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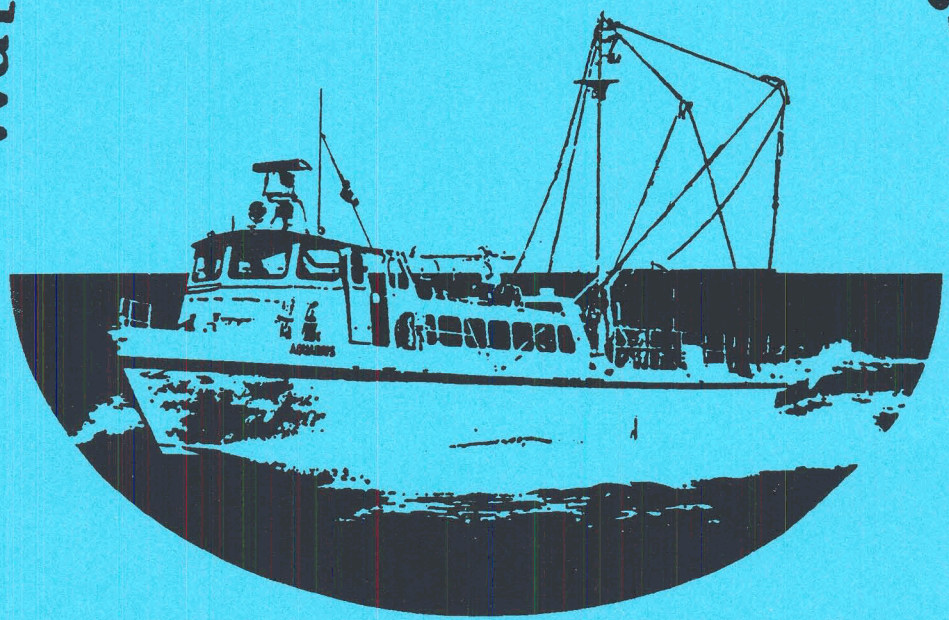
Chesapeake Bay Water Quality Monitoring Program

ECOSYSTEMS PROCESSES COMPONENT (EPC)



DATA DICTIONARY

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MARYLAND DEPARTMENT OF THE ENVIRONMENT

MARYLAND CHESAPEAKE BAY WATER QUALITY MONITORING PROGRAM

ECOSYSTEM PROCESSES COMPONENT (EPC) DATA DICTIONARY

PREPARED FOR:

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PREFACE

This data dictionary is submitted in accordance with the Schedule of Deliverables set out in Contract 177-C-MDE-89 between the Maryland Department of the Environment (MDE), Chesapeake Bay and Special Projects and the University of Maryland, Center for Environmental and Estuarine Studies (CEES). This is a **draft** copy, the final document will be produced after review by MDE.

All data sets of the Water Quality Monitoring Program, both Sediment Oxygen and Nurient Exchanges (SONE) and Vertical Flux Monitoring (VFX), will be converted from their present format using LOTUS 1,2,3 into SAS files which will be loaded into the public information data base of the Chesapeake Bay Program(CBP) called CHESSEE. The data dictionary is a working tool which will be essential in cross referencing MDE/EPC variables with the matching one to eight character variables used in CHESSEE. Any specific questions concerning changes in file or variable names should be directed to: Dr F.M. Rohland, Tel. (301) 326-4281.

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1. INTRODUCTION

This data dictionary is an extensive reference document providing a listing and description of all variables used by the Maryland Department of the Environment, Ecosystem Processes Component (MDE/EPC) of the Maryland Chesapeake Bay Water Quality Monitoring Program.

The structure of the data dictionary follows that of the Sediment Data Management Plan (EPA, 1989). The document is divided into three parts, an introduction which provides an overview of the program, part A which is a variable and parameter list and part B which contains detailed data dictionary tables.

Part A lists all variables used in both the sediment oxygen and nutrient exchanges (SONE) and vertical flux (VFX) studies. The variables are sorted in alphabetical order using the MDE/EPC table name (Table A-1). This is followed by the one to eight character CHESSEE variable name as a cross reference since the data from this component is to be incorporated into the Chesapeake Bay Program (CBP) data base (CHESSEE). Table A-1 contains a parameter description, the MDE/EPC unit of measure and the unit abbreviation used in all MDE/EPC data tables.

Part B, Tables B-1 through B-16, identifies codes and tabular values that are valid entries for coded values in MDE/EPC tables and which will also be included in SAS data files. Table B-6.1 contains a list of conversion factors which can be used to convert MDE/EPC units to comparable historical units currently used in the CHESSEE data base.

2. PROGRAM DESCRIPTION

2.1 Introduction

During the past decade much has been learned about the effects of nutrient inputs (e.g. nitrogen, phosphorus, silica), from both natural and anthropogenic sources, on such important estuarine processes as phytoplankton production and oxygen status (Nixon, 1981; D'Elia et al., 1983). While our understanding is not complete, important pathways regulating these processes have been identified and related to water quality conditions. For example, annual algal primary production and maximum algal biomass levels in many estuaries (including portions of Chesapeake Bay) are related to the magnitude of nutrient loading from all types of sources (Boynton et al., 1982a). Also, high, and at times excessive, algal production is sustained through the summer and fall periods by the benthic recycling of essential nutrients. Similarly, sediment oxygen demand (SOD) is related to the amount of organic matter reaching the sediment surface and the magnitude of this demand is sufficiently high in many regions to be a major oxygen sink (Hargrave, 1969; Kemp and Boynton, 1980).

2.2 Nutrient input and sediment deposition in Chesapeake Bay

The delay between nutrient additions and the response of algal communities suggests that there are mechanisms which retain nutrients in estuaries such as the Chesapeake. These nutrients can be mobilized for use at later dates. Research conducted in Chesapeake Bay and other estuaries indicates that estuarine sediments can act as both important storages and sources for nutrients as well as sites of intense oxygen consumption (Kemp and Boynton, 1984). For example, during summer periods in the Choptank and Patuxent estuaries, 40-70% of the total oxygen utilization was associated with sediments and 25-70% of algal nitrogen demand was supplied from estuarine sediments (Boynton et al., 1982b). Processes of this magnitude have a pronounced effect on estuarine water quality and habitat conditions. In terms of storage, sediments in much of Chesapeake Bay, especially the upper Bay and tributary rivers, contain large amounts of carbon, nitrogen, phosphorus and other compounds. A large percentage of this material appears to reach the sediments during the spring period of each year. Some portion of this same material is available to regenerative processes; and therefore, eventually becomes available for continued algal utilization. Nutrients and other materials deposited or buried in sediments represent the potential "water quality memory" of the Bay.

Nutrients and organic matter enter the Bay from a variety of sources, including sewage treatment plant effluents, fluvial inputs, local non-point drainage and direct rainfall on Bay waters. These dissolved nutrients are rapidly incorporated into particulate matter via biological, chemical, and physical mechanisms. Much of this particulate material then sinks to the bottom and is remineralized. Essential nutrients released during the decomposition of organic matter may then be utilized by algal communities. A portion of this newly produced organic matter then sinks to the bottom, contributing to the development of anoxic conditions and loss of habitat for important infaunal, shellfish and demersal fish communities. The regenerative capacities and the potentially large nutrient storages in bottom sediments insures a large return flux of nutrients from sediments to the water column and sustained continued phytoplankton growth, deposition of organics to deep waters and anoxic conditions typically associated with eutrophication of estuarine systems.

Sediment-water processes and deposition of organic matter to the sediment surface are major features of estuarine nutrient cycles. These processes play an important role in determining water quality and habitat conditions. For example, during summer periods, when water quality conditions are typically poorest (i.e. anoxic conditions in deep water, algal blooms), sediment releases of nutrients (e.g. nitrogen, phosphorus) and consumption of oxygen are often highest as is the rate of organic matter deposition to the deep waters of the Bay. To a considerable extent, it is the magnitude of these processes which determines nutrient and oxygen water quality conditions in many zones of the Bay. Ultimately, these processes are driven by inputs of organic matter and nutrients from both natural and anthropogenic sources. If water quality management programs are instituted and loadings decrease, changes in the magnitude of the processes monitored in this program will serve as a guide in determining the effectiveness of strategies aimed at improving Bay water quality and habitat conditions.

Within the context of this model a monitoring study of deposition, sediment oxygen demand and sediment nutrient regeneration has been initiated. The working hypothesis is that if nutrient and organic matter loading to the Bay decreases then the cycle of deposition to sediments, sediment oxygen demand, release of nutrients and continued high algal production will also decrease. Since benthic processes exert important influences on water quality conditions, changes in these processes will serve as important indications of the effectiveness of nutrient control actions.

2.3 Objectives of the Water Quality Monitoring Program

The objectives of the Ecosystem Processes Component (EPC) of the Maryland Chesapeake Bay Water Quality Monitoring Program are to:

1) Characterize the present state of the bay (including spatial and seasonal variation) relative to sediment-water nutrient exchanges and oxygen consumption and the rate at which organic and inorganic particulate materials reach deep waters and the sediment surface.

2) Determine the long-term trends that develop in sediment-water exchanges and deposition rates in response to pollution control programs.

3) Integrate the information collected in this program with other elements of the monitoring program to gain a better understanding of the processes affecting Chesapeake Bay water quality and its impact on living resources.

2.4 Sampling locations

Measurements of sediment-water nutrient and oxygen exchanges are made on a quarterly basis (five times per year beginning in 1989) at locations in the mainstem Bay, and in each of three major tributary rivers (Patuxent, Choptank, and Potomac). Deposition rates are monitored at one mainstem Bay location, in the central anoxic region. Deposition measurements are made almost continuously during the spring, summer and fall periods, with a lower frequency during the winter. Activities in this program have been coordinated with other components of the Maryland Chesapeake Bay Water Quality Monitoring Program in terms of station locations, sampling frequency, methodologies, data storage and transmission, reporting schedules and data synthesis. This program was initiated in July 1984 and the basic data collection scheme has been followed through June 1989.

Locations of SONE stations (Figure B-6 and Tables B-5.2 and B-5.3) were selected based on prior knowledge of the general patterns of sediment-water nutrient and oxygen exchanges in Chesapeake Bay. Several earlier studies (Boynton et al., 1980, 1984 and Boynton and Kemp, 1985) reported the following:

1) Along the mainstem of the Bay, fluxes were moderate in the upper Bay, large in the mid-Bay and reached a maxima in the lower Bay.

2) Fluxes in the transition zone of tributaries were much larger than those observed in the higher salinity downstream portions of tributaries.

Hence, a series of stations were located along the mainstem from Still Pond Neck in the upper Bay to Point No Point near the mouth of the Potomac River. A pair of stations were established in three tributaries (Potomac, Patuxent, and Choptank), one in the transition zone and one in the lower estuary. In all cases, station locations were selected to have depths and sediment characteristics representative of the estuarine zone being monitored. Beginning in July 1989 note station deletions and additions.

In a few instances (Patuxent stations and Choptank station at Horn Point) SONE stations are not located exactly at the same site as other Maryland Chesapeake Bay Water Quality Monitoring Program stations, although they are close (< 10 km). The prime reason for including these stations was the considerable amount of benthic flux data available from the SONE sites selected in the Patuxent and Choptank that could be used by the monitoring program. In all cases our stations and the MDE stations are in the same estuarine zone. Benthic fluxes are reasonably similar over small spatial scales (10-20 km) within estuarine zones of similar salinity, sediment type, and depth; therefore, this program retains a high degree of comparability with other program components (Boynton et al., 1982b).

Beginning July 1989 the number and location of SONE sampling stations was revised. Prior to July 1989, four of the ten stations sampled as part of the SONE study were located along the salinity gradient in the mainstem Bay between Point No Point (north of the mouth of the Potomac River) and Still Pond Neck (20 km south of the Susquehanna River mouth). Two additional stations were located in each of three tributary rivers (Patuxent, Choptank and Potomac), one in the turbidity maximum or transition zone and one in the lower mesohaline region. After July 1, 1989 sampling at four upper tributary and mainstem stations, Still Pond, R-78, Windy Hill and Maryland Point, was discontinued and two stations, Marsh Point and Broomes Island, were added in the Patuxent River (Figure B-6).

The VFX monitoring study station is located in the mainstem of the Bay in the central anoxic region (Figure B-6). The salinity characteristics of each station are listed in Table B-7.1. The range of salinity values and codes are found in Table B-7.

The use of sediment trap methodology to determine the net vertical flux of particulate material is restricted to the deeper portions of the Bay. In shallower areas local resuspension of bottom sediments is sufficiently large to mask the downward flux of "new" material. Hence, sediment traps are not a useful tool in the upper reaches of the mainstem bay and in many tributary areas. The sediment trap array is positioned near the center of the region experiencing seasonal anoxia (Figure B-6) to monitor the vertical flux of particulate organics reaching deeper waters. This location is close to MDE station 4.3.C. Since sediment traps are moored pieces of gear and exposed to damage or loss by commercial boat traffic, the location was selected to be out of main traffic lanes, but still close to the MDE station.

2.5 Sampling Frequency

The sampling frequency for the SONE portion of this program is based on the seasonal patterns of sediment water exchanges observed in previous studies conducted in the Chesapeake Bay region (Kemp and Boynton, 1980; Kemp and Boynton, 1981; Boynton et al., 1982b; and Boynton and Kemp, 1985). These studies indicated several distinct periods over an annual cycle including:

1) A period influenced by the presence of a large macrofaunal community (spring-early summer).

2) A period during which macrofaunal biomass is low but water temperature and water column metabolic activity high with anoxia prevalent in deeper waters (August).

3) A period in the fall when anoxia is not present and macrofaunal community abundance is low but re-establishing.

4) An early spring period (April-May) when the spring phytoplankton bloom occurs, and water column nutrient concentrations are high (particularly nitrate).

Previous studies also indicate that short-term temporal (day-month) variation in these exchanges is small; however, considerable differences in the magnitude and characteristics of fluxes appear among distinctively different estuarine zones (i.e. tidal fresh vs. mesohaline regions). In light of these results, the monitoring design adopted for the SONE study involves quarterly measurements (five measurements per year since 1989; May, June, July, August and October), as described above, distributed in zones characteristic of mainstem Chesapeake Bay and tributary rivers. A complete listing giving the sampling dates of all SONE cruises together with alpha-numeric cruise identification codes can be found in Table B-2.

The selection of sampling frequency for the VFX (organic deposition) monitoring program is governed by different constraints, although compatible with SONE sampling frequencies. Net depositional rates appear largest during the warm seasons of the year (April-October) and are considerably lower during winter periods (November-March). Resuspension of near-bottom sediments and organics in one tributary of the Bay (Patuxent) followed a similar pattern (Boynton et al., 1982b; Kemp and Boynton, 1984). However, some variability occurs in warm season depositional rates, probably due to algal blooms of short duration (days-week), variation in zooplankton grazing rates (week-month) and other, less well described, features of the Bay. Given the importance of obtaining interannual estimates of organic matter deposition rates to deep waters of the Bay, sampling is almost continuous during spring-fall (March-November) and only occasionally during the winter (December-February). Direct measurements of organic deposition to Bay sediments were monitored 19 to 31 times per year. To coordinate vertical deposition rate measurements with SONE measurements, sediment-water exchanges are monitored at the end of each intensive VFX deployment period. VFX measurements also coincide with other monitoring program sampling activities. The sampling schedule for 1984-1986 is shown in Figure B-3 and 1987-1989 in Figure B-4 for this component of the monitoring program.

3. DATA COLLECTION

3.1 Field Methods

Details concerning methodologies are described in the Ecosystem Processes Component Study Plan (Garber et. al, 1987). The following section provides an overview of field activities.

3.1.1 SONE Study

3.1.1.1 Water Column Profiles.

At each of the ten SONE stations (eight stations since July 1989), vertical water column profiles of temperature, salinity and dissolved oxygen are obtained at 2 m intervals from the surface to the bottom immediately prior to obtaining intact sediment cores for incubation. The turbidity of the water is measured using a Secchi disc.

3.1.1.2 Water Column Nutrients.

A surface and bottom sample are analyzed for the following dissolved nutrients and particulate materials: ammonium (NH_4^+), nitrite (NO_2^-), nitrite plus nitrate (NO_2^- + NO_3^-) dissolved inorganic phosphorus (DIP or PO_4^{-3}), silicious acid ($Si(OH)_4$), particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), total and active chlorophyll a concentrations and seston content.

Measurements of total dissolved nitrogen (TDN), which comprised ammonium (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-) plus dissolved organic nitrogen (DON), and total dissolved phosphorus (TDP), comprising dissolved inorganic (DIP) and dissolved organic (DOP) phosphorus, were discontinued at the end of the 1987 calendar year.

3.1.1.3 Sediment Profiles

At each SONE station an intact sediment core is used to measure Eh at 1 cm intervals to about 10 cm. Additionally, surficial sediments are sampled for particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), total and active chlorophyll a concentrations.

3.1.1.4 Sediment Cores.

Three intact cores, obtained at each SONE station using a modified Bouma box corer, are used to estimate net exchanges of oxygen and dissolved nutrients between sediments and overlying waters. Oxygen concentrations are recorded and water samples (35 ml) are extracted from each core every 30 or 60 minutes (depending on the rate of oxygen uptake) over the 2-5 hour incubation period. During the incubation period, five water samples are extracted from each core. An opaque Plexiglas liner filled with bottom water, incubated, and sampled as described above serves as a blank. Water samples are filtered and immediately frozen for later analysis for ammonium (NH_4^+), nitrite (NO_2^-), nitrite plus

nitrate ($NO_2^- + NO_3^-$), dissolved inorganic phosphorous (DIP or PO_4^{-3}) and silicious acid ($Si(OH)_4$) concentrations. Oxygen and nutrient fluxes are estimated by calculating the mean rate of change in concentration over the incubation period and then converting the volumetric rate to a flux using the volume:area ratio of each core.

Beginning in July 1989 fluxes of hydrogen sulphide (H_2S) were measured at SONE stations exhibiting bottom water DO < 1mg/l or when sulfide in bottom water was detected by smell.

3.1.2 VFX Study

3.1.2.1 Water Column Profiles

At the VFX station, a water column profile of temperature, salinity and dissolved oxygen is obtained at 2 m intervals from 0.5 meters to 1 meter off of the bottom to characterize the general physical features of the water column. Turbidity of the water is measured using a Secchi disc.

Water samples are also collected at three depths from near-bottom and near-surface waters, and at the depth of the mouth of the middle sediment trap. Water samples are analyzed for particulate materials including particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), total and active chlorophyll a concentrations, biogenic silica and seston content. These data provide descriptions of the particulate matter in the field at the time of sampling and are useful in evaluating results obtained from sediment trap collections.

3.1.2.2 Sediment Sampling

A surficial sediment sample (surface 1cm, surface 2mm after 9 August 1989) is obtained using either a Van Veen grab or the Bouma box corer which is preferred because it obtains a better surficial sediment sample. Sediment samples are later analyzed to determine particulate carbon (PC), particulate nitrogen (PN) and particulate phosphorous (PP), total and active chlorophyll a concentrations. Until the end of the 1987 calendar year, an additional 10 ml sample was preserved using a modified Lugol's solution, and later examined to determine characteristics of collected particulate material (e.g. algal speciation, zooplankton fecal pellets, etc.).

3.1.2.3 Vertical Deposition Measurements

The sampling device used to develop estimates of the vertical flux of particulate materials has a surface buoy connected to a lead or concrete anchor-weight (200 kg) by a series of stainless steel cables (0.8 cm diameter, Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about 5 m and 9 m beneath the water surface to obtain estimates of vertical flux of particulates from the surface euphotic zone to the pycnocline and flux across the pycnocline to deep waters.

The sediment trap string is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped

prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

The contents of a collecting cup are removed and aliquots taken for determination of particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), total and active chlorophyll a concentrations and seston content. Until the end of the 1987 calendar year, an additional 10 ml sample was preserved using a modified Lugol's solution, and later examined to determine characteristics of collected particulate material (e.g. algal speciation, zooplankton fecal pellets, etc.).

Particulate material concentrations in sampling cups are converted to units of vertical flux, at the depth of the collecting cup, using the cross-sectional area of the collecting cup, deployment time, sample and subsample volumes.

3.1.3 Chemical Analyses

In brief, methods for the determinations of dissolved and particulate nutrients are as follows: ammonium (NH_4^+), nitrite (NO_2^-), nitrite plus nitrate ($NO_2^- + NO_3^-$), and dissolved inorganic phosphorus (DIP or PO_4^{-3}) are measured using the automated method of EPA (1979); silicious acid ($Si(OH)_4$) is determined using the Technicon Industrial System (1977) method; particulate carbon (PC) and particulate nitrogen (PN) samples are analyzed using a model 240B Perkin-Elmer Elemental Analyzer; particulate phosphorus (PP) concentration is obtained by acid digestion of muffled-dry samples (Aspila et al. 1976); methods of Strickland and Parsons (1972) and Shoaf and Lium (1976) are followed for chlorophyll a analysis; biogenic silica is measured using the method of Paasche (1973); total suspended solids (seston) are determined by the gravimetric technique of EPA (1979).

4. DATA MANAGEMENT

Data files are given unique names which are a combination of an alpha code reflecting the type of data set and a numeric descriptor which indicates the number of the SONE cruise or sampling year in the case of VFX (Tables B-2.1, B-2.2, B-2.3 and B-2.4).

4.1 SONE Study

The data collected at each SONE station are organized into six data sets:

WATER COLUMN PROFILES (Filename: **H2OPRFxx**, Table B-15.1) contain temperature, salinity and dissolved oxygen data measured at two meter intervals.

WATER COLUMN NUTRIENTS (Filename: **H2ONUTxx**, Table B-15.2) report surface and bottom water dissolved nutrient concentrations.

SEDIMENT PROFILES (Filename: **SEDPRFxx**, Table B-15.3) include redox potential and selected sediment measurements of particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), total and active chlorophyll a concentrations.

CORE PROFILES (Filename: **CORPRFxx**, Table B-15.4) lists percentage water, particulates and pore water nutrient measurements at SONE stations. Data is only available for SONES 2, 6 and 10.

CORE DATA (Filename: **CORDATxx**, Table B-15.5) lists dissolved oxygen and nutrient measurements in SONE sediment-water flux chambers.

and **SEDIMENT-WATER FLUX** (Filename: **SWFLUXxx**, Table B-15.6) is a summary table providing mean and flux data for oxygen and nutrient flux data.

4.2 VFX Study

VFX data currently only collected at one station, R-64, are organized into three data sets:

WATER COLUMN PROFILES (Filename: **VFXPRFxx**, Table B-16.1) contain temperature, salinity and dissolved oxygen data measured at two meter intervals.

SURFICIAL SEDIMENT PARTICULATES (Filename: **VFXSEDxx**, Table B-16.2) lists particulate material concentration data including particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), total and active chlorophyll a concentrations.

and **VERTICAL FLUX OF PARTICULATES** (Filename: **VFXDEPxx**, Table B-16.3) which includes rate of deposition of particulate materials to collection cup depth for particulate carbon (PC), particulate nitrogen (PN), particulate phosphorus (PP), active and total chlorophyll a, biogenic silica and seston.

