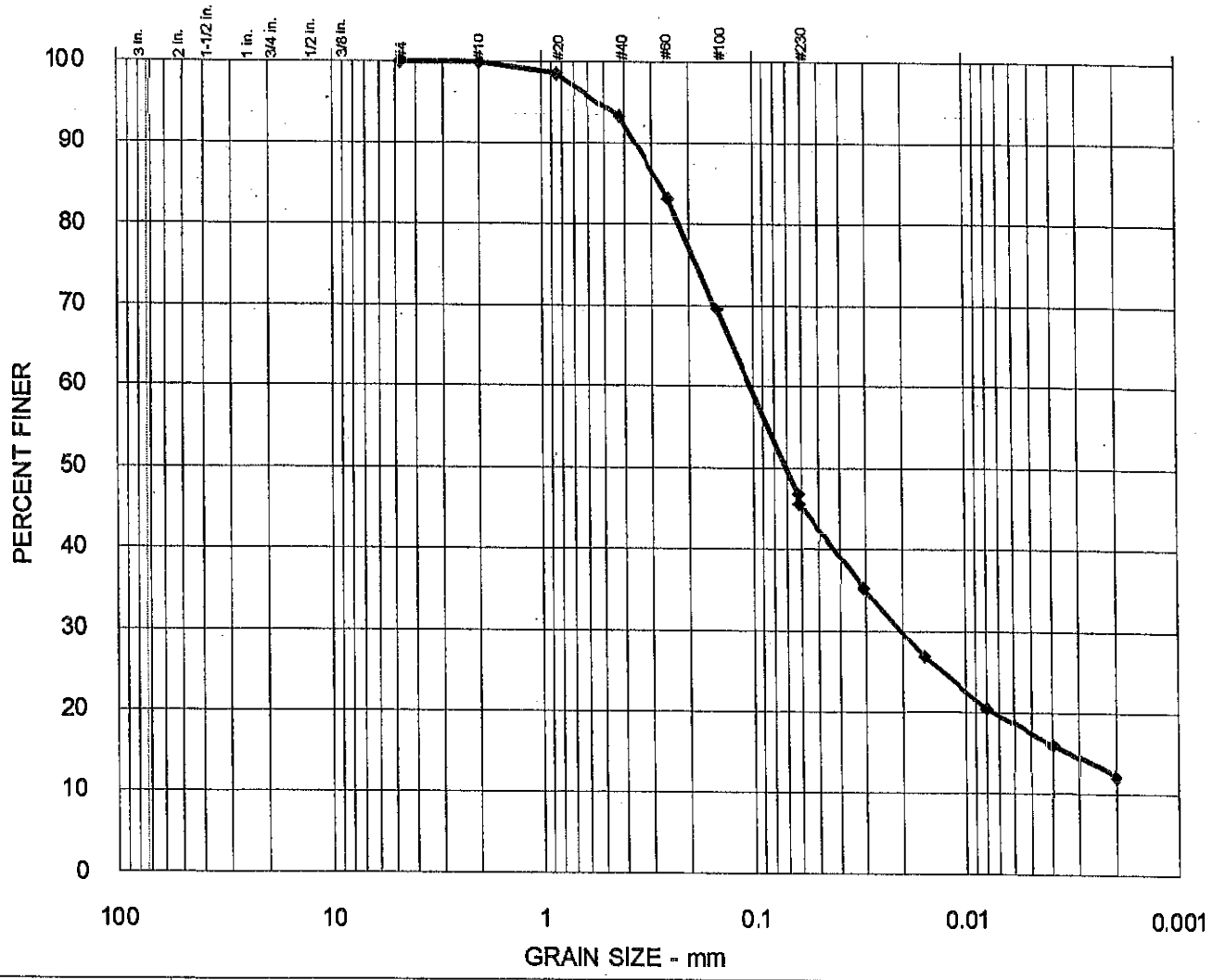
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 46

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	53%	31%	16%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-31	0 - 10 cm	Sediment		64.23%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

Remarks:

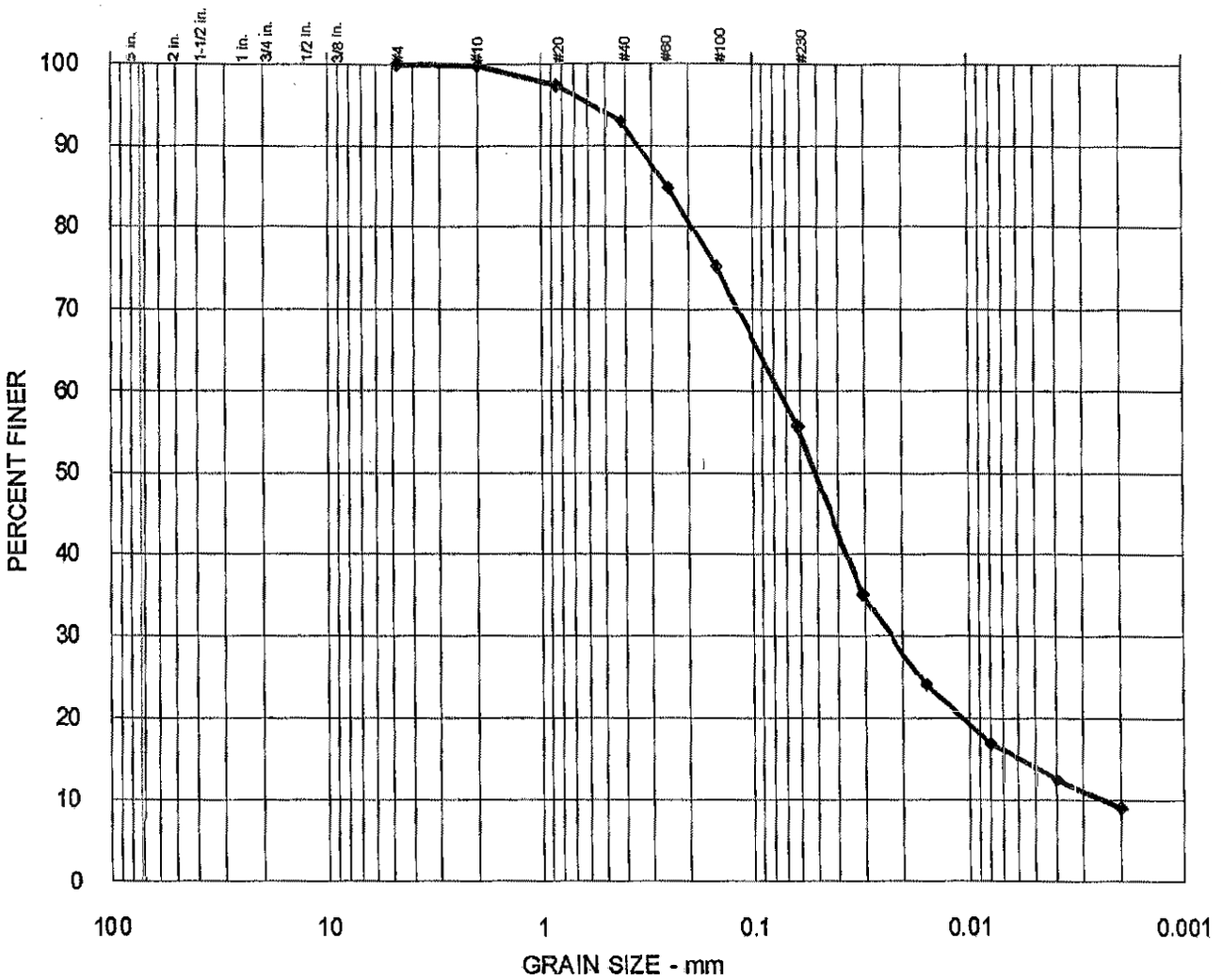
Project: Harbor Island Sediments

HARTCROWSER

J-4300

Figure 56

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	44%	44%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-32	0 - 10 cm	Sediment		50.73%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

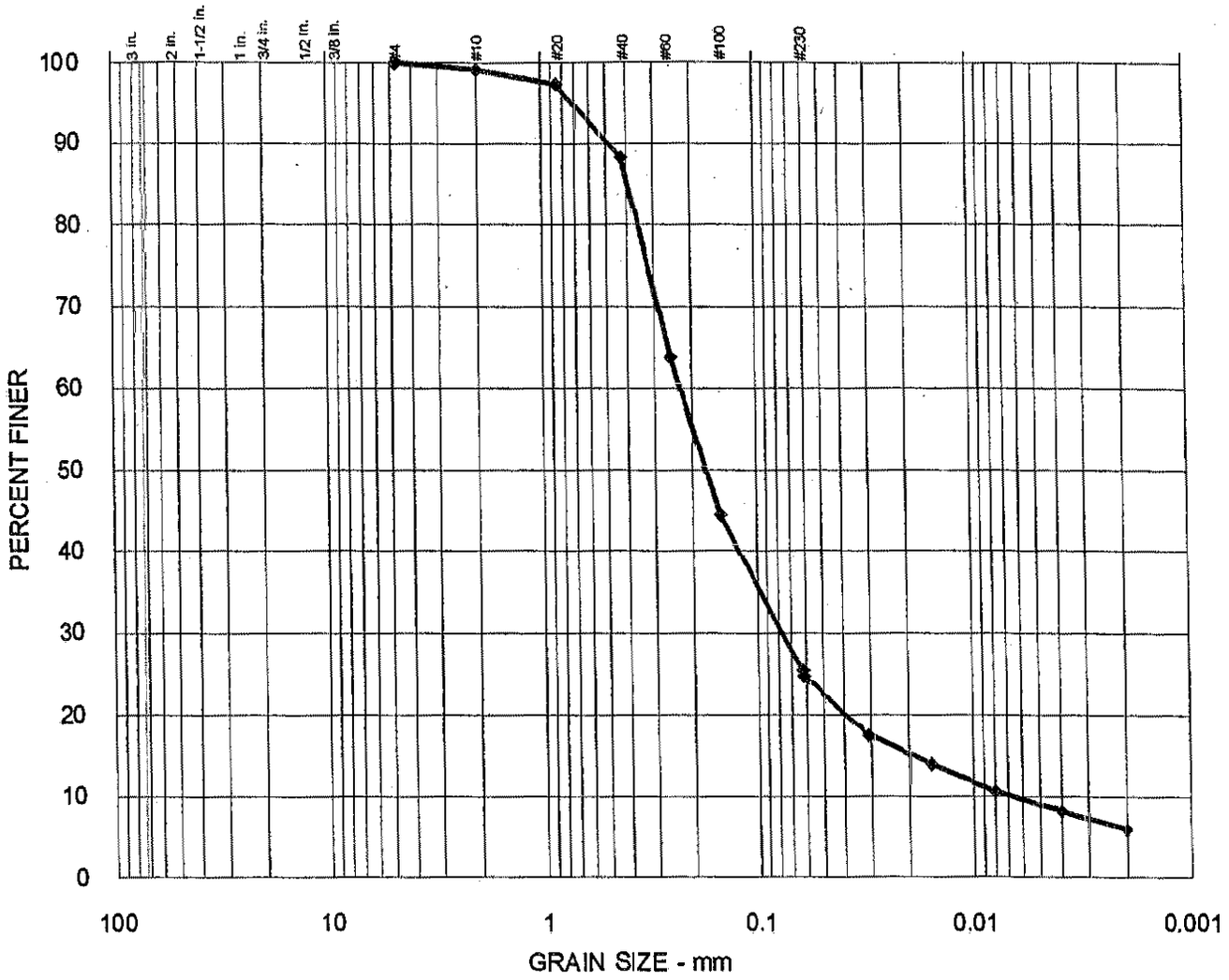
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 57

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	74%	17%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-62	0 - 10 cm	Sediment		47.40%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

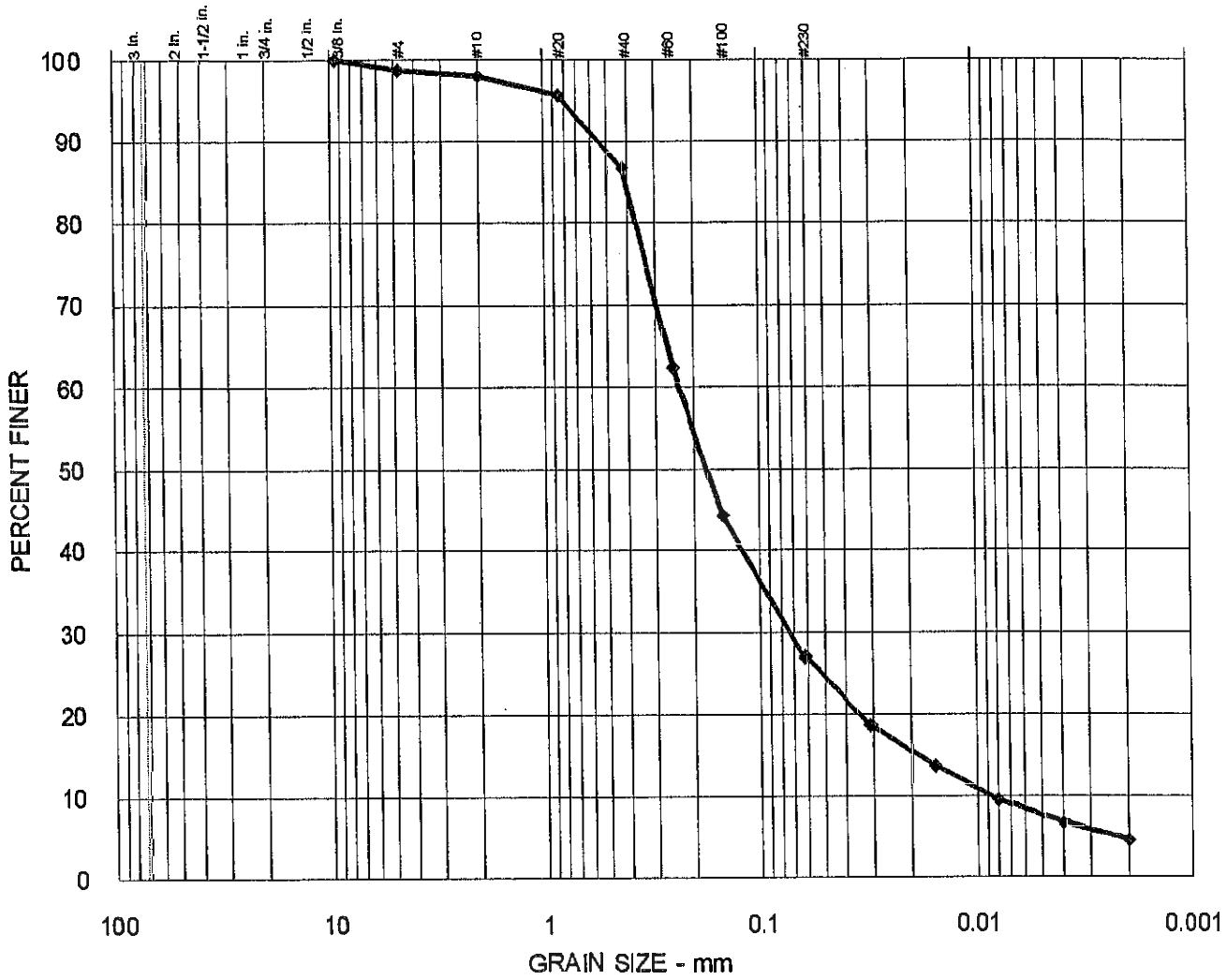
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 58

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	2%	71%	20%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-63	0 - 10 cm	Sediment		53.85%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

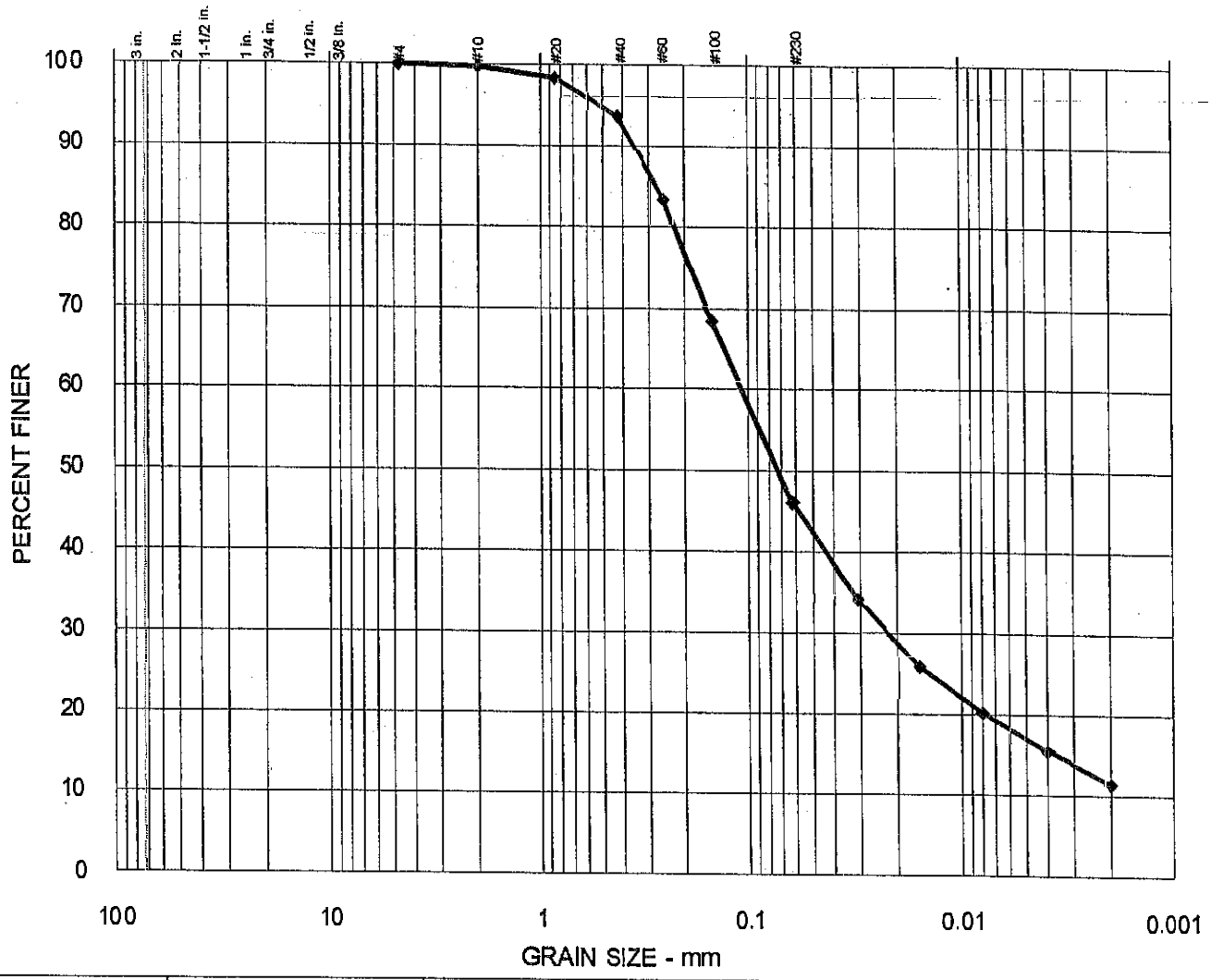
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 59

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	54%	31%	15%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-64	0 - 10 cm	Sediment		60.31%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

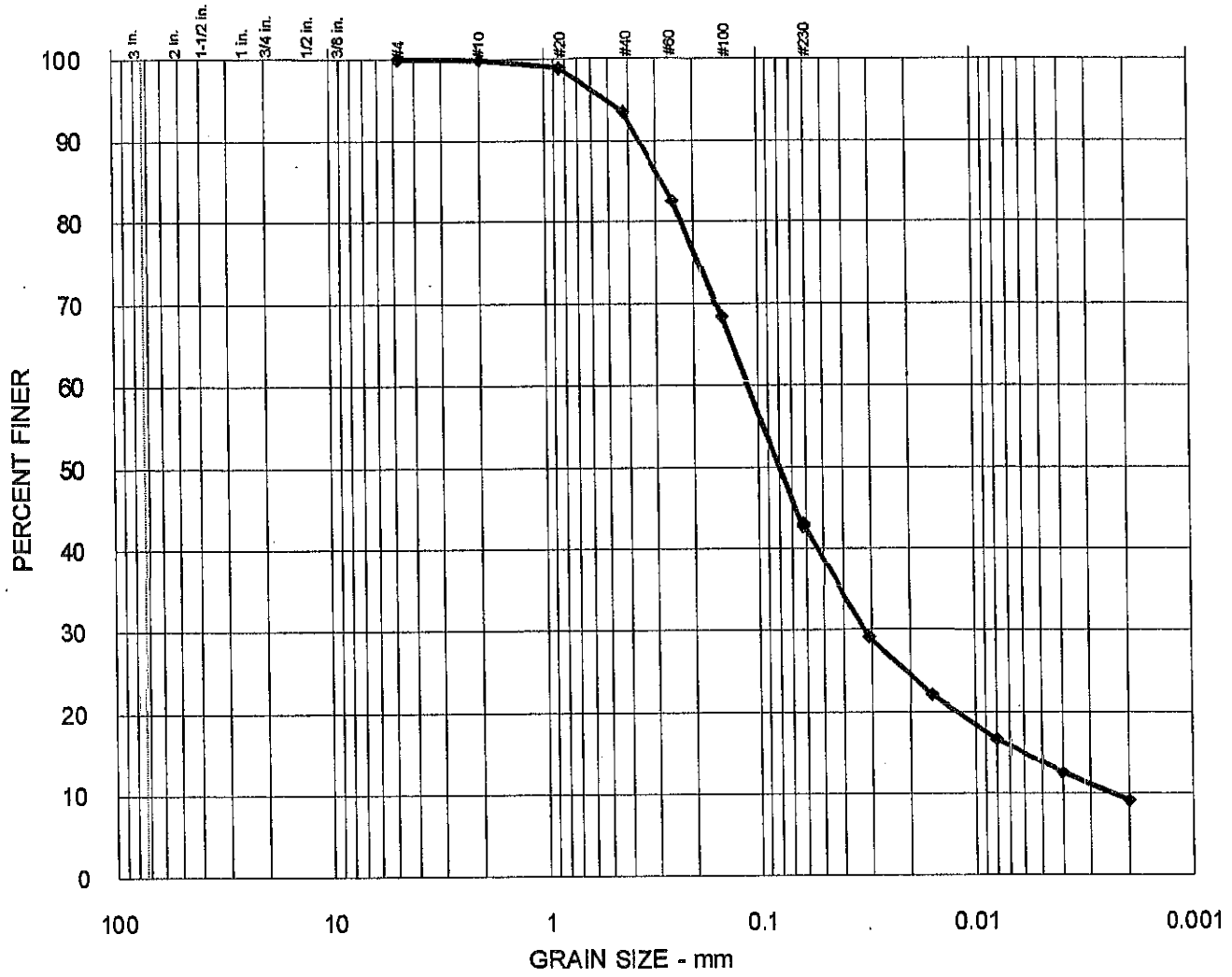
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 60

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	57%	31%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-65	0 - 10 cm	Sediment		59.59%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

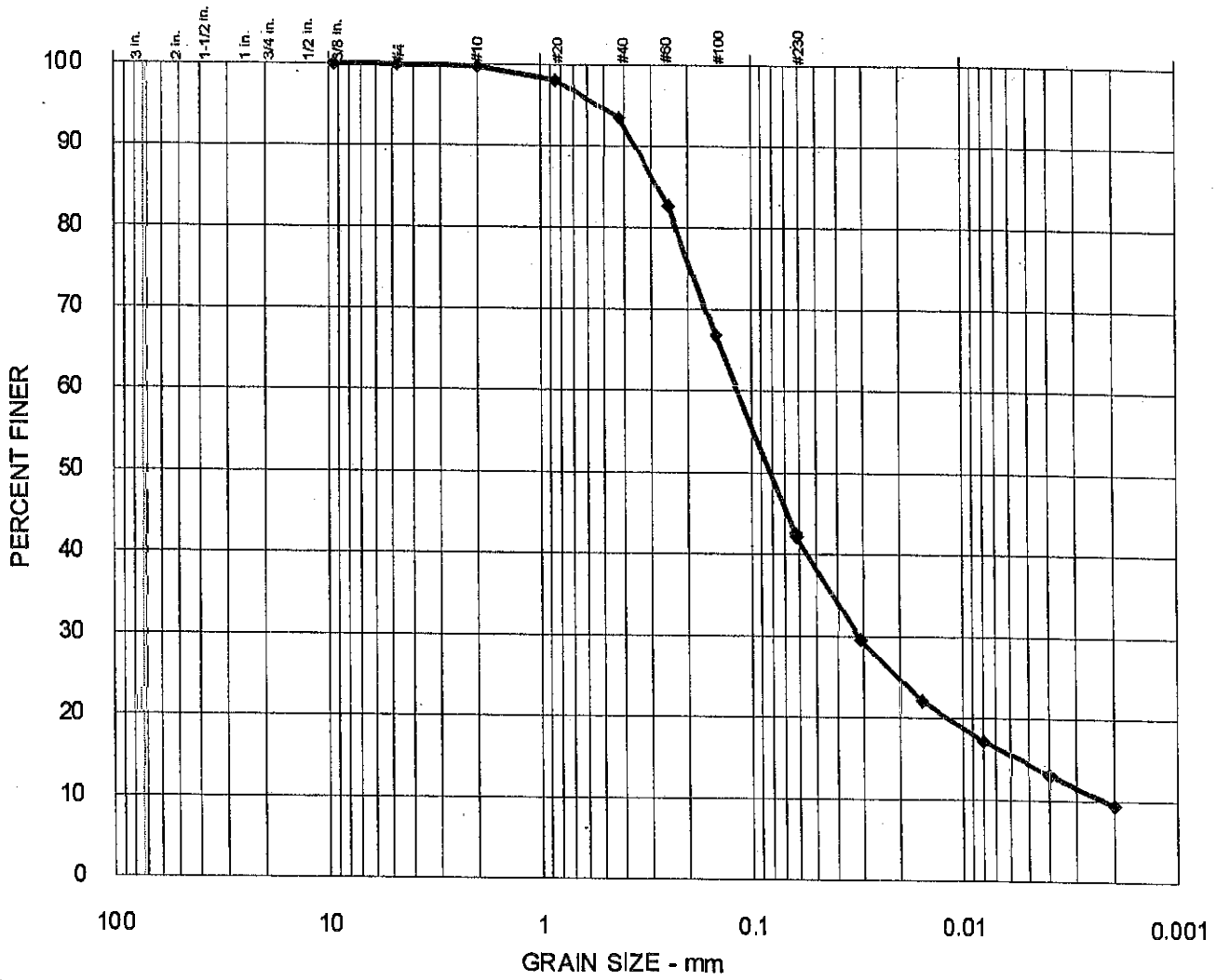
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 61

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	57%	30%	13%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-65T1	0 - 10 cm	Sediment		59.59%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

Remarks:

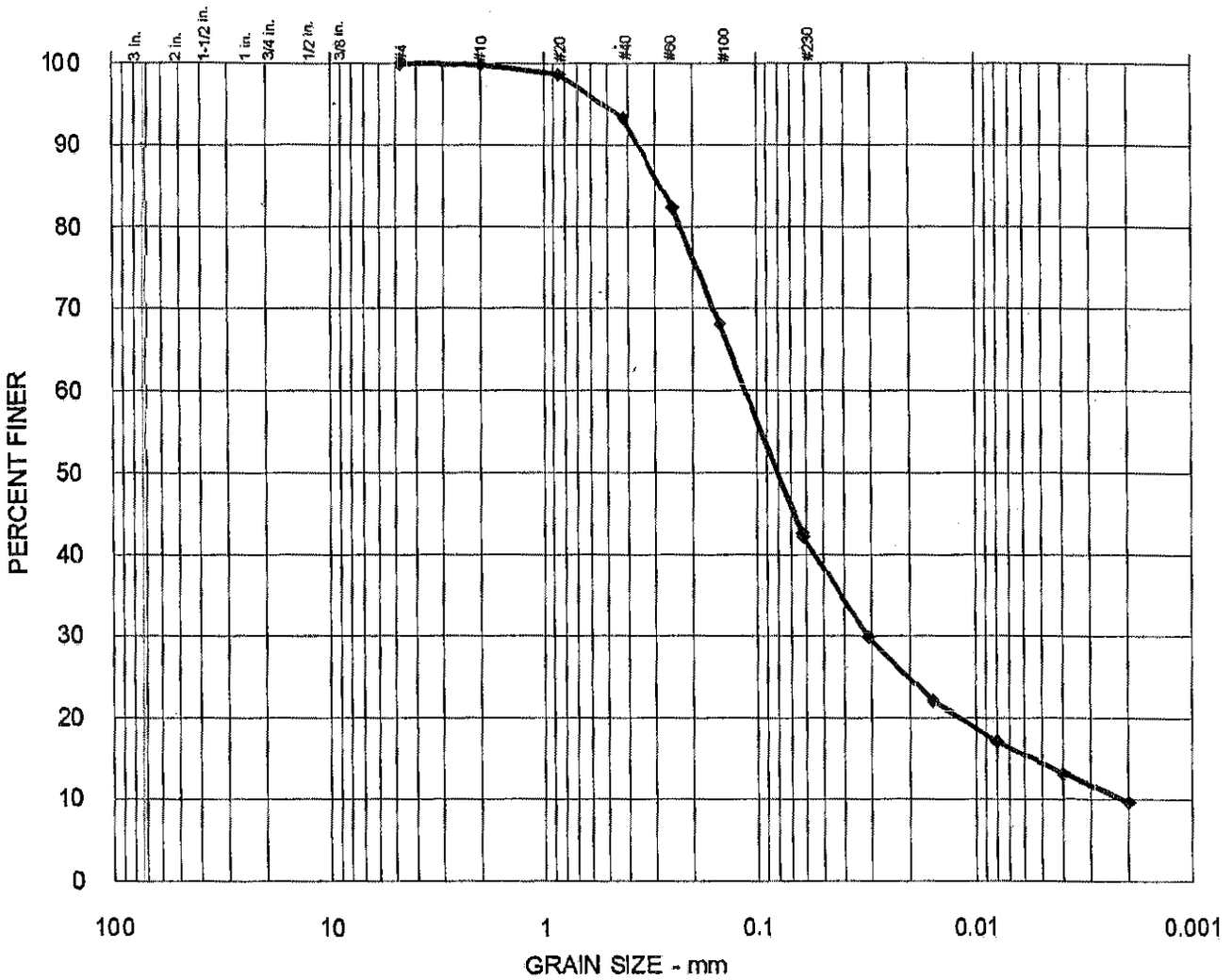
Project: Harbor Island Sediments

HARTCROWSER

J-4300

Figure 62

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	57%	30%	13%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-65T2	0 - 10 cm	Sediment		59.59%

	MATERIAL DESCRIPTION	
	Clayey, very silty SAND	

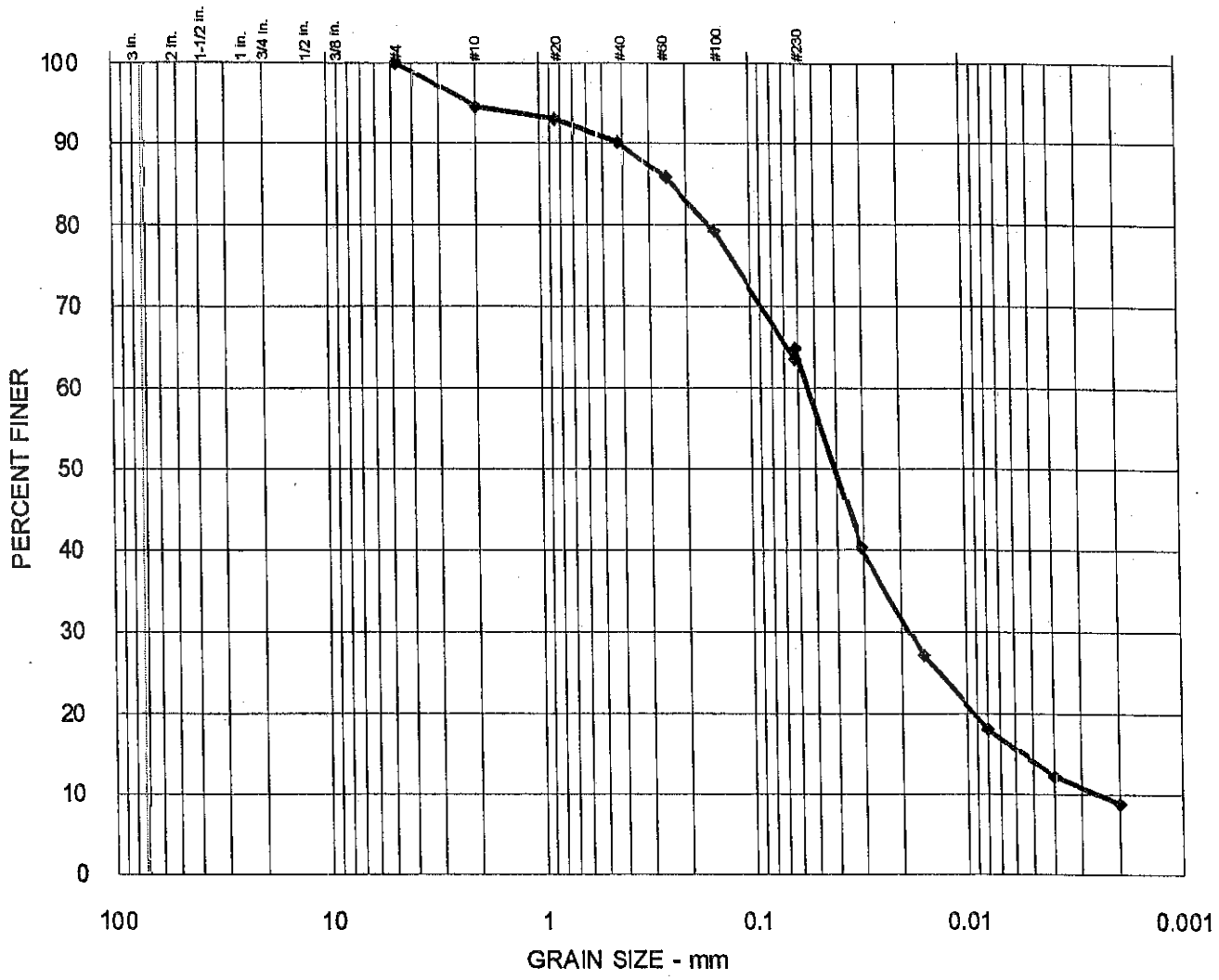
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 63

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	5%	31%	52%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-66	0 - 10 cm	Sediment		53.40%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

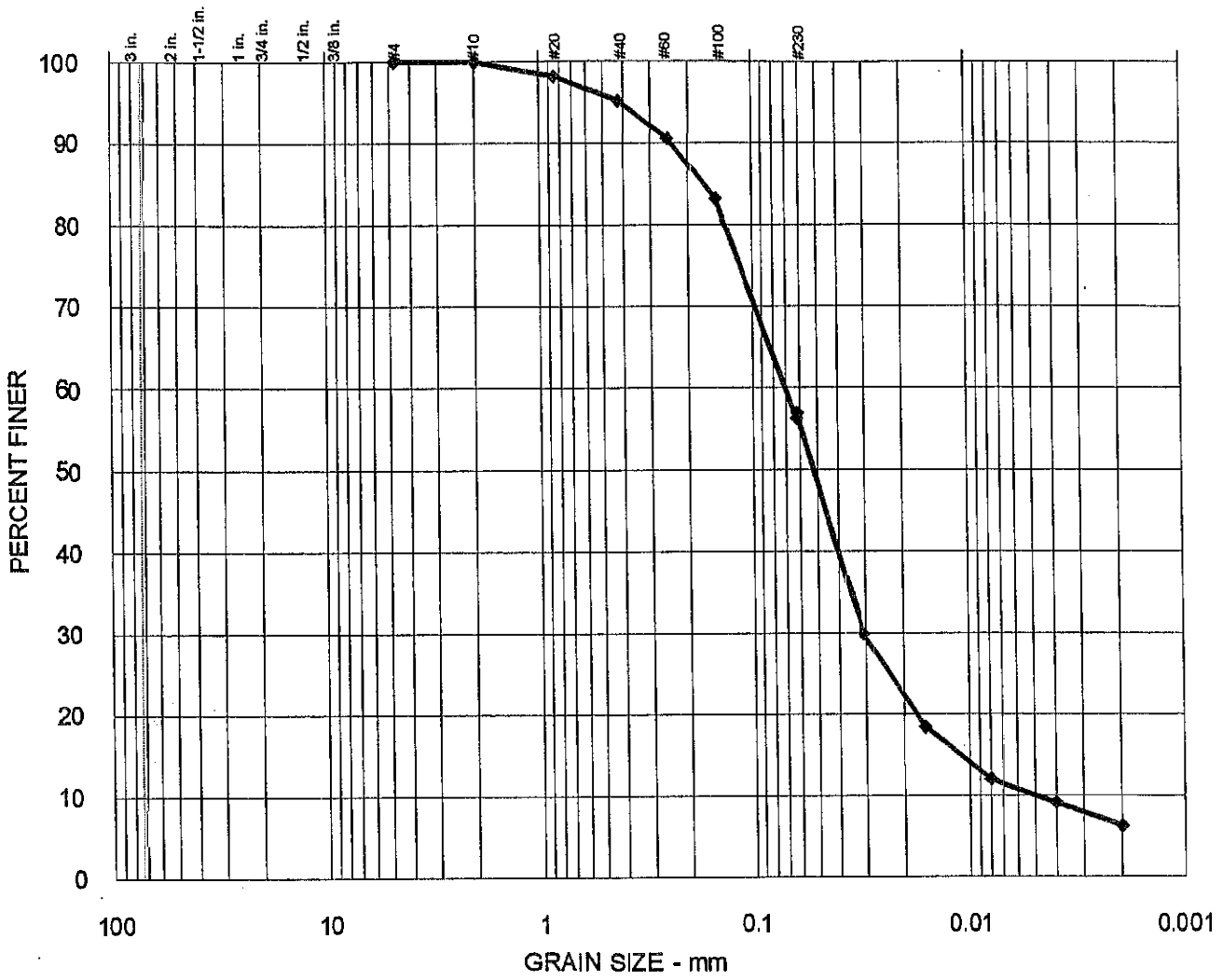
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 64

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	44%	47%	9%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-67	0 - 10 cm	Sediment		52.93%

