CATALOG DOCUMENTATION
NATIONAL COASTAL ASSESSMENT- NORTHEAST DATABASE
YEAR 2002 STATIONS
SEDIMENT CHEMISTRY DATA: “SEDCHEM”

TABLE OF CONTENTS

1. DATASET IDENTIFICATION

1.1 Title of Catalog document

National Coastal Assessment-Northeast Region Database
Year 2002 Stations
SEDIMENT CHEMISTRY DATA

1.2 Authors of the Catalog entry

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1.3 Catalog revision date

August 2007

1.4 Dataset name

SEDCHEM

1.5 Task Group

National Coastal Assessment-Northeast

1.6 Dataset identification code

007

1.7 Version

001

1.8 Requested Acknowledgment

EMAP requests that all individuals who download EMAP data acknowledge the source of these data in any reports, papers, or presentations. If you publish these data, please include a statement similar to: "Some or all of the data described in this article were produced by the U. S. Environmental Protection Agency through its Environmental Monitoring and Assessment Program (EMAP)”.

2. INVESTIGATOR INFORMATION (for full addresses see Section 13)

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2.3 Sample Processing Investigators

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3. DATASET ABSTRACT

3.1 Abstract of the Dataset

The SEDCHEM data file reports the concentrations of chemical contaminants in sediment samples collected in Northeast estuaries sampled during the summer of 2002. Sediment samples were analyzed for 86 chemical constituents, including metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and pesticides. One record is presented per analyte. For concentration values smaller than the MDL (non-detects), the result is reported as zero, the method detection limit (MDL) is listed, and the record is flagged; thereby giving the data user options for alternative treatment of non-detects (see Section 4.3). Note that consistent methods were not followed by all analytical laboratories in two respects: (1) in the digestion method used to analyze metals, and (2) in the MDL values used for most chemical analyses (see Section 5.2.6).

3.2 Keywords for the Dataset

Sediment contaminants, metals, polynuclear aromatic hydrocarbons, PAH, polychlorinated biphenyls, PCB, pesticides, DDT.

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

The National Coastal Assessment (NCA) is a national monitoring and assessment program with the primary goal of providing a consistent evaluation of the estuarine condition in U.S. estuaries. It is an initiative of the Environmental Monitoring and Assessment Program (EMAP), and is a partnership of several federal and state environmental agencies, including: EPA's Regions, Office of Research and Development, and Office of Water; state environmental protection agencies in the 24 marine coastal states and Puerto Rico; and the United States Geological Survey (USGS) and the National Oceanic and Atmospheric Agency (NOAA). The NCA program was initiated in 2000, and known as the Coastal 2000 Program.

Stations were randomly selected using EMAP's probabilistic sampling framework and were sampled once during a summer index period (June to October). A consistent suite of indicators was used to measure conditions in the water, sediment, and in benthic and fish communities. The measured data may be used by the states to meet their reporting requirements under the Clean Water Act, Section 305(b). The data will also be used to generate a series of national reports characterizing the condition of the Nation’s estuaries.

4.2 Dataset Objective

The objective of the sediment chemistry data file is to report the concentrations of chemical contaminants in estuarine sediment samples collected in the northeast NCA program in 2002.

4.3 Dataset Background Discussion

Refer to Section 4.4 for a list of dataset parameters. Additional information about selected parameters are discussed in this section.

The suite of analytes measured are very similar to the contaminants measured by EPA’s Environmental Monitoring and Assessment Program (EMAP) and NOAA’s National Status and Trends program. Four classes of analytes are measured: polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), organo-chlorine pesticides, and metals. Twenty-two PAHs are measured, consisting of the 16 priority pollutants defined by the Superfund program and several alkylated derivatives that prove to be useful in identifying sources of these compounds. The concentrations of 20 PCBs and 20 pesticides, all Superfund priority pollutants, are also measured. The NCA protocol calls for measuring total metal concentrations, which includes an aggressive HF/HNO3 digestion prior to analysis. As is discussed below, some samples received a less aggressive HNO3 digestion. Sediment grain-size and Total Organic Carbon (TOC) measurements made on the same sediments are reported in the SEDGRAIN file.