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PART A

SEDIMENT OXYGEN AND NUTRIENT EXCHANGES (SONE) AND VERTICAL FLUX (VFX) VARIABLE AND PARAMETER LIST

PART A

SEDIMENT OXYGEN AND NUTRIENT EXCHANGES (SONE) AND VERTICAL FLUX (VFX) VARIABLE AND PARAMETER LIST

INTRODUCTION.

Part A Table A-1 lists all variables used in both the sediment oxygen and nutrient exchanges (SONE) and vertical flux (VFX) studies. The variables are sorted in alphabetical order using the MDE/EPC table name. This is followed by the one to eight character CHESSEE variable name as a cross reference since the data from this component is to be incorporated into the Chesapeake Bay Program (CBP) data base (CHESSEE). Table A-1 contains a parameter description, the MDE/EPC unit of measure and the unit abbreviation used in all MDE/EPC data tables.

Table A-1. SONE and VFX Variable and Parameter List

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
AA VIAL NO	SAMPLEID	Basic identification number for water samples.	Number	
BASIN	BASIN	Name of basin: Chesapeake Bay.	Alpha	
BLANK SLOPE DIP	BS_DIP	Time rate of change of phosphorus concentration in SONE blank chamber.	Micromoles per liter per minute	μM/(l • min)
BLANK SLOPE DO	BS_DO	Time rate of change of dissolved oxygen concentration in SONE blank chamber.	Milligrams per liter per minute	mg/(l • min)
BLANK SLOPE H2S	BS_H2S	Time rate of change of hyrodgen sulfide concentration in SONE blank chamber.	Nanomoles per liter per minute	nM/(l • min)
BLANK SLOPE NH4	BS_NH4	Time rate of change of ammonium concentration in SONE blank chamber.	Micromoles per liter per minute	μM/(l • min)
BLANK SLOPE NO23	BS_NO23	Time rate of change of nitrite plus nitrate concentration in SONE blank chamber.	Micromoles per liter per minute	μM/(l • min)
BLANK SLOPE Si(OH)4	BS_DSI	Time rate of change of siliceous acid concentration in SONE blank chamber.	Micromoles per liter per minute	μM/(l • min)
B Si	BIO_SI	Particulate biogenic silica (amorphous opal) concentration in water sample.	Micrograms per liter	μg/l
CHLa ACTIVE	CHL_A	The total chlorophyll-a of a water sample is acidified and measured flourometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidification from the total chlorophyll-a value.	Micrograms per liter	μg/l
CHLa TOTAL	CHL_T	The total chlorophyll-a concentration of a water sample determined by extraction in 90% acetone and measured flourometrically. This value includes active chlorophyll-a and some undefined chlorophyll-a degredation products.	Micrograms per liter	μg/l
COND	COND	Conductivity of water.	Millimhos per centimeter	mmho/cm
CORE DEPTH	CORE_Z	Depth either above or beneath (negative values) the sediment water interface at which measurement was taken; a core depth of zero represents the sediment water interface.	Centimeters	cm
CORE H_2O DEPTH	COREWATZ	Height of water above the sediment surface in SONE chamber.	Meters	m
CORE H_2O VOL	CORE_WAT	Total volume of water overlying SONE sediment core in a SONE chamber.	Milliliters	ml

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
CORE NO	CORE_NO	SONE chamber replicate identifier.	Alpha or numeric	
CRUISE	CRUISE	SONE cruise identifier.	See Appendix B Table B-2	
CUP DEPTH	CUP_DPTH	Depth of water from water surface to the top of the sediment trap cup.	Meters	m
DATE	DATE	Date of sample collection or measurement, alphanumeric.	Day, Month, Year	DDMMMYY
DATE DEP	DATE_DEP	Date on which VFX sediment trap was set out, alphanumeric.	Day, Month, Year	DDMMMYY
DATE RET	DATE_RET	Date on which VFX sediment trap was retreived, alpha-numeric.	Day, Month, Year	DDMMMYY
DILU VOL	DILU_VOL	Total volume, in liters, in which VFX sediment trap contents are suspended for sub-sampling.	Liters	l
DIP	DIP_MOL	Dissolved inorganic phosphorus concentration of a filtered water sample.	Micromolar	μM
DIP FLUX	DIP_FLUX	Net flux of dissolved inorganic phosphorus across sediment water interface.	Micromolar phosphorus per square meter per hour	$\mu MP/(m^2 \cdot hr)$
DIP FLUX MEAN	DIP_MFLX	Average of triplicate dissolved inorganic phosphorus flux determinations at a SONE station.	Micromolar phosphorus per square meter per hour	$\mu MP/(m^2 \cdot hr)$
DO	DISOXY	Dissolved oxygen concentration.	Milligrams per liter	mg/l
DIP SLOPE	DIP_SLP	Time rate of change of dissolved inorganic phosphorus concentration in overlying waters of a SONE chamber.	Micromolar phosphorus per liter per minute	$\mu MP/(l \cdot min)$
DO FLUX	DO_FLUX	Net flux of dissolved oxygen across sediment-water interface. DO flux is synonomous with sediment oxygen consumption (SOC).	Grams oxygen per square meter per day	$gO_2/(m^2 \cdot day)$
DO FLUX MEAN		Average of replicate dissolved Oxygen flux determinations at a SONE station	Grams oxygen per per square meter per day	$gO^2/m^2 \cdot day$

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
DO FLUX MEAN	DO_MFLX	Average of triplicate dissolved oxygen flux determinations at a SONE station.	Grams oxygen per square meter per day	$gO_2/(m^2 \cdot day)$
DO SAT	DOSAT	Measured oxygen concentration relative to oxygen saturation concentration at sample temperature and salinity.	Percentage	%
DO SLOPE	DO_SLP	Time rate of change of dissolved oxygen concentration in overlying waters of a SONE chamber.	Milligrams O_2 per liter per minute	$mg/(l \cdot min)$
Eh CORR	EH_CORR	Eh corrected = Eh measured + 244mV. This gives Eh relative to the hydrogen electrode.	Millivolts	mV
Eh MEAS	ORP	A measure of the chemical environment (oxidizing or reducing) at a specific depth in the sediment column measured relative to a calomel electrode.	Millivolts	mV
FLUX BSi	BSI_VFX	The calculated flux of biogenic silica to the depth of the opening of the VFX sediment trap cup.	Milligrams per square meter per day	$mg/(m^2 \cdot day)$
FLUX CHLa ACTIVE	CHLA_VFX	The calculated flux of active chlorophyll-a to the depth of the opening of the VFX sediment trap cup.	Milligrams per square meter per day	$mg/(m^2 \cdot day)$
FLUX CHLa TOTAL	CHLT_VFX	The calculated flux of total chlorophyll-a to the depth of the opening of the VFX sediment trap cup.	Milligrams per square meter per day	$mg/(m^2 \cdot day)$
FLUX PC	PC_VFX	The calculated flux of particulate organic carbon to the depth of the opening of the VFX sediment trap cup.	Milligrams per square meter per day	$mg/(m^2 \cdot day)$
FLUX PN	PN_VFX	The calculated flux of particulate organic nitrogen to the depth of the opening of the VFX sediment trap cup.	Milligrams per square meter per day	$mg/(m^2 \cdot day)$
FLUX PP	PP_VFX	The calculated flux of particulate phosphorus to the depth of the opening of the VFX sediment trap cup.	Milligrams per square meter per day	$mg/(m^2 \cdot day)$
FLUX SESTON	SEST_VFX	The calculated flux of total particulates to the depth of the opening of the VFX sediment trap cup.	Grams per square meter per day	$g/(m^2 \cdot day)$

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
GEAR CODE	GEAR	Sampling Gear Code.	See Appendix B Table B-8	
H2O %	H2O_SED	The percentage (by weight) of water loss by drying for a specified section of the sediment column.	Grams of water per 100 grams of wet sediment	%
H2S	H2S_NMOL	Hydrogen sulfide concentration of a filtered water sample.	Nanomolar	nMS
H2S FLUX	H2S_FLUX	Net flux of dissolved hydrogen sulfide across sediment water interface.	Micromolar sulfur per square meter per hour	μMS/(m^2 • hr)
H2S FLUX MEAN	H2S_MFLX	Average of triplicate hydrogen sulfide flux determinations at a SONE station.	Micromolar sulfur per square meter per hour	μMS/(m^2 • hr)
H2S SLOPE	H2S_SLP	Time rate of change of hydrogen sulfide concentration in overlying waters of a SONE chamber.	Nanomolar sulfur per liter per minute	nMS/(l • min)
LAT	LAT	Latitude.	Decimal degrees and minutes	
LONG	LONG	Longitude.	Decimal degrees and minutes	
NH4	NH4_MOL	Ammonium concentration of a filtered water sample.	Micromolar	μM
NH4FLUX	NH4_FLUX	Net flux of dissolved ammonium across sediment water interface.	Micromolar nitrogen per square meter per hour	μMN/(m^2 • hr)
NH4 FLUX MEAN	NH4MFLX	Average of triplicate ammonium flux determinations at a SONE station	Micromolar nitrogen per square meter per day	μMN/(m^2•day)

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
NH4 SLOPE	NH4_SLP	Time rate of change of ammonium concentration in overlying waters of a SONE chamber.	Micromoles nitrogen per liter per minute	μMN/(l • min)
NO2	NO2_MOL	Nitrite concentration of a filtered water sample.	Micromolar	μM
NO2 FLUX	NO2_FLUX	Net flux of dissolved nitrite across sediment water interface.	Micromolar nitrogen per square meter per hour	μMN/(m^2 • hr)
NO2FLUX MEAN	NO2_MFLX	Average of triplicate nitrite flux determinations at a SONE station.	Micromolar nitrogen per square meter per hour	μMN/(m^2 • hr)
NO2SLOPE	NO2_SLP	Time rate of change of nitrite concentration in overlying waters of a SONE chamber.	Micromolar nitrogen per liter per minute	μMN/(l • hr)
NO2+NO3	NO23_MOL	Nitrite + nitrate concentration of a filtered water sample.	Micromolar	μM
NO2+NO3 FLUX	NO23FLUX	Net flux of dissolved nitrite + nitrate across sediment water interface.	Micromolar nitrogen per square meter per hour	μMN/(m^2 • hr)
NO2+NO3 FLUX MEAN	NO23MFLX	Average of triplicate nitrite + nitrate flux determinations at a SONE station.	Micromolar nitrogen per square meter per hour	μMN/(m^2 • hr)
NO2+NO3 SLOPE	NO23_SLP	Time rate of change of nitrite + nitrate concetration in overlying waters of a SONE chamber.	Micromolar nitrogen per liter per minute	μMN/(l • min)

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
PC	PC_WAT	Particulate organic carbon concentration of a water sample.	Micrograms per liter	µg/l
PN	PN_WAT	Particulate organic nitrogen concentration of a water sample.	Micrograms per liter	µg/l
PP	PP_WAT	Particulate phosphorus concentration of a water sample.	Micrograms per liter	µg/l
SALIN	SALIN	Salinity of water at sample depth.	Parts per thousand	ppt
SALZONE	SALZONE	Basic description of salinity regime at a SONE or VFX sampling station.	See Appendix B Table B-7	
SAMPLE DEPTH	SDEPTH	Sample depth from surface of water.	Meters	m
SECCHI DEPTH	SECCHI	Depth from water surface to which Secchi disk can be seen.	Meters	m
SECTION MIDPOINT	SECMPT	The midpoint of a sediment section as measured from the sediment surface e.g. a sediment slice from 2-3 cm depth would have a sediment midpoint of 2.5 cm.	Centimeters	cm
SED CHLa ACTIVE	CHLA_SED	The total chlorophyll-a sediment section sample is acidified and measured fluorometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidification from the total chlorophyll-a value.	Milligrams per square meter	mg/m^2
SED CHLa TOTAL	CHLT_SED	The total chlorophyll-a concentration of a sediment section sample determined by extraction in 90% acetone and measured fluorometrically. This value includes active chlorophyll-a and some undefined chlorophyll-a degredation products.	Milligrams per square meter	mg/m^2
SED PC	PC_SED	Percentage by dry weight of particulate organic carbon for a specified section of the sediment column.	Grams carbon per 100 grams of dry sediment	% (wt)
SED PN	PN_SED	Percentage by dry weight of particulate organic nitrogen for a specified section of the sediment column.	Grams nitrogen per 100 grams of dry sediment	% (wt)
SED PP	PP_SED	Percentage by dry weight of particulate phosphorus for a specified section of the sediment column.	Grams phosphorus per 100 grams of dry sediment	% (wt)

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
SEGMENT	SEGMENT	Chesapeake Bay Program segment designation.	See Appendix B Table B-3	
SESTON	SES_MG	Concentration as dry weight of total particulates in a water sample (seston).	milligrams per liter	mg/l
SILICATE FLUX	DSI_FLUX	Net flux of dissolved silicate across sediment water interface.	Micromolar silicate per square meter per hour	μMSi/(m^2 • hr)
SILICATE FLUX MEAN	DSIMFLUX	Average of triplicate silicate flux determinations at a SONE station.	Micromolar silicate per square meter per hour	μMSi/(m^2 • hr)
SILICATE SLOPE	DSISLOPE	Time rate of change of silicate concentration in overlying waters of a SONE chamber.	Micromolar silicate per liter per minute	μMSi/(l • min)
Si(OH)4	DSI_MOL	Silicious acid concentration of a filtered water sample.	micromolar	μM
SOURCE	SOURCE	Data collecting agency.	See Appendix B Table B-4	
STANAME	STANAME	Nearest Maryland station.	See Appendix B Table B-5.2	
STATION	STATION	Sampling station identifier.	See Appendix B Table B-5.1	
TDN	TDN_MOL	Total dissolved nitrogen concentration of a filtered water sample.	Micromolar nitrogen per liter	μMN/l
TDP	TDP	Total dissolved phosphorus concentration of a filtered water sample.	Micromolar phosphorus per liter	μMP/l
TEMP	WTEMP	Temperature of water at sample depth.	Degrees Centigrade	C
TIME	TIME	Time of day that sample was collected using 24-hour clock.	Hours, minutes in 24-hour time	HHMM
TIME DELTA	TIME_DEL	Time difference between samples.	Minutes	MM

Table A-1. SONE and VFX Variable and Parameter List - CONT

MDE/EPC TABLE NAME	CHESSEE VARIABLE NAME	PARAMETER DESCRIPTION	MDE/EPC UNIT	UNIT ABBR
TIME DEP	TIME_DEP	Time of day at which VFX sediment trap was deployed using 24-hour clock.	Hours, minutes in 24-hour time	HHMM
TIME OF SAMPLE hr	TIME_H	Hour portion of time variable.	Hours	HH
TIME OF SAMPLE min	TIME_M	Minute portion of time variable.	Minutes	MM
TIME RET	TIME_RET	Time of day at which VFX sediment trap was retrieved, using 24-hour clock.	Hours, minutes in 24-hour time	HHMM
TIME SUM	TIME_SUM	Summation of the time elapsed from beginning of incubation of a SONE chamber.	Minutes	MM
TIME TOTAL	TIME_TOT	Total number of deployment days of VFX sediment trap.	Decimal days	Days
TOTAL DEPTH	TDEPTH	Total depth of water column at station.	Meters	m
TOTAL DEPTH AVG	TDEP_AVG	Average of water depth measured when VFX sediment trap was deployed and water depth measured when VFX sediment trap was retrieved.	Meters	m
[UMCEES] CBL REF. NO.	DOC_ID	Documentation identification.	Alpha-numeric	

DATE: 24 January 1990

PART B

SEDIMENT OXYGEN AND NUTRIENT EXCHANGES (SONE) AND VERTICAL FLUX (VFX) DATA DICTIONARY TABLES

PART B

SEDIMENT OXYGEN AND NUTRIENT EXCHANGES (SONE) AND VERTICAL FLUX (VFX) DATA DICTIONARY TABLES

B-1. Method Codes.

This section provides a description of the sampling techniques and methods of analysis used during data collection for both SONE and VFX studies. These are referenced using two, one to eight character alpha-numeric codes, ***FIELD METHOD NO.*** and ***ANALYTICAL METHOD NO.*** Method codes are presented in the order in which they appear in SONE and VFX data files.

B-1.1. Method Codes for Water Column Profiles (SONE): Vertical profiles of temperature, salinity, dissolved oxygen and other characteristics at SONE stations.

FILENAME: H2OPRFxx

B-1.1.1. Variable: Total Depth

MDE/EPC ABBREVIATION: ***TOTAL DEPTH***

FIELD METHOD NO.: TOTDF01

COLLECTION DEVICE: Research Vessel Fathometer (Raytheon V800)

SAMPLE COLLECTION: The electronic signal of the Fathometer is directed to the bottom and the echo from that signal is recorded in units of either feet or meters.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	995 m	± 0.3 m	July 1984-Present

REFERENCES:

(1) **Research Fleet Operations**, CEES, Box 38, Solomons, MD 20688.

B-1.1.2. MDE/EPC Variable: Secchi Depth

MDE/EPC ABBREVIATION: *SECCHI DEPTH*

FIELD METHOD NO.: SECCIF02

COLLECTION DEVICE: Secchi Disk

SAMPLE COLLECTION: A secchi disk measuring 25.5 cm diameter is used. The upper surface is divided into four equal quadrants and are colored so that the two quadrants opposite each other are black and the intervening ones are white.

Readings with the secchi disk are made in situ on the shaded side of the boat without the aid of sunglasses. The secchi disk is lowered into the water and the depth at which it disappears is recorded.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	≈ 100 m	± 0.1 m	July 1984-Present

REFERENCES:

(1) **Tyler, John.** 1968. The secchi disk. Limnol. Oceanogr. 13(1): 1-6.

B-1.1.3 MDE/EPC Variable: Sample Depth

MDE/EPC ABBREVIATION: ***SAMPLE DEPTH***

FIELD METHOD NO.: SAMDF03

COLLECTION DEVICE: Research Vessel Meter Block

SAMPLE COLLECTION: The cable meter is a single purchase block equipped with a digital readout which indicates the length of sampling wire deployed.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	≈ 100 m	±0.3 m	July 1984-Present

REFERENCES:

(1) **Research Fleet Operations**, CEES, Box 38, Solomons, MD 20688.

B-1.1.4. MDE/EPC Variable: Temperature

MDE/EPC ABBREVIATION: ***TEMP***

FIELD METHOD NO.: TEMPF04

COLLECTION DEVICE: Beckman Induction Salinometer
Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Models 33, 57 - Precision Thermistor

SAMPLE COLLECTION: Thermistor is directly exposed to the water it is measuring (in situ). Sample water is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: centigrade (C)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	45 C	± 0.1 C	July 1984-Present

REFERENCE:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instructions for YSI Model 33 and 33M S-C-T Meters.** 1983. Scientific Division, Yellow Springs Instrument Co., Inc. Yellow Springs, OH 45387.
(4) **Instrument Manual YSI Model 57 Dissolved Oxygen Meter.** 1974. Yellow Springs Instrument Co. Yellow Springs, OH 45387.

B-1.1.5. MDE/EPC Variable: Conductivity

MDE/EPC ABBREVIATION: *COND*

FIELD METHOD NO.: COND05

COLLECTION DEVICE: Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Model 33

Hydrolab 4000 and Surveyor II: A four electrode technique for measuring resistance between electrodes.
YSI Model 33: Platinized pure nickel electrode measuring resistance between electrodes.

SAMPLE COLLECTION: Electrodes are directly exposed to sample water which is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: millimhos per centimeter (mmho/cm)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	150 mmho/cm	0.1 mmho/cm	July 1984-Present

REFERENCES:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instructions for YSI Model 33 and 33M S-C-T Meters.** 1983. Scientific Division, Yellow Springs Instrument Co., Inc. Yellow Springs, OH 45387.
(4) **Instrument Manual YSI Model 57 Dissolved Oxygen Meter.** 1974. Yellow Springs Instrument Co. Yellow Springs, OH 45387.

B-1.1.6. MDE/EPC Variable: Salinity

MDE/EPC ABBREVIATION: *SALIN*

FIELD METHOD NO.: SALNF06

COLLECTION DEVICE: Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Model 33 - Conductivity Cell
Beckman Induction Salinometer

SAMPLE COLLECTION: Measurement of salinity (based on conductivity) manually or automatically compensating for temperature. Probe is directly exposed to sample water which is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: parts per thousand (ppt)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	40 ppt	± 0.5 ppt	July 1984-Present

REFERENCES:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instructions for YSI Model 33 and 33M S-C-T Meters.** 1983. Scientific Division, Yellow Springs Instrument Co., Inc. Yellow Springs, OH 45387.

B-1.1.7. MDE/EPC Variable: Dissolved Oxygen

MDE/EPC ABBREVIATION: *DO*

FIELD METHOD NO.: DOF07

COLLECTION DEVICE: Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Models 57 and 58
Orbisphere Oxygen Meter

Orbisphere: Clark type polarigraphic electrode (gold cathode and platinum annode).
Others: Clark type polarigraphic electrode (gold cathode and silver annode).

SAMPLE COLLECTION: A current, proportional to the partial pressure of dissolved oxygen in the sample, is recorded and converted to units of milligrams per liter. The oxygen is directly exposed to sample water which is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: milligrams per liter (mg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	20 mg/l	± 0.3 mg/l	July 1984-Present

REFERENCE:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instrument Manual YSI Model 57 Dissolved Oxygen Meter.** 1974. Yellow Springs Instrument Co. Yellow Springs, OH 45387.
(4) **Instruction Manual for Oxygen Measuring System Model 2610.** Undated. Orbisphere Laboratories, 70 Kinderkamac Road, Emerson, NJ 07630.

B-1.2. Method Codes for Water Column Nutrients (SONE): Dissolved and particulate nutrient concentration in surface and bottom waters at SONE stations.

FILENAME: H2ONUTxx

B-1.2.1. MDE/EPC Variable: Total Depth

MDE/EPC ABBREVIATION: ***TOTAL DEPTH***

FIELD METHOD NO.: TOTDF01

COLLECTION DEVICE: Research Vessel Fathometer (Raytheon V800)

SAMPLE COLLECTION: The electronic signal of the Fathometer is directed to the bottom and the echo from that signal is recorded and reported in units of either feet or meters.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	995 m	± 0.3 m	July 1984-Present

REFERENCES:

(1) **Research Fleet Operations**, CEES, Box 38, Solomons, MD 20688.

B-1.2.2. MDE/EPC Variable: Sample Depth

MDE/EPC ABBREVIATION: ***SAMPLE DEPTH***

FIELD METHOD NO.: SAMDF03

COLLECTION DEVICE: Research Vessel Meter Block

SAMPLE COLLECTION: The cable meter is a single purchase block equipped with a digital readout which indicates the length of sampling wire deployed.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	≈ 100 m	± 0.3 m	July 1984-Present

REFERENCES:

(1) **Research Fleet Operations**, CEES, Box 38, Solomons, MD 20688.