	MATERIAL DESCRIPTION	
	Slightly clayey, very sandy SILT	

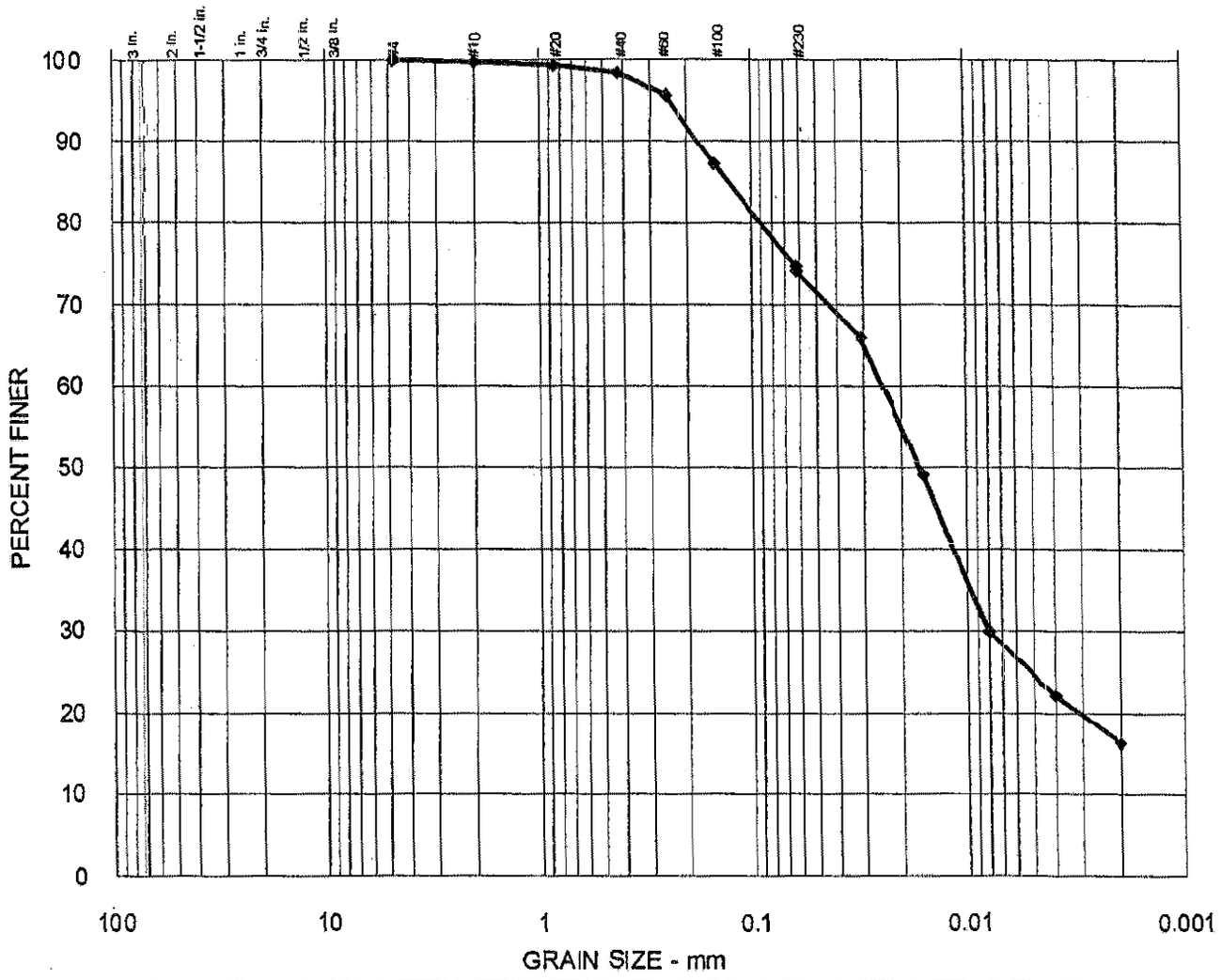
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 65

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	25%	53%	22%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-01	0 - 10 cm	Sediment		102.74%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

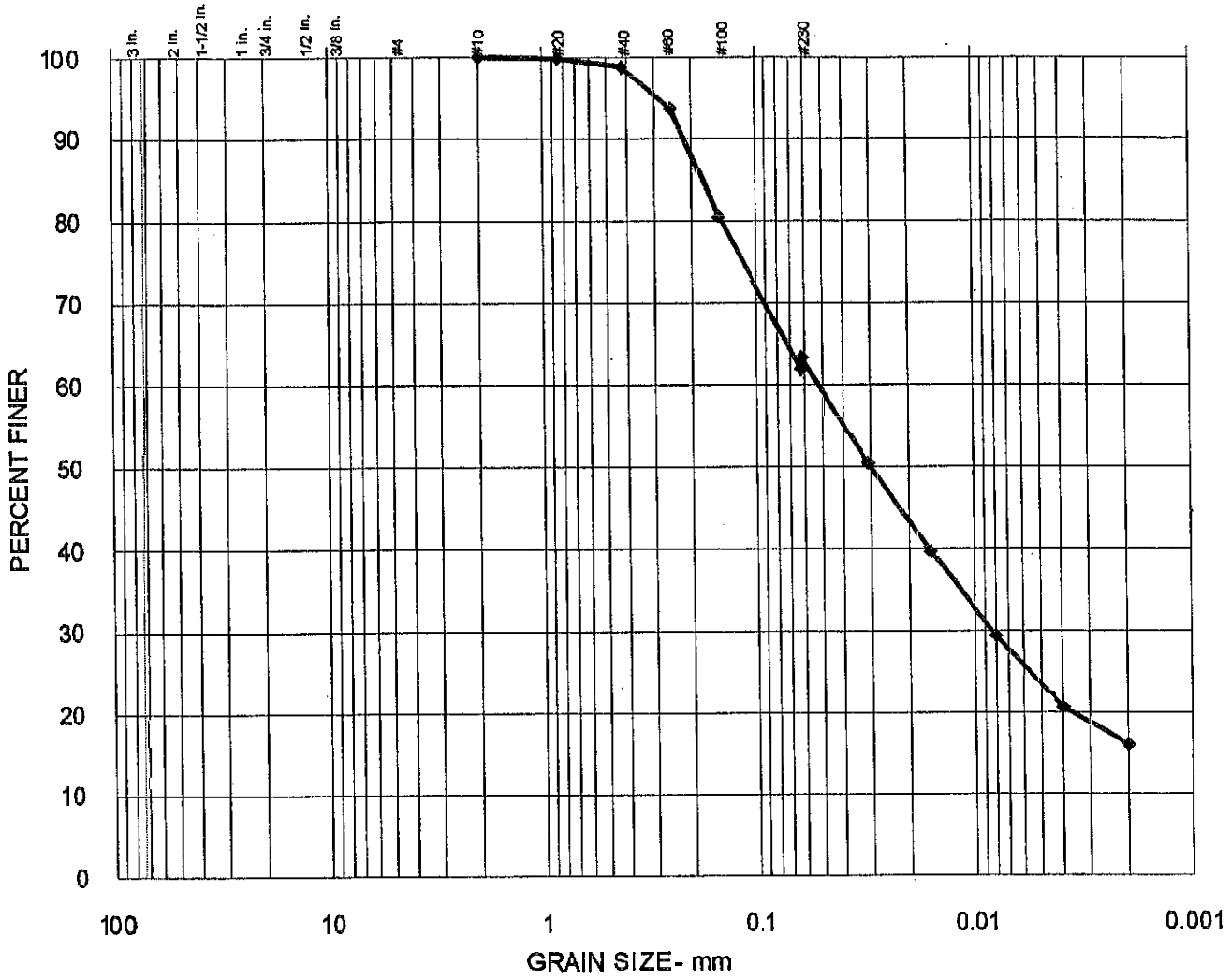
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 1

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	38%	41%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-02	0 - 10 cm	Sediment		82.11%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

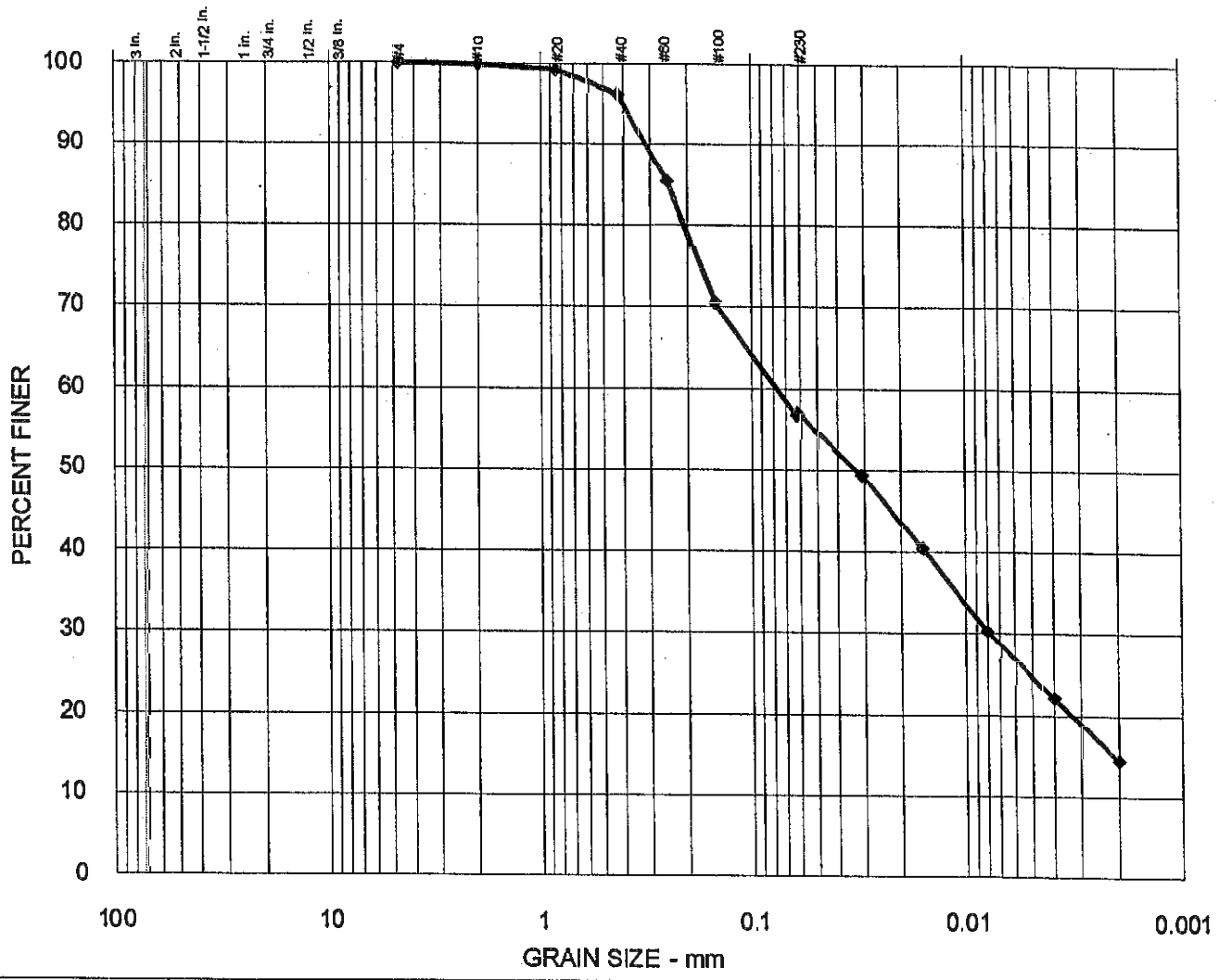
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 1

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	43%	35%	22%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-03	0 - 10 cm	Sediment		78.92%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

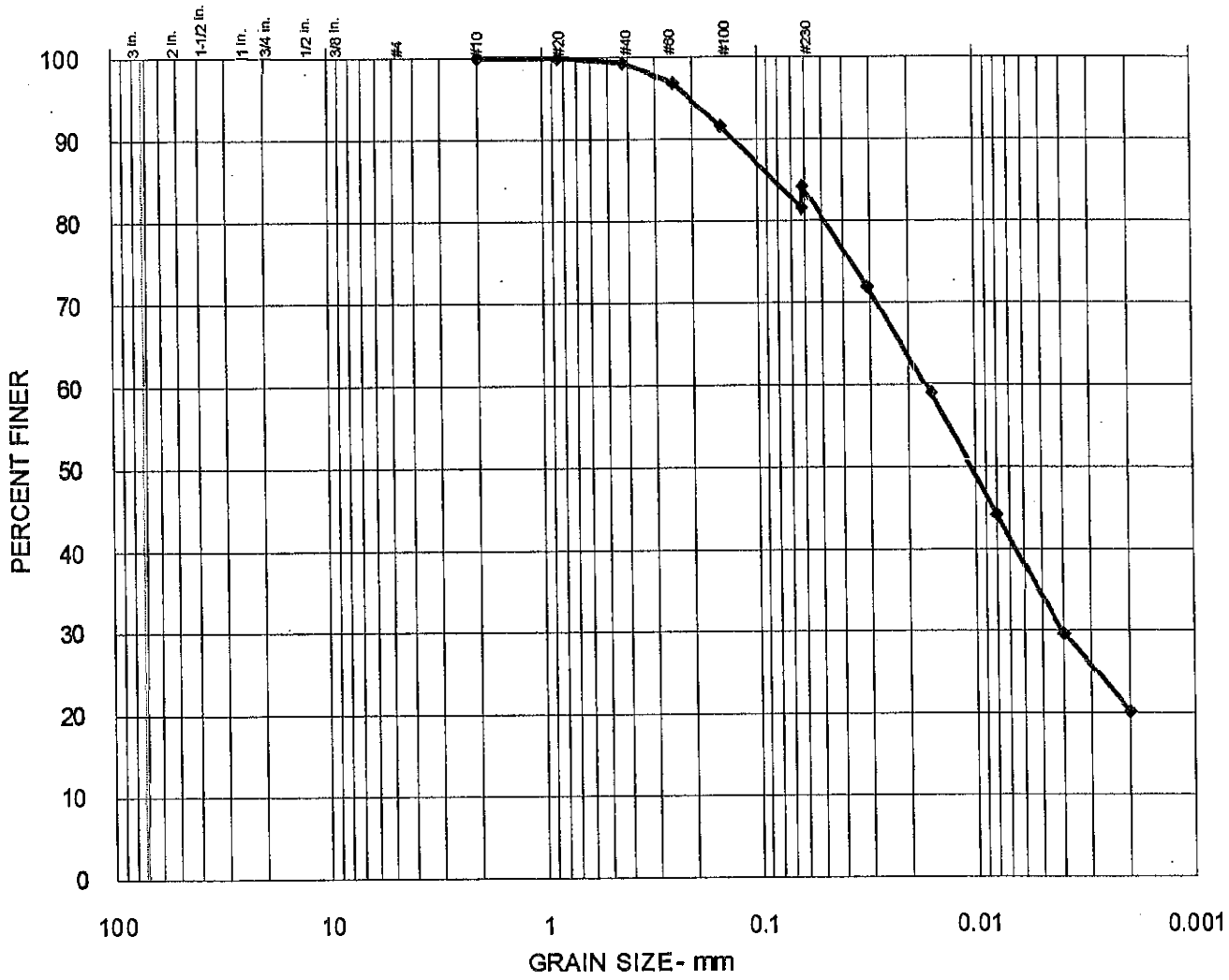
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 2

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	18%	52%	30%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-04	0 - 10 cm	Sediment		108.53%

	MATERIAL DESCRIPTION	
	Sandy, very clayey SILT	

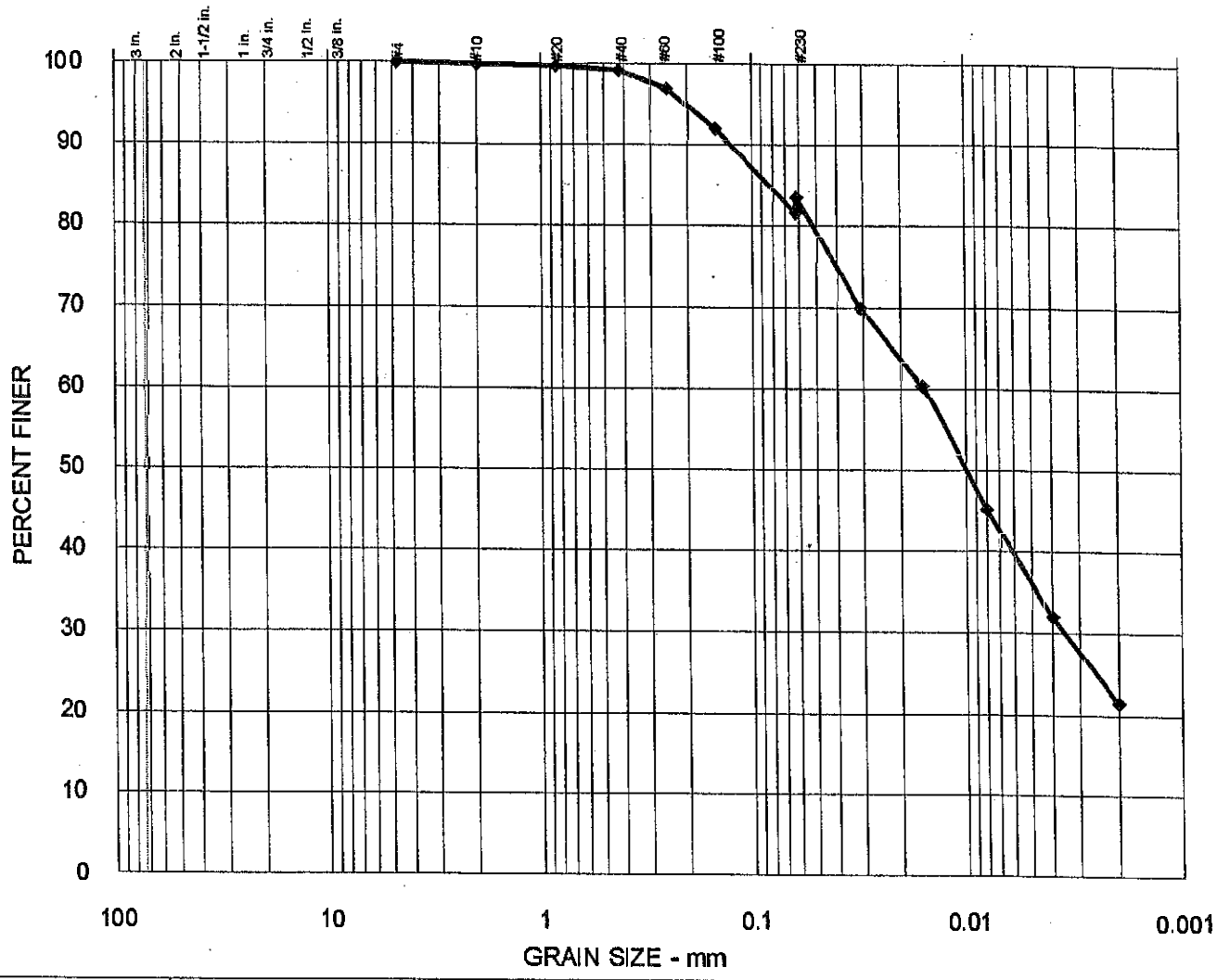
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 3

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	18%	50%	32%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-05	0 - 10 cm	Sediment		100.71%

	MATERIAL DESCRIPTION	
	Sandy, very clayey SILT	

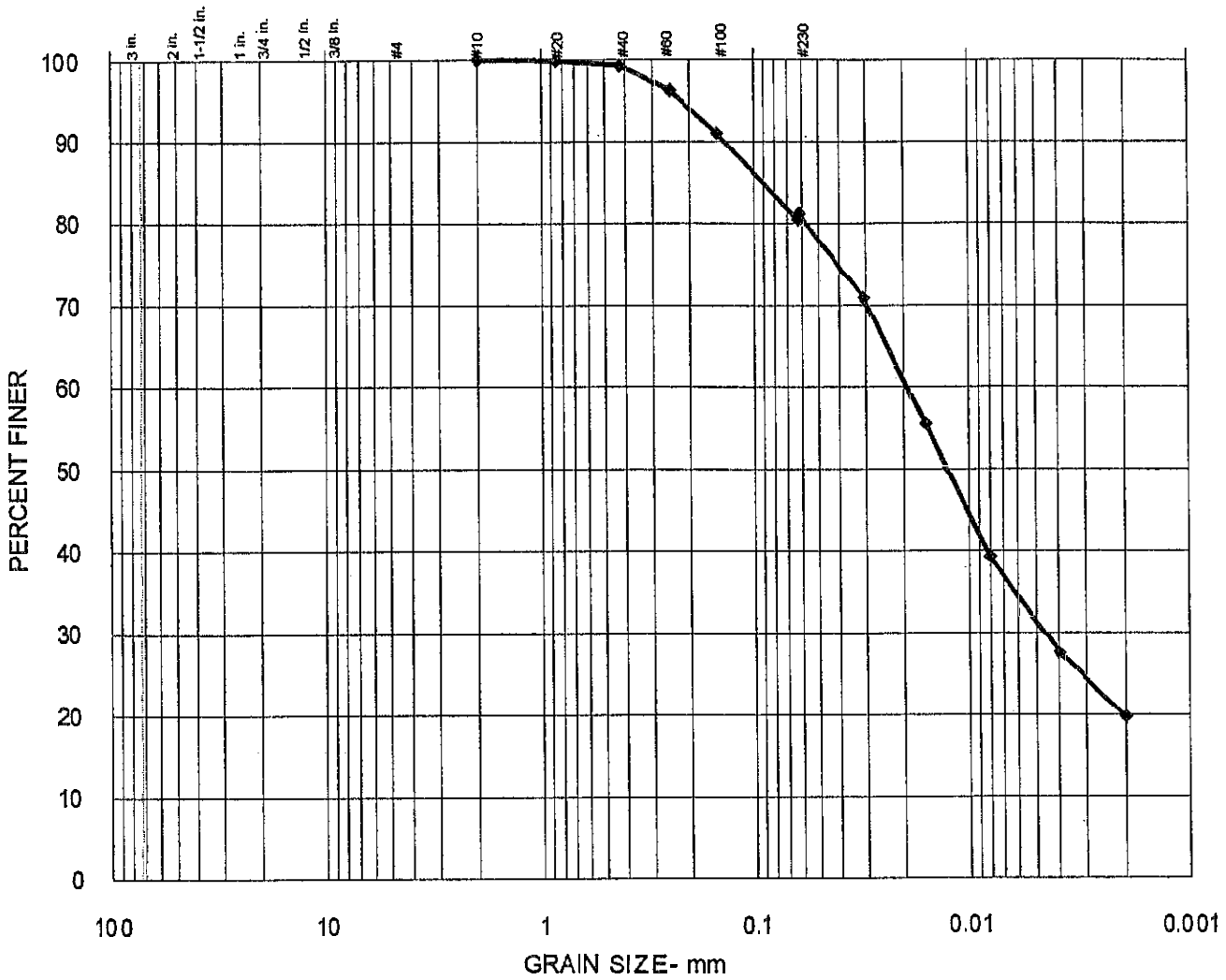
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 4

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	20%	52%	28%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-06	0 - 10 cm	Sediment		103.71%

	MATERIAL DESCRIPTION	
	Sandy, clayey SILT	

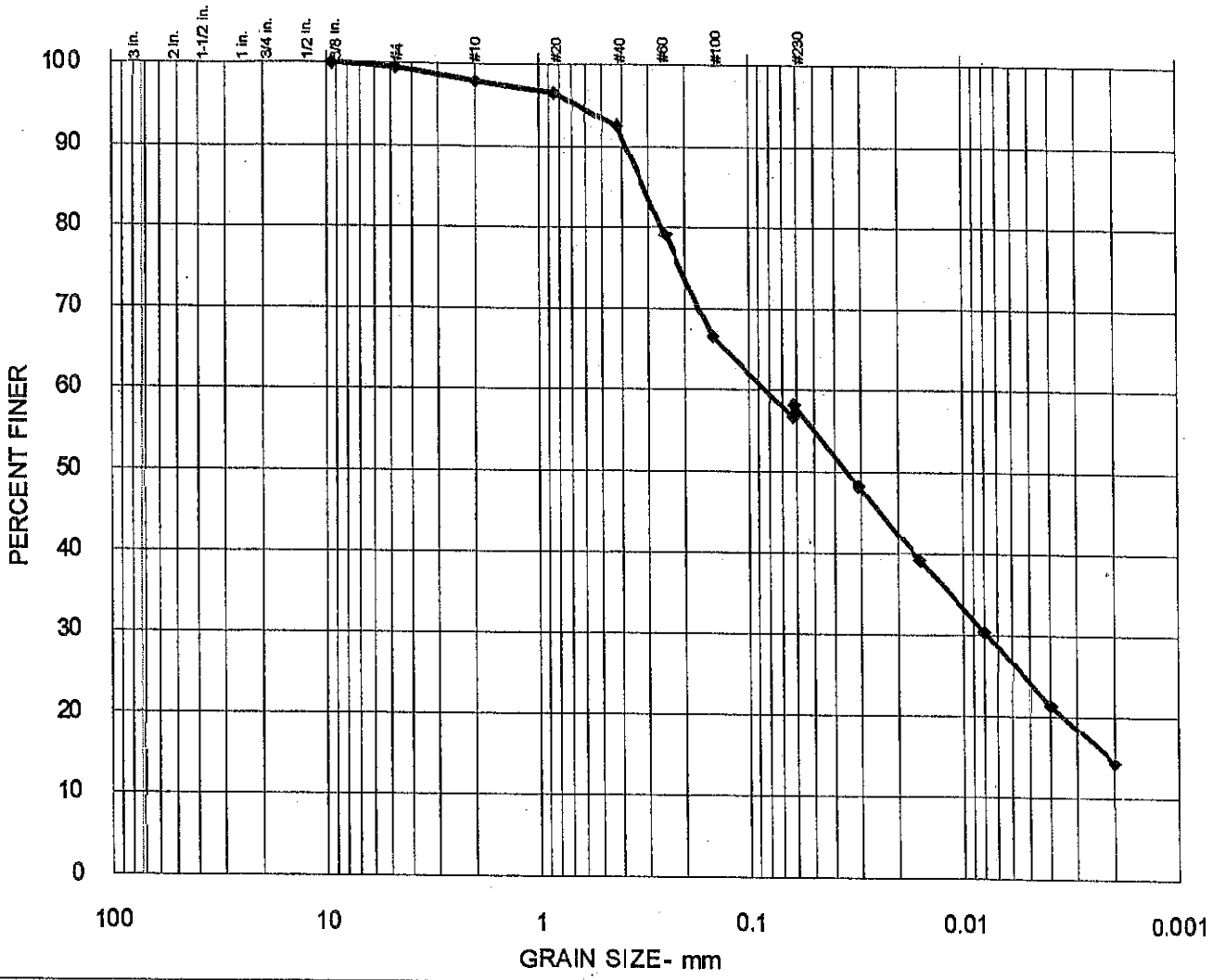
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 5

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	2%	41%	36%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-07	0 - 10 cm	Sediment		74.63%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

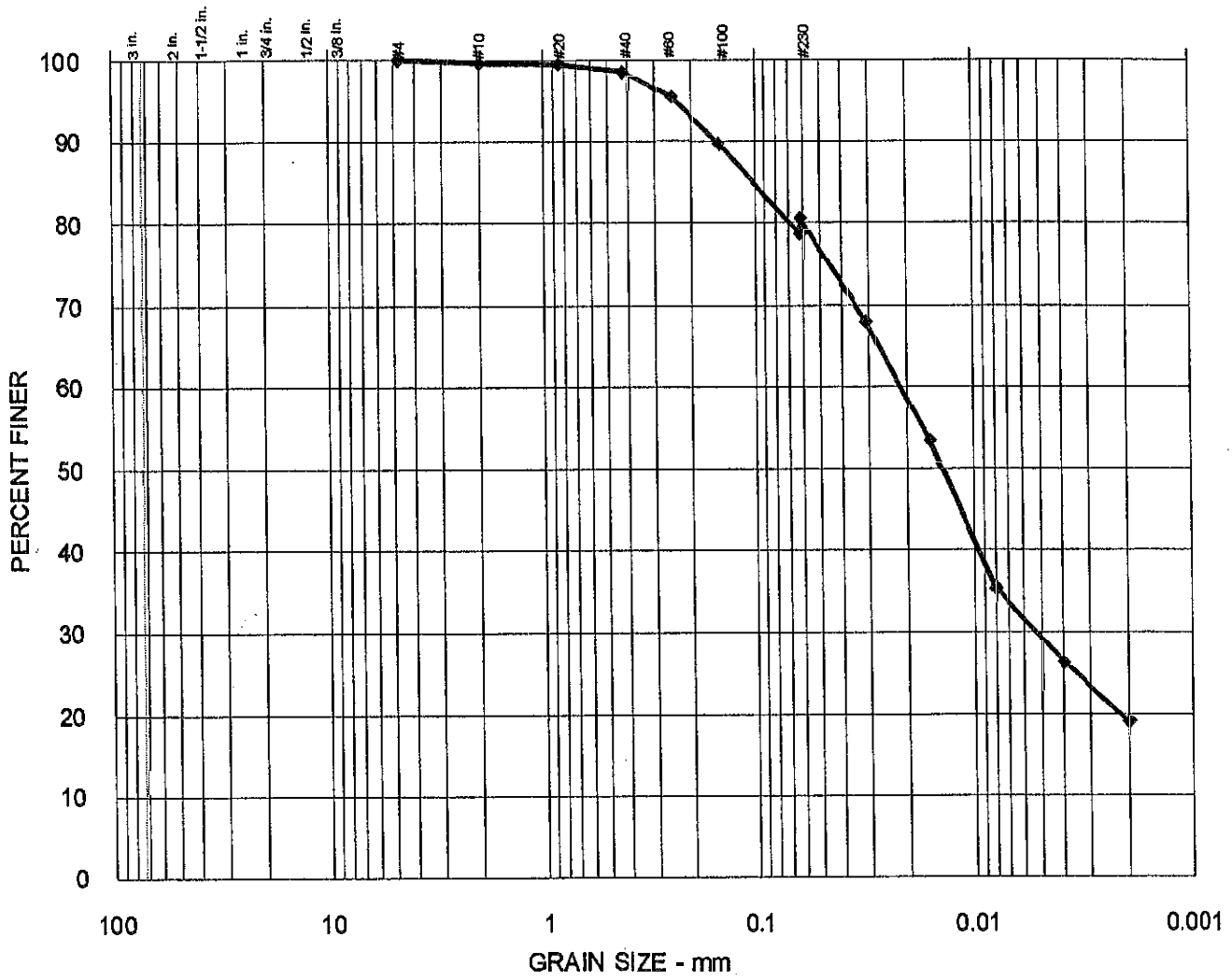
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 5

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	21%	53%	26%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-08	0 - 10 cm	Sediment		102.69%

	MATERIAL DESCRIPTION	
	Sandy, clayey SILT	

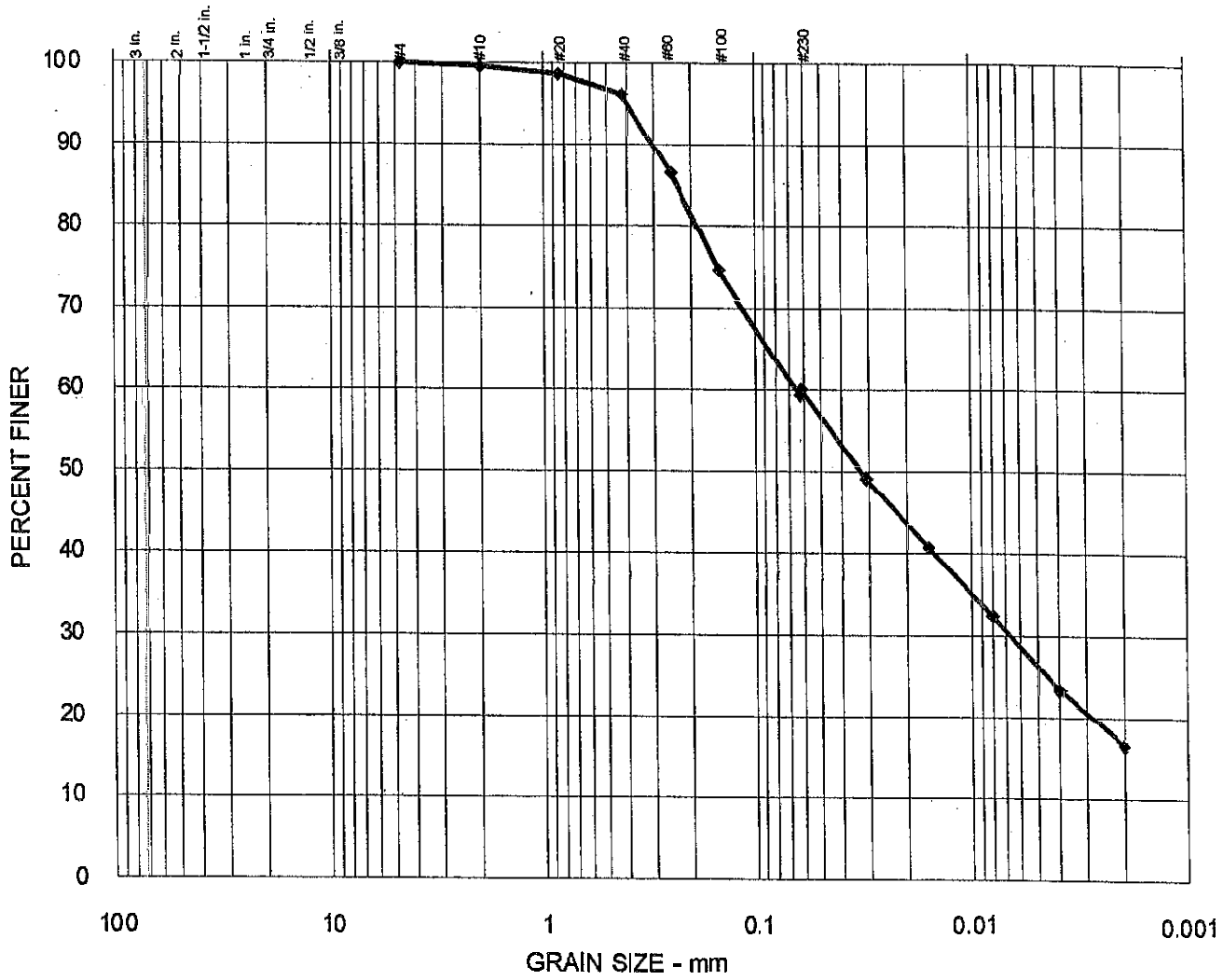
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 6

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	41%	36%	23%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-09	0 - 10 cm	Sediment		79.58%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

Remarks:

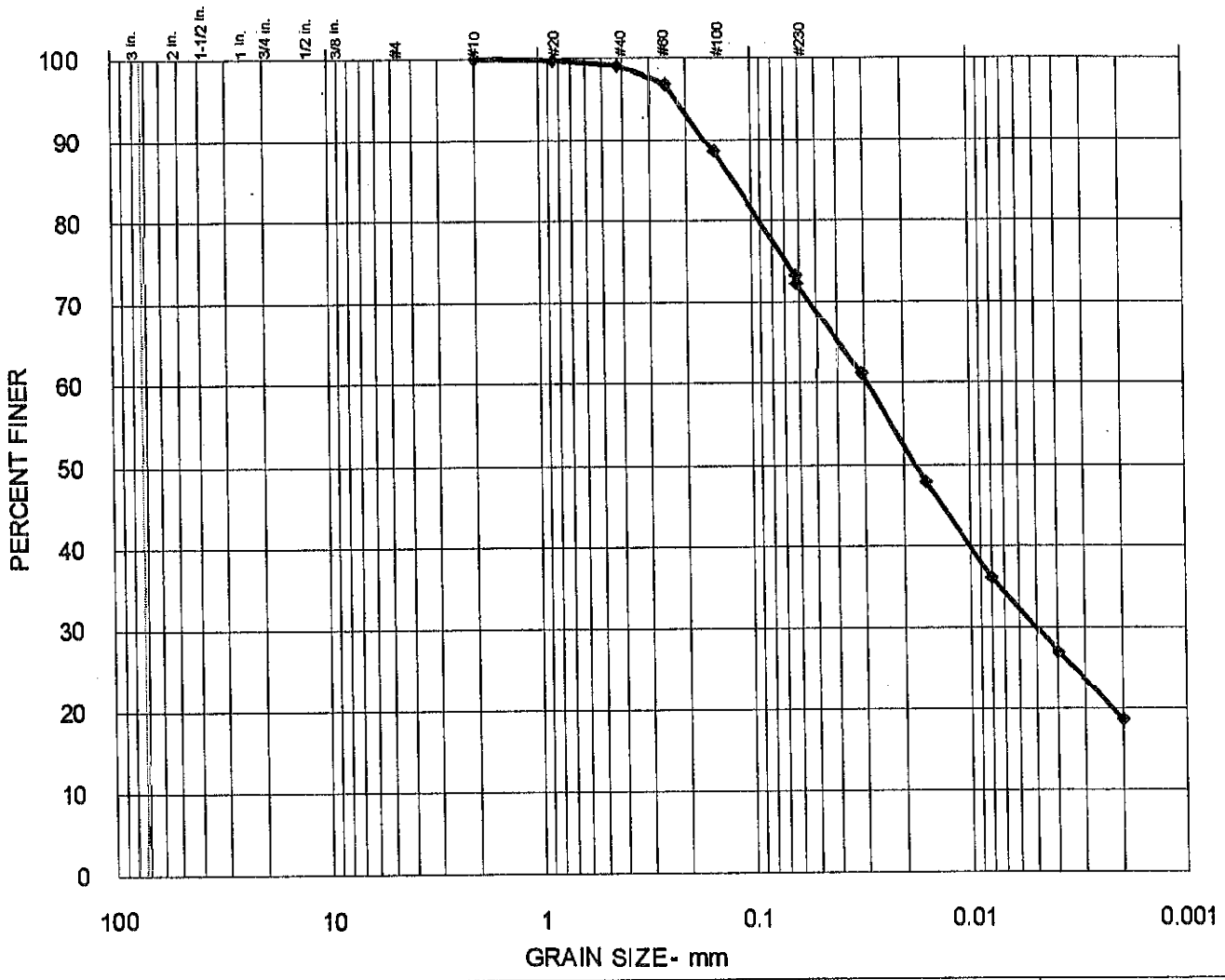
Project: Harbor Island Sediments

HARTCROWSER

J-4300

Figure 7

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	27%	46%	27%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-10	0 - 10 cm	Sediment		82.65%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

