

Chesapeake Bay Maryland (CBM) NERR Water Quality Metadata
January – December 2023
Latest Update: April 15, 2024

Note: This is a provisional metadata document; it has not been authenticated as of its download date. Contents of this document are subject to change throughout the QAQC process and it should not be considered a final record of data documentation until that process is complete. Contact the CDMO (cdmosupport@baruch.sc.edu) or reserve with any additional questions.

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

Jennifer Raulin, Manager
Chesapeake Bay National Estuarine Research Reserve Maryland
Maryland Department of Natural Resources
Tawes State Office Building, E-2
580 Taylor Avenue, E-2
Annapolis, MD 21401
Phone: (410) 260-8745
Fax: (410) 260-8739
e-mail: jennifer.raulin@maryland.gov

Kyle Derby, Research Coordinator
Chesapeake Bay National Estuarine Research Reserve Maryland
Maryland Department of Natural Resources
Tawes State Office Building, E-2
580 Taylor Avenue, E-2
Annapolis, MD 21401
Phone: (410) 260-8724
Fax: (410) 260-8739
e-mail: kyle.derby@maryland.gov

Lauren Cunningham, Research Technician
Maryland Department of Natural Resources
1919 Lincoln Drive
Annapolis, Maryland 21401
Phone: (410) 990-4503
Fax: (410) 263-2468
email: lauren.cunningham@maryland.gov

2) Entry verification –

Deployment data are uploaded from the YSI data logger to a personal computer with Windows 7 or newer operating system. Files are exported from KOR Software in a comma separated file (CSV) and uploaded to the CDMO where they undergo automated primary QAQC; automated Depth/Level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. A reserve may opt to include additional non-required data during primary upload, such as chlorophyll/fluorescence data. CBM NERR does collect and upload chlorophyll fluorescence data (see section 4 for additional chlorophyll methodology information). During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data,

remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. CBM NERR applies codes to data that are out of water due to low water depth, data obtained from sensors that malfunctioned/broke/post-calibrated out of range, data skewed by heavy biofouling, and data that appear as anomalous “spikes.” To objectify what qualifies as a spiked data point and decrease the inherent subjectivity of such determinations, a data point is coded as a blocked optic or turbidity/chlorophyll spike if it is at least three times greater than both its preceding and following values. Other anomalous data are coded with the appropriate code as well as a “see metadata” code to further explain their exclusion from the dataset. Upload after secondary QAQC results in ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO’s authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12. Lauren Cunningham is responsible for data management at CBM NERR.

3) Research objectives –

One of the objectives of the monitoring program at CBM NERR is to conform to the NERR System Wide Monitoring Program (SWMP) where the overall goal is a long-term dataset providing baseline water quality information capable of tracking trends and identifying changes in water quality over temporal and spatial scales. In addition to the aforementioned NERR-wide research objectives, reserve-specific objectives include understanding how anthropogenic activities affect water quality and examining the effects of submerged macrophyte communities on water quality. To accomplish this, monitoring sites were selected that characterize the variety of habitat and water quality conditions existing at two of the three components that make up the CBM NERR, the Jug Bay and Otter Point Creek components. At the Jug Bay component, three sites were selected that span the range of conditions thought to be typical of this site. These sites include a reference site, an impaired site and a mainstem site; where the reference site is thought to have little anthropogenic-induced effect on water quality, an impaired site where anthropogenic activities strongly influence local water quality, and a mainstem site thought to be highly representative of mainstem water quality conditions at the Jug Bay component. The fourth site is located at the Otter Point Creek component, a much smaller component, and is thought to represent typical water quality conditions at this site. All four sites span the range of habitat conditions at these components to include varying abundances of submerged macrophyte communities as well as varying depth and energy regimes from shallow tidal creeks to proportionately deep tidal river systems to shallow open water embayments. Additional monitoring, outside the scope of this effort, is being done at all three components: Jug Bay, Otter Point Creek, and Monie Bay. These efforts use comparable field sampling methods, with high spatial resolution, to better understand the spatial variability between and around the sites monitored in this effort.

4) Research methods –

Water quality measurements were taken every 15 minutes from January through December 2023 at each station, weather permitting. One YSI EXO2 data logger is deployed at each station. All data are recorded in Eastern Standard Time. When a datasonde is retrieved, another datasonde is deployed at the same time to ensure a continuous dataset. During transport to and from the sampling sites, dataloggers are placed horizontally in a cooler with a damp towel. The cooler lid is kept slightly ajar, allowing the datalogger to be in equilibrium with the ambient barometric pressure.

Deployment apparatuses are constructed out of 4" diameter PVC pipe and suspended vertically in the water column. 2" diameter holes are cut into the PVC pipes at 2" intervals to guarantee free flow of water through the PVC pipe. The pipes are painted with Trinidad SR antifouling paint. The pipe is attached to a 2x4, also painted with antifouling paint, using two copper plated clevis hangers, one above the surface of the water and another towards the bottom of the 2x4 where it is submerged in the water. The 2x4 is bolted to a piling with the bottom of the PVC pipe just resting on the bottom of the riverbed. A stop bolt is inserted horizontally through the PVC pipe at a height of 0.25 meters from the bottom of the pipe to keep the YSI instrument at a constant depth above bottom.

Measurements for temperature, specific conductance, salinity, percent oxygen saturation, dissolved oxygen concentration, water depth, pH, turbidity, and chlorophyll fluorescence are recorded every 15 minutes.

Deployments range from two to four weeks, depending on biofouling intensity (temperature dependent) and availability of field personnel. When a deployment concludes, YSI dataloggers are replaced with newly serviced and calibrated instruments. At the time of replacement, one (1) or two (2) simultaneous 15-minute overlapping readings are taken between the old and new YSI instruments, as well as an in situ reading with a YSI EXO1 sonde in order to provide a QA/QC check of the old and new instruments. All simultaneous overlapping readings are taken prior to the previously deployed sonde being disturbed in any way. Once retrieved, the sondes are placed in a cooler with a damp towel for transport back to the lab. The sondes are then placed in a bucket with 100% air-saturated water, continuing to log data every 15 minutes. DO post-calibration record is taken from this logged data either the same day or within the following three days, using the current barometric pressure reading from a mercury barometer. Logging is then stopped, and YSI sondes are post calibrated using the same standards as used in the calibration.