B-1.2.3. MDE/EPC Variable: Ammonium

MDE/EPC ABBREVIATION: *NH4*

ANALYTICAL METHOD NO.: NH4A01

METHOD SUMMARY: The ammonium in a filtered water sample reacts with alkaline phenol and hypochlorite to form indophenol blue which is proportional to the ammonium concentration present. The color is intensified by the addition of sodium nitroprusside and measured colorimetrically at 630 nm, using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial Systems.** 1978. Ammonia in water and seawater. Technicon Industrial Method No. 154-71W/B. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
and: **United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.
(2) **Clesceri, L.S., A.E. Greenberg and R.R. Trussell (Editors).** 1989. Standard methods for the examination of water and waste water. Am. Public Health Assoc., Am. Water Works Assoc. and Water Pollution Control Federation. Washington, DC. (Section: 4500-NH_3 H. Automated Phenate Method.)

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.2 μM	Oct 1987-Present

FIELD METHOD NO.: DISNF08

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.4. MDE/EPC Variable: Nitrite

MDE/EPC ABBREVIATION: *NO2*

ANALYTICAL METHOD NO.: NO2A02

METHOD SUMMARY: Nitrite in a filtered water sample is determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colorimetrically at 550 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.01 μM	Oct 1987-Present

FIELD METHOD NO.: DISNF08

COLLECTION DEVICE : Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.5. MDE/EPC Variable: Nitrite + Nitrate

MDE/EPC ABBREVIATION: *NO2+NO3*

ANALYTICAL METHOD NO.: NO23A03

METHOD SUMMARY: Filtered samples are passed through a granulated copper cadmium column to reduce nitrate to nitrite. The nitrite (originally present plus reduced nitrate) is then determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colorimetrically using the Auto-Analyzer II. Nitrate is obtained by subtracting NO_2 values from NO_2 + NO_3.

REFERENCES:

(1) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.

***and*: United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.

***as modified by:* D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.01 μM	Oct 1987-Present

FIELD METHOD NO.: DISNF08

COLLECTION DEVICE : Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm fiber glass filter pad.

SAMPLE PRESEVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.6. MDE/EPC Variable: Total Dissolved Nitrogen

MDE/EPC ABBREVIATION: *TDN*

ANALYTICAL METHOD NO: TDNA04

METHOD SUMMARY: This method uses the persulfate oxidation technique for nitrogen where under alkaline conditions, nitrate is the sole N product. Filtered samples are passed through a granulated copper cadmium column to reduce nitrate to nitrite. The nitrite (originally present plus reduced nitrate) is then determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colormetrically using the Auto-Analyzer II.

REFERENCES:

(1) **D'Elia, C.F., P.A. Steudler and N. Corwin.** 1977. Determination of total nitrogen in aqueous samples using persulfate digestion. Limnol. Oceanogr. 22: 760-764.

(2) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.

***and*: United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Method #353.2. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.

***as modified by:* D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	1.4 μM	May 1985-Present

FIELD METHOD NO: DISNF08

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 l/m.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.7. MDE/EPC Variable: Dissolved Inorganic Phosphorus

MDE/EPC ABBREVIATION: ***DIP***

ANALYTICAL METHOD NO.: DIPA05

METHOD SUMMARY: A filtered water sample is reacted with ammonium molybdate and antimony potassium tartrate in an acid medium to form an antimony phosphomolybdate complex which is reduced to an intensely blue colored complex by acsorbic acid. The sample is measured colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial Systems.** 1973. Ortho phosphate in water and seawater. Technicon Industrial Method No. 155-71W/Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.6.
and: **United States Environmental Protection Agency.** 1979. Methods for chemical analysis of water and wastes. Method #365.1. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	0.02 μM	May 1985-Present

FIELD METHOD NO.: DISNF08

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.8. MDE/EPC Variable: Total Dissolved Phosphorus

MDE/EPC ABBREVIATION: *TDP*

ANALYTICAL METHOD NO.: TDPA06

METHOD SUMMARY: This method uses the persulfate oxidation technique for phosphorus where under alkaline conditions, phosphorus is the sole P product. A filtered water sample is reacted with ammonium molybdate and antimony potassium tartrate in an acid medium to form an antimony-phosphomolybdate complex which is reduced to an intensely blue colored complex by ascorbic acid. The sample is measured colormetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Menzel, D.W. and N.Corwin.** 1965. The measurement of total phosphorus in seawater based on the liberation of organically bound fractions by persulfate oxidation. Limnol. Oceanogr. 10:280-282.

(2) **United States Environmental Protection Agency.** 1979. Methods for chemical analysis of water and wastes. Method #365.3. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.

***as modified by*: D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.03 μM	Oct 1987-Present

FIELD METHOD NO.: DISNF08

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.9. MDE/EPC Variable: Silicate (Siliceous Acid)

MDE/EPC ABBREVIATION: *SI(OH)*4

ANALYTICAL METHOD NO.: SIOH4A07

METHOD SUMMARY: This reaction is based on the reduction of silicomolybdate in acidic solution to "molybdenum blue" by ascorbic acid. Oxalic acid is added to eliminate interference from phosphates. The silicomolybdate complex is measured colorimetrically at 660 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial Systems.** 1977. Silicates in water and seawater. Technicon Industrial Method No. 186-72W/B. Technicon Industrial Systems, Terrytown, NY. 10591. p.2.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.21 μM	May 1985-Present

FIELD METHOD NO.: DISNF08

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a 2.5 cm diameter GF/F filter pad. Approximately 15 ml is collected in four Auto-Analyzer (AA) vials, which are triple rinsed with sample water prior to filling with sample and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.10. MDE/EPC Variable: Particulate Carbon

MDE/EPC ABBREVIATION: *PC*

ANALYTICAL METHOD NO.: PCA08

METHOD SUMMARY: Prior to analysis the pads in the aluminium foil are placed in a drying oven and dried overnight at 45 C. Combustion of the sample occurs in pure oxygen under static conditions in an excess of oxygen at about 950 C. Detection of carbon is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	63.3 μg/l	Oct 1987-Present

FIELD METHOD NO.: PCNF09

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). A known volume of water is filtered using a Gelman filter and a precombusted (muffled) 2.5 cm diameter GF/F filter pad. The filter pad is folded in half inward, wrapped in aluminium foil and frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, precombusted (550 C for one hour), 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.11. MDE/EPC Variable: Particulate Nitrogen

MDE/EPC ABBREVIATION: *PN*

ANALYTICAL METHOD NO.: PNA09

METHOD SUMMARY: Prior to analysis the pads in the aluminium foil are placed in a drying oven and dried overnight at 45 C. Combustion of the sample occurs in pure oxygen under static conditions. Detection of nitrogen is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	10.5 μg/l	Oct 1987-Present

FIELD METHOD NO.: PCNF09

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a precombusted (muffled) 2.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil and frozen

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, precombusted (550 C for one hour), 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.12. MDE/EPC Variable: Particulate Phosphorus

MDE/EPC ABBREVIATION: *PP*

ANALYTICAL METHOD NO.: PPA10

METHOD SUMMARY: The sample is dried at 50 C overnight, muffled at 550 C for 1.5 hours and cooled. Phosphate is extracted using 1N HCl and the "phosphomolybdenum blue" complex read colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Aspila, I., H. Agemian and A.S.Y. Chau.** 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst. 101: 187-197.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	1.2 μg/l	Oct 1987-Present

FIELD METHOD NO.: PPCHF10

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward, wrapped in aluminum foil and frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.13. MDE/EPC Variable: Total Chlorophyll-a

MDE/EPC ABBREVIATION: *CHLa TOTAL*

ANALYTICAL METHOD NO.: CHTOTA11

METHOD SUMMARY: Prior to analysis, the filter pads are thawed and chlorophyll-a extracted overnight in 10 ml of 90% acetone. The sample is read flourometrically.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: PPCHF10

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward, wrapped in aluminum foil and frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.14. MDE/EPC Variable: Active Chlorophyll-a

MDE/EPC ABBREVIATION: ***CHLa ACTIVE***

ANALYTICAL METHOD NO.: CHACTA12

METHOD SUMMARY: The total chlorophyll-a sample is acidified and measured flourometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidfication from the total chlorophyll-a value.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: PPCHF10

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward, wrapped in aluminum foil and frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.2.15. MDE/EPC Variable: Seston

MDE/EPC ABBREVIATION: ***SESTON***

ANALYTICAL METHOD NO.: TSSA13

METHOD SUMMARY: A known volume of water is filtered through pre-weighed filter pads. Filters are dried for one hour at 103 - 105 C and weighed.

REFERENCES:

(1) **Clesceri, L.S., A.E. Greenberg and R.R. Trussell (Editors).** 1989. Standard methods for the examination of water and waste water. Method 208D. Am. Public Health Assoc., Washington, DC. 1268p.

REPORTED UNITS: milligrams per liter (mg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	1.50 mg/l	May 1985-Present

FIELD METHOD NO.: TSSF11

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: A water sample of surface (between zero and one meter of surface) and bottom (within one meter of bottom) is collected using a submersible pump (see above). This is filtered using a Gelman filter and a preweighed 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward, wrapped in aluminum foil and frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, dried, preweighed, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen < - 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.3. Method Codes for Sediment Profiles (SONE): Vertical sediment profiles of Eh and surficial sediment characteristics at SONE stations.

FILENAME: SEDPRFxx

B-1.3.1. MDE/EPC Variable: Eh

MDE/EPC ABBREVIATION: ***Eh MEAS***

ANALYTICAL METHOD NO.: EHA14

COLLECTION DEVICE: Corning Eh meter

SAMPLE COLLECTION: Eh is measured using a calomel reference electrode and a platinum electrodes. Eh is a measure of the chemical environment (oxidizing or reducing) at a specific depth in the sediment column measured relative to the calomel electrode. Both electrodes are calibrated using Zobel's solution and are inserted into the water overlying the sediment core, this measurement is recorded for the overlying water. The calomel electrode is left in the overlying water while the platinum electrode is inserted in holes in the side of the Plexiglass liner and readings are taken at one centimeter intervals to a depth of ten centimeters. The platinum electrode is etched in Zobel's solution for three minutes between readings.

REPORTED UNITS: millivolts (mV)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	± 50mV	July 1984-Present

REFERENCES:

(1) **Twilley, Robert.** Pers. comm. University of Southern Louisiana, Lafayette, LA 70504.

FIELD METHOD NO.: EHF12

COLLECTION DEVICE: An intact sediment core is obtained using a Bouma box corer. A special Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm) is used which has holes drilled one centimeter apart on one of the narrow sides. The liner has a Plexiglass bottom plate (1.2 cm thick) with a foam gasket ensuring a water tight seal.

SAMPLE COLLECTION: After removal of the box corer, the level of sediment is adjusted so that the sediment surface is level with one of the holes in the liner. The platinum electrode is inserted into these holes to obtain a measurement.

REFERENCES:

(1) **Twilley, Robert.** Pers. comm. University of Southern Louisiana, Lafayette, LA 70504.

B-1.3.2. MDE/EPC Variable: Surficial Sediment Particulate Carbon

MDE/EPC ABBREVIATION: *SED PC*

ANALYTICAL METHOD NO.: SDPCA15

METHOD SUMMARY: A known weight of dried sediment (approximately 10 mg) is placed in an aluminium capsule. Combustion of the sample occurs in pure oxygen under static conditions in an excess of oxygen at about 950 C. Dectection of carbon is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: grams carbon per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.13%	July 1984-Present

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment column contained within the Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of the sediment column. The surfical sediment sample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.3.3. MDE/EPC Variable: Surficial Sediment Particulate Nitrogen

MDE/EPC ABBREVIATION: *SED PN*

ANALYTICAL METHOD NO.: SDPN16

METHOD SUMMARY: A known weight of dried sediment (approximately 10 mg) is placed in an aluminium capsule. Combustion of the sample occurs in pure oxygen under static conditions. Dectection of nitrogen is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: grams nitrogen per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.008%	July 1984-Present

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); a bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment column contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of the sediment column. The surfical sediment sample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.3.4. MDE/EPC Variable: Surficial Sediment Particulate Phosphorus

MDE/EPC ABBREVIATION: ***SED PP***

ANALYTICAL METHOD NO.: SDPP17

METHOD SUMMARY: A known weight of dried sediment (50-200 mg) is placed in a muffle furnace at 550 C for 1.5 hours. The sediment is ground in a crucible and phosphorus extracted using 1N HCl. After adding reagents the "phosphomolybdenum blue" complex is read colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Aspila, I., H. Agemian and A.S.Y. Chau.** 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst. 101:187-197.

REPORTED UNITS: grams phosphorus per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.0030%	Jan 1990-Present

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment column contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of the sediment column. The surfical sediment sample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen < -20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.3.5. MDE/EPC Variable: Surficial Sediment Particulate Total Chlorophyll-a

MDE/EPC ABBREVIATION: ***SED CHLa TOTAL***

ANALYTICAL METHOD NO.: SDCHTA18

METHOD SUMMARY: Prior to analysis, the sample is thawed and chlorophyll-a extracted overnight in 40 ml of 90% acetone. The sample is read flourometrically.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: milligrams per square meter (mg/m^2)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment column contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of the sediment column. The surfical sediment sample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.3.6. MDE/EPC Variable: Surficial Sediment Particulate Active Chlorophyll-a

MDE/EPC ABBREVIATION: ***SED CHLa ACTIVE***

ANALYTICAL METHOD NO.: SDCHAA19

METHOD SUMMARY: The total chlorophyll-a sample is acidified and measured flourometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidification from the total chlorophyll-a value.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: milligrams per square meter (mg/m^2)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment column contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of the sediment column. The surfical sediment sample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4. Method Codes for Core Profiles (SONE): Vertical Profiles of percentage H_2O, particulates and pore water nutrients at SONE stations.

FILENAME: CORPRFxx

B-1.4.1. MDE/EPC Variable: Percent water

MDE/EPC ABBREVIATION: ***H2O %***

ANALYTICAL METHOD NO.: H2OPA20

METHOD SUMMARY: A frozen sediment sample is weighed and the weight recorded. The sample is dried in the oven at 60 C for 48 hours and placed in a desicator to prevent weight gain. The sample is then reweighed. Percent water is calculated by subtracting the value recorded for the oven dried sample from the value recorded for the frozen sample.

REFERENCES:

(1) **EPC Group.** Chesapeake Biological Laboratory, Box 38, Solomons, MD 20688.

REPORTED UNITS: percentage (%)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	100%	0.1%	July 1984-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted . A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **EPC Group.** Chesapeake Biological Laboratory, Box 38, Solomons, MD 20688.

B-1.4.2. MDE/EPC Variable: Sediment Particulate Carbon

MDE/EPC ABBREVIATION: ***SED PC***

ANALYTICAL METHOD NO.: SDPCA15

METHOD SUMMARY: A known weight of dried sediment (approximately 10 mg) is placed in an aluminium capsule. Combustion of the sample occurs in pure oxygen under static conditions in an excess of oxygen at about 950 C. Dectection of carbon is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: grams carbon per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.13%	July 1984-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.3. MDE/EPC Variable: Sediment Particulate Nitrogen

MDE/EPC ABBREVIATION: ***SED PN***

ANALYTICAL METHOD NO.: SDPN16

METHOD SUMMARY: A known weight of dried sediment (approximately 10 mg) is placed in an aluminium capsule. Combustion of the sample occurs in pure oxygen under static conditions. Dectection of nitrogen is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: grams nitrogen per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.008%	July 1984-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.4. MDE/EPC Variable: Sediment Particulate Phosphorus

MDE/EPC ABBREVIATION: ***SED PP***

ANALYTICAL METHOD NO.: SDPP17

METHOD SUMMARY: A known weight of dried sediment (50-200 mg) is placed in a muffle furnace at 550 C for 1.5 hours. The sediment is ground in a crucible and phosphorus extracted using 1N HCl. After adding reagents the "phosphomolybdenum blue" complex is read colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Aspila, I., H. Agemian and A.S.Y. Chau.** 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst. 101:187-197.

REPORTED UNITS: grams phosphorus per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.5. MDE/EPC Variable: Ammonium

MDE/EPC ABBREVIATION: *NH4*

ANALYTICAL METHOD NO.: SNH4A21

METHOD SUMMARY: The sample is placed in a centrifuge tube and thawed. The sample is then spun and the water decanted and the volume measured. The water is filtered using a Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter and stored frozen in AA vials until analysis.

The ammonium in a filtered water sample reacts with alkaline phenol and hypochlorite to form indophenol blue which is proportional to the ammonium concentration present. The color is intensified by the addition of sodium nitroprusside and measured colorimetrically at 630 nm, using the Auto-Analyzer II.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Technicon Industrial Systems.** 1978. Ammonia in water and seawater. Technicon Industrial Method No. 154-71W/B. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
and: **United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Method 350.1. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.
(2) **Clesceri, L.S., A.E. Greenberg and R.R. Trussell (Editors).** 1989. Standard methods for the examination of water and waste water. Am. Public Health Assoc., Am. Water Works Assoc. and Water Pollution Control Federation. Washington, DC. (Section: 4500-NH_3 H. Automated Phenate Method.)

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.21μM	Oct 1987-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.6. MDE/EPC Variable: Nitrite

MDE/EPC ABBREVIATION: *NO2*

ANALYTICAL METHOD NO.: SNO2A22

METHOD SUMMARY: The sample is placed in a centrifuge tube and thawed. The sample is then spun and the water decanted and the volume measured. The water is filtered using a Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter and stored frozen in AA vials until analysis.

Nitrite in a filtered water sample is determined by diaotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colorimetrically at 550 nm using the Auto-Analyzer II.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
and: **United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.01μM	Oct 1987-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.7. MDE/EPC Variable: Nitrite plus nitrate

MDE/EPC ABBREVIATION: *NO2+NO3*

ANALYTICAL METHOD NO.: SNO23A23

METHOD SUMMARY: The sample is placed in a centrifuge tube and thawed. The sample is then spun and the water decanted and the volume measured. The water is filtered using a Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter and stored frozen in AA vials until analysis.

Filtered samples are passed through a granulated copper cadmium column to reduce nitrate to nitrite. The nitrite (originally present plus the reduced nitrate) is then determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colorimetrically using the Auto-Analyzer II. Nitrate is obtained by subtracting NO_2 values from NO_2 + NO_3.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
and: **United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Method #353.2. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.01μM	Oct 1987-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by

33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.8. MDE/EPC Variable: Dissolved Inorganic Phosphorus

MDE/EPC ABBREVIATION: ***DIP***

ANALYTICAL METHOD NO.: SDIPA24

METHOD SUMMARY: The sample is placed in a centrifuge tube and thawed. The sample is then spun and the water decanted and the volume measured. The water is filtered using a Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter and stored frozen in AA vials until analysis.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Technicon Industrial Systems.** 1973. Ortho phosphate in water and seawater. Technicon Industrial Method No. 155-71W/Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.6.
and: **United States Environmental Protection Agency.** 1979. Methods for chemical analysis of water and wastes. Method #365.1. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.02μM	May 1985-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into the sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted from the microcosm. A one centimeter sediment sample is slowly extruded and placed in a pre-weighed eight

centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.4.9. MDE/EPC Variable: Silicate (Siliceous Acid)

MDE/EPC ABBREVIATION: *SI(OH)4*

ANALYTICAL METHOD NO.: SSLCA25

METHOD SUMMARY: The sample is placed in a centrifuge tube and thawed. The sample is then spun and the water decanted and the volume measured. The water is filtered using a Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter and stored frozen in AA vials until analysis.

The reaction is based on the reduction of silicomolybdate in acidic solution to "molybdenum blue" by ascorbic acid. Oxalic acid is added to eliminate interference from phosphates. The silicomolybdate complex is measured colorimetrically at 660 nm, using the Auto-Analyzer II.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7 μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Technicon Industrial Systems.** 1977. Silicates in water and seawater. Technicon Industrial Method No. 186-72W/B. Technicon Industrial Systems, Terrytown, NY. 10591. p.2.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.21μM	May 1985-Present

FIELD METHOD NO.: CRPRF14

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A sub-core is taken by very slowly inserting a PVC pipe into an intact sediment column which was collected using the Bouma box corer. A rubber stopper is fitted to the open end and the sub-core extracted. A one centimeter

sediment sample is slowly extruded and placed in a pre-weighed eight centimeter diameter petri dish. Additional one centimeter sediment slices are extruded to a depth of ten centimeters. The samples are frozen until analysis.

SAMPLE PRESERVATION: Frozen -20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.5. Method Codes for Core Data (SONE): Dissolved nutrient and oxygen concentration in SONE sediment-water flux chamber.

FILENAME: CORDATxx

B-1.5.1. MDE/EPC Variable: Dissolved Oxygen

MDE/EPC ABBREVIATION: *DO*

ANALYTICAL METHOD NO.: CDDOA26

METHOD SUMMARY: Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. Oxygen concentrations in the water overlying sediment cores are recorded every 30 to 60 minutes, depending on the rate of oxygen uptake.

REFERENCES:

(1) **Instruction Manual for Oxygen Measuring System Model 2610.** Undated. Orbisphere Laboratories, 70 Kinderkamac Road, Emerson, NJ 07630.

REPORTED UNITS: milligrams per liter (mg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	20 mg/l	± 0.05 mg/l	May1985-Present

FIELD METHOD NO.: CDDOF15

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the overlying core water and the water in the blank chamber is replaced by fresh bottom water to ensure that water quality conditions in the cores closely approximate in situ conditions. The three core together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted

(Figure B-1) and the cores are allowed to stabilize prior to sampling for about 20-40 minutes.