Routinely, the concentration values from clean sites were reported as smaller than the method detection limit (MDL). In this file, these ‘non-detects’ are reported as zero and the QACODE is set to “CHM-A” to indicate the assignment. While the concentration of the analyte is clearly small, it is not strictly zero. The MDL is therefore listed as a guideline to users who wish to substitute values other than zero, i.e., setting the non-detect value to the MDL value, half the MDL value, etc. Furthermore, results of organic analytes may routinely show non-zero values that are less than the MDL. This apparent inconsistency is possible because, by convention, the MDLs for organic analyses are calculated to indicate the threshold of reliable measurements, rather than the stricter limit of instrumental detection. In these cases, the best estimate of the concentration is reported (i.e., the value reported by the analytical laboratory), the QACODE is set to “CHM-B”, and the MDL is listed. The user can be confident that the analyte is present, but there is a high degree of uncertainty in the reported concentration. Note that the value of the MDL depends on the dilution history of the sample; therefore, its magnitude can differ widely among samples. Most results in this file are larger than the MDL and are reported directly without MDL values or QACODEs. Finally, records flagged with “CHM-C” indicate that the concentration value is uncertain because an interference was noted in the blank analysis performed with the sample; caution is advised in interpreting these results. To summarize:

QACODE	INTERPRETATION	CONC reported	MDL reported
<none>	result is detectable and > MDL	as measured	<none>
CHM-A	result is ≤ MDL and undetectable	zero	MDL is listed

CHM-B	result is ≤ MDL but detectable	best estimate	MDL is listed
CHM-C	result may be affected by interference	best estimate	<none>

Several analytical labs were involved in analyzing sediment analytes in 2002: two state labs for sediment samples collected by co-operative teams in Connecticut and New York (designated by LABCODE = NY and CT) and two national contract lab for samples collected in other northeastern states (LABCODE = NAT_ERI and NAT_GPL).

NCA planners provide two alternate locations for a station location in the event that the original location cannot be sampled. The parameter STA_ALT indicates whether the station location was the original site, first alternate, or second alternate—STA_ALT = "A", "B", or "C", respectively. Also refer to discussion in the STATIONS metadata file regarding use of this parameter during analysis of the data.

Massachusetts did not participate in the NCA program in 2002. Rhode Island conducted fish trawls only in 2002, and collected physical water parameters in conjunction with the trawls. Connecticut collected all parameters, but at an abbreviated group of in-shore stations (stations in the Long Island Sound intended for sampling in 2002 were sampled in 2003).

4.4 Summary of Dataset Parameters

* denotes parameters that should be used as key fields when merging data files

*STATION	Station name
*STAT_ALT	Alternate Site Code (A, B, C)
*EVNTDATE	Event date
*ANALYTE	Name of analyte measured. A list of the ANALYTE codes and their full chemical names is presented in the file ANALYTES; also see Section 7.1.3.
CONC	Concentration of analyte. Results fall into one of three categories: 1) the analyte concentration was large and reliably reported; 2) the analyte concentration was less than the method detection limit, but the best estimate of the concentration is reported; and 3) and the analyte was not detected and is reported as zero. See Section 4.3 for further discussion.
CHMUNITS	Concentration units used to report results, reported as the mass of analyte per dry mass of sediment: Metals ug/g (ppm) PAHs, PCBs, Pesticides ng/g (ppb)
MDL	Method Detection Limit; reported only when measured concentration is < MDL (see Section 4.3)
QACODE	QA/QC codes: <blank> CONC > MDL; concentration value is reliable CHM-A CONC is undetectable; value set to zero (user may wish to substitute another value) CHM-B CONC ≤ MDL, but is detectable; best estimate reported CHM-C failed QA criteria: an interference was noted in the blank analysis performed with the sample; caution is advised in interpreting the result See Section 4.3 for further discussion.
LABCODE	Code identifying laboratory responsible for performing chemical analyses

CT	State laboratory for CT samples
NY	State laboratory for NY samples
NAT_ERI	National contract lab (ERI)
NAT_GPL	National contract lab (GPL)

ANALTYPE Code identifying type of analysis

PEST	Pesticides
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
METALS	Metals

5.0 DATA ACQUISITION AND PROCESSING METHODS

5.1 Data Acquisition / Field Sampling

The sample collection methods used by USEPA trained field crews will be described here. Any significant variations by NCA partners are noted in Section 5.1.12. Details regarding NCA partners are reported in the STATIONS data file.

5.1.1 Sampling Objective

Sediment sub-samples were collected for the analysis of metallic and organic chemical constituents. Separate sub-samples from the same grab were used for sediment grain-size analyses and toxicity testing. Additional sediment grabs were taken for benthic macrofaunal analysis.

5.1.2 Sample Collection: Methods Summary

Sediment was collected with a 0.04-m^2 Young-modified Van-Veen grab or similar sampler. Only the top two centimeters of a grab were retained for physical, chemical, and toxicological analyses. A sufficient number of grabs were processed to provide three liters of the 2-cm composite material. The composite was homogenized and separated into two fractions for storage until analysis. One fraction was frozen and used in the measurement of total organic carbon (TOC) and concentrations of chemical contaminants. The second fraction was chilled but not frozen during storage, and was used for grain-size and toxicity analyses. Separate sediment grabs were taken for benthic macrofaunal analysis.

