# Maryland Chesapeake Bay Mainstem Water Quality Monitoring Program - 2018

## Metadata:

*Identification_Information:*
*Citation:*
*Citation_Information:*
*Originator:* Maryland Department of Natural Resources, Resource Assessment Service
*Publication_Date:* 20190501
*Title:* MD Dept. of Natural Resources, Chesapeake Bay Mainstem Water Quality Monitoring 2018
*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 22-Jan-2018 through 13-Dec-2018. Planned sampling was conducted twice monthly in June, July and August of 2018, 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, except at upper Bay stations CB1.1, CB2.1, CB2.2, CB3.1 and CB3.2. CB3.3E, CB3.3C and CB3.3W where nutrient and chlorophyll samples were collected to assess the impact of historic high flow and releases from Conowingo Dam. 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 2018.

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:*
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*Beginning_Date:* 20180122
*Ending_Date:* 20181213
*Currentness_Reference:* Ground Condition

*Status:*
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*Maintenance_and_Update_Frequency:* As needed
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*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].
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*Browse_Graphic:*
*Browse_Graphic_File_Name:* MDDNR Mainstem Monitoring Project 2018 Station Map [http://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/metadata/MdDNR_MainstemStns2018.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 2018 Maryland Chesapeake Bay Mainstem Water Quality Monitoring Sites.
*Browse_Graphic_File_Type:* PDF
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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 2018: When the dissolved oxygen sensor used at station CB5.1W was post calibrated, the measurement was high by 0.17 mg/l. 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 ship passed when sampling operations at station CB5.2 were conducted and surface conductivity readings changed by 900 micro Siemens/cm while on station. Surface and above pycnocline samples were collected from a single bottle at both station CB4.1C and station CB3.3C. Station CB3.1 surface conductivity shifted approximately 2,500 micro Siemens/cm during sampling operations.

February 2018: LI-COR measurements were not made at station CB5.1W because sea conditions were too rough. The 0.5m and 1.0m samples at station CB5.1W were collected from the same water bottle. The water quality sonde dissolved oxygen sensor was slow to stabilize at station CB3.1. The absence of a pycnocline at stations CB5.2 and CB5.1, led to above pycnocline and below pycnocline water sample collections at 1/3 and 2/3 of total water column depth at each location.

March 2018: There were no known attribute accuracy issues during March.

April 2018: A ship passed prior to sampling at station CB4.3C. The survey vessel drifted during operations at station CB4.2E and it was not possible to maintain the normal station depth. Surface conductivity changed during sampling at station CB5.3. Surface and 1.0m water samples were collected from a single bottle at each of the following stations: CB4.3E, CB4.3C, CB4.3W, CB4.2W, CB4.2C, CB4.2E, CB4.1E, CB4.1C and CB4.1W. There were no pycnoclines at station CB5.2 and station CB2.2 and above and below pycnocline samples were collected from 1/3 and 2/3 of total station water column depth. Rain fell the night prior to sample collection at stations CB2.1 and CB1.1. The sampling vessel drifted during operations at station CB4.1E and the sampling sonde/pump array struck bottom at 22m depth. Concern about touching bottom at station CB4.3E necessitated a bottom sample at 21m depth. Similar concerns resulted in a shallower than normal bottom sample at station CB4.1C.

May 2018: The cruise report noted heavy rainfall on 12-May-2018, an algal bloom, the preceding week, which covered the entire bay and an unusual flat calm. A bottom dissolved oxygen reading of 0.96 mg/l at station CB3.2 was noted. LI-COR readings were characterized as possibly unreliable. On 16-May-2018 the data sonde pH sensor response time was slow and the dissolved oxygen sensor readings slowly crept lower when below 1.0 mg/l. Station CB4.3E

surface and 1m water samples were collected from the same depth. Station CB4.1E surface and above pycnocline water samples were collected from the same bottle. Since there was no pycnocline at station CB2.2, above pycnocline and below pycnocline samples were collected at 1/3 and 2/3 of total station water column depth.

June 2018: The first June cruise was conducted June 4-6. Due to issues with the sample refrigerator door 4-Jun-2018, samples were stored in the food refrigerator. A replacement sample refrigerator was installed 5-Jun-2018. 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 CB4.1E. A slight H2S odor was noted in bottom water samples collected at stations CB4.1E and CB3.3C. Station CB4.1C 8m depth water temperature was double checked. Bottom and below pycnocline water samples at station CB2.2 were collected from the same bottle.

