CATALOG DOCUMENTATION
EMAP-ESTUARIES PROGRAM LEVEL DATABASE
1991 VIRGINIAN PROVINCE
WATER QUALITY VERTICAL PROFILE DATA

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1. DATA SET IDENTIFICATION

1.1 Title of Catalog document

EMAP-Estuaries Program Level Database
1991 Virginian Province
Water Quality Vertical Profile Data Summarized by Station

1.2 Authors of the Catalog entry

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1.3 Catalog revision date

2 April 1996

1.4 Data set name

VP_WATR

1.5 Task Group

Estuaries

1.6 Data set identification code

00023

1.7 Version

001

1.8 Requested Acknowledgment

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

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

2. INVESTIGATOR INFORMATION

2.1 Principal Investigator

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3. DATA SET ABSTRACT

3.1 Abstract of the Data Set

The VERTICAL PROFILE WATER QUALITY (VP_WATR) file provides a snapshot of the acceptable vertical profiles taken at a station. The reported surface measurements were taken within one (1) meter of the surface, while bottom measurements were taken within one (1) meter of the bottom. Several parameters were calculated, including surface and bottom density, maximum fluorescence, rate of light extinction and compensation depth.

If a file specification is cited, Quality Assurance/Quality Control code(s) are reported. Suspended solids concentration was measured from a surface water sample.

3.2 Keywords for the Data Set

Bottom values, dissolved oxygen, fluorescence, light extinction rate, PAR, pH, QA code, salinity, surface values, temperature, transmissivity, vertical profile data

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

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

4.2 Data Set Objective

The objective of the Vertical Profile data set is to provide summary data of surface and bottom values of specific water column parameters at each station visited in the Virginian Province.

4.3 Data Set Background Discussion

Habitat indicators provide important information about the environmental setting of a sample site. Salinity and temperature are among the most important factors controlling the distribution of biota and ecological processes in estuaries. Water depth itself has little direct effect on estuarine biota because most estuaries are relatively shallow, and the pressure changes that occur are minor. However, in almost all estuaries, changes in water depth are associated with changes in sediment characteristics, dissolved oxygen concentration, and temperature regime. Therefore, information about depth is useful for explaining many of the observations that will be taken by EMAP-E.

Dissolved oxygen concentration, an EMAP-E abiotic condition indicator, is a parameter of overwhelming importance to assessment endpoints and is one of the most important factors contributing to fish and shellfish mortality in estuarine and coastal waters. Dissolved oxygen (DO) concentration is also a link in the eutrophication process, making it a critical component of the EMAP-E conceptual mode. Stresses that occur in conjunction with low DO (e.g., exposure to hydrogen sulfide) may cause as much, if not more, harm to aquatic biota than exposure to low DO alone. In addition, aquatic populations exposed to low DO may be more susceptible to the adverse effects of other stressors (e.g., disease, toxic chemicals).

One of the human use endpoints is visual aesthetics of the environment. A habitat is degraded for the aesthetics indicator if floating and

deposited garbage and trash are abundant, if there are noxious odors, or if the water is not clean in appearance. Water clarity was measured in three ways: transmissometry, fluorometry, and photosynthetically active radiation (PAR). Transmissometry provided information on the turbidity of water; fluorometry provided information concerning the degree to which reduction in light penetration may be due to the presence of photosynthetic algae, and PAR provided information on the degree to which turbidity can inhibit photosynthetic activity. The incremental cost for measuring all three was small since each was obtained with a probe added to the SeaBird CTD package.

4.4 Summary of Data Set Parameters

Surface and bottom water quality parameters are reported for one vertical profile taken at a station. These include: temperature, salinity, dissolved oxygen concentration, pH, fluorescence, light transmission and photosynthetically active radiation (PAR) and suspended solids. Other summary values were calculated: density (sigma-t) and rates of light extinction. Depth of the water column at the time of sampling is also reported. Measurements were taken at one meter below the surface of the water and at one meter above the bottom. The transmissivity at 1 meter (TRANS_1MT), a rate of light extinction (AVG_K) and secchi depth (SECCHI) were not measured in the Virginian Province.

