Maryland Chesapeake Bay Mainstem Water Quality Monitoring Program - 2020

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator: Maryland Department of Natural Resources, Resource Assessment Service
Publication_Date: 20210429
Title: MD Dept. of Natural Resources, Chesapeake Bay Mainstem Water Quality Monitoring 2020
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, thirteen samplings were completed in the period of 13-Jan-2020 through 23-Dec-2020. Planned sampling was conducted twice monthly in June, July, August of 2020, and once monthly during January, February, May, September, October and December. Samplings planned for March and April were not conducted due to the COVID-19 pandemic and the State of Emergency declared by Maryland Governor Larry Hogan. This caused all field-related activities to be suspended by DNR on 13-Mar-2020, including planned samplings of the Chesapeake Bay Mainstem. DNR resumed monitoring and field activities during the week of 26-May-2020, including sampling of the Chesapeake Bay mainstem on 26-May-2020. Due to the lateness that May sampling started, May cruises were completed in June, specifically 2-June-2020.

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 2020.

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, 2020 - June 30, 2021 [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/QAPP_MT_2020-2021_wApp.pdf].

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20200113
Ending_Date: 20201223
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). 2021. GCMD Keywords, Version 10.1. 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://wiki.earthdata.nasa.gov/display/gcmdkey]

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 PROCESSES/MEASUREMENTS>WATER DEPTH
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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:

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Browse_Graphic:

Browse_Graphic_File_Name: MDDNR Mainstem Monitoring Project 2020 Station Map [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/metadata/MdDNR_MainstemStns2020.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 2020 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 2020: 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. Meter scoping was noted at stations CB2.2, CB3.1, CB4.4, and CB5.1. Phytoplankton samples collected at stations CB4.4, CB5.1, CB5.1W, CB5.2, LE2.3, CB5.3, CB4.3C, CB4.1C, CB3.3C, CB4.2C, CB2.1, CB2.2, CB3.1, and CB3.2. Sampling was conducted in the fog at stations CB3.1 and CB3.2.

February 2020: Meter scoping was noted at station CB5.3. Phytoplankton samples collected at stations CB5.2, LE2.3, CB3.3C, CB4.3C, and CB3.1. Sampling was conducted in the fog at stations CB3.3C, CB4.1C, CB4.2C, and CB4.3C. Station CB5.1W was sampled after an earlier rainstorm. 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. Conductivity readings at 0.5 m depth was very unstable at station CB3.2. Surface and above pycnocline water samples collected at station CB3.2 were taken from the same bottle.

May 2020: The May mainstem survey was conducted May 26-June 2. Phytoplankton samples were collected at stations CB3.3C, CB1.1, CB3.3E, CB3.3W, CB3.2, CB4.3E, CB4.3C, CB4.3W, CB4.2W, CB4.2E, CB4.2C, CB4.1E, CB4.1C, CB4.4, CB5.3, CB5.1, CB5.2, and LE2.3. Sampling was conducted in the fog at stations CB3.2, CB4.3E, and CB4.3C. Conductivity readings at 10 m depth were unstable at station CB5.2. The sonde/bottle sampling array touched bottom at 8 m at station CB2.1. Surface and above pycnocline water samples collected at station CB4.2C were taken from the same bottle. The sonde/bottle sampling array touched bottom at 8 m at station CB4.2E. The 5 m water quality sonde readings at station CB3.1 were double-checked. Stations CB4.4 and CB5.1 surface and 1 m sonde measurements were made at the same depth due to rough seas.

June 2020: The first June mainstem survey was conducted June 8-12. Phytoplankton samples were collected at stations CB3.3C, CB1.1, CB3.3E, CB3.3W, CB4.3E, CB4.3C, CB4.3W, CB4.2W, CB4.2E, CB4.2C, CB4.1E, CB4.1C, CB4.1W, CB4.4, CB5.3, CB5.1, CB5.2, and LE2.3. The 11 m water quality sonde readings at station CB5.2 were double checked. 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. The 3 m and 4 m temperature readings at station CB3.3W were double checked. An odor of H2S was observed in bottom and below pycnocline water samples collected at stations CB3.3C and CB4.1E. An odor of H2S was also observed in below pycnocline samples collected at stations CB4.1C and CB4.2C

The second June survey was conducted June 24-26. Phytoplankton samples were collected at stations CB4.4, CB4.1E, CB4.3C, CB4.3E, CB3.3E, CB4.1C, CB4.1W, CB4.3W, CB3.3C, CB3.1, CB3.2, and CB3.3W. Samples to analyze for vibrio were collected at stations CB5.2, CB5.3, CB4.3C, and CB2.2. An odor of H2S was observed in bottom and below pycnocline water samples collected at station CB4.1C. 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. Bottom and below pycnocline water samples collected at stations CB3.1 and CB3.2 were taken from the same bottle.