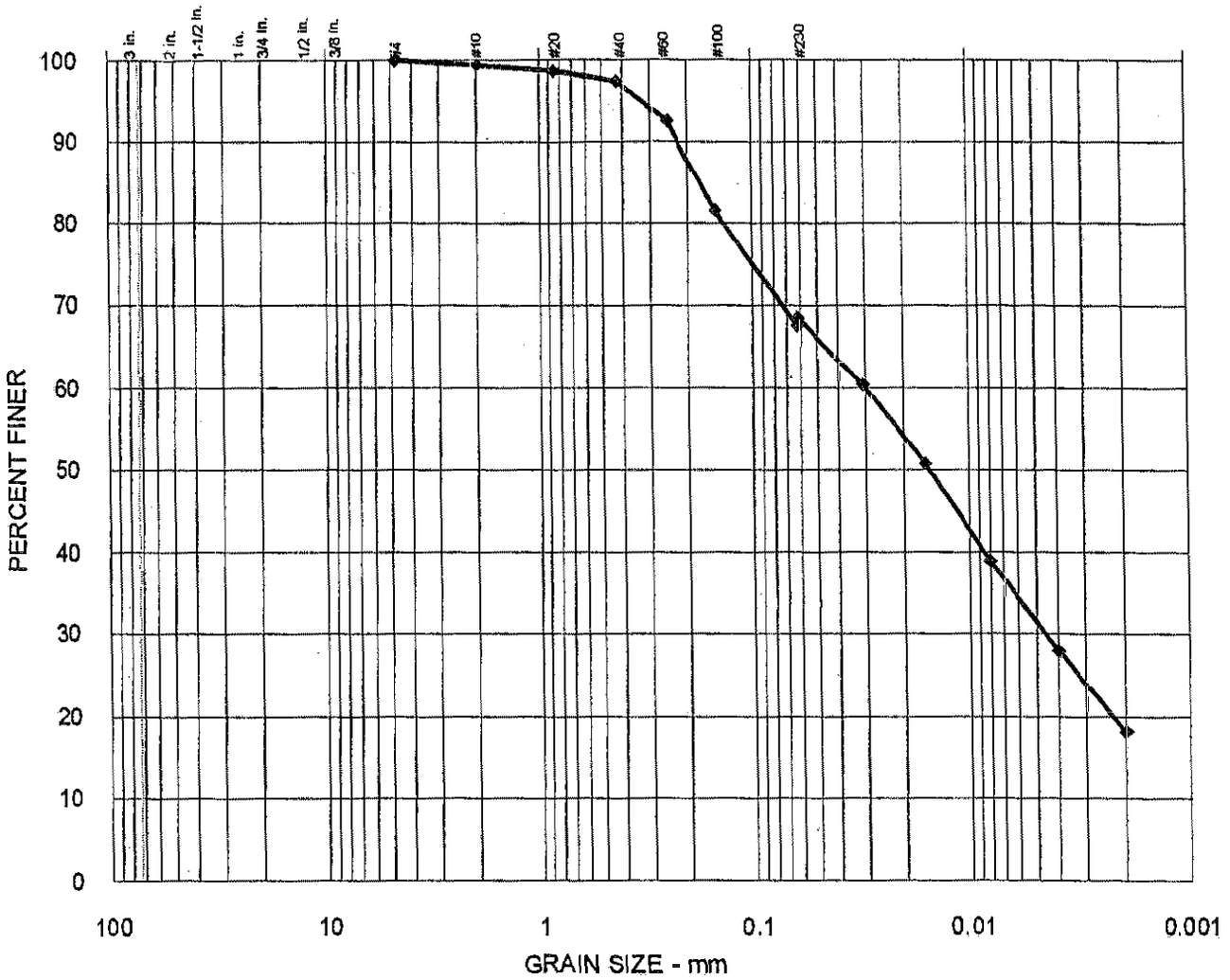
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 8

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	1%	31%	40%	28%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-11	0 - 10 cm	Sediment		81.56%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

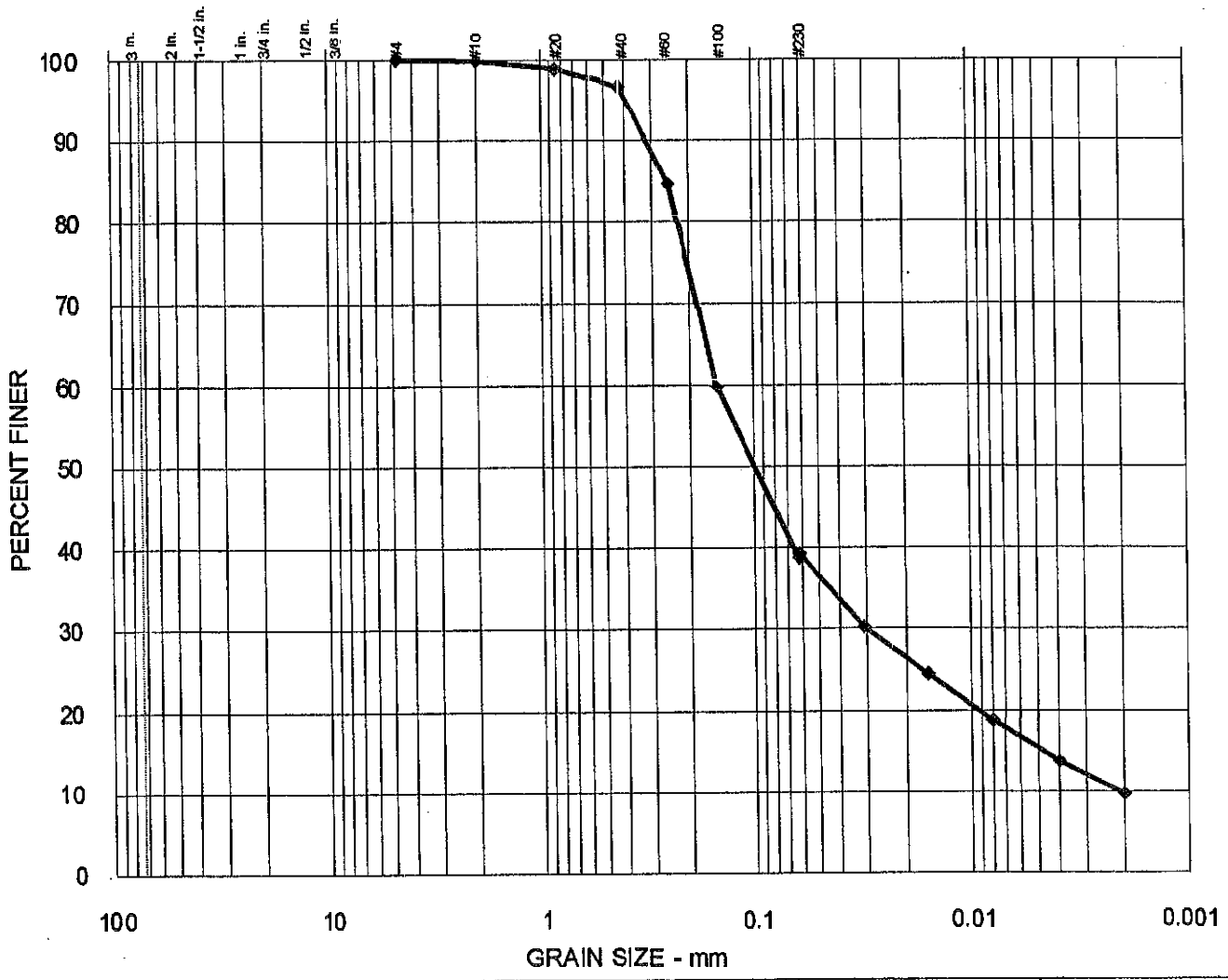
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 9

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	61%	25%	14%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-12	0 - 10 cm	Sediment		61.80%

	MATERIAL DESCRIPTION	
	S.I.d.t.v.c.h.e.v.s.l.v.S.A.N.D	

Remarks:

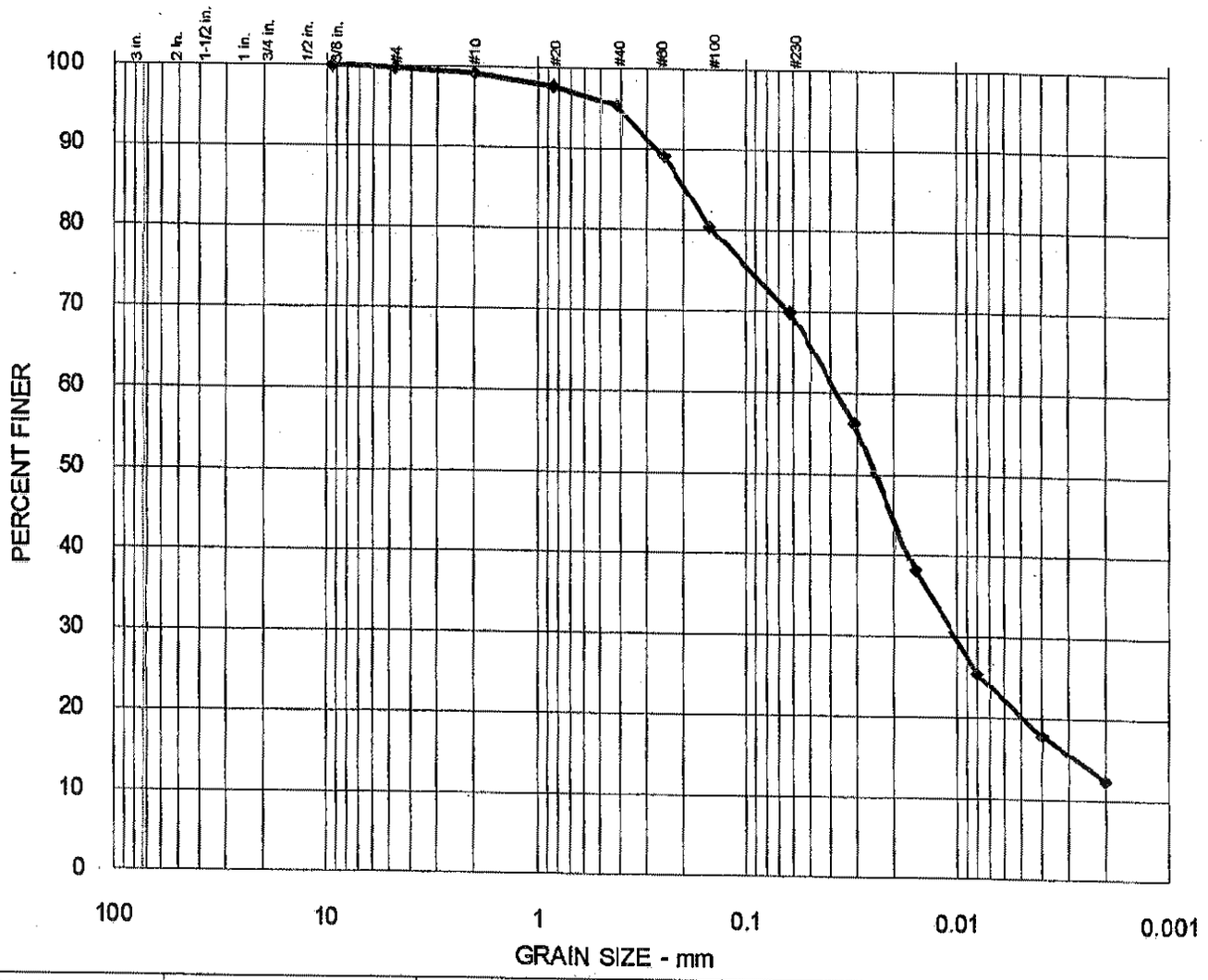
Project: Harbor Island Sediments

HARTCROWSER

J-4300

Figure 9

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	1%	29%	52%	18%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-01	0 - 10 cm	Sediment		57.90%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

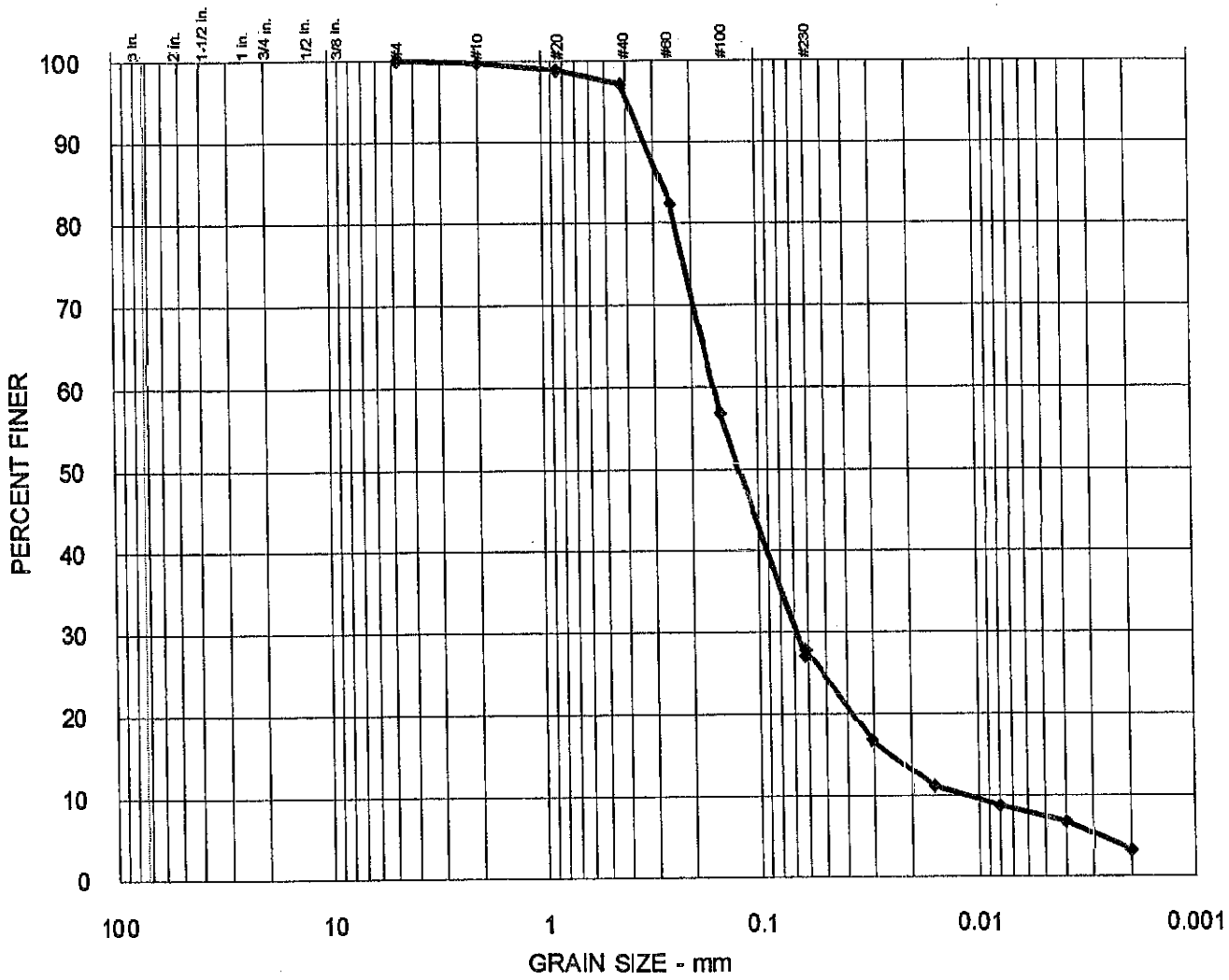
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 10

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	73%	20%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-02	0 - 10 cm	Sediment		54.17%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

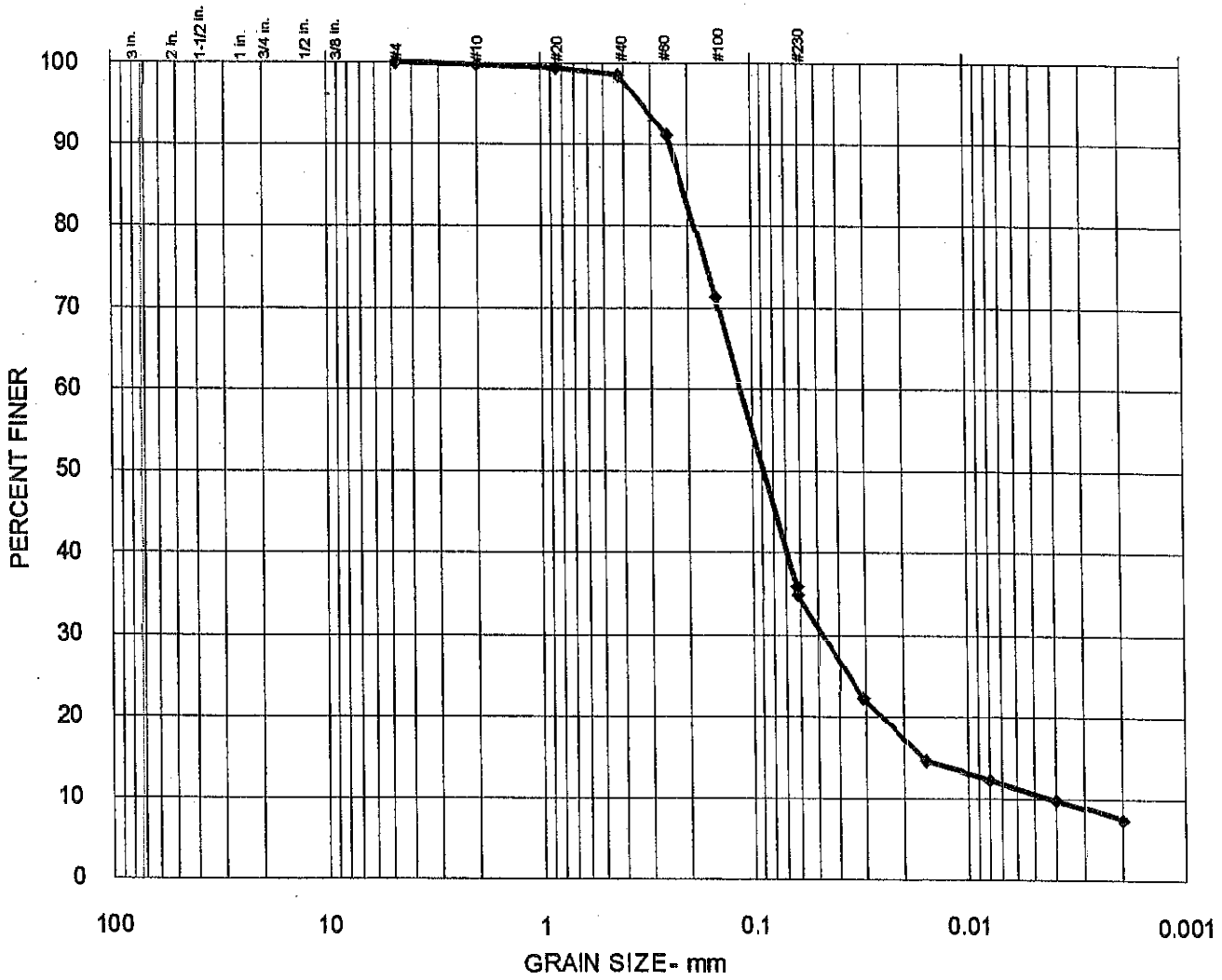
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 11

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	64%	26%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-03	0 - 10 cm	Sediment		47.64%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

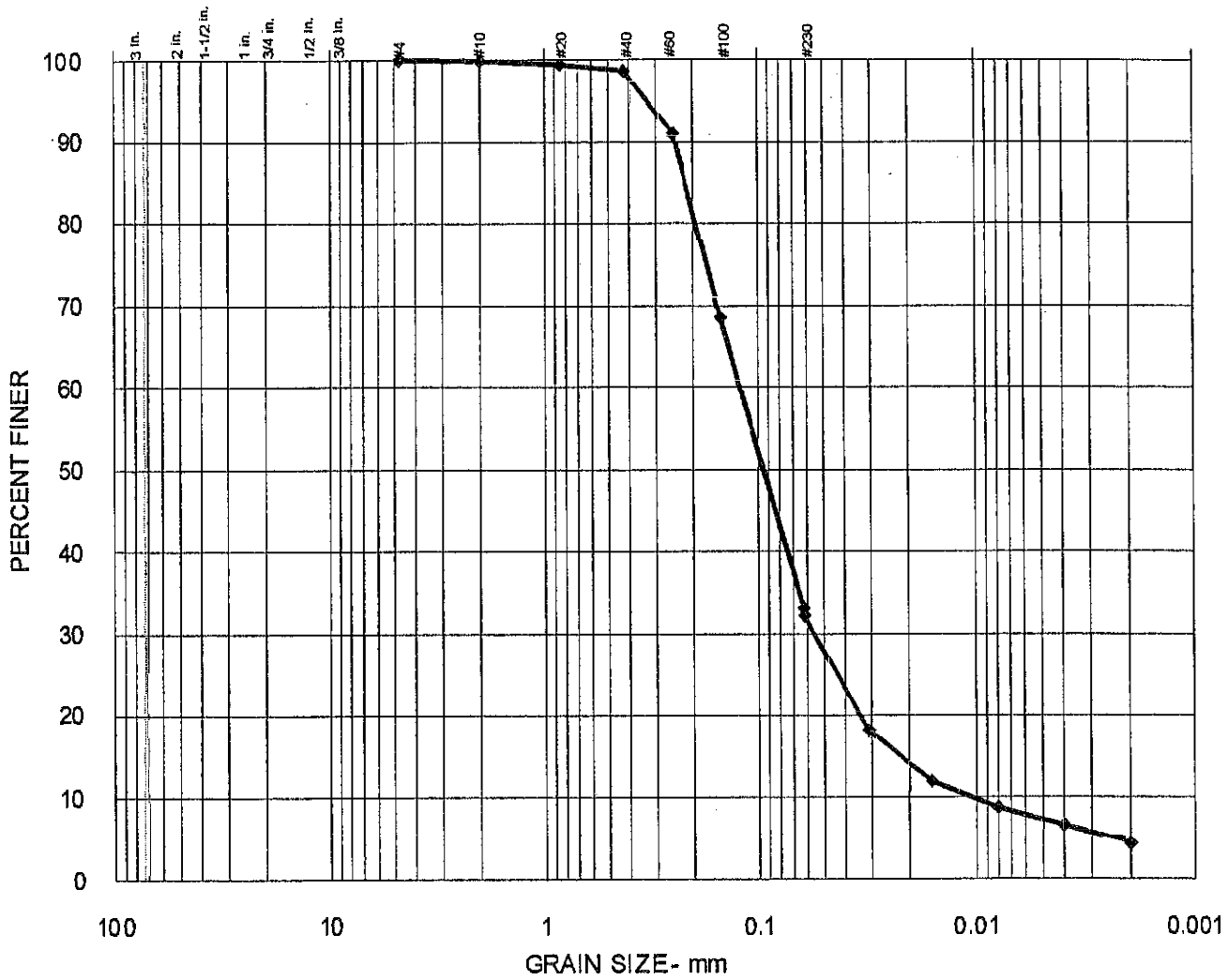
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 12

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	67%	26%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-04	0 - 10 cm	Sediment		57.51%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

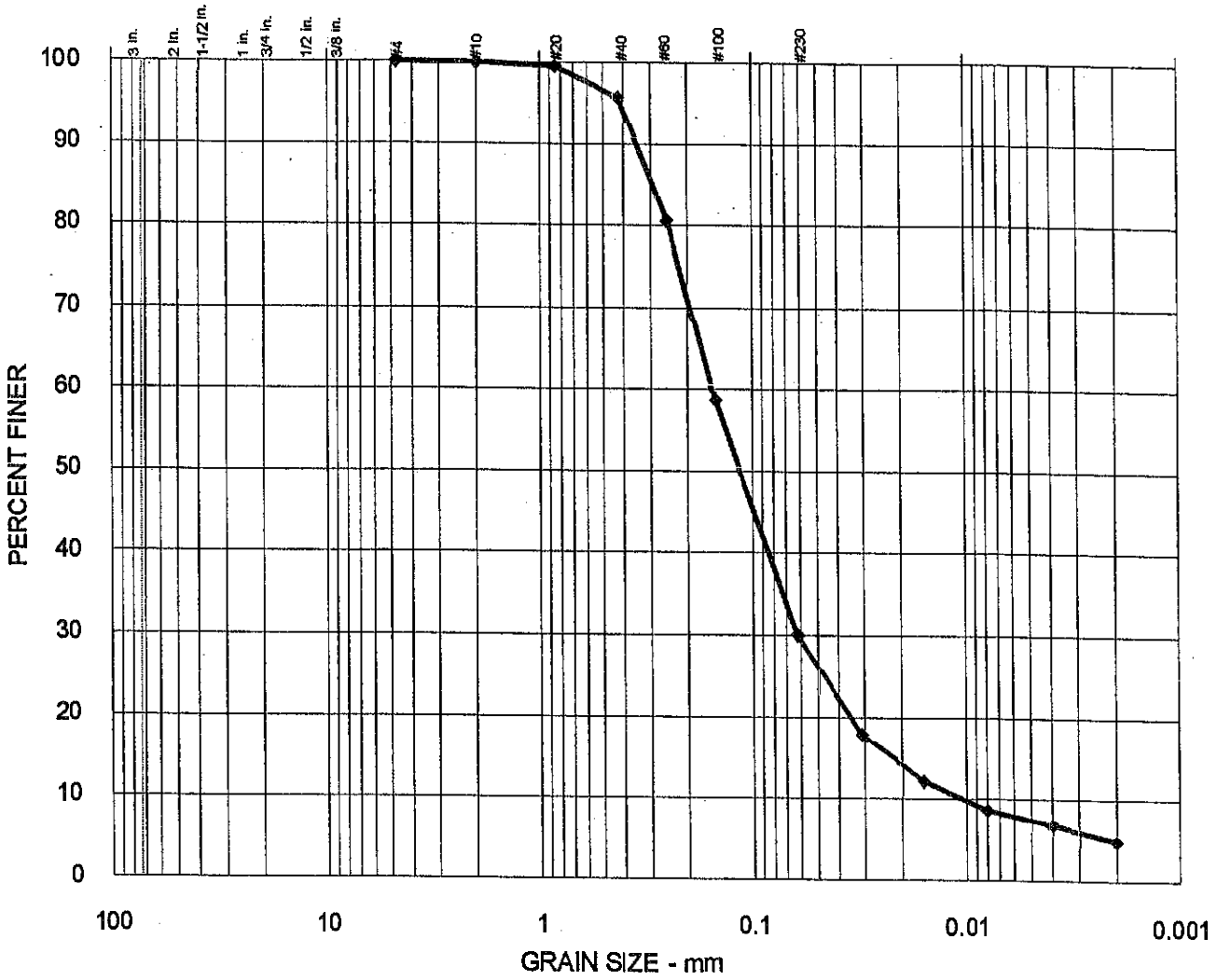
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 15

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	70%	23%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-05	0 - 10 cm	Sediment		48.41%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

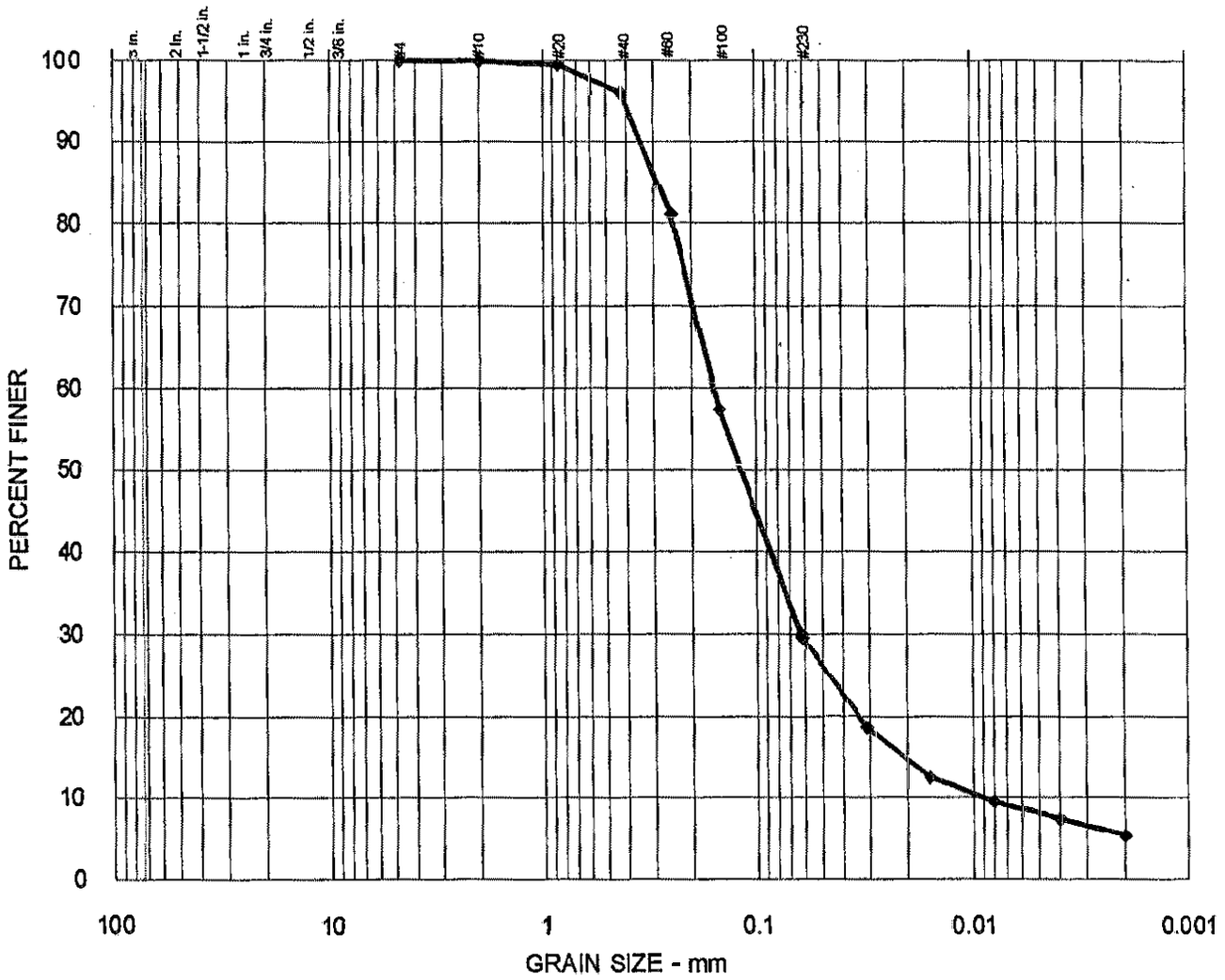
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 13

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	70%	23%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-05T1	0 - 10 cm	Sediment		46.41%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

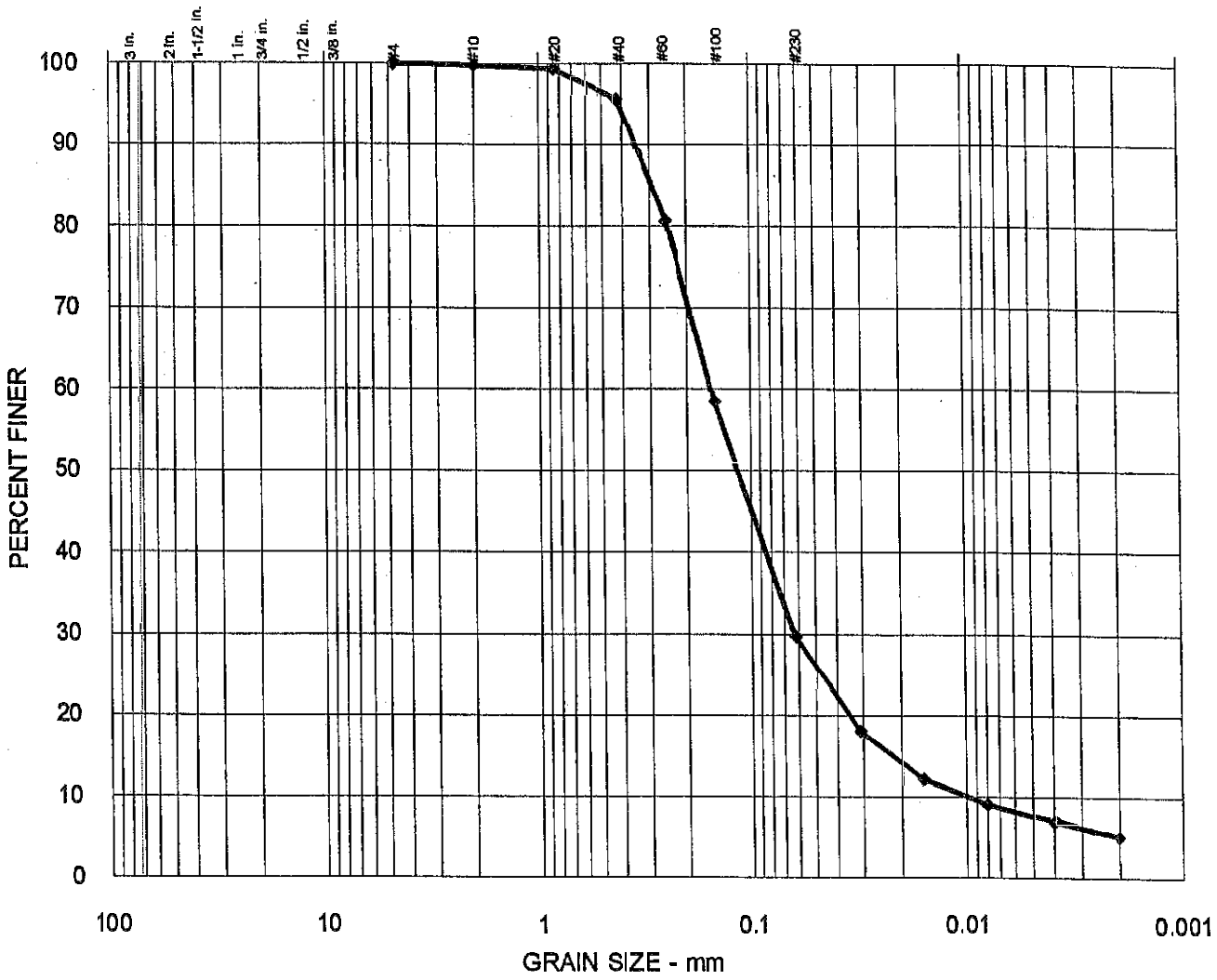
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 14

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	70%	23%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-05T2	0 - 10 cm	Sediment		48.41%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

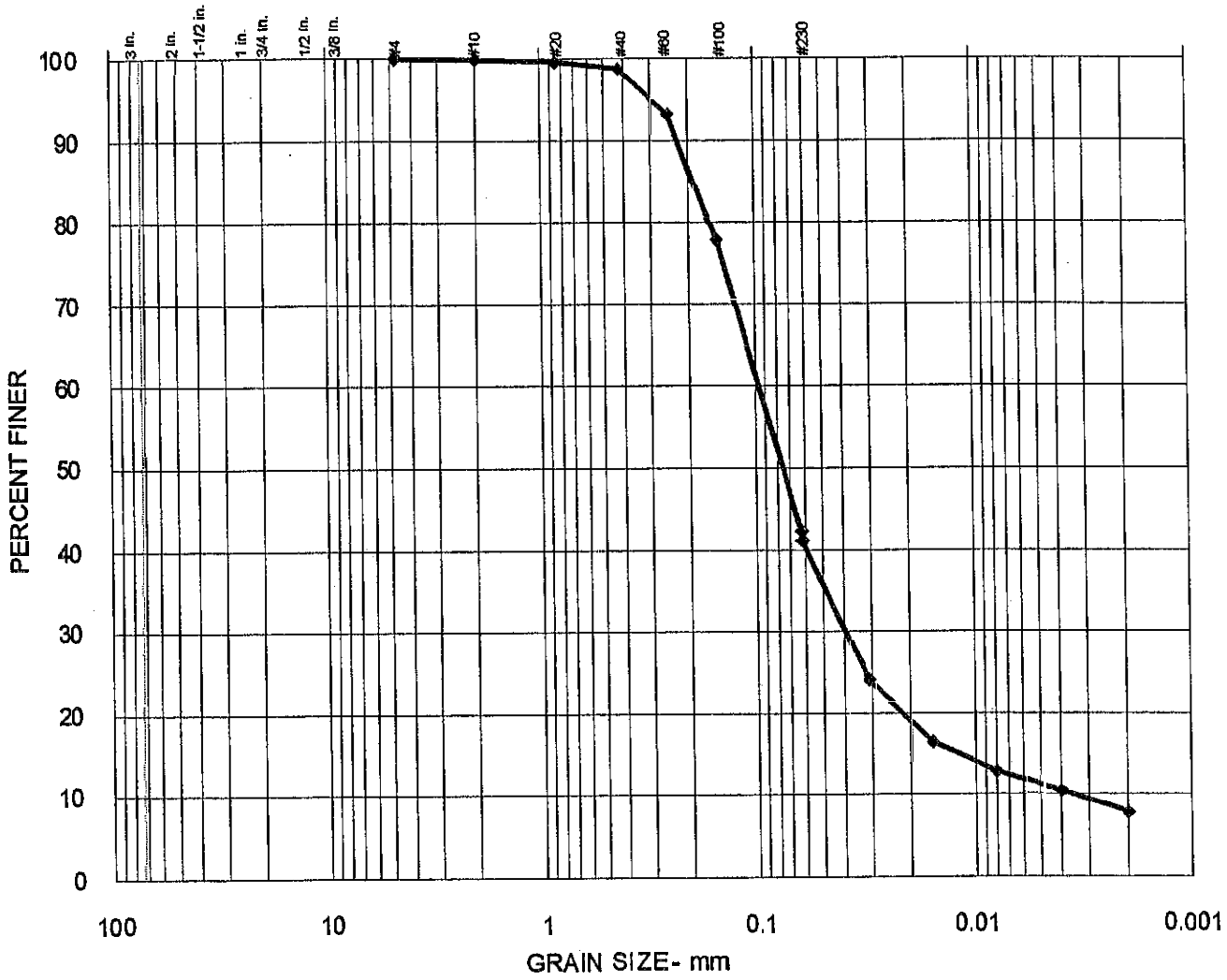
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 15

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	58%	32%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-06	0 - 10 cm	Sediment		56.23%

