

Maryland Shallow Water Monitoring Program – 2011 DATAFLOW

Metadata:

Identification_Information:

Citation:

Citation_Information:

Originator: Maryland Department of Natural Resources, Resource Assessment Service (MD DNR RAS)

Publication_Date: 20120301

Title: MD DNR Water Quality Mapping Project 2011

Geospatial_Data_Presentation_Form: Spatial dataset

Description:

Abstract:

This record describes one year of an on-going water quality monitoring project. Mapping surveys were performed monthly from April through October 2011.

A total of forty-nine mapping cruises were conducted on Maryland water bodies. The spatial extent of water quality was measured on the following rivers: Big Annemessex, Corsica, Manokin, and Patapsco. An open-water segment of the Chesapeake Bay, designated CBSEG_2003 CB3MH, was also surveyed.

Two surveys were required to map the Patapsco River. Data from the Upper and Lower Patapsco River surveys were combined. Similarly, data collected during the Eastern and Western surveys of Chesapeake Bay segment CBMH3 were combined.

Water quality mapping was conducted using DATAFLOW, a compact, self-contained surface water quality mapping system deployed in a small boat operating at planing speeds of up to 25 km/hr (25 kts). Measurements were made approximately every four seconds, or 30 meters (100 feet). Seven water quality parameters were measured: water temperature, salinity, conductivity, dissolved oxygen, turbidity, fluorescence and pH. Water depth was also measured. The DATAFLOW system sampled water at approximately 0.5-m depths below the surface.

Additional water-quality measurements were made at thirty-five calibration stations. Secchi disk depth, HydroLab (water temperature, pH, dissolved oxygen, specific conductance, and salinity) and photosynthetic active radiation measurements were made at five stations during each survey.

Water-quality calibration chlorophyll and total suspended solids 'grab' water samples were collected at five stations during each monthly mapping survey. The 'grab' samples were collected, after stopping the boat, at 0.5-m depth and filtered on site.

A suite of nutrient 'grab' water samples were also collected monthly at Corsica River stations: COR0056, XHH3851, XHH4528, XHH4916 and XHH4931. The Corsica survey was the only water quality mapping survey on which nutrient samples were collected.

Laboratory analyses were performed on calibration 'grab' samples. Concentrations of chlorophyll a, total dissolved nitrogen, particulate nitrogen, nitrite, nitrite + nitrate, ammonium, total dissolved phosphorus, particulate phosphorus, orthophosphate, dissolved organic carbon, particulate carbon, total suspended solids and volatile suspended solids were determined. Dissolved organic carbon and particulate carbon samples were collected on a single survey, the June 2011 Corsica River survey.

Purpose:

The Maryland Department of Natural Resources Shallow Water Monitoring program is part of a cooperative effort between the Federal government and State and local governments in the Chesapeake Bay watershed to assess the ambient water quality criteria for dissolved oxygen, chlorophyll and water clarity in shallow water habitats.

Water quality mapping provides data on variability and patchiness that are valuable in assessing water quality criteria, and in determining attainment of those criteria. For example, spatial information on turbidity can be correlated to the spatial coverage of living resources such as Submerged Aquatic Vegetation (SAV). This information can be used to determine and assess water clarity criteria necessary to support SAV growth, address the progress of meeting SAV restoration goals, and target specific locations for SAV restoration.

Spatially intensive data can also help pinpoint localized areas of water quality concern, such as areas of low dissolved oxygen that can cause fish kills, and their possible links to nearby land uses or point sources.

Water quality maps can capture localized areas of algae blooms, high turbidity, or low dissolved oxygen that may adversely affect living resources in shallow water habitats and spawning areas.

Spatial data can also be aggregated across watershed units to aid in the evaluation of entire systems. Water quality mapping data are integrated with data from other Bay water quality stations and living resources monitoring projects and used to understand linkages, temporal variation and long-term trends.

Water quality data are used to refine, calibrate and validate Chesapeake Bay ecological models. The models are used to develop and assess water quality criteria with the goal of removing the Chesapeake Bay and its tidal rivers from the list of impaired waters.

