Maryland Chesapeake Bay Mainstem Water Quality Monitoring Program - 2019

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator: Maryland Department of Natural Resources, Resource Assessment Service
Publication_Date: 20200422
Title: MD Dept. of Natural Resources, Chesapeake Bay Mainstem Water Quality Monitoring 2019
Geospatial_Data_Presentation_Form: Spatial dataset
Online_Linkage: [http://www.chesapeakebay.net/data/index.htm]

Description:
Abstract:
The physical/chemical component of the Maryland Chesapeake Bay Water Quality Monitoring Program consists of data collected at twenty-two stations located in Maryland's Chesapeake Bay mainstem.

In total, fifteen samplings were completed in the period of 15-Jan-2019 through 13-Dec-2019. Planned sampling was conducted twice monthly in June, July, August of 2019, and once monthly during January, February, March, April, May, September, October and December.

Sampling during the second July cruise was limited to physical measurements collected to better assess dissolved oxygen levels in the mainstem deep waters. No samples were collected January, February, November or December at eastern and western transect stations, resulting in only twelve mainstem flanking station samplings during year 2019.

The water quality monitoring program began in 1984 and is ongoing. The program assesses the water quality by evaluating the levels of nutrients and closely related habitat impacts such as dissolved oxygen and water clarity. One of the main goals of the Chesapeake Bay restoration is to reduce the impacts of excess nutrients on the Bay and these measures provide some of the most direct linkages to management programs that are achieving this goal. The Chesapeake Bay Program jurisdictions have agreed to reduce nitrogen, phosphorus and sediment pollution to the Bay.

Purpose:
The Maryland Department of Natural Resources Chesapeake Bay Water Quality 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 status and trends of nutrient and sediment concentrations in Maryland's Chesapeake Bay mainstem.

The information is 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 the 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 the 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]. An updated version of the data dictionary is a Chesapeake Bay Program work in progress.

Guide to Using Chesapeake Bay Program Water Quality Monitoring Data, EPA 903-R-12-001, February 2012, CBP/TRS 304-12 [http://www.chesapeakebay.net/documents/3676/wq_data_userguide_10feb12_mod.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://www.chesapeakebay.net/documents/CBPMethodsManualMay2017.pdf].

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component for the period July 1, 2018 - June 30, 2019 [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MdDNR_MTQAPP2018.pdf].

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20190115
Ending_Date: 20191215
Currentness_Reference: Ground Condition
Status:
Progress: Complete
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -80.53758
East_Bounding_Coordinate: -75.0405

North_Bounding_Coordinate: 39.7425
South_Bounding_Coordinate: 37.8713
Keywords:
Theme:
Theme_Keyword_Thesaurus: Global Change Master Directory (GCMD). 2020. GCMD Keywords, Version 9.1 Greenbelt, MD: Earth Science Data and Information System, Earth Science Projects Division, Goddard Space Flight Center (GSFC) National Aeronautics and Space Administration (NASA). URL (GCMD Keyword Forum Page): [https://earthdata.nasa.gov/gcmd-forum]
Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOSYSTEMS>MARINE ECOSYSTEMS>ESTUARY
Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOLOGICAL DYNAMICS>ECOSYSTEM FUNCTIONS>NUTRIENT CYCLING
Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOLOGICAL DYNAMICS>ECOSYSTEM FUNCTIONS>PRIMARY PRODUCTION
Theme_Keyword: EARTH SCIENCE>OCEANS>SALINITY/DENSITY>PYCNOCLINE < OK as of 2019.10.21 >
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>SURFACE WATER>SURFACE WATER PROCESSES/MEASUREMENTS>WATER DEPTH
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CHLOROPHYLL CONCENTRATIONS
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CONDUCTIVITY
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>GASES>DISSOLVED NITROGEN
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>GASES>DISSOLVED OXYGEN
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>EUTROPHICATION
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>LIGHT TRANSMISSION
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>NITROGEN
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>NITROGEN COMPOUNDS
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Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>PHOSPHOROUS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>PHOSPHOROUS COMPOUNDS
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>SALINE CONCENTRATION
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>SOLIDS>SUSPENDED SOLIDS
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>SOLIDS>TOTAL DISSOLVED SOLIDS
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>WATER TEMPERATURE
Place:
Place_Keyword_Thesaurus: Common geographic areas
Place_Keyword: fUS = United States
Place_Keyword: fUS24 = Maryland
Place_Keyword: h02080101 = Lower Chesapeake Bay
Place_Keyword: h02060001 = Upper Chesapeake Bay
Place_Keyword: f24005 = Baltimore
Place_Keyword: f24029 = Kent
Place_Keyword: f24025 = Harford
Place_Keyword: f24035 = Queen Anne's
Temporal:
Temporal_Keyword_Thesaurus: USGS Thesaurus
Temporal_Keyword: summer
Temporal_Keyword: spring (season)
Temporal_Keyword: autumn
Temporal_Keyword: winter
Access_Constraints: None
Use_Constraints: Acknowledgement of the MD Department of Natural Resources, Resource Assessment Service as a data source would be appreciated in products developed from these data. Please use the following citation: Maryland Department of Natural Resources, Resource Assessment Service. Eyes on the Bay. URL: [http://www.eyesonthebay.net].
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Renee Karrh
Contact_Position: Program Manager
Contact_Address:
Address_Type: Mailing and physical
Address: 580 Taylor Avenue, C2
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21401
Country: USA