	MATERIAL DESCRIPTION	
	Slightly clayey, very silty SAND	

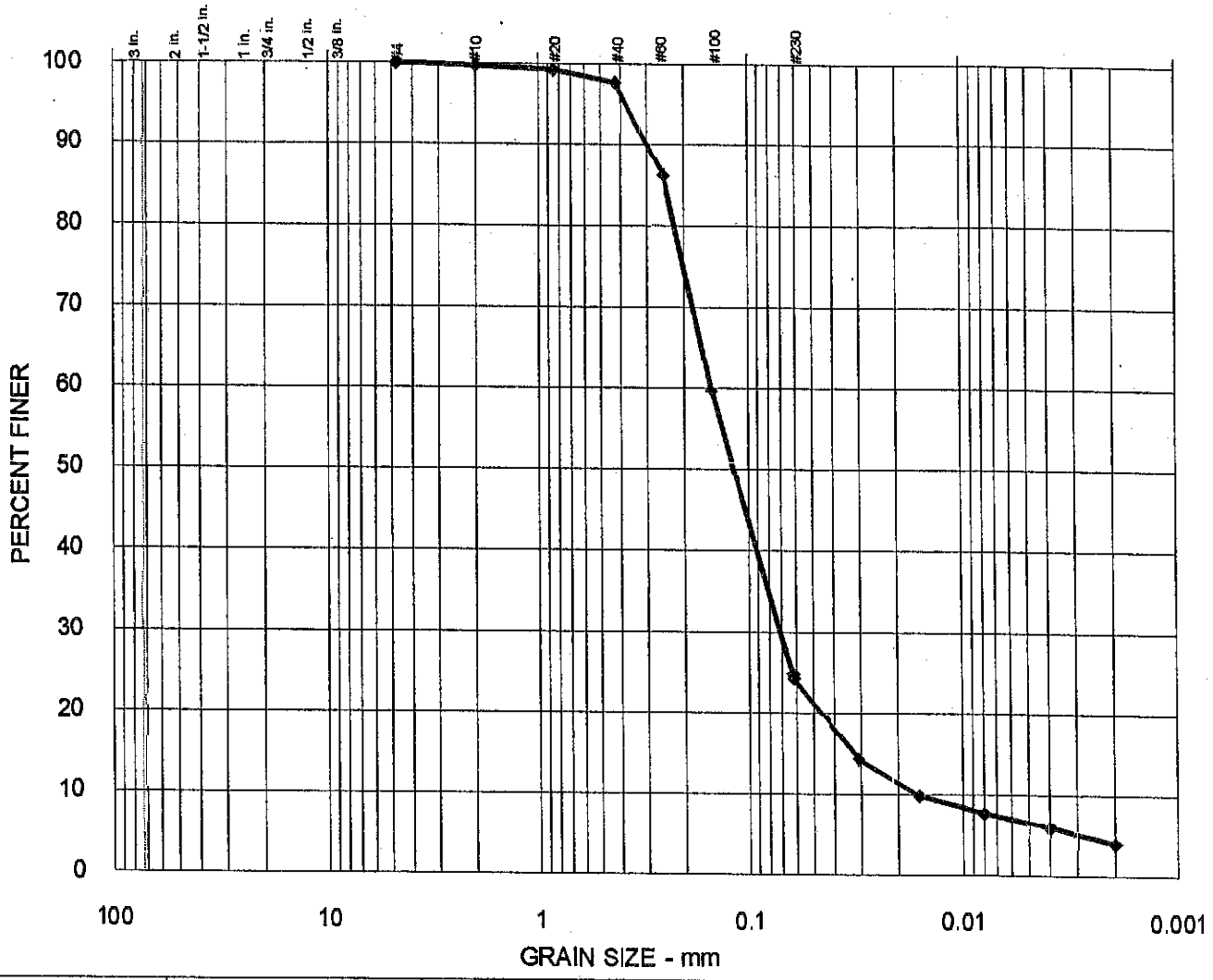
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 16

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	75%	19%	6%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-07	0 - 10 cm	Sediment		49.16%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

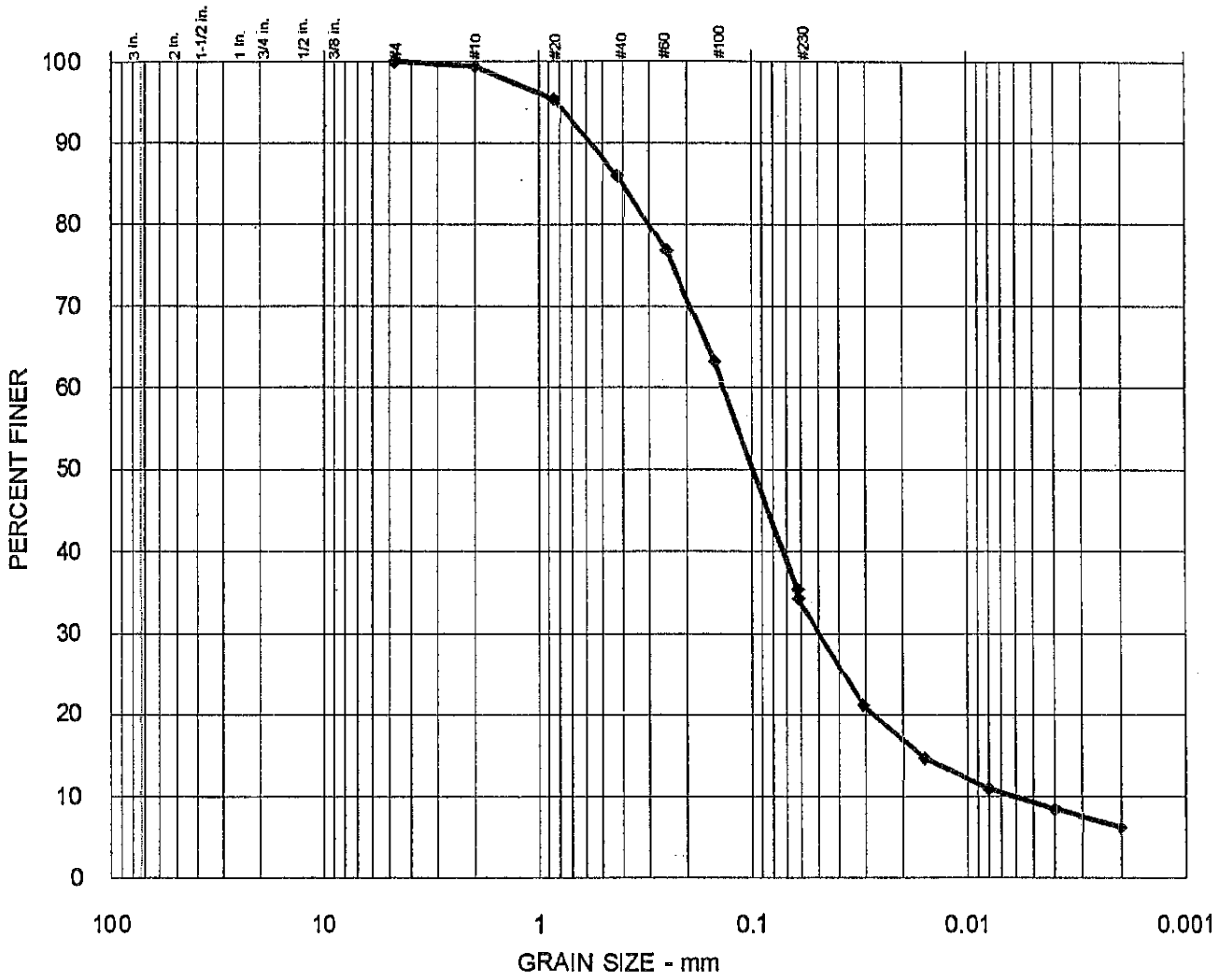
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 17

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	% CLAY
	1%	64%	27%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-08	0 - 10 cm	Sediment		48.37%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

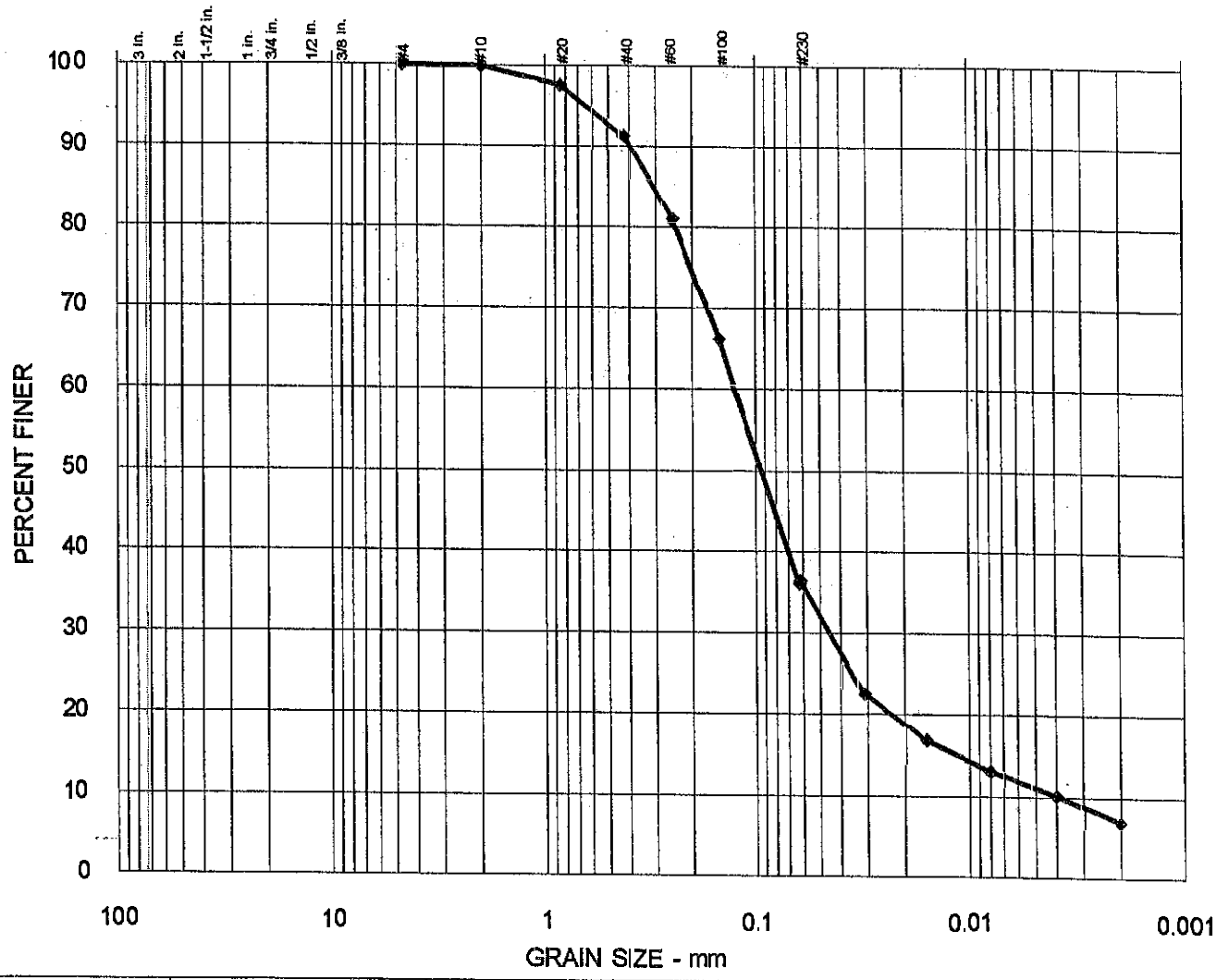
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 20

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	64%	26%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-09	0 - 10 cm	Sediment		59.13%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

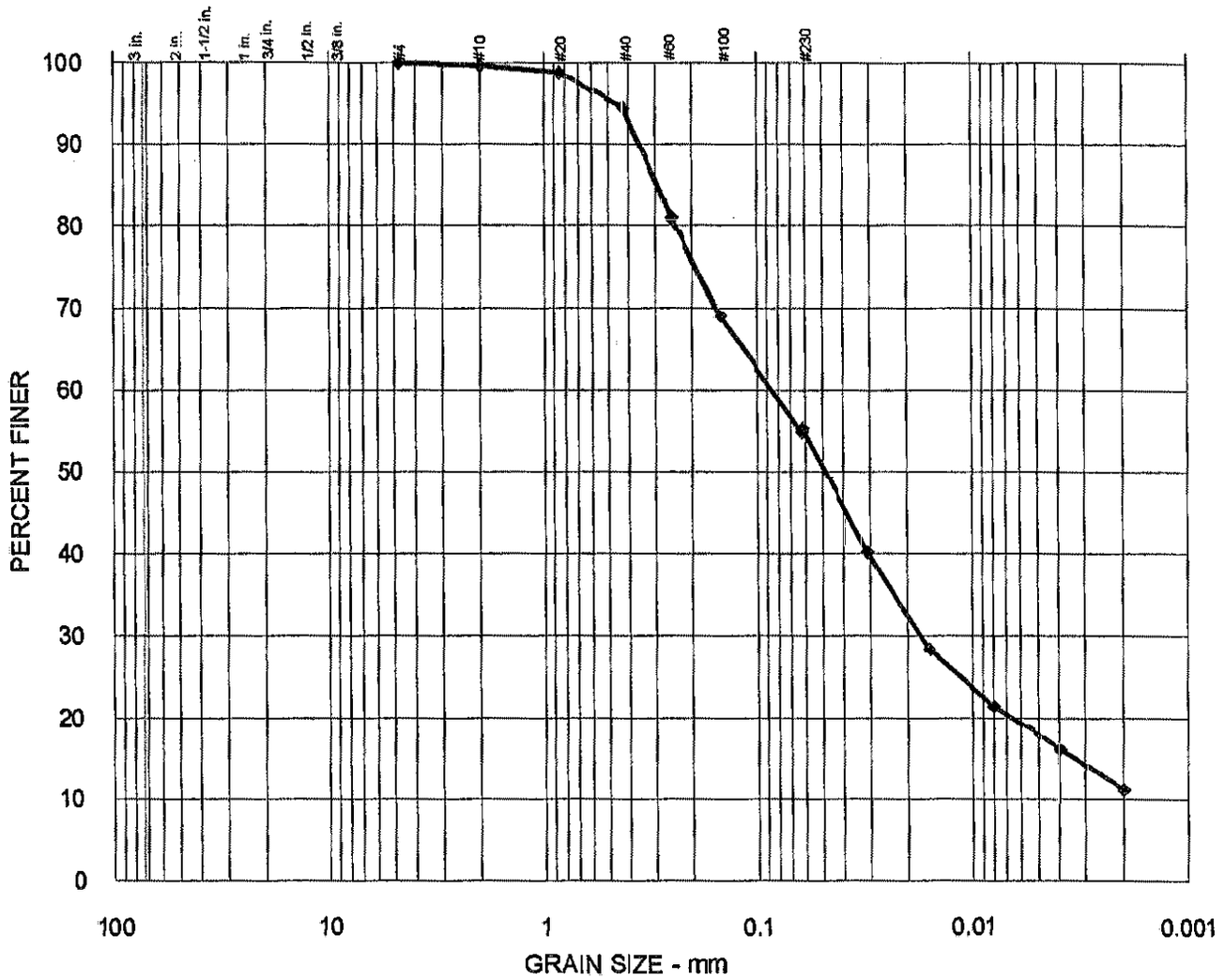
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 18

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	45%	39%	16%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-12	0 - 10 cm	Sediment		73.16%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

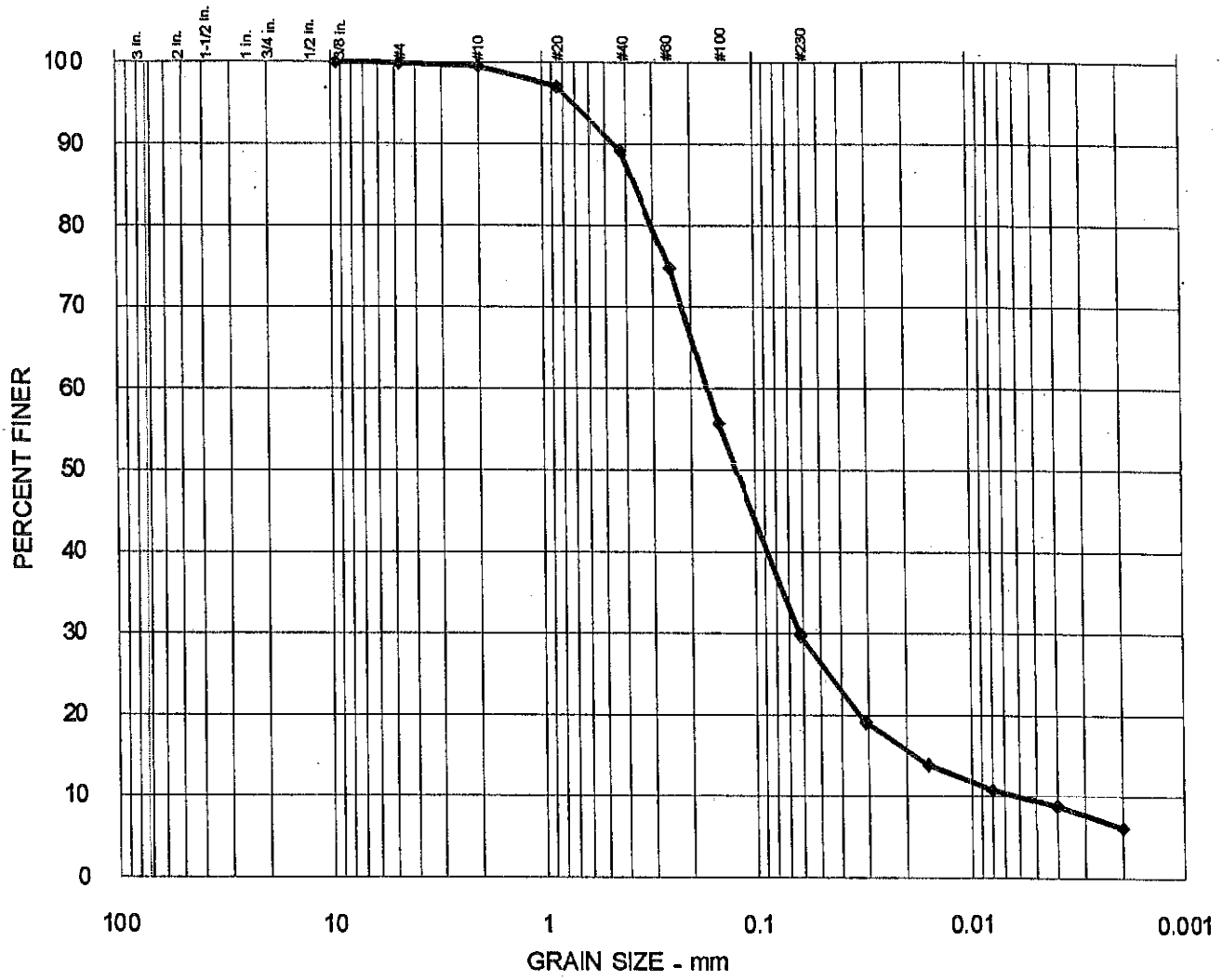
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 21

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	70%	21%	9%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-13	0 - 10 cm	Sediment		49.29%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

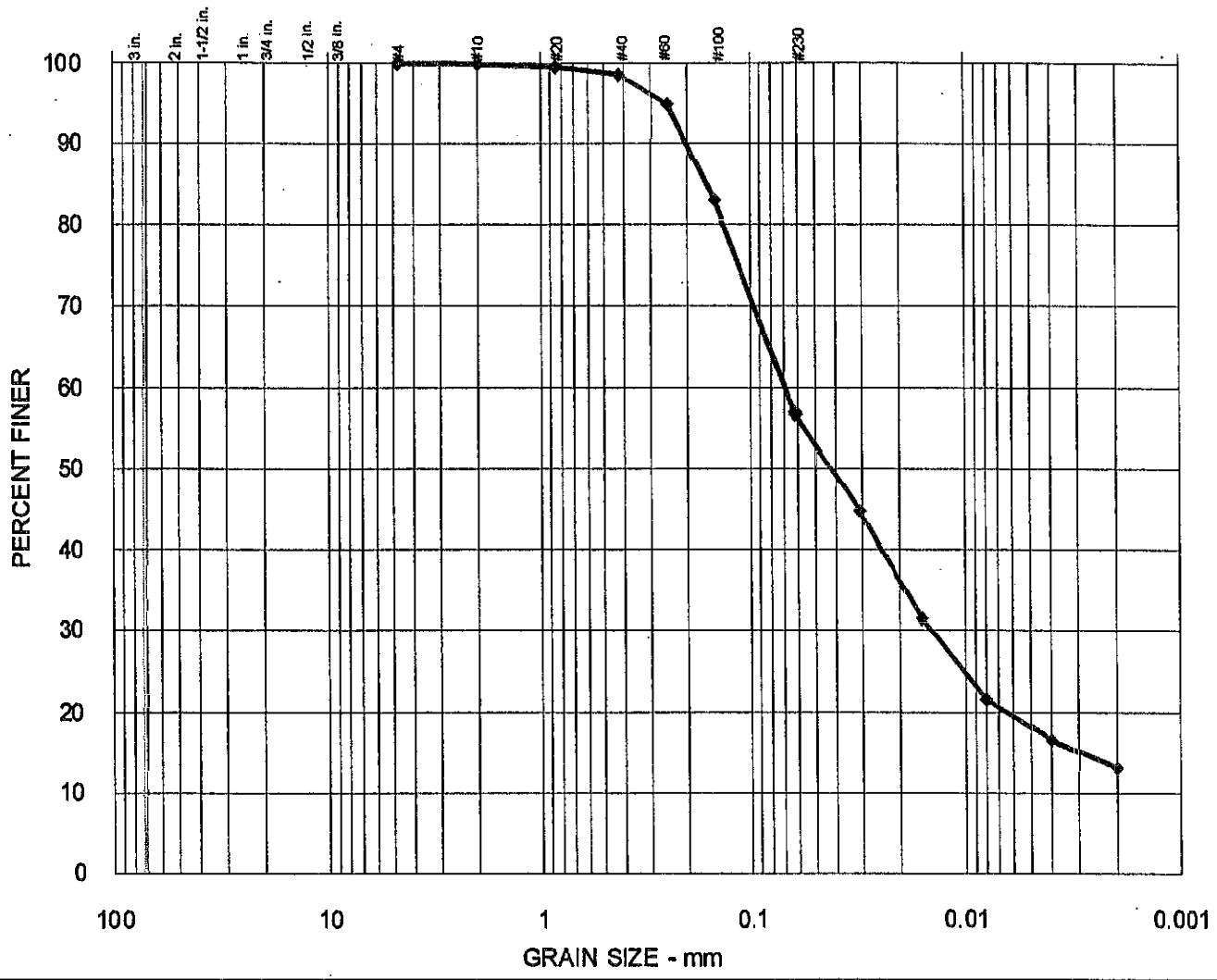
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 22

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	43%	40%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-14	0 - 10 cm	Sediment		116.63%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

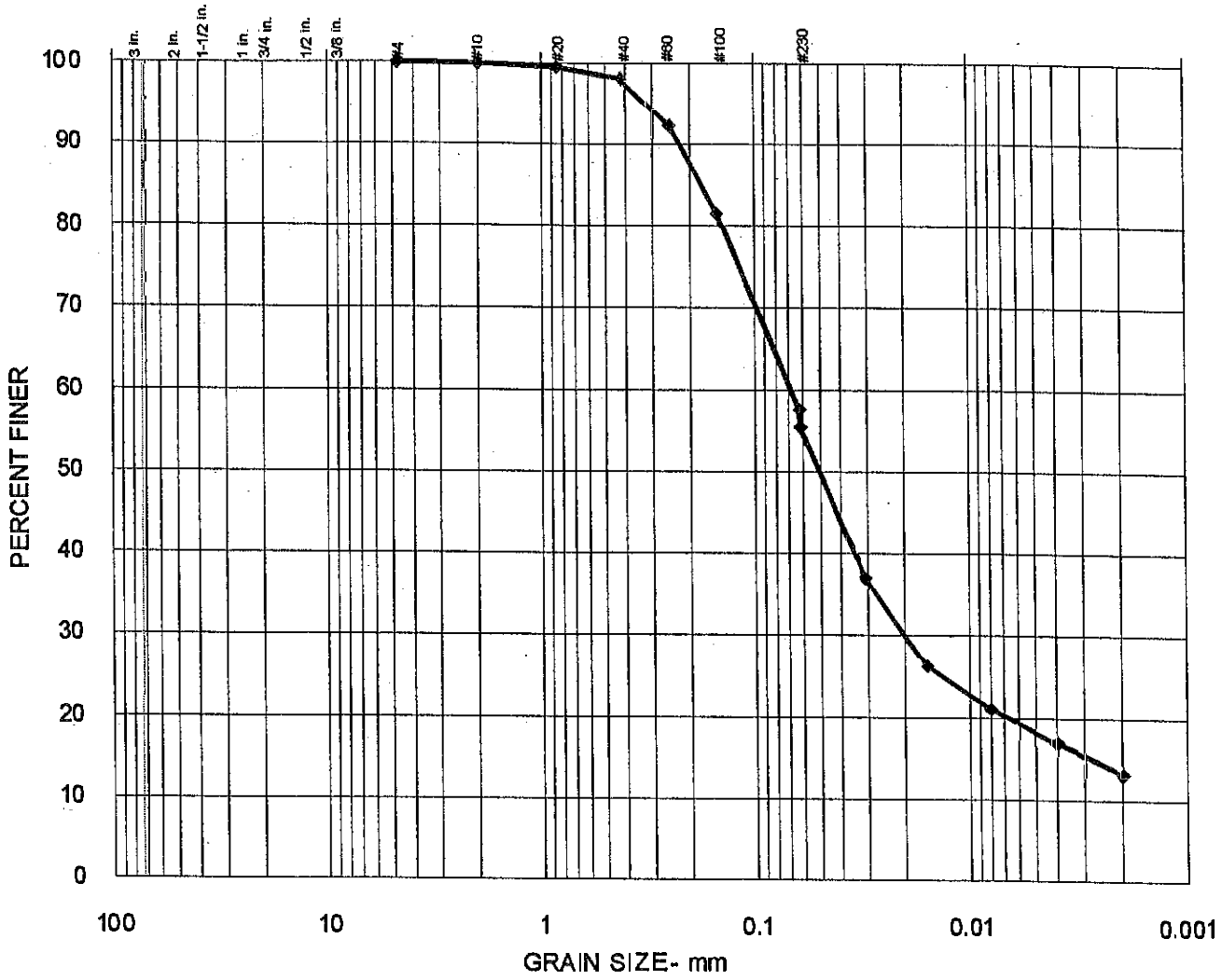
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 23

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	42%	41%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-15	0 - 10 cm	Sediment		69.77%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

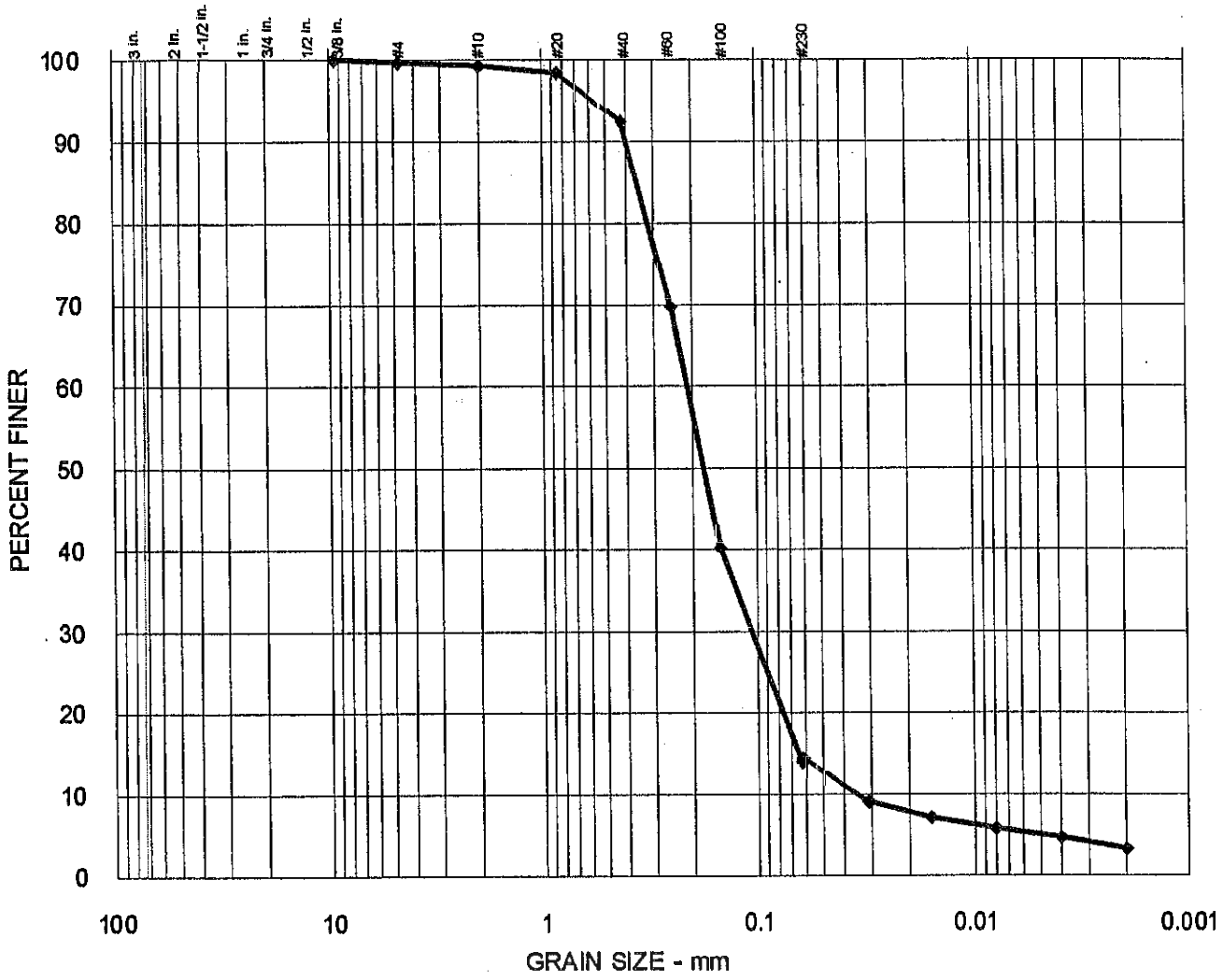
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 24

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
	1%	85%	9%	5%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-16	0 - 10 cm	Sediment		46.54%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4300
Figure 25

APPENDIX F

SUBSURFACE SEDIMENT
GRAIN SIZE DISTRIBUTION PLOTS

Laboratory Testing Program Summary
Hart Crowser Samples
Harbor Island
J-4249-03

Sample Shipment/Storage

The Hart Crowser Laboratory received a total of 45 sediment samples from March 15 to April 6, 1995. All samples were logged into the Hart Crowser sample management refrigerators. The samples were relinquished in the lab by Hart Crowser field representatives to a Hart Crowser laboratory representative. The lab returned all samples to the refrigerators after removing test aliquots.

Quality Control

According to PESP protocol, the laboratory ran two samples in triplicate:

- HI-WW-27-S1; and
- HI-WW-18-S3.

The results were as follows:

Sample ID	% Gravel	% Sand	% Silt	% Clay
HI-WW-27-S1	0%	59%	31%	10%
HI-WW-27-S1T1	0%	59%	32%	9%
HI-WW-27-S1T2	0%	59%	31%	10%
HI-WW-18-S3	0%	91%	8%	1%
HI-WW-18-S3T1	0%	91%	9%	0%
HI-WW-18-S3T2	0%	90%	8%	2%

We observed the following quality control issues, and took the corrective actions based on PESP protocol:

- Moisture content results indicate a dry weight of the fine-grained material above 25g on the following samples:
  - HI-EW-01;
  - HI-EW-06; and
  - HI-WW-10.

Tests were re-run with a smaller aliquot, results were within project requirements.

- The difference between the sum of the weights of all the coarse size fractions and the initial weight of the coarse fraction was greater than 1% for the following sample:

  - HI-NS-08-S1

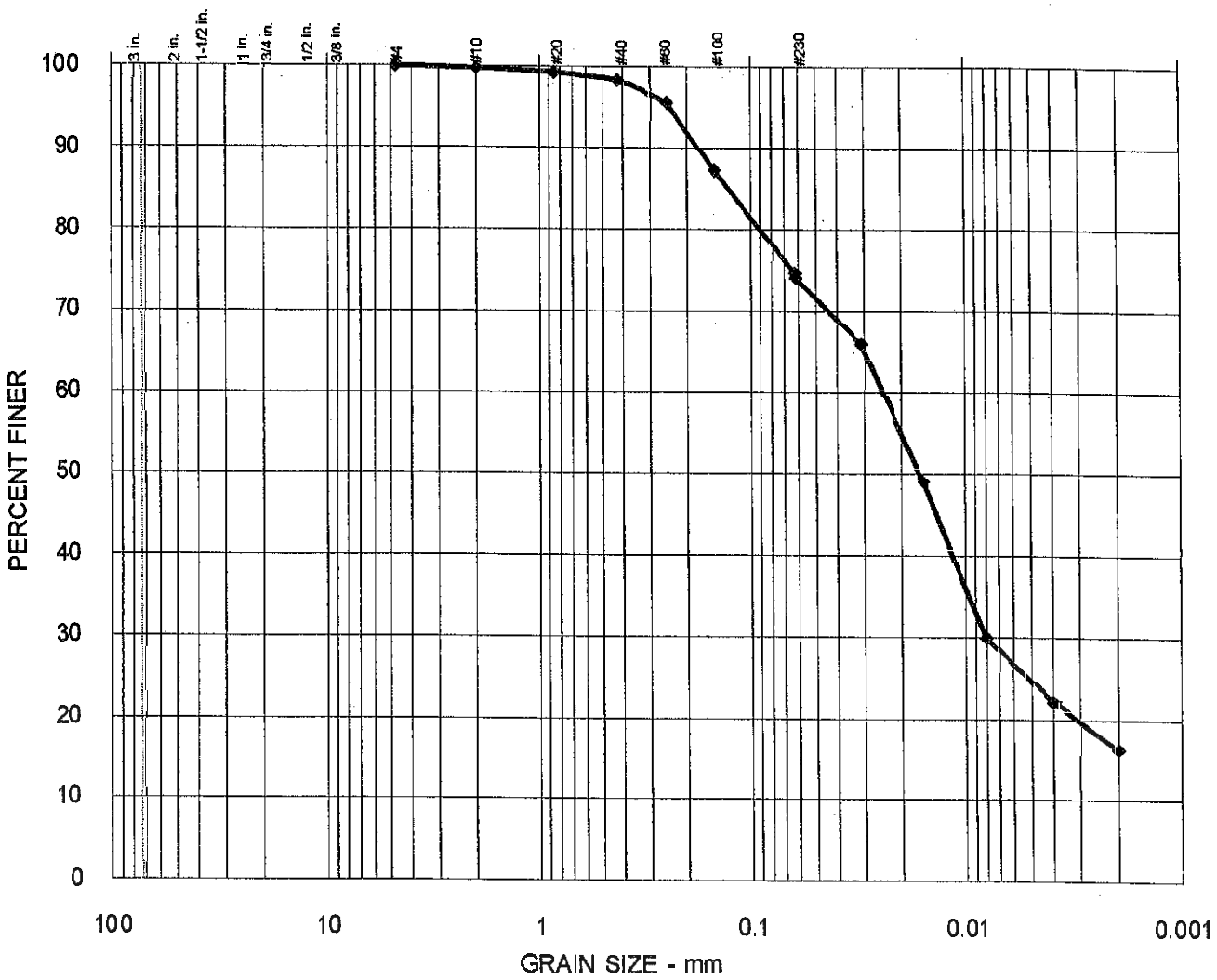
  The sample was oven dried and re-sieved. Test results were within project requirements.

- We observed flocculation of the fines in the following samples:

  - HI-EW-01; and
  - HI-EW-06.

  We increased the volume of dispersant from 10 to 20 ml. Flocculation was not observed in the tests with 20 ml of dispersant.