Supplemental Information:

The target audiences for this information include Resource Managers, Technical/Scientific Users, Government, Educators, Students and General Public.

Data users who desire very detailed information about Water Quality Monitoring data definition, sampling procedures and data processing are encouraged to refer to two documents listed below. The documents may be obtained from The Chesapeake Bay Program Office.

Water Quality Database - Database Design and Data Dictionary, Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004. [http://archive.chesapeakebay.net/pubs/cbwqdb2004_RB.PDF].

The most current version of the Water Quality Data Dictionary - Online may be found at: [http://archive.chesapeakebay.net/data/data_dict.cfm?DB_CODE=CBP_WQDB].

Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2011 - June 30, 2012. [http://mddnr.chesapeakebay.net/eyesonthebay/documents/SWM_QAPP_2011_2012_FINAL.pdf].

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20110406

Ending_Date: 20111024

Currentness_Reference: Ground condition

Status:

Progress: Complete

Maintenance_and_Update_Frequency: As needed

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -79.4938

East_Bounding_Coordinate: -75.0405

North_Bounding_Coordinate: 39.7425

South_Bounding_Coordinate: 37.8713

Keywords:

Theme:

Theme_Keyword_Thesaurus:

Olsen, L.M., G. Major, K. Shein, J. Scialdone, R. Vogel, S. Leicester, H. Weir, S. Ritz, T. Stevens, M. Meaux, C. Solomon, R. Bilodeau, M. Holland, T. Northcutt, R. A. Restrepo, 2007.

NASA/Global Change Master Directory (GCMD) Earth Science Keywords. Version 6.0.0.0.0 [online: http://gcmd.nasa.gov/Resources/valids/gcmd_parameters.html]

Theme_Keyword: Biosphere > Aquatic Ecosystems > Estuarine Habitat

Theme_Keyword: Biosphere > Aquatic Ecosystems > Rivers/Stream Habitat

Theme_Keyword: Biosphere > Ecological Dynamics > Ecosystem Functions > Nutrient Cycling

Theme_Keyword: Biosphere > Ecological Dynamics > Ecosystem Functions > Primary Production

Theme_Keyword: Terrestrial Hydrosphere > Surface Water > Rivers/Streams

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Chlorophyll

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry >

Conductivity

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Light

Transmission

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Nitrogen

Compounds

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Nutrients

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Oxygen

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > pH

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry >

Phosphorous Compounds

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Suspended

Solids

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Turbidity

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Water

Temperature

Place:

Place_Keyword_Thesaurus: Producer Defined

Place_Keyword: United States

Place_Keyword: Maryland

Place_Keyword: Chesapeake Bay Watershed

Place_Keyword: Anne Arundel County

Place_Keyword: Baltimore County

Place_Keyword: Baltimore City County

Place_Keyword: Kent County

Place_Keyword: Queen Anne's County

Place_Keyword: Somerset County

Place_Keyword: Big Annemessex River

Place_Keyword: Chesapeake Bay

Place_Keyword: Corsica River

Place_Keyword: Manokin River

Place_Keyword: Patapsco River

Access_Constraints: None

Use_Constraints: None

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Position: Program Chief, Water Quality Informatics, Tidewater Ecosystem

Assessment

Contact_Address:

Address_Type: Mailing Address

Address: Tawes State Office Building, 580 Taylor Avenue, D2

City: Annapolis

State_or_Province: MD

Postal_Code: 21401

Contact_Voice_Telephone: 410 260-8630

Contact_Electronic_Mail_Address: MTRICE_nospam_@dnr.state.md.us[Remove
nospam for valid email address]

Browse_Graphic:

Browse_Graphic_File_Name:

[http://mddnr.chesapeakebay.net/eyesonthebay/documents/metadata/MdDNR_DFlowStns2011.pdf]

Browse_Graphic_File_Description: Overview map of thirty-five 2011 DATAFLOW calibration station sites located on Maryland Chesapeake Bay tributaries.

Browse_Graphic_File_Type: PDF

Data_Set_Credit:

Survey and calibration data were collected by MD DNR Resource Assessment Service (RAS) Annapolis Field Office staff.

The Nutrient Analytical Services Laboratory (NASL) at the Chesapeake Biological Laboratory (University of Maryland) analyzed chlorophyll, nutrient and suspended solids samples.

The project was made possible with funding provided by the State of Maryland, the United States Environmental Protection Agency Chesapeake Bay Program, and the National Atmospheric and Oceanic Administration Chesapeake Bay Program Office.

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

QUALITY ASSURANCE/QUALITY CONTROL

MD DNR followed specific procedures to ensure that the DATAFLOW component of the Shallow Water Quality Monitoring Program project design was properly implemented and managed with sufficient accuracy, precision and detection limits. Accuracy (closeness to the true value) of collected data was controlled and assured by the proper use, calibration and maintenance of both field and laboratory equipment used for the measurement of physical and chemical parameters.

YSI 6600 sondes were configured with the following probes: 6025 (chlorophyll); 6136 (turbidity); 6560 (spCond & temperature); 6561(pH); and 6150ROX (dissolved oxygen) during 2011. Resolution, range and accuracy specifications for the sonde and probes may be obtained from the manufacturer [<http://www.y.si.com/accessories.php>] - Sensors&Probes - 6-Series.

The procedures to control and assure the accuracy of field measurements involved the calibration of field instruments, the verification of calibrations, equipment maintenance, and collection of filter blanks. Most of the details of how data acquired with YSI sondes were

quality assured and quality controlled are described in process description elements in the Lineage portion of this metadata record. The results of the water quality attribute data analyzed in the laboratories were also used to calibrate and crosscheck the sonde data for accuracy.

PAR sensors were returned to LICOR, Inc. prior to the field season for factory calibration.

Daily quality control checks (including the running of blanks and standards) were used to control and assure laboratory accuracy.

Accuracy of Chesapeake Biological Laboratory, Nutrient Analytical Services Laboratory (CBL NASL) results was also assessed through DNR's participation in the Chesapeake Bay Coordinated Split Sample Program (CSSP), a split sampling program in which five laboratories involved in Chesapeake Bay monitoring analyze the coordinated split samples. CSSP was established in June 1989 to establish a measure of comparability between sampling and analytical operations for water quality monitoring throughout the Chesapeake Bay and its tributaries. DNR followed the protocols in the Chesapeake Bay Coordinated Split Sample Program Implementation Guidelines (EPA 1991) and its revisions. Split samples were collected quarterly. Analytical results were compared using appropriate statistical tests to determine if results differed significantly among labs. If a difference occurred, discussions began regarding techniques and potential methods changes to resolve discrepancies.

Additionally, CBL NASL participated two times in 2011 in the United States Geologic Survey (USGS) Standard Reference Sample Project.

OTHER ATTRIBUTE ACCURACY INFORMATION

JULY 2011

Numerous transducer adjustments during the Manokin River survey may have affected depth measurements.

Numerous transducer adjustments during the Lower Patapsco River survey may have affected depth measurements.

AUGUST 2011

Comments were made in the Manokin River survey cruise log regarding passing through an area where the bottom had been disturbed by a fishing boat.

SEPTEMBER 2011

It was noted in the Corsica River survey cruise log that a high chlorophyll reading may have been collected from a depth of one meter while the boat was getting up on a plane.

Logical Consistency Report:

MAY 2011

The Manokin River survey cruise track was altered on several occasions due to heavy seas. The Lower Patapsco River survey cruise track was altered due to heavy seas. The Western CB3MH cruise track was altered to include the area missed on the Lower Patapsco Survey. The

Eastern CB3MH cruise track was modified to recover an area due to concern about GPS instrument results.

JULY 2011

During the Eastern CB3MH cruise, data flow equipment was turned off from 08:50 to 10:06. During the Big Annemessex River survey, data flow equipment was turned off from 09:23 to 10:15 while operations unrelated to the project were performed.

OCTOBER 2011

The Lower Patapsco survey cruise track was modified in order to map the mouth of the river before winds increased.