Deployment data are collected, and data are uploaded onto a PC, archived, and then put through a QA/QC process. Efforts are made to relate sensor conditions to any apparent outliers or anomalies (e.g., any biofouling present, wiper malfunctions, optical shorts, etc.). Data are reviewed and edited according to the YSI Data Review and Editing Protocol in Appendix B of the CDMO manual. Data loggers and sensors are cleaned, serviced, calibrated, and post-calibrated according to the methods described in the YSI Operating Manual and SWMP Operating Procedures. Laboratory calibration procedures are carried out in accordance with the YSI Operating Manual methods. A polymer-based turbidity standard is purchased from YSI (part #607300) Standards for pH (7 and 10 buffers) and Chlorophyll (Rhodamine WT) are purchased from Fisher Scientific, a YSI approved vendor. Specific conductance standards are prepared in-house, from A.C.S. certified KCl and reverse osmosis deionized water. The pH, specific conductance, depth, turbidity, and chlorophyll sensors are calibrated using the following methods: 2-point pH 7 and 10, specific conductance standard to the nearest concentration of river (with the following standards 6.668 mS/cm and 24.82 mS/cm), pressure-dependent depth in the air, 2-point turbidity standards of 0 (deionized water) and 124 NTU's, 2-point chlorophyll standards of 0 (deionized water) and temperature-dependent Rhodamine WT standard. The DO sensor is calibrated using the YSI recommended aerated water in a bucket method. Sensors are immersed in the appropriate standard solutions (e.g., pH) and readings recorded using discrete sampling. As a quality assurance check, YSI datalogger records during sonde deployment and retrieval are compared to the YSI EXO1 instrument. Post-deployment measurements of all the parameters are recorded before cleaning the data loggers.

Because chlorophyll fluorescence data is collected *in vivo* there is an inherent loss of accuracy due to lack of disruption of the cells and subsequent extraction of chlorophyll, possible interference from other fluorescent organisms, and the inverse effects of temperature and light. Chlorophyll data should be used only as estimates of chlorophyll activity, not as accurate quantitative measurements. These limitations are reduced by following calibration and Rhodamine WT standard protocol according to the YSI Operating Manual. Chlorophyll data are considered as accurate as possible when matchup readings correlate and post-calibration is within range of the temperature-dependent standard, suggesting there was no sensor drift in readings during the deployment. For more accurate chlorophyll measurements contact the Research Coordinator for the extractive analysis data obtained from field grab samples.

A Storm3 logger and GOES V2 satellite transmitter unit was installed at the Railroad Bridge (RR) station on 9/22/2022 that transmits data to the NOAA GOES satellite, NESDIS ID # 3B00629C. A Storm3 logger and GOES V2 satellite transmitter unit was installed at the Otter Point Creek (OC) station on 8/4/2022 that transmits data to the NOAA GOES satellite, NESDIS ID # 3B03D61C. The transmissions are scheduled hourly and contain four (4) datasets reflecting fifteen-minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The “real-time” telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at www.nerrsdata.org.

5) Site location and character –

The Chesapeake Bay Maryland NERR is comprised of three components, Otter Point Creek, Jug Bay, and Monie Bay, which are scattered throughout the Maryland portion of the Chesapeake Bay. All three components are

thought to represent the diverse semi-diurnal estuarine environments of the Maryland portion of the Chesapeake Bay.

Otter Point Creek is a shallow, open water embayment located in the tidal headwaters of the Bush River on the Upper Western Shore of the Chesapeake Bay. Otter Point Creek is the smallest and proportionately shallowest of the three components and consists of 672 acres of open water, tidal marshes, forested wetlands, and upland hardwood forests surrounded by major highways, large residential communities, and heavy commercial and industrial development. The watershed draining into Otter Point Creek is rapidly being developed and urbanized. As a result, sediments are rapidly accreting into the marsh and are very fine and flocculent resulting in typically high turbidity when submerged macrophytes are not present. The non-native *Hydrilla verticillata* submerged macrophyte invaded the marsh in 2002 and has colonized most bottom substrates less than one half meter depth at low tide. There is one station (OC) located at the Otter Point Creek component.

Jug Bay is located in the upper tidal reaches of the Patuxent River and represents a river dominated by tidal freshwater marsh with expansive emergent vegetation communities. The Patuxent River is located on the western shore of the Chesapeake Bay and drains highly urbanized areas of the Washington Metropolitan area. Jug Bay is a 722-acre tidal estuary providing a narrow transition zone between brackish marshes and upland freshwater wetlands. The broad, shallow waters of Jug Bay support a profusion of freshwater plants and animals. Emergent and submerged vegetation crowd the river channel and form an interlaced pattern of tidal and nontidal marshes, swamps and forested wetlands surrounded by upland woods and fields. The component has deep water river dominated areas (>10m depth) as well as an extensive shallow water (<1m depth) network of tidal creeks and flooded mud flats. Submerged macrophytes are persistent along the shoreline of these creeks and are extensive within the flooded mud flats and the emergent marshes. There are three stations (MC, RR, IP) located at the Jug Bay Component.

Monie Bay is located on the lower Eastern Shore of the Chesapeake Bay at the mouth of the Wicomico River. The Monie Bay Component represents a mesohaline bay with primarily three tidal creeks representing a variety of agricultural input. The local area is largely undeveloped with varying agriculture and rural residential land use. The component is dominated by salt marshes with tidal fresh marshes in the upper tidal reaches of the tributaries. Shallow water habitats give way to fringing submerged macrophyte communities. One monitoring site (MB) is located within this component. MB is a secondary site, established effective January 1, 2020. Non SWMP compliant data had been collected starting 2006 but not submitted to the CDMO and may be obtained directly from the reserve.

The following is a list of the 5 sites with site characteristics:

Mataponi Creek (MC)

38° 44.599'N, 76° 42.446'W (NAD83)

38.74331667, -76.70743333 (GIS format)

Site MC is located in a small tributary off the upper tidal headwaters of the Patuxent River, Maryland. MC is 2.4 km upstream of the mouth, midchannel in the creek, which is approximately 7m wide. The southern bank is steep and covered mainly with hardwood trees while the northern bank is tidal marsh. The sonde is deployed vertically in a perforated PVC pipe. Average depth at this site is roughly 0.7 meters with a mean tidal fluctuation of approximately 0.6 m. The YSI is deployed 0.25m off the creek bottom. Salinities at this site rarely exceed 0.1 ppt. The bottom habitat is soft sediment. Grassbeds of SAV were historically abundant during the summer months, but coverage has declined drastically in the past 3-4 years. The SAV community at this site was seasonally very dense and thus water quality was thought to be strongly influenced by the presence of SAV during the summer months. Because this site is located along the main channel of Mataponi Creek, water quality is reflective of the general quality of water flowing along the main portion of the creek. Freshwater inputs are not quantified. Any pollutants would most likely be due to agricultural runoff. No USGS gauge for streamflow is available.