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

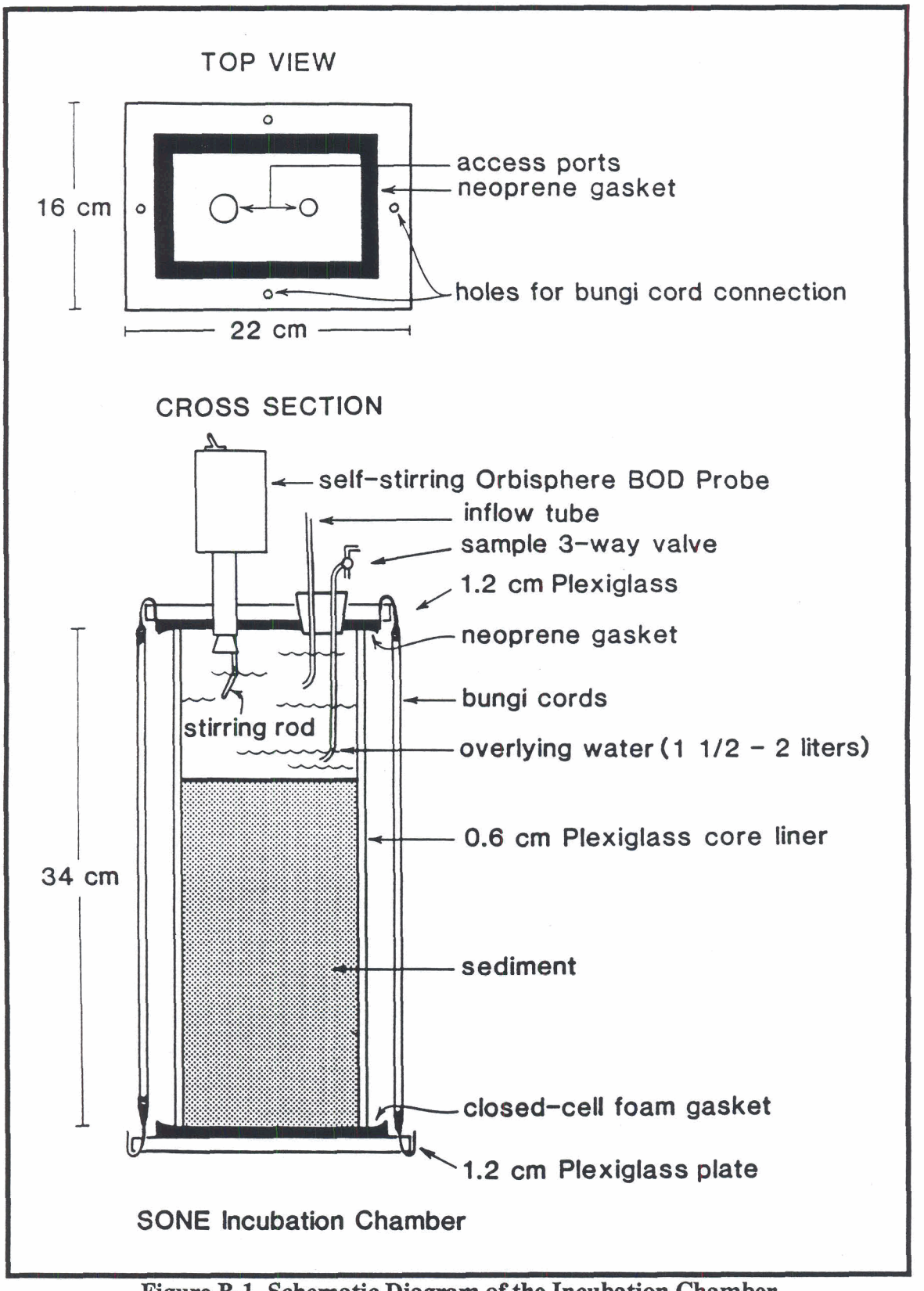

Figure B-1. Schematic Diagram of the Incubation Chamber

B-1.5.2. MDE/EPC Variable: Ammonium

MDE/EPC ABBREVIATION: *NH4*

ANALYTICAL METHOD NO.: NH4A01

METHOD SUMMARY: The ammonium in a filtered water sample reacts with alkaline phenol and hypochlorite to form indophenol blue which is proportional to the ammonium concentration present. The color is intenstified by the addition of sodium nitroprusside and measured colorimetrically at 630 nm, using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial Systems.** 1978. Ammonia in water and seawater. Technicon Industrial Method No. 154-71W/B. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
and: **United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Method 350.1. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.
(2) **Clesceri, L.S., A.E. Greenberg and R.R. Trussell (Editors).** 1989. Standard methods for the examination of water and waste water. Am. Public Health Assoc., Am. Water Works Assoc. and Water Pollution Control Federation. Washington, DC. (Section: 4500-NH_3 H. Automated Phenate Method.)

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.21μM	Oct 1987-Present

FIELD METHOD NO.: CDNTF16

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and

bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the overlying core water and the water in the blank chamber is replaced by fresh bottom water to ensure that water quality conditions in the cores closely approximate in situ conditions.

The three cores together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted (Figure B-1) and the cores are allowed to stabilize for about 20-40 minutes prior to sampling. Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. A total of five water samples are extracted from the core at 30 to 60 minutes intervals during the 2-5 hour incubation period. Water samples are filtered using Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filters and collected in Auto-Analyzer (AA) vials and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.5.3. MDE/EPC Variable: Nitrite

MDE/EPC ABBREVIATION: *NO2*

ANALYTICAL METHOD NO.: NO2A02

METHOD SUMMARY: Nitrite in a filtered water sample is determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colorimetrically at 550 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
***and*: United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
***as modified by:* D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DETECTION LIMIT:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.01 μM	Oct 1987-Present

FIELD METHOD NO.: CDNTF16

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the overlying core water and the water in the blank chamber is replaced by fresh bottom

water to ensure that water quality conditions in the cores closely approximate in situ conditions.

The three cores together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted (Figure B-1) and the cores are allowed to stabilize for about 20-40 minutes prior to sampling. Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. A total of five water samples are extracted from the core at 30 to 60 minutes intervals during the 2-5 hour incubation period. Water samples are filtered using Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filters and collected in Auto-Analyzer (AA) vials and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.5.4. MDE/EPC Variable: Nitrite plus nitrate

MDE/EPC ABBREVIATION: *NO2+NO3*

ANALYTICAL METHOD NO.: NO23A03

METHODS SUMMARY: Filtered samples are passed through a granulated copper cadmium column to reduce nitrate to nitrite. The nitrite (originally present plus reduced nitrite) is then determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a reddish purple azo dye which is then measured colorimetrically using the Auto-Analyzer II. Nitrate is obtained by subtracting NO_2 values from $NO_2 + NO_3$.

REFERENCES:

(1) **Technicon Industrial System.** 1977. Nitrate and nitrite in water and seawater. Technicon Industrial Method No. 158-71W/A Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.4.
and: **United States Environmental Protection Agency.** 1979. Methods of chemical analysis of water and wastes. Method #353.2. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.01μM	Oct 1987-Present

FIELD METHOD NO.: CDNT16

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the

overlying core water and the water in the blank chamber is replaced by fresh bottom water to ensure that water quality conditions in the cores closely approximate in situ conditions.

The three cores together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted (Figure B-1) and the cores are allowed to stabilize for about 20-40 minutes prior to sampling. Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. A total of five water samples are extracted from the core at 30 to 60 minutes intervals during the 2-5 hour incubation period. Water samples are filtered using Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filters and collected in Auto-Analyzer (AA) vials and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.5.5. MDE/EPC Variable: Dissolved Inorganic Phosphorus

MDE/EPC ABBREVIATION: ***DIP***

ANALYTICAL METHOD NO.: DIPA05

METHOD SUMMARY: A filtered water sample is reacted with ammonium molybdate and antimony potassium tartrate in an acid medium to form an antimony-phosphomolybdate complex which is reduced to an intensely blue colored complex by ascorbic acid. The sample is measured colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial Systems.** 1973. Ortho phosphate in water and seawater. Technicon Industrial Method No. 155-71W/Tentative. Technicon Industrial Systems, Tarrytown, NY 10591. p.6.
and: **United States Environmental Protection Agency.** 1979. Methods for chemical analysis of water and wastes. Method #365.1. Off. Res. Devel. Cincinnati, OH. EPA-600/4-79-020.
as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.02μM	May 1985-Present

FIELD METHOD NO.: CDNTF16

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the overlying core water and the water in the blank chamber is replaced by fresh bottom

water to ensure that water quality conditions in the cores closely approximate in situ conditions.

The three cores together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted (Figure B-1) and the cores are allowed to stabilize for about 20-40 minutes prior to sampling. Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. A total of five water samples are extracted from the core at 30 to 60 minutes intervals during the 2-5 hour incubation period. Water samples are filtered using Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filters and collected in Auto-Analyzer (AA) vials and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.5.6. MDE/EPC Variable: Silicate (Siliceous Acid)

MDE/EPC ABBREVIATION: *SI(OH)4*

ANALYTICAL METHOD NO.: SIOH4A07

METHOD SUMMARY: The reaction is based on the reduction of silicomolybdate in acidic solution to "molybdenum blue" by ascorbic acid. Oxalic acid is added to eliminate interference from phosphates. The silicomolybdate complex is measured colorimetrically at 660 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Technicon Industrial Systems.** 1977. Silicates in water and seawater. Technicon Industrial Method No. 186-72W/B. Technicon Industrial Systems, Terrytown, NY. 10591. p.2.

as modified by: **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.2 μM	May 1985-Present

FIELD METHOD NO.: CDNTF16

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the overlying core water and the water in the blank chamber is replaced by fresh bottom water to ensure that water quality conditions in the cores closely approximate in situ conditions.

The three cores together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted (Figure B-1) and the cores are allowed to stabilize for about 20-40 minutes prior to sampling. Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. A total of five water samples are extracted from the core at 30 to 60 minutes intervals during the 2-5 hour incubation period. Water samples are filtered using Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filters and collected in Auto-Analyzer (AA) vials and immediately frozen.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

SAMPLE PRESERVATION: Darkened holding incubator filled with bottom water

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.5.7. MDE/EPC Variable: Hydrogen Sulfide

MDE/EPC ABBREVIATION: *H2S*

ANALYTICAL METHOD NO.: CDH2SA27

METHOD SUMMARY: Hydrogen sulfide in a filtered water sample (from SONE chambers only) is determined by a reaction with Pachmeyer reagents and measured colorimetrically at 670 nm using a Milton Roy Spec 20 or a Shimadzu UV 120-02 spectrophotometer.

REFERENCES:

(1) **Truper, H.G. and H.G. Schlegel.** 1964. Sulfur metabolism and Phiorhoclacea. 1. Antonie van Leeuwenhoek. J. Microbio. Serol. 30: 225-238.

REPORTED UNITS: micromolar (μM)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: CDNTF16

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: Three intact sediments cores are obtained at each SONE station using a modified Bouma box corer. After deployment and retrieval of the box corer, the Plexiglass liner containing the sediment sample is removed and visually inspected for disturbance. The sediment fills slightly more than half the volume of the chamber, the remaining top half being filled with in situ bottom water. An additional blank SONE chamber is also filled with bottom water (no sediment). The top and bottom of the chambers are sealed and the chambers placed in a darkened water-filled holding incubator to maintain ambient temperature. Just prior to incubation the overlying core water and the water in the blank chamber is replaced by fresh bottom water to ensure that water quality conditions in the cores closely approximate in situ conditions.

The three cores together with the blank are transferred to a circulating, temperature controlled water bath. Oxygen probes and sample tubes are inserted (Figure B-1) and the cores are allowed to stabilize for about 20-40 minutes prior to sampling. Gentle circulation of water with no sediment resuspension is maintained in the cores during the measurement period via the stirring devices attached to the Orbisphere oxygen probes. A total of five water samples are extracted from the core at 30 to 60 minutes

intervals during the 2-5 hour incubation period. Nine milliliter samples are filtered using Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pads. One-half milliliter of each Pacmeyer reagent is added, sample is held for 15 minutes and read on a spectrophotometer at 670 nm.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: None, samples are analyzed immediately.

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.6. Method Codes for Water Column Profiles (VFX): Vertical profiles of temperature, salinity, dissolved oxygen and particulates at VFX stations.

FILENAME: VFXPRFxx

B-1.6.1. MDE/EPC Variable: Total Depth

MDE/EPC ABBREVIATION: ***TOTAL DEPTH***

FIELD METHOD NO: TOTDF01

COLLECTION DEVICE: Research Vessel Fathometer (Raytheon V800)

SAMPLE COLLECTION: The electronic signal of the Fathometer is directed to the bottom and the echo from that signal is recorded in units of either feet or meters.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	995 m	± 0.3 m	July 1984-Present

REFERENCES:

(1) **Research Fleet Operations**, CEES, Box 38, Solomons, MD 20688.

B-1.6.2. MDE/EPC Variable: Secchi Depth

MDE/EPC ABBREVIATION: ***SECCHI DEPTH***

FIELD METHOD NO: SECCIF02

COLLECTION DEVICE: Secchi Disk

SAMPLE COLLECTION: A secchi disk measuring 25.5 cm diameter is used. The upper surface is divided into four equal quadrants and are colored so that the two quadrants opposite each other are black and the intervening ones are white.

Readings with the secchi disk are made in situ on the shaded side of the boat without the aid of sunglasses. The secchi disk is lowered into the water and the depth at which it disappears is recorded.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	$\approx$ 10 m	$\pm$ 0.1 m	July 1984-Present

REFERENCES:

(1) **Tyler, John.** 1968. The secchi disk. Limnol. Oceanogr. 13(1): 1-6.

B-1.6.3 MDE/EPC Variable: Sample Depth

MDE/EPC ABBREVIATION: ***SAMPLE DEPTH***

FIELD METHOD NO: SAMDF03

COLLECTION DEVICE: Research Vessel Meter Block

SAMPLE COLLECTION: The cable meter is a single purchase block equipped with a digital readout which indicates the length of sampling wire deployed.

REPORTED UNITS: meters (m)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	≈ 100 m	± 0.3 m	July 1984-Present

REFERENCES:

(1) **Research Fleet Operations**, CEES, Box 38, Solomons, MD 20688.

B-1.6.4. MDE/EPC Variable: Temperature

MDE/EPC ABBREVIATION: ***TEMP***

FIELD METHOD NO: TEMPF04

COLLECTION DEVICE: Beckman Induction Salinometer
Hydrolab 4000
Hydrolab Surveyor II
Yelllow Springs Instrument (YSI)
Models 33, 57 - Precision Thermistor

SAMPLE COLLECTION: Thermistor is directly exposed to the water it is measuring (in situ). Sample water is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: centigrade (C)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	45 C	± 0.1 C	July 1984-Present

REFERENCES:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instructions for YSI Model 33 and 33M S-C-T Meters.** 1983. Scientific Division, Yellow Springs Instrument Co., Inc. Yellow Springs, OH 45387.
(4) **Instrument Manual YSI Model 57 Dissolved Oxygen Meter.** 1974. Yellow Springs Instrument Co. Yellow Springs, OH 45387.

B-1.6.5. MDE/EPC Variable: Conductivity

MDE/EPC ABBREVIATION: *COND*

FIELD METHOD NO: CONDF05

COLLECTION DEVICE: Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Model 33

Hydrolab 4000 and Surveyor II: A four electrode technique for measuring resistance between electrodes.
YSI Model 33: Platinized pure nickel electrode measuring resistance between electrodes.

SAMPLE COLLECTION: Electrodes are directly exposed to the sample water which is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: millimhos per centimeter (mmho/cm)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	150mmho/cm	0.1mmho/cm	July 1984-Present

REFERENCES:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instructions for YSI Model 33 and 33M S-C-T Meters.** 1983. Scientific Division, Yellow Springs Instrument Co., Inc. Yellow Springs, OH 45387.
(4) **Instrument Manual YSI Model 57 Dissolved Oxygen Meter.** (1974). Yellow Springs Instrument Co. Yellow Springs, OH 45387.

B-1.6.6. MDE/EPC Variable: Salinity

MDE/EPC ABBREVIATION: *SALIN*

FIELD METHOD NO: SALNF06

COLLECTION DEVICE: Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Model 33
Conductivity Cell
Beckman Induction Salinometer

SAMPLE COLLECTION: Measurement of salinity (based on conductivity) manually or automatically compensating for temperature. Probe is directly exposed to sample water. Sample water is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: parts per thousand (ppt)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	40ppt	± 0.5ppt	July 1984-Present

REFERENCES:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.

(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.

(3) **Instructions for YSI Model 33 and 33M S-C-T Meters.** 1983. Scientific Division, Yellow Springs Instrument Co., Inc. Yellow Springs, OH 45387.

B-1.6.7. MDE/EPC Variable: Dissolved Oxygen

MDE/EPC ABBREVIATION: *DO*

FIELD METHOD NO: DOF07

COLLECTION DEVICE: Hydrolab 4000
Hydrolab Surveyor II
Yellow Springs Instrument (YSI) Models 57 and 58
Orbisphere Oxygen Meter

Orbisphere: Clark type polarigraphic electrode (gold cathode and platinum annode).
Others: Clark type polarigraphic electrode (gold cathode and silver annode).

SAMPLE COLLECTION: A current proportional to the partial pressure of dissolved oxygen in the sample, is recorded and converted to units of milligrams per liter. The oxygen probe is directly exposed to the sample water, which is supplied using a Gould deep well submersible pump with a flow rate of 40 liters per minute.

REPORTED UNITS: milligrams per liter (mg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	20 mg/l	± 0.3 mg/l	July 1984-Present

REFERENCES:

(1) **Operation and Maintenance Instructions, Hydrolab 4000.** 1981. Hydrolab Corporation, Austin, TX 78727.
(2) **Surveyor II Operating Manual (and Performance Manual).** 1985. Hydrolab Corporation, Austin, TX 78727.
(3) **Instrument Manual YSI Model 57 Dissolved Oxygen Meter.** 1974. Yellow Springs Instrument Co. Yellow Springs, OH 45387.
(4) **Instruction Manual for Oxygen Measuring System Model 2610.** Undated. Orbisphere Laboratories, 70 Kinderkamac Road, Emerson, NJ 07630.

B-1.6.8. MDE/EPC Variable: Particulate Carbon

MDE/EPC ABBREVIATION: *PC*

ANALYTICAL METHOD NO: PCA08

METHOD SUMMARY: Prior to analysis the pads in the aluminium foil are placed in a drying oven and dried overnight at 45 C. Combustion of the sample occurs in pure oxygen under static conditions in an excess of oxygen at about 950 C. Detection of carbon is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	63.3 μg/l	Oct 1987-Present

FIELD METHOD NO: SEDNF17

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the sediment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a submersible pump (see above). A known volume of water is filtered using a Gelman filter and a precombusted (muffled) 2.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, precombusted (550 C for one hour), 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.6.9. MDE/EPC Variable: Particulate Nitrogen

MDE/EPC ABBREVIATION: *PN*

ANALYTICAL METHOD NO: PNA09

METHOD SUMMARY: Prior to analysis the pads in the aluminium foil are placed in a drying oven and dried overnight at 45 C. Combustion of the sample occurs in pure oxygen under static conditions. Detection of nitrogen is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyser.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.
(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	10.5 μg/l	Oct 1987-Present

FIELD METHOD NO: SEDNF17

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the sediment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a submersible pump (see above). A known volume of water is filtered using a Gelman filter and a precombusted (muffled) 2.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, precombusted (550 C for one hour), 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.6.10. MDE/EPC Variable: Particulate Phosphorus

MDE/EPC ABBREVIATION: ***PP***

ANALYTICAL METHOD NO: PPA10

METHOD SUMMARY: The sample is dried at 50 C overnight, muffled at 550 C for 1.5 hours and cooled. Phosphate is extracted using 1N HCl and the "phospho-molybdenum blue" complex read colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Aspila, I., H. Agemian and A.S.Y. Chau.** (1976). A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst. 101:187-197.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	1.2 μg/l	Oct 1987-Present

FIELD METHOD NO: SEDPF18

COLLECTION DEVICE: Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the seiment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a submersible pump (see above). A known volume of water is filtered using a Gelman filter and a untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.6.11. MDE/EPC Variable: Total Chlorophyll-a

MDE/EPC ABBREVIATION: *CHLa TOTAL*

ANALYTICAL METHOD NO: CHTOTA11

METHOD SUMMARY: Prior to analysis, the filter pads are thawed and chlorophyll-a extracted overnight in 10 ml of 90% acetone and read flourometrically.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	Not Available	

FIELD METHOD NO: SEDPF18

COLLECTION DEVICE : Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the sediment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a submersible pump (see above). A known volume of water is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.6.12. MDE/EPC Variable: Active Chlorophyll-a

MDE/EPC ABBREVIATION: ***CHLa ACTIVE***

ANALYTICAL METHOD NO: CHACTA12

METHOD SUMMARY: The total chlorophyll-a sample is acidified and measured flourometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidification from the total chlorophyll-a value.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	Not available	

FIELD METHOD NO: SEDPF18

COLLECTION DEVICE : Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the sediment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a submersible pump (see above). A known volume of water is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.6.13. MDE/EPC Variable: Seston

MDE/EPC ABBREVIATION: *SESTON*

ANALYTICAL METHOD NO: TSSA13

METHOD SUMMARY: A known volume of water is filtered through pre-weighed filter pads. Filters are dried for one hour at 103-105 C and weighed.

REFERENCES:

(1) **Clesceri, L.S., A.E. Greenberg and R.R. Trussell (Editors).** 1989. Standard methods for the examination of water and waste water. Method 208D. Am. Public Health Assoc., Washington, DC. 1268p.

REPORTED UNITS: milligrams per liter (mg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	1.50 mg/l	May 1985-Present

FIELD METHOD NO.: SEDTSS19

COLLECTION DEVICE : Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the sediment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a high volumn submersible pump (see above). A known volume of water is filtered using a Gelman filter and a preweighed 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, dried, preweighed, 0.7μm glass fiber filter pad.

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES] CBL Ref. No. 89-050. p.25.

B-1.6.14. MDE/EPC Variable: Biogenic Silica

MDE/EPC ABBREVIATION: *B Si*

ANALYTICAL METHOD NO: BSIA28

METHOD SUMMARY: The sample is treated with NaOH, digested at 100 C for 20 minutes and neutralized with H_2SO_4.

The reaction is based on the reduction of silicomolybdate in acidic solution to "molybdenum blue" by ascorbic acid. Oxalic acid is added to eliminate interference from phosphates. The silicomolybdate complex is measured colorimetrically at 660 nm, using the Auto-Analyzer II.

REFERENCES:

(1) **Paasche, E.** 1973. Silicon and the ecology of marine plankton diatoms. I. *Thalassiosira psuedonana (Cyclotella nana)* grown in a chemostat with silicate as limiting nutrient. Mar. Biol. 19:117-126.

(2) **D'Elia C.H., N.L. Kaumeyer, C.W. Keefe, K.V. Wood and C.F. Zimmermann.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms per liter (μg/l)

DETECTION LIMITS:	Upper Limit	Lower Limit	Date Valid
	N/A	Not Available	

FIELD METHOD NO.: SEDBSI20

COLLECTION DEVICE : Gould deep well submersible pump; flow rate is 40 liters per minute.

SAMPLE COLLECTION: Three samples are collected, one at the surface above the level of the sediment trap cups, one at mid-depth above the cups and one near-bottom. The water is collected using a submersible pump (see above). A known volume of water is filtered using a nuclepore polycarbonate (PC) membrane filter. The filter is stored in a numbered 50 ml polpropylene centrifuge tube, which has been presoaked in 5% NaOH, rinsed and dried. The tube is capped and the sample frozen.

FILTER TYPE/PORE SIZE: Nuclepore polycarbonate (PC) membrane filter, 47mm diameter, pore size 1 micron (μ).

SAMPLE PRESEVATION: Frozen <- 20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.7. Method Codes for Surficial Sediment Particulates (VFX): Concentration of particulate carbon, nitrogen, phosphorus and chlorophyll-a in the surface sediment at VFX stations.

FILENAME: VFXSEDxx

B-1.7.1. MDE/EPC Variable: Surficial Sediment Particulate Carbon

MDE/EPC ABBREVIATION: ***SED PC***

ANALYTICAL METHOD NO.: SDPCA15

METHOD SUMMARY: A known weight of dried sediment (approximately 10 mg) is placed in a aluminium capsule. Combustion of the the sample occurs in pure oxygen under static conditions in an excess of oxygen at about 950 C. Detection of carbon is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.
(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: grams carbon per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.13%	July 1984-Present

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment core contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of two sub-cores. The surfical sediment sample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.7.2. MDE/EPC Variable: Surficial Sediment Particulate Nitrogen

MDE/EPC ABBREVIATION: *SED PN*

ANALYTICAL METHOD NO.: PNA09

METHOD SUMMARY: A known weight of dried sediment (approximately 10 mg) is placed in an aluminium capsule. Combustion of the sample occurs in pure oxygen under static conditions. Detection of nitrogen is by thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: grams nitrogen per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	0.0008%	July 1985-Present

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: A open-ended 50 ml syringe is very slowly inserted into the intact sediment core contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of two sub-cores. The surfical sediment subsample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES] CBL Ref. No. 89-050. p.25.

