CATALOG DOCUMENTATION
EMAP-ESTUARIES PROGRAM LEVEL DATABASE
1991 VIRGINIAN PROVINCE
SEDIMENT GRAIN COMPOSITION DATA

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1. DATA SET IDENTIFICATION

1.1 Title of Catalog document

EMAP-Estuaries Program Level Database
1991 Virginian Province
Sediment Grain Composition Data by Station

1.2 Authors of the Catalog entry

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1.3 Catalog revision date

25 March 1996

1.4 Data set name

SEDGRAIN

1.5 Task Group

Estuaries

1.6 Data set identification code

00034

1.7 Version

001

1.8 Requested Acknowledgment

These data were produced as part of the U.S. EPA's Environmental Monitoring and Assessment Program (EMAP). If you plan to publish these data in any way, EPA requires a standard statement for work it has supported:

"Although the data described in this article has been funded wholly or in part by the U. S. Environmental Protection Agency through its EMAP-Estuaries Program, it has not been subjected to Agency review, and therefore does not necessarily reflect the views of the Agency and no official endorsement should be inferred."

2. INVESTIGATOR INFORMATION

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2.3 Principal Investigator-Sample Processing

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3. DATA SET ABSTRACT

3.1 Abstract of the Data Set

The Sediment Grain Size data set presents the results of grain composition analyses. These analyses were conducted on a surface sediment sample collected at a station in a Province.

Sediment grain size analyses were conducted on a sample extracted from a sediment homogenate. The sample was derived from sediment which was scraped from the top 2 cm of several grabs and homogenized. The homogenate was divided into samples for sediment chemistry analysis, a sediment toxicity test and full sediment grain size analysis. The grain size analyses included only measurements of per cent sand and per cent silt/clay.

3.2 Keywords for the Data Set

Grain analyses, sand, silt/clay, grain size

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

The Environmental Monitoring and Assessment Program (EMAP) was designed to periodically estimate the status and trends of the Nation's ecological resources on a regional basis. EMAP provides a strategy to identify and bound the extent, magnitude and location of environmental degradation and improvement on a regional scale based on station sites randomly located in estuaries. Only BASE Sampling Sites were included in this data set.

4.2 Data Set Objective

The objective of the sediment grain data set is to characterize the grain size distribution of sediment collected from estuaries in the Virginian Province. These samples represent only the top two cm of sediment, i.e., the recently deposited sediment analyzed for chemical contaminants and toxicity.

4.3 Background Discussion

The concentration of contaminants in sediments is dependent upon interactions between natural (e.g., physical sediment characteristics) and anthropogenic factors (e.g., type and volume of contaminant loadings). Sediment composition determinations were made to supplement contaminant analyses.

4.4 Summary of Data Set Parameters

Grain composition parameters were measured from a surface sediment homogenate collected at a station.

5.0 DATA ACQUISITION AND PROCESSING METHODS

5.1 Data Acquisition

5.1.1 Sampling Objective

Collect sediment samples suitable for the analysis of sediment constituents. One (1) sediment sample was expected to be collected at each station.

5.1.2 Sample Collection Methods Summary

The grab sampler was lowered through the water column. The grab penetrated the sediment by gravity releasing a trigger which kept the jaws of the grab open. When the grab was pulled from the sediment using the winch, the jaws closed, encapsulating the sediment sample.

Large, non-living surface items in the grab such as rocks or pieces or wood were removed from the sediment. The top two centimeters of the sediment were removed using a spoon (all items were washed with Alconox and rinsed with ambient seawater before use). The sediment was placed in a pan or pot and placed in a cooler on ice for refrigerated storage.

The procedure was repeated with each sediment grab collected until at least 3,000 cc of sediment had been collected. The sediment composite was then homogenized by stirring with a Teflon paddle for 10 minutes. A Whirl-Pak was filled with approximately 100 cc of sediment homogenate and the sample was stored on ice.

5.1.3 Sampling Start Date

22 July 1991

5.1.4 Sampling End Date

13 September 1991

5.1.5 Platform

Sampling was conducted from 8 m (24 ft), twin-engine Chesapeake style work boats.