Completeness_Report:

The 2011 DATAFLOW project dataset includes mapping and calibration data acquired during monthly sampling runs, between April and October.

Sampling-event, water-quality-calibration, pigment and suspended solids data from thirty-five stations are included in the dataset. Five calibration samples were collected during each of the following monthly sampling runs: Big Annemessex, CB3MH East, CB3MH West, Corsica, Manokin, Patapsco Lower, and Patapsco Upper.

Beginning in January 2010, a full suite of nutrient samples was no longer collected during most Water Quality Mapping Surveys. The exception was the Corsica River surveys, where, during 2011, full nutrient suites continued to be collected at stations: COR0056, XHH3851, XHH4528, XHH4916 and XHH4931.

Samples from the five calibration stations on the Corsica River were collected and analyzed for the same suite of nutrients as those measured for the Chesapeake Bay Mainstem Program (chlorophyll a, pheophytin, total dissolved nitrogen, particulate nitrogen, nitrite, nitrite + nitrate, ammonium, total dissolved phosphorus, particulate phosphorus, orthophosphate, particulate carbon, total suspended solids and volatile suspended solids) plus particulate inorganic phosphorus.

Contour maps based on 2011 Dissolved Oxygen, Salinity, Turbidity, Temperature and Chlorophyll data acquired during DATAFLOW monthly mapping cruises are available on-line. [http://mddnr.chesapeakebay.net/sim/dataflow_data.cfm].

Data users may discover a few interruptions in sonde datasets. These were related to short-term problems with flow, power or sonde operation.

Turbidity data were censored in cases where bottom sediment disturbances were determined to be caused by the sampling vessel or other vessels.

MAY 2011

During the Eastern CB3MH survey, software application issues made it necessary to shut the data flow computer down and re-start it on three occasions.

JUNE 2011

The only dissolved organic carbon and particulate carbon samples collected during the year 2011 were collected at stations: COR0056, XHH3851, XHH4931, XHH4916 and XHH4528.

During the Western CB3MH survey, a power failure occurred and no data were collected between 07:48 and 08:11 and there are no water quality records for the time when the station XHF6841 calibration sample was collected. A second power failure caused the dataflow computer to shut down and it was not possible to restart it. Therefore the cruise was terminated early and no calibration samples were collected at station XHF2584.

The Western CB3MH survey was also cut short due to a computer failure.

Data from 07:20 to 07:25 on the Lower Patapsco River survey were missing coordinates due to a GPS malfunction and were deleted. Later, during the Lower Patapsco River survey, a power was lost due to battery failure.

Records were deleted from the Corsica River survey due to missing GPS coordinates.

The GPS signal was intermittent during the entire Manokin River survey and records without GPS coordinates were deleted.

AUGUST 2011

The Eastern CB3MH survey was terminated when the dataflow computer battery failed.

SEPTEMBER 2011

There were power issues between 09:06 and 09:50 on the Upper Patapsco River survey. Records were deleted from the Corsica River survey due to missing GPS coordinates.

OCTOBER 2011

There were power issues between 10:40 and 10:47 on the Upper Patapsco River survey.

All other missing attribute values were masked because the data were determined to be unreliable during the quality control process.

Lineage:

Process_Step:

Process_Description:

SONDE CALIBRATION and POST-CALIBRATION:

YSI 6600 data sondes equipped with a 6560 conductivity/temperature probe, a 6136 turbidity probe, a 6025 chlorophyll probe, a 6561 pH probe and a 6150ROX (Optical) Dissolved Oxygen probe were maintained and calibrated before and after each deployment in accordance with YSI recommendations. [<http://www.ysi.com/resource-library.php>]

CONTINUOUS SURFACE WATER QUALITY MAPPING:

DATAFLOW is a compact, self-contained surface water quality mapping system, suitable for use in a small boat operating at planing speeds of about 25 knots. The system collects water through a pipe ("ram") deployed on the transom of the vessel, pumps it through an array of water quality sensors, and then discharges the water overboard. Orientation of the sonde vertically, with probes upward, ensures that no air bubbles are conveyed to the sensors, preventing errors that might be caused by such bubbles.