5. DATA ACQUISITION AND PROCESSING METHODS

5.1 Data Acquisition

5.1.1 Sampling Objective

To collect high-quality vertical water column profiles of salinity, temperature, dissolved oxygen concentration, transmissivity, fluorescence, pH and photosynthetically active radiation. One CTD cast was performed on each visit to EMAP sampling stations to collect these data. A surface water sample was collected for a suspended solids measurement.

5.1.2 Sample Collection Methods Summary

CTD: The first activity performed at a station was a CTD cast. The CTD was attached to the end of a winch cable with a shackle. The instrument was swung over the side of the boat, turned on and lowered to just below the water surface. The instrument was allowed to reach thermal equilibrium (about three minutes). The instrument was then lowered through the water column at a rate of approximately 0.25 meter per second until it reached the bottom. The boat's depth finder was used to prevent the CTD from impacting the bottom by stopping its descent when it was approximately one meter or less from the bottom. The unit was allowed to equilibrate and to collect bottom data for two minutes. The unit was then raised to the surface, turned off and brought back on the boat. If the water depth was too shallow (<3 meters to obtain a profile, the unit was suspended 1 meter above the bottom and allowed to collect data for two minutes following the equilibrium period.

After being brought back on the boat, the CTD was then connected to the on-board GRiD 386 computer and the data were uploaded using the Sea-Bird software. The data were viewed on the screen of the computer. If the cast was acceptable, appropriate entries were made on a data sheet. Up to three attempts were made to collect an acceptable CTD cast.

SUSPENDED SOLIDS: The suspended solids sample was collected at the same time as the CTD cast. After the CTD instrument reached equilibrium, a surface water sample was collected with a Go-Flo bottle or a bucket.

The surface water sample in the Go-Flo bottle was shaken to ensure a homogeneous distribution of sediments. A 625 ml plastic container was filled with water from the Go-Flo bottle. The sample was placed on ice.

5.1.3 Sampling Start Date

22 July 1991

5.1.4 Sampling End Date

13 September 1991

5.1.5 Platform

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

5.1.6 Sampling Gear

A Sea-Bird Electronics, Inc. model SBE-25 SeaLogger CTD is a self-contained array of instruments capable of measuring salinity, temperature, dissolved oxygen, pH, transmissivity (an estimate of suspended solids concentration), fluorescence (an estimate of chlorophyll_a concentration) and photosynthetically active radiation (PAR; a measurement of the intensity of light in the range of wavelengths used by algae in photosynthesis). Oxygen was measured with a Beckman polarographic DO electrode.

The core of the unit is a data logger which stores all data collected by the individual probes. The entire array is powered internally using batteries; therefore, it does not require any electronic connection to the boat during operation. Supplied with the instrument is the software required for communicating with the data logger and for downloading data to an on-board computer.

5.1.7 Manufacturer of Instrument

Sea-Bird Electronics, Inc.

5.1.8 Key Variables

This data set contains surface values collected at the time of sampling. Bottom values may be instantaneous measurements or may be values averaged over two (2) minutes of measurements.

5.1.9 Sampling Method Calibration

CTD units were calibrated at the Virginian Province Field Operations Center prior to the start of the sampling season. If a unit failed quality control checks in the field, it was shipped back to the Center for re-calibration.

5.1.10 Sample Collection Quality Control

A QC check was performed on the CTD unit once per crew shift. The CTD unit was lowered into the water and allowed to equilibrate for up to ten minutes (equilibration time was dependant on the difference between the air and water temperatures). The DO probe on the CTD unit was checked against a calibrated YSI meter. The salinity of a water sample taken from next to the CTD was measured using a refractometer and the temperature of the water sample was taken using a stem thermometer. The CTD was brought out of the water and the pH measurement from the CTD was checked using a pH 10 buffer. If the measurements from the CTD unit did not agree with the "ambient" measurements within 2oC temperature, 0.5 mg/L dissolved oxygen, 2 ppt salinity, and 0.5 pH unit, the QC process was repeated. If, after a second attempt, the unit still produced erroneous numbers, a decision was made to either use the instrument or return it to the Field Operations Center; in addition, all DO data collected since the last successful QC check were flagged.