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	25%	53%	22%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-01	0 - 10 cm	Sediment		102.74%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

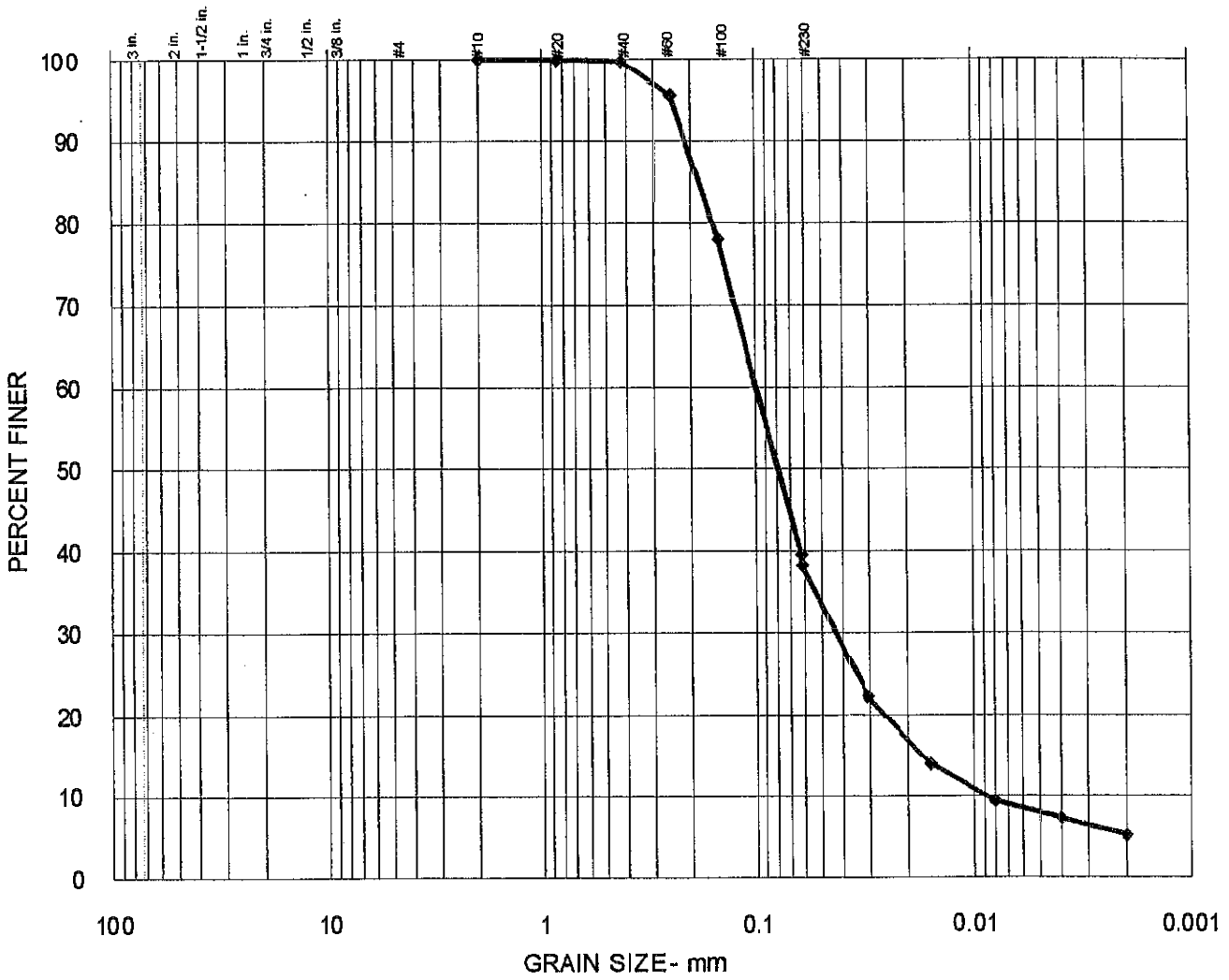
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 1

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	60%	33%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-01-S3	4.3' - 9.3'	Sediment		34.54%

	MATERIAL DESCRIPTION	
	Slightly clayey, very silty SAND	

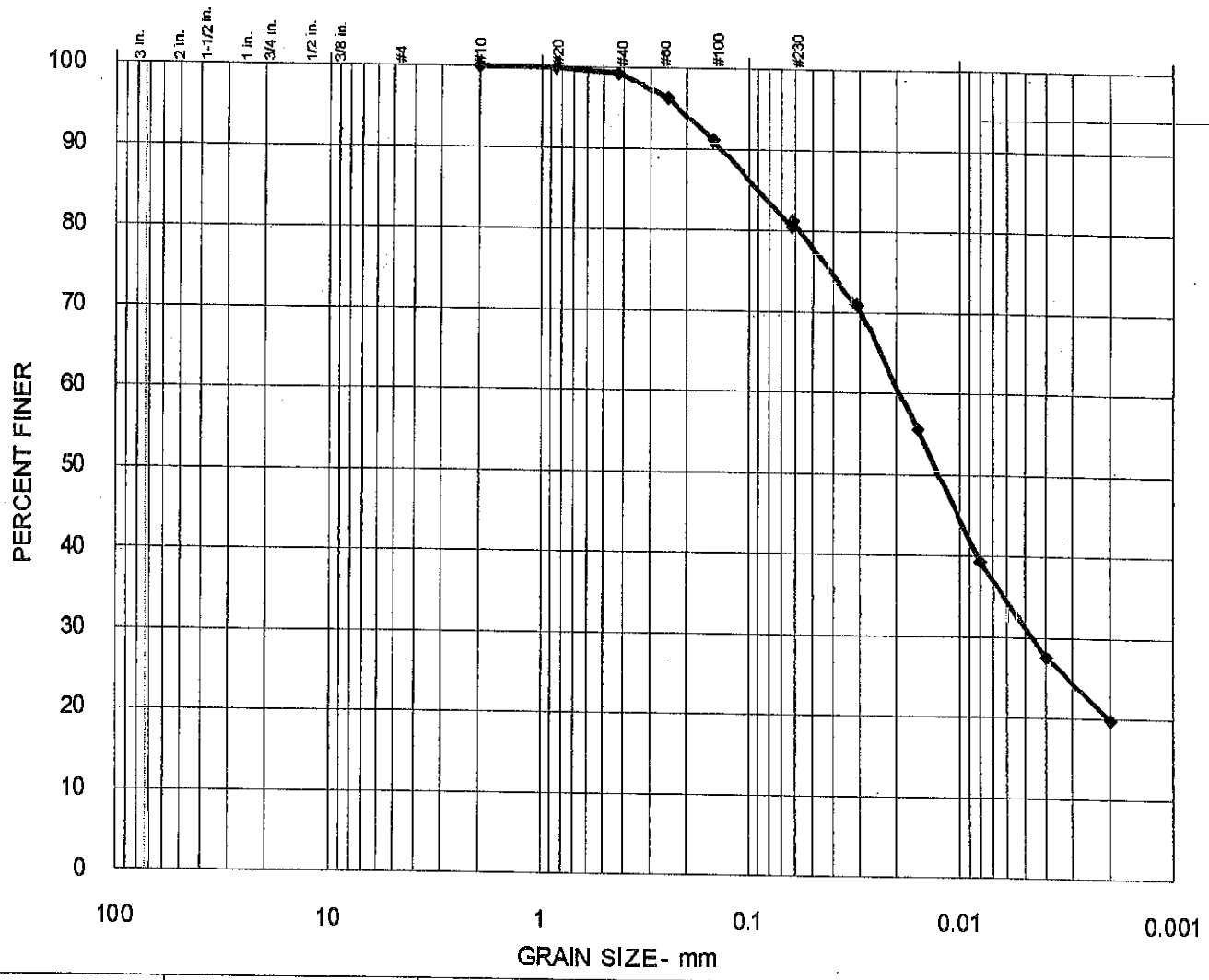
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 4

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	20%	52%	28%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-06	0 - 10 cm	Sediment		103.71%

	MATERIAL DESCRIPTION	
	Sandy, clayey SILT	

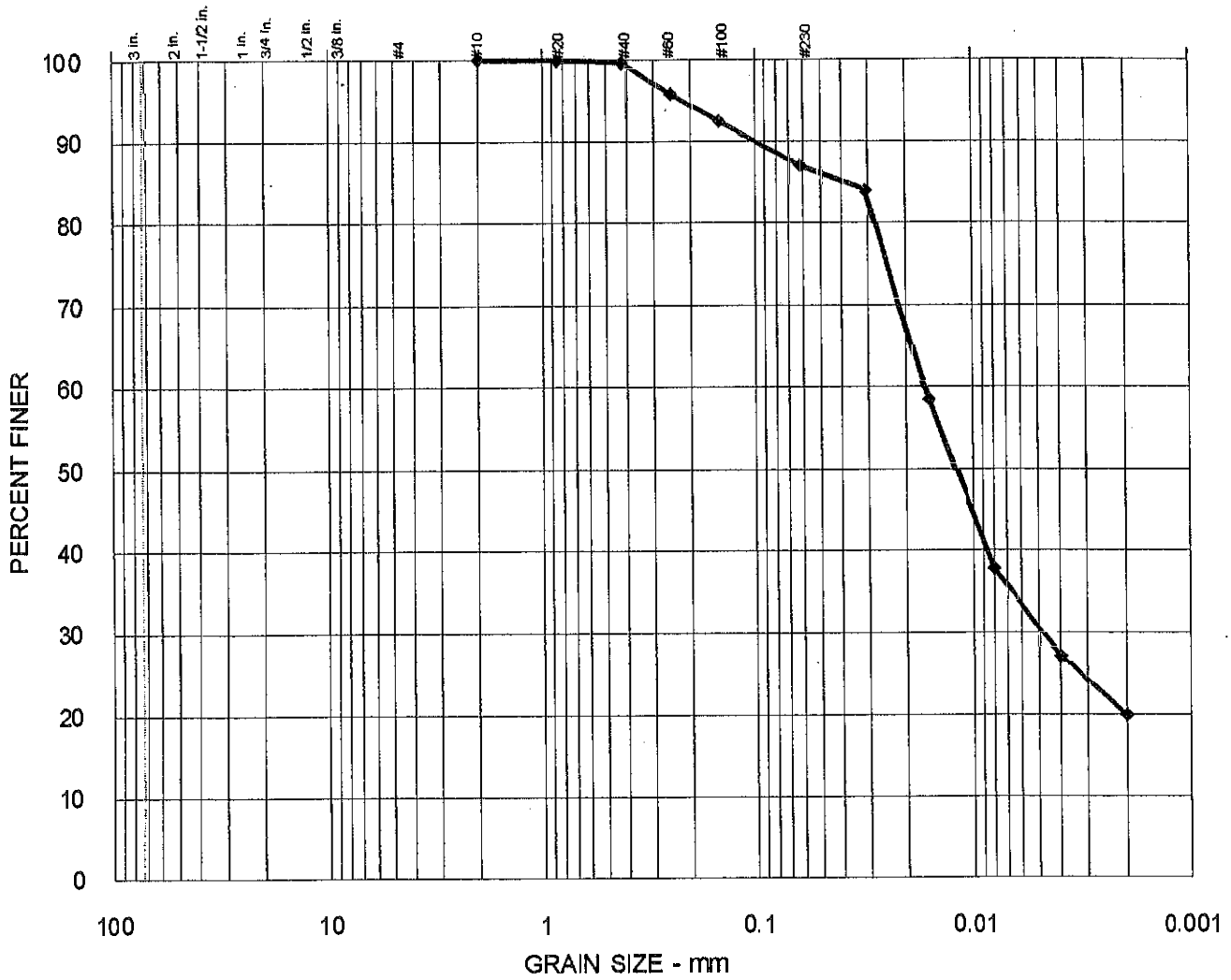
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 5

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	13%	60%	27%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-06-S1	0.0'-1.7'	Sediment		124.20%

	MATERIAL DESCRIPTION	
	Sandy, clayey SILT	

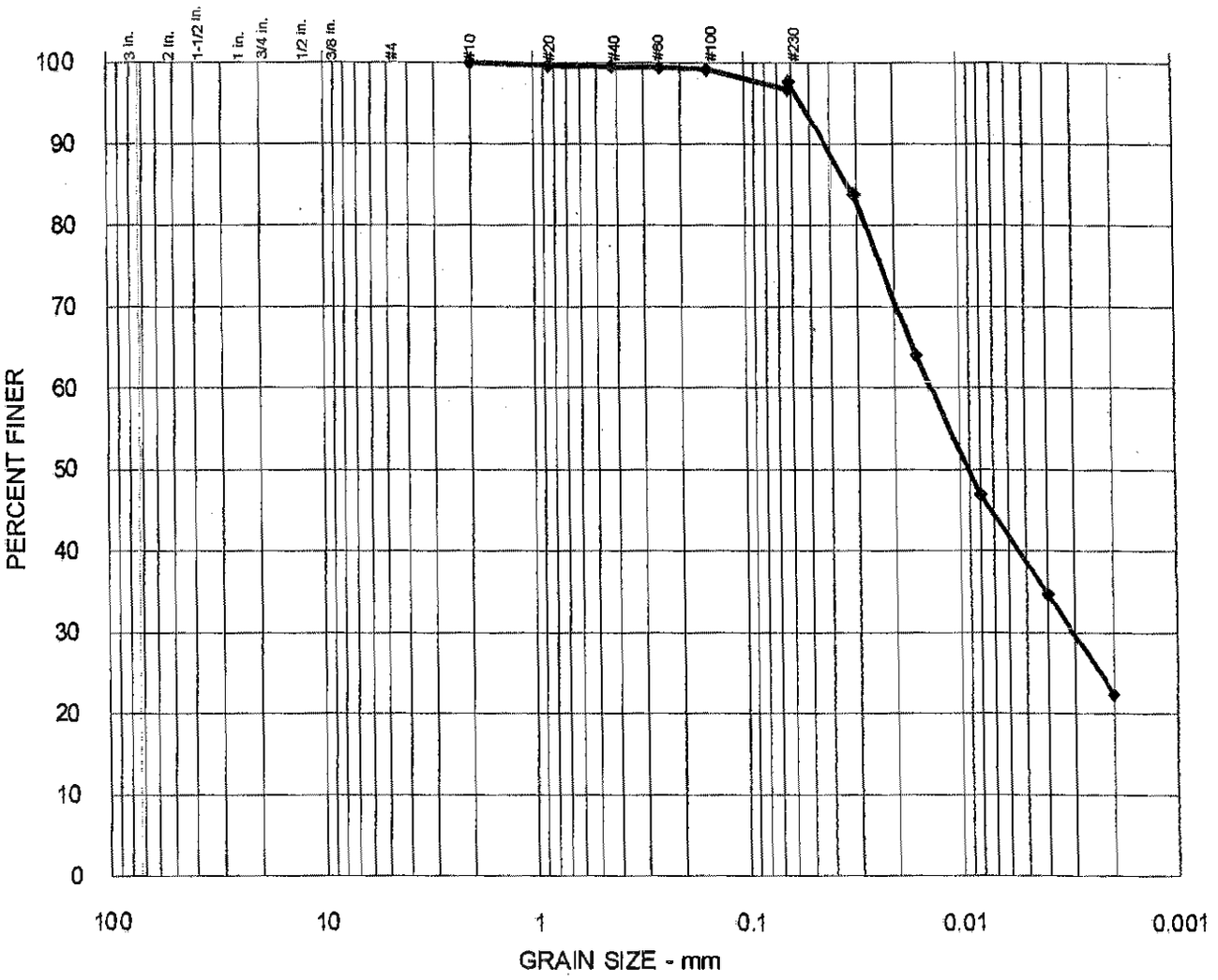
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 6

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	3%	62%	35%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-06-S2	1.7' - 5.2'	Sediment		63.62%

	MATERIAL DESCRIPTION	
	Very clayey SILT	

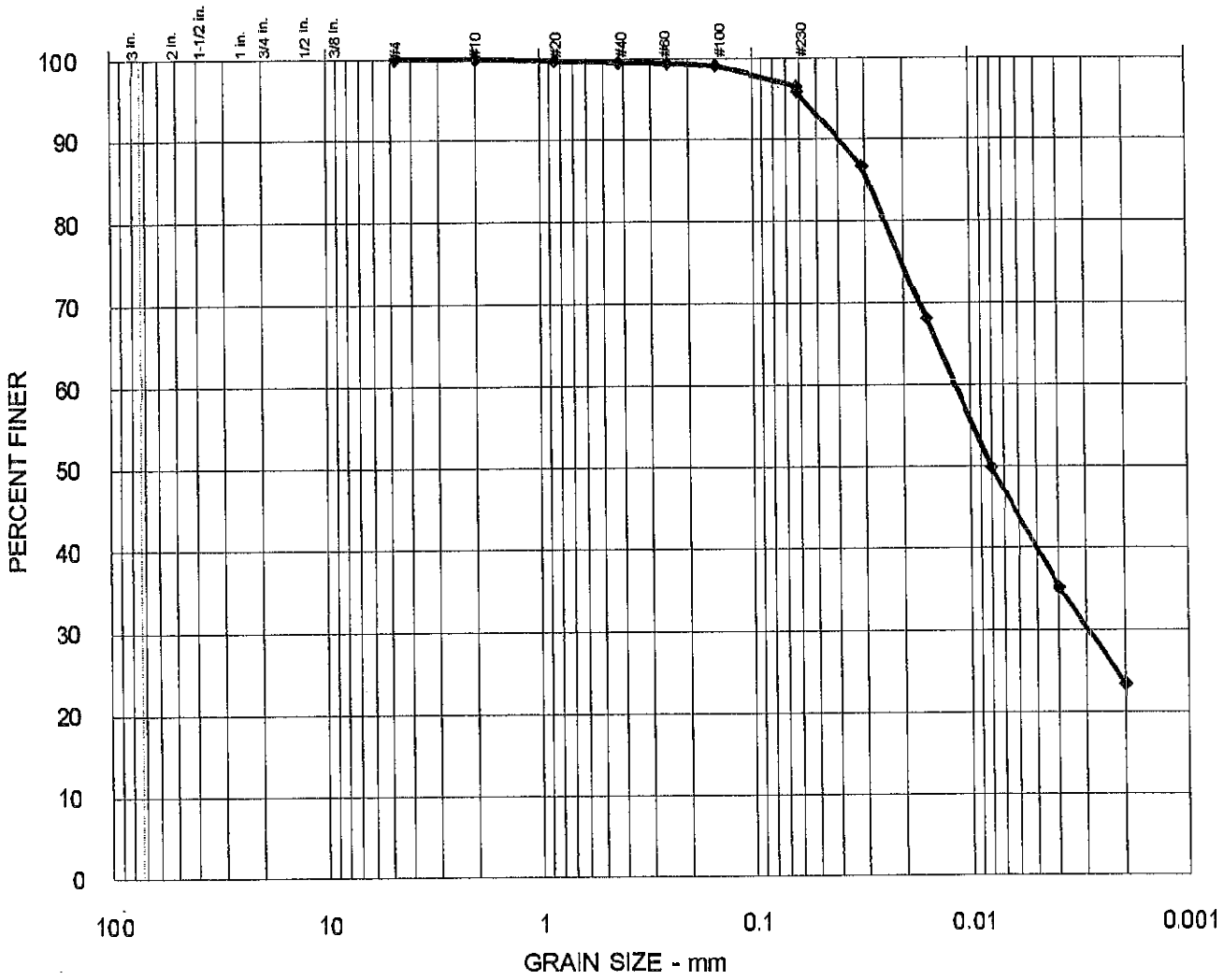
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 7

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	3%	62%	35%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-06-S3	5.2' - 8.8'	Sediment		65.91%

	MATERIAL DESCRIPTION	
	Very clayey SILT	

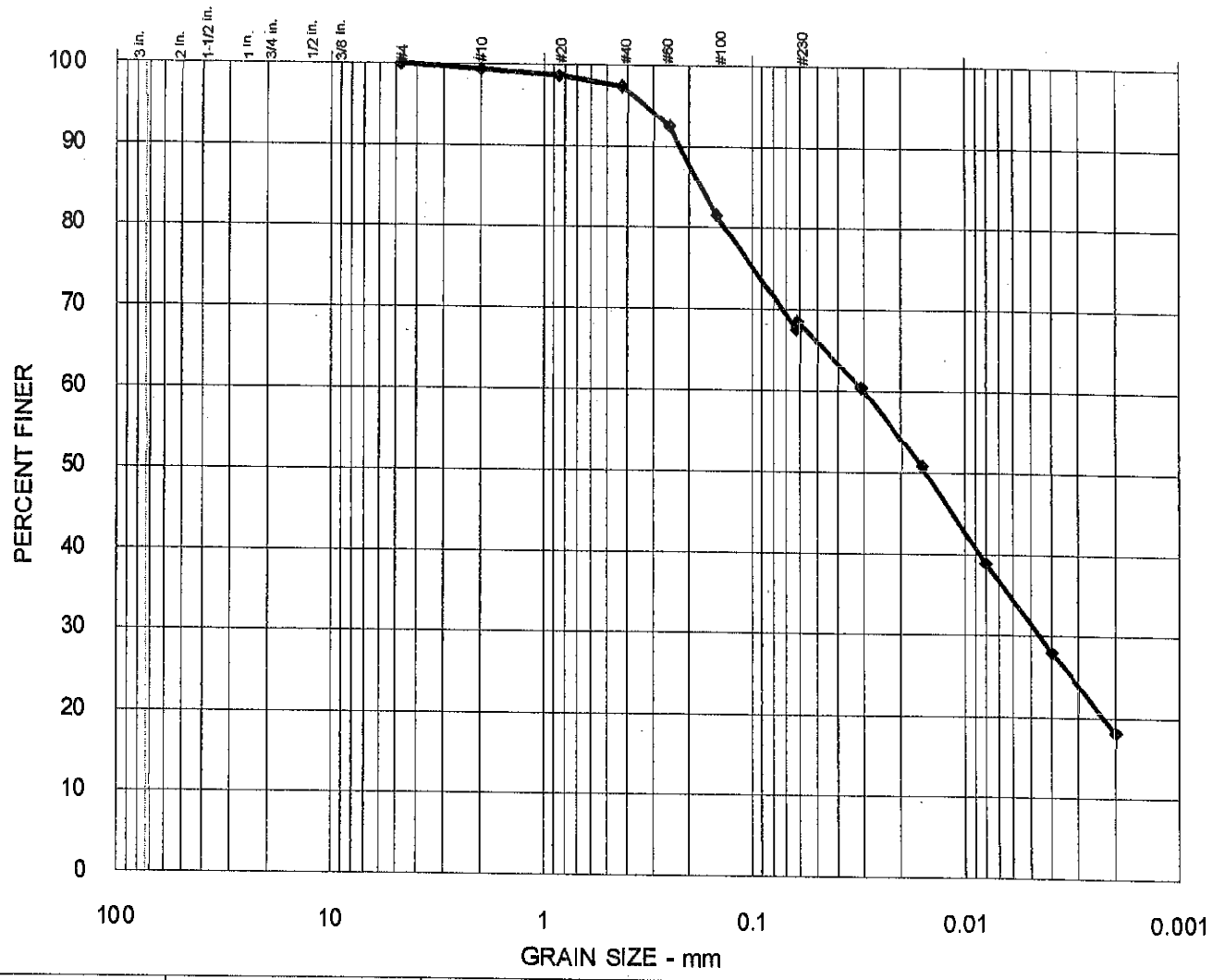
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 8

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	1%	31%	40%	28%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-11	0 - 10 cm	Sediment		81.56%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

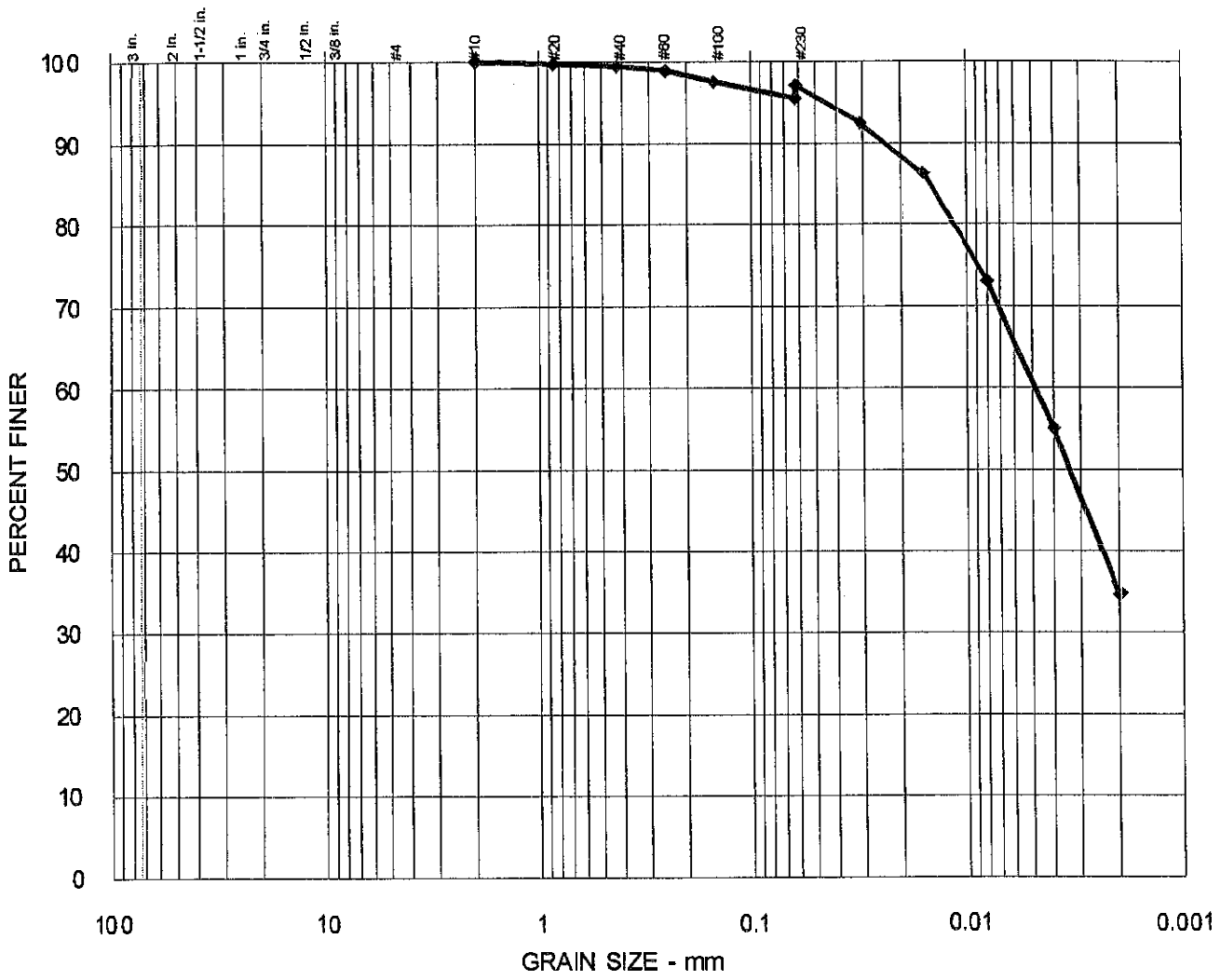
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 9

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	5%	40%	55%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-11-S1	0.0' - 1.3'	Sediment		82.40%

	MATERIAL DESCRIPTION	
	Slightly sandy, very silty CLAY	

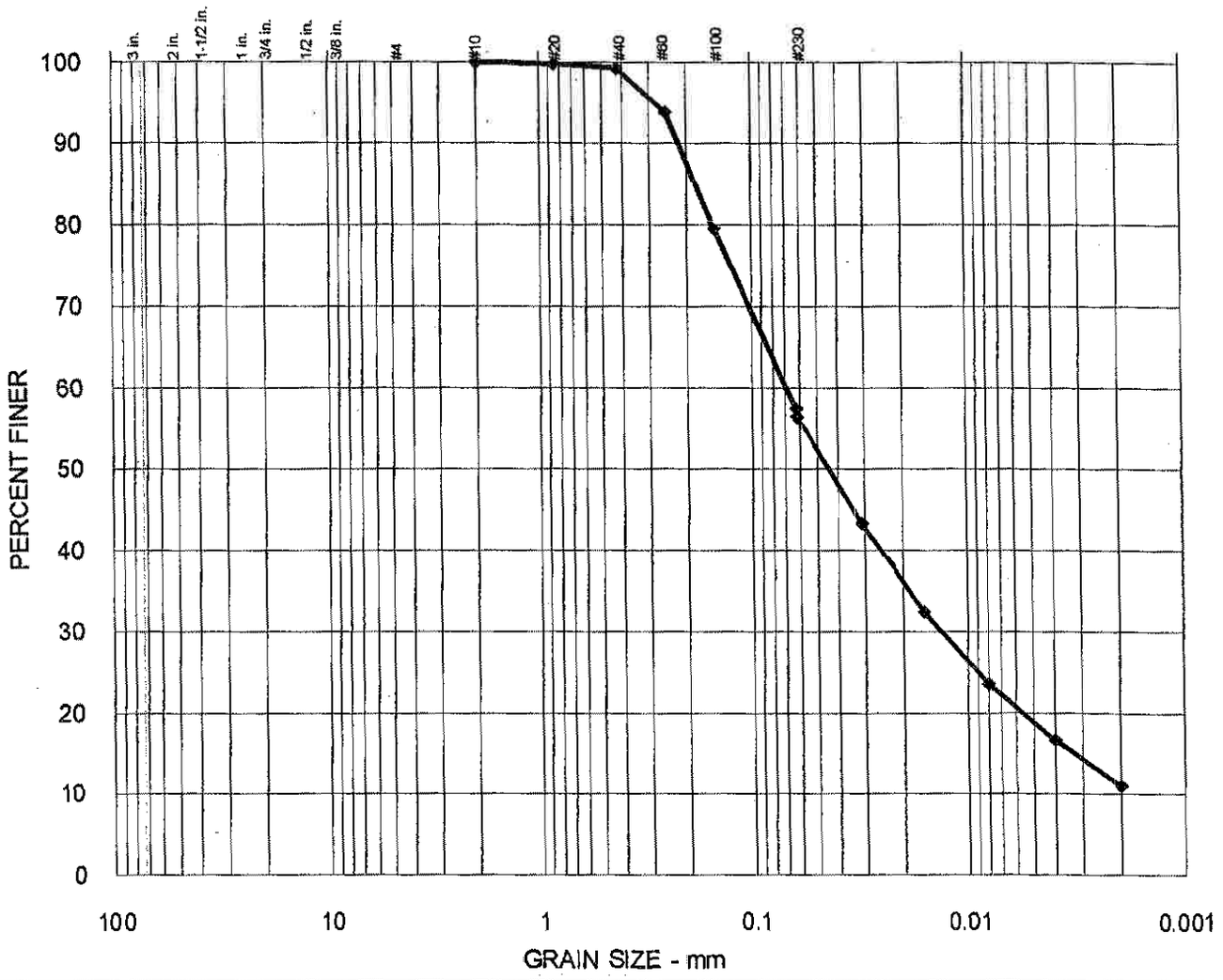
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 10

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	43%	40%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-11-S2	1.3' - 5.0'	Sediment		46.01%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

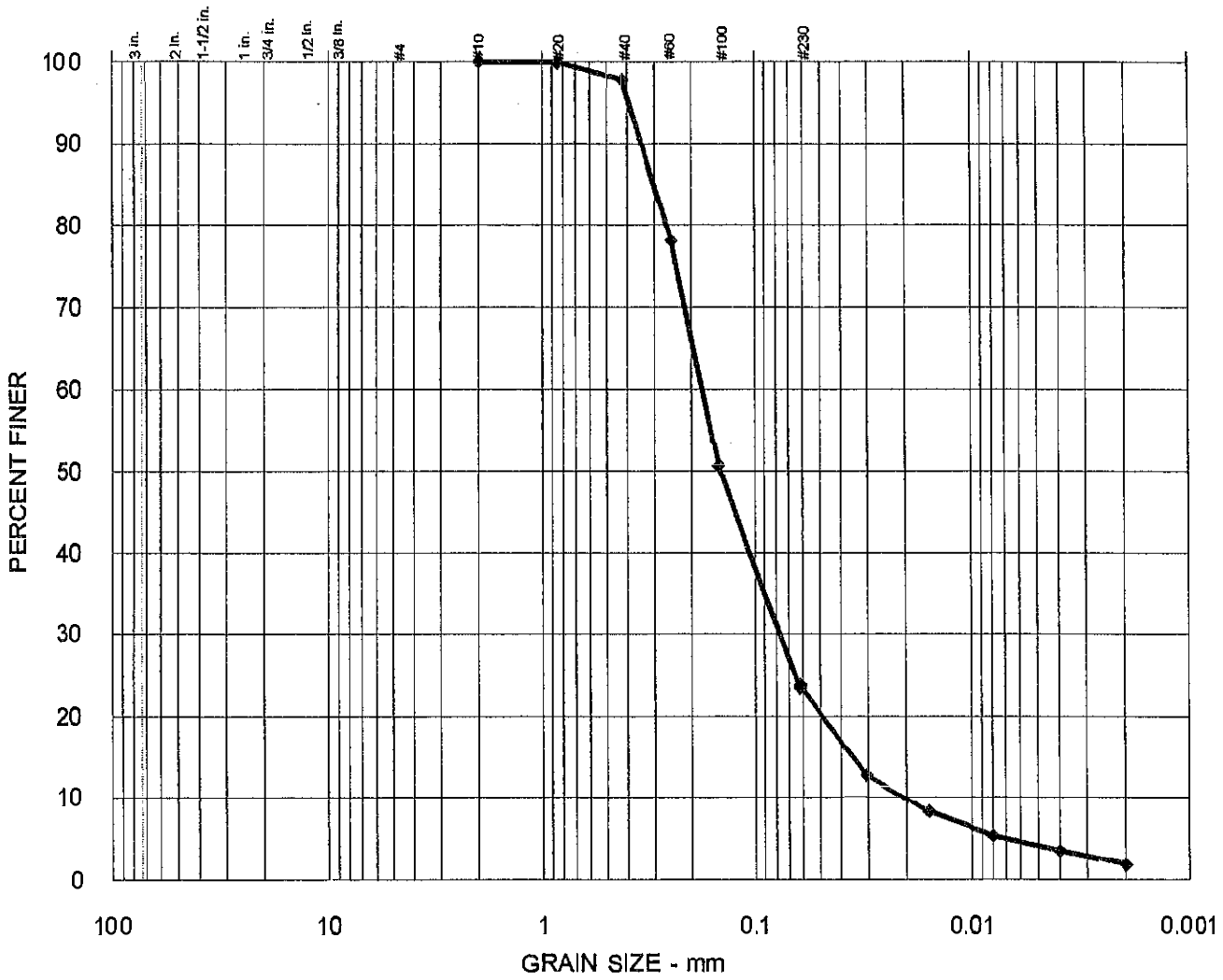
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 11

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	76%	21%	3%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-11-S3	5.0' - 8.2'	Sediment		28.39%

	MATERIAL DESCRIPTION	
	Silty SAND	

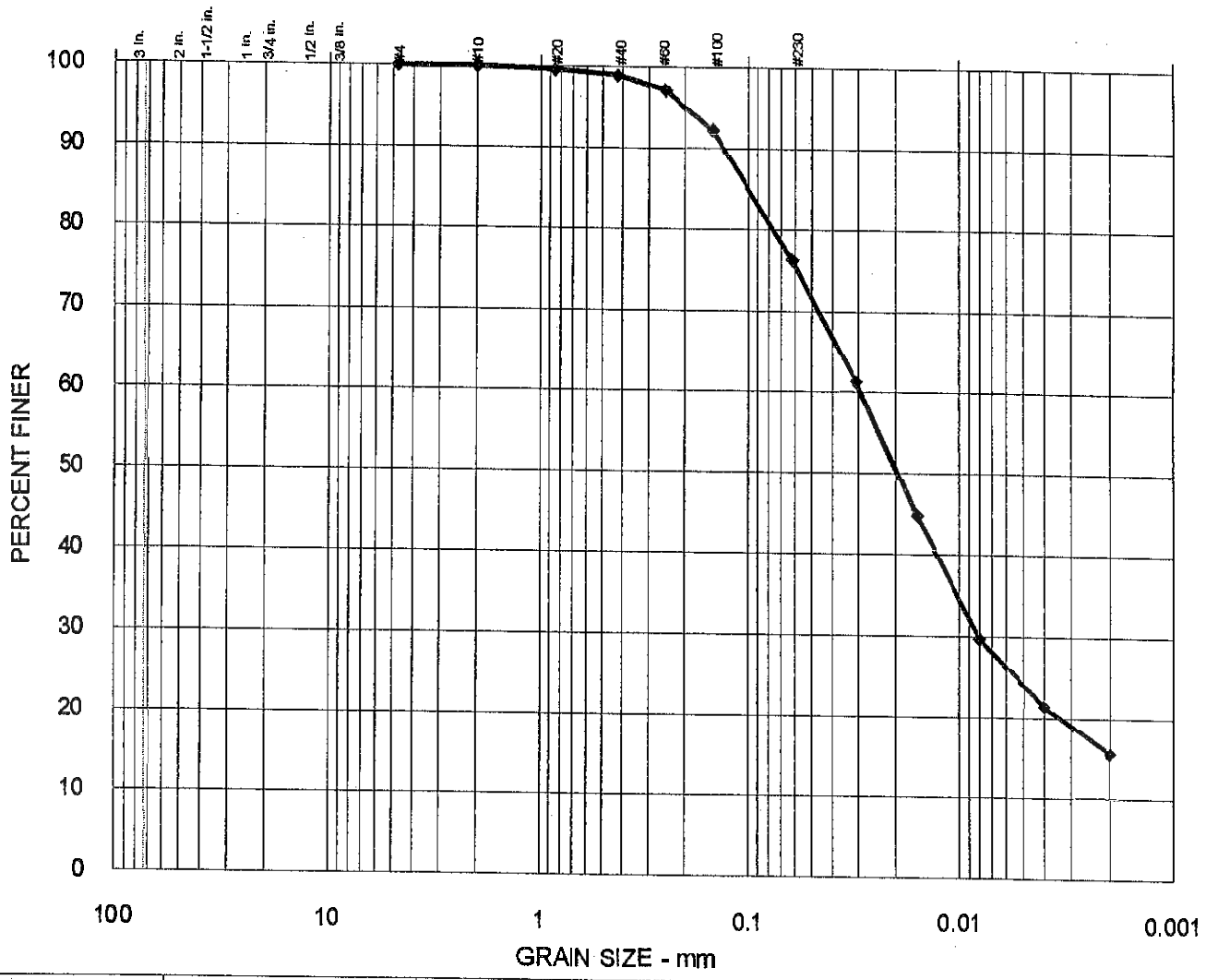
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 12

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	24%	55%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-60	0 - 10 cm	Sediment		89.82%