The second June cruise was conducted June 25-27. Meter scoping was noted at stations CB5.3 and CB5.2. The CB5.3 and CB5.2 surface and 1.0m water samples were collected at the same depth. Meter scoping at station CB4.4 prevented getting bottom water quality measurements at the 29m depth. An odor of H2S was observed in bottom water samples collected at stations CB4.4 and CB4.3W. Similarly, H2S odors were logged in below pycnocline and bottom samples at stations CB4.3E, CB4.3C, CB4.2C, CB4.1E, CB4.1C and CB3.3C. Sample freezer problems resulted in unfrozen samples on 26-Jun-2018 and 27-Jun-2018. A conductivity change was noted after the below pycnocline water sample was collected at station CB5.1. A ship passed prior to sample collection at station CB3.2. At station CB3.2, the sonde/pump sampling array touched bottom at 12 m and the surface and 1m sample waters were collected at the same depth. There was no pycnocline at station CB2.2 and above pycnocline and below pycnocline samples were collected at 1/3 and 2/3 of total station water column depth. The response time of the water quality sonde pH sensor was characterized as slow at stations CB2.1 and CB1.1.

July 2018: During the first July survey (July 9-11), hydrogen sulfide odors were noted in bottom and below pycnocline sample waters collected at stations CB5.1, CB4.4, CB4.3E, CB4.3C, CB4.2C, CB4.1E, CB4.1C and CB3.3C. Station CB5.3 dissolved oxygen results at 4m depth were double checked with a second meter. There was no pycnocline at station CB2.2 and the above pycnocline and below pycnocline water samples were collected at 1/3 and 2/3 of station total water column depth, respectively.

Water column measurements only (no pigment or nutrient samples) were collected the second July 2018 cruise (July 26 and 27), except at upper Bay stations CB1.1, CB2.1, CB2.2, CB3.1 and CB3.2. CB3.3E, CB3.3C and CB3.3W where nutrient and chlorophyll samples were collected to assess the impact of historic high flow and releases from Conowingo Dam. Approximately 20 gates of the Conowingo dam were open and water flowed through the gates at a rate of 400,000 cubic feet per second. There was lots of floating debris at stations CB2.1 and CB1.1 and the waters were completely fresh. Observations were made regarding heavy rainfall during the week preceding sample collection at stations CB1.1, CB2.1, CB2.2, CB3.1, CB3.2, CB3.3C, CB3.3E and CB3.3W. There was no pycnocline at station CB2.2 and above pycnocline and below pycnocline sample waters were collected from 1/3 and 2/3 of total station

water column depth, respectively. Rain showers, during the night prior to sampling, were noted at stations CB3.3C, CB3.3E and CB3.3W. Surface water conductivity changed during the hydrocast at station CB3.3C.

August 2018: On the first survey (August 6-8), a slight hydrogen sulfate odor in bottom sample water was noted at station CB4.1C. Above pycnocline and surface samples were collected from different sample bottle at station CB4.1E. Lack of a pycnocline at stations CB2.1 and CB3.1 resulted in collection of above pycnocline and below pycnocline samples from 1/3 and 2/3 of total station water column depth, respectively. The sonde/pump sampling array hit bottom at 12m depth when sampling at station CB3.2 and the bottom sample was collected at 11m. Station CB3.2 dissolved oxygen results at 3m and 4m were double checked with a second meter. At station CB4.4, the sonde/pump sampling array hit bottom while collecting bottom water samples. During sampling operations at station CB4.4, at 10m depth, it was necessary to quickly bring gear aboard and move north to avoid a squall. The vessel returned to station 15 minutes later and resumed sampling at 10m.

During the second cruise (August 21, 22 and 24), the sonde/pump array hit bottom at 24m depth at station CB3.3C. When station CB4.1C was sampled, pH 3m results were double checked with a second sonde. Rain began falling during sampling operations at station CB4.1C. Surface and 1m samples were collected at the same depth at stations CB4.1C, CB4.1W, CB4.2W, CB4.3W and CB4.4. There was no pycnocline at station CB2.2 and above pycnocline and below pycnocline samples were collected at 1/3 and 2/3 of total water column depth, respectively. Station CB5.1 conductivity readings at 9m were unstable.

September 2018: Mainstem survey samples are, ideally, collected over the course of three consecutive days. A hurricane (Hurricane Florence), weather and schedule conflicts required the September cruise to be sampled outside this preferred window. Stations CB4.1C, CB4.1W, CB4.2C and CB4.2W were sampled 17-Sep-2018. Stations CB2.2 and CB2.3 were sampled 19-Sep-2018. Stations CB4.3C, CB4.3W, CB4.4, CB5.2 and CB5.3 were sampled 25-Sep-2018. A slight odor of hydrogen sulfate was noted at station CB4.1C. Meter scoping was an issue during station CB4.2C sampling and conductivity was unstable at 12m, 11m and 10m depths. Surface and 1m samples were collected at the same depth when stations CB4.1W, CB4.2C, CB4.2W, CB4.3C and CB4.3W were sampled. 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 total station water column depth, respectively. The below pycnocline sample at station CB3.2 was collected from the wrong depth and should have been collected at 6m depth. Station CB4.4 conductivity readings were unstable at 14m depth.