Railroad Bridge (RR)

38° 46.877'N, 76° 42.822'W (NAD 83)

38.78128333, -76.7137 (GIS format)

Site RR is located in the mainstem of the upper tidal headwaters of the Patuxent River, Maryland. The site is slightly upstream (roughly 0.3km) from Jackson's Landing at the Patuxent River Park (previous PR site 2002). This section of the Patuxent River is approximately 70m wide and average depth at the site is 1.4m. The YSI is deployed 0.25 m off of the river bottom. Bottom habitat is soft sediment, and grassbeds are evident in the area during summer months. Mean tidal fluctuation is approximately 0.6 m. Salinities are typically less than 1 ppt at this site throughout the year. In 2003 this site was moved from 38° 46' 50.6" N, 76° 42' 29.1" W (Jug Bay) to its present location because of the shallow nature of the old site. The new site location (RR) is at the end of the old railroad bed and is deployed vertically in a perforated PVC pipe near midchannel of the Patuxent River. Because this site is located along the main channel of the Patuxent River, water quality is reflective of the general quality of water flowing along the main portion of the river. The site is roughly 1km downstream of the confluence of the Western Branch tributary and the Patuxent River Mainstem, thus water quality is influenced by the Western Branch. A large wastewater treatment plant (averaging 20 mgd) discharges directly into the Western Branch tributary of the Patuxent River just upstream of IP. USGS streamflow for the closest gauge (Latitude 38°57'21.3"N, Longitude 76°41'37.3"W NAD83): yearly mean of approximately 350 – 430 cfs.

Iron Pot Landing (IP)

38° 47.760'N, 76° 43.248' W (NAD 83)
38.796, -76.7208 (GIS Format)

Site IP is located 2.09km from the mouth of Western Branch. IP is attached vertically off a small pier near midchannel of the river and has an average depth of 1.6m. The YSI is deployed 0.25 m off the river bottom. The site is roughly 1km downstream of a large (20 mgd) wastewater treatment plant effluent. The river is approximately 15m wide and flows through extensive riparian buffers. Both banks of the river are flanked by hardwood flora. Mean tidal fluctuation is approximately 0.6 m. Salinity at this site is generally 0.1 ppt. The bottom habitat is soft sediment, and grassbeds are evident during the summer months. USGS streamflow for the closest gauge (Latitude 38°48'51.2"N, Longitude 76°44'55.4"W NAD83): yearly mean of approximately 100 – 130 cfs. In addition, a wastewater treatment plant discharges about 15 – 30 cfs about 1 km upstream of site.

Otter Point Creek (OC)

39° 27.047'N, 76° 16.474'W (NAD 83)
39.45078333, -76.27456667 (GIS Format)

Site OC is located approximately 0.3km from the Anita C. Leight Estuary Center. OC is deployed vertically in a perforated PVC pipe and has an average depth of 0.7m. The YSI is deployed 0.25 m off the creek bottom. The bottom habitat is extremely soft sediment, and grass beds inundate the site during summer months. Salinity at this station rarely rises above 0.1 ppt. Mean tidal fluctuation is about 0.3 m. The average water levels are generally lower in the winter due to north and northwest winds that increase the egress from Chesapeake Bay. The sonde is periodically exposed to very low tides, and sediments at the site are extremely fine and flocculent. Because of the shallowness of the tidal marsh, coupled with the dramatic daily changes in the depth and width of the stream, deployments at the site present many problems. These problems include periodic exposure of the sonde, very high turbidity, sedimentation rates associated with tidal infiltration, and wind and wave generated resuspension that causes severe fouling of the probes. Water quality at the site represents extreme shallow water habitats. Thus, it is not uncommon to see very large fluctuations in temperature and dissolved oxygen at this site ranging from complete anoxia to full saturation, due in part to the shallow nature of the site and the effects of marsh processes on water quality. Additionally, the site is seasonally dominated by dense SAV communities from June-October and thus water quality conditions during this time are likely influenced by the presence of these macrophytes. USGS streamflow for the closest gauge (Latitude 39°26'21.4"N, Longitude 76°18'21.7"W NAD83): yearly mean of approximately 90 cfs. Site is in substantially urban environment which accounts for its flashiness. Pollutants are mostly urban run-off, with some industrial discharge possible.

Monie Bay (MB) (Secondary SWMP Station)

38 12.513' N, 75 48.275' W (NAD83)
38.20855, -75.80458333 (GIS Format)

Site MB is located on Little Monie Creek, a tidal creek draining into Monie Bay. Monie Bay is a small embayment of the Chesapeake Bay of Maryland's Eastern Shore. MB is located approximately 4km upstream of the mouth of Little Monie Creek, attached to the end of a pier at the Monie Bay Field Station. Much of the creek is flanked on both sides by emergent brackish tidal marsh, however upstream of the station agricultural areas comprise most of the watershed, with a small woodland buffer between the agricultural areas and the fringing tidal marsh. The sonde is housed in a vertical PVC pipe, approximately 0.25m off the creek bottom, which is composed of soft unconsolidated sediments. The average depth is 0.8m. The semi-diurnal tidal fluctuation is approximately 0.8m. Salinity at this site rarely falls below 4 ppt or above 15 ppt., except during exceptional events. Due to the tidal nature of this station, large variation of the data, both seasonally and daily is observed. No USGS streamflow gauge is available.

SWMP Station Timeline

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
RR	P	Railroad Bridge	38°57'21.3"N 76°41'37.3"W	04/04/03 – present	NA	NA
IP	P	Iron Pot Landing	38°48'51.2"N 76°44'55.4"W	04/04/03 – present	NA	NA
MC	P	Mataponi Creek	38° 44.599'N, 76° 42.446'W	04/22/03 – present	NA	NA
OC	P	Otter Point Creek	39°26'21.4"N 76°18'21.7"W	04/15/03 - present	NA	NA
MB	S	Monie Bay	38 12.513' N 75 48.275' W	07/18/06 - present	NA	NA
JB	P	Jug Bay	38° 46' 45.12 N, 76° 42' 27.72 W	7/1/95 - 12/1/02	Inadequate deployment structure, poor representation of river	NA
PR	P	Patuxent River	38° 46' 23.52 N, 76° 42' 32.76 W	7/1/95 - 12/1/02	Inadequate deployment structure, poor representation of river	NA

6) Data collection period –

Long-term data collection using sondes at Railroad Bridge (Jug Bay Wetlands Sanctuary) (RR) began on April 4, 2003; Mataponi Creek (MC) began April 22, 2003; Iron Pot Landing (IP) began April 4, 2003; Otter Point Creek (OC) began April 15, 2003; and Monie Bay (MB) began July 18, 2006.

2023 deployment dates and times are as follows. All times are in Eastern Standard Time (EST).