July 2020: The first July mainstem survey was conducted July 6-8. Phytoplankton samples were collected at stations CB5.2, CB4.3C, CB3.3C, CB2.2, and CB1.1. Samples to analyze for Vibrio were collected at stations CB5.2, CB4.3C, CB3.3C, CB2.2, and CB1.1. Conductivity readings at 9 m depth were unstable at station CB5.2. Station CB5.1 surface and 1 m sonde measurements were made at the same depth. The sonde/bottle sampling array touched bottom at 11 m at station CB3.2. The 4 m and 5 m dissolved oxygen readings at station CB3.2 were double checked. 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.

The second July mainstem survey was conducted July 20-22. Water column measurements only (no pigment or nutrient samples) were collected during the second July mainstem survey, except at station CB3.3E where a phytoplankton sample was collected. It was noted that thunderstorms had occurred the evening prior to surveys at stations CB4.1W, CB3.2, CB3.1, and CB2.2.

August 2020: The first August mainstem cruise was conducted August 3-11. Phytoplankton samples collected at stations CB5.2, CB4.3C, CB4.3W, CB4.2W, CB3.3C, CB3.3W, CB2.2, and CB1.1. Stations CB5.2, CB5.1, CB4.4, CB4.1C, CB3.3C, CB4.3E, CB4.3C, CB4.2C, and CB4.1E samples from the bottom and below pycnocline waters had hydrogen sulfide odors. An early morning thunderstorm was noted at station CB5.1. Surface samples were taken at stations CB1.1, CB2.2, CB3.3C, CB4.3C, and CB5.2 for Oxford Cooperative laboratory to test for Vibrio. Water temperature was double checked at the 3m sampling depth at station CB4.2E, and the DO reading at 1m depth at station CB5.1W was also double checked. Station CB4.4 surface (0.5 m) and 1.0 m water column results were acquired at a single depth due to rough seas. The pH 10 post calibration result of the sonde was outside of

the acceptable limit. An odor of H2S was observed in bottom and below pycnocline samples collected at stations CB5.2, CB5.1, CB4.4, CB4.3E, CB4.3C, CB4.2C, CB4.1E, CB4.1C, and CB3.3C.

The second August mainstem survey was conducted August 25-26, and hazy conditions were reported during this cruise. Phytoplankton samples collected at stations CB3.3E, CB3.3C, and CB4.3C. A pycnocline was not evident at stations CB4.1E, CB3.1, or CB2.2, therefore the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth, respectively. The above pycnocline sample for station CB4.1C was taken at 14m, and should have been taken at 12m. Bottom and below pycnocline samples were collected from a single bottle at station CB3.2.

September 2020: Due to technical issues, a YSI EXO was used as well as a YSI 6600 on the September sampling survey. The majority of the readings were taken with a YSI EXO, and compared with YSI 6600 readings, when available. The water quality meter was scoping towards the bottom at station CB5.3. Phytoplankton samples were collected at station CB5.2, CB4.3C, CB3.3E, CB3.3C, CB2.2, and CB1.1. Pycnoclines were not evident at stations: LE2.3, CB5.1, CB5.2, and CB4.1E. At stations LE2.3, CB5.1, and CB4.1E the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth, respectively. The dissolved oxygen readings at 21m at station CB4.3E were double-checked. Bottom and below pycnocline samples were collected from a single bottle at station CB4.2C.

October 2020: A pycnocline was not evident at stations CB3.2 and CB3.3C, therefore the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth, respectively. No pycnocline was detected at CB3.2. At stations LE2.3, CB5.1, and CB5.2, the surface and 1m sonde readings were taken at the same depth. The bottom could not be reached at CB5.1. Notes state that, while sampling station CB3.3W, the water was very cloudy and stirred up and that a cargo ship had just passed. Phytoplankton samples were collected at stations CB5.1, CB5.2, CB4.3C, CB3.3C, CB3.2, CB1.1, and CB2.2.

November 2020: Due to technical issues, a YSI EXO was used on the November sampling survey. Pycnoclines were not evident at stations: CB4.4, CB5.1, CB5.2, LE2.3, CB5.3, CB4.3C, CB3.3C, CB4.1C, CB4.2C, CB3.2, CB1.1, CB2.1, CB3.1, and CB2.2. Therefore the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth, respectively. No pycnocline was calculated at station CB3.3C. Surface readings changed between the beginning and end of the hydrocasts at stations CB5.3. The post calibration check of the EXO pH meter read 0.2 units higher than the standard at stations CB1.1, CB2.1, CB2.2, CB3.1, and CB3.2. Phytoplankton samples were collected at stations CB5.1, CB5.2, CB4.3C, CB3.3C, CB3.2, CB1.1, and CB2.2.