Checks were also performed at each station. Immediately prior to obtaining the CTD profile, a bottom water sample was collected using a Go-Flo bottle and the DO concentration was determined with an air-calibrated YSI meter. After the CTD cast was performed, the bottom DO from the CTD was compared with the value obtained by the YSI meter. If these measurements did not agree within 0.5 mg/L, the data were flagged.

5.1.11 Sample Collection Method Reference

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

5.1.12 Sample Collection Method Deviations

None

5.2 Data Preparation and Sample Processing

5.2.1 Sample Processing Objective

Evaluate the quality of the data on a cast-by-cast basis in order to assign appropriate Quality Assurance Codes.

5.2.2 Sample Processing Methods Summary

SUSPENDED SOLIDS: The suspended solids samples were stored at four degrees C until analysis. To determine suspended solids (non-filterable residue) concentrations, the sample was well mixed and filtered through

a glass fiber filter. Non-representative particulates such as leaves or sticks were excluded from the sample. The suspended solids concentration was usually determined from a 0.1 liter volume of sample. However, if the residue weight collected from 0.1 L of sample was less than 1 mg, the sample was filtered a second time using 0.2 L. The residue retained on the filter was dried to constant weight at 103-105 degrees Centigrade for at least one hour. The filter was then cooled in a desiccator and weighed.

CTD: A cast was verified to have been taken at a particular station on a particular date by comparing date, time, bottom salinity and depth in the file to data recorded on field data sheets.

The CTD file processing involved the splitting of CTD casts into segments. The complete raw CTD files were split into sections by comparing time versus depth data to a graph from a CTD cast shown on a PC using a CTD splitting program. Each cast was split into several sections representing the surface equilibration, downcast, bottom soak and upcast.

5.2.3 Sample Processing Method Calibration

NA

5.2.4 Sample Processing Quality Control

Notes were kept on any sections not included in the split casts and on any unusual patterns discerned in the time vs. depth graphs.

The following summarizes the quality control objectives of each SeaBird CTD probe:

Salinity: A refractometer measurement served as a gross check on the CTD probe. The instrument would be recalibrated if the probe and refractometer measurements differed by 1 ppt.

Temperature: The temperature sensor on the probe was calibrated by the manufacturer using a National Institutes of Standards and Technology (NIST) certified thermometer. If on-site calibration results differed from the original calibration by > 2 deg C, the data may be flagged.

pH: Standard pH solutions were used to check the unit calibration. The QC check should be within 0.2 pH units of the true value of the buffer solution. If the QC check is outside control limits, the data were flagged.

Fluorometry: The measurement of in situ chlorophyll_a fluorescence was accomplished using a fluorometer attached to the SeaBird CTD. The optical filters used in this fluorometer were selected for optimum estimation of chlorophyll_a fluorescence. The probe was not calibrated.

Transmissometry: A Sea Tech 10 cm pathlength transmissometer was used to provide in situ measurements of beam transmission and the concentration of suspended matter at each station occupied. Surface water samples were collected for later determination of suspended solids

concentration. These were to have provided a calibration of the field measurements, but a post-calibration was not conducted.

5.2.5 Sample Processing Method Reference

6. DATA MANIPULATIONS

6.1 Name of New or Modified Values

Surface data were generally measurements from the first record after the instrument had equilibrated. The bottom data were generally derived as a mean of a two minute bottom soak. TRANS_1MT, AVG_K and SECCHI were not measured in the Virginian Province.

6.2 Data Manipulation Description

6.2.1 Alignment

Some files were subjected to alignment procedures if comparison of downcast and upcast plots suggested there were differences in DO, salinity and temperature v depth at the pycnocline. Such lags were a function of the rate of descent and the lag time of the individual probes. Delay factors of 1 to 5 or more seconds were applied to specific parameters, i.e., DO, salinity, temperature, until the upcast and downcast aligned at the pynocline.