	MATERIAL DESCRIPTION	
	Clayey, sandy SILT	

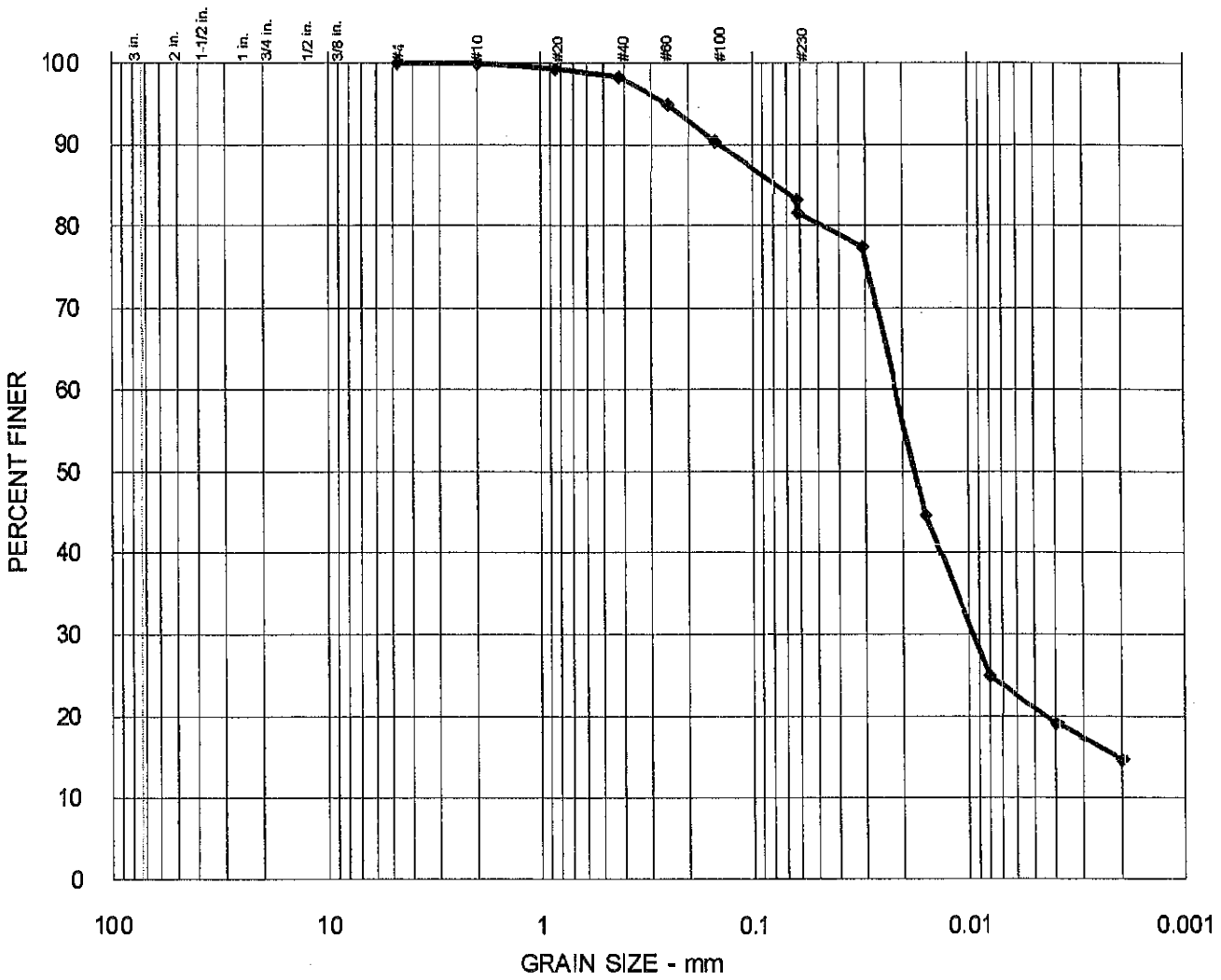
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 13

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	17%	64%	19%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-EW-61	0 - 10 cm	Sediment		108.73%

	MATERIAL DESCRIPTION	
	Sandy, clayey SILT	

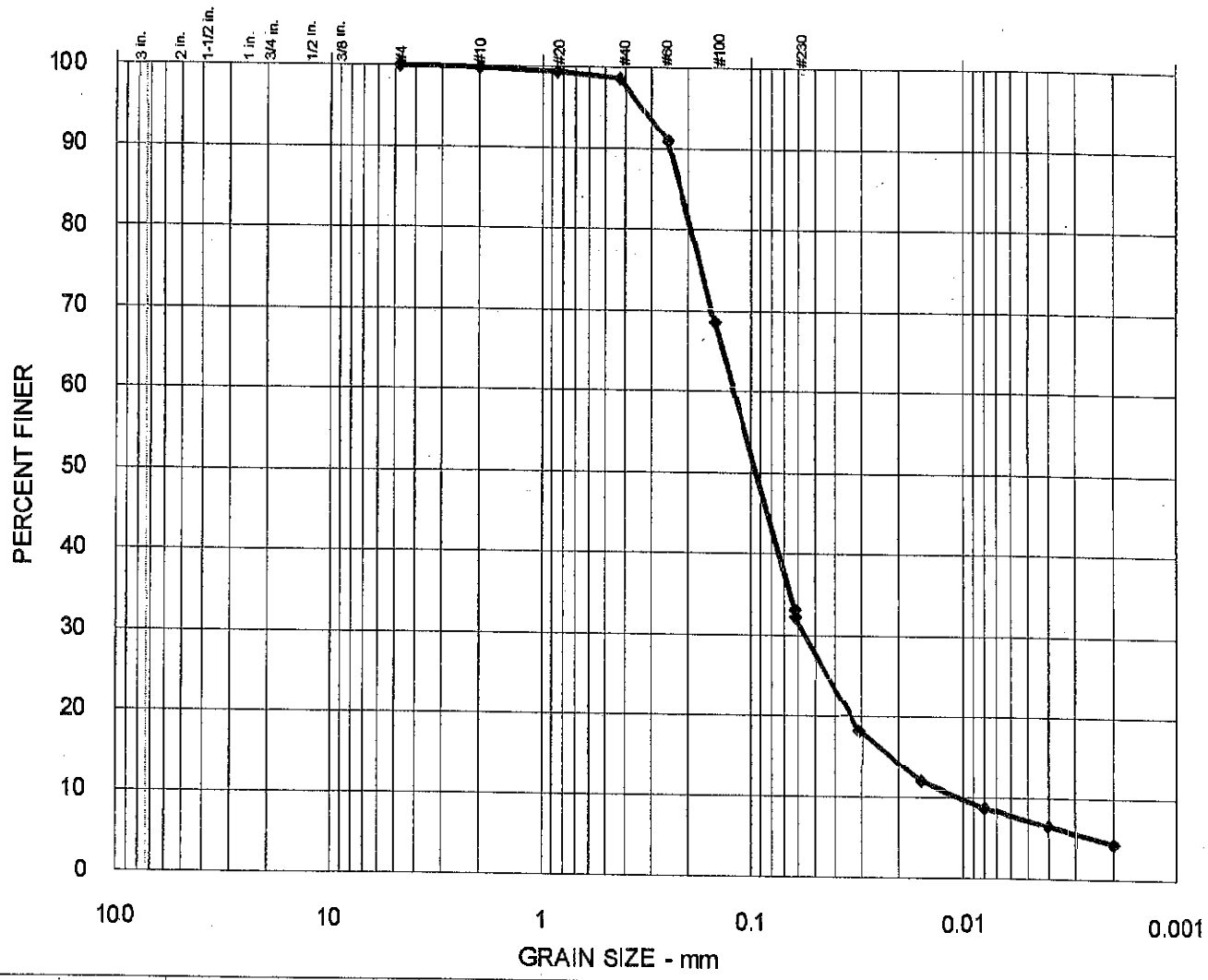
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 14

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	67%	26%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-04	0 - 10 cm	Sediment		57.51%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

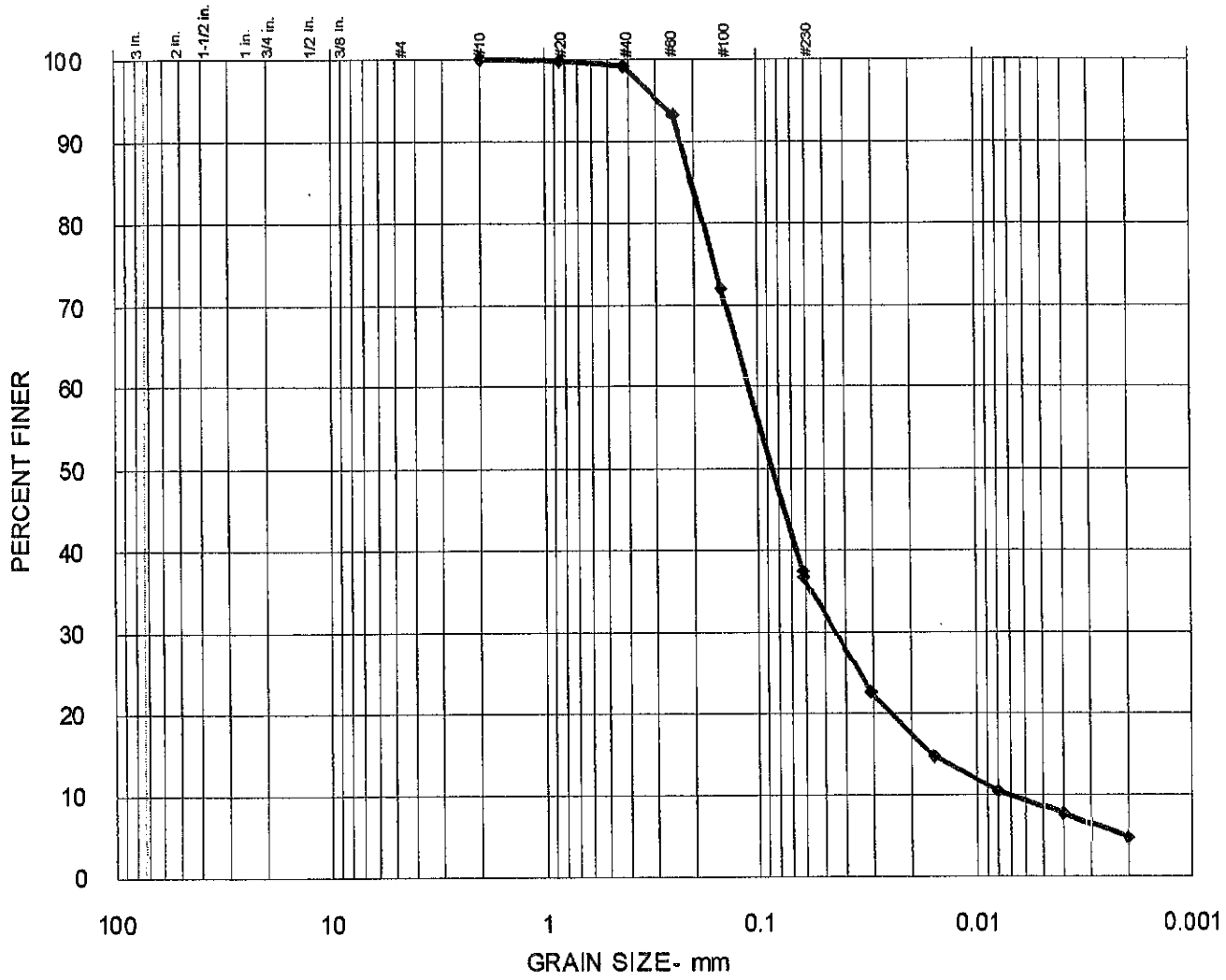
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 15

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	63%	29%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-04-S1	0.0' - 2.5'	Sediment		31.12%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

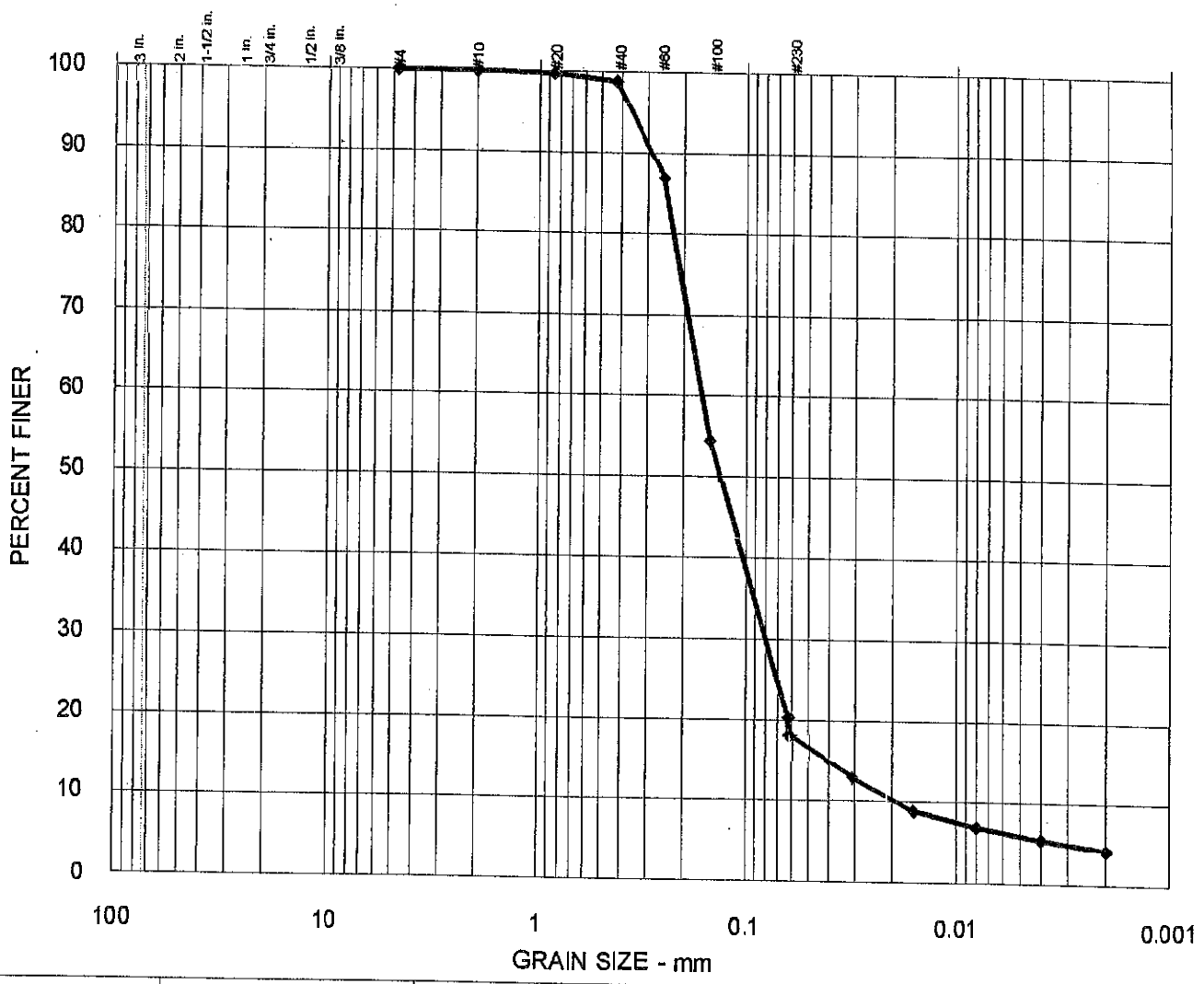
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 16

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	80%	15%	5%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-04-S2	2.5' - 4.2'	Sediment		29.73%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

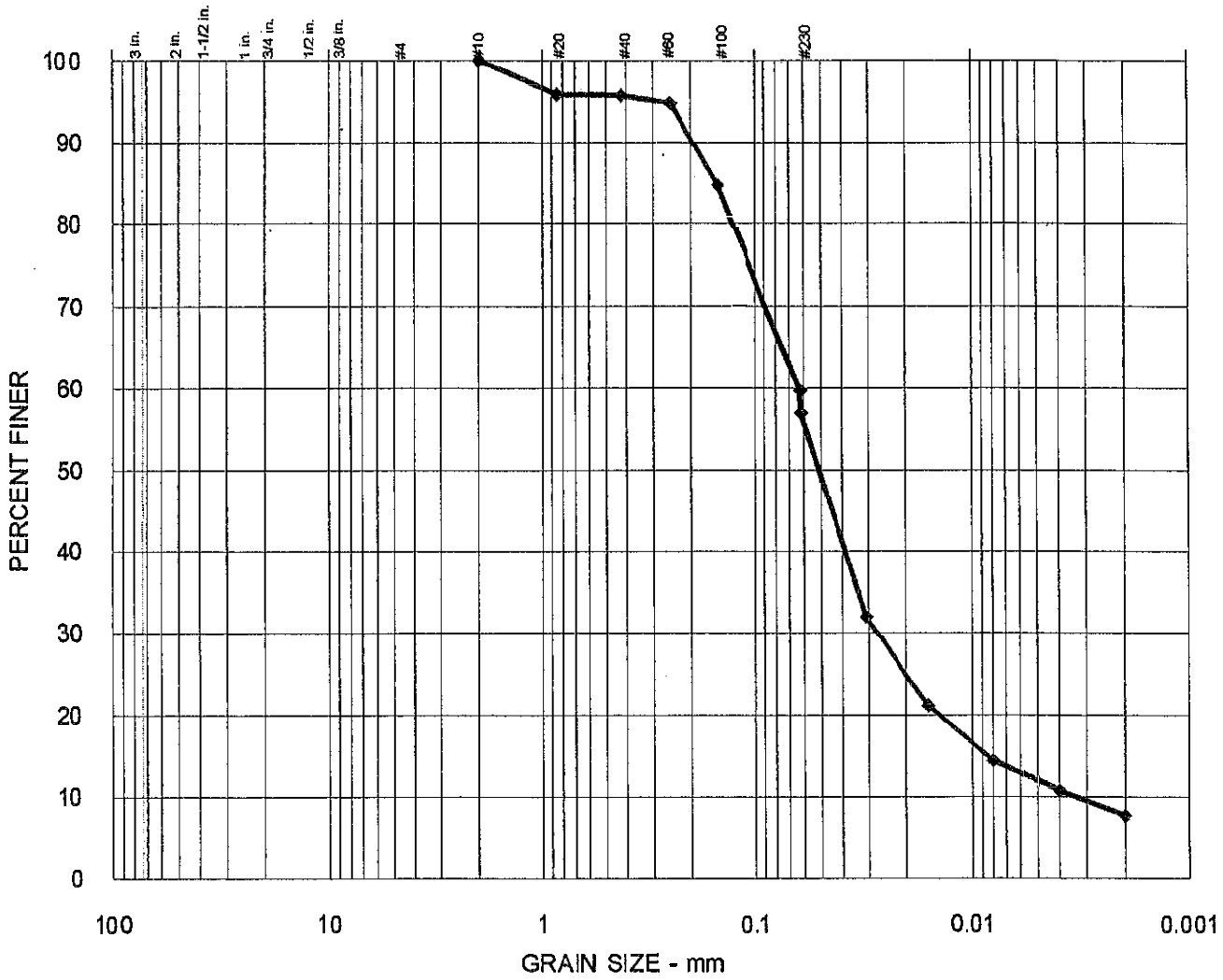
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 17

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	40%	49%	11%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-04-S3	4.2' - 9.4'	Sediment		33.16%

	MATERIAL DESCRIPTION	
	Slightly clayey, very sandy SILT	

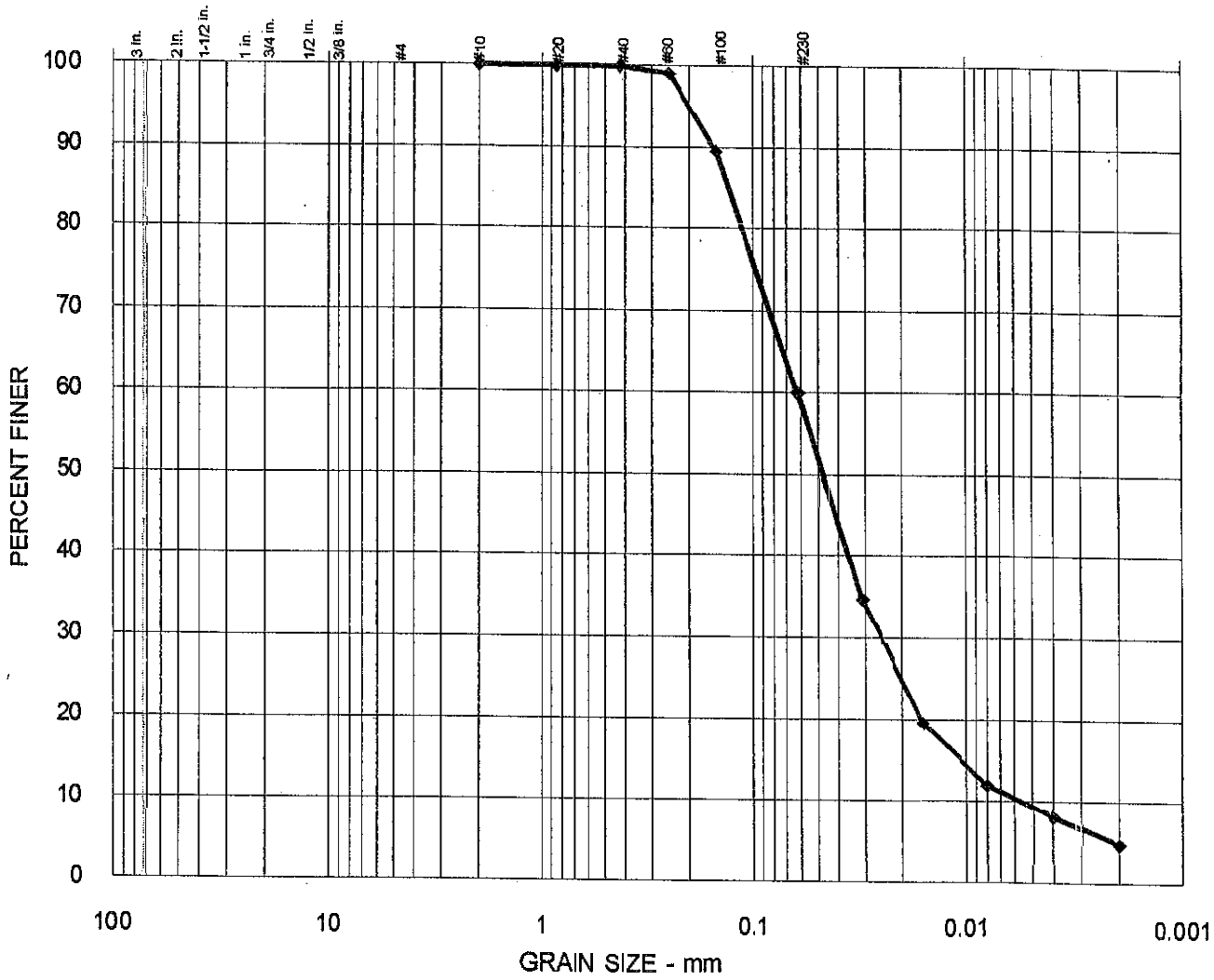
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 18

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	40%	52%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-04-80	N/A	Sediment		35.97%

	MATERIAL DESCRIPTION	
	Slightly clayey, very sandy SILT	

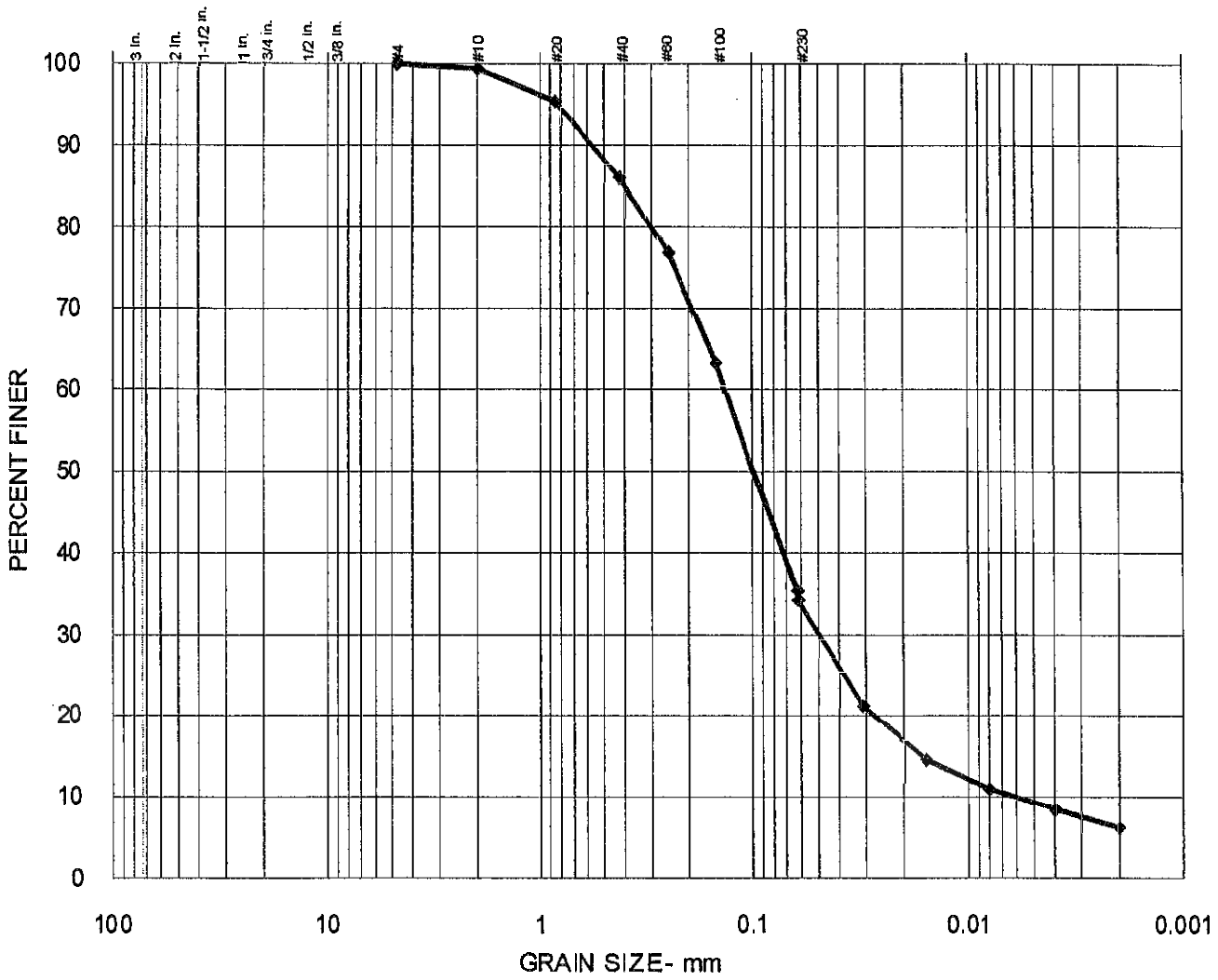
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 19

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	64%	27%	8%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-08	0 - 10 cm	Sediment		48.37%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

Remarks:

Project: Harbor Island Sediments

HARTCROWSER

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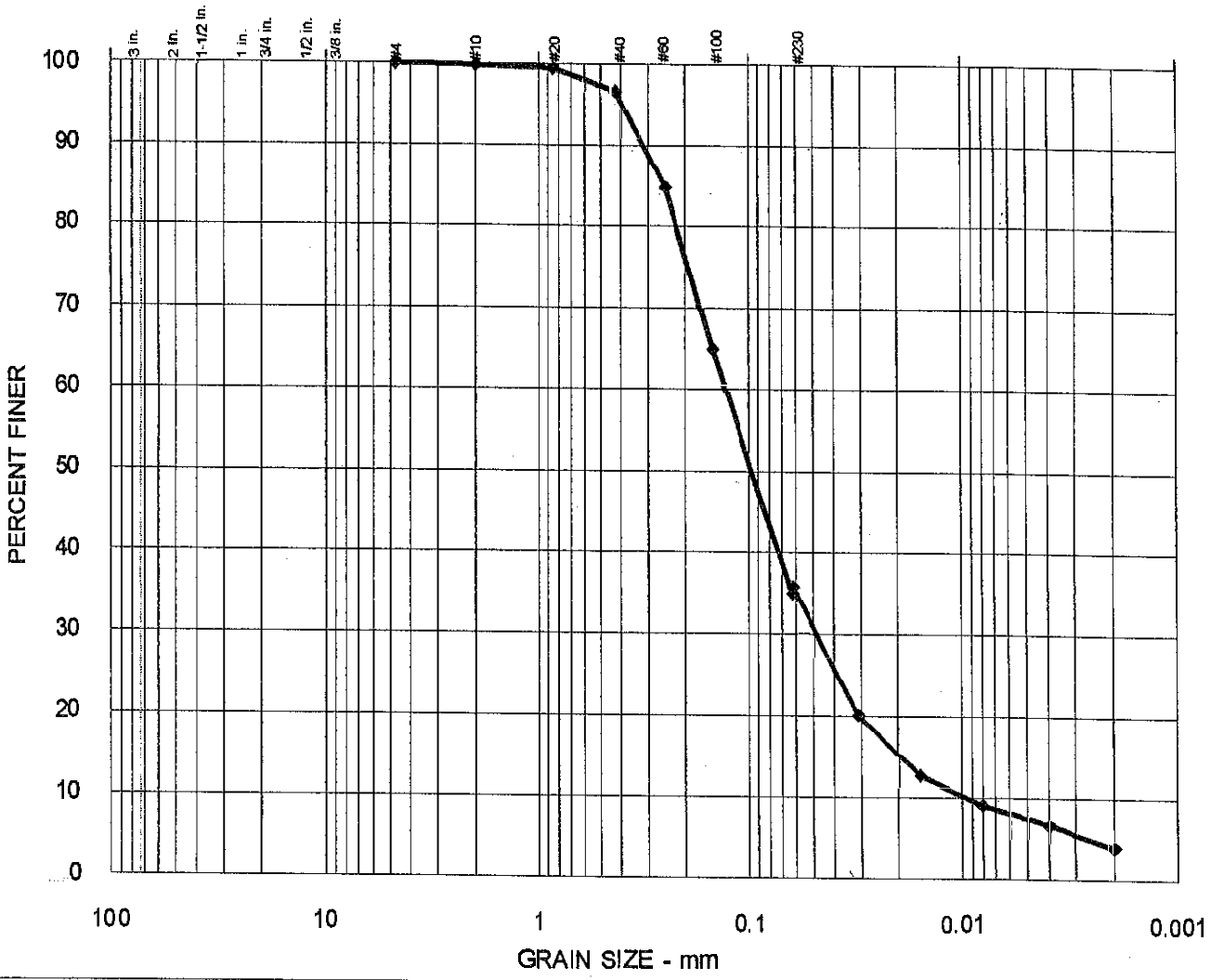
Figure 20

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	65%	28%	7%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-08-S1	0.0'-2.1'	Sediment		39.07%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

Remarks:

Project: Harbor Island Sediments

HARTCROWSER

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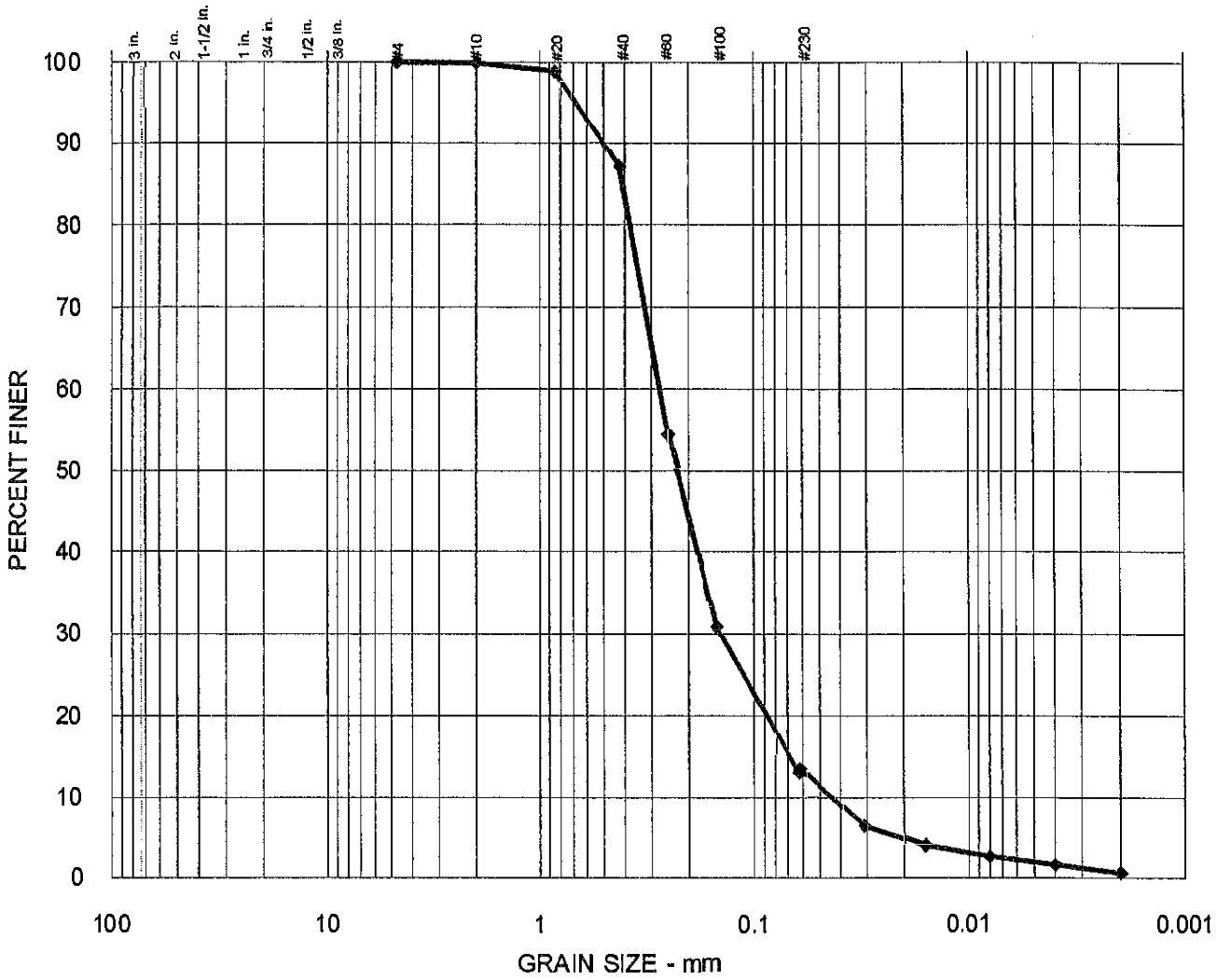
Figure 21

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	87%	11%	2%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-08-S2	2.1' -4.9'	Sediment		27.46%

	MATERIAL DESCRIPTION	
	Silty SAND	

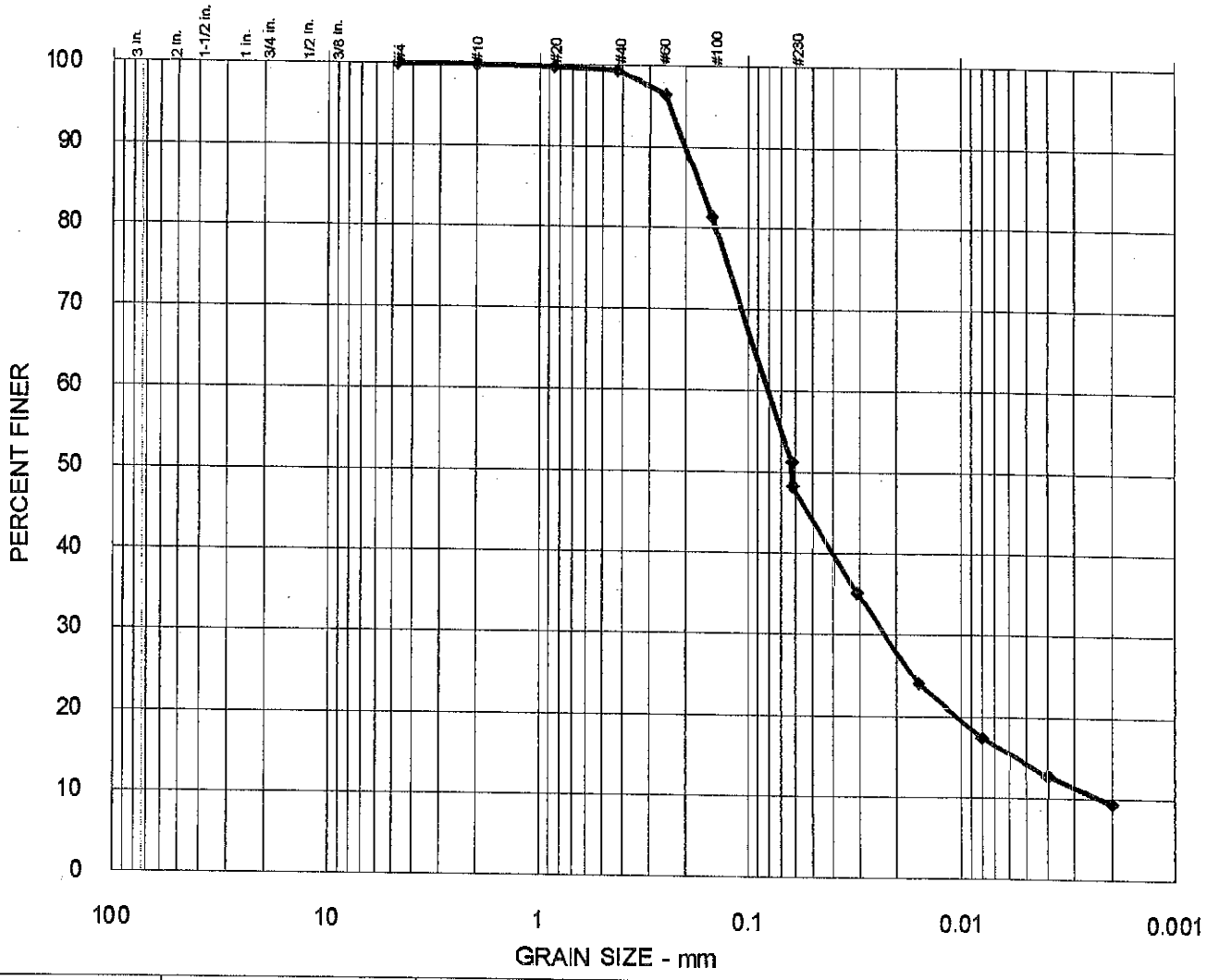
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 22

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	49%	38%	13%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-08-S3	4.9' - 8.3'	Sediment		40.88%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