Water quality instrumentation consisted of a YSI 6600 Sonde equipped with a flow-through chamber. The system was configured with conductivity/temperature, turbidity, chlorophyll, pH and Dissolved Oxygen probes. The sonde transmitted data collected from the sensors to a YSI 650 data logger.

Positioning and depth instrumentation consisted of a Garmin GPS/MAP 168 Sounder or Raymarine A70D Chartplotter/Sounder. The data logger matched the position data with water-quality sensor data for each observation. The Garmin 168 or (Raymarine A70D) GPS transmitted NMEA data to a small form factor computer. A DATAFLOW/Labview program was used to merge position and depth data with data collected by the logger and create an output file.

The system was equipped with an inline flow meter. Although the flow rate did not affect sensor readings, decreased flow was an indication of either a partial blockage or an interruption of water flow to the instrument. Flow data were used in the field as a diagnostic tool to ensure that the system was working properly and, later, as a quality assurance tool to verify that water flow was uninterrupted. A boat horn was wired to the flow meter. If the flow-rate fell below 3.0 L s⁻¹, the horn sounded and warned operators that a problem needed to be corrected.

Cruise tracks varied depending on the water body being mapped. In general, a square-wave pattern was followed by alternately sampling shallow shoreline areas, and open, deeper waters while traveling up and down river. Alternative cruise paths were followed if water body size, shape impediments, or obstructions dictated otherwise. Cruise patterns were selected to obtain representative coverage of shallow water habitats and open waters so that segment-wide criteria could be assessed as accurately as possible. Navigational issues and placement of representative calibration sites also determined ultimate cruise tracks.

WATER QUALITY CALIBRATION SAMPLES:

At each calibration station, 'grab' water quality samples were collected from the outflow of the DATAFLOW unit.

'Grab' samples were collected at the same time as the HydroLab surface sample was recorded. Numbered two quart bottles were triple-rinsed and filled with water for chlorophyll and total suspended solids samples and, on the Corsica River survey, "whole" and "filtered" nutrient samples.

Nutrient, chlorophyll and suspended-solid water-samples were filtered on station or shortly thereafter. Sample waters and filters were placed on ice immediately after filtration.

Particulate samples included: Chlorophyll, Particulate Carbon, Particulate Nitrogen, Particulate Phosphorus (PP), Particulate Inorganic Phosphorous (PIP), Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS).

Filtrate collected from TSS/VSS or PP/PIP filtrations was used for dissolved nutrient samples. Nitrate, Nitrite, Ammonia, Orthophosphate and Dissolved Organic Carbon samples were collected.

HYDROLAB PROFILE:

The first reading of the HydroLab water-column profile at each calibration station was recorded at the same time the water quality bottle sample was collected. The first HydroLab record logged was for the 0.5-meter depth. The sonde was then lowered to the bottom. A reading was taken at 0.3-meters above the bottom. The sonde was raised and measurements were recorded at 0.5-meter or 1.0-meter increments until it reached the surface. (In cases where station depth was greater than 3-meters, the sonde was raised in 1-meter increments).

SECCHI DEPTH:

Secchi Disk Depth was measured at each calibration station. Readings with the Secchi disk were made in situ without the aid of sunglasses. The Secchi disk was lowered into the water, on the shady side of the boat, and the depth at which it was no longer visible was recorded. The Secchi depth reading was taken near the stern of the vessel, and the time at which the reading was taken was noted (to the second) from the Global Positioning System. This facilitated later matching of Secchi depth readings with turbidity probe data.

PAR MEASUREMENT:

Underwater Photosynthetically Active Radiation (PAR, 400-700nm)

At each calibration station, down-welling light penetrating the water column (PAR) was measured underwater at several depths to calculate the light attenuation coefficient, K_d . Simultaneous deck and submersed PAR intensity measurements were taken to account for variability in incident surface irradiance due to changes in cloud cover. Data collected using this procedure were used to estimate the depth of the photic zone.