October 2018: The station CB4.4 below pycnocline sample should have been collected at 20m depth but was collected at 19m due to a shift in water quality data sonde readings.

November 2018: Post-survey calibration tests of the conductivity sensor, used for stations CB4.3C, CB4.2C, CB4.1C, CB3.3C and CB3.2, returned results 3,600 micro ohms/cm higher than the 24,280 micro ohms/cm standard. The issue was determined to be due to a bad dissolved oxygen sensor affecting conductivity/temperature sensor results. There were no pycnoclines at stations CB3.1 and CB2.1 and above pycnocline and below pycnocline samples

were collected from 1/3 and 2/3 of total station water column depths. Stations CB3.1, CB2.2, CB2.1 and CB1.1 were sampled using a small boat and water samples were processed at the dock at Betterton.

December 2018: The station CB4.3C below pycnocline sample water should have been collected at 12m and the above pycnocline sample should have been collected at 6m. Station CB4.1C surface and above pycnocline water samples were collected from the same bottle. At both station CB2.1 and station CB1.1, slow responses of pH sensor, due to very cold water, were noted.

*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 2018.

February 2018: The normal mainstem survey cruise track was altered to include Tributary survey stations EE1.1, EE2.1, EE2.2 and EE4.2 to mitigate risks of using smaller vessels to sample tributary deeper water sites.

August 2018 - survey 2 (August 21, 22 and 24), the survey was conducted a week earlier than scheduled to capture Conowingo Dam high discharge conditions. Rough seas and high winds prevented lower bay sampling on 21-Aug-2018, RV Kerhin was unavailable 20-Aug-2018 and 24-Aug-2018. High winds on 23-Aug-2018 prevented sampling. Station CB5.1 samples were collected using a small boat.

September 2018: Extra volatile suspended solids, dissolved organic carbon and silicate samples were collected at stations CB3.3W, CB3.3C, CB3.3E CB3.2, CB3.1, CB2.2, CB2.1 and CB1.1 to assess the impact of historically high flows. Surface and bottom dissolved organic carbon samples were collected at station CB5.2.

November 2018: Sampling for stations CB3.1, CB2.1 and CB1.1 were conducted using a small boat.

*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 2018.

January 2018: Station CB1.1 was not sampled due to vessel time constraints.

February 2018: LI-COR samples were not collected at stations CB5.3 and CB5.2.

June 2018: During the first June cruse (June 4-6), station CB5.3 was not sampled due to dangerous conditions. LI-COR samples were not collected at stations CB5.2 and CB5.1 due to rough seas

August 2018: During the second cruise (August 21, 22 and 24), station CB5.3 was not sampled due to high winds and rough seas. Station CB5.3 sampling was conducted using a field office vessel the maximum depth sampled was 21m due to a less efficient sampling pump.

September 2018: Station CB5.3 was not sampled due to scheduling issues.

October 2018: Bad weather-high winds-rough seas- postponed scheduled sampling. Bad weather and vessel time constraints limited sampling time. Stations CB5.3, CB4.3E, CB4.3W, CB4.2E CB4.2W, CB4.1E, CB4.1W, CB3.3E CB3.3W, CB2.1 and CB1.1 were not sampled.

November 2018: Station CB5.1W was not sampled dues to dangerous seas.
There are no known completeness issues for the months: March, April, May, July and December 2018.

*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 0.5m, 1.0m, 2.0m and 3.0m 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 2.0m interval, readings were taken at 1.0m intervals between these two readings. For total depths less than or equal to 10.0m, readings were taken at 1.0m intervals.

GRAB SAMPLING DEPTH PROTOCOLS:

At stations where two depths were sampled, collections were taken at 0.5m below the surface, and 1.0m above the bottom. If the station total depth was equal to 1.5m, the bottom sample was also collected at 0.5m. 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 0.5m below the surface, 1.5m above the upper boundary of the pycnocline, 1.5m below the lower boundary of the pycnocline, and 1.0m above the bottom.

At stations where 4 depths were sampled and there was no discernable pycnocline, samples were taken at 0.5m 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 1.0m above the bottom.

SECCHI DEPTH:

Water transparency was determined, to the nearest 0.1m 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
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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:*

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*Contact_Person_Primary:*

*Contact_Person:* Jerry Frank

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*State_or_Province:* Maryland

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*Country:* USA

*Contact_Voice_Telephone:* 410.326.7252

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*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 2018.

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, Station, 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, SampleReplicateType, SampleType, Source, Station, 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, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleReplicateType, 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:* 8.4

*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:* 20190520
*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