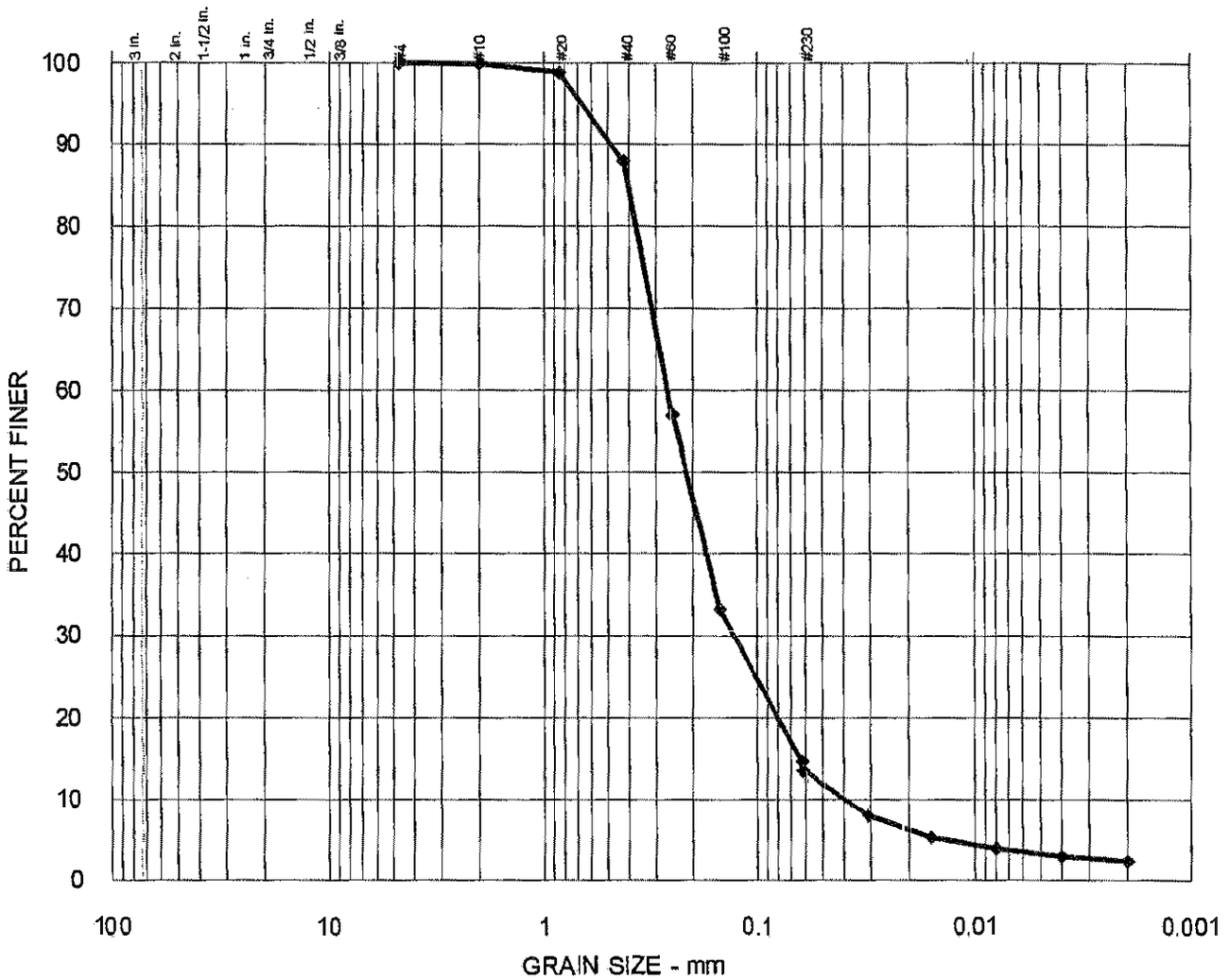
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 23

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	85%	12%	3%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-NS-08-80	N/A	Sediment		25.87%

	MATERIAL DESCRIPTION	
	Silty SAND	

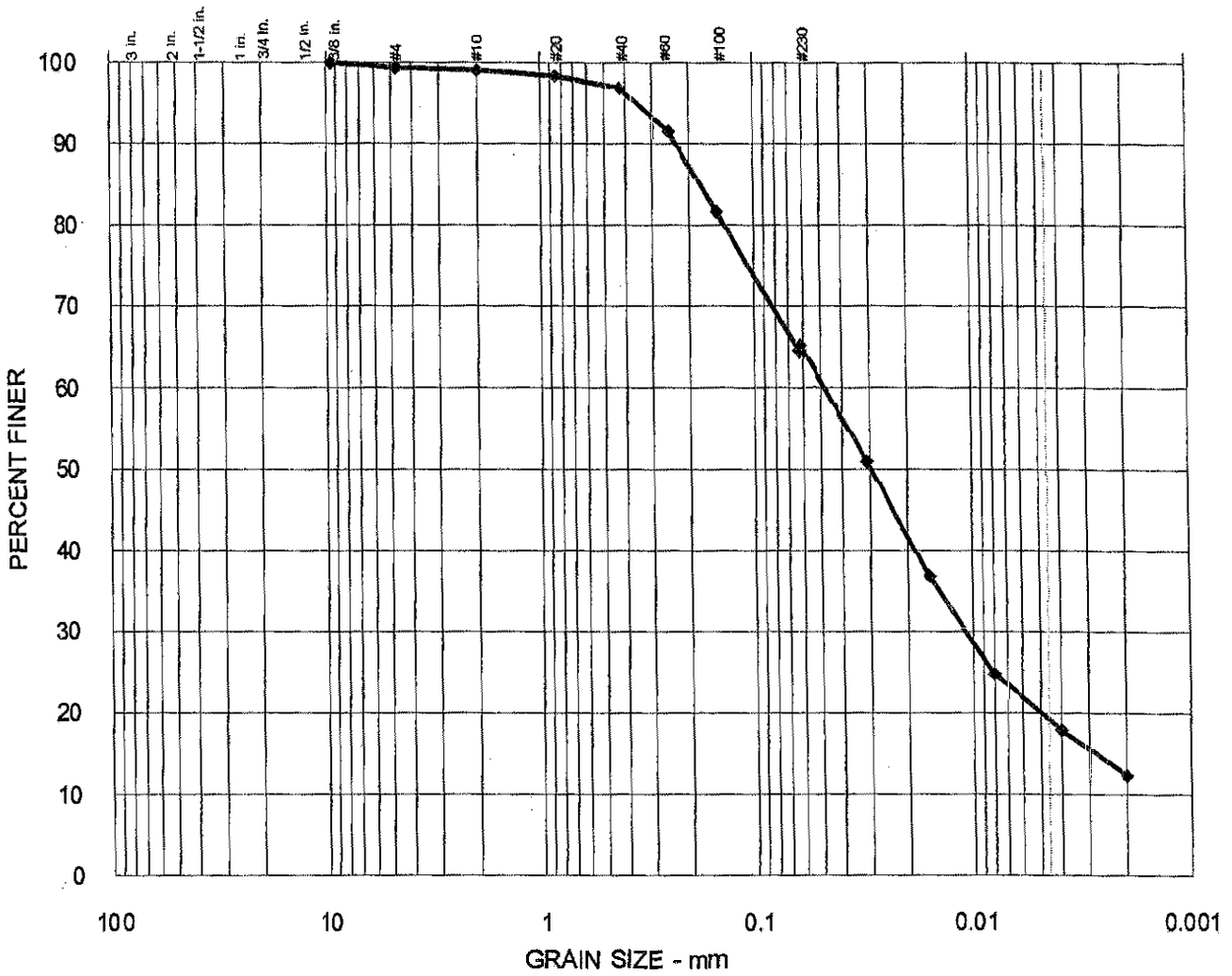
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 24

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	1%	34%	47%	18%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-05	0 - 10 cm	Sediment		90.49%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

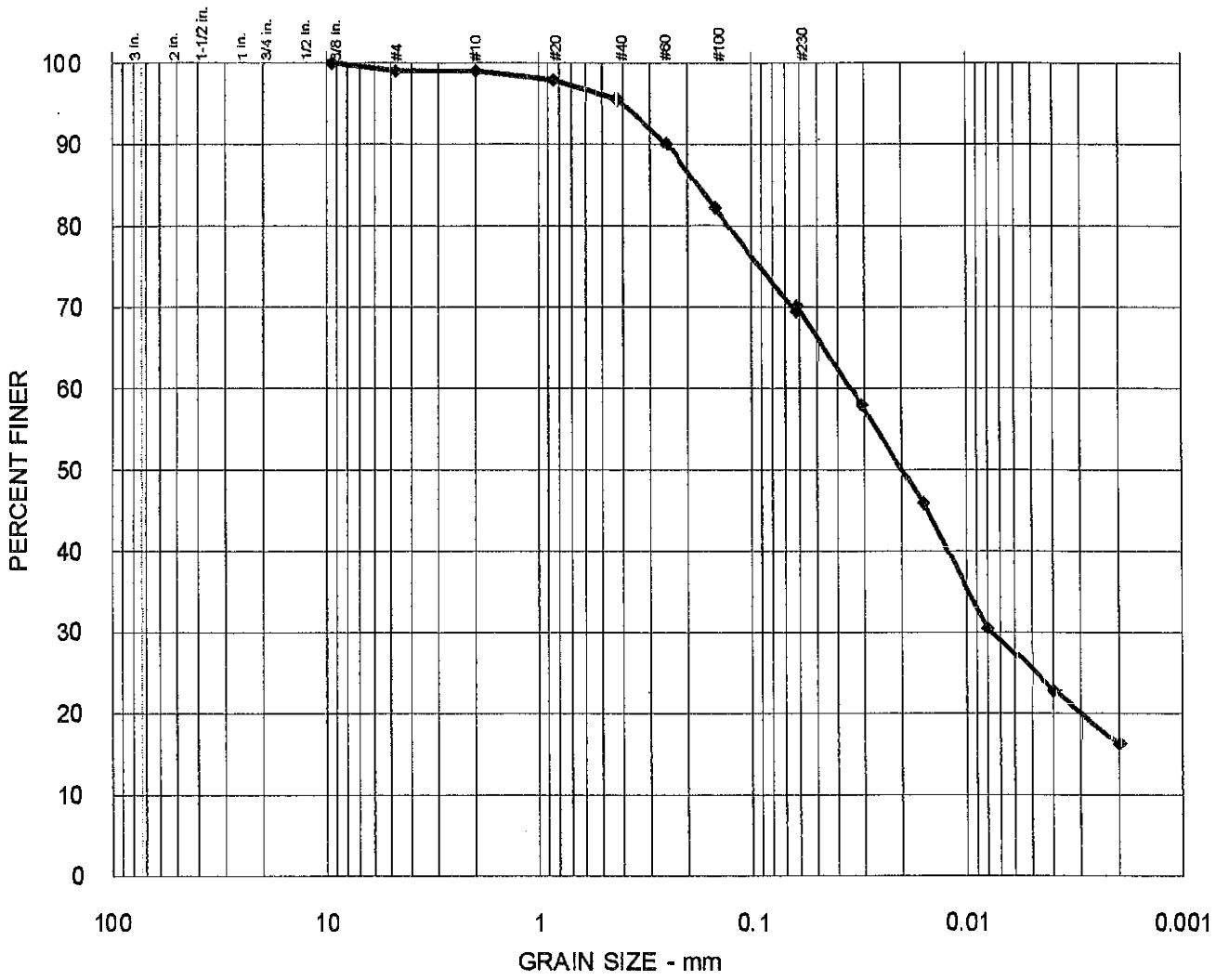
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 25

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	% SAND	%SILT	%CLAY
	1%	30%	46%	23%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-05-S1	0.0' - 1.4'	Sediment		89.24%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

Remarks:

Project: Harbor Island Sediments

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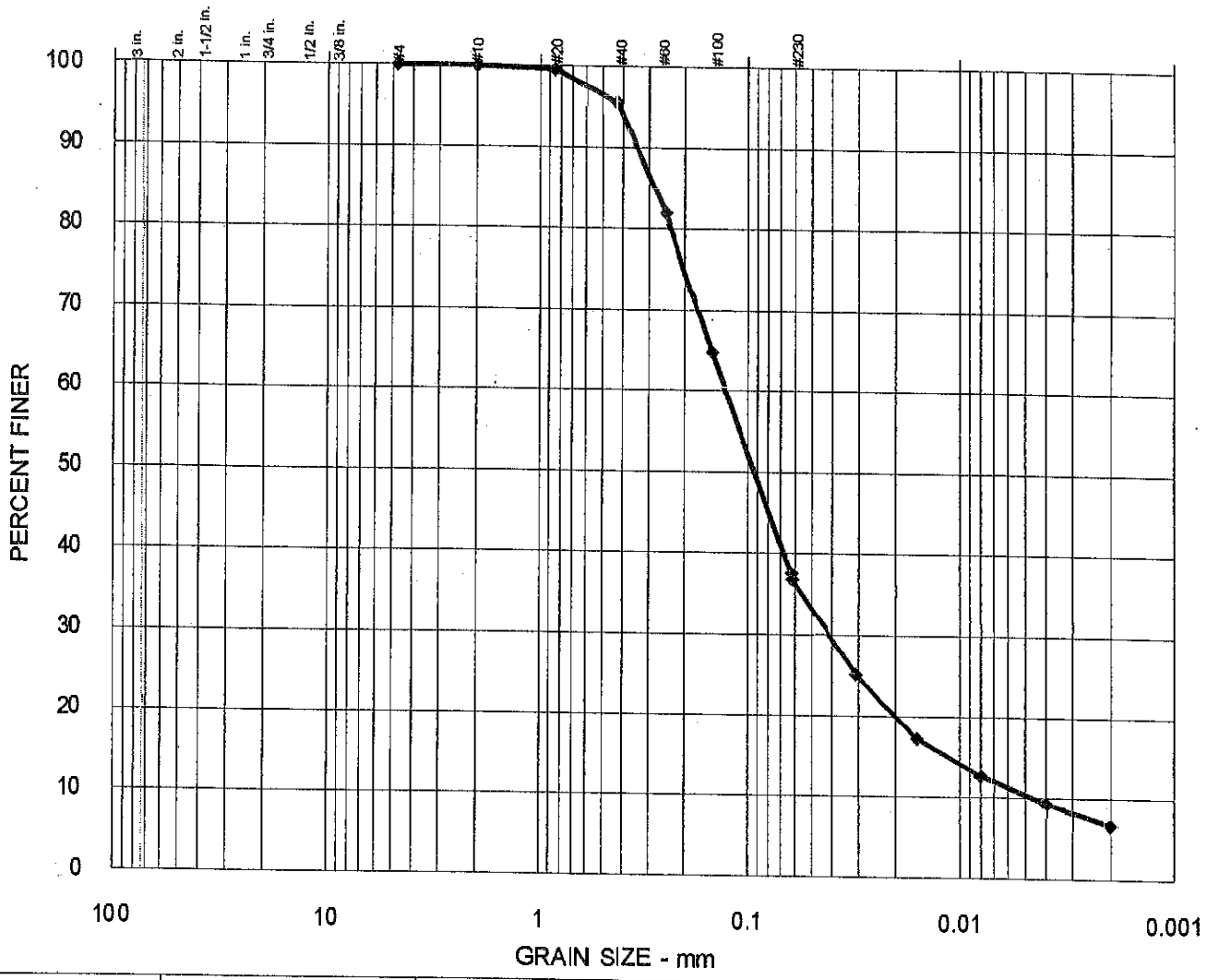
Figure 26

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	62%	29%	9%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-05-S2	1.4' - 4.7'	Sediment		37.59%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

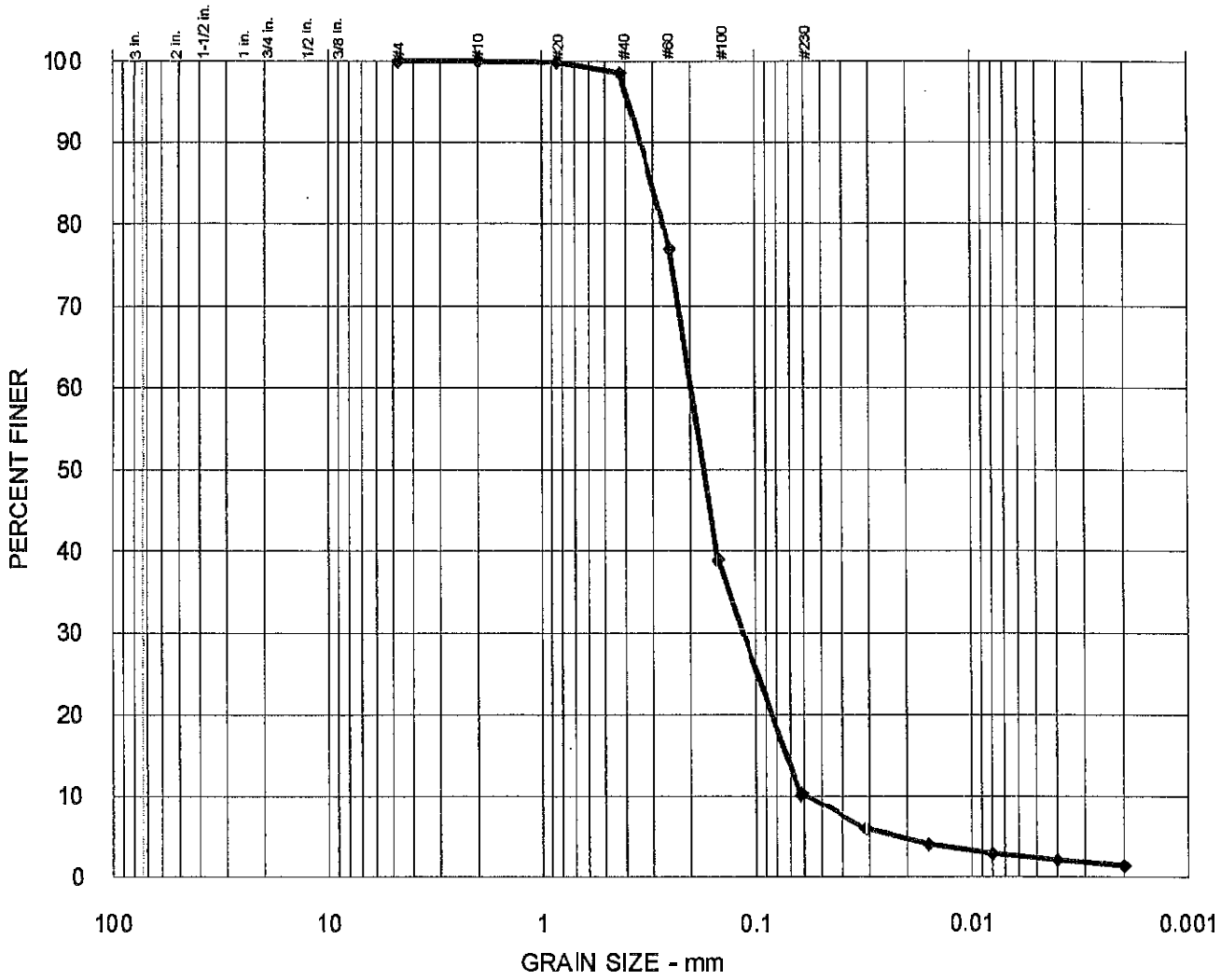
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 27

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	90%	8%	2%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-05-S3	4.7' - 8.0'	Sediment		31.53%

	MATERIAL DESCRIPTION	
	Slightly silty SAND	

Remarks:

Project: Harbor Island Sediments

HARTCROWSER

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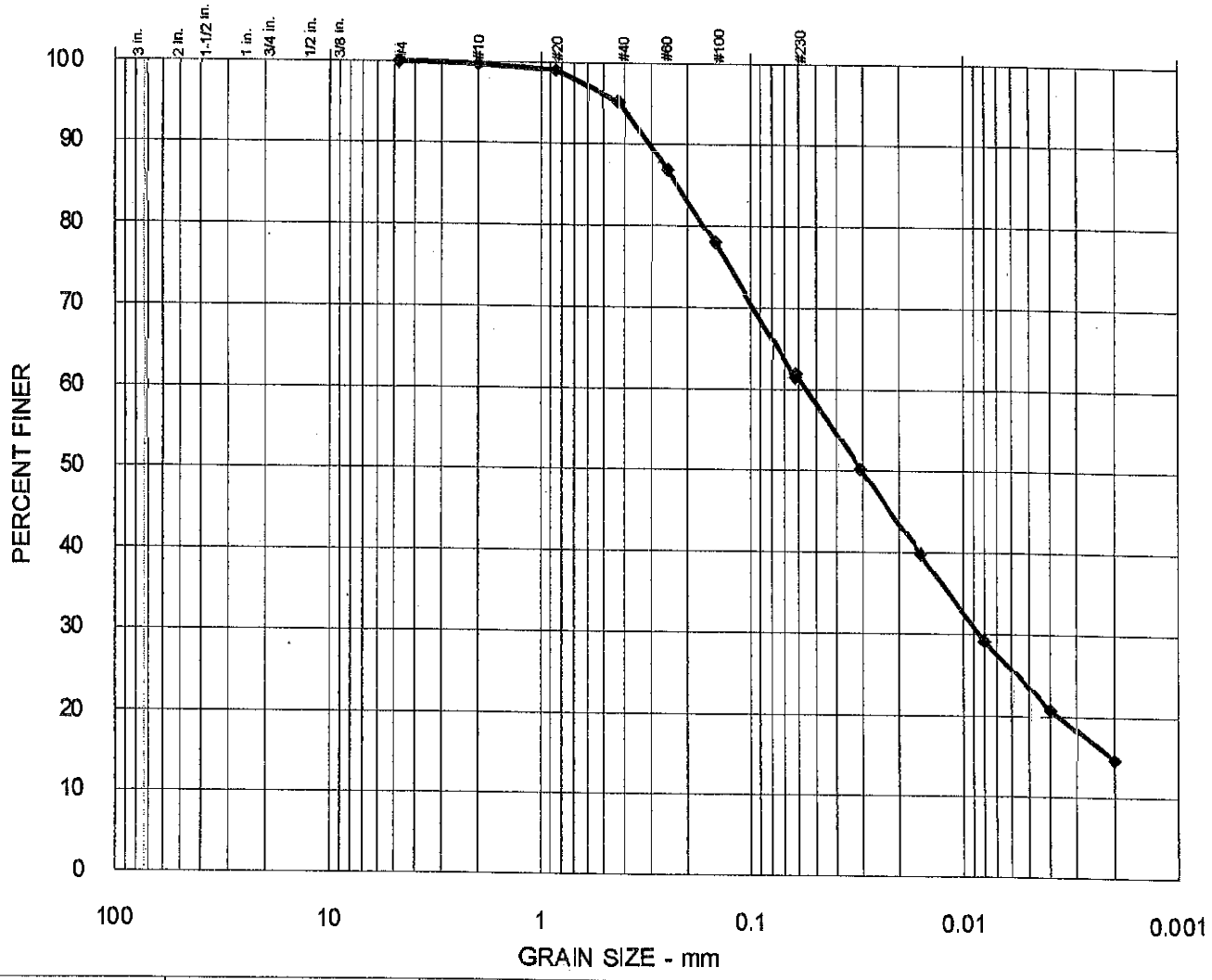
Figure 28

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	38%	41%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-10	0 - 10 cm	Sediment		77.90%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

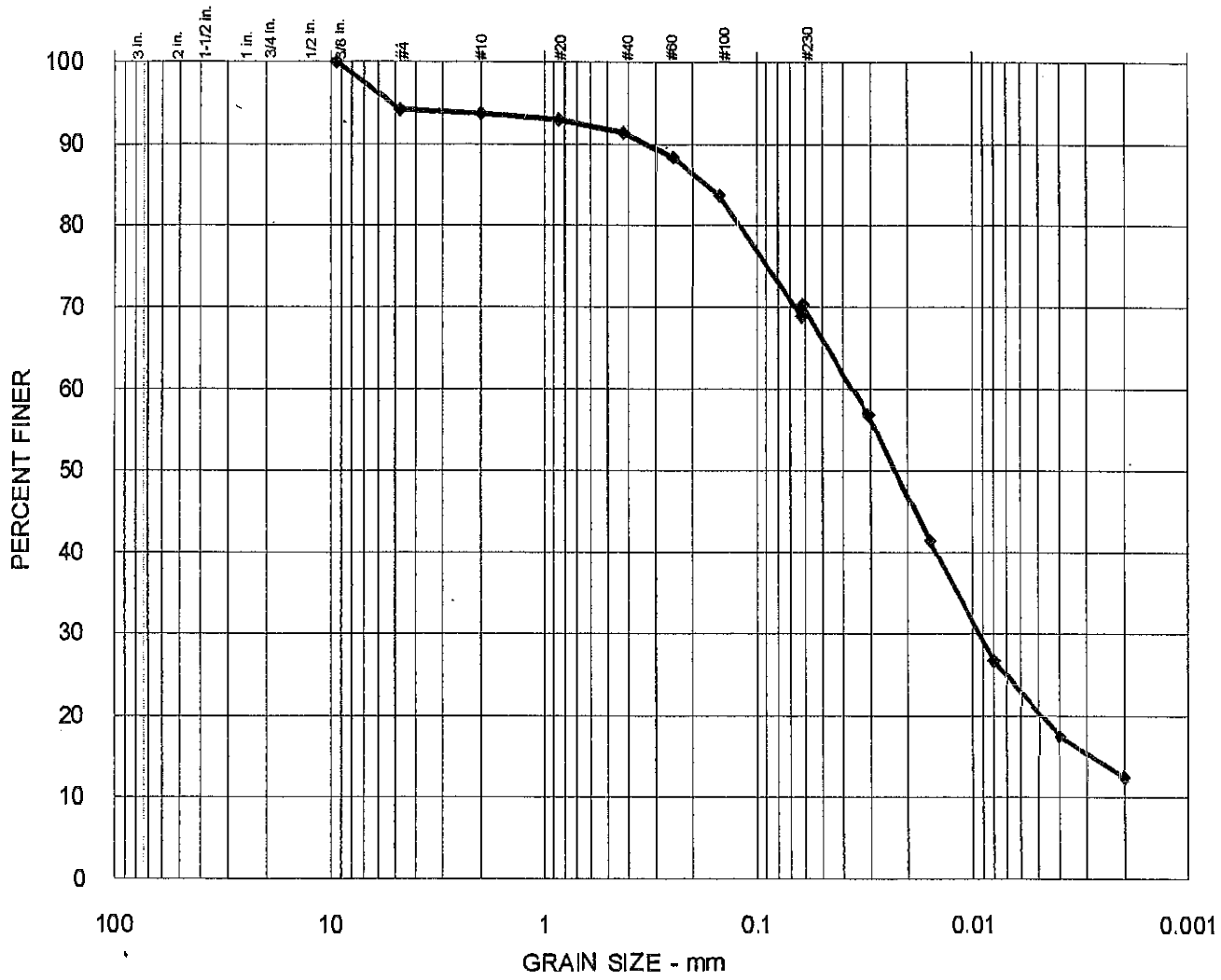
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 29

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	6%	25%	52%	17%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-10-S1	0.0'-2.1'	Sediment		78.67%

	MATERIAL DESCRIPTION	
	Slightly gravelly, clayey, sandy SILT	

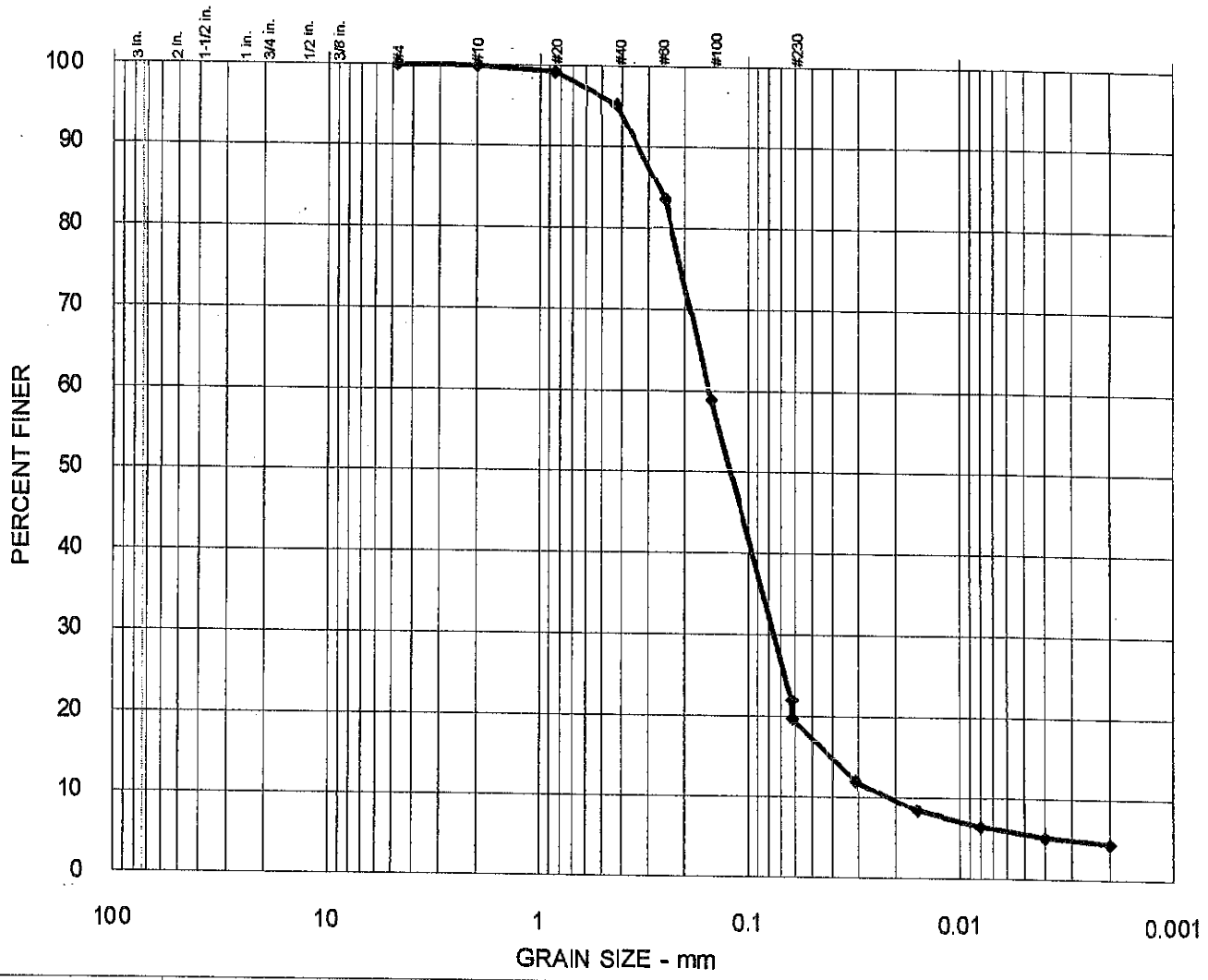
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 30

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	78%	17%	5%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-10-S2	2.1' - 3.8'	Sediment		29.80%

	MATERIAL DESCRIPTION	
	Slightly clayey, silty SAND	

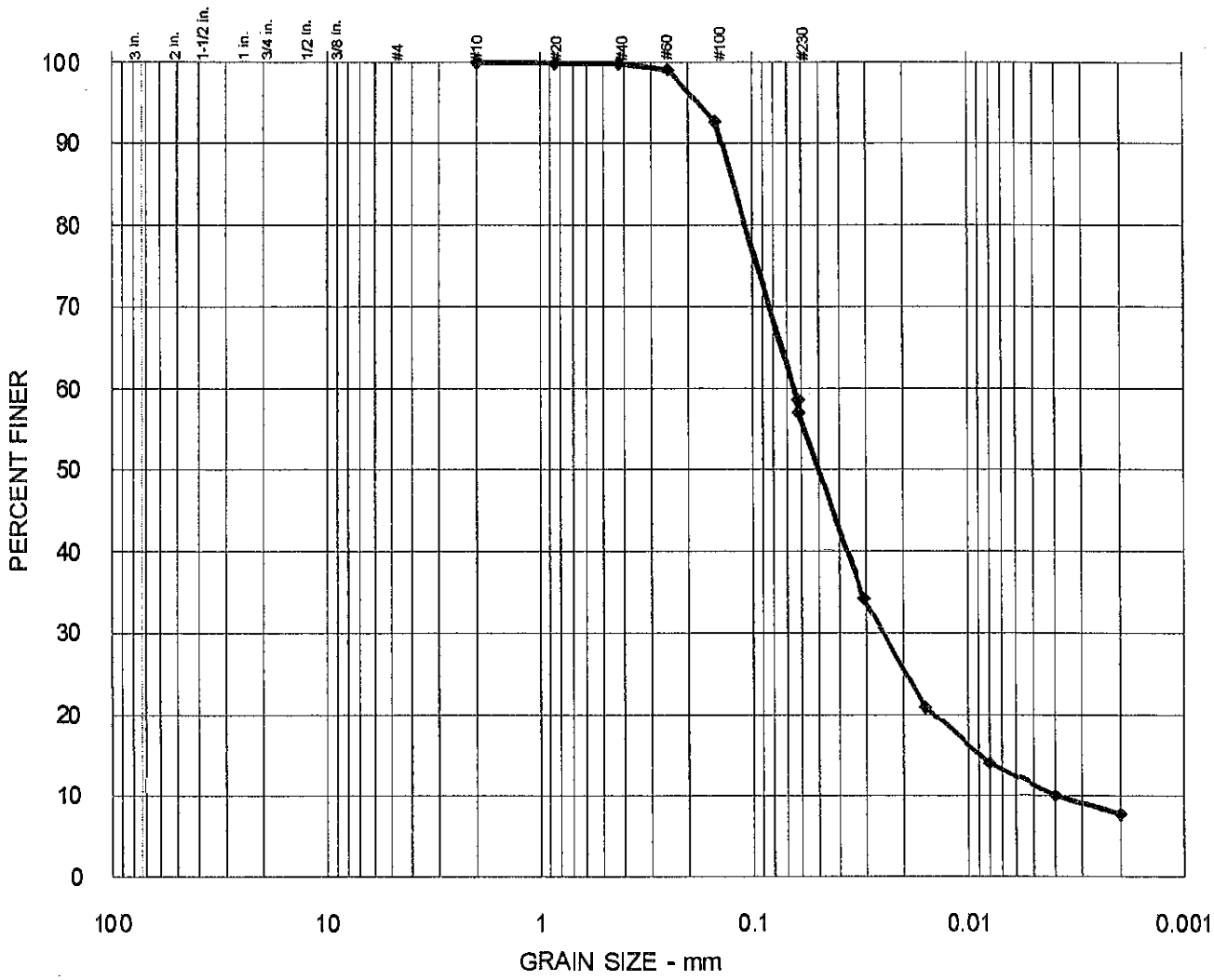
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 31

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	41%	49%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-10-S3	3.8' - 6.4'	Sediment		35.92%

	MATERIAL DESCRIPTION	
	Slightly clayey, very sandy SILT	

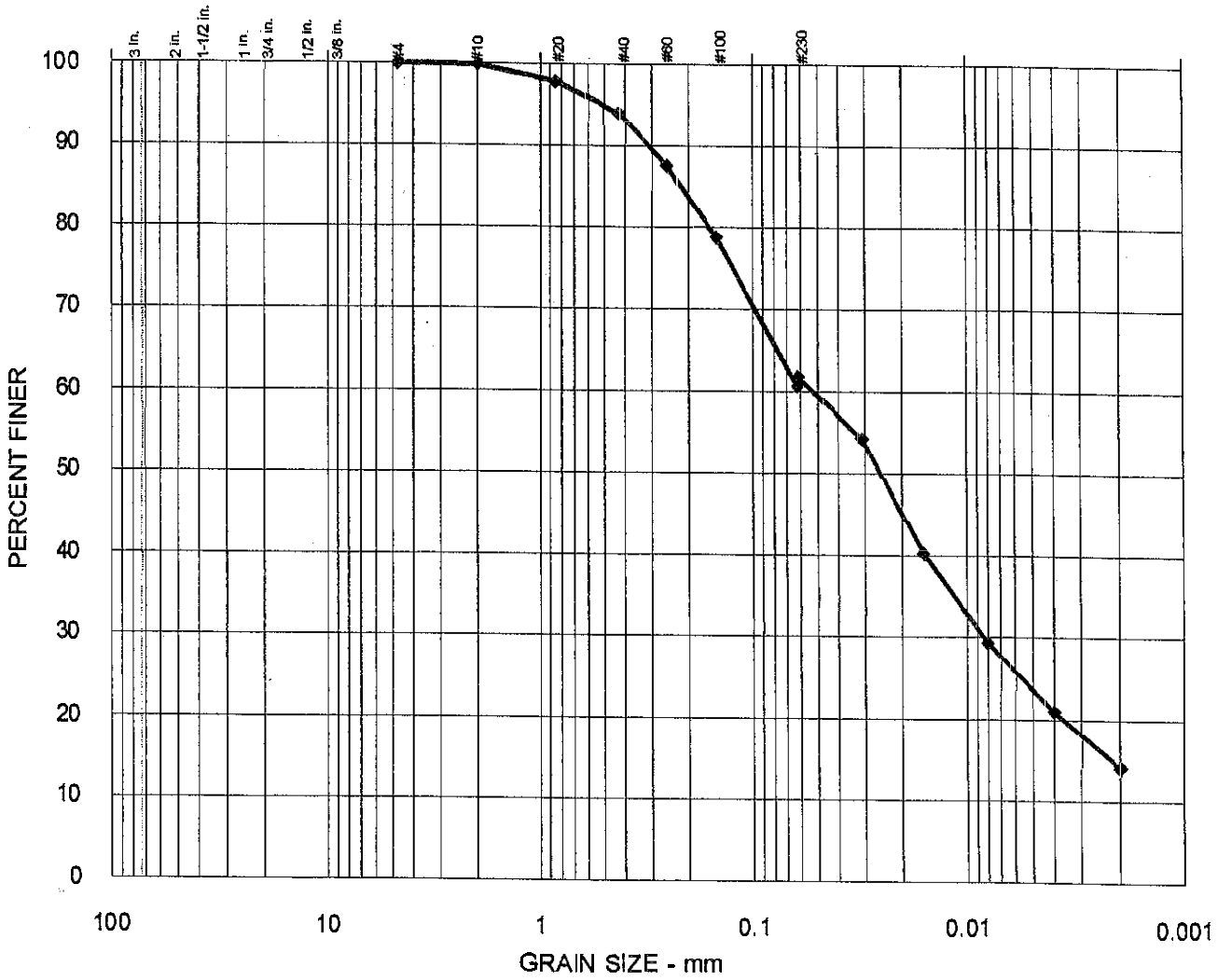
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 32

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	39%	40%	21%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18	0 - 10 cm	Sediment		86.46%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