Contact_Voice_Telephone: 410.260.8630
Contact_Electronic_Mail_Address: renee.karrh_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Browse_Graphic:
Browse_Graphic_File_Name: MDDNR Mainstem Monitoring Project 2019 Station Map [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/metadata/MdDNR_MainstemStns2019.pdf]. If the map URL raises a file not found error, drill down from [http://eyesonthebay.net].
Browse_Graphic_File_Description: Map of twenty-two 2019 Maryland Chesapeake Bay Mainstem Water Quality Monitoring Sites.
Browse_Graphic_File_Type: PDF
Data_Set_Credit:
Maryland Department of Natural Resources (MDDNR) Resource Assessment Service (RAS) staff collected the samples and processed the data. The Nutrient Analytical Services Laboratory (NASL) at the University of MD Center for Environmental Science Chesapeake Biological Laboratory analyzed chlorophyll, nutrient and suspended solids samples.

The project was made possible with funding provided by The State of Maryland and the United States Environmental Protection Agency Chesapeake Bay Program.

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
QUALITY ASSURANCE/QUALITY CONTROL Maryland Department of Natural Resources followed specific procedures to ensure that the Mainstem component of the Chesapeake Bay Water Quality Monitoring Program 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 proper use, calibration and maintenance of both field and laboratory equipment for the measurement of physical and chemical parameters. The procedures to control and assure the accuracy of field measurements involved the calibration of field instruments, the verification of calibrations, and equipment maintenance. Most of the details of how data acquired with YSI sondes were quality assured and quality controlled are described in the process description elements in the Lineage portion of this metadata record.

Daily quality control checks, which included 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. Results were analyzed by appropriate

statistical methods to determine if results differed significantly among labs. If a difference occurred, discussions began regarding techniques and potential methods changes to resolve discrepancies.

ADDITIONAL COMMENTS

January 2019: There was no pycnocline at station CB5.2 and the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth. A very small pycnocline was noted at station CB5.1. Surface conductivity readings changed between the beginning and end of the hydrocasts at stations CB4.4 and CB4.2C. Bottom and below pycnocline samples were collected from a single bottle at station CB2.2. Station CB5.3 and station CB3.3C 0.5 m and 1.0 m water quality readings were taken at the same depth. Station CB3.3C sampling was conducted as the sun set.

February 2019: Notes regarding rainfall were logged 11-Feb and 12-Feb. There was no pycnocline at station CB2.2 and above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of station total water column depth. Concern about elevated pH results at station CB2.2 prompted a switch of water quality sondes. The station CB2.2 pH readings on both meters were 9.0 pH units. The data sonde was allowed to sit equilibrating near the bottom for five minutes at station CB2.1. PH readings at station CB1.1 were high and sensor equilibration was protracted.

March 2019: Absence of a pycnocline at station CB2.2 led to taking above pycnocline and below pycnocline samples at 1/3 and 2/3 of station total depth. The 0.5 m and 1.0 m water quality readings at stations CB4.3E and CB4.3C were acquired at a single depth. The 18 m and 16 m sonde results at station CB4.3C were double checked. The cabin of RV Kerhin was freshly painted. Nutrient samples collected 11-Mar were not frozen due to equipment issues. On 13-Mar the sampling pump was found to have frozen overnight and was brought into the cabin to defrost enroute to the first station. Meter J was used on 11-Mar and 12-Mar and meter Z was used on 14-Mar.