The user should note that the depth measurements reported are from the depth sensor and are NOT adjusted for the relative position of the various probes on the CTD. The depth sensor is located at the bottom of the instrument at the same level as the pump intake. The dissolved oxygen, temperature and conductivity sensors are all included in the loop of pumped water; therefore, the readings from these probes correspond accurately to the depth reported for that line of data. The remaining probes are located at different levels within the CTD frame. As a result, the depth reported for these measurements is inaccurate and the user may desire to offset them. The transmissometer is positioned 8 inches (0.232 m) above the plane of the depth sensor; the fluorometer and pH probe are both 12 inches (0.305 m) above the plane of the depth sensor. The PAR meter is 28 inches (0.711 m) above the plane of the depth sensor. For example, the true depth of PAR measurement reported at a depth of 5.0 meters would actually be 5.0 - 0.711 = 4.289 meters. As stated above, the data reported in this package have not been adjusted for these offsets, and it is the responsibility of the user to do so if desired.

6.2.2 COMP_PAR: Compensation Depth

The first depth at which PAR is equal to or less than 1 % of the surface PAR value:

$$\text{PAR at depth } x < 0.01(\text{SRF\_PAR})$$

6.2.3 K_PAR

K_PAR is the slope of the line defined by the regression of light v depth at each station location.

6.2.4 MAX_FLR

The file associated with a station was searched to select the maximum fluorescence value found at a station

6.2.5 DENSITY

Surface and bottom density were calculated using the following equations incorporating surface and bottom temperature and salinity:

Surface density was calculated as follows:

```
a4=(1.0281045)-(0.0000535633*srf_temp)-(0.00000678195*(srf_temp**2)
a5=(0.000000070517*(srf_temp**3))-(0.00000000084794*(srf_temp**4)) +

  (0.000000000005057*(srf_temp**5))
a6=(0.00080792)-(0.0000032481*srf_temp) +
  (0.00000006423*(srf_temp**2))-(0.000000000649*(srf_temp**3))
a7=srf_salinity-35
a8=(0.0000002045*(srf_salinity-35)**2))
a9=a4 + a5 + a6 + a7 + a8

SURFACE DENSITY  = (a9*1000)-1000
```

Bottom density was calculated as follows:

```
a4=(1.0281045)-(0.0000535633*btm_temp)-(0.00000678195*(btm_temp**2)
a5=(0.000000070517*(btm_temp**3))-(0.00000000084794*(btm_temp**4)) +

  (0.000000000005057*(btm_temp**5))
a6=(0.00080792)-(0.0000032481*btm_temp) +
  (0.00000006423*(btm_temp**2))-(0.000000000649*(btm_temp**3))
a7=btm_salinity-35
a8=(0.0000002045*(btm_salinity-35)**2))
a9=a4 + a5 + a6 + a7 + a8

BOTTOM DENSITY  = (a9*1000)-1000
```

6.2.6 The suspended solids concentration in mg/L was determined as: (A-B)*1000/C

A = weight of filter and residue in mg
B = weight of filter in mg
C = mL of sample filtered