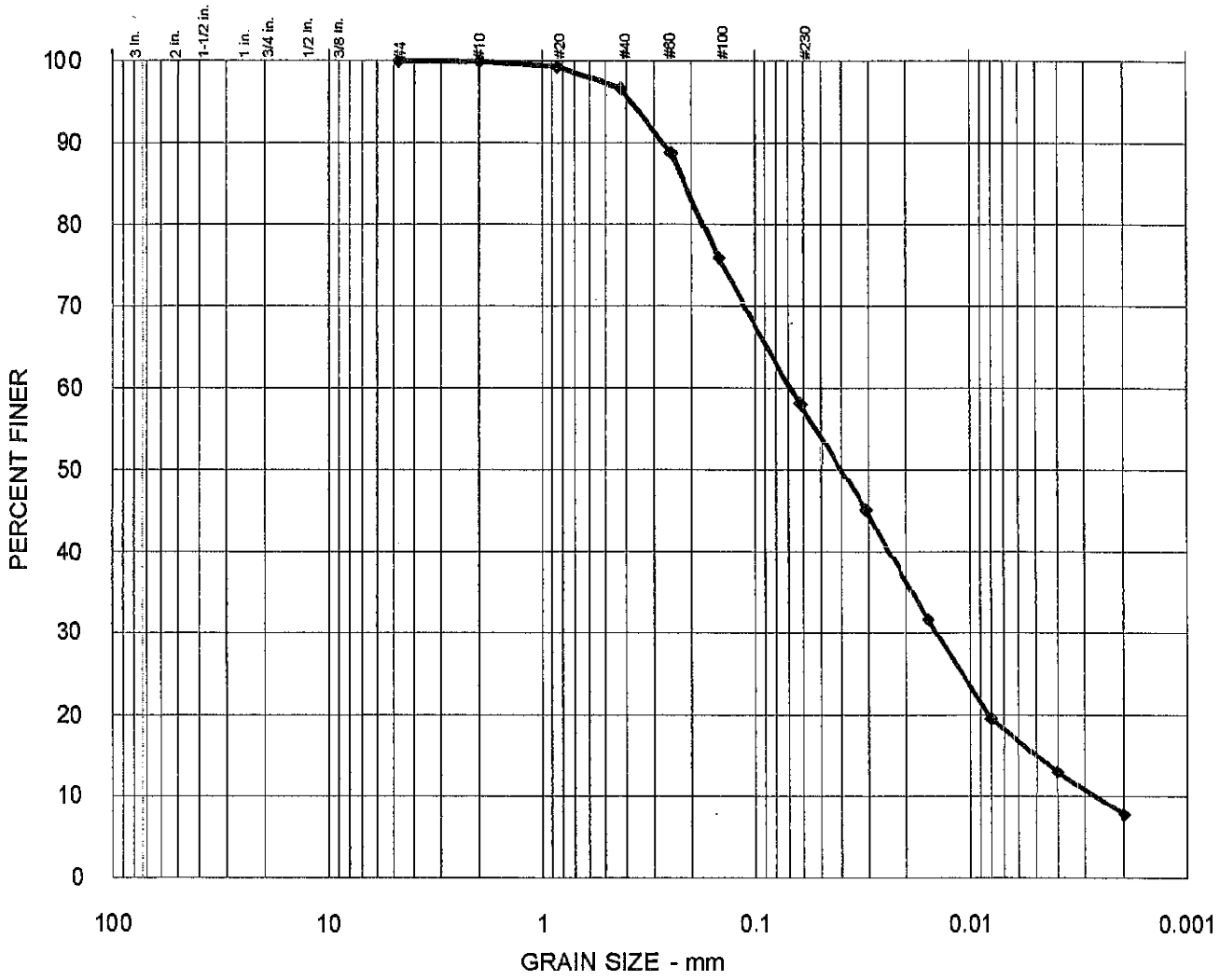
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 33

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	% SILT	%CLAY
	0%	42%	45%	13%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18-S1	0.0' - 1.7'	Sediment		68.18%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

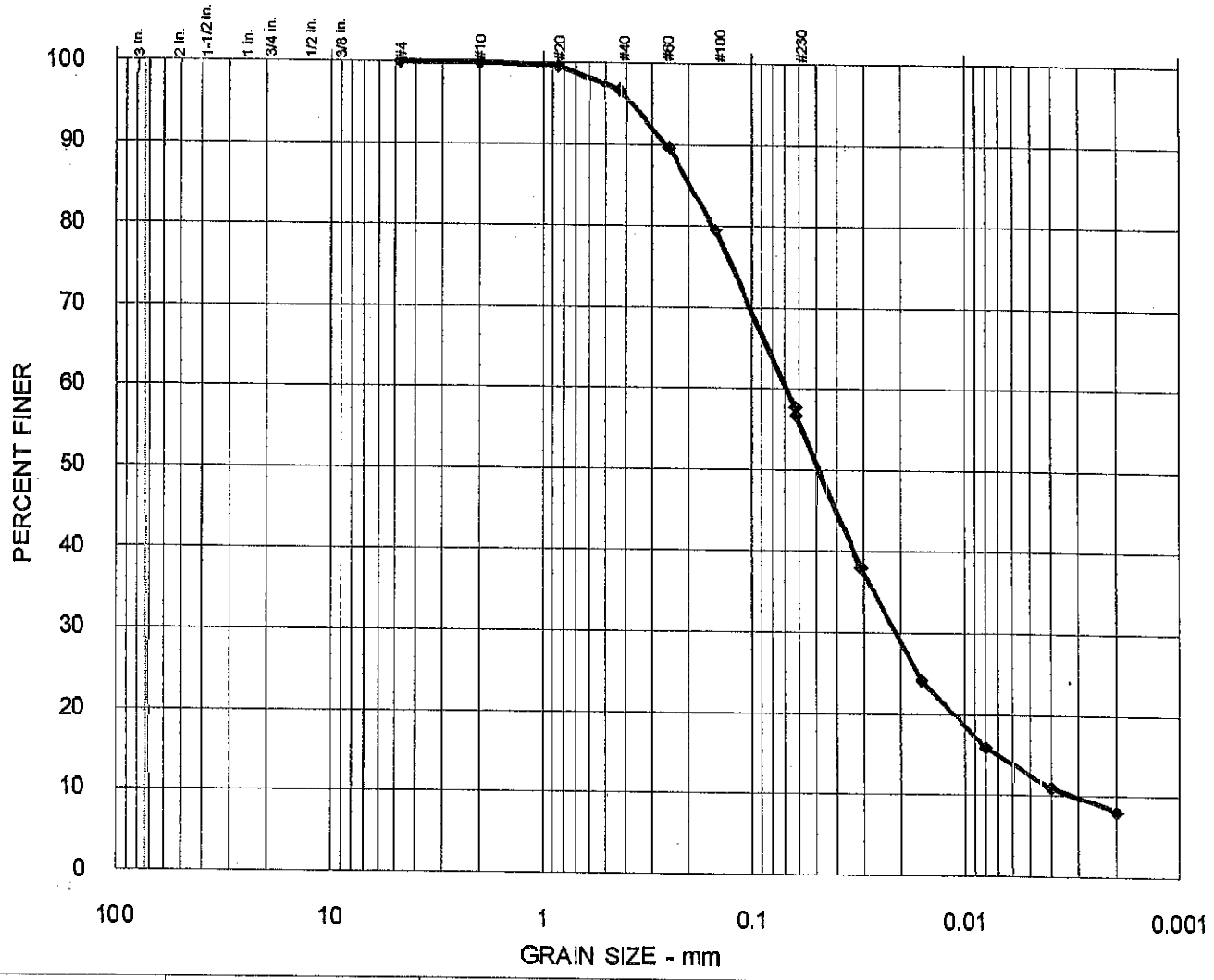
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 34

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	42%	47%	11%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18-S2	1.7' - 6.3'	Sediment		36.76%

	MATERIAL DESCRIPTION	
	Slightly clayey, very sandy SILT	

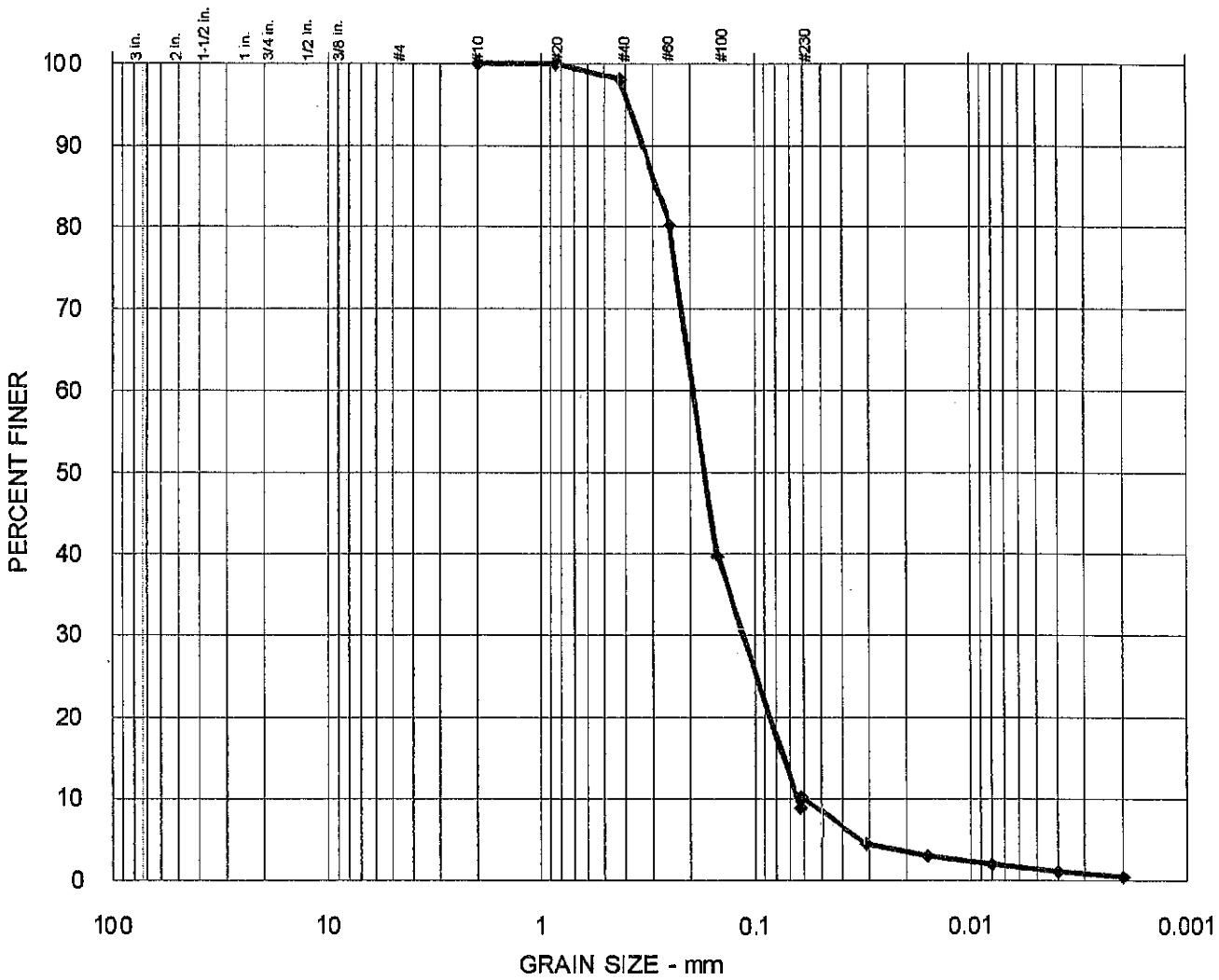
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 35

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	91%	8%	1%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18-S3	6.3' - 8.0'	Sediment		31.66%

	MATERIAL DESCRIPTION	
	Slightly silty SAND	

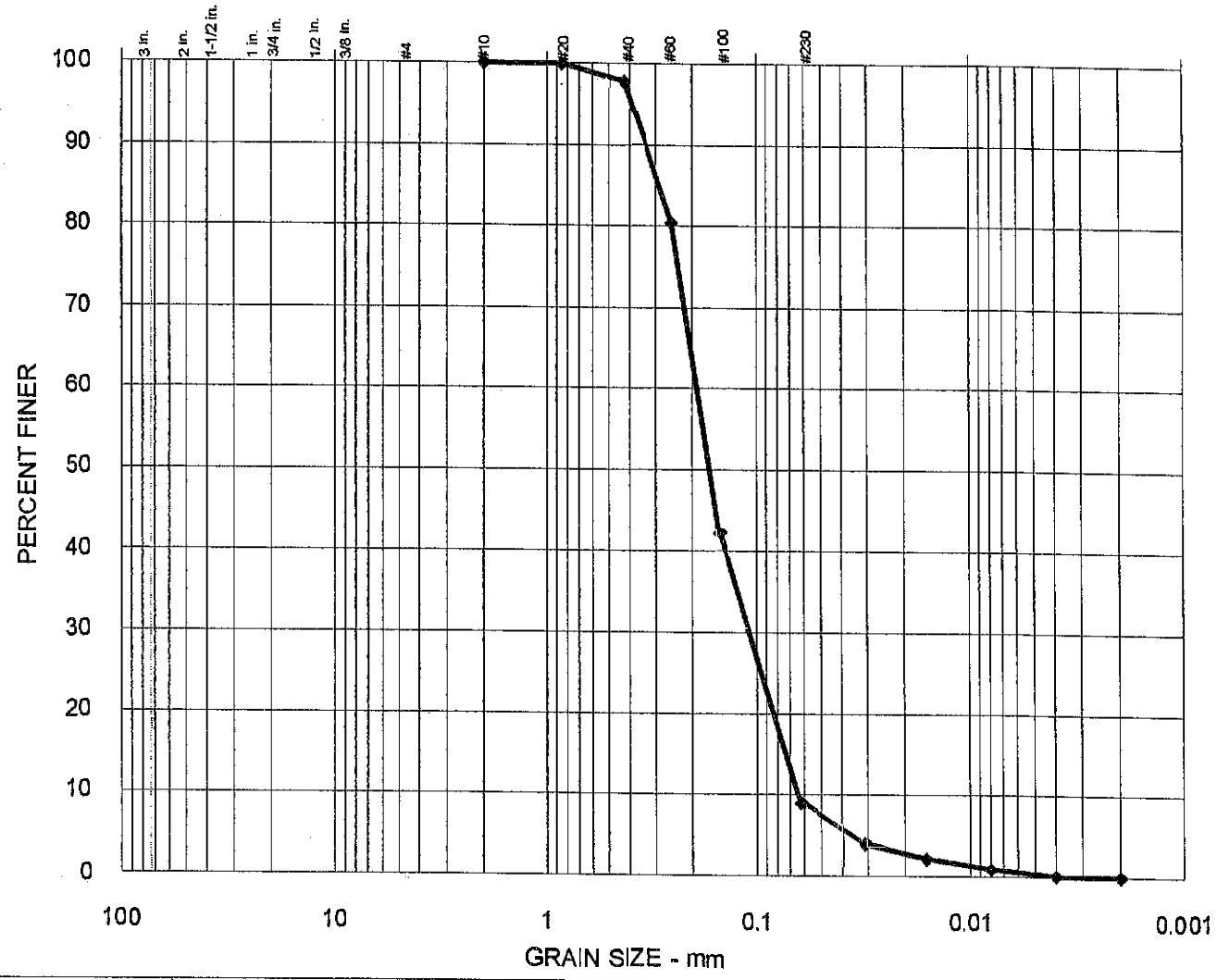
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 36

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	91%	9%	0%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18-S3T1	6.3' - 8.0'	Sediment		31.66%

	MATERIAL DESCRIPTION	
	Slightly silty SAND	

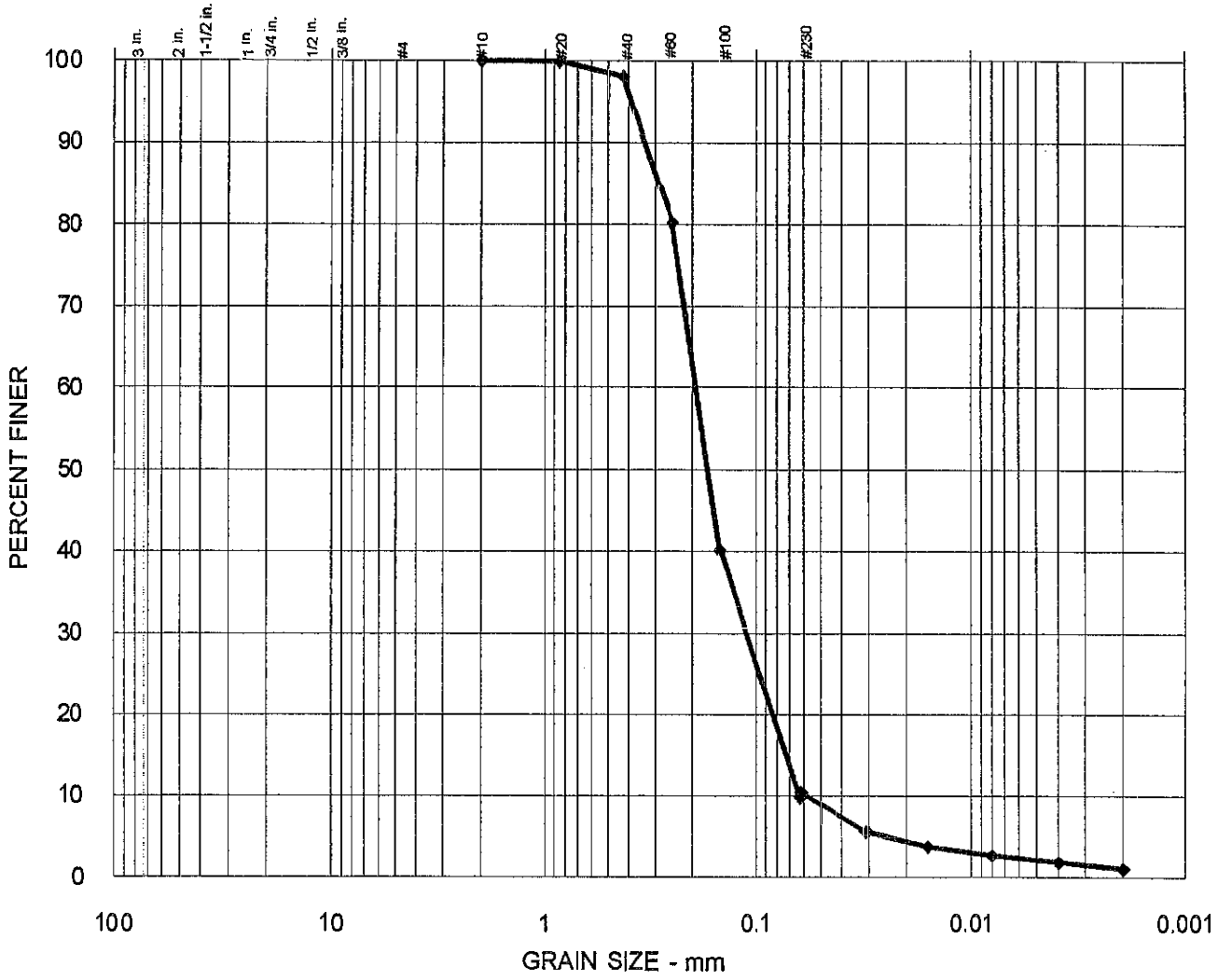
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 37

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	90%	8%	2%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18-S3T2	6.3' - 8.0'	Sediment		31.66%

	MATERIAL DESCRIPTION	
	Slightly silty SAND	

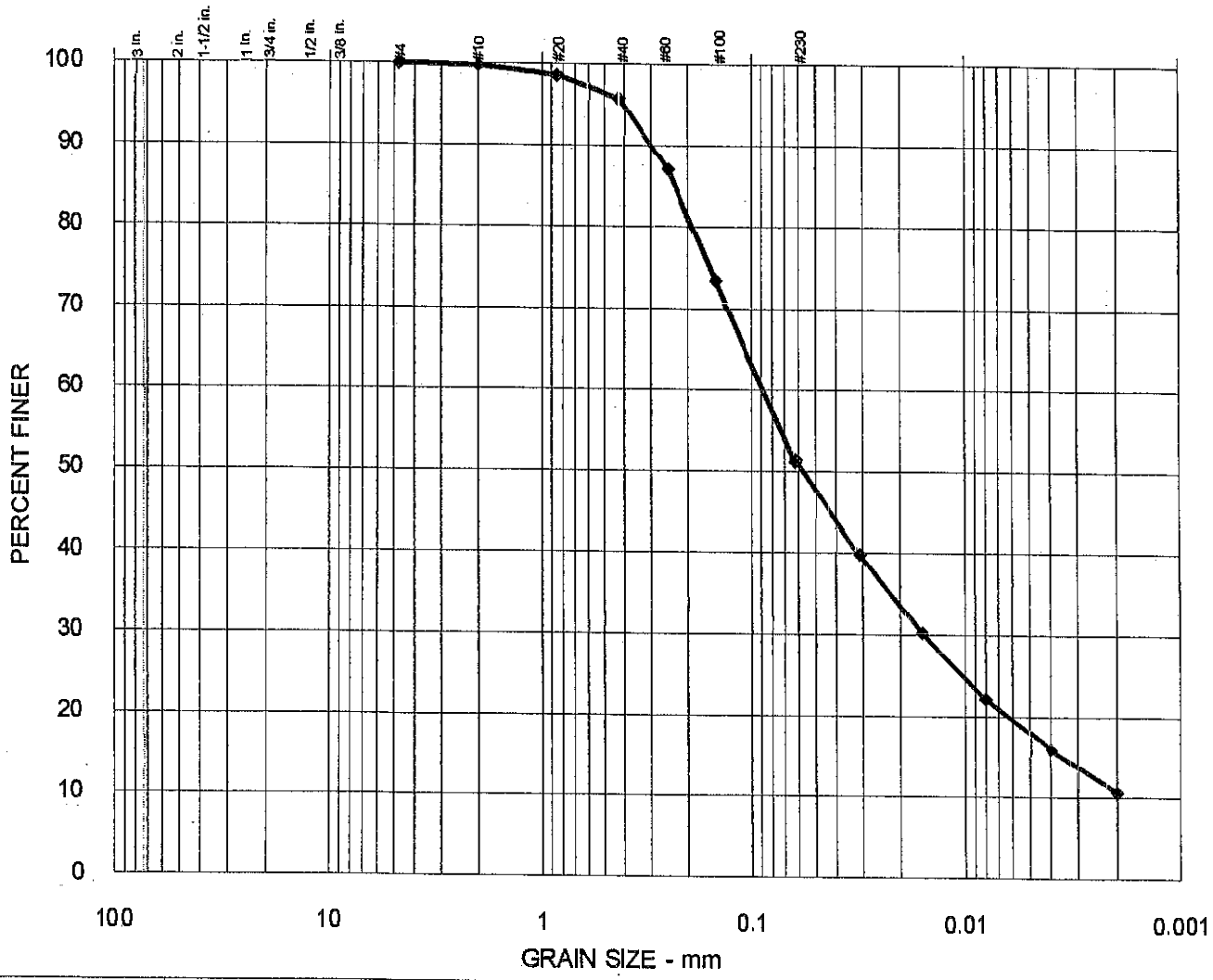
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 38

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	49%	35%	16%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-18B	0 - 10 cm	Sediment		82.39%

	MATERIAL DESCRIPTION	
	Clayey, very sandy SILT	

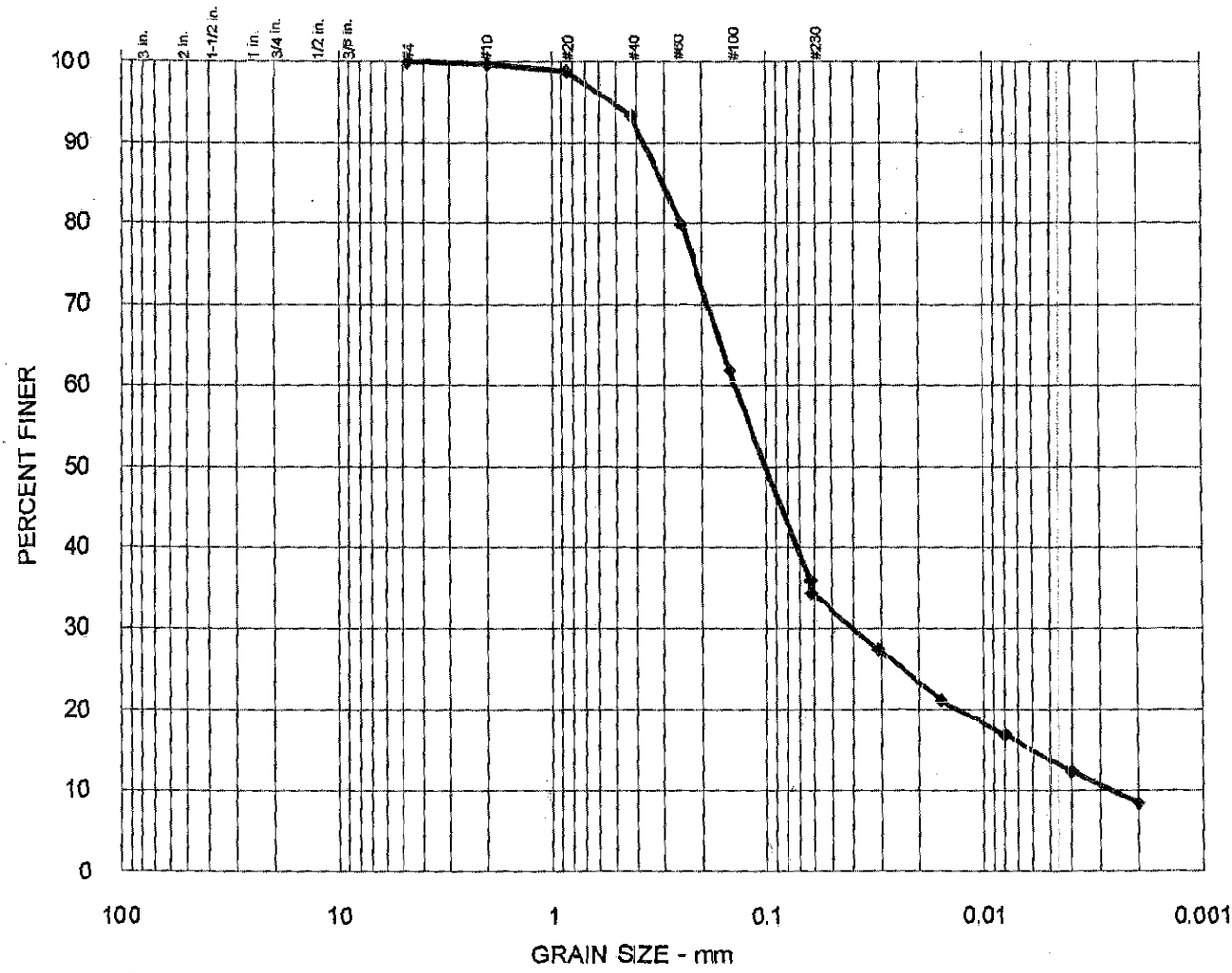
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 39

PIPET ANALYSIS TEST REPORT



% +75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	64%	24%	12%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-27	0 - 10 cm	Sediment		60.50%

	MATERIAL DESCRIPTION	
	Clayey, silty SAND	

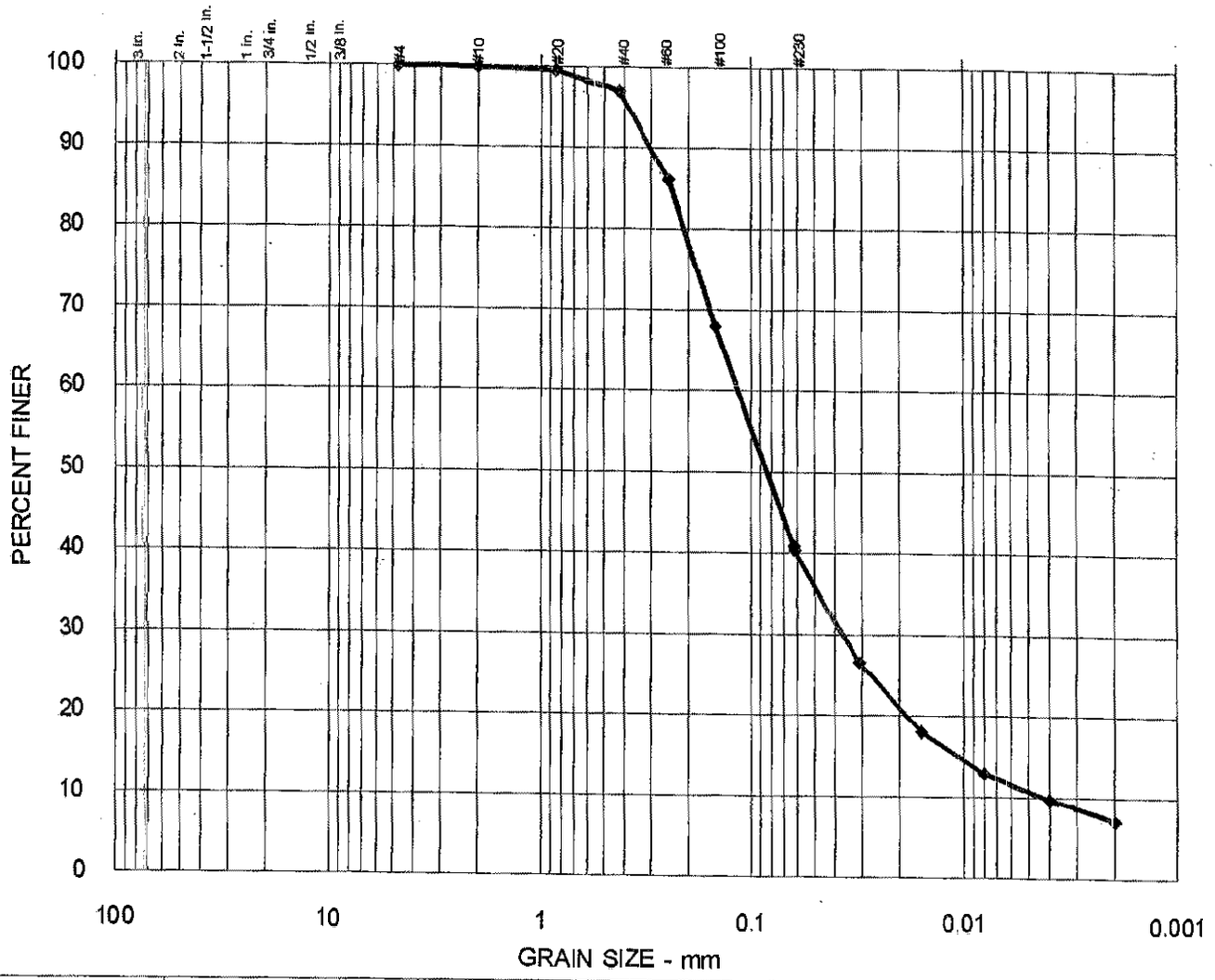
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 40

PIPET ANALYSIS TEST REPORT



%+75mm	%GRAVEL	%SAND	%SILT	%CLAY
	0%	59%	31%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-27-S1	0.0' - 2.3'	Sediment		34.28%

	MATERIAL DESCRIPTION	
	Slightly clayey, very silty SAND	

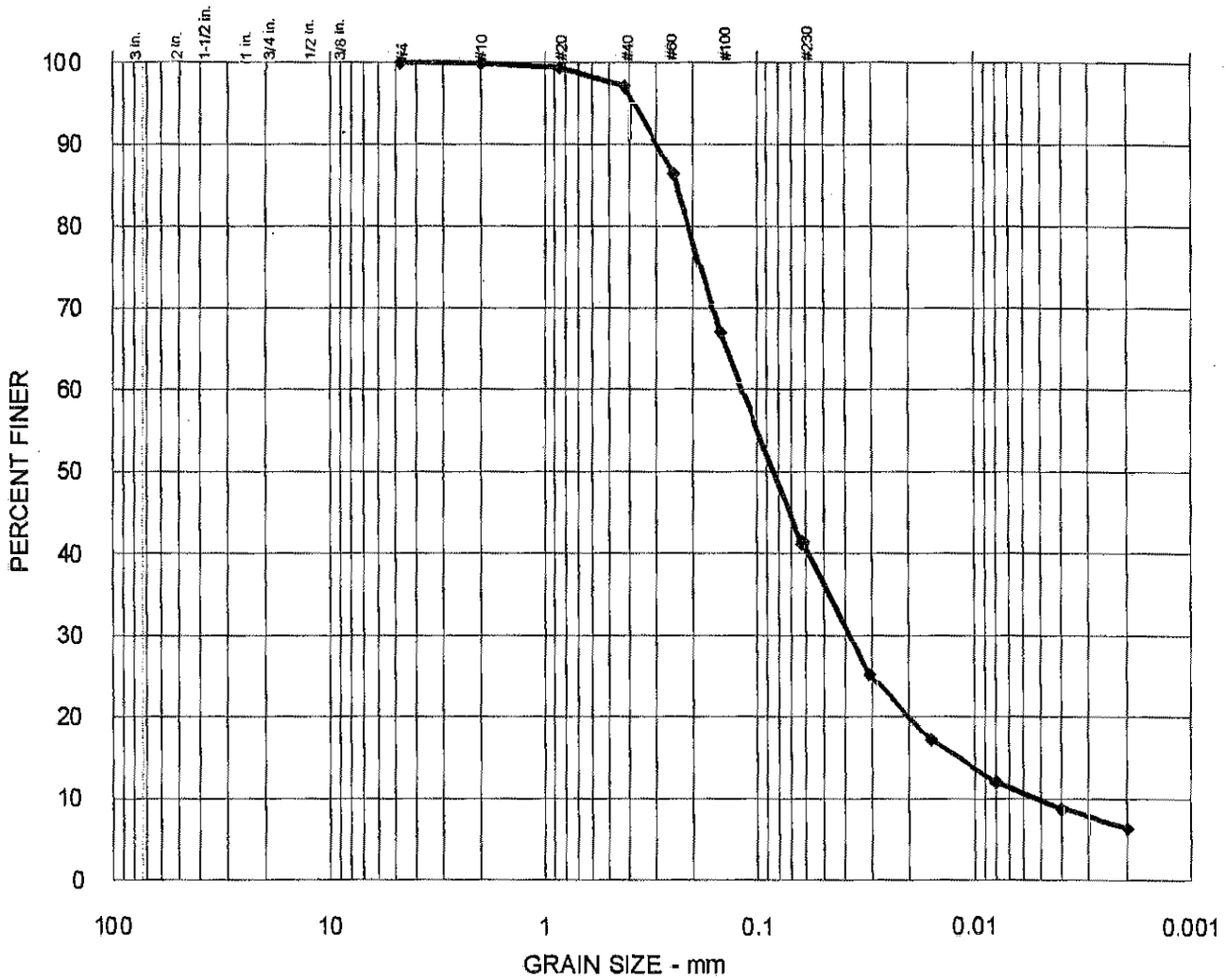
Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 41

PIPET ANALYSIS TEST REPORT



%+75mm	% GRAVEL	%SAND	% SILT	%CLAY
	0%	59%	32%	9%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-27-S1T1	0.0' - 2.3'	Sediment		34.28%

	MATERIAL DESCRIPTION	
	Slightly clayey, very silty SAND	

Remarks:

Project: Harbor Island Sediments

HARTCROWSER

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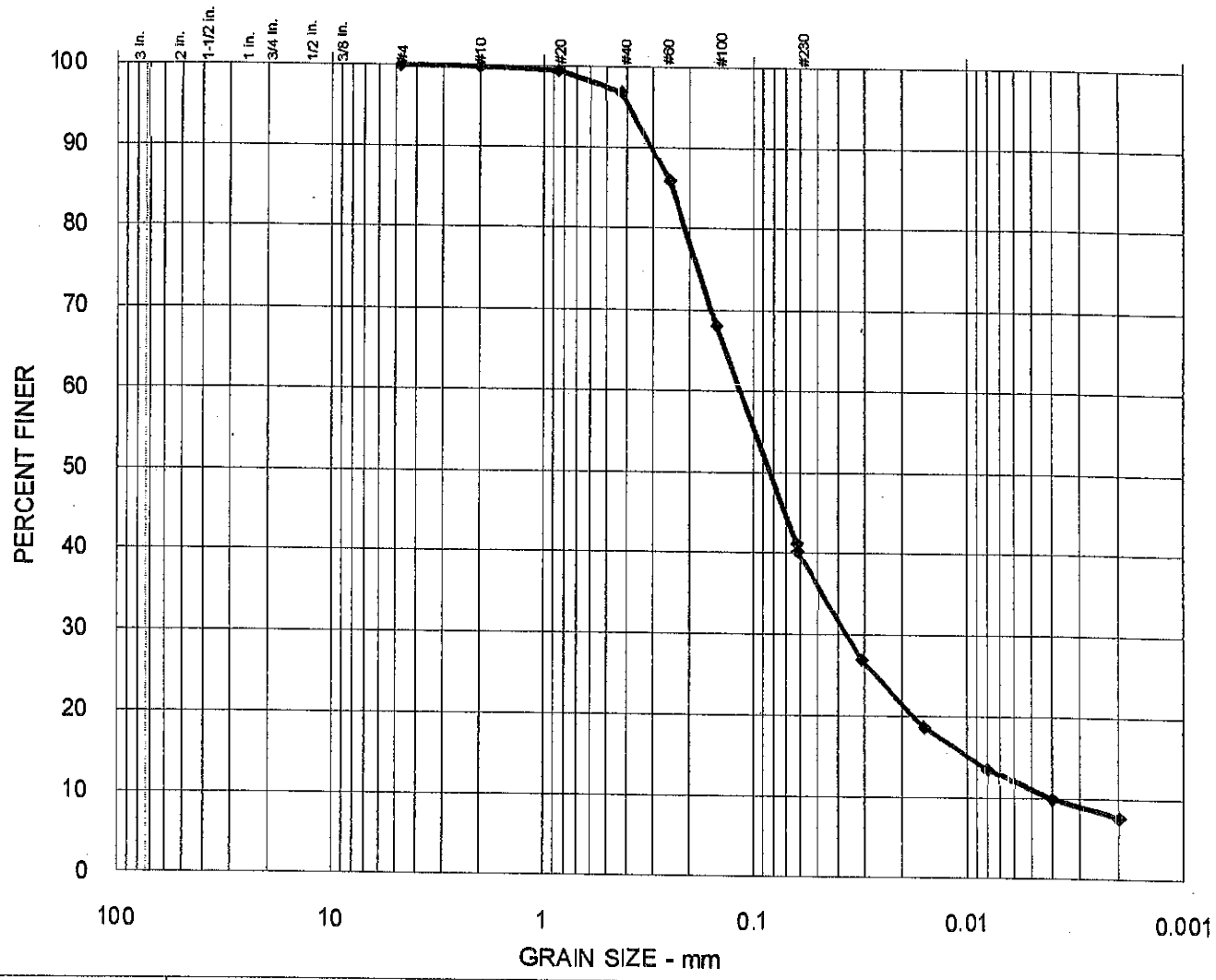
Figure 42

PIPET ANALYSIS TEST REPORT



% +75mm	% GRAVEL	%SAND	%SILT	%CLAY
	0%	59%	31%	10%

Sample Number:	Sample Depth:	Sample Matrix:		Natural Moisture:
HI-WW-27-S1T2	0.0' - 2.3'	Sediment		34.28%

	MATERIAL DESCRIPTION	
	Slightly clayey, very silty SAND	

Remarks:

Project: Harbor Island Sediments

HARTCROWSER

J-4249-03
Figure 43