April 2019: The sonde/bottle array touched bottom at station CB5.2 and was repositioned 0.5 m higher in the water column. The array also touched bottom at 24 m at station CB4.1E. Bottom and below pycnocline waters were collected from a single bottle at station CB3.1E. Above and below pycnocline samples were collected at 1/3 and 2/3 of station CB2.2 total depth, respectively. Nutrient samples were not frozen aboard ship 18-April due to problems with the freezer.

May 2019: 0.5 m and 1.0 m water quality measurements were taken at the same depth and bottom and below pycnocline samples were collected from the same depth at both station CB3.2 and station CB3.1. Station CB2.2 below and above pycnocline water samples were collected at 1/3 and 2/3 of total depth, respectively.

June 2019: The first June mainstem cruise was conducted June 4-6. Station CB5.1W samples were collected June 12 during the Patuxent River survey and 1.0 m and 0.5 m sonde measurements were taken at the same water depth. Upper and lower pycnocline samples at

station CB2.2 were collected at 1/3 and 2/3 of total station depth. Sonde readings at 11 m at station CB5.3 were unstable. Station CB4.4 13 m readings were double checked. The 0.5 m and 1.0 m water quality values at station CB4.3E and station CB4.3C were respectively collected at one depth.

The second June cruise was conducted June 24-26. Station CB4.1C bottom and below pycnocline sample waters had hydrogen sulfide odors. Station CB5.1 and CB4.2C 0.5 m and 1.0 m water column results were acquired at a single depth at each station. A slight hydrogen sulfide odor was noted in below pycnocline and bottom waters sampled at CB4.1C. The station CB3.1 above pycnocline water sample should have been collected a 3.0 m depth however it was collected at 4.0 m. Three dead fish floated by during sampling operations at station CB3.1. Absence of a pycnocline at station CB2.2 led to taking above pycnocline and below pycnocline samples at 1/3 and 2/3 of station total depth.

July 2019: The first July mainstem survey was conducted July 8-10. Scoping is a term used to describe situations when strong currents and or winds make it difficult to maintain the water quality data sonde at a depth long enough for readings to stabilize. Scoping was noted at station CB5.1E where the surface and 1.0 m waters samples were collected from the same water depth. Thunderstorms, meter scoping and unstable 12 m sonde readings were observed at station CB4.4. Upper and lower pycnocline samples at station CB2.2 were collected at 1/3 and 2/3 of total station depth because there was no pycnocline. Hydrogen sulfide odors were remarked in station CB4.1C bottom and below pycnocline samples.

July 2019: The second July mainstem survey samples were collected July 22-24. Rainfall was heavy at stations CB5.2 and CB5.1. Sampling operations were limited to hydrocasts and comprised solely of water quality sonde readings. Station CB5.1 1-16 m readings were repeated due to concern over meter wheel operations. The station CB4.1 dissolved oxygen reading at 9 m was double checked. Station CB4.3E surface and 1 m sonde measurements were made at the same depth. Log entries stated that rainfall preceded sampling operations at stations CB4.3C, CB4.3W, CB4.1E and CB4.1C. Just one pycnocline break was observed at station CB4.1E. A hydrogen sulfide smell was noted in below pycnocline and bottom water samples collected at station CB4.1C. Dissolved oxygen read less than 0.6 mg/L from 9 m to the bottom at station CB5.3. Station CB5.2 dissolved oxygen readings of less than 0.6 mg/L extended from 7 m to the bottom. Dissolved oxygen less than 0.6 mg/L from extended from 10 m to the bottom. Due to a meter wheel malfunction, station CB5.1 readings from surface to 16 meters were repeated.

August 2019: On the first survey (August 5-7), bottom hydrogen sulfide odors were noted at station CB4.4. Similarly, Hydrogen sulfide smells were observed in both below pycnocline and bottom water samples collected at stations CB4.3E, CB4.3C, CB4.2C, CB4.1E, CB4.1C and CB3.3C. The station CB3.3 below pycnocline sample collected at 12 m should have been collected at 11 m. The 5 m and 3 m water quality sonde readings at station CB3.2 were double-checked. Station CB3.2 bottom and below pycnocline sample waters were collected from the same bottle. Station CB2.2 readings at 1 m were checked twice. There was no station CB2.2 pycnocline and the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth. Field log entries for stations CB51, CB4.4, CB4.3E, CB4.3C and CB4.3W noted the presence of afternoon thunderstorms.