The equipment used was manufactured by LI-COR, Inc. and consisted of a LI-192SA, flat cosine Underwater Quantum Sensor, a LI-190SA air (deck) reference sensor and a Data Logger (LI-1000 or LI-1400).

Deck and underwater readings were recorded simultaneously. Readings were allowed to stabilize before being recorded. If the station depth was less than 3 meters, readings were taken at 0.1 meter and at 0.25-meter intervals until 10% of the 0.1-meter reading was reached. If the

station depth was greater than 3 meters, a reading was taken at 0.1-meter and at 0.5-meter intervals until 10% of the 0.1-meter reading was reached.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Sally Bowen

Contact_Position: Project Chief, Monitoring Field Office, DNR

Contact_Address:

Address_Type: mailing and physical

Address: 1919 Lincoln Drive

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410 263-3369

Contact_Electronic_Mail_Address: SBOWEN_nospam_@dnr.state.md.us[Remove _nospam_ for valid email address]

Process_Step:

Process_Description:

DATAFLOW FILE POST-PROCESSING:

Each raw .txt file, created by DATAFLOW/LabView during 2011 mapping cruises on all water bodies was post-processed in the following manner.

Each file was opened in Microsoft Excel(tm) and renamed. Rows of data acquired before and after mapping were deleted. Records (if any) were also deleted if they did not have associated GPS values. A macro was executed that rearranged columns and inserted error-tracking columns and headings. Next, negative values were flagged, and values outside each parameter's normal range were highlighted. The macro also returned a form summarizing exceedances. Finally, mapping cruise event and instrument information were appended to each record.

Flagged values were evaluated for common anomalies including spikes in fluorescence and turbidity, dips in specific conductance, and extremely high dissolved oxygen readings. Instrument post-calibration results, in situ comparisons with HydroLab, LI-COR readings, historical data from nearby locations, and survey crew remarks were used to determine whether sensor values were acceptable.

In cases where data were determined to be unreliable, the reason(s) values were determined to be "bad" were documented with error codes and comments. Unreliable data were masked. No data were discarded. All DATAFLOW data for each mapping cruise, both "good" and "bad", were retained in an archival file. Only data considered reliable were published in reports.

MERGING PRIMARY AND SECONDARY SONDE DATA

When a second data sonde was used on a survey, it was necessary to generate time adjustment values because the clocks in the two sondes were not synchronized. Secondary sonde adjusted times made it possible to merge secondary sonde data with data from the primary sonde. Adjustment values for 16,179 records were derived using expressions which shifted the time. The mean time adjustment was 1.4 seconds and a small number of four second adjustments were needed.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Position: Program Chief, Water Quality Informatics, Tidewater Ecosystem Assessment

Contact_Address:

Address_Type: mailing and physical

Address: Tawes State Office Building, 580 Taylor Avenue, D2

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: United States

Contact_Voice_Telephone: 410 260-8630

Contact_Electronic_Mail_Address: MTRICE_nospam_@dnr.state.md.us[Remove _nospam_ for valid email address]

Process_Step:

Process_Description:

LABORATORY ANALYSIS - CBL

University of Maryland's Chesapeake Biological Laboratory (CBL), Nutrient Analytical Services Laboratory (NASL) analyzed chlorophyll, total dissolved nitrogen, particulate nitrogen, nitrite, nitrite + nitrate, ammonium, total dissolved phosphorus, particulate phosphorus, particulate inorganic phosphorus, orthophosphate, dissolved organic carbon, particulate carbon, total suspended solids, and volatile suspended solids.

Further information about laboratory analytical procedures may be obtained from the "Process_Contact".