7. DATA DOCUMENTATION

7.1 Desciption of Parameters

#	Parameter SAS Name	Data Type	Len	Format	Parameter Label
1	STA_NAME	Char	8	8.	The Station Identifier
2	VST_DATE	Num	8	YYMMDD6.	The Date the Sample was Collected
3	SRF_DO	Num	8	5.1	Dissolved oxygen (mg/l) at the Surface
4	SRF_TEMP	Num	8	5.2	Temperature (C) at the Surface
5	SRF_SAL	Num	8	5.2	Salinity (ppt) at the Surface
6	SRF_PAR	Num	8	5.	PAR (mE/m2/s) at the Surface
7	SRF_PH	Num	8	5.1	pH (units) at the Surface
8	SRF_TRNS	Num	8	4.	Transmissivity (%) at the Surface
9	SRF_FLR	Num	8	4.	Fluorescence at the Surface
10	SRF_DENS	Num	8	5.2	Density (Sigma T) at the Surface
11	BTM_DO	Num	8	5.1	Dissolved Oxygen (mg/l) at the Bottom
12	BTM_TEMP	Num	8	5.2	Temperature (C) at the Bottom
13	BTM_SAL	Num	8	5.2	Salinity (ppt) at the Bottom
14	BTM_PAR	Num	8	5.	PAR (mE/m2/s) at the Bottom
15	BTM_PH	Num	8	5.1	pH (units) at the Bottom
16	BTM_TRNS	Num	8	4.	Transmissivity (%) at the Bottom
17	BTM_FLR	Num	8	4.	Fluorescence at the Bottom
18	BTM_DENS	Num	8	5.2	Density (Sigma T) at the Bottom
19	MAX_FLR	Num	8	4.	Maximum Fluorescence measured in VP file
20	K_PAR	Num	8	5.2	Rate of Light Extinction
21	COMP_PAR	Num	8	5.1	Depth where PAR = 1 % of SRF PAR
22	VP_NAME	Char	80	$80.	Full File Specification of Profile
24	SS_CONC	Num	8	7.1	Total Suspended Solids Conc. (mg/l)
23	QA_CODE	Char	30	$30.	Quality Assurance Code for Data

7.1.6 Precision to which values are reported

The number of decimal places for each value reflects the precision of the probe.

7.1.7 Minimum Value in Data Set by Parameter

SRF_DO	3.0
SRF_TEMP	18.70
SRF_SAL	0.04
SRF_PH	6.7
SRF_PAR	19
SRF_TRNS	4
SRF_FLR	2
SRF_DENS	-4.20
BTM_DO	0.1
BTM_TEMP	16.2
BTM_SAL	0.00
BTM_PH	6.8
BTM_PAR	2
BTM_TRNS	2
BTM_FLR	2
BTM_DENS	-4.13

```
MAX_FLR          3
K_PAR            0.111
AVG_K
COMP_PAR         1.5
TRNS_1MT
SS_CONC          3.2
SECCHI
```

7.1.7 Maximum Value in Data Set by Parameter

```
SRF_DO           10.1
SRF_TEMP         30.85
SRF_SAL          32.30
SRF_PH            8.7
SRF_PAR        2722
SRF_TRNS         93
SRF_FLR          30
SRF_DENS         22.40
BTM_DO            9.7
BTM_TEMP         29.96
BTM_SAL          32.31
BTM_PH            8.6
BTM_PAR        1392
BTM_TRNS         91
BTM_FLR          30
BTM_DENS         23.52
MAX_FLR          30
K_PAR             4.760
AVG_K
COMP_PAR         15.2
TRNS_1MT
SS_CONC          70.9
SECCHI
```

7.2 Data Record Example

7.2.1 Column Names for Example Records

```
STA_NAME VST_DATE SRF_DO    SRF_TEMP SRF_SAL SRF_PH SRF_PAR SRF_TRNS SRF_FLR
SRF_DENS BTM_DO   BTM_TEMP  BTM_SAL  BTM_PH  BTM_PAR
```

7.2.2 Example Data Records

```
OBS  STA_NAME  VST_DATE SRF_DO SRF_TEMP SRF_SAL SRF_PH SRF_PAR SRF_TRNS

 1   VA91-261   910803   6.8    26.53    22.92    7.9    765     61
 2   VA91-262   910815   6.7    25.73    24.43    8.0    380     60
 3   VA91-263   910803   8.1    28.41    15.04    7.8   2722     28

OBS  SRF_FLR SRF_DENS BTM_DO BTM_TEMP BTM_SAL BTM_PH BTM_PAR

 1     13      13.78    6.4   26.47    22.95    7.9    19
 2     15      15.16    5.2   21.45    30.73    7.9     3
 3     15       7.33    8.1   28.39    15.07    7.8     8
```

OBS	BTM_TRNS	BTM_FLR	BTM_DENS	MAX_FLR	K_PAR	AVG_K	COMP_PAR	TRNS_1MT
1	58	13	13.83	14	1.117	.	.	.
2	54	10	21.13	17	0.741	.	6.7	.
3	20	17	7.36	18	2.786	.	2.0	.