B-1.7.3. MDE/EPC Variable: Surficial Sediment Particulate Phosphorus

MDE/EPC ABBREVIATION: ***SED PP***

ANALYTICAL METHOD NO.: SDPP17

METHOD SUMMARY: A known weight of dried sediment (50-200 mg) is placed in a muffle furnace at 550 C for 1.5 hours. The sediment is ground in a crucible and phosphorus extracted using 1N HCl. After adding reagents the "phosphomolybdenum blue" complex is read colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Aspila, I., H. Agemian and A.S.Y. Chau.** 1976. A semi-automated method for determination of inorganic, organic and total phosphate in sediments. Analyst. 101:187-197.

REPORTED UNITS: grams phosphorus per 100 grams of dry sediment [% (wt)]

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment core contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of two sub-cores. The surfical sediment subsample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.7.4. MDE/EPC Variable: Surficial Sediment Particulate Total Chlorophyll-a

MDE/EPC ABBREVIATION: ***SED CHLa TOTAL***

ANALYTICAL METHOD NO.: SDCHAA19

METHOD SUMMARY: Prior to analysis, the sample is thawed and chlorophyll-a extracted overnight in 40 ml of 90% acetone. The sample is read flourometrically.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: milligrams per square meter (mg/m^2)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment core contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted. The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of two sub-cores. The surfical sediment subsample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.7.5. MDE/EPC Variable: Surficial Sediment Particulate Active Chlorophyll-a

MDE/EPC ABBREVIATION: ***SED CHLa ACTIVE***

ANALYTICAL METHOD NO.: CHACTA12

METHOD SUMMARY: The total chlorophyll-a sample is acidified and measured flourometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidification from the total chlorophyll-a value.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: milligrams per square meter (mg/m^2)

DETECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: SEDPF13

COLLECTION DEVICE: A sediment core is obtained using a Bouma box corer. The box corer is equipped with a Plexiglass liner (inner dimensions: 8.76 cm by 15.80 cm by 33.95 cm); bottom plate (1.2 cm thick with a foam gasket) within which a sediment sample is contained.

SAMPLE COLLECTION: An open-ended 50 ml syringe is very slowly inserted into the intact sediment core contained within a Plexiglass microcosm, to a depth of 5-6 cms. A stopper is placed on the open end and the sample extracted . The syringe plunger is then inserted in the bottom of the syringe, the stopper removed from the top and the sediment sample slowly extruded to the desired height. Until 9 August 1989 sediments were sampled to a depth of one centimeter. Beginning 9 August 1989 sediment samples were taken from the top two to three millimeters of two sub-cores. The surfical sediment subsample is placed in a centrifuge tube and frozen.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES] CBL Ref. No. 89-050. p.25.

B-1.8. Method Codes for Vertical Flux of Particulates (VFX): Rate of deposition of seston, PC, PN, PP, chlorophyll-a and biogenic silica determined with sediment traps at VFX stations.

FILENAME: VFXDEPxx

B-1.8.1. MDE/EPC Variable: Dilution Volume

MDE/EPC ABBREVIATION: *DILU VOL*

ANALYTICAL METHOD NO.: DVOLA29

METHOD SUMMARY: The total amount of material and water in a sediment trap cup is poured into a graduated cylinder. This volume is then increased to four liters by addition of filtered seawater.

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES] CBL Ref. No. 89-050. p.25.

REPORTED UNITS: liters (l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	50 ml	July 1984-Present

FIELD METHOD NO.: VFXAF21

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

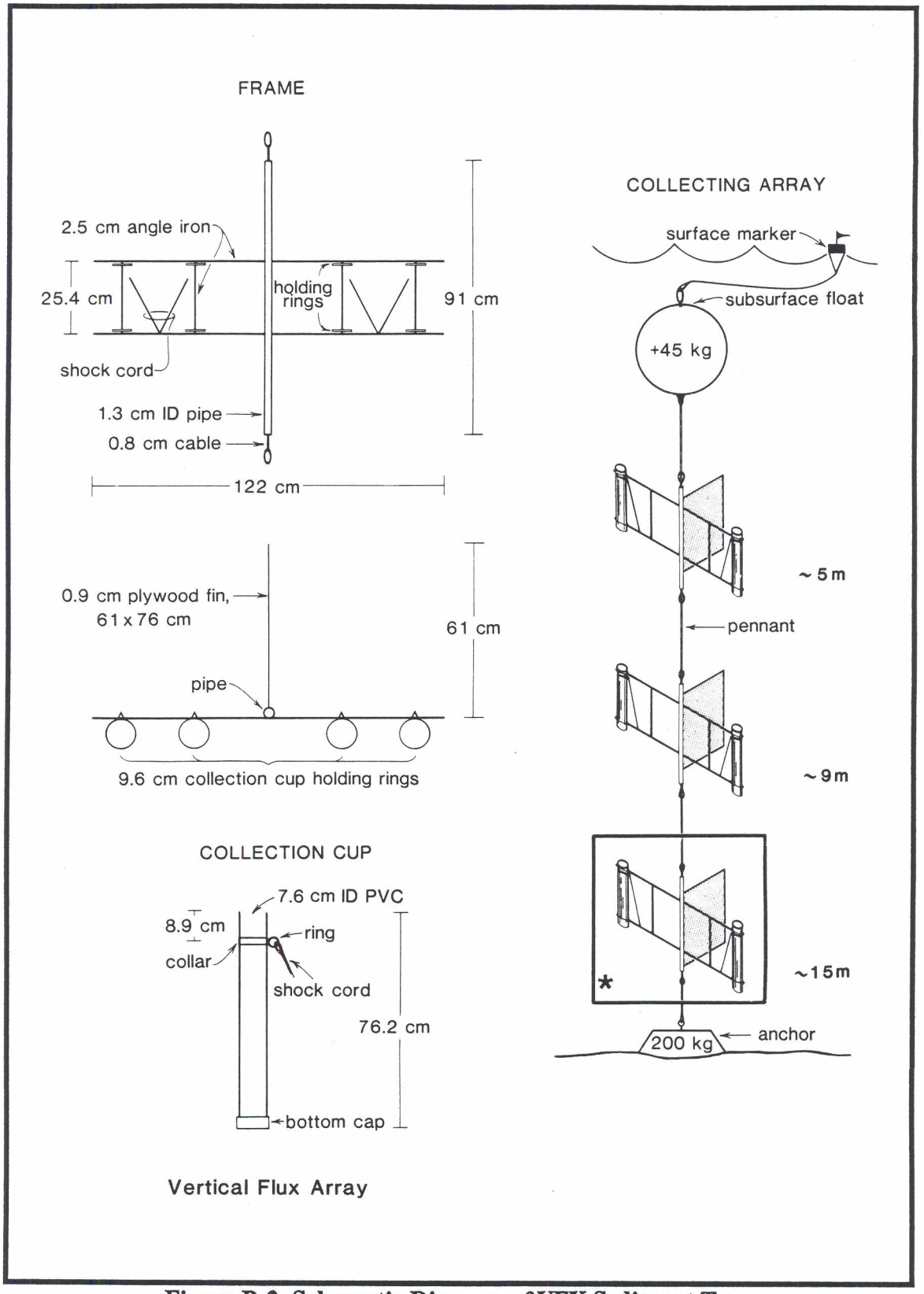

Figure B-2. Schematic Diagram of VFX Sediment Trap

B-1.8.2. MDE/EPC Variable: Particulate Carbon

MDE/EPC ABBREVIATION: *PC*

ANALYTICAL METHOD NO.: PCA08

METHOD SUMMARY: Prior to analysis the pads in the aluminium foil are placed in a drying oven and dried overnight at 45 C. Combustion of the weighed sampled occurs in pure oxygen under static conditions.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.
(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21

REPORTED UNITS: micrograms per liter (μg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	63.3μg/l	Oct 1987-Present

FIELD METHOD NO.: VFXCNF22

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a Gelman filter and precombusted (muffled) 2.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, precombusted (550 C for one hour), 0.7 μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.8.3. MDE/EPC Variable: Particulate Nitrogen

MDE/EPC ABBREVIATION: *PN*

ANALYTICAL METHOD NO.: PNA09

METHOD SUMMARY: Prior to analysis the pads in the aluminium foil are placed in a drying oven overnight at 45 C. Combustion of the weighed sample occurs in pure oxygen under static conditions. Detection of nitrogen thermal conductivity using a Perkin-Elmer 240-XA Elemental Analyzer.

REFERENCES:

(1) **Control Equipment Corporation.** 1986. Operating Manual for Model 240-XA Elemental Analyzer. Lowell, MA.

(2) **D'Elia, C.F., N.L. Kaumeyer, C.W. Keefe, K. V. Wood and C.F. Zimmerman.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21

REPORTED UNITS: micrograms/liter (μg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	10.5 μg/l	Oct 1987-Present

FIELD METHOD NO.: VFXCNF22

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a Gelman filter and a precombusted (muffled) 2.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 2.5 cm diameter, precombusted (550 C for one hour), 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.8.4. MDE/EPC Variable: Particulate Phosphorus

MDE/EPC ABBREVIATION: ***PP***

ANALYTICAL METHOD NO.: PPA10

METHOD SUMMARY: The sample is dried at 50 C overnight, muffled and cooled. Phosphate is extracted using 1N HCl and the "phosphomolybdenum blue" complex read colorimetrically at 880 nm using the Auto-Analyzer II.

REFERENCES:

(1) **Aspila, I., H. Agemian and A.S.Y. Chau.** 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. Analyst. 101:187-197.

REPORTED UNITS: microgram/liter (μg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	1.2 μg/l	Oct 1987-Present

FIELD METHOD NO.: VFXPCF23

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES] CBL Ref. No. 89-050. p.25.

B-1.8.5. MDE/EPC Variable: Total Chlorophyll-a

MDE/EPC ABBREVIATION: *CHLa TOTAL*

ANALYTICAL METHOD NO.: CHTOTA11

METHOD SUMMARY: Prior to analysis, the filter pads are thawed and chlorophyll-a extracted overnight in 10 ml of 90% acetone and read flourometrically.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: micrograms per liter (μg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: VFXPCF23

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.8.6. MDE/EPC Variable: Active Chlorophyll-a

MDE/EPC ABBREVIATION: ***CHLa ACTIVE***

ANALYTICAL METHOD NO.: CHACTAC12

METHOD SUMMARY: The total chlorophyll-a sample is acidified and measured flourometrically. Active chlorophyll-a is then determined by subtracting the value obtained following acidification from the total chlorophyll-a value.

REFERENCES:

(1) **Strickland, J.D.H. and T.R. Parsons.** 1972. A practical handbook of seawater analysis. Bull. 167 (Second Edition), Fisheries Research Board of Canada, Ottawa, Canada.

REPORTED UNITS: micrograms/liter (μg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: VFXPCF23

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (see Figure B-2). The array is maintained in a vertical position through the water column by two surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a Gelman filter and an untreated 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, untreated, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.8.7. MDE/EPC Variable: Seston

MDE/EPC ABBREVIATION: ***SESTON***

ANALYTICAL METHOD NO.: TSSA13

METHOD SUMMARY: Filters are dried for one hour at 103-105 C and pads are weighed an hour later to check for additional weight loss. If there is more than 0.5 mg weight loss between the same filter pads, all pads are redried and reweighed.

REFERENCES:

(1) **Clesceri, L.S., A.E. Greenberg and R.R. Trussell (Editors).** 1989. Standard methods for the examination of water and waste water. Method 208D. Am. Public Health Assoc., Washington, DC. 1268pp.

REPORTED UNITS: milligrams/liter (mg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
		1.50 mg/l	May 1985-Present

FIELD METHOD NO.: VFXSSF24

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a Gelman filter and a preweighed 5.5 cm diameter GF/F filter pad. The filter pad is folded in half inward and wrapped in aluminium foil.

FILTER TYPE/PORE SIZE: Whatman GF/F 5.5 cm diameter, dried, preweighed, 0.7μm glass fiber filter pad.

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **Garber, J.H., W.R. Boynton and W.M. Kemp.** 1987. Ecosystem processes component study plan and budget for FY-88. Maryland Office of Environmental Programs. Maryland Chesapeake Bay Water Quality Monitoring Program. Chesapeake Biological Laboratory (CBL), University of Maryland, Solomons, MD. [UMCEES]CBL Ref. No. 89-050. p.25.

B-1.8.8. MDE/EPC Variable: Biogenic Silica

MDE/EPC ABBREVIATION: *B Si*

ANALYTICAL METHOD NO.: BSIA28

METHOD SUMMARY: The sample is treated with NaOH, digested at 100 C for 20 minutes and neutralized with H_2SO_4.

The reaction is based on the reduction of silicomolybdate in acidic solution to "molybdenum blue" by ascorbic acid. Oxalic acid is added to eliminate interference from phosphates. The silicomolybdate complex is measured colorimetrically at 660 nm, using the Auto-Analyzer II.

REFERENCES:

(1) **D'Elia C.H., N.L. Kaumeyer, C.W. Keefe, K.V. Wood and C.F. Zimmermann.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

REPORTED UNITS: micrograms/liter (μg/l)

DECTECTION LIMITS:	Upper Limit	Lower Limit	Dates Valid
	N/A	Not available	

FIELD METHOD NO.: VFXBSF25

COLLECTION DEVICE: The vertical flux array has a surface buoy connected to a lead or concrete anchor weight (200 kg) by a series of stainless steel cables, 0.8 cm diameter (Figure B-2). The array is maintained in a vertical position through the water column by two sub-surface buoys (45 cm diameter, 40 kg positive buoyancy and 33 cm diameter, 16 kg positive buoyancy). Collecting frames with cups are attached at about five meters and nine meters beneath the water surface. Cups are made of PVC with an internal diameter of 2.2 cm and a length of 76.2 cm.

SAMPLE COLLECTION: The vertical flux array is routinely deployed and retrieved using CEES research vessels with normal sampling periods lasting one to two weeks. The VFX cruise dates are listed in Tables B-2.2, B-2.3, and B-2.4, while a schematic representation of the VFX sampling schedule is presented in Figures B-3 and B-4. At the end of a sampling period, collecting cups are retrieved by hoisting the entire array to shipboard. Cups are not capped prior to retrieval. After fouling organisms are removed from the frames, new cups are attached and the array lowered back into the water.

An aliquot is filtered using a nuclepore polycarbonate (PC) membrane filter. The filter is stored in a numbered 50 ml poypropylene centrifuge tube, which has been presoaked in 5% NaOH, rinsed and dried. The tube is capped and the sample frozen.

FILTER TYPE/PORE SIZE: Nuclepore polycarbonate (PC) membrane filter, 47 mm diameter, pore size 1 micron (μ).

SAMPLE PRESERVATION: Frozen <-20 C

REFERENCES:

(1) **D'Elia C.H., N.L. Kaumeyer, C.W. Keefe, K.V. Wood and C.F. Zimmermann.** 1988. Nutrient Analytical Services Laboratory Standard Operating Procedures. Chesapeake Biological Laboratory (CBL), Box 38, Solomons, MD 20688. p.21.

B-2. Cruise Identifier.

This alpha-numeric code identifies the cruise to which the data observation belongs. Cruise identification is useful for grouping data that are collected over a range of sample dates, but which are considered data for a specific sampling period. The current values for the field are given in Tables B-2.1, B-2.2, B-2.3 and B-2.4

Table B-2 .1. SONE Cruise Identifier.

CRUISE	DATE	BEGIN DATE	END DATE	RESEARCH VESSEL
SONE 01	AUG 1984	27 AUG	30 AUG	Aquarius
SONE 02	OCT 1984	15 OCT	18 OCT	Aquarius
SONE 03	MAY 1985	06 MAY	09 MAY	Aquarius
SONE 04	JUN 1985	24 JUN	27 JUN	Aquarius
SONE 05	AUG 1985	19 AUG	22 AUG	Aquarius
SONE 06	OCT 1985	14 OCT	17 OCT	Aquarius
SONE 07	MAY 1986	03 MAY	08 MAY	Aquarius
SONE 08	JUN 1986	23 JUN	26 JUN	Aquarius
SONE 09	AUG 1986	18 AUG	22 AUG	Orion
SONE 10	NOV 1986	10 NOV	13 NOV	Aquarius
SONE 11	APR 1987	20 APR	23 APR	Aquarius
SONE 12	JUN 1987	10 JUN	15 JUN	Aquarius
SONE 13	AUG 1987	17 AUG	20 AUG	Aquarius
SONE 14	NOV 1987	09 NOV	16 NOV	Aquarius
SONE 15	APR 1988	17 APR	22 APR	Aquarius
SONE 16	JUN 1988	01 JUN	07 JUN	Aquarius
SONE 17	AUG 1988	15 AUG	21 AUG	Aquarius
SONE 18	NOV 1988	01 NOV	09 NOV	Aquarius
SONE 19	APR 1989	04 APR	10 APR	Aquarius
SONE 20	JUN 1989	12 JUN	16 JUN	Aquarius
SONE 21	JUL 1989	12 JUL	14 JUL	Aquarius
SONE 22	AUG 1989	14 AUG	16 AUG	Aquarius
SONE 23	OCT 1989	16 OCT	18 OCT	Aquarius

Table B-2.2. VFX Cruise Dates (23rd July 1984 to 30 August 1984) for Station Thomas Point (TMPT)

DATE	CRUISE NO.	RESEARCH VESSEL
23 JUL 1984	1042	Orion
30 JUL 1984	1046	Orion
07 AUG 1984	Note 1	Osprey
14 AUG 1984	Note 1	Osprey
22 AUG 1984	Note 1	Osprey
30 AUG 1984	766	Aquarius

NOTE 1: Divers Serviced Traps.

Table B-2.3. VFX Cruise Dates (17th September 1984 to 27th June 1985) for Station R-78

DATE	CRUISE NO.	RESEARCH VESSEL
17 SEP 1984	774	Aquarius
24 SEP 1984	777	Aquarius
04 OCT 1984	784	Aquarius
16 OCT 1984	790	Aquarius
30 NOV 1984	802	Aquarius
17 DEC 1984	1082	Orion
19 FEB 1985	809	Aquarius
05 MAR 1985	1090	Orion
01 APR 1985	815	Aquarius
15 APR 1985	1097	Orion
27 MAY 1985	1109	Orion
05 JUN 1985	829	Aquarius
18 JUN 1985	1113	Orion
27 JUN 1985	833	Aquarius

Table B-2.4. VFX Cruise Dates (23rd July 1984 to 30th November 1989) for Station R-64 and Dares Beach (11th July 1985 to 14 November 1986).[1]

DATE	CRUISE NO.	RESEARCH VESSEL
23 JUL 1984	1042	Orion
30 JUN 1984	1046	Orion
07 AUG 1984	Note 2	Osprey
14 AUG 1984	Note 2	Osprey
22 AUG 1984	Note 2	Osprey
30 AUG 1984	766	Aquarius
17 SEP 1984	774	Aquarius
24 SEP 1984	777	Aquarius
04 OCT 1984	784	Aquarius
16 OCT 1984	790	Aquarius
30 NOV 1984	802	Aquarius
17 DEC 1984	1082	Orion
19 FEB 1985	809	Aquarius
05 MAR 1985	1090	Orion
01 APR 1985	815	Aquarius
15 APR 1985	1097	Orion
30 APR 1985	1101	Orion
08 MAY 1985	825	Aquarius
27 MAY 1985	1109	Orion
05 JUN 1985	829	Aquarius
18 JUN 1985	1113	Orion
25 JUN 1985	833	Aquarius
11 JUL 1985	1119	Orion
24 JUL 1985	1123	Orion
30 JUL 1985	1125	Orion
05 AUG 1985	1128	Orion
13 AUG 1985	1130	Orion
21 AUG 1985	844	Aquarius
17 SEP 1985	1141	Orion
25 SEP 1985	851	Aquarius
01 OCT 1985	1146	Orion
16 OCT 1985	858	Aquarius
06 JAN 1986	1165	Orion
17 JAN 1986	872	Aquarius
27 FEB 1986	884	Aquarius
12 MAR 1986	1170	Orion
28 MAR 1986	888	Aquarius
14 APR 1986	1178	Orion
29 APR 1986	1185	Orion
05 MAY 1986	898	Aquarius
14 MAY 1986	899	Aquarius
19 MAY 1986	1194	Orion

DATE	CRUISE NO.	RESEARCH VESSEL
28 MAY 1986	1197	Orion
03 JUN 1986	1198	Orion
12 JUN 1986	1201	Orion
16 JUN 1986	906	Aquarius
24 JUN 1986	910	Aquarius
01 JUL 1986	912	Aquarius
11 JUL 1986	915	Aquarius
23 JUL 1986	1208	Orion
30 JUL 1986	1212	Orion
07 AUG 1986	1215	Orion
14 AUG 1986	921	Aquarius
22 AUG 1986	1220	Orion
14 OCT 1986	1231	Orion
23 OCT 1986	936	Aquarius
30 OCT 1986	1235	Orion
06 NOV 1986	1237	Orion
14 NOV 1986	941	Aquarius
26 FEB 1987	1247	Orion
11 MAR 1987	1251	Orion
25 MAR 1987	951	Aquarius
08 APR 1987	1256	Orion
21 APR 1987	956	Aquarius
07 MAY 1987	959	Aquarius
12 MAY 1987	1272	Orion
19 MAY 1987	1276	Orion
26 MAY 1987	1279	Orion
02 JUN 1987	1283	Orion
12 JUN 1987	968	Aquarius
17 JUN 1987	969	Aguarius
23 JUN 1987	1288	Orion
01 JUL 1987	1292	Orion
08 JUL 1987	1294	Orion
15 JUL 1987	1297	Orion
23 JUL 1987	976	Aquarius
28 JUL 1987	1301	Orion
05 AUG 1987	1304	Orion
11 AUG 1987	1306	Orion
18 AUG 1987	983	Aquarius
14 OCT 1987	1323	Orion
22 OCT 1987	998	Aquarius
30 OCT 1987	1000	Aquarius
04 NOV 1987	1329	Orion

Table B-2.4. VFX Cruise Dates (23rd July 1984 to 30th November 1989) for Station R-64 and Dares Beach (11th July 1985 to 14 November 1986).[1] - CONT

DATE	CRUISE NO.	RESEARCH VESSEL
16 NOV 1987	1003	Aquarius
01 DEC 1987	1005	Aquarius
18 DEC 1987	1335	Orion
09 FEB 1988	1341	Orion
25 FEB 1988	1346	Orion
10 MAR 1988	1352	Orion
23 MAR 1988	1355	Orion
06 APR 1988	1015	Aquarius
22 APR 1988	1017	Aquarius
02 MAY 1988	1366	Orion
09 MAY 1988	1368	Orion
16 MAY 1988	1370	Orion
23 MAY 1988	1372	Orion
01 JUN 1988	1027*	Aquarius
08 JUN 1988	1027*	Aquarius
17 JUN 1988	1376	Orion
22 JUN 1988	1378	Orion
28 JUN 1988	1034	Aquarius
05 JUL 1988	1380	Orion
13 JUL 1988	1038	Aquarius
19 JUL 1988	1039	Aquarius
27 JUL 1988	1385	Orion
04 AUG 1988	1043	Aquarius
11 AUG 1988	1389	Orion
17 AUG 1988	1047	Aquarius
06 SEP 1988	1392	Orion
13 SEP 1988	1050	Aquarius
19 SEP 1988	1395	Orion
12 OCT 1988	1401	Orion
17 OCT 1988	1404	Orion
24 OCT 1988	1066	Aquarius
01 NOV 1988	1067*	Aquarius
09 NOV 1988	1067*	Aquarius
17 NOV 1988	1070	Aquarius
23 NOV 1988	1408	Orion
08 FEB 1989	1082	Aquarius
27 FEB 1989	1084	Aquarius
10 MAR 1989	1087	Aquarius
22 MAR 1989	1089	Aquarius
05 APR 1989	1091	Aquarius
20 APR 1989	1093	Aquarius
02 MAY 1989	1426	Orion
09 MAY 1989	1098	Aquarius
16 MAY 1989	1429	Orion
23 MAY 1989	1104	Aquarius
31 MAY 1989	1432	Orion
07 JUN 1989	1435	Orion
12 JUN 1989	1110	Aquarius
21 JUN 1989	1441	Orion
27 JUN 1989	1112	Aquarius
05 JUL 1989	1114	Aquarius
12 JUL 1989	1118	Aquarius
19 JUL 1989	1120	Aquarius
26 JUL 1989	1122	Aquarius
02 AUG 1989	1450	Orion
09 AUG 1989	1128	Aquarius
14 AUG 1989	1129	Aquarius
24 AUG 1989	1131	Aquarius
06 SEP 1989	1455	Orion
14 SEP 1989	1457	Orion
20 SEP 1989	1458	Orion
03 OCT 1989	1141	Aquarius
12 OCT 1989	1464	Orion
17 OCT 1989	1146	Aquarius
02 NOV 1989	1469	Orion
08 NOV 1989	1470	Orion
15 NOV 1989	1155	Aquarius
30 NOV 1989	1156	Aquarius

NOTE 1: Dares Beach was sampled on the same VFX cruises as R-64 from 11 July 1985 to 14 November 1986.
NOTE 2: Divers Serviced Traps.
* Traps serviced at beginning and end of same SONE cruise.