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Carl Zimmerman

Contact_Position: Director of Analytical Services/Quality Assurance Officer

Contact_Address:

Address_Type: mailing and physical

Address: Chesapeake Biological Laboratory, Center for Environmental and Estuarine Studies, The University of Maryland System, 1 Williams St; P.O. Box 38

City: Solomons

State_or_Province: Maryland

Postal_Code: 20688

Country: USA

Contact_Voice_Telephone: 410 326-7252

Contact_Electronic_Mail_Address: carlz_nospam@cbl.umces.edu[Remove_nospam_for valid email address]

Process_Step:

Process_Description:

VERIFICATION AND DATA MANAGEMENT:

At the end of the monitoring season, DNR Tawes Office and Field Office personnel conducted additional data QA/QC procedures. All of the water quality calibration "grab" sample data were plotted. Outliers and anomalous values were thoroughly researched. Staff compared unusual values to historic values from the site and values from nearby sites in the Bay. Weather events were considered, event logs were reviewed and field staff members were consulted regarding possible legitimate causes for outlying values. In cases where values were not considered to be legitimate, they were masked from the published dataset with the approval of the field staff and the Quality Assurance Officer.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Position: Program Chief, Water Quality Informatics, Tidewater Ecosystem

Assessment

Contact_Address:

Address_Type: mailing and physical

Address: Tawes State Office Building, 580 Taylor Avenue, D2

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410 260-8630

Contact_Electronic_Mail_Address: MTRICE_nospam@dnr.state.md.us[Remove_nospam_for valid email address]

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference: Big Annemessex River, CB_2003 CB3MH, Chesapeake Bay, Corsica River, Manokin River, Patapsco River, Maryland, USA.

Direct_Spatial_Reference_Method: Point

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic:

Latitude_Resolution: 0.0001

Longitude_Resolution: 0.0001

Geographic_Coordinate_Units: Decimal degrees

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Semi-major_Axis: 6378137

Denominator_of_Flattening_Ratio: 298.257

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview:

This metadata record describes water collected during a water-quality mapping project. Project data are an aggregation of 2011 data collected during thirty-five DATAFLOW mapping cruises.

The data are contained in five related entities (tables): Station_Information, Monitoring_Event_Data, Water_Quality_Data, Light_Attenuation_Data and SONDE_DATA. Each table contains attributes (fields). NOTE: SONDE_DATA were not served by the Chesapeake Bay Program at the time this metadata record was developed.

The entity Station_Information is comprised of the attributes: STATION, DESCRIPTION, WATER_BODY, CBP_BASIN, TS_BASIN, BASIN, CBSEG_2003, CBSEG_2003_DESCRIPTION, HUC8, CATALOGING_UNIT_DESCRIPTION, HUC11, WATERSHED, FIPS, STATE, COUNTY/CITY, FALL_LINE, LATITUDE, LONGITUDE, LL_DATUM, UTM_X and UTM_Y.

The entity Monitoring_Event_Data is comprised of the attributes: EVENT_ID, SOURCE, AGENCY, PROGRAM, PROJECT, STATION, EVENT_START_DATE, EVENT_START_TIME, CRUISE, TOTAL_DEPTH, UPPER_PYCNOCLINE, LOWER_PYCNOCLINE, AIR_TEMP, WIND_SPEED, WIND_DIRECTION, PRECIP_TYPE, TIDE_STAGE, WAVE_HEIGHT, CLOUD_COVER, GAGE_HEIGHT, PRESSURE, FLOW_STAGE, DETAILS and WATER_BODY.

The entity Water_Quality_Data is comprised of the attributes: EVENT_ID, SOURCE, PROJECT, STATION, SAMPLE_DATE, SAMPLE_TIME, DEPTH, LAYER, SAMPLE_TYPE, SAMPLE_ID, PARAMETER, QUALIFIER, VALUE, UNIT, METHOD, LAB, PROBLEM, DETAILS, TOTAL_DEPTH, UPPER_PYCNOCLINE, LOWER_PYCNOCLINE, LAT, and LONG.

The entity Light_Attenuation_Data is comprised of the attributes: EVENT_ID, SOURCE, PROJECT, STATION, SAMPLE_DATE, SAMPLE_TIME, SAMPLE_REPLICATE_TYPE,

DEPTH, EPAR_S, EPARU_Z, EPARD_Z, UNIT, METHOD, DETAILS, WATER_BODY, TOTAL_DEPTH, UPPER_PYCNOCLINE, and LOWER_PYCNOCLINE.