Railroad Bridge (RR):

Deployment Date / Time

12/6/2022 08:45

1/4/2023 8:45

Retrieval Date/ Time

1/4/2023 8:30

2/2/2023 8:30

2/2/2023	8:45	3/2/2023	8:45
3/2/2023	9:00	4/4/2023	7:30
4/4/2023	7:45	4/18/2023	8:30
4/18/2023	8:45	5/2/2023	7:30
5/2/2023	7:45	5/16/2023	7:15
5/16/2023	7:30	5/30/2023	7:30
5/30/2023	7:45	6/13/2023	7:30
6/13/2023	7:45	6/27/2023	7:30
6/27/2023	7:45	7/11/2023	7:15
7/11/2023	7:30	7/25/2023	7:45
7/25/2023	8:00	8/8/2023	7:30
8/8/2023	7:45	8/29/2023	8:45
8/29/2023	9:00	9/12/2023	7:45
9/12/2023	8:00	9/26/2023	7:45
9/26/2023	8:00	10/11/2023	8:15
10/11/2023	8:30	10/24/2023	7:45
10/24/2023	8:00	11/8/2023	8:30
11/8/2023	8:45	12/12/2023	10:30
12/12/2023	10:45	1/24/2024	08:45

Iron Pot Landing (IP):

Deployment Date / Time		Retrieval Date/ Time	
12/6/2022	11:30	1/4/2023	9:45
1/4/2023	10:00	2/6/2023	8:30
2/6/2023	8:45	3/2/2023	11:45
3/2/2023	12:00	4/4/2023	10:45
4/4/2023	11:00	4/18/2023	10:00
4/18/2023	10:15	5/2/2023	8:30
5/2/2023	8:45	5/16/2023	8:45
5/16/2023	9:00	5/30/2023	9:15
5/30/2023	9:30	6/13/2023	10:15
6/13/2023	10:30	6/27/2023	9:00
6/27/2023	9:15	7/11/2023	9:00
7/11/2023	9:15	7/25/2023	9:15
7/25/2023	9:30	8/8/2023	9:00
8/8/2023	9:15	8/29/2023	10:00
8/29/2023	10:15	9/12/2023	9:15
9/12/2023	9:30	9/26/2023	9:30
9/26/2023	9:45	10/11/2023	9:45
10/11/2023	10:00	10/24/2023	10:15
10/24/2023	10:30	11/8/2023	10:15
11/8/2023	10:30	12/12/2023	12:15
12/12/2023	12:30	1/30/2024	08:30

Mataponi Creek (MC):

Deployment Date / Time		Retrieval Date/ Time	
1/4/2023	10:45	2/2/2023	10:15
2/6/2023	14:15	3/2/2023	10:45
3/2/2023	11:00	4/4/2023	9:30
4/4/2023	9:45	4/18/2023	11:15
4/18/2023	11:30	5/2/2023	9:30
5/2/2023	9:45	5/16/2023	9:45
5/16/2023	10:00	5/30/2023	10:15
5/30/2023	10:30	6/3/2023	9:15
6/13/2023	9:30	6/27/2023	10:45
6/27/2023	11:00	7/11/2023	10:00
7/11/2023	10:15	7/25/2023	11:00
7/25/2023	11:15	8/8/2023	10:00
8/8/2023	10:15	8/29/2023	11:15
8/29/2023	11:30	9/12/2023	10:15
9/12/2023	10:30	9/26/2023	10:45
9/26/2023	11:00	10/11/2023	11:15
10/11/2023	11:30	10/24/2023	9:15
10/24/2023	9:30	11/8/2023	11:30
11/8/2023	11:45	12/12/2023	13:15
12/12/2023	13:30	1/11/2024	09:30

Otter Point Creek (OC):

Deployment Date / Time		Retrieval Date/Time	
1/25/2023	11:45	2/2/2023	9:00
2/15/2023	11:00	3/21/2023	8:15
3/21/2023	8:30	4/6/2023	8:45
4/6/2023	9:00	4/20/2023	9:30
4/20/2023	9:45	5/4/2023	7:45
5/4/2023	8:00	5/18/2023	7:45
5/18/2023	8:00	6/1/2023	9:00
6/1/2023	9:15	6/15/2023	7:45
6/15/2023	8:00	6/29/2023	9:45
6/29/2023	10:00	7/12/2023	8:15
7/12/2023	8:30	7/26/2023	9:15
7/26/2023	9:30	8/7/2023	8:15
8/7/2023	8:30	8/23/2023	8:45
8/23/2023	9:00	9/5/2023	9:00
9/5/2023	9:15	9/21/2023	8:30
9/21/2023	8:45	10/4/2023	7:45
10/4/2023	8:00	10/18/2023	8:30
10/18/2023	8:45	11/7/2023	9:00

11/7/2023	9:15	12/6/2023	11:00
12/6/2023	11:15	12/5/2023	10:45
12/15/2023	11:00	1/4/2024	09:15

Monie Bay (MB) – EXO2

Deployment Date / Time		Retrieval Date/ Time	
12/1/2022	10:30	1/17/2023	12:00
1/17/2023	12:15	2/13/2023	10:00
2/13/2023	10:15	3/9/2023	9:45
3/9/2023	10:00	4/5/2023	11:15
4/5/2023	11:30	5/3/2023	8:45
5/3/2023	9:00	5/3/2023	11:00
5/31/2023	11:15	6/29/2023	8:30
6/29/2023	8:45	7/27/2023	9:00
7/27/2023	9:15	8/22/2023	9:00
8/22/2023	9:15	9/20/2023	11:00
9/12/2023	11:15	10/19/2023	11:45
10/19/2023	12:00	11/2/2023	11:30
11/2/2023	11:45	12/5/2023	11:15
12/5/2023	11:30	1/2/2024	11:15

7) Distribution –

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:

NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: <http://www.nerrdata.org/>; accessed 12 October 2023.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page www.nerrdata.org. Data are available in comma delimited format.

8) Associated researchers and projects –

As part of the SWMP long-term monitoring program, CBM NERR also monitors 15-minute meteorological data along with monthly grab samples and diel sampling for nutrient data which may be correlated with this water quality dataset. These data are available at www.nerrdata.org. The weather station is maintained by the Maryland

Department of Natural Resources Continuous Monitoring Program. The principal objectives are to record meteorological information for the Chesapeake Bay National Estuarine Research Reserve in Maryland. This information is available for the following: 1) to track and record atmospheric and meteorological conditions useful to help understand and explain additional data collected concurrently 2) to create a database capable of detecting long-term changes in weather patterns 3) to record and identify the impact of storms, hurricanes, heavy rain and other episodic weather events capable of influencing other environmental conditions such as water quality (as monitored by the SWMP effort) and to collect ancillary data in support of other research efforts. The weather station records temperature, relative humidity, barometric pressure, wind speed, wind direction, light as measured by a LI-COR Quantum Sensor, and precipitation.