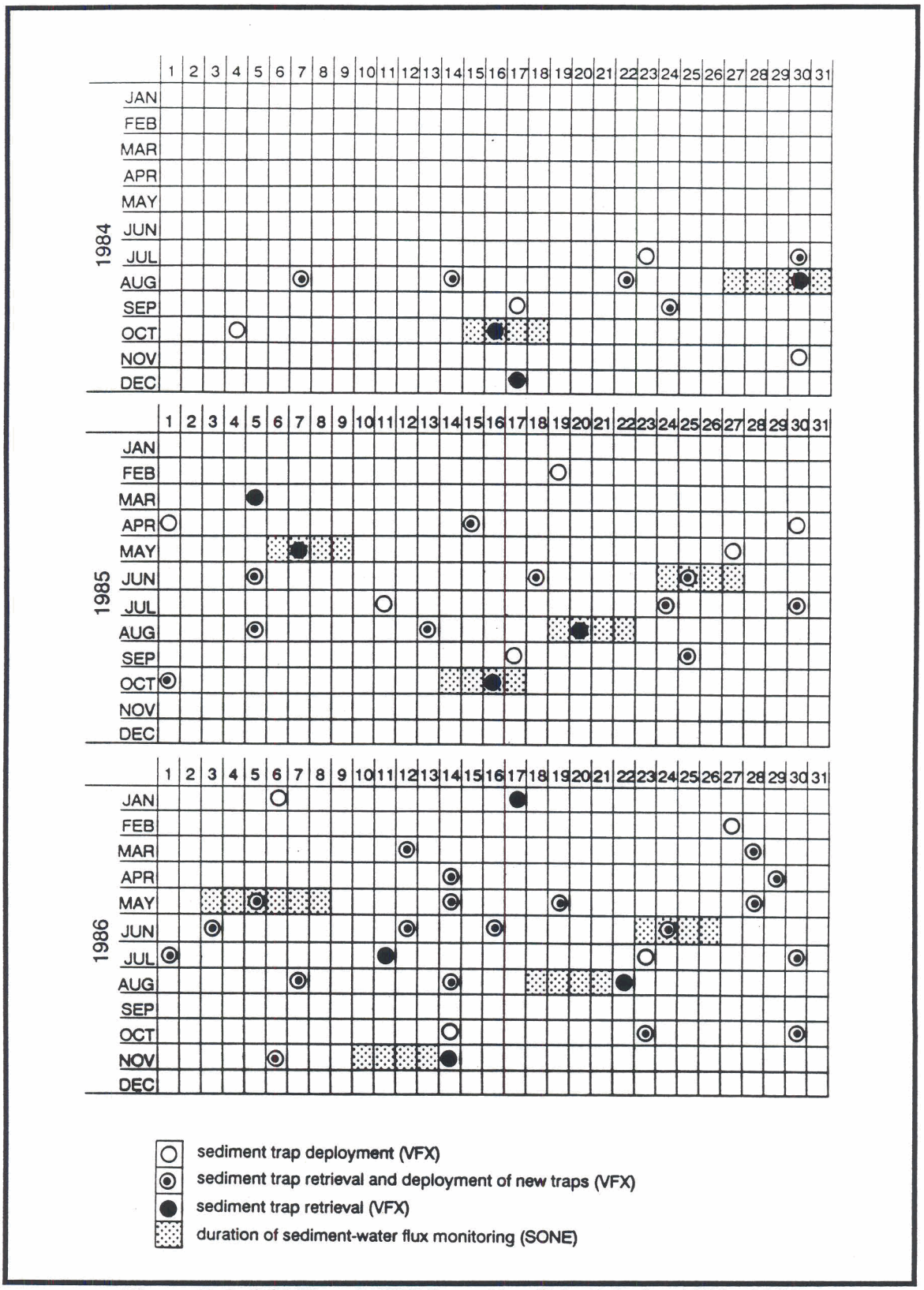

Figure B-3. SONE and VFX Sampling Schedule for 1984 - 1986

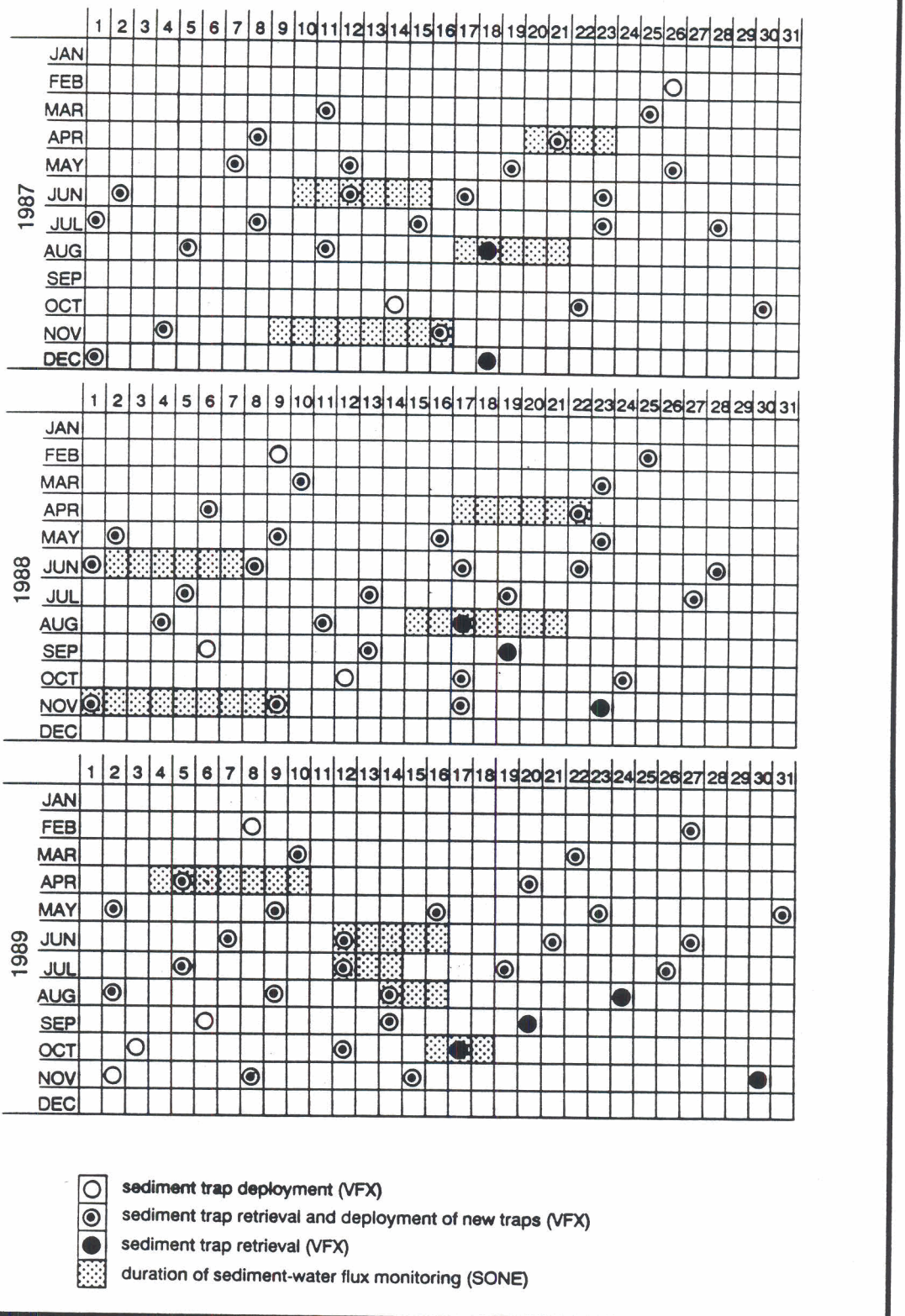

Figure B-4. SONE and VFX Sampling Schedule for 1987 - 1989

Table B-3. Chesapeake Bay Program Segment Designation.

This code identifies the Chesapeake Bay Segment from which the sample was taken. The acceptable codes (Figure B-5) are listed as follows:

CODE	SEGMENT
CB1	Susquehanna Flats
CB2	Upper portion of the Chesapeake Bay mainstream
CB3	Upper-most reach for the Esturine Zone in mainstream of the Chesapeake Bay
CB4	Upper portion of the central Chesapeake Bay mainstream
CB5	Central portion of the mainstream of the Chesapeake Bay
CB6	Lower west-central portion of the mainstream of the Chesapeake Bay
CB7	Lower east-central portion of the mainstream of the Chesapeake Bay
CB8	Southern-most segment of the Chesapeake Bay
ET1	Northeast River
ET2	Elk River and Bohemia River
ET3	Sassafras River
ET4	Chester River
ET5	Choptank River
ET6	Nanticoke River
ET7	Wicomico River
ET8	Manokin River
ET9	Big Annemessex River
ET10	Pocomoke River
EE1	Eastern Bay, Miles River and Wye River
EE2	Choptank River, west of Castle Haven, including Tred Avon River, Broad Creek, Harris Creek and Little Choptank River
EE3	Tangler and Pocomoke Sound

CODE	SEGMENT
LE1	Patuxent River - Lower Estuarine Segment
LE2	Potomac River - Lower Estuarine Segment
LE3	Rappahannock River - Lower Estuarine Segment
LE4	York River - Lower Estuarine Segment
LE5	James River - Lower Estuarine Segment
RET1	Patuxent River - Riverine-estuarine Transition Zone
RET2	Potomac River - Riverine-estuarine Transition Zone
RET3	Rappahannock River - Riverine-estuarine Transition Zone
RET4	York River - Riverine-estuarine Transition Zone
RET5	James River - Riverine-estuarine Transition Zone
TF1	Patuxent River - Tidal Freshwater Segment
TF2	Potomac River - Tidal Freshwater Segment
TF3	Rappahannock River - Tidal Freshwater Segment
TF4	York River - Tidal Freshwater Segment
TF5	James River - Tidal Freshwater Segment
WT1	Bush River
WT2	Gunpowder River
WT3	Middle River and Seneca Creek
WT4	Back River
WT5	Patapsco River
WT6	Magothy River
WT7	Severn River

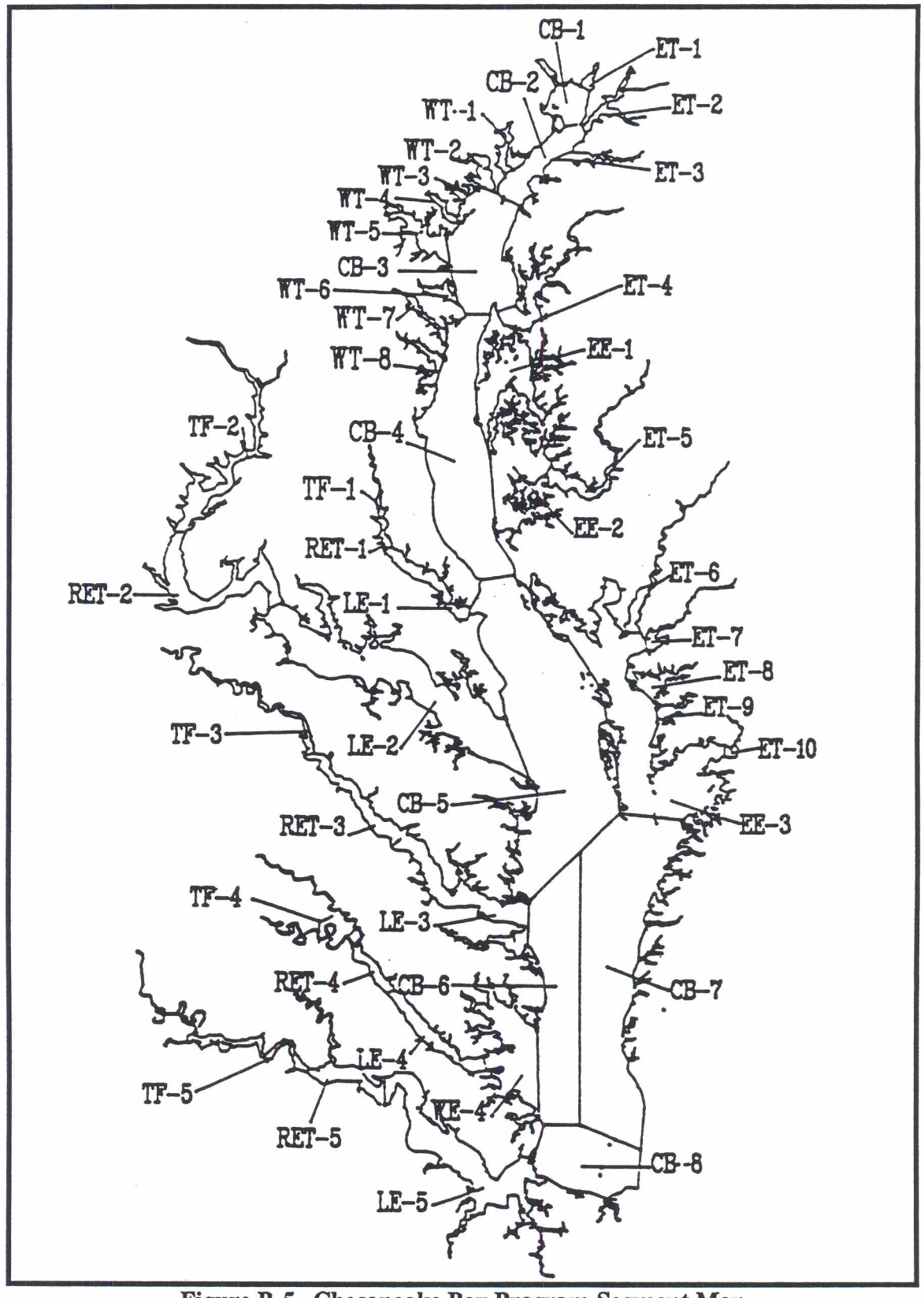

Figure B-5. Chesapeake Bay Program Segment Map

Table B-4. Data Collecting Agency.

This eight-character code indicates who has submitted the data. The current values for this field are as follows:

CODE	DATA COLLECTING AGENCY
MD/MDE	Maryland, Maryland Department of the Environment
MD/DNR	Maryland, Department of Natural Resources
MDE/EPC	Maryland Department of the Environment/ Ecosystem Processes Component, University of Maryland, Cheasapeake Biological Laboratory
VA/WCB	Virginia, Water Control Board
VA/ODU	Virginia, Old Dominion University
VA/VIMS	Virginia, Virginia Institute of Marine Science
DC/DCRA	District of Columbia, Department of Consumer and Regulatory Affairs
PA/SRBC	Pennsylvania, Susquehanna River Basin Commission
PA/DER	Pennsylvania, Department of Environmental Resources
UM/CBL	University of Maryland, Chesapeake Biological Laboratory
UM/HPEL	University of Maryland, Horn Point Environmental Laboratory
US/NOAA	United States National Oceanic and Atmospheric Administration

Table B-5. Sampling Station Identifier.

This is a comprehensive listing of all stations used during SONE and VFX studies. The following tables provide station code names and associated latitude and longitude, basin and station location descriptions.

Table B-5.1. Station Name, ID and Sampling Order.

The current monitoring stations (Figure B-6) in their correct order are as follows:

REGION	STATION NAME	STATION CODE NAME	SAMPLING ORDER[3] A	B
Patuxent River	St. Leonard Creek	STLC	1	1
	Broomes Island	BRIS		2
	Marsh Point	MRPT		3
	Buena Vista	BUVA	2	4
Choptank River	Horn Point	HNPT	3	5
	Windy Hill	WDHL	4	
Potomac River	Ragged Point	RGPT	5	6
	Maryland Point	MDPT	6	

Table B-5.1. Station Name, ID and Sampling Order - CONT

REGION	STATION NAME	STATION CODE NAME	SAMPLING ORDER[3] A	B
Chesapeake Mainstream	Point No Point	PNPT	7	7
	Buoy R-64[1]	R-64	8	8
	Dares Beach	DRBH	x	
	Thomas Point	TMPT	*	
	Buoy R-78[2]	R-78	9	
	Still Pond	SLPD	10	

NOTES:

A = Stations sampled in SONE 1 - 21, August 1984 - June 1989. Numerical ranking indicates the order in which they appear in the data tables.

B = Stations sampled beginning with SONE 22 and future samples. Numerical ranking indicates the order in which they appear in the data tables.

* = Thomas Point was sampled July - August 1984. Thomas Point was replaced by station R-78.

x = Dares Beach was a VFX station sampled from 11 July 1985 to 14 November 1986

1 = This is the only current VFX station.

2 = This was also a VFX station which was sampled from 17 September 1984 to 27 June 1985.

3 = Prior to July 1, 1989, measurements at SONE stations were made four times per year (April or May, June, August and October or November). After this date, measurements were made five times per year (May, June, July, August and October).

Table B-5.2. Station Code, Grid Location and Nearest MDE Station.

The list of current monitoring stations, locations (latitude/longitude) and depth specifications, nearest MDE station and Bay Segment are as follows:

STATION CODE NAME	LATITUDE DEG MIN	LONGITUDE DEG MIN	STATION DEPTH	MDE STATION	BAY SEGMENT
Patuxent River					
STLC	38° 22.88'	76° 30.06'	7.0	XDE2792	LE1
BRIS	38° 23.64'	76° 33.17'	15.0	XDE2792	LE1
MRPT	38° 26.81'	76° 30.06'	5.2	XDE5339	LE1
BUVA	38° 31.12'	76° 39.82'	5.8	XDE9401	RET1
Choptank River					
HNPT	38° 37.18'	76° 08.09'	8.2	MET5.2	ET5
WDHL	38° 41.45'	77° 11.49'	3.8	NONE	ET5
Potomac River					
RGPT	38° 09.86'	76° 15.13'	16.5	XBE9541	LE2
MDPT	38° 21.37'	76° 26.63'	10.2	XDA1177	LE2
Chesapeake Mainstream					
PNPT	38° 07.99'	76° 15.13'	14.2	MCB5.2	CB5
R-64	38° 33.59'	76° 26.63'	16.8	MCB4.3C	CB4
DRBH	38° 33.50'	76° 29.30'	10.7	MCB4.3C	CB4
TMPT	38° 54.08'	76° 24.46'	52.0	MCB4.1W	CB4
R-78	38° 57.81'	76° 23.62'	15.8	MCB3.3C	CB4
SLPD	39° 20.87'	76° 10.87'	10.4	MCB2.2	CB2

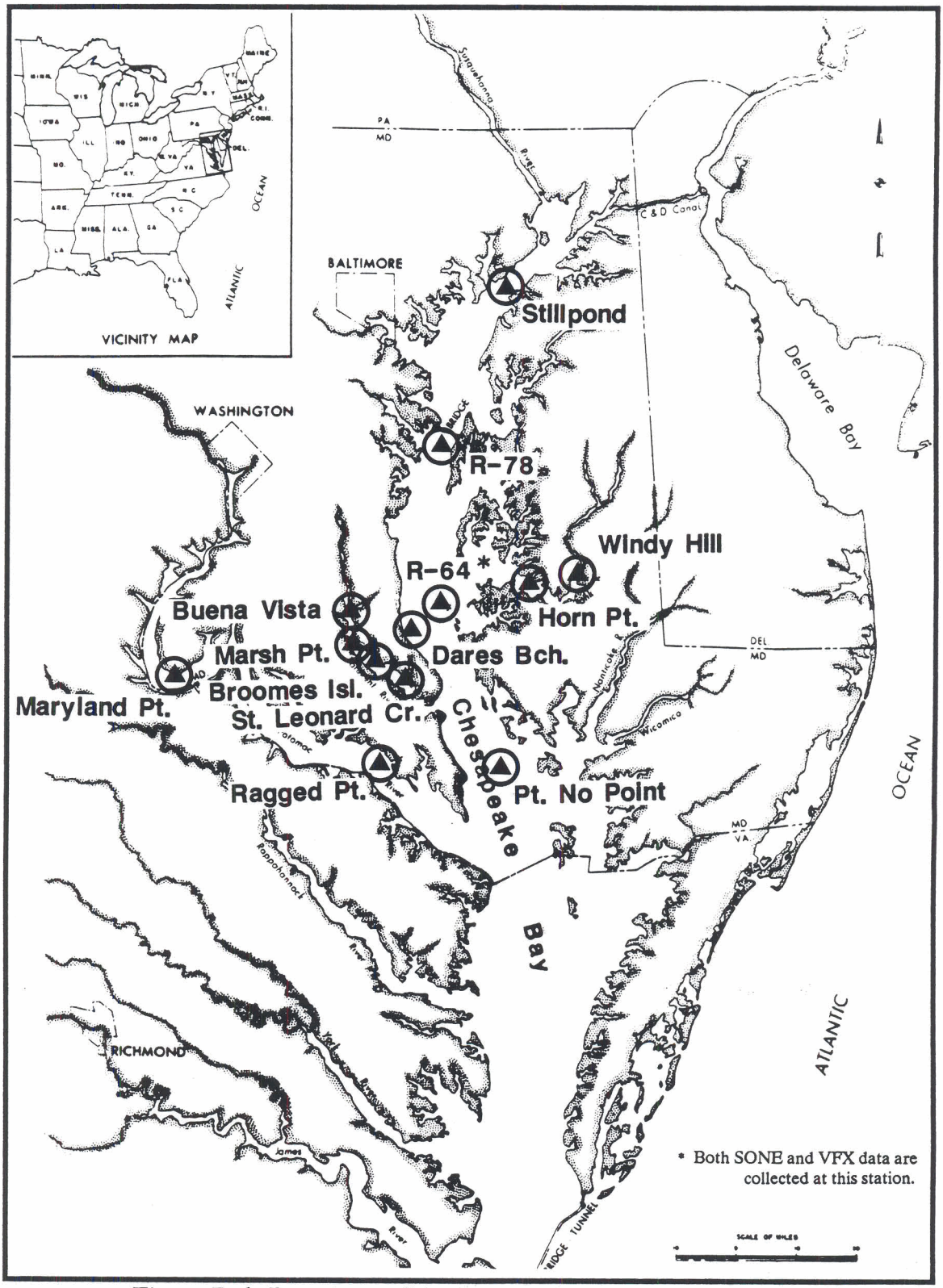

Figure B-6. Location of SONE and VFX Monitoring Stations in the Maryland Portion of the Chesapeake Bay

Table B-5.3. Station Code and Description.