OBS	VP_NAME	QA_CODE	SS_CONC	SECCHI
1	narvax::disk$emap:[rawdata.ctdraw]1030066.dwn	GD	24.2	.
2	narvax::disk$emap:[rawdata.ctdraw]1018066.dwn	GD	27.4	.
3	narvax::disk$emap:[rawdata.ctdraw]1034066.dwn	GD	29.0	.

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude

-77 Degrees 18 Minutes 58.80 Decimal Seconds

8.2 Maximum Longitude

-70 Degrees 01 Minutes 00.00 Decimal Seconds

8.3 Minimum Latitude

36 Degrees 56 Minutes 24.60 Decimal Seconds

8.4 Maximum Latitude

42 Degrees 08 Minutes 00.00 Decimal Seconds

8.5 Name of area or region

Virginian Province

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

9. QUALITY CONTROL/QUALITY ASSURANCE

9.1 Data Quality Objectives

Measurement quality objectives were outlined in the Quality Assurance Project Plan (Valente and Schoenherr, 1991). Accuracy and precision goals are outlined below:

Measurement Quality Objectives for EMAP-Estuaries Indicators and associated data.

Data Type	Maximum Allowable Accuracy Goal	Precision Goal	Completeness Goal
DO	0.5 mg/l	10 %	90 %
Salinity	1 ppt	10 %	90 %
Depth	0.5 m	10 %	90 %
Fluorometry	NA	10 %	90 %
Transmissometry	NA	10 %	90 %
pH	0.2 units	NA	90 %
Temperature	0.5 deg C	NA	90 %

9.2 Quality Assurance Procedures

9.2.1 1991 CTD Files

Verification reports were generated in SAS which included the following flags:

- If CTD cast sampleid was not seven digits and/or did not end in 066 or 067;
- If CTD cast sampleid and CTD cast filename (minus the .dat extension) were not the same;
- If the CTD bar code did not match one of the unit bar codes (either 802537, 648222, 648223 or 648224);
- If YSI bottom dissolved oxygen was not in the range 0-10 mg/l;
- If refractometer bottom salinity was not in the range 0 to 35 ppt;
- If CTD bottom dissolved oxygen was not in the range 0-10 mg/l;
- If CTD bottom salinity was not in the range 0 to 35 ppt

If any flags were generated by the verification report, the information management staff rechecked the data in the database against the data sheets.

The second step in the CTD verification process was to confirm that the CTD casts were associated with the proper event and station. Automated comparisons were made using SAS to help identify CTD casts that had been associated with the wrong station or event. Flags using the average of the bottom cast values were included as part of QC reports:

- If difference between the depth of the CTD cast and the station depth recorded by the fathometer exceeded 3 meters
- If difference between CTD bottom salinity and bottom salinity measured by the refractometer exceeded 3 ppt

- If difference between CTD bottom dissolved oxygen and YSI dissolved oxygen exceeded 0.5 mg/L

All of the above flags generated in the QC SAS report were investigated to ensure that CTD casts were associated with the proper event and station.

The validation process for CTD data files involved six steps which are described below.

1) Performance check of CTD units at the end of the season.

At the conclusion of the sampling season, a performance check was made of the four CTD units. An outline of this procedure follows:

1. Obtain simultaneous readings from all CTD units submerged in a 500 gallon seawater tank - compare individual readings to each other;

2. Determine accuracy of dissolved oxygen readings using a YSI meter and Winkler titrations

3. Assess salinity measurements with auto-salinometer readings

4. Verify temperature readings with a certified thermometer and/or YSI thermometer

5. Use a Hydrolab DS-3 unit as an additional comparison

6. Perform dry sensor tests for the transmissometer and fluorometer by reporting voltage endpoints

7. Take pH buffer readings of 3 pH standards

2) Range Checks of downcast and bottomcast

After the CTD casts were split, the following range checks were made on the downcast and bottomcast values:

Depth (0.3-50 meters)
Temperature (10-35°C)
Salinity (0-35 ppt)
Dissolved Oxygen (0-15 mg/l)
pH (6-11 pH units)
Light Transmission (0-100%)
Fluorescence (0-30 mg/m3)
PAR (0-6000 microeinsteins/s/m2)

Any values falling outside of these ranges were flagged. The values and flags were output in a QC report for each cast.