The Jug Bay Wetlands Sanctuary staff has been collecting weekly to monthly temperature, salinity, dissolved oxygen, and nutrient samples at various tidal and non-tidal sites throughout the Jug Bay marsh since 1989. One of their historic sites includes the current (RR) site as well as the historic (1995-2002) (JB) site. Sampling for their sites is done monthly throughout the year (when ice is not present) and includes parameters such as nitrate/nitrite, ammonium and chlorophyll a. Additionally, the staff samples at other sites throughout the Jug Bay marsh, which provide additional similar data at a larger spatial scale.

Staff at the Anita C. Leight Estuary Center at Otter Point Creek, in conjunction with CBNERR/MD staff, have also been collecting bi-weekly to monthly temperature, salinity, dissolved oxygen, total suspended solids, chlorophyll a, and nutrient samples (to include nitrate/nitrite, ammonium, ortho-phosphate, total nitrogen and total phosphorus) at the same location as datalogger OC and 5 other sites in the Otter Point Creek marsh since 2002. For more information on either the Jug Bay Wetlands Sanctuary or Otter Point Creek monitoring, contact Kyle Derby, the Reserve's Research Coordinator.

An additional ten stations throughout the Monie Bay Component are monitored for water quality by reserve staff and data can be obtained by contacting the Reserve's Research Coordinator. Reserve staff also monitor sediment accretion or erosion using surface elevation tables in the Monie Bay marshes. The Maryland Department of the Environment collects information on fecal coliform contamination at different shellfish sampling stations located within the Monie Bay system. Routine and specialized habitat, wildlife monitoring studies have been conducted in the Monie Bay system by various units of Maryland Department of Natural Resources.

Additional discrete nutrient data and semi-continuous water quality data is also available through the Department of Natural Resources Continuous Monitoring Program (see <http://eyesonthebay.dnr.maryland.gov/>) that provides increased spatial coverage of many of the same parameters for 2023. This monitoring program included as many as 15 additional continuous monitoring sites (similar to the CBM NERR effort) throughout Maryland tidal waters sampled semi-continuously (every 15 minutes) either from April-October or year round. The Maryland Department of Natural Resources Continuous Monitoring Program began in 1999. For more information on this program see <http://eyesonthebay.dnr.maryland.gov/>.

II. Physical Structure Descriptors

9) Sensor specifications –

In 2023, CBM NERR deployed YSI EXO2 sondes at all five sites.

YSI EXO Sonde:

Parameter: Temperature

Units: Celsius (C)

Sensor Type: CT2 probe, Thermistor

Model#: 599870

Range: -5 to 50 C

Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .05

Resolution: 0.001 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: CT2 probe, 4-electrode cell with autoranging

Model#: 599870

Range: 0 to 200 mS/cm

Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm; 100 to 200: +/- 1% of reading

Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity

Units: practical salinity units (psu)/parts per thousand (ppt)

Sensor Type: CT2 probe, Calculated from conductivity and temperature

Range: 0 to 70 psu

Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater

Resolution: 0.01 psu

OR

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Wiped probe; Thermistor

Model#: 599827

Range: -5 to 50 C

Accuracy: ± 0.2 C

Resolution: 0.001 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: Wiped probe; 4-electrode cell with autoranging

Model#: 599827

Range: 0 to 100 mS/cm

Accuracy: $\pm 1\%$ of the reading or 0.002 mS/cm, whichever is greater

Resolution: 0.0001 to 0.01 mS/cm (range dependent)

Parameter: Salinity

Units: practical salinity units (psu)/parts per thousand (ppt)

Model#: 599827

Sensor Type: Wiped probe; Calculated from conductivity and temperature

Range: 0 to 70 ppt

Accuracy: $\pm 2\%$ of the reading or 0.2 ppt, whichever is greater

Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation

Sensor Type: Optical probe w/ mechanical cleaning

Model#: 599100-01

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 5% of reading

Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)

Units: milligrams/Liter (mg/L)

Sensor Type: Optical probe w/ mechanical cleaning

Model#: 599100-01

Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 5% of the reading
Resolution: 0.01 mg/L

Parameter: Non-vented Level - Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 33 ft (10 m)
Accuracy: +/- 0.013 ft (0.004 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599701(guarded) or 599702(wiped)
Range: 0 to 14 units
Accuracy: +/- 0.1 units within +/- 10° of calibration temperature, +/- 0.2 units for entire temperature range
Resolution: 0.01 units

Parameter: Turbidity
Units: formazin nephelometric units (FNU)
Sensor Type: Optical, 90 degree scatter
Model#: 599101-01
Range: 0 to 4000 FNU
Accuracy: 0 to 999 FNU: 0.3 FNU or +/-2% of reading (whichever is greater); 1000 to 4000 FNU +/-5% of reading
Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU

Parameter: Chlorophyll
Units: micrograms/Liter
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.01 ug/L chl a, 0.1% FS

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.02 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting Depth/Level data for changes in barometric pressure as measured by the reserve's associated meteorological station during data ingestion. These corrected Depth/Level

data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

NOTE: older Depth data cannot be corrected without verifying that the depth offset was in place and whether a vented or non-vented depth sensor was in use. No SWMP data prior to 2006 can be corrected using this method. The following equation is used for corrected Depth/Level data provided by the CDMO beginning in 2010:
$$((1013-BP)*0.0102)+Depth/Level = cDepth/cLevel.$$

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

Chlorophyll Fluorescence Disclaimer:

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual including interference from other fluorescent species, differences in calibration method, and effects of cell structure, particle size, organism type, temperature, and light on sensor measurements.

10) Coded variable definitions –

Water Quality Sampling station:	Sampling Site code:	Station code:
Railroad Bridge	RR	cbmrrwq
Mattaponi Creek	MC	cbmmcqwq
Iron Pot Landing	IP	cbmipwq
Otter Point Creek.	OC	cbmocwq
Monie Bay	MB	cbmmbwq

11) QAQC flag definitions –

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

- 5 Outside High Sensor Range
- 4 Outside Low Sensor Range
- 3 Data Rejected due to QAQC
- 2 Missing Data
- 1 Optional SWMP Supported Parameter

- 0 Data Passed Initial QAQC Checks
- 1 Suspect Data
- 2 *Open - reserved for later flag*
- 3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

12) QAQC code definitions –

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIC	No instrument deployed due to ice
GIM	Instrument malfunction
GIT	Instrument recording error; recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Corrected Depth/Level Data Codes

GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
SCS	Chlorophyll spike
SDF	Depth port frozen
SDG	Suspect due to sensor diagnostics
SDO	DO suspect
SDP	DO membrane puncture
SIC	Incorrect calibration / contaminated standard
SNV	Negative value
SOW	Sensor out of water
SPC	Post calibration out of range
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSM	Sensor malfunction
SSR	Sensor removed / not deployed
STF	Catastrophic temperature sensor failure
STS	Turbidity spike
SWM	Wiper malfunction / loss

Comments

CAB*	Algal bloom
------	-------------

CAF	Acceptable calibration/accuracy error of sensor
CAP	Depth sensor in water, affected by atmospheric pressure
CBF	Biofouling
CCU	Cause unknown
CDA*	DO hypoxia (<3 mg/L)
CDB*	Disturbed bottom
CDF	Data appear to fit conditions
CFK*	Fish kill
CIP*	Surface ice present at sample station
CLT*	Low tide
CMC*	In field maintenance/cleaning
CMD*	Mud in probe guard
CND	New deployment begins
CRE*	Significant rain event
CSM*	See metadata
CTS	Turbidity spike
CVT*	Possible vandalism/tampering
CWD*	Data collected at wrong depth
CWE*	Significant weather event

13) Post deployment information –

Railroad Bridge (RR)- EXO2

Deployment Date	SpCond	DO	pH		Turb		Depth		Chl		
	ms/cm	%sat			NTU		m		µg/L		
	6.668	100%	7	10	0	124	Sonde	Pressure-determined Offset	0	Meter in Rhodo Sol'n	Temp-determined Std
1/4/2023	6.462	100.50	6.92	9.84	0.140	123.33	0.051	0.082	0.020	68.70	66.40
2/2/2023	6.628	97.80	7.16	10.08	0.700	120.30	0.021	0.014	0.200	70.03	65.50
3/2/2023	6.621	99.90	7.06	10.06	0.050	118.16	0.043	0.054	0.260	66.09	65.60
4/4/2023	6.691	99.10	7.34	10.28	1.380	123.30	0.065	0.041	0.240	68.80	68.00
4/18/2023	6.605	97.50	6.98	9.96	1.070	121.23	-0.022	0.082	0.030	71.63	67.70
5/2/2023	6.647	98.70	7.20	10.16	2.030	126.79	-0.046	-0.054	0.120	67.51	66.00
5/16/2023	6.590	100.60	7.06	10.04	3.400	116.70	0.087	0.082	1.100	64.00	64.90
5/30/2023	6.889	98.50	7.07	9.96	3.900	112.30	0.097	-0.136	-0.200	53.20	65.40
6/13/2023	6.602	99.60	7.00	10.01	-0.070	128.93	-0.103	-0.109	-0.440	67.20	66.00
6/27/2023	6.605	98.40	7.01	9.91	1.900	137.10	-0.003	-0.014	0.500	83.50	67.20
7/11/2023	6.366	97.10	7.07	10.07	3.660	128.30	0.015	0.014	1.450	69.05	67.90
7/25/2023	6.957	98.80	7.07	10.03	0.200	119.20	-0.036	-0.041	-0.100	67.40	67.40
8/8/2023	6.705	97.70	7.10	10.10	1.400	121.60	-0.028	-0.014	0.400	69.30	66.30
8/29/2023	6.638	98.50	7.07	9.99	0.100	129.90	-0.006	0.000	0.100	67.20	66.50
9/12/2023	6.637	98.00	7.00	10.04	0.290	123.01	0.109	0.122	0.280	68.14	66.10
9/26/2023	6.669	101.10	7.03	10.03	1.460	129.70	-0.023	-0.014	1.060	66.80	67.50
10/11/2023	6.671	100.50	7.03	10.00	1.280	119.24	0.105	0.122	0.530	70.56	67.60
10/24/2023	6.656	98.80	6.97	9.88	0.850	129.84	-0.055	-0.041	0.180	68.74	68.20

11/8/2023	6.647	101.30	7.00	10.06	1.860	122.10	0.181	0.177	0.520	68.77	66.90
12/12/2023	6.877	100.30	7.09	10.02	0.000	120.60	0.136	0.136	0.200	71.80	66.00

Iron Pot Landing (IP) – EXO2

Deployment Date	SpCond	DO	pH		Turb		Depth		Chl		
	ms/cm	%sat			NTU		m		µg/L		
	6.668	100%	7	10	0	124	Sonde	Pressure-determined Offset	0	Meter in Rhodo Sol'n	Temp-determined Stnd
1/4/2023	6.615	100.7	6.97	9.86	0.4	122.4	0.053	0.027	0.1	72.7	65.80
2/6/2023	6.649	98.8	7.01	9.97	0.9	118.4		0.014	0.63	69.8	66.20
3/2/2023	6.702	101.8	6.95	10.07	0.03	119.7	0.042	0.054	0.03	67.15	66.30
4/4/2023	6.661	99.1	7.16	10.12	3.43	126.5		0.041	0.53	70.29	67.60
4/18/2023	6.531	97.4	7.02	9.99	2.64	130.39	0.092	0.082	0.07	68.04	67.60
5/2/2023	6.626	98.3	7.09	10.09	4.2	134.3	-0.059	-0.054	0.1	66.4	66.30
5/16/2023	6.611	100.2	7.07	10.04	0.1	124.8	0.043	0.054	-0.1	62.7	64.80
5/30/2023	7.108	94.5	7.06	10.06	2.12	141.68	0.113	-0.136	-0.02	63.51	65.40
6/13/2023	6.57	97	7.02	10.03	2.5	123	-0.098	-0.109	0.03	49.6	66.00
6/27/2023	6.348	98.6	7.05	9.98	0.3	138.8	-0.015	-0.014	0.2	68.4	67.30
7/11/2023	6.332	97.4	7.01	10.01	1.56	132.43	0.002	0.014	0.26	70.63	68.10
7/25/2023	6.696	98.6	6.99	9.94	1.1	124.5	-0.038	-0.014	0.4	67.3	67.30
8/8/2023	6.488	97.6	7.04	10	1.2	132.2	-0.037	-0.014	0	67.1	65.80
8/29/2023	6.678	98.6	7.04	10.02	0.1	121.7	0.026	0	0.2	68.2	66.80
9/12/2023	5.99	99.7	7.01	9.99	0.3	133.5	0.126	0.122	0	69.8	65.20
9/26/2023	6.682	100.8	6.99	10.01	1.61	126.1	-0.002	-0.014	0.5	69.1	67.80
10/11/2023	6.739	101	7	9.96	0.12	123.7	0.134	0.122	0.13	70.7	67.80
10/24/2023	6.505	98.4	7.08	10.04	0.31	128.53	-0.052	-0.014	-0.22	69.54	67.50
11/8/2023	6.544	101.2	7.06	10.03	1.99	126.5	0.187	0.177	0.08	70.61	67.10
12/12/2023	6.732	99.2	7.05	9.97	1.11	117.51	0.084	0.082	-0.07	74.71	65.90