During the second cruise (August 27- 29), below pycnocline and bottom water samples with hydrogen sulfide odors were noted at stations CB4.2C and CB3.3C. Bottom water hydrogen sulfide odors were observed at stations CB4.3E, CB4.2E, CB4.1E and CB4.1C.

September 2019: The drop in dissolved oxygen readings at 12 m at station CB5.1 was double checked. All dissolved oxygen readings at station CB4.4 were double checked. Early morning showers preceded sampling at stations CB4.3E, CB4.3C, CB4.3W, CB4.2W, CB4.2C, CB4.1E, CB4.1W, CB3.3E and CB3.3W. Stations CB4.3E, CB4.3C, CB4.3W, CB4.2W and CB4.2C 0.5 m and 1 m water quality sonde values were measured at the same depth. The sonde/bottle sampling array hit bottom at station CB4.2C and samples were collected at 25 m. At station CB4.1E, the array touched bottom at 23 m and water samples were taken at 22 m.

October 2019: Surface dissolved oxygen readings greater than 9 mg/L at stations CB5.1 and CB4.4 prompted opportunistic phytoplankton sample collection at the sites. Station CB4.1E bottom sample water smelled of hydrogen sulfide. The water quality meter was scoping up to 13 m at station CB4.3C. Meter scoping was noted at station CB4.2C. The 17 m above pycnocline sample at station CB4.1C should have been collected at 16 m.

November 2019: The water quality sonde used at station CB5.1 ceased operating at 5 m depth and was replaced with a backup instrument. The pH post calibration result of the replacement sonde was outside of acceptable limit of pH 10. Station CB5.1 from 5 m to the surface pH readings were considered questionable. There were no pycnoclines at stations CB5.3, CB5.2, CB4.4 and CB4.1C and the above pycnocline and below pycnocline samples were collected at 1/3 and 2/3 of station total depths. Station CB4.4 water quality sonde values at 0.5 m and 1 m were measured at the same depth. The 2 m above pycnocline sample at station CB4.2C should have been taken at 1 m. Surface and above pycnocline water samples collected at station CB3.2 were taken from the same bottle. Station CB3.1 surface conductivity at the beginning of the hydrocast, changed by the end of the hydrocast. The boat was repositioned in order to collect surface reading and samples at station CB1.1.

December 2019: The pH 10 post calibration check result of the water quality sonde used for 11-Dec sampling was outside the acceptable range. All 11-Dec pH readings were considered suspect. Log entries for stations CB3.2, CB3.1, CB2.2, CB2.1 and CB1.1 noted overnight snowfall. There were no pycnoclines at stations CB5.2 and CB5.1 and the above pycnocline and below pycnocline samples were collected at 1/3 and 2/3 for station total depth. Meter scoping occurred at station CB5.2 and 0.5 m and 1 m water quality sonde readings were taken at the same depth. The 0.5 m and 1 m water quality sonde readings at station CB5.2 were taken at the same depth. Station CB3.1 conductivity readings at 6 m were unstable. The sonde/bottle sampling array touched bottom at 10 m at station CB2.2.

Logical_Consistency_Report:

For logistical reasons, station LE2.3, a Potomac River water quality sampling project station, is routinely sampled during Chesapeake Bay mainstem sampling cruises. Tributaries monitoring project boat stations are sampled using small boats for most of the year. The larger mainstem sampling vessel is used when weather and safety are concerns. In addition to

mainstem stations sampling, one or more of the following tributaries project stations may be sampled using the larger vessel during December, January and February surveys: EE1.1, EE2.2, EE2.1, ET4.2 and WT5.1. For logistical reasons, water samples for mainstem project station CB5.1W are routinely collected on the Tributaries project Patuxent boat survey. Two surveys were scheduled and conducted in each of months: June, July and August 2019.

February 2019: Sampling planned for 12-Feb was postponed to 14-Feb due to weather.

July 2019: The second July mainstem survey samples were collected July 22-24. Sampling operations were limited to hydrocasts and comprised solely of water quality sonde readings.

October 2019: Ideally, mainstem surveys are conducted over a period of during three consecutive days. The October 2019 survey dates were 15-Oct, 21-Oct and 22-Oct. The ship's mate was in an automobile accident 15-Oct and rough seas and gale winds precluded sampling 16 and 17-Oct. The vessel was available the following week on 21-Oct and 22-Oct and the survey was completed.

December 2019: Mainstem surveys are normally conducted over three days beginning in the South and proceeding North. Bad weather lead to sampling from North to South in December.

There were no other known January, March, April, May, June, August, September or November logical consistency issues in 2019.

Completeness_Report:

NOTE: Water samples for mainstem project station CB5.1W are routinely collected on the Tributaries Patuxent Boat survey for logistical reasons. Two surveys were conducted in each of months: June, July, and August 2019.

January 2019: The survey was delayed due to heavy weather 14-Jan. Just mainstem station CB5.3 was sampled 15-Jan when the weather became too heavy for sampling and RV Kerhin headed to safety. LI-COR readings were not taken at station CB5.1W due to non-functioning equipment. The CB3.3C silicate sample vial was not labeled #38.

April 2019: Station CB5.3 was not sampled due to rough seas. Station CB1.1 was not sampled due to limited vessel time.

June 2019: LI-COR samples were not collected at station CB5.1W due to rough sea conditions.

October 2019: LI-COR samples were not taken due to rough conditions.

November 2019: The ambient air thermometer broke 8-Nov. The 0.1 m LI-COR reading was not recorded. LI-COR readings were not taken at CB2.1.

There are no other known completeness issues for the months: February, March, May, July, August, September and December 2019.

Lineage:
Process_Step:
Process_Description:
SONDE CALIBRATION and POST-CALIBRATION

The Yellow Springs Instrument (YSI) 6820 v2 data sondes were maintained and calibrated before and after each cruise in accordance with manufacturer's recommendations.

WATER COLUMN PROFILE SAMPLING PROTOCOLS:

A profile of temperature, specific conductance, dissolved oxygen, and pH was obtained from the water column by deploying the data sonde at 0.5 m, 1.0 m, 2.0 m and 3.0 m depth intervals below the surface. Thereafter readings were taken at 2.0m intervals and at the bottom. If the change in dissolved oxygen exceeded 1.0 mg/L or if the change in specific conductance equaled or exceeded 1,000 micromhos/cm over any 2.0 m interval, readings were taken at 1.0 m intervals between these two readings. For total depths less than or equal to 10.0m, readings were taken at 1.0 m intervals.

GRAB SAMPLING DEPTH PROTOCOLS:

At stations where two depths were sampled, collections were taken at 0.5 m below the surface, and 1.0 m above the bottom. If the station total depth was equal to 1.5 m, the bottom sample was also collected at 0.5 m. Great caution was exercised when taking bottom samples; if the bottom was disturbed and bottom sediments appeared to have been included, the sample was dumped out and collected after the sediments had settled. Alternately, the sample was collected slightly higher in the water column and the new bottom sample depth was noted.

At stations where 4 depths were sampled and a pycnocline existed, collections were taken at 0.5 m below the surface, 1.5 m above the upper boundary of the pycnocline, 1.5 m below the lower boundary of the pycnocline, and 1.0 m above the bottom.

At stations where 4 depths were sampled and there was no discernable pycnocline, samples were taken at 0.5 m below the surface, at the closest profile depth one third of the distance from the surface to the bottom, at the closest profile depth two thirds of the distance from the surface to the bottom, and 1.0 m above the bottom.

SECCHI DEPTH:

Water transparency was determined, to the nearest 0.1 m using a 20 cm standard Secchi disc lowered into the water column with a calibrated rope. Observations were made on the shady side of the sampling location.

Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Kristen Heyer

Contact_Position: Manager, Water Quality Monitoring
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: 410.990.4600
Contact_Electronic_Mail_Address: kristen.heyer_nospam_@maryland.gov[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 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.

The NASL also performed chlorophyll analyses. Prior to 2009, chlorophyll analyses were performed by the Maryland Department of Mental Health and Hygiene.