5.1.6 Sampling Equipment

A 1/25 m2, stainless steel (coated with Kynar), Young-modified Van Veen Grab sampler was used to collect sediments. This grab sampled an area of 440 cm2 and a maximum depth of penetration in the sediment of 10 cm.

5.1.7 Manufacturer of Instrument

Young's Welding, Sandwich, MA

5.1.8 Key Variables

NA

5.1.9 Collection Method Calibration

The sampling gear does not require any calibration. It required inspection for deformities incurred due to mishandling or impact on rocky substrates.

5.1.10 Collection Quality Control

A successful grab had relatively level, intact sediment over the entire area of the grab and a sediment depth of 7-10 centimeters. Unacceptable grabs included those: containing no sediments, which were partially filled or had shelly substrates or grossly slumped surfaces. Grabs completely filled to the top, where the sediment was in direct contact with the hinged top, were also unacceptable.

Field technicians were trained to follow Standard Operating Procedures to insure the collection of representative, uncontaminated and high quality samples. Examples of QA/QC measures taken in the field to avoid or reduce contamination and insure the collection of representative samples include the following: use of Teflon implements or implements made of stainless steel coated with Kynar for mixing and transferring sediments, thorough cleaning and rinsing of the grab sampler and implements between samples, use of pre-cleaned sample containers for sediment storage, assuring that engines were off when the sample was exposed to air and immediate storage of samples on ice following collection.

The chance of sampling the exact same location twice was minimized. After three (3) grabs were taken, the boat was moved five (5) meters downstream by letting out the appropriate length of anchor line.

5.1.11 Sample Collection Method Reference

Strobel, C.J. and S.C. Schimmel. 1991. Environmental Monitoring and Assessment Program-Near Coastal Component: 1991 Virginian Province Effort Field Operations and Safety Manual. U.S. EPA, Office of Research and Development, NHEERL-AED, Narragansett, RI. June 1991.

5.2 Data Preparation and Sample Processing

5.2.1 Sample Processing Objective

Process uncontaminated sediment samples to characterize the grain composition of the sediment chemistry samples.

5.2.2 Sample Processing Methods Summary

SAND AND SILT/CLAY

The sediment sample was homogenized before a sub-sample was removed for analysis. For sandy sediments (anticipated sand content of approximately 25% or more by weight), about 50 g wet weight was removed and placed in a beaker. For muddy sediments (anticipated sand content of less than approximately 25%), about 20 g wet weight was removed and placed in a beaker. 5 mL of sodium hexametaphosphate (6.2 g/L) and 50 mL of distilled water were added to the sample and stirred on a magnetic stirrer for 1-5 minutes. The suspension was then sieved through a 63 um sieve.

The <63 um portion of the sample was transferred to a 1 L graduated cylinder and brought up to 1 L with distilled water. The cylinder was shaken to create an even suspension, then 40 mL were immediately removed and placed in a tared evaporating dish. This sub-sample was dried at 100 degrees Centigrade and weighed. The >63 um portion of the sample was transferred from the sieve to a tared evaporating dish, dried at 100 degrees Centigrade, and weighed.

TOTAL ORGANIC CARBON

The concentration of total organic carbon in each sediment sample was determined by ultraviolet light-promoted persulfate oxidation.

5.2.3 Sampling Processing Method Calibration

NA

5.2.4 Sampling Processing Quality Control

Quality control of sediment grain size analyses is accomplished by strict adherence to protocol and documentation of quality control checks.

Several procedures are critical to the collection of high quality particle size data. Most important to the dry sieve analysis is that the screens are clean before conducting the analysis, and that all of the sample is retrieved from them. To clean a screen, it should be inverted and tapped on a table, while making sure that the rim hits the

table evenly. Further cleaning of brass screens may be performed by gentle scrubbing with a stiff bristle nylon brush. Stainless steel screens may be cleaned with a nylon or brass brush.

The most critical aspect of the pipet analysis is knowledge of the temperature of the silt-clay suspension. An increase of only 1 Degree C will increase the settling velocity of a particle 50 um in diameter by 2.3 percent. It is generally recommended that the pipet analysis be conducted at a constant temperature of 20 Degrees C. However, Plumb (1981) provides a table to correct for settling velocities at other temperatures; this table is included in the EMAP-E Laboratory Methods Manual (U.S. EPA, 1995). Thorough mixing of the silt-clay suspension at the beginning of the analysis is also critical. A perforated, plexiglass disc plunger is very effective for this purpose. If the mass of sediment used for pipet analysis exceeds 25 g, a subsample should be taken as described by Plumb (1981). Silt-clay samples in excess of 25 g may give erroneous results because of electrostatic interactions between the particles. Silt-clay samples less than 5 g yield a large experimental error in weighing relative to the total sample weight.