3) Comparison of pre-deployment and post-deployment surface soak values and comparison of values at the beginning and end of bottomcast.

Additional validation checks on the CTD included the following:

- **Compare the last dissolved oxygen record in the pre-deployment surface soak and the last record in the post-deployment surface soak. Flag if the difference is greater than 1 mg/l.**

- **Compare the light transmission from the last record of the pre-deployment soak and the last record of the post-deployment soak. Flag if difference exceeds 10%.**

- **Compare the dissolved oxygen values at the beginning and end of the bottom soak. Flag if the difference exceeds 0.5 mg/l.**

- **Compare the salinity values at the beginning and end of the bottom soak. Flag if the values differ by more than 1 ppt.**

4) Comparison of bottom values with YSI and hydrolab values

The following comparisons of bottom values were performed:

- **Compare the average dissolved oxygen record in the bottom soak and the YSI bottom dissolved oxygen. Flag if the difference is more than 1 mg/l.**

- **Compare the average dissolved oxygen record in the bottom soak with the first recorded record of the hydrolab deployment if a first visit cast (066) or with last recorded record of a hydrolab file (066) if a second visit cast (067). Flag if difference exceeds 1 mg/l.**

5) Visual inspection of graphs and data.

Each CTD cast was visually inspected to identify any unusual patterns or spikes that necessitate further review. Specific parameters which were checked are:

- **Amount of time at the surface - should be at least 2 minutes.**

- **Stability of dissolved oxygen at the end of the surface soak - readings for the last 30 seconds prior to the downcast should not vary by more than 0.5 mg/l.**

- **Unexpected patterns or trends in the downcast or upcast (e.g., spikes or dissolved oxygen values increasing with depth).**

- **A match between downcast and upcast values.**

- **Amount of time at the bottom - should be at least 60 seconds.**

- **Indications that CTD was lowered into the sediments (large change in oxygen and/or salinity, spike in transmissometry values)**

6) Assign quality assurance code to cast.

After the above checks were made, one or more QA codes were assigned to the cast. Note that QC codes have not been applied to density measurements (sigma-t). Sigma-t is calculated from temperature and salinity; therefore, temperature and salinity QC codes apply to density measurements as well.

9.2.2 Suspended Solids

To assure the quality of suspended solids analyses, ten percent of analyses were replicated in order to compare the results. The results of the two filtrations should have been within ten percent of each other.

If 0.1 L of sample produced a residue weight of less than 1.0 mg, the sample was re-filtered using 0.2 L. Only results which passed quality assurance procedures are included in the data base.

9.3 Unassessed Errors

Samples high in dissolved solids, such as saline waters, brines, and some wastes, may be subject to a positive interference. Washing of the filter and any dissolved solids in the filter was done with care to minimize this potential interference.

10. DATA ACCESS

10.1 Data Access Procedures

A Data Request Package can be requested from a contact under Section 10.3. Data can be downloaded from the WWW site.

10.2 Data Access Restrictions

Data are only accessible on-line from the EPA WWW public access server.

10.3 Data Access Contact Persons

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10.4 Data Set Format

Data can be transmitted in a variety of formats derived from SAS data sets when a Data Request Form is submitted.

10.5 Information Concerning Anonymous FTP

Not accessible

10.6 Information Concerning WWW

Data can be downloaded from the WWW server

10.7 EMAP CD-ROM Containing the Data Set

Data not available on CD-ROM.

11. REFERENCES

Holland, A.F., ed. 1990. Near Coastal Program Plan for 1990: Estuaries. EPA 600/4-90/033. U.S. EPA, Office of Research and Development, NHEERL-AED, Narragansett, RI. November 1990.

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

Valente, R. and J. Schoenherr. 1991. Environmental Monitoring and Assessment Program-Near Coastal Virginian Province: Quality Assurance Project Plan. U.S. EPA,NHEERL-AED, Narragansett, RI. July 1991.

12. TABLE OF ACRONYMS

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