Mataponi Creek (MC) - EXO2

Deployment Date	SpCond	DO	pH		Turb		Depth		Chl		
	ms/cm	%sat			NTU		m		µg/L		
	6.668	100%	7	10	0	124	Sonde	Pressure-determined Offset	0	Meter in Rhodo Sol'n	Temp-determined Stnd
1/4/2023	6.376	100.90	6.86	9.70	2.01	119.86	0.06	0.08	-0.02	60.88	66.50
2/6/2023	6.660	98.30	7.05	9.97	2.20	113.80	0.03	0.01	1.10	71.30	65.80
3/2/2023	6.662	99.60	6.98	10.06	0.99	120.05	0.05	0.05	0.08	65.76	65.90
4/4/2023	6.658	98.90	7.06	10.02	0.80	134.70	0.04	0.04	0.77	67.80	67.60
4/18/2023	6.543	97.00	7.04	10.04	1.03	132.79	-0.19	0.08	0.32	70.63	67.70
5/2/2023	6.741	97.70	7.02	10.06	-0.17	116.24	-0.07	-0.05	-0.61	69.65	66.70

5/16/2023	6.637	100.00	7.01	9.96	1.30	121.80	0.09	0.08	-0.50	65.00	65.00
5/30/2023	6.908	93.30	7.04	9.89	-0.26	133.94	0.10	-0.14	-0.31	64.80	65.70
6/13/2023	6.600	97.20	7.02	9.98	0.12	126.18	-0.10	-0.11	-0.50	68.63	65.90
6/27/2023	6.648	97.60	6.98	10.01	3.70	131.30	-0.01	-0.01	1.10	70.80	67.20
7/11/2023	6.378	98.00	7.07	10.03	4.28	130.31	0.01	0.01	0.24	67.20	67.50
7/25/2023	7.079	97.10	7.05	9.95	0.10	120.20	-0.07	-0.07	-0.10	66.20	66.70
8/8/2023	6.622	96.80	7.11	10.06	3.40	131.40	-0.04	-0.01	1.50	67.20	66.10
8/29/2023	6.600	98.30	7.03	9.93	2.80	123.10	-0.01	0.00	0.60	67.50	66.40
9/12/2023	6.637	99.00	7.06	10.07	1.69	127.12	0.11	0.12	0.00	67.58	66.00
9/26/2023	6.694	102.00			1.32	127.10	-0.01	-0.03	0.23	67.10	67.50
10/11/2023	6.744	100.80	7.03	10.01	2.40	125.19	0.12	0.12	0.03	72.08	67.80
10/24/2023	6.674	99.00	6.96	9.95	2.42	120.80	-0.04	-0.04	-0.10	69.77	67.70
11/8/2023	6.653	101.70	7.03	10.04	0.81	122.30	0.19	0.18	-0.10	72.43	66.90
12/12/2023	6.822	101.00	7.02	9.98	1.40	121.70	0.06	0.08	0.40	70.00	66.10

Otter Point Creek (OC) – EXO2

Deployment Date	SpCond ms/cm	DO %sat	pH		Turb NTU		Depth m		Chl µg/L		
	6.668	100%	7	10	0	124	Sonde	Pressure-determined Offset	0	Meter in Rhodo Sol'n	Temp-determined Std
1/25/2023	6.424	100.6	7.01	9.94	-0.8	121.6	0.028	-0.014	0	74	67.1
2/15/2023	6.608	100	7.16	10.15	4.3	118.4	0.052	0.014	1.7	68	66.5
3/21/2023	6.867	100.8	7.05	10.01	3.38	122.97		0.054	0.09	61.95	65
4/6/2023	6.67	101.1	7.05	10.07	2.1	129.6	0.027	0.027	-0.1	69.5	65.6
4/20/2023	6.563	101.1	7.07	10.01	2.99	127.44	0.068	0.068	0.02	75.41	68.3
5/4/2023	6.703	99.6	6.98	10.06	0.51	123.99	0.109	0.109	-0.06	72.67	66.6
5/18/2023	6.485	98	7.09	10	-1.2	123.9	0.008	0.014	-0.3	65.1	65.4
6/1/2023	6.568	95	7.07	10.13	2.5	134.9	-0.078	-0.082	0.7	66.8	65.5
6/15/2023	6.011	100.5	7.16	10.18	0.09	123.17	0.046	0.027	-0.01	66.65	66
6/29/2023	6.663	98.8	7.02	10.03	0.3	130.8	0.01	0	0.2	74.3	67.6
7/12/2023	6.409	102.2	7.05	10.01	0.25	134.74	0.015	0.014	-0.01	68.04	67.4
7/26/2023	6.823	100.1	7.01	9.94	0.42	165.75	-0.123	-0.041	0.03	67.97	63.7
8/7/2023	6.223	101.6	7.06	10.03	2.1	134.5	0.054	0.068	0.02	66.93	65.1
8/23/2023	6.731	98.8	7.08	10.05	0.2	123.2	-0.004	-0.014	0.1	67.3	67
9/5/2023	6.703	98.9	7.04	9.96	4.7	130	0.097	0.095	0.01	65.1	66
9/21/2023	6.671	99.2	7.11	10.11	1.85	124.2	0.091	0.095	0.16	70.4	67
10/4/2023	6.618	101.1	7.11	9.98	-0.1	120.3	0.087	0.068	-0.1	72.6	67.7
10/18/2023	6.738	94.1	7.07	9.94	2.06	124.1	-0.051	-0.068	0.65	73.45	67.1
11/7/2023	6.668	98.3	7.02	10.18	0.82	127.46	0.01	0.027	0.16	68.27	66.7
12/6/2023	6.727	101.7	7.02	10.05	0.05	125.3		0.054	0.1	69.8	67.3

12/15/2023	6.794	98.6	7.04	9.97	-0.05	125.02	0.161	0.15	-0.03	70.82	66.9
------------	-------	------	------	------	-------	--------	-------	------	-------	-------	------