The analytical balance, drying oven, sieve shaker, and temperature bath used in the analysis should be calibrated at least monthly.

5.2.5 Sample Processing Method Reference

U.S. EPA. 1995. Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analyses. U.S. Environmental Protection Agency, Office of Research and Development, Narragansett, RI. EPA/620/R-95/008.

5.2.6 Sample Processing Method Deviations

None

6. DATA ANALYSIS AND MANIPULATIONS

6.1 Name of New or Modified Values

% SILTCLAY
% SAND

6.2 Data Manipulation Description

6 .2.1 The silt-clay weight calculation used the < 63 um fraction:

6.2.2 The sand weight calculation used the > 63 um fraction:

6.3 Data Manipulation Examples

6.3.1 SILTCLAY

a. Silt-clay weight = (gross wt. - tare wt.)*(total volume in cylinder)/ (sample volume from cylinder)

b. The percent silt-clay calculation is as follows:

% silt-clay =
silt-clay wt/(sand wt + silt-clay wt) * 100

6.3.2 SAND

Sand weight =gross wt.(sample+pan) - tare wt.(pan)

7. DATA DESCRIPTION

7.1 Description of Parameters

#	Parameter SAS Name	Data Type	Len	Format	Parameter Label
1	STA_NAME	Char	8	8.	The Station Identifier
2	VST_DATE	Num	8	YYMMDD6.	The Date the Sample was Collected
3	SAND_PC	Num	8	5.1	Sand (%) in Sample
4	SICL_PC	Num	8	5.1	Silt/Clay (%) in Sample
5	SICL_PC	Num	8	5.1	Silt/Clay (%) in Sample
6	CLAY_PC	Num	8	5.1	Clay (%) in Sample
7	Q1_PHI	Num	8	5.1	25 % Quartile Diameter (Phi)
8	Q3_PHI	Num	8	5.1	75 % Quartile Diameter (Phi)
9	QUARDVTN	Num	8	5.1	Phi Quartile Deviation (Folk 1974)
10	SKEWNESS	Num	8	5.1	Phi Quartile Skewness (Folk 1974)
11	MED_DIAM	Num	8	5.1	50 % Quartile Diameter (Phi)

7.1.6 precision to which values are reported

Values are reported to one decimal point.

7.1.7 Minimum Value in Data Set

SAND_PC 0.2
SICL_PC 0.8

7.1.8 Maximum Value in Data Set

SAND_PC 99.2
SICL_PC 99.8

7.2 Data Record Example

7.2.1 Column Names for Example Records

STA_NAME VST_DATE SAND_PC SILT_PC SICL_PC CLAY_PC Q1_PHI Q3_PHI QUARDVTN SKEWNESS MED_DIAM

7.2.2 Example Data Records

OBS	STA_NAME	VST_DATE	SAND_PC	SILT_PC	SICL_PC	CLAY_PC	Q1_PHI	Q3_PHI	QUARDVTN	SKEWNESS	MED_DIAM
1	VA91-261	910803	97.1	.	2.9	.	.	.	.	.	.
2	VA91-262	910815	95.0	.	5.0	.	.	.	.	.	.
3	VA91-263	910803	26.0	.	74.0	.	.	.	.	.	.

7.2.2 Example Data Records, continued

OBS	STA_NAME	VST_DATE	SAND_PC	SILT_PC	SICL_PC	CLAY_PC	Q1_PHI	Q3_PHI	QUARDVTN	SKEWNESS	MED_DIAM
4	VA91-265	910815	49.2	.	50.8	.	.	.	.	.	.
5	VA91-266	910817	60.1	.	39.9	.	.	.	.	.	.
6	VA91-269	910804	5.7	.	94.3	.	.	.	.	.	.