5.1.3 Beginning Sampling Dates

25 June 2002

5.1.4 Ending Sampling Dates

31 October 2002

5.1.5 Sampling Platform

Samples were collected from gasoline or diesel powered boats, 18 to 133 feet in length.

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.

5.1.7 Manufacturer of Sampling Equipment

Young's Welding, Sandwich, MA

5.1.8 Key Variables

Not applicable

5.1.9 Sample Collection: Methods Calibration

The sampling gear does not require calibration, although it was inspected regularly for damage by mishandling or impact on rocky substrates.

5.1.10 Sample Collection: Quality Control

Care was taken to minimize disturbance to the sediment grabs. Grabs that were incomplete, slumped, less than 7 cm in depth, or comprised chiefly of shelly substrates were discarded. The chance of sampling the same location was minimized by repositioning the boat five meters downstream after three sampling attempts.

5.1.11 Sample Collection: References

Strobel, C.J. 2000. Environmental Monitoring and Assessment Program: Coastal 2000 - Northeast component: field operations manual. Narragansett (RI): U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division. Report nr EPA/620/R-00/002. 68 p.

5.1.12 Sample Collection: Alternate Methods

Different grab samplers used by NCA partners include the Smith-MacIntyre and Ponar grab samplers.

5.2 Data Preparation and Sample Processing

5.2.1 Sample Processing Objective

Sediment samples were analyzed for total metals, PAHs, PCBs and pesticides.

5.2.2 Sample Processing: Methods Summary

All analyses were performed on samples that were stored frozen. Sediments analyzed for total metals were dried and completely digested in nitric/hydrofluoric acids (acid persulfate for mercury). The analytical methods used to measure analyte concentrations were: cold vapor atomic analysis (AA) for mercury; graphite furnace AA for silver, arsenic, cadmium, lead, antimony, tin and thallium; hydride generation atomic fluorescence for selenium; and optical-emission ionically coupled plasma (ICP) for the remaining metals. For the organic analyses, sediments were extracted using the procedures of NOAA National Status and Trends Program (Lauenstein and Cantillo, 1993). The PAHs were analyzed by gas-chromatography / mass-spectrometry (GC/MS); pesticides and PCBs were analyzed by GC/ECD (electron capture detector).

5.2.3 Sample Processing: Calibration

The analytical instruments were calibrated by standard laboratory procedures including: constructing calibration curves, running blank and spiked quality control samples, and analyzing standard reference materials.

5.2.4 Sample Processing: Quality Control (QC)

Each batch of samples was accompanied by QC analyses consisting of method blanks, matrix spikes, matrix spike duplicates, and standard reference materials (SRMs). In total, approximately 5% of all analyses were QC analyses. Processing quality was considered acceptable if the following criteria were met: blanks were less than three times the minimum detection limit; accuracy, as determined by analysis of certified reference materials, was within 30% for organic analytes and within 15% for inorganic analytes; and precision, as determined by replicate analyses, was within 30% for organic analytes and within 15% for inorganic analytes. Additional specifications and guidelines are presented in U.S. EPA 2001.

5.2.5 Sample Processing: References

Lauenstein, G. G. and A. Y. Cantillo (eds.). 1993. Sampling and analytical methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Projects 1984-1992: Comprehensive descriptions of trace organic analytical methods, Volume IV NOAA Technical Memorandum NOS ORCA 71, Silver Spring, MD. 182 pp.

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U.S. EPA. 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, FL. EPA/620/R-01/002. 189 p

5.2.6 Sample Processing: Alternate Methods

Several analytical labs were involved in analyzing sediment analytes in 2002: two state labs for sediment samples collected by co-operative teams in Connecticut and New York (designated by LABCODE = NY and CT_ERI) and two national contract labs for samples collected in other northeastern states (LABCODE = NAT_ERI, NAT_GPL). In two respects, there are noticeable differences in results attributable to different methods used by the three labs. (1) There is a distinction in the number of "non-detects" (concentrations less than the method detection limit or MDL) evident among labs, probably arising from different MDL values used by the labs during analysis. (2) The labs used different procedures to digest sediment samples prior to metal analysis, affecting results for several metals.

6. DATA ANALYSIS AND MANIPULATIONS

6.1 Name of New or Modified Values

Not applicable

6.2 Data Manipulation Description

Concentrations of metallic analytes smaller than the method detection limit were reported as zero (see Section 4.3 for details).