Monie Bay (MB) – EXO2

Deployment Date	SpCond ms/cm	DO %sat	pH		Turb NTU		Depth m		Chl µg/L		
	24.82	100%	7	10	0	124	Sonde	Pressure-determined Offset	0	Meter in Rhodo Sol'n	Temp-determined Stnd
1/17/2023	24.779	100.9	7.05	9.98	0.80	119.60	0.229	0.054	-0.10	66.10	65.50
2/13/2023	24.730	100.4	6.95	9.93	3.50	125.80	0.050	0.041	2.10	72.50	65.90
3/9/2023	24.792	104.9	7.07	10.09	2.75	121.34	0.073	0.054	0.20	64.07	65.10
4/5/2023	24.597	99.6	7.06	10.03	5.19	126.27	0.075	0.068	-0.47	72.82	68.00
5/3/2023	24.510	99.8	7.04	9.98	0.70	125.60	0.060	0.054	0.90	63.20	64.40
5/31/2023	23.964	102.1	7.04	10.02	0.60	119.20	0.039	0.027	0.10	65.60	64.90
6/29/2023	24.680	96.6	7.00	9.99	0.85	124.50		0.014	0.15	68.14	67.40
7/27/2023	23.989	100.5	7.06	10.01	0.74	119.32	0.053	0.068	0.14	66.07	66.20
8/22/2023	24.581	98.3	6.97	9.91	1.80	127.40	0.100	0.082	0.50	68.20	67.20
9/12/2023	25.200	97.7	7.03	10.00	0.81	127.89	-0.069	-0.068	-0.56	70.90	67.60
10/19/2023	27.000	99.1	7.09	10.06	0.37	128.80	0.216	0.177	0.12	77.60	70.80
11/2/2023	24.831	100.6	7.04	10.05	1.12	126.25	0.025	0.027	-0.05	66.73	66.50
12/5/2023	25.043	100.6	6.97	9.92	0.14	122.36	0.040	0.054	0.37	69.60	66.60

14) Other remarks/notes –

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for “not a number” and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

In addition to the sampling described above, several other data sets were collected. Photosynthetically Active Radiation (PAR) was also collected using a LI-COR LI-1500 display with two sensors: one underwater quantum sensor and one ambient quantum sensor along with Secchi depth. Additional nutrient samples were also collected during the months of April through October. These data are available through the Maryland Department of Natural Resources. Visit <http://eyesonthebay.dnr.maryland.gov/> for more information.

Because the CBM NERR services other stations outside of the five NERR sites, some of which get incredibly fouled, it is very difficult to keep all of the post-cal standards clean. It is not feasible for the technicians to make or use a new standard for each sonde, especially not the turbidity standard solution, as it is very expensive. Conductivity and pH standards are swapped if they seem to be impacted by fouling since the reserve has those in larger quantities. This is often not the case with standards for chlorophyll and turbidity. Due to this, turbidity and chlorophyll posts were most impacted by these fouled standards causing often artificially low or high posts. However, data do not appear to be impacted by fouling or drift when viewing the data.

Railroad Bridge (RR)

While the pH mV and standard values were within range at post-calibration, pH values seem to be slightly elevated for the entirety of the 5/2/2023 deployment. All pH values flagged suspect <1> (CSM) unless otherwise noted.

A significant rain event occurred on 6/21/2023. This rain event caused a drastic drop in specific conductance and salinity that was not observed until 6/23/2023 to 6/24/2023. This is indicated in the data by a record comment of {CRE}, with specific conductance and salinity flagged <0> [GSM] (CDF) from 6/23/2023 at 21:45 to 6/24/2023 at 03:30 in order to highlight this drastic drop.

Iron Pot Landing (IP)

SpCond and salinity data during the December 6, 2022 deployment were impacted by a bad calibration <1>[SPC](CSM) from 1/1/2023 at 00:00 until 1/4/2023 at 09:45. We believe there were air bubbles in the ports of the conductivity probe at calibration. When air bubbles are present in the ports of the probe, it causes the readings to be lower than what is expected. When the probe is calibrated with air bubbles still present, any proceeding SpCond and salinity values are falsely elevated. Failure to remove the air bubbles caused the readings to be off from where they should have been and explains the elevated reading of 7,888 uS/cm in 6,668 uS/cm specific conductance standard at the post-calibration.

All depth data are missing <-2> [SSM] (CSM) for the entire 4/4/2023 deployment from 4/4/2023 at 11:00 to 4/18/2023 at 10:00. The sonde dropped depth after being unplugged from the laptop after doing a dissolved oxygen check the morning of the deployment.

Otter Point Creek (OC)

All temperature data is marked suspect <1> [SSD] (CSM) from 8/19/2023 at 00:00 through the end of that deployment on 8/23/2023 at 08:45. A pre-deployment temperature check with a digital reference thermometer was done and values looked good, but the post-deployment temperature check was out of range. However, beginning and end of deployment temperature matchups were within range of the YSI EXO1 discrete meter, so temperature data was marked as suspect and not rejected.

Specific conductance and salinity data during the 10/18/2023 deployment are rejected as a result of a bad calibration <-3>[SIC](CSM) from 10/18/2023 at 08:45 until 11/7/2023 at 09:00. We believe there were air bubbles or fouling in the ports of the conductivity probe at calibration. Failure to remove the air bubbles or fouling would have caused the readings to be off from where they should have been. While the post-calibration value is within range (6,738 uS/cm in 6,668 uS/cm standard), most likely due to the fouling bringing the value down and making it falsely seem in range, the beginning and ending matchup values are off and the graph of the specific conductance from this deployment in relation to the previous and following deployments is disjunct. Dependent parameters of DO mg/L and depth are also rejected during this time <-3>[SCF].

All depth data are missing <-2> [SSM] (CSM) for the entire 12/6/2023 deployment from 12/6/2023 at 11:15 to 12/15/2023 at 10:45. The sonde dropped depth after being unplugged from the laptop after doing a dissolved oxygen check the morning of the deployment.

Monie Bay (MB)

The 12/1/2022 deployment that spanned into 2023 exceeded the maximum allowed length of a 45 day deployment. The data file began on 11/30/22 at 10:45. The maximum allowed length of 45 days was reached on 1/14/2023 at 10:45. A record comment of {CSM} from 1/14/23 at 10:45 until the end of the deployment on 1/17/23 at 12:00 is used to indicate this in the dataset. Exceeding the maximum deployment length did not seem to affect any of the sensor values as all post-calibrations and end of deployment matchups were good.

Technicians visited the Monie Bay site between deployments on 9/6/2023 to troubleshoot a malfunctioning telemetry unit. The sonde was out of the water at 09:30 <-3> [GSM] (CMC) and the batteries were removed from the sonde from 09:45 – 10:15 <-2> [GMC] (CSM).

Specific conductance and salinity data during the 10/19/2023 deployment is rejected as a result of a bad calibration <-3>[SIC](CSM) from 10/19/2023 at 12:00 until 11/2/2023 at 11:30. We believe there were air bubbles or fouling in the ports of the conductivity probe at calibration. Failure to remove the air bubbles or fouling would have caused the readings to be off from where they should have been and explains the elevated reading of 27,000 uS/cm in 24,820 uS/cm specific conductance standard at the post-calibration. Dependent parameters of DO mg/L and depth are also rejected during this time <-3>[SCF].