The station code and location description is as follows:

STATION CODE NAME	DESCRIPTION
Patuxent River	
STLC	7.5 nautical miles upstream of Patuxent River mouth. (R km = 12.1)
BRIS	10 nautical miles upstream of Patuxent River mouth. (R km = 16.1)
MRPT	14.5 nautical miles upstream of Patuxent River mouth. (R km = 23.4)
BUVA	0.75 nautical miles north of Route 231 Bridge at Benedict, MD. (R km = 31.5)
Choptank River	
HNPT	4.0 nautical miles downstream of Route 50 Bridge at Cambridge, MD. (R km=18.6)
WDHL	10.0 nautical miles upstream from Route 50 Bridge at Cambridge, MD. (R km = 39.5)
Potomac River	
RGPT	1.5 nautical miles WNW of Buoy 51-B. (R km = 29.8)
MDPT	1250 yards SE of Buoy R-18. (R km = 71.0)
Chesapeake Mainstream	
PNPT	3.2 nautical miles East of Point No Point. (R km = 129.0)
R-64	300 yards North East of channel Buoy R-64.* (R km = 177.4)
DRBH	West of channel Buoy R-64.* (R km = 177.4)
TMPT	4.03 nautical miles south of channel Buoy R-78.* (R km = 219.3)
R-78	200 yards NNW of channel Buoy R-78.* (R km = 225.8)
SLPD	700 yards West of channel marker 41.* (R km = 258.1)

NOTE:
* Marked buoy numbers correspond to numbering system prior to USCG renumbering.
[1] River kilometers (R km) are measured from the mouth of the river or Chesapeake Bay.

Table B-5.4. Station Information.

The following additional station data are appended to each SAS record:

CBP CODE	DESCRIPTION	UNITS
BASIN	Name of estuarine basin i.e. Chesapeake	Alpha
CRUISE	Cruise identifier	See Table B-2
DATE	Date of sample collection	DDMMMYY
DOC ID	[UMCEES] CBL Reference Number	Number
GEAR	Sampling gear	See Table B-8.1
LAT	Latitude	Dec Deg
LONG	Longitude	Dec Deg
SALZONE	Salinity value	See Table B-7.1

Table B-5.4. Station Information - CONT

CBP CODE	DESCRIPTION	UNITS
SAM_TYPE	Sample type	See Table B-11
SEGMENT	Chesapeake Bay Program segment designation	See Table B-3
SOURCE	Data collection agency	See Table B-4
CODE NAME	Unique identifier of sampling station	See Table B-5.1
STANAME	Nearest Maryland station	See Table B-5.2
TDEPTH	Average total column depth at station in meters	meters See Table B-5.2
TIME	Time of day that sample was collected in 2400 hour clock	Hours/Mins (24 Hour Clock)

Table B-6. Reported Units.

This parameter describes the units in which a substance is measured. The MDE/EPC unit abbreviation for each variable measured, together with a description, is given in Part A Table A-1.

Table B-6.1. Conversion Factors.

This table is a reference for converting units used by the Ecosystem Processing Component to historical units used in the CHESSEE data base.

MDE/EPC TABLE NAME	MDE/EPC UNIT	CHESSEE UNIT	CONVERSION FACTOR
DISSOLVED NUTRIENTS (Filename: H2ONUTxx (Filename: CORDATxx)			
NH4	µM	mg/l	(µM/1000) x n where n=14
NO2	µM	mg/l	(µM/1000) x n where n=14
NO2 + NO3	µM	mg/l	(µM/1000) x n where n=14
TDN	µM	mg/l	(µM/1000) x n where n=14
DIP	µM	mg/l	(µM/1000) x n where n=31
TDP	µM	mg/l	(µM/1000) x n where n=31
Si(OH)4	µM	mg/l	(µM/1000) x n where n=28
H2S	µM	mg/l	(µM/1000) x n where n=32
PARTICULATES (Filename: H2ONUTxx) (Filename: VFXDEPxx)			
PC	µg/l	mg/l	µg/1000
PN	µg/l	mg/l	µg/1000
PP	µg/l	mg/l	µg/1000

Table B-7. Salinity Zone (SALZONE).

The Salinity Zone layer codes are as follows:

SALINITY CODE	DESCRIPTION
F	Freshwater
O	Oligohaline 0.5 - 5.0 ppt
M	Mesohaline 5.0 - 18.0 ppt
P	Polyhaline 18.0 - 32.0 ppt

Table B-7.1. Station and Salinity Characterization.

The salinity code giving the salinity regime at each SONE or VFX sampling station is as follows:

STATION CODE	SALINITY CODE
Patuxent River	
STLC	M
BRIS	M
MRPT	M
BUVA	O
Choptank River	
HNPT	M
WDHL	O
Potomac River	
RGPT	M
MDPT	O
Chesapeake Mainstream	
PNPT	M
R-64	M
TMPT	M
R-78	M
SLPD	O

B-8. Sampling Gear .

The sampling gear code listed in the following tables are referenced for use when EPC data is incorporated into the CHESSEE data base. To date, only two EPC data tables, H2OPRF and VFXPRF include gear codes as the variables, temperature, conductivity, salinity and dissolved oxygen were measured in the field using a number of different instruments which are documented in the data tables. In all cases, the units used are comparable. In the case of all other variables, the gear used throughout the study period remains unchanged and was therefore not documented in the data tables.

Table B-8.1. Data Specifications for Water Column Profiles: Parameter name and sampling gear used.

FILENAME: H2OPRFxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
TOTAL DEPTH	WP01	Fathometer
SECCHI DEPTH	WP02	Secchi Disk
SAMPLE DEPTH	WP03	Meter Block
TEMP	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP06	Salinometer, Yellow Springs Model 33
	WP07	Salinometer, Beckman Induction
	WP08	Dissolved Oxygen Meter,Yellow Springs Model 57
	WP09	Dissolved Oxygen Meter,Yellow Springs Model 58
COND	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP06	Salinometer, Yellow Springs Model 33
	WP07	Salinometer, Beckman Induction
SALIN	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP06	Salinometer, Yellow Springs Model 33
	WP07	Salinometer, Beckman Induction
DO	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP08	Dissolved Oxygen Meter,Yellow Springs Model 57
	WP09	Dissolved Oxygen Meter,Yellow Springs Model 58
	WP10	Oxygen Meter, Orbisphere
SALIN/TEMP + DO	WP11	Yellow Springs Model 33 (Salinity) Yellow Springs Models 57 & 58 (Oxygen & Temperature)

NOTE 1: This instrument measures Salinity, Conductivity and Temperature.

TABLE B-8.2. Data Specifications for Water Column Nutrients (SONE): Parameter name and sampling gear used.

FILENAME: H2ONUTxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
TOTAL DEPTH	WP01	Fathometer
SAMPLE DEPTH	WP03	Meter Block
DISSOLVED NUTRIENTS	HN01	Pump, submersible, Gould, deep well, flow rate 40 l/m
	HN02	Bottle, wide mouth, Nalgene, 4 liters
	HN03	Filter pad, 2.5 cm diameter, Whatman GF/F, 0.7 μm, untreated
a. NH4, NO2, NO2+NO3, DIP, SI(OH)4	HN04	Vials, Auto-Analyzer (AA)
b. TDN, TDP	HN05	Test tubes, 25 ml, glass
PARTICULATE NUTRIENTS	HN01	Pump, submersible, Gould, deep well, flow rate 40 l/m
	HN02	Bottle, wide mouth, Nalgene, 4 liters
	HN06	Bottle, wide mouth, Nalgene, 2 liters
a. PC and PN	HN07	Filter pad, 2.5 cm diameter, Whatman GF/F, 0.7 μm precombusted (muffled)
b. CHL-a (active and total) and PP	HN08	Filter pad, 5.5 cm diameter, Whatman GF/F, 0.7 μm, untreated
c. Seston	HN09	Filter pad, 5.5 cm diameter, Whatman GF/F, 0.7 μm, dried and preweighed

TABLE B-8.3. Data Specifications for Sediment Profile (SONE): Parameter name and sampling gear used.

FILENAME: SEDPRFxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
SEDIMENT CORE	SP01 SP02	Bouma Box Corer Plexiglass liner: Inner Dimensions 8.75 cm x 15.80 cm x 33.95 cm
Eh MEAS	SP03	Eh Meter, Corning
SURFICIAL SEDIMENT PARTCULATES	SP04	Syringe, 50ml, plastic internal diameter 2.6 cm
	SP05	Centrifuge tubes, plastic

Table B-8.4. Data Specification for Core Profile (SONE): Parameter name and sampling gear used.

FILENAME: CORPRFxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
H2O %	CP01	Petri dish, 8 cm diameter, preweighed
PARTICULATES: PC, PN, PP	SP05	Centrifuge tube, plastic
PORE WATER: NH_4, NO_2, NO_2+NO_3, DIP, $SI(OH)_4$	SP05	Centrifuge tube, plastic

Table B-8.5. Data Specification for Core Data (SONE): Parameter name and sampling gear used.

FILENAME: CORDATxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
SEDIMENT CORE	SP01	Bouma Box Corer
	SP02	Plexiglass liner, inner dimensions 8.75cm x 15.80cm x 33.95cm, bottom plate 1.2 cm thick with foam gasket
	CD01	Holding incubator
	CD02	Cubitainers, 20 liters, polythene
DISSOLVED NUTRIENTS	CD03	Water bath, external circulating
	CD04	Valves, gang
	CD05	Incubation box
	CD06	Filter/syringe apparatus, 50 cc Swinex
	HN04	Vials, Auto-Analyzer (AA)
NH4, NO2, NO2+NO3, DIP, SI(OH)4, H2S	HN03	Filter pad, 2.5 cm diameter, Whatman GF/F, 0.7 μm, untreated
DISSOLVED OXYGEN	WP10	Oxygen Meter, Orbisphere

Table B-8.6. Data Specifications for Water Column Profiles (VFX): Parameter name and sampling gear used.

FILENAME: VFXPRFxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
TOTAL DEPTH	WP01	Fathometer
SECCHI DEPTH	WP02	Secchi Disk
SAMPLE DEPTH	WP03	Meter Block
TEMP	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP06	Salinometer, Yellow Springs Model 33
	WP07	Salinometer, Beckman Induction
	WP08	Dissolved Oxygen Meter, Yellow Springs Model 57
	WP09	Dissolved Oxygen Meter, Yellow Springs Model 58
COND	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP06	Salinometer, Yellow Springs Model 33
	WP07	Salinometer, Beckman Induction
SALIN	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP06	Salinometer, Yellow Springs Model 33
	WP07	Salinometer, Beckman Induction
DO	WP04	S-C-T[1] Instrument, Hydrolab 4000
	WP05	S-C-T[1] Instrument, Hydrolab Surveyor II
	WP08	Dissolved Oxygen Meter, Yellow Springs Model 57
	WP09	Dissolved Oxygen Meter, Yellow Springs Model 58
	WP10	Oxygen Meter, Orbisphere
WATER COLUMN PARTICULATES:	HN01	Pump, submersible, Gould, deep well, flow rate 40 l/m
	HN06	Bottle, wide mouth, Nalgene, 2 liters
	HN02	Bottle, wide mouth, Nalgene, 4 liters
a. PC and PN	HN07	Filter pad, 0.7 μm glass fiber, Whatman GF/F 2.5 cm diameter, precombusted (muffled)
b. CHL-a (active and total) and PP	HN08	Filter pad, 0.7 μm glass fiber, Whatman GF/F 5.5 cm diameter, untreated
c. Seston	HN09	Filter pad, 0.7 μm glass fiber, Whatman GF/F 5.5 cm diameter, dried and preweighed
d. B Si	VS01	Membrane filter, diameter 47 mm, pore size 1 micron (μ), Nuclepore, polycarbonate(PC)

NOTE 1: This instrument measures salinity, conductivity and temperature.

Table B-8.7. Data Specifications for Surficial Sediment Particulates (VFX): Parameter name and sampling gear used.

FILENAME: VFXSEDxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
SEDIMENT CORE	SP01 SP02	Bouma box corer Plexiglass liner, inner dimension 8.75 cm x 15.80 cm x 33.95 cm, bottom plate 1.2 cm thick with foam gasket
SURFICIAL SEDIMENT PARTICULATES: SED PC, SED PN, SED PP, SED CHLa TOTAL SED CHLa ACTIVE	SP04 SP05	Syringe, 50 ml, internal diameter 2.6 cm, plastic Centrifuge tubes, plastic

Table B-8.8. Data Specification for Vertical Flux of Particulates (VFX): Parameter name and sampling gear used.

FILENAME: VFXDEPxx

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
TOTAL DEPTH	WP01	Fathometer
CUP DEPTH	VF01 VF02 VF03 VF04 VF05 VF06	Buoy, surface marker Anchor weight, 200 kg, lead or concrete Cables, 0.8 cm diameter, stainless steel Buoy, sub-surface, 45 cm diameter, 40 kg positive buoyancy Buoy, sub-surface, 33 cm diameter, 16 kg positive buoyancy Vertical Flux Array comprising collecting frames with four PVC cups 7.6 cm internal diameter x 76.2 cm deep attached at 5 m and 9 mbeneath the water surface supported by holding rings and with a plywood fin 61 x 76 x 0.9 cm attached.

Table B-8.8. Data Specification for Vertical Flux of Particulates (VFX): Parameter name and sampling gear used - CONT

MDE/EPC TABLE ABBREVIATION	GEAR CODE	GEAR
DILU VOL	VF07	Cylinder, graduated, Plexiglass, 4 liters
	VF08	Pipette, 5 ml, with rubber bulb
	VF09	Pipette, 10 ml, with rubber bulb
	VF10	Cylinder, graduated, 25 ml
	VF11	Cylinder, graduated, 50 ml
	VF12	Cylinder, graduated, 100 ml
	VF13	Cylinder, graduated, 250 ml
a. PC and PN	HN07	Filter pad, 0.7 μm glass fiber, Whatman GF/F 2.5 cm diameter, precombusted (muffled)
b. CHL-a (active and total) and PP	HN08	Filter pad, 0.7 μm glass fiber, Whatman GF/F 5.5 cm diameter, untreated
c. Seston	HN09	Filter pad, 0.7 μm glass fiber, Whatman GF/F 5.5 cm diameter, dried and preweighed
d. B Si	VS01	Membrane filter, diameter 47 mm, pore size 1 micron (μ), Nuclepore, polycarbonate (PC)

Table B-9. Detection Limit Code.

This one-character code indicates when the value of the parameter is outside the detection limits of the method being used. The valid entries for this field are as follows:

DETECTION LIMIT CODE	DESCRIPTION
<	Less than the detected limit of the method
J	Estimated value
N	Not detected

Table B-10. Analysis Problem Code

This two letter alpha code describes the problem associated with a questionable parameter value. The valid entries used in the Ecosystem Processes Component extraction from the Sediment Data Management Plan are as follows:

ANALYSIS PROBLEM CODE	DESCRIPTION
A	Laboratory accident
B	Interference
C	Mechanical/materials failure
D	Insufficient sample
N	Sample lost
P	Lost results
R	Sample contaminated
S	Sample container broken during analysis
V	Sample results rejected due to QA/QC criteria
W	Duplicate results for all parameters
X	Sample not preserved properly
AA	Sample thawed when received
BB	Torn filter paper
CC	Pad unfolded in foil pouch
EE	Foil pouch very wet when received from field, therefore poor replication between pads, mean reported.
FF	Poor replication between pads; mean reported
HH	Sample not taken
JJ	Amount filtered not recorded (calculation could not be done)
LL	Mislabeled
NI	Data for this variable are considered to be non-interpretable (Table B-13.1.3.1.)
NN	Particulates found in filtered sample
PP	Assumed sample volume (pouch volume differs from data sheet volume; pouch volume used)
QQ	Although value exceeds a theoretically equivalent or greater value (e.g., PO4F>TDP), the excess is within precision of analytical techniques and therefore not statistically significant
RR	No sample received
SS	Sample contaminated in field
TT	Instrument failure on board research vessel
UU	Analysis discontinued
WW	Station was not sampled due to bad weather conditions, research vessel mechanical failure or failure of state highway bridges to open or close
XX	Sampling for this variable was not included in the monitoring program at this time or was not monitored during a specific cruise

Table B-11. Replicate Type.

This character code identifies sample types, kinds and levels of sample replication. It is usually used in conjunction with REP_NUM. The current valid entries are as follows:

REPLICATE CODE	DESCRIPTION
FLD	Field replicate
LAB	Laboratory replicate
FL	Field and laboratory replicate in data set
METH	Method comparison
SPK	Spike split
SPLT	Field split
CTRL	Control sample
BLNK	A SONE chamber filled with only bottom water. Blanks are sampled in the same way as SONE chambers having sediments. Blank fluxes are used to correct normal sediment fluxes for water column net nutrient and oxygen exchanges.

Table B-12. Sampling Media Type (SAM_TYPE).

The sampling media are listed as follows:

SAMPLING CODE	DESCRIPTION
MICROL	Microlayer (0 - 0.20 cm) of sediment
WATCOL	Water column
SEDSAM	Sediment sample (other than core)
SEDCOR	An intact sediment sample contained in a SONE chamber
CORE_WATR	Water above the sediment surface in SONE chamber
SEDTRP	Sediment trap
SEDWAT	Sediment/water interface (0 - 1 cm)
WATINT	Interstitial water

Table B-13. Flux/Sedimentation Calculations.

The format of the calculations given below follows that used in the Lotus files:

Table B-13.1. SONE Calculations.

FILENAME: H2OPRFxx

Two calculations are used in the **Water Column Profiles** data tables:

SALINITY (SALIN): As calculated from conductivity data (COND)

SALIN (ppt) = $[20 + (0.69608) * (COND - 32.188)] + [(0.0013094) * (COND - 32.188)^2] - [(0.000011918) * (COND - 32.188)^3] + [(0.0000001792) * (COND - 32.188)^4] - [(3.1112 * 10^{-9}) * (COND - 32.188)^5]$

REFERENCE: Pers. comm. Hydrolab Corporation, Austin, TX 78727.

OXYGEN SATURATION (DO Sat): Measured oxygen concentration relative to oxygen saturation concentration at sample temperature and salinity.

DO Sat (%) = $(100 * DO)/(1.428 * (@EXP(-173.4292 + (249.6339 * (100/(TEMP + 273))) + (143.3483 * @LN((TEMP + 273)/100)) - (21.8492 * ((TEMP + 273)/100)) + SALIN * (-0.033096 + (0.014259 * ((TEMP + 273)/100)) - 0.0017 * ((TEMP + 273)/100)^2))))$

REFERENCE: Weiss, R.F. 1970. The solubility of nitrogen, oxygen and argon in water and seawater. Deep Sea Reasearch 17:721-735.

Table B-13.1.2 . FILENAME: SEDPRFxx

One calculation is used in sediment profile tables:

Corrected Eh **represents Eh relative to the hydrogen electrode.**

Eh CORR (mV) = Eh MEAS + 244

Table B-13.1.3. FILENAME: SWFLUXxx

Calculations used in sediment-water flux tables Core Water Depth represents height of water above the sediment surface in SONE chamber.

Core H_2O Depth (m) = (CORE VOL/139)/100

General method for calculating net sediment-water fluxes:

NET DO FLUX $[gO_2/(m^2 \cdot d)]$ = [(DO SLOPE) − (DO BLANK SLOPE)] x (CORE H_2O DEPTH[a]) x (1440[b])

NET NUTRIENT FLUX $[\mu M/(m^2 \cdot h)]$ = [(VARIABLE SLOPE[c]) − (VAR BLANK SLOPE[c])] x (CORE H_2O DEPTH [a]) x (60[d]) x (1000[c])

where:

a	converts measurements from volumetric to areal basis
b	converts time units from per minute to per day
c	variables are NH_4^+, NO_2^-, NO_2^- + NO_3^-, DIP, Si and H_2S
d	converts time units from minutes to hours
e	converts mass units from mM to μM.

Specific calculations used in sediment-water flux tables:

DISSOLVED OXYGEN FLUX

DO FLUX $[gO_2/(m^2 \cdot day)]$ = (DO SLOPE − BLANK DO) * 1440 * (CORE H_2O DEPTH)

DO FLUX MEAN $[gO_2/(m^2 \cdot day)]$ = @ SUM [DO FLUX(1) + DO FLUX(2) + DO FLUX(3)]/OBS[1]

AMMONIUM FLUX

NH_4 FLUX $[\mu MN/(m^2 \cdot hr)]$ = (NH_4 SLOPE − BLANK NH_4) * 60 * (CORE H_2O DEPTH) * 1000

NH_4 FLUX MEAN $[\mu MN/(m^2 \cdot hr)]$ = @ SUM[(NH_4FLUX(1)+NH_4 FLUX(2)+NH_4FLUX(3)]/OBS[1]

NOTE 1: OBS = number of valid observations and does not include non-interpretable (NI) values.