7. DATA DESCRIPTION

7.1 Description of Parameters

7.1.1 Components of the Dataset

PARAMETER	TYPE	LENGTH	LABEL
ANALYTE	Char	8	Code for Analyte Measured
CONC	Num	8	Concentration of Analyte in Sample
CHMUNITS	Char	10	Unit of Measure
MDL	Num	8	Method Detection Limit
STATION	Char	9	Station Name
STAT_ALT	Char	1	Station Name
EVNTDATE	Num	8	Event Date
QACODE	Char	10	QA Code(s)
LABCODE	Char	10	Contract/Lab Identifier
ANALTYPE	Char	10	Code for type of analyisis

7.1.2 Precision of Reported Values

All values have been rounded to three significant digits.

7.1.3 Minimum and Maximum Value in Dataset (non-zero data)

* Comments indicate exceptions by analytical labs (LABCODE)
Blank entries in MIN and MAX columns indicate non-detects

ANALYTE ID	ANALYTE NAME	MIN	MAX	Comment*
Metals				
AG	Silver	0.016	6.7	
AL	Aluminum	70.8	51900	
AS	Arsenic	0.35	28.3	
CD	Cadmium	0.045	13.8	
CR	Chromium	0.53	419	
CU	Copper	0.56	258	
FE	Iron	7.03	52500	
HG	Mercury	0.01	5.3	
MN	Manganese	8.09	2430	
NI	Nickel	0.43	101	
PB	Lead	0.079	334	
SB	Antimony	0.17	20.6	
SE	Selenium	0.1	3.9	
SN	Tin	1.26	12800	except NY
ZN	Zinc	1.19	658	
Polynuclear aromatic hydrocarbons (PAHs)				
ACENTHE	Acenaphthene	0.006	320	
ACENTHY	Acenaphthlylene	0.005	490	
ANTHRA	Anthracene	0.004	1200	
BENANTH	Benz(a)anthracene	0.007	2900	

BENAPY	Benz(a)pyrene	0.005	2400	
BENEPY	Benz(e)pyrene	0.005	1070	CT only
BENZOBFL	Benzo(b)fluoranthene	0.007	3600	
BENZOKFL	Benzo(k)fluoranthene	0.006	1220	
BENZOP	Benzo(g,h,i)perylene	0.005	1600	
BIPHENYL	Biphenyl	0.005	80	
CHRYSENE	Chrysene	0.011	3000	
DIBENTP	Dibenzothiophene	0.005	280	
DIBENZ	Dibenz(a,h)anthracene	0.006	457	
DIMETH	2,6-dimethylnaphthalene	0.03	290	
FLUORANT	Fluoranthene	0.005	5700	
FLUORENE	Fluorene	0.008	470	
INDENO	Indeno(1,2,3-c,d)pyrene	0.006	1300	
MENAP1	1-methylnaphthalene	0.009	120	
MENAP2	2-methylnaphthalene	0.007	170	
MEPHEN1	1-methylphenanthrene	0.005	866	
METH	Methoxychlor			CT only
NAPH	Naphthalene	0.005	180	
PHENANTH	Phenanthrene	0.005	2000	NAT only
PYRENE	Pyrene	0.007	6070	
TRIMETH	2,3,5-trimethylnaphthalene	0.01	330	

Polychlorinated biphenyls (PCBs)

PCB101	2,2',4,5,5'-pentachlorobiphenyl	0.39	180	
PCB105	2,3,3',4,4'-pentachlorobiphenyl	0.38	66	
PCB110	2,2',4,5,5'pentachlorobiphenyl	1	18	NY only
PCB118	2,3',4,4',5-pentachlorobiphenyl	0.22	190	
PCB126	3,3',4,4',5-pentachlorobiphenyl	1.16	19	
PCB128	2,2',3,3',4,4'-hexachlorobiphenyl	0.26	14	
PCB138	2,2',3,4,4',5'-hexachlorobiphenyl	0.16	100	
PCB153	2,2',4,4',5,5'-hexachlorobiphenyl	0.28	81	
PCB170	2,2',3,3',4,4',5-heptachlorobiphenyl	0.59	71	
PCB18	2,2',5-trichlorobiphenyl	0.48	94	
PCB180	2,2',3,4,4',5,5'-heptachlorobiphenyl	0.27	56	
PCB187	2,2',3,4',5,5',6-heptachlorobiphenyl	0.25	20	
PCB195	2,2',3,3',4,4',5,6-octachlorobiphenyl	0.25	4.8	
PCB206	2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	0.4	6.7	
PCB209	decachlorobiphenyl	0.28	13	
PCB28	2,4,4'-trichlorobiphenyl	0.54	210	
PCB44	2,2',3,5'-tetrachlorobiphenyl	0.26	120	
PCB52	2,2',5,5'-tetrachlorobiphenyl	0.65	160	
PCB66	2,3',4,4'-tetrachlorobiphenyl	0.981	21	
PCB77	3,3',4,4'-tetrachlorobiphenyl	0.22	14	

PCB8	2,4'-dichlorobiphenyl	0.72	67	
Pesticides				
ABHC	alpha-Hexachlorohexane	2.33	2.33	CT only
ALDRIN	Aldrin	0.64	2.09	
BBHC	beta-Hexachlorohexane	0.52	0.52	CT only
CISCHL	alpha-Chlordane	2.74	20	except NY
CNONCHL	cis-Nonachlor			CT only
DBHC	delta-Hexachlorohexane	6.77	6.77	CT only
DIELDRIN	Dieldrin	1.4	47	
ENDOSUI	Endosulfan I	0.52	0.55	
ENDOSUII	Endosulfan	0.514	9.5	
ENDOSULF	Endosulfan II	1	7.7	
ENDRIN	Endrin	0.47	3.5	
ENDRINA	Endrin-a	1.13	1.13	CT only
ENDRINK	Endrin-k			CT only
GBHC	gamma-Hexachlorohexane	1.17	130	CT only
HEPTACHL	Heptachlor	5	5	
HEPTAEPO	Heptachlor epoxide	1	7.8	
HEXACHL	Hexachlorobenzene	0.15	28	
LINDANE	Lindane (gamma-BHC)	0.977	2.84	
MIREX	Mirex	1.45	4.09	
OPDDD	2,4'-DDD	0.27	82	
OPDDE	2,4'-DDE	0.5	37	
OPDDT	2,4'-DDT	0.6	0.6	except NY
OXYCHL	Oxychlordane	0.43	0.43	CT only
PPDDD	4,4'-DDD	0.29	360	except NY
PPDDE	4,4'-DDE	0.4	230	
PPDDT	4,4'-DDT	0.5	90	
TNONCHL	trans-Nonachlor	0.43	2	
TOXAPHEN	Toxaphene			

7.1.4 Maximum Value in Dataset

See Section 7.1.3

7.2 Data Record Example

7.2.1 Column Names for Example Records

station	stat_alt	evntdate	analyte	conc	qacode	mdl	chmunits	labcode	analytype

7.2.2 Example Data Records

station	stat_alt	evntdate	analyte	conc	qacode	mdl	chmunits	labcode	analytype
CT02-0200	A	9/18/2002	ABHC	0	CHM-A	0.799	ng/g	CT (ERI)	PEST
CT02-0200	A	9/18/2002	ACENTHE	0	CHM-A	16	ng/g	CT (ERI)	PAHs
CT02-0200	A	9/18/2002	ACENTHY	0	CHM-A	16	ng/g	CT (ERI)	PAHs

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude (Westernmost)
-75.6977 decimal degrees

8.2 Maximum Longitude (Easternmost)
-67.0482 decimal degrees

8.3 Minimum Latitude (Southernmost)
38.4739 decimal degrees

8.4 Maximum Latitude (Northernmost)
45.1848 decimal degrees

8.5 Name of Region
The National Coastal Assessment Northeast Region covers the northeastern US coastline from Maine to Delaware

9. QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Measurement Quality Objectives
Measure replicate grain size of samples to within a precision of 10% (see U.S. EPA 2001).

9.2 Data Quality Assurance Procedures

9.3 Actual Measurement Quality

10. DATA ACCESS

10.1 Data Access Procedures
Data can be downloaded from the web http://www.epa.gov/emap/nca/html/regions/index.html

10.2 Data Access Restrictions
None

10.3 Data Access Contact Persons
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10.4 Dataset Format
ASCII (CSV) and SAS Export files

10.5 Information Concerning Anonymous FTP
Not available

10.6 Information Concerning WWW
No gopher access, see Section 10.1 for WWW access

10.7 EMAP CD-ROM Containing the Dataset
Data not available on CD-ROM

11. REFERENCES

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12. TABLE OF ACRONYMS

AED	Atlantic Ecology Division
CSC	Computer Sciences Corporation
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
MDL	Method Detection Limit
NCA	National Coastal Assessment
ng/g	Nano gram per gram
NHEERL	National Health and Environmental Effects Research Laboratory
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
ppb	parts per billion
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
SRM	Standard Reference Material
TOC	Total Organic Carbon
ug/g	Micro gram per gram
WWW	World Wide Web

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