

Chesapeake Bay Virginia (CBV) NERR Water Quality Metadata

January - December 2007

Latest update: January 4, 2013

I. Data Set and Research Descriptors

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2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch in a comma-delimited format (.CDF) and uploaded to the CDMO where they undergo automated primary QAQC and become part of the CDMO's online provisional database. Excessive pre- and post-deployment data are removed from the file prior to upload with up to 2 hours of pre- and post-deployment data retained to assist in data management. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve 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 graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove remaining pre- and post-deployment data, append files, and export the resulting data file to the CDMO for tertiary QAQC 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.

Joy Austin has been responsible for data management since January 2002.

3) Research objectives

Goodwin Islands (GI) component:

The Goodwin Islands represent marsh islands surrounded by intertidal flats, submerged aquatic vegetation (SAV) beds, oyster reefs, and shallow open estuarine waters. Because minimal human activities occur within upland portions, the Goodwin Islands are suitable as a reference or control site for non-point source water quality issues. Furthermore, due to extensive wetlands, intertidal, and submerged habitats, the Goodwin Islands are used extensively for SAV, material flux, fisheries science and trophic interaction research activities.

Claybank (CB) component:

The Claybank site represents a shallow (< 2m) littoral area approximately 300-400 meters in width and located within the mesohaline portion of the York River estuary. Prior to 1972, this area supported submersed aquatic vegetation (SAV) but current conditions are not conducive to SAV survival. This site is used extensively to study sediment dynamics and environmental stress on SAV.

Taskinas Creek (TC) component:

The Taskinas Creek watershed is representative of an inner coastal plain, rural watershed within the southern Chesapeake Bay system. This watershed is dominated by forested and agricultural land uses with an increasing urban land use component. The drainage basin is suited for investigating hydrologic and non-point source water quality issues associated with developing land use patterns.

Sweet Hall Marsh (SH) component:

Sweet Hall Marsh is the most downriver extensive tidal freshwater marsh located in the Pamunkey River, one of two major tributaries of the York River. Research activities are currently addressing the impacts of salinity intrusion due to relative sea level rise. In addition, Sweet Hall Marsh has been used extensively to study general ecology and material flux within tidal freshwater marshes.

4) Research methods

The following research methods apply for all stations.

A YSI 6600 EDS unvented datalogger was used to measure specific conductivity, pH, depth, percent dissolved oxygen saturation, temperature, and turbidity at 15-minute intervals throughout the 2007 deployment year (see Section 6 for deployment intervals). Salinity and dissolved oxygen concentration are calculated parameters. Water depth data for 2007 have been post-corrected for atmospheric pressure changes that occurred between time of calibration and field retrieval. CBNERRVA maintains atmospheric pressure sensors at Gloucester Point, Taskinas Creek, and Sweet Hall Marsh. Atmospheric pressure information is collected at 15-minute intervals. Calibration pressure information was provided by measurements made within the laboratory at Gloucester Point, VA. At approximately one to two-week intervals, the datalogger was returned to the lab for downloading, cleaning, membrane replacement and recalibration. Maintenance intervals vary from year to year and site-to-site depending on the amount of biofouling and expected battery life. In general, YSI dataloggers were deployed for two-week intervals from mid October to the end of June and one-week intervals from the beginning of July through mid October. A second YSI datalogger was deployed following retrieval of the original YSI datalogger in order to maintain a continuous record.

Field verification samples for pH, dissolved oxygen, salinity, and temperature were taken during the deployment/retrieval procedure. Dissolved oxygen was determined by Winkler titrations in the field with a LaMotte kit. Temperature, pH, and salinity were determined in the field by using the YSI 600 XLM sonde. All YSI procedures are in accordance with the YSI operating manual methods, Sections 3 and 6. Standards for pH were purchased from Fisher. Standards for specific conductivity and turbidity were purchased from YSI. Data are reviewed and edited according to the YSI Data Review and Editing Protocol in Appendix C of the CDMO manual version 6.0.

Goodwin Islands (GI) component:

The Chesapeake Bay Virginia NERR maintains a long-term water quality monitoring station at Goodwin Islands. This station is located on the southeastern side of the main island in a shallow embayment, approximately 400 meters from shore. The station was established in 1997 and consisted of a stable structure composed of a 4 inch PVC pipe housed within a galvanized steel tower. The lower portion of the PVC pipe was milled to allow for water circulation within the pipe and around the datalogger sensors. The datalogger was suspended so that the sensors are maintained 0.5 m from the bottom substrate. On July 22, 2004 (12:15 EST), the station was moved approximately 25 meters southwest of the previous station in order to address sand shoaling and station maintenance issues. Other than the datalogger being suspended 0.25 m above the bottom substrate, the construction design of the new station is identical to the previous station.

Clay Bank (CB) component:

The Chesapeake Bay Virginia NERR maintains a long-term water quality monitoring station at Clay Bank. The station is located within a shallow (<2m) littoral area approximately 300-400 meters wide. A stable structure that consists of a 4 inch PVC pipe attached to a piling was built in January 2001. The lower portion of the PVC pipe was milled to allow for water circulation within the pipe and around the datalogger sensors. The datalogger is suspended so that sensors are located 0.25 m from the bottom substrate. On June 17, 2004 (13:15 EST) the station was moved approximately 100 meters offshore of the previous station in order to address sand shoaling and station maintenance issues. The new structure is composed of a 4 inch PVC pipe, with the lower portion milled to allow for uninhibited water circulation, housed within a galvanized steel tower. The datalogger is suspