Maryland Chesapeake Bay Tributary Water Quality Monitoring Program – 2023

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator: Maryland Department of Natural Resources (MD DNR), Resource Assessment Service
Publication_Date: 20240409
Title: MD DNR Chesapeake Bay Tributary Water Quality Monitoring Program 2023
Geospatial_Data_Presentation_Form: Spatial dataset
Online_Linkage: [https://www.chesapeakebay.net/what/data]

Description:
Abstract:
One of the main goals of the Chesapeake Bay restoration is to reduce the impacts of excess nutrients on the Bay and its tributaries. In accordance with this goal, the Chesapeake Bay Program jurisdictions have agreed to reduce nitrogen, phosphorus, and sediment pollution to the Bay. The Maryland Chesapeake Bay Tributary Water Quality Monitoring Program evaluates the physical/chemical component of water quality at sixty-eight tributary stations. By measuring levels of nutrients and closely related habitat characteristics such as dissolved oxygen and water clarity, the monitoring program provides some of the most direct linkages to management actions that are reducing nutrient loads to the Bay.

Samples are collected monthly at each tributary station with the following exceptions:

1) Samples are not routinely collected at stations EE3.3 and XAK7810 in January and February, and
2) For logistical reasons, station LE2.3 is routinely sampled as part of the Chesapeake Bay mainstem monitoring project. Thus, station LE2.3 follows the mainstem sampling schedule and is sampled twice monthly during June, July, and August. The second sampling in July at station LE2.3 includes field readings only; no samples are collected for laboratory analyses.

The number of stations sampled by the MD DNR Chesapeake Bay Tributary Water Quality Monitoring Program has fluctuated through the years. Due to changes in funding availability and/or information needs, sampling at some stations has been interrupted or discontinued over the course of the program as follows:

1) Tributary water quality monitoring project sampling ceased in January 2014 at stations BXK0031, CCM0069, MNK0146, XDJ9007, POK0087, XAK7810, TRQ0088, TRQ0146, TRQ0203, TRQ0224, WIW0141 and XCI4078. Sampling was reinstated at station WIW0141 in

July 2014, and resumed at BXK0031, CCM0069, MNK0146, XDJ9007, POK0087, XAK7810, TRQ0088, TRQ0146 and XCI4078 in January 2020.

2) In January 2017, sampling was discontinued at station XHH4742.

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 and its tidal tributaries.

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 also 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 four documents listed below. The first three documents may be obtained from The Chesapeake Bay Program Office. The fourth document is available via The Maryland Department of Natural Resources "Eyes on the Bay" web site.

Water Quality Database - Database Design and Data Dictionary, Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/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 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/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://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Methods_Manual.pdf].

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component, May 2023

[https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MdDNR_MTQAPP_May2023.pdf].

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20230109

Ending_Date: 20231220

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: Global Change Master Directory (GCMD). 2024. GCMD Keywords, Version 17.9, 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://forum.earthdata.nasa.gov/app.php/tag/GCMD+Keywords].

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

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>SURFACE WATER>SURFACE WATER FEATURES>RIVERS/STREAMS

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>ALKALINITY

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>BIOCHEMICAL OXYGEN DEMAND (BOD)

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CHLOROPHYLL CONCENTRATIONS

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Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>WATER TEMPERATURE
Place:
Place_Keyword_Thesaurus: Producer Defined
Place_Keyword: Chesapeake Bay
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Place_Keyword: West River
Place_Keyword: Wicomico River
Temporal:
Temporal_Keyword_Thesaurus: USGS Thesaurus
Temporal_Keyword: autumn
Temporal_Keyword: spring (season)
Temporal_Keyword: summer
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
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Browse_Graphic:

Browse_Graphic_File_Name: MDDNR Tributaries Monitoring Project 2023 Station Map [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/metadata/MdDNR_TribsStns2023.pdf].

Browse_Graphic_File_Description: Map of sixty-eight, year 2023, Maryland Chesapeake Bay tributary 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 majority of samples and processed the data. The Nutrient Analytical Services Laboratory (NASL) at the University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory analyzed chlorophyll, nutrient, and suspended solids samples. The Maryland Department of Health (MDH) analyzed biological oxygen demand, turbidity, and alkalinity samples for Potomac River sites.

The project was made possible with funding provided by The State of Maryland.

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

QUALITY ASSURANCE/QUALITY CONTROL

Maryland Department of Natural Resources followed specific procedures to ensure that the Tributary 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 used 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 and Hydrolab 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

In September 2021, the Baltimore Gas and Electric company began work rebuilding a transmission line that runs across the Bush River in Harford County, Maryland. The project involves the replacement of three double circuit steel lattice towers (one on each shore and one located within Bush River) and four single circuit wood H-frames (two on each side of the river) with nine steel galvanized monopoles. MD DNR tributary monitoring station WT1.1 is located on the Bush River within 1000ft downstream of the project, and water quality at that station may be impacted by the ongoing construction activities. This work was completed on or before April 2023.

January 2023: A pycnocline was not detected at stations EE1.1, EE2.1, EE3.1, EE3.2, and ET5.2. Above pycnocline and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. The Secchi disk depth measurement at station TF1.3 was greater than the total depth. Overnight showers occurred prior to sampling station LE2.3. The surface conductivity at station RET2.4 changed during sampling.

February 2023: Rain earlier in the day was noted at station EE2.1. Samples at stations EE2.2, EE3.1, EE3.2, ET4.2, and ET5.2 were collected at 1/3 and 2/3 depths due to the absence of a pycnocline. Demolition of the old bridge at station RET2.4 was active on the sample date.

March 2023: Due to the absence of a pycnocline at stations EE3.1, EE3.2, and ET5.2, above and below pycnocline samples were collected from 1/3 and 2/3 of total station water column depths. Specific conductance changed during sampling at station ET5.1. The Secchi disk depth measurement at station TF1.3 was greater than the total depth. Dredging was reported at station ET2.3, downstream of the Elk River.

April 2023: Stations EE1.1, EE2.1, EE3.1, EE3.2, ET5.2, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. The Secchi disk depth measurement at station TF1.3 was greater than the total depth. The meter used at stations LE1.1, RET1.1, TF1.5, TF1.6, and TF1.7 failed post-calibration for pH, however data appears normal.

May 2023: Scattered showers were reported earlier in the day at station LE2.3, and drizzle was reported at station RET2.4. A pycnocline was not detected at stations LE2.3, EE3.1, EE3.2, and ET5.2. Above pycnocline and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. The total depth was greater than 2.0 meters at station TRQ0088, and a strong current was detected at this station. Dissolved oxygen readings at station WT7.1 were double-checked with a second meter. The Secchi disk depth measurement at station XGG8251 was greater than the total depth.

June 2023: Hazy conditions due to regional wildfires were reported at stations BXK0031, ET4.1, ET5.1, ET5.2, WT1.1, WT2.1, WT3.1, WT4.1, WT5.1, WT6.1, WT7.1, and WT8.2. Weather conditions at station POK0087 were gusty, and hail was recorded. Stations EE2.1, EE3.1, EE3.2, ET5.2 and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. The meter used at stations WT6.1 and WT7.1 was unable to be post-calibrated for pH, but data appear normal.

July 2023: Due to the absence of a pycnocline, samples were collected at 1/3 and 2/3 depths at the following stations: EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, LE2.3, and RET2.4. Specific conductance changed during sampling at station EE3.1. Hazy conditions were reported at stations TF1.0 and TF1.2. The meter was unable to be post-calibrated for pH for the following stations: RET2.4, RET2.2, RET2.1, TF2.4, MAT0016, TF2.3, TF2.2, TF2.1, and XFB1986, but the data appear normal.

August 2023: Stations LE2.2, LE2.3, EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. The conductivity reading at 3.0 meters at LE1.2 was reported to be questionable. At station LE1.3 the pH value at 1.0 meters was also listed to be questionable and was flagged, but data appears normal.

September 2023: Morning rain was documented for stations LE1.2, LE1.3, and RET2.4, as well as a morning thunderstorm at station LE2.2. Overnight showers were recorded for RET2.1 and TF2.4. A heavy current was reported at station RET2.4. A pycnocline was not detected at stations EE2.1, EE3.2, and ET5.2; therefore, samples at these stations were collected at 1/3 and 2/3 depths. Unstable specific conductance readings were reported at stations RET2.4 and TF2.4.

October 2023: Stations EE3.1, EE3.2, ET4.2, ET5.2, LE2.3, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. The Secchi disk depth measurement at station TF1.3 was greater than the total depth. Dissolved oxygen values were noted to be high at station XFB1986, possibly indicating an algae bloom.

November 2023: A pycnocline was not detected at stations EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, LE2.2, and LE2.3. Above and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. Station TF2.1 was sampled in deep water.

December 2023: The Potomac River sampling cruise was rescheduled from 11-Dec to 12-Dec due to hazardous winter storm conditions. Over four inches of rain fell over southern Maryland 10-Dec to 11-Dec, with two inches of rapid snow melt. Stations EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, and LE2.3 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. Surface specific conductance changed during sampling at station ET4.2.

Logical_Consistency_Report:

For logistical reasons, station LE2.3, a Potomac River water quality sampling 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 concerneds. 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.

Enhanced safety protocols and social distancing guidelines adopted during the COVID-19 pandemic required the Potomac River and Patuxent River monitoring to be conducted by two separate boat crews beginning with the June 2020 cruises. On the Potomac cruises, these protocols resulted in sample filtration at stations MAT0016, TF2.3, TF2.2, TF2.1, and XFB1986 being done with equipment that was used for all programs instead of the dedicated Potomac equipment. In addition, the holding times for all Potomac samples increased. In April 2022, sampling on the Potomac River returned to using just one boat. Sampling on the Patuxent River continued to use two boats throughout 2022 and 2023.

ADDITIONAL COMMENTS

January 2023: Station ET7.1 was sampled from land. Due to ordinance, MAT0016 was sampled northeast of the station. Station XAK7810 was not sampled from the R/V Rachel Carson.

February 2023: Station WIW0141 was sampled from the bulkhead. Due to a flooded road, station TRQ0088 was sampled from the boat ramp. Station ET7.1 was sampled from the pier of a Bed and Breakfast.

March 2023: The water sample collected at station ET3.1 was processed off-site at Toal Park.

June 2023: The pH meter was switched at station WT8.1 due to instrument failure. The above pycnocline sample at station LE2.2 should have been collected at 0.5m depth.

July 2023: The bottom sample from station ET10.1 should have been collected at 6.2 meters depth. The below pycnocline sample from station LE2.2 should have been taken at 9.0 meters. At station WT5.1 the above pycnocline sample should have been collected at 2.0 meters. The water sample collected at station TF1.0 was processed at Bob Evans in Bowie, MD.

August 2023: Station TRQ0088 was sampled at the boat ramp downstream from the bridge.

September 2023: The bottom readings and samples should have been taken at 4.2 meters at station ET4.1, and at 6.2 meters at station ET3.1. Due to specific conductance values being unstable, the meter was switched at station TF2.4.

October 2023: The bottom sample at ET4.1 should have been taken at 4.9 meters, and at station ET10.1 the bottom sample should have been at 5.3 meters. The surface sample at station ET3.1 should have been taken at 0.5 meters instead of 1.0 meters. Station TF1.3 was sampled from the park, and station TRQ0088 was sampled from the boat ramp.

November 2023: Station TRQ0088 was sampled from the boat ramp downstream.

December 2023: The bottom samples taken at station ET6.1 should have been at 3.9 meters and should have been at 12.0 meters at station LE2.3.

There were no known Logical consistency issues in April or May 2023.

Completeness_Report:

Biological Oxygen Demand (BOD), turbidity and alkalinity samples were collected at a subset of Potomac River Tributaries project stations: MAT0016, MAT0078, PIS0033, RET2.4, RET2.2, RET2.1, TF2.4, TF2.3, TF2.2, TF2.1 and XFB1986. When the Monday following Biological Oxygen Demand sample collection was a holiday, samples were not collected. BOD samples were discontinued in November 2023.

Tributary samples are not routinely collected at stations EE3.3 and XAK7810 during January and February.

The second sampling in July at station LE2.3 includes readings only; no samples are collected.

ADDITIONAL COMMENTS

January 2023: Total depth was not recorded for station WIW0141. Station EE3.3 was not sampled. Because station ET7.1 was sampled from the shore, a bottom sample was not collected.

February 2023: Stations EE3.3 and XAK7810 were not sampled.

March 2023: Secchi depth was not recorded at stations BXK0031, ET10.1, MNK0146, and POK0087. LI-COR readings were not collected at station LE1.2 due to an instrument logging malfunction. At station TF1.5 pH values were not recorded at depths 0.5, 1.0, and 2.0 meters. Total depth at station WIW0141 could not be determined because of flooding.

April 2023: Station WT4.1 was not sampled due to the research vessel breaking down. LI-COR readings were not collected at stations LE1.2, LE1.3, and LE1.4 due to rough weather and instrument malfunction. A bottom sample was not able to be collected at station ET3.1, as the alpha bottle broke.