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DRAFT -TO BE DETERMINED when sonde data are served by Chesapeake Bay Program. (SONDE_DATA were not available for download from the Chesapeake Bay Program when this metadata record was developed).

The entity SONDE_DATA is comprised of the attributes: SAMPLE_DATE, SAMPLE_TIME, WATER_BODY, SECTION, PRI_SEG, SONDE, LATITUDE, LONGITUDE, TOTAL_DEPTH, BOAT_SPEED, BATT, WTEMP, SPCOND, SALINITY, DO_SAT, DO, PH, TURB_NTU, FLUOR, TCHL_PRE_CAL and COMMENTS.

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Maps created by interpolating the Dissolved Oxygen, Turbidity, Chlorophyll a, Salinity and Temperature data acquired during mapping cruises may be viewed and downloaded from [http://mddnr.chesapeakebay.net/sim/dataflow_data.cfm].

Entity_and_Attribute_Detail_Citation:

Water Quality Database - Database Design and Data Dictionary Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004. [http://archive.chesapeakebay.net/pubs/cbwqdb2004_RB.PDF].

The most current version of the Water Quality Data Dictionary - Online may be found at: [http://archive.chesapeakebay.net/data/data_dict.cfm?DB_CODE=CBP_WQDB].

Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2011 - June 30, 2012. [http://mddnr.chesapeakebay.net/eyesonthebay/documents/SWM_QAPP_2011_2012_FINAL.pdf].

Distribution_Information:

Distributor:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Michael Mallonee

Contact_Position: Water Quality Data Manager

Contact_Address:

Address_Type: mailing

Address: 410 Severn Avenue

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21403

Contact_Voice_Telephone: 800 968-5785

Contact_Electronic_Mail_Address: mmallone@_no_spam_chesapeakebay.net[Remove _nosпам_ for valid email address]

Resource_Description: Downloadable data

Distribution_Liability: None of the Chesapeake Bay Program partners nor any of their employees, contractors, or subcontractors make any warranty, expressed or implied, nor assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information or data contained within the web site. Reference to any specific commercial products, processes, or services or the use of any trade, firm, or corporation name is for the information and convenience of the public and does not constitute endorsement, recommendation or favoring by the Chesapeake Bay Program partners.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Format_Name: ASCII file, formatted for text attributes, declared format

Format_Information_Content: Station Information, Monitoring Event data, Light Attenuation data and Water Quality data.

File-Decompression_Technique: No compression applied

Transfer_Size: 1.4

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name: [http://www.chesapeakebay.net/data_waterquality.aspx]

Access_Instructions: Data are available through the Chesapeake Bay Programs CIMS data hub. Select Water Quality Database (1984-Present). Access the data by following web site (see network resource name) instructions.

Digital_Form:

Digital_Transfer_Information:

Format_Name: ASCII file, formatted for text attributes, declared format

Format_Information_Content: Water quality mapping sonde data

File-Decompression_Technique: No compression applied

Transfer_Size: 27.2

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name: [http://www.chesapeakebay.net/data_waterquality.aspx]

Access_Instructions: UNKNOWN ++++++ TO BE DETERMINED when data are served by CBP.

Digital_Form:

Digital_Transfer_Information:

Format_Name: Excel

Format_Information_Content: Cyanobacteria sonde data merged with primary sonde data.

File-Decompression_Technique: No compression applied

Transfer_Size: 9.7

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name: [http://www.chesapeakebay.net/data_waterquality.aspx]

Access_Instructions: UNKNOWN ++++++ TO BE DETERMINED when data are served by CBP.

Fees: None

Metadata_Reference_Information:

Metadata_Date: 20120416

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Ben Cole

Contact_Address:

Address_Type: Mailing and physical address

Address:

Maryland Department of Natural Resources, D-2

580 Taylor Avenue

City: Annapolis

State_or_Province: MD

Postal_Code: 21401

Contact_Voice_Telephone: (410) 260-8630

Contact_Electronic_Mail_Address: bcole_nospam_@dnr.state.md.us[Remove _nospam_ for valid email address]

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998