December 2020: Due to technical issues, a YSI EXO was used on the December sampling survey. Pycnoclines were not evident at stations: CB4.4, CB4.3C, CB5.1, CB5.2, and LE2.3. Therefore the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of total water column depth, respectively. No pycnocline was detected at stations CB4.2C, CB3.3C, or CB4.1C. At station CB3.3C the surface and 1m sonde readings were taken at the

same depth. Wind gusted to 36kt while station CB4.1C was sampled. Surface conductivity readings changed between the beginning and end of the hydrocasts at stations CB3.1 and CB3.2. The pH sensor was slow to respond during sampling at station CB1.1, values were recorded once the readings were stable. Dense fog was reported in the morning at station CB5.1W.

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 2020.

May 2020: Due to the COVID-19 pandemic and the State of Emergency declared by Maryland Governor Larry Hogan, all monitoring and field activities were suspended by DNR until 26-May. The May mainstem survey did not commence until 26-May and was not completed until 2-Jun. Sampling conducted on 2-Jun for stations CB4.4, CB5.3, CB5.1, CB5.2, and LE2.3 were grouped with May mainstem survey results. Sampling was conducted outside of main channel due to fog at station CB3.2. The station CB4.1E below pycnocline sample collected at 3 m should have been collected at 13 m. These results were deleted and flagged.

June 2020: The first June mainstem survey, originally scheduled for June 1-2, was rescheduled and conducted on June 8-12 due to the completion of the May mainstem survey on 2-Jun. The second June mainstem survey, originally scheduled for June 22-24 was rescheduled and conducted on June 24-26. Sampling scheduled for station CB3.3W during the second June mainstem survey on 25-Jun was moved to 26-Jun due to thunderstorms.

July 2020: Sampling scheduled for stations CB1.1, CB2.1, and CB2.2 during the first July mainstem survey on 8-Jul was conducted on 7-Jul.

August 2020: The first August sampling cruise was originally scheduled for August 3-5, however Tropical Storm Isaias postponed sampling on August 3, prevented sampling on August 4, and once again postponed sampling on August 5. Sampling began on August 6 in the reverse station order in an attempt to avoid thunderstorms. Thunderstorms on August 7 cancelled sampling for part of the day, and the cruise was rescheduled for August 10-11.

December 2020: The December sampling cruise was postponed on December 14th due to high winds. Sampling began December 15th, however due to an engine malfunction, the vessel returned to shore at 1035. Sampling was scheduled to resume the following week, December 21-23.

There were no other known January, February, September, October, or November logical consistency issues in 2020.

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 2020.

March 2020: Scheduled mainstem surveys were not conducted due to the COVID-19 pandemic and the State of Emergency declared by Maryland Governor Larry Hogan.

April 2020: Scheduled mainstem surveys were not conducted due to the COVID-19 pandemic and the State of Emergency declared by Maryland Governor Larry Hogan.

June 2020: Stations CB3.2 and CB3.1 were not sampled during the first June mainstem cruise.

July 2020: LI-COR readings were not taken at station CB5.1W due to rough conditions.

August 2020: During the first cruise (August 3-11) stations CB5.3 and LE2.3 were not sampled due to a multitude of setbacks, including severe weather.

September 2020: Station CB5.1W was not sampled, due to rough sea conditions.

October 2020: LI-COR readings were not taken at stations CB2.1, CB1.1, CB2.2, CB3.1, CB5.1W and CB3.2, due to non-functioning equipment. Only a partial LI-COR data record was collected at station CB3.3C, as the instrument failed midway. Due to dangerous conditions and an unseaworthy vessel the following stations could not be sampled: CB4.4, CB4.1C, CB5.3, CB4.2E, CB4.3E, CB4.3C, CB4.3W, CB4.2C, CB4.2W, and CB4.1E.

There are no other known completeness issues for the months: January, February, May, November, and December 2020.

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
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Contact_Address:
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Country: USA
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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, Nutrient Analytical Services Laboratory
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 2020.

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, 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, CloudCover, Cruise, Details, EventId, FieldActivityEventType, FieldActivityRemark, FlowStage, GaugeHeight, 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, Cruise, Depth, Details, EventId, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, 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, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, 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. [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, 2020 - June 30, 2021. [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/QAPP_MT_2020-2021_wApp.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: 20210722
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Mark Trice

Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service
Contact_Position: 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