May 2023: Due to a broken Secchi disk, Secchi depth was not recorded at station XCI4078 or XFB1986.

June 2023: Due to rough conditions, LI-COR readings were not collected at station LE1.4. pH values were not recorded at depths 0.5, 1.0, and 2.0 meters at station LE1.1. Depth was not taken at station POK0087 due to hail and gusty conditions, and station MNK0146 was unable to be sampled due to hail and lightning. Only water quality readings were taken at station LE2.3 because of submersible pump failure.

July 2023: Secchi disk depth was not recorded at station LE1.4. Because station WIW0141 was sampled from the ferry, total depth was not measured. Due to rough weather, only water quality readings were taken at station LE2.3, no LI-COR readings or water samples were collected. The meter used at stations EE3.2, EE3.3, ET1.1, ET2.1, ET2.2, ET2.3, ET5.1, ET5.2, ET8.1, ET9.1, WT5.1, and XAK7810 was unable to be post-calibrated for specific conductance;

following QA/QC protocols the specific conductance data for these stations were deleted. The meter was unable to be post-calibrated for pH for the following stations: LE1.1, RET1.1, TF1.7, TF1.6, TF1.5, WT1.1, WT2.1, WT3.1, and WT4.1; following QA/QC procedures these data were deleted.

August 2023: The meter used at stations WT6.1, WT7.1, WT8.1, WT8.2, WT8.3 was unable to be post-calibrated for pH. Following QA/QC protocols, the pH data for these stations were deleted.

September 2023: Sea conditions were too rough for LI-COR measurements to be taken at stations LE1.1, LE1.2, and LE1.3. The dissolved oxygen sensor died at stations TF2.4. The meter was unable to be post-calibrated for pH at the following stations: EE3.0, EE3.1, ET6.2, ET7.1, and XCI4078. Following QA/QC protocols, the pH values were deleted for these stations. Wave height was not recorded at EE3.3.

October 2023: Because station WIW0141 was sampled from the ferry, total depth was not measured. No bottom sample was taken at station EE3.2 as the hose was not long enough.

November 2023: Due to instrument malfunction, LI-COR measurements were not taken at stations LE1.2, LE1.3, and LE1.4. Due to station WIW0142 being sampled from the ferry, total depth was not recorded.

December 2023: LI-COR measurements were not taken at station LE1.1 due to rough conditions. Tidal state was not recorded at station ET5.2. The water temperature value at 1.0 meters at station ET9.1, and dissolved oxygen reading at 13.0 meters at station LE2.3 were not recorded.

Lineage:
Process_Step:
Process_Description:
SONDE CALIBRATION and POST-CALIBRATION
The Yellow Springs Instrument (YSI) data sondes and HydroLab multi-parameter sondes were maintained and calibrated before and after each cruise in accordance with manufacturer's recommendations. During 2023, YSI series 6820 V2, YSI EXO1, YSI EXO2, Hydrolab series 5 and HL4 sondes were deployed. Field sheet dissolved oxygen method and equipment-set unit number values were used to track sondes used for station water quality measurements.

SONDE PROFILE SAMPLING PROTOCOLS
A profile of temperature, specific conductance, dissolved oxygen, and pH was obtained from the water column at 0.5 m, 1.0 m, 2.0 m and 3.0 m depth intervals below the surface. Thereafter readings were taken at 2.0 m intervals and at the bottom. Tributary bottom equals total depth minus one meter (not rounded). If the change in dissolved oxygen exceeded 1.0 mg/L or if the change in specific conductance equaled or exceeded 1,000 microsiemens/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 10.0 m, 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 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 the distance from the surface to the bottom, at the closest profile depth two thirds the distance from the surface to the bottom, and 1 m above the bottom.

Note that six Patuxent River stations, at which samples are also collected from four depths, use a different fixed-depth protocol for sampling mid-water depths. At station TF1.5 and RET1.1, samples are collected at 3 m and 6 m. Mid-water-column samples at stations LE1.1 and LE1.4 are collected at 3 m and 9 m. Samples are collected at 3 m and 12 m depths at stations LE1.2 and LE1.3.

LIGHT ATTENUATION SENSOR CALIBRATION

Once every two years, per LI-COR Bioscientific recommendations, the ambient and underwater sensors (used to measure Photosynthetic Active Radiation (PAR)) were factory re-calibrated. Upon return from the factory, updated, sensor specific, correction values were entered into the displays before the equipment was deployed. A LI-COR equipment tracking maintenance log was used to provide a permanent record of all re-calibrations, battery replacements, lowering-line checks and equipment repairs.