NITRITE FLUX

NO_2 FLUX = [μMN/(m^2•hr)] = (NO_2 SLOPE − BLANK NO_2) * 60 * (CORE H_2O DEPTH) * 1000

NO_2FLUX MEAN = [μMN/(m^2•hr)] = @SUM(NO_2 FLUX(1)+NO_2 FLUX (2)+NO_2 FLUX (3)]/OBS[1]

NITRITE + NITRATE FLUX

$NO_2 + NO_3$ FLUX = [μMN/(m^2 • hr)] = [(NO_2 + NO_3) SLOPE − BLANK (NO_2 + NO_3)] * 60 * (CORE H_2O DEPTH) * 1000

$NO_2 + NO_3$ FLUX MEAN = [μMN/(m^2 • hr)] = @SUM[(NO_2 + NO_3) FLUX(1) + (NO_2 + NO_3) FLUX(2) + (NO_2 + NO_3) FLUX (3)]/OBS[1]

DISSOLVED INORGANIC PHOSPHORUS FLUX

DIP FLUX = [μMP/(m2 • hr)] = (DIP SLOPE − DIP BLANK) * 60 * (CORE H_2O DEPTH) *1000

DIP FLUX MEAN = [μMP/(m^2 • hr)] = @SUM[DIP FLUX (1)+DIP FLUX (2)+DIP FLUX(3)]/OBS[1]

SILICATE FLUX

SILICATE FLUX = [μMSi/(m^2 • hr)] = [SILICATE SLOPE − BLANK $Si(OH)_4$] * 60 * (CORE H_2O DEPTH) * 1000

SILICATE FLUX MEAN = [μMSi/(m^2 • hr)] = @SUM[SILICATE FLUX(1) + SILICATE FLUX(2) + SILICATE FLUX (3)]/OBS[1]

HYDROGEN SULFIDE FLUX

H_2S FLUX = [μMS/(m^2 • hr)] = (H_2S SLOPE − H_2S BLANK) * 60 * (CORE H_2O DEPTH) * 1000

H_2S FLUX MEAN = [μMS/(m^2 • hr)] = @SUM[H_2S FLUX(1)+H_2S FLUX(2)+H_2S FLUX(3)]/OBS[1]

NOTE 1: OBS = number of valid observations and does not include non-interpretable (NI) values.

Table B-13.1.3.1. Criteria for accepting, rejecting and modifying variable slopes used in calculating net sediment water fluxes.

The method to measure each variable can be reviewed in Section B-1.5 Method Codes for Core Data (SONE): Dissolved nutrients and oxygen concentration in SONE sediment-water flux chamber.

Nutrient concentrations are plotted against time of sampling and the slope of this curve is used to calculate net sediment-water exchanges. The following steps assume that all data have been previously verified following normal protocols.

1. If the slope of the nutrient concentration vs time plot is statistically significant, the slope is used in calculating fluxes without modification.

2. Occasionally, there are plots which indicate a clear increasing or decreasing trend in concentration over time but which have **one** data point which diverges strongly (either higher or lower concentration) from the trend. We consider these divergent data to represent contaminated samples (either by addition of the compound or addition of water having a much lower concentration of the compound) and they are not used. The slope is recalculated using lower degrees of freedom and a higher "r" value as a criteria for significance. If the slope is statistically significant, it is used in calculating fluxes.

3. If the concentration vs time plots are erratic (i.e. no statistically significant increasing or decreasing trend in concentration over time) and if the difference in concentration among observations is **greater than** twice the detection limit for that variable, the data for that variable are considered to be non-interpretable. The slope is not calculated and the entry for that variable in the SWFLUXxx file is recorded as "NI." Further, if the blank core yielded a significant slope for that variable, the non-interpretable slope is not corrected. Detection limit for variables are found in Section B-1.5.

4. If the concentration vs time plots are erratic (i.e. no statistically significant increasing or decreasing trend in concentration over time) and differences among observations is **less than** twice the detection limit for that variable, then the slope is taken to be zero and the net sediment-water flux is reported as zero (or some other value if the blank correction is other than zero). Occasionally, statistically significant slopes have been found for some variables (mostly nitrite and dissolved inorganic phosphorus) where concentration differences over the incubation period do not exceed twice the reported detection limit. These slopes are used to calculate net sediment-water exchanges.

Table B-13.2. VFX Calculations.

Table B-13.2.1. FILENAME: VFXPRFxx

Two calculations are used in the water column profiles tables:

SALINITY (SALIN): As calculated from conductivity data (COND)

$$\text{SALIN (ppt)} = [20 + (0.69608) * (\text{COND} - 32.188)] + [(0.0013094) * (\text{COND} - 32.188)^2] - [(0.000011918) * (\text{COND} - 32.188)^3] + [(0.0000001792) * (\text{COND} - 32.188)^4] - [(3.1112 * 10^{-9}) * (\text{COND} - 32.188)^5]$$

REFERENCE: Pers. comm. Hydrolab Corporation, Austin, TX 78727.

OXYGEN SATURATION (DO Sat): Measured oxygen concentration relative to oxygen saturation concentration at sample temperature and salinity.

$$\text{DO Sat (\%)} = (100 * \text{DO})/(1.428 * (@\,\text{EXP}\,(-173.4292 + (249.6339 * (100/(\text{TEMP} + 273))) + (143.3483 * @\text{LN}((\text{TEMP} + 273)/100)) - (21.8492 * ((\text{TEMP} + 273)/100)) + \text{SALIN} * (-0.033096 + (0.014259 * ((\text{TEMP} + 273)/100)) - 0.0017 * ((\text{TEMP} + 273)/100)^2))))$$

REFERENCE: Weiss, R.F. 1970. The solubility of nitrogen, oxygen and argon in water and seawater. Deep Sea Reasearch 17:721-735.

Table B-13.2.2. FILENAME: VFXDEPxx

Calculations used in vertical flux of particulates tables. General method for calculating vertical deposition rates:

$$\text{Deposition Rate}^a\ [\text{mg}/(\text{m}^2 \cdot \text{day})] = (\text{VARIABLE CONCENTRATION}^b)(\text{DILU VOL})(219.3^c)/(\text{TIME TOTAL})/(1000^d)$$

where:

a Deposition rate is calculated as the flux of a particulate variable to the depth of the opening of the VFX sediment cup:
b variables are PC, PN, PP, B Si, CHLa ACTIVE, CHLa TOTAL and SESTON.
c converts the cross sectional area of collecting cups to a square meter basis.
d converts mass units from μg to mg (except for seston where conversion is from mg to g).

Specific calculations used in vertical flux of particulates tables:

FLUX PC = [mg/(m^2•d)] (PC * DILU VOL * 219.3)/(TIME TOTAL)/(1000)

PARTICULATE ORGANIC NITROGEN FLUX:

FLUX PN = [mg/(m^2•d)] (PN * DILU VOL * 219.3)/(TIME TOTAL) / (1000)

PARTICULATE PHOSPHORUS FLUX:

FLUX PP = [mg/(m^2•d)] (PP * DILU VOL * 219.3)/(TIME TOTAL) / (1000)

TOTAL CHLOROPHYLL-a FLUX:

FLUX CHLa TOTAL = [mg/(m^2•d)] (CHLa TOTAL * DILU VOL * 219.3)/(TIME TOTAL) / (1000)

ACTIVE CHLOROPHYLL-a FLUX:

FLUX CHLa ACTIVE = [mg/(m^2•d)] (CHLa ACTIVE * DILU VOL * 219.3)/(TIME TOTAL)/ (1000)

SESTON FLUX:

FLUX SESTON = [g/(m^2•d)] (SESTON * DILU VOL * 219.3)/(TIME TOTAL)/(1000)

BIOGENIC SILICA FLUX:

FLUX B Si = [mg/(m^2•d)] (B Si * DILU VOL * 219.3)/(TIME TOTAL)/ (1000)

Table B-14. Naming Conventions Relating to Data Files.

Each data file is given a unique name comprising eight characters:

- SONE data sets: A six letter descriptor indicating the data set is followed by a two digit descriptor identifying SONE cruise number. (Refer to Table B-2.1.)
- VFX data sets: A six letter descriptor indicating the data set is followed by a two digit descriptor identifying the sampling year.

DATA SET	FILE NAME
SONE:	
Water Column Profiles	H2OPRFxx
Water Column Nutrients	H2ONUTxx
Sediment Profile	SEDPRFxx
Core Profile	CORPRFxx (SONES 2, 6, & 10)
Core Data	CORDATxx
Sediment - Water Flux	SWFLUXxx
VFX:	
Water Column Profiles	VFXPRFxx
Surficial Sediment Particulates	VFXSEDxx
Vertical Flux of Particulates	VFXDEPxx

Table B-15. Format Documentation for SONE Data Sets.

These tables include a sequential listing of the variable names (column headings) for each SONE data set including the column width of each field, the units and significant places used in measurement or calculation of the variables.

Table B-15.1. WATER COLUMN PROFILES: Vertical profiles of temperature, salinity, dissolved oxygen and other characteristics at SONE stations.

FILENAME: H2OPRFxx

Temperature, salinity and dissolved oxygen concentrations are measured throughout the water column (2 meter intervals) at eight (previously ten) stations (Table B-5.1 and Figure B-6) in the Maryland portion of the Chesapeake Bay and tributaries during four periods of the year (April or May, June, August and October or November) in association with sediment oxygen and nutrient exchange measurements. After July 1, 1989, measurements are made five times per year in May, June, July, August and October (Table B-5.1). Several additional descriptive measurements are also made.

Water Column Profiles: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviations
DATE		8	Right	DDMMMYY
TIME		9	Right	HHMM (24 Hour Clock)
TOTAL DEPTH	m	9	Right	xx.x
SECCHI DEPTH	m	9	Right	x.x
GEAR CODE		4	Left	Alpha-Numeric Code
SAMPLE DEPTH	m	9	Right	xx.x
TEMP	C	9	Right	xx.x
COND	mmho/cm	9	Right	xx.x
SALIN	ppt	9	Right	xx.x Calculation/ Measurement
DO	mg/l	9	Right	xx.xx
DO SAT	%	9	Right	xxx.x Calculation

Table B-15.2. WATER COLUMN NUTRIENTS: Dissolved and particulate nutrient concentration in surface and bottom water at SONE stations.

FILENAME: H2ONUTxx

Measurements of surface and bottom water particulate and dissolved nutrient concentrations are made quarterly at eight (previously ten) stations (Table B-5.1 and Figure B-6) in the Maryland portion of the Chesapeake Bay and three tributaries, during five (previously four) periods of the year. Table B-5.1 has sampling schedule and location changes.

Water Column Nutrients: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviations
DATE		8	Left	DDMMMYY
TIME		9	Right	MMHH (24 Hour Clock)
TOTAL DEPTH	m	7	Right	xx.x
SAMPLE DEPTH	m	7	Right	xx.x
DISSOLVED NUTRIENTS:				
NH4	μM	6	Right	xx.x
NO2	μM	6	Right	x.xx
NO3 + NO2	μM	8	Right	xx.xx
TDN	μM	6	Right	xx
DIP	μM	6	Right	x.xx
TDP	μM	6	Right	x.xx
SI(OH)4	μM	8	Right	xx.x
PARTICULATES:				
PC	μg/l	6	Right	xxxxx
PN	μg/l	6	Right	xxxx
PP	μg/l	6	Right	xx.x
CHLa TOTAL	μg/l	7	Right	xx.x
CHLa ACTIVE	μg/l	7	Right	x.x
SESTON	μg/l	7	Right	xxx

Table B-15.3. SEDIMENT PROFILES: Vertical sediment profiles of Eh and surficial sediment characteristics at SONE stations.

FILENAME: SEDPRFxx

Concentrations of particulate organic carbon, organic nitrogen, phosphorus, biogenic silica, chlorophyll-a (total and active) are measured in surficial sediments at eight (previously ten) stations (Table B-5.1 and Figure B-6) in the Maryland portion of the Chesapeake Bay and three tributaries, during five periods of the year. Table B-5.1 has sampling schedule and location changes. Additionally, Eh is measured at 1 cm intervals in sediment cores to a depth of 10 cm.

Sediment Profiles: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviations
DATE		8	Left	DDMMMYY
TIME		9	Right	HHMM (24 Hour Clock)
CORE DEPTH	cm	7	Right	xxx.x
Eh MEAS	mV	7	Right	xxxx
Eh CORR	mV	7	Right	xxxx
SURFICIAL SEDIMENT (0-1.0 cm)[1] PARTICULATES:				
SED PC	% (wt)	7	Right	x.xx
SED PN	% (wt)	7	Right	x.xxx
SED PP	% (wt)	7	Right	x.xxx
SED CHLa TOTAL	mg/m^2	10	Right	xxxx.x
SED CHLa ACTIVE	mg/m^2	10	Right	xxxx.x

NOTE 1: After August 1989, surficial sediments were sampled from the top 0.2 - 0.3 cm.

Table B-15.4. CORE PROFILES: Vertical profiles of percentage H_2O, particulates and pore water nutrients at SONE stations.

FILENAME: CORPRFxx

Concentrations of particulate organic carbon, organic nitrogen, phosphorus, ammonium, nitrite, nitrite plus nitrate, dissolved inorganic phosphorus, siliceous acid and H_2O%, are measured at 1 cm intervals in sediment cores to a depth of 10 cm, once each year at SONE stations. These measurements were only made in October 1984, October 1985 and November 1986.

Core Profiles: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviation
DATE		8	Right	DDMMMYY
TIME		9	Right	HHMM (24 Hour Clock)
SECTION MID-POINT	cm	8	Right	x.x
H_2O %	%	7	Right	xx.x
PARTICULATES:				
SED PC	% (wt)	8	Right	x.xx
SED PN	% (wt)	8	Right	x.xxx
SED PP	% (wt)	8	Right	x.xxx
PORE WATER:				
NH4	μM	8	Right	xxx
NO2	μM	7	Right	x.xx
NO3 + NO2	μM	8	Right	x.xx
DIP	μM	7	Right	xx.x
SI(OH)4	μM	8	Right	xxx.x

Table B-15.5. CORE DATA: Dissolved nutrient and oxygen concentration in SONE sediment-water flux chamber.

FILENAME: CORDATxx

Concentration measurements of oxygen, ammonium, nitrite, nitrite plus nitrate, dissolved inorganic phosphorus and siliceous acid, are made over three to four hour incubation periods in SONE chambers using samples collected at eight (previously ten) stations (Table 5-1) in the Maryland portion of the Chesapeake Bay and three tribuitaries, during five (previously four) periods of the year. Table B-5.1 has sampling schedule and location changes.

Core Data: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviations
DATE		8	Left	DDMMMYY
CORE NO		5	Right	X or B
TIME OF SAMPLE	hr min	3 4	Right Right	xx xx
TIME DELTA	min	7	Right	xx
TIME SUM	min	5	Right	xxx
DO	mg/l	8	Right	x.xx
AA VIAL NO		5	Right	xxx
DISSOLVED NUTRIENTS:				
NH4	μM	6	Right	xx.x
NO2	μM	6	Right	x.xx
NO3 + NO2	μM	8	Right	xxx.xx
DIP	μM	6	Right	x.xx
SI(OH)4	μM	8	Right	xxx.x
H2S	μM	8	Right	xxxx.xx

Table B-15.6. SEDIMENT-WATER FLUX: Net sediment-water exchange rates of disssolved oxygen [$gO_2/(m^2 \cdot day)$] and nutrients [μM N, P, Si and $S/(m^2 \cdot hr)$].

FILENAME: SWFLUXxx

Net sediment water exchange rates of dissolved oxygen and nutrients; nitrogen, phosphorus, silicate and hydrogen sulfide measured at eight (previously ten) stations (Table B-5.1) in the Maryland portion of the Chesapeake Bay and three tributaries, during five (previously four) periods of the year. Table B-5.1 has sampling schedule and location changes.

Sediment Water Flux: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviations
DATE		8	Left	DDMMMYY
CORE NO.		4	Right	x
CORE H_2O VOL	ml	7	Right	xxxx
CORE H_2O DEPTH	m	7	Right	x.xxx
DO SLOPE	mg/l/min	11	Right	xx.xxxxxx
DO FLUX	$gO_2/(m^2 \cdot day)$	8	Right	xx.xx
DO FLUX MEAN	$gO_2/(m^2 \cdot day)$	8	Right	xx.xx
NH4 SLOPE	μMN/min	11	Right	x.xxxxxx
NH4 FLUX	$\mu MN/(m^2 \cdot day)$	8	Right	xxx.x
NH4 FLUX MEAN	$\mu MN/(m^2 \cdot day)$	8	Right	xxx.x
NO2 +NO3 SLOPE	μMN/min	11	Right	xx.xxxxxx
NO2 +NO3 FLUX	$\mu MN/(m^2 \cdot hr)$	8	Right	xx.xx
NO2 +NO3 FLUX MEAN	$\mu MN/(m^2 \cdot hr)$	8	Right	xx.xx
DIP SLOPE	μMP/min	11	Right	xx.xxxxxx
DIP FLUX	$\mu MP/(m^2 \cdot hr)$	8	Right	xx.xx
DIP FLUX MEAN	$\mu MP/(m^2 \cdot hr)$	8	Right	xx.xx
SILICATE SLOPE	μMSi/min	11	Right	xx.xxxxxx
SILICATE FLUX	$\mu MSi/(m^2 \cdot hr)$	8	Right	xxxx
SILICATE FLUX MEAN	$\mu MSi/(m^2 \cdot hr)$	8	Right	xxx
H2S SLOPE	nMS/(1 • min)	11	Right	xx.xxxxxx
H2S FLUX	$\mu MS/(m^2 \cdot hr)$	8	Right	xxxx
H2S FLUX MEAN	$\mu MS/(m^2 \cdot hr)$	8	Right	xxxx
BLANK SLOPES:				
DO	mg/(1 • min)	10	Right	xx.xxxxx
NH4	μMN/(1 • min)	10	Right	xx.xxxxx
NO3	μMN/(1 • min)	10	Right	xx.xxxxx
DIP	μMP/(1 • min)	10	Right	xx.xxxxx
SI(OH)4	μMSi/(1 • min)	10	Right	xx.xxxxx
H2S	nMS/(1 • min)	10	Right	xx.xxxxx

Table B-16. Format Documentation For VFX Data Sets.

These tables include a sequential listing of the variable names (column headings) for each VFX data set including the column width of each field, the units and significant places used in measurement or calculation of the variables.

Table B-16.1. WATER COLUMN PROFILES: Vertical profiles of temperature, salinity, dissolved oxygen and particulates at VFX stations.

FILENAME: VFXPRFxx

Temperature, salinity, oxygen and particulate concentrations of silicate, organic carbon, organic nitrogen, phosphorus, chlorophyll-a (active and total), seston and biogenic silica are measured at various depths at one (previously several) sediment trap station in the Maryland portion of the Chesapeake Bay. Modifications of sediment trap stations are given in the footnotes of Table B-5.1.

VFX measurements are made approximately 30 times a calendar year. Cruise dates for each calendar year are listed in Tables B-2.2, B-2.3 and B-2.4.

Water Column Profiles: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		8	Left	Alpha Abbreviations
DATE		8	Left	Number
TIME		5	Right	HHMM (24 Hour Clock)
TOTAL DEPTH	m	6	Right	xx.x
SECCHI DEPTH	m	7	Right	x.x
GEAR CODE		5	Left	Alpha-Numeric Code
SAMPLE DEPTH	m	7	Right	xx.x
TEMP	C	6	Right	xx.x
COND	mmho/cm	10	Right	xx.x
SALIN	ppt	7	Right	xx.x Calculation/ Measurement
DO	mg/l	7	Right	xx.xx
DO SAT	%	6	Right	xxx.x Calculation
WATER COLUMN PARTICULATES:				
PC	µg/l	6	Right	xxxxx
PN	µg/l	6	Right	xxxx
PP	µg/l	6	Right	xx.x
CHLa TOTAL	µg/l	7	Right	xx.x
CHLa ACTIVE	µg/l	7	Right	x.x
SESTON	µg/l	7	Right	xxx
B Si	µg/l	6	Right	xxx

Table B-16.2. SURFICIAL SEDIMENT PARTICULATES: Concentration of particulate carbon, nitrogen, phosphorus and chlorophyll-a in the surface sediment at VFX stations.

FILENAME: VFXSEDxx

Concentrations of particulate organic carbon, organic nitrogen, phosphorus and chlororphyll-a (total and active) are measured in surficial sediments at one (previously several) sediment trap station in the Maryland portion of the Chesapeake Bay. Modifications of sediment trap stations are given in the footnotes of Table B-5.1.

From July 1984 until August 1989, concentrations were based on a sample of the surface 1 cm of the sediment column. After this date, these concentrations are based on samples from the top two to three millimeters of the sediment column.

Surficial Sediment Particulates: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		9	Left	Alpha Abbreviation
DATE		9	Left	DDMMMYY
SURFICIAL SEDIMENT PARTICULATES (0 - 1.0 cm)[1]				
SED PC	% (wt)	9	Right	x.xx
SED PN	% (wt)	9	Right	x.xxx
SED PP	% (wt)	9	Right	x.xxx
SED CHLa TOTAL	mg/m^2	9	Right	xxxx.x
SED CHLa ACTIVE	mg/m^2	9	Right	xxxx.x

NOTE 1: After August 1989, surficial sediments were sampled from the top 0.2 - 0.3 cm.

Table B-16.3. VERTICAL FLUX OF PARTICULATES: Rate of deposition of seston, PC, PN, PP, chlorophyll-a and biogenic silica determined with sediment traps at VFX stations.

FILENAME: VFXDEPxx

Estimates of particulate organic carbon, organic nitrogen and phosphorus, biogenic silica, chlorophyll-a (total and active) and seston deposition measured at the depth of the sediment trap collecting cup at one (previously several) sediment trap station in the Maryland portion of the Chesapeake Bay. Modification of sediment trap stations are given in the footnotes of Table B-5.1. VFX measurements are made approximately 30 times a calendar year. Cruise dates for each calendar year are listed in Tables B-2.2, B-2.3 and B-2.4.

Vertical Flux of Particulates: Column headings and order.

NAME	UNITS	COLUMN WIDTH	JUSTIFIED	SIGNIFICANT PLACES
STATION		9	Left	Alpha Abbreviation
DATE DEP		8	Left	DDMMMYY
TIME DEP		6	Right	HHMM (24 Hr Clock)
DATE RET		8	Left	DDMMMYY
TIME RET		6	Right	HHMM (24 Hr Clock)
TOTAL TIME	days	6	Right	xx.x
TOTAL DEPTH AVG	m	6	Right	xx.x
CUP DEPTH	m	6	Right	xx.x
PC FLUX	mg/(m^2 • day)	9	Right	xxxx
PN FLUX	mg/(m^2 • day)	7	Right	xxxx
PP FLUX	mg/(m^2 • day)	7	Right	xx.x
CHLa TOTAL FLUX	mg/(m^2 • day)	8	Right	xx.x
CHLa ACTIVE FLUX	mg/(m^2 • day)	7	Right	x.x
SESTON FLUX	g/(m^2 • day)	7	Right	xx.x
B Si FLUX	mg/(m^2 • day)	8	Right	xxxx
DILU VOL	l	7	Right	x.x
PC	mg/l	6	Right	xxxxx
PN	mg/l	8	Right	xxxx
PP	mg/l	8	Right	xxx
CHLa TOTAL	mg/l	8	Right	xxx.x
CHLa ACTIVE	mg/l	8	Right	xx.x
SESTON	mg/l	8	Right	xxxx
B Si	mg/l	7	Right	xxxxx