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: Jerry Frank
Contact_Position: Manager of Analytical Services
Contact_Address:
Address_Type: Mailing and physical
Address: Chesapeake Biological Laboratory, Center for Environmental and Estuarine Studies, The University of Maryland System, 146 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: frank _nospam_@umces.edu[Remove _nospam_ for valid email address]

Process_Step:
Process_Description:
VERIFICATION AND DATA MANAGEMENT:

Each month DNR Tawes Office and Field Office personnel conduct data QA/QC procedures. All of the water quality calibration "grab" sample data are plotted. Outliers and anomalous values are thoroughly researched. Staff members compare unusual values to historic values from the site and values from nearby sites. Weather events are considered, event logs are reviewed and CBL analytical laboratory staff members and DNR field staff members are consulted regarding possible legitimate causes for outlying values. In cases where values are not considered to be legitimate, they were masked in 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: Renee Karrh
Contact_Position: Program Manager
Contact_Address:
Address_Type: Mailing and physical
Address: 580 Taylor Ave., C2
City: Annapolis
State_or_Province: MD
Postal_Code: 21401
Contact_Voice_Telephone: 410.260.8630
Contact_Electronic_Mail_Address: renee.karrh_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Spatial_Data_Organization_Information:
Indirect_Spatial_Reference: Chesapeake Bay, Maryland
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 is a description of the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component Database for the Maryland Chesapeake Bay Mainstem. Project data are an aggregation of data collected at twenty-two Maryland mainstem stations during 2019.

The data are contained in five related entities (tables): Light_Attenuation_Data, Monitoring_Event_Data, Optical_Density_Data, Station_Information, and Water_Quality_Data. Each table contains attributes (fields).

The entity Light_Attenuation_Data is comprised of the attributes: Agency, BiasPC, Cruise, Depth, Details, EventId, HUC8, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TotalDepth, Unit and UpperPycnocline.

The entity Monitoring_Event_Data is comprised of the attributes: Agency, CloudCover, Cruise, Details, EventId, FieldActivityEventType, FieldActivityRemark, FlowStage, GaugeHeight, Latitude, Longitude, LowerPycnocline, MonitoringStation, PrecipType, Pressure, Program, Project, SampleDate, SampleTime, Source, Station, TideStage, TotalDepth, UpperPycnocline, WaveHeight, WindDirection and WindSpeed.

The entity Optical_Density is comprised of the attributes: Agency, BiasPC, Cruise, Depth, Details, EventId, HUC8, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TotalDepth, Unit and UpperPycnocline.

The entity Station_Information is comprised of the attributes: CBSeg2003, CBSeg2003Description, CBSegmentShed2009, CBSegmentShed2009Description, CountyCity, FallLine, FIPS, HUC12, HUC8, Latitude, LLDatum, Longitude, State, Station, StationDescription, USGSGage, UTMX and UTMY.

The entity Water_Quality_Data is comprised of the attributes: Agency, BiasPC, Cruise, Depth, Details, EventId, HUC8, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TotalDepth, Unit and UpperPycnocline.

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]. An updated version of the data dictionary is a Chesapeake Bay Program work in progress.

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties

Component for the period July 1, 2018 - June 30, 2019. [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MdDNR_MTQAPP2018.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://www.chesapeakebay.net/documents/CBPMethodsManualMay2017.pdf].

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Mike Mallonee
Contact_Position: Water Quality Data Manager
Contact_Address:
Address_Type: Mailing and physical
Address: 410 Severn Avenue, Suite 109
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21403
Country: USA
Contact_Voice_Telephone: 410.267.5785
Contact_Electronic_Mail_Address: mmallone@_no_spam_chesapeakebay.net[Remove _nospam_ 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: Light_Attenuation_Data, Monitoring_Event_Data, Optical_Density, Station_Information, and Water_Quality_Data.
File_Decompression_Technique: No compression applied
Transfer_Size: 8

Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name: [http://www.chesapeakebay.net/data]

Access_Instructions: Data are available through the Chesapeake Bay Program's Data Hub. Select Water Quality Database (1984-Present). Access the data by following web site (see network resource name) instructions.
Fees: None

Metadata_Reference_Information:
Metadata_Date: 20200521
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Ben Cole
Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service
Contact_Position: Natural Resource Biologist
Contact_Address:
Address_Type: Mailing and physical
Address: 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: benjamin.cole_nospam_@maryland.gov[Remove _nospam_ for valid email address]
Metadata_Standard_Name: Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998