LIGHT ATTENUATION SAMPLING PROTOCOLS

Vertical profiles of light penetration were obtained. An initial reading with the underwater sensor just below the surface of the water (0.1 m) was followed by measurements at either 0.25 m or 0.5 m intervals until a value less than ten percent (10 %) of the surface reading (0.1 m) was attained.

SECCHI DEPTH

Water transparency was determined, to the nearest 0.1 m using a 20 cm standard Secchi disk 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: 410.263.3369
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 Center for Environmental Science (UMCES) Chesapeake Biological Laboratory (CBL), Nutrient Analytical Services Laboratory (NASL) analyzed 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.

The NASL began performing chlorophyll analyses in the year 2009. Prior to 2009, chlorophyll analyses were performed by the Maryland Department of Health and Mental 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 (Jerome) Frank
Contact_Position: Manager, Nutrient Analytical Services Laboratory
Contact_Address:
Address_Type: mailing and physical
Address: University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, 146 Williams Street, 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 conducted 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. Weather events were considered, event logs were reviewed and CBL analytical laboratory staff and DNR 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_Organization: Maryland Department of Natural Resources, Resource Assessment Service
Contact_Position: Program Chief, Water Quality Informatics
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: mark.trice_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Process_Step:
Process_Description:
MDH DES ECL LABORATORY ANALYSIS
Maryland Department of Health, Division of Environmental Sciences, Environmental Chemistry Laboratory, Baltimore, MD, analyzed biological oxygen demand, total alkalinity, and turbidity for Potomac River stations.
Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Lara Phillips
Contact_Position: Supervisor, Inorganics Laboratory
Contact_Address:
Address_Type: mailing and physical
Address: 1770 Ashland Ave.
City: Baltimore

State_or_Province: Maryland
Postal_Code: 21205
Country: USA
Contact_Voice_Telephone: 443.681.3863
Contact_Electronic_Mail_Address: lara.johnson_nospam_@maryland.gov [Remove _nospam_ for valid email address]

Spatial_Data_Organization_Information:
Indirect_Spatial_Reference: Back River, Big Annemessex River, Bohemia River, Bush River, C&D Canal, Chesapeake Bay, Chester River, Choptank River, Corsica River, Eastern Bay, Elk River, Fishing Bay, Gunpowder River, Little Choptank River, Magothy River, Manokin River, Middle River, Nanticoke River, Northeast River, Patapsco River, Potomac River, Patuxent River, Pocomoke River, Pocomoke Sound, Rhode River, Sassafras River, Severn River, South River, Tangier Sound, West River and Wicomico River.
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 Tributaries. Project data are an aggregation of data collected at sixty-eight Maryland tributaries stations during 2023.

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, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit, and UpperPycnocline.

The entity Monitoring_Event_Data is comprised of the attributes: Agency, AirTemp, CBSeg2003, CBSegmentShed2009, CloudCover, Cruise, Details, EventId, FieldActivityEventType, FieldActivityRemark, FieldActivitySiteTypeCodeDescription, FIPS, FlowStage, GaugeHeight, HUC8, HUC12, Latitude, Longitude, LowerPycnocline, MonitoringStation, PrecipType, Pressure, Program, Project, SampleDate, SampleTime, Source, Station, TideStage, TierLevel, TotalDepth, UpperPycnocline, WaveHeight, WindDirection, and WindSpeed.

The entity Optical_Density is comprised of the attributes: Agency, BiasPC, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, 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, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, 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 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/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, 2022 - June 30, 2023 [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MdDNR_MTQAPP2022_2023.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Methods_Manual.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: 1750 Forest Drive, Suite 130
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21401
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_Data, Station_Information and Water_Quality_Data.
File_Decompression_Technique: No compression applied
Transfer_Size: 23.7
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
[https://www.chesapeakebay.net/what/downloads/cbp_water_quality_database_1984_present]
Access_Instructions: Data are available through the Chesapeake Bay Program Water Quality Database. Select CBP Water Quality Database (1984-Present). Access the data by following web site (see Network Resource Name) instructions.
Fees: None

Metadata_Reference_Information:
Metadata_Date: 20230627
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Mark Trice

Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service
Contact_Position: Program Chief, Water Quality Informatics
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: mark.trice_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