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude

-77 Degrees 18 Minutes 58.80 Decimal Seconds

8.2 Maximum Longitude

-70 Degrees 01 Minutes 00.00 Decimal Seconds

8.3 Minimum Latitude

36 Degrees 56 Minutes 24.60 Decimal Seconds

8.4 Maximum Latitude

42 Degrees 08 Minutes 00.00 Decimal Seconds

8.5 Name of area or region

Virginian Province

Stations were located in estuaries along the East Coast of the United States from Cape Cod, Massachusetts, to Cape Henry, Virginia, at the mouth of the Chesapeake Bay. The area includes the District of Columbia and the States of Virginia, Maryland, New Jersey, Delaware, Pennsylvania, New York, Connecticut, Rhode Island and Massachusetts.

9. QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Measurement Quality Objectives

The maximum allowable precision goal for sediment grain composition analysis was 10%. The completeness goal for these data was 90%.

9.2 Data Quality Assurance Procedures

9.2.1 Sediment Composition Analyses

Quality control for the sediment analysis procedures was accomplished by reanalyzing samples that failed either a range check or recovery check. For the range check, any sample results that fell outside expected ranges were reanalyzed. For example, any percentage that totaled greater than 100% was reanalyzed. For the recovery check, if the total weight of the

recovered sample was 10% (by weight) less or greater than the starting weight of the sample, the sample was reanalyzed.

Quality assessment included reanalysis of randomly selected archived samples in the following manner:

1. Approximately 10% of each batch completed by the same technician was reanalyzed.

2. A random selection of the samples was processed in the same manner as the original sample batch.

3. If the absolute difference between the original silt-clay percentage and the second silt-clay percentage was greater than 10% then a third analysis was completed by a different technician. In addition, all of the other samples in the same batch should have been re-analyzed, and the laboratory protocol and/or technician's practices should have been reviewed and corrected to bring the measurement error under control.

4. The values closest to the third value were entered into the data base.

5. If more than 10% of the data from a batch were found in error, the whole batch was reprocessed using the archived sediment. A third check of the reanalyzed samples was completed by a different technician to assure that the reanalyzed values were correct.

6. Reanalysis and QA checks were accomplished within 30 days of the date of the original sediment analysis.

   The analytical balance (accurate to 0.1 mg) and drying oven used in the analysis should have been calibrated at least monthly.

9.2.2 Total Organic Carbon analyses

All QC results for the analysis of total organic carbon in the 1991 sediment samples fell within required control limits. The Certified Reference Material PACS-1 (issued by the National Research Council of Canada) was utilized as the Laboratory Control Material. The certified concentration of total carbon in this reference material is 3.69% (percent dry weight). The average percent recovery achieved by the laboratory for n = 11 batches of TOC samples (i.e., 11 separate analyses of CRM PACS-1) was 94.1%, with all values falling within the range 88% to 99%. Since the PACS-1 certified concentration includes both organic carbon and a very small fraction of inorganic carbon, the laboratory's percent recovery values for organic carbon are expected to be below 100%.

Based on the good overall percent recovery of organic carbon in the Certified Reference Material, the 1991 sediment TOC data were deemed acceptable for use without qualification.

9.3 Actual Measurement Quality

All "sediment grain size" and at least one "benthic grain size" sample per station were analyzed for the determination of percent silt/clay. Approximately 10% of these analyses were performed in duplicate and the difference determined as per the EMAP-VP 1991 QA Project Plan. The maximum allowable percent difference for the predominant fraction

(silt/clay or sand) is 10%. The mean difference for the samples analyzed was less than 1%, with none exceeding 10%, so no remedial action or retesting was required.

10. DATA ACCESS

10.1 Data Access Procedures

Data can be downloaded from the WWW server.

10.2 Data Access Restrictions

10.3 Data Access Contact Persons

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10.4 Data Set Format

Data can be downloaded in several formats from the web application and web site.

10.5 Information Concerning Anonymous FTP

Not accessible

10.6 Information Concerning WWW

Data can be downloaded from the WWW server.

10.7 EMAP CD-ROM Containing the Data Set

Data not available on CD-ROM.

11. REFERENCES

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U.S. EPA. 1995. Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analyses. U.S. Environmental Protection Agency, Office of Research and Development, Narragansett, RI. EPA/620/R-95/008.

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12. TABLE OF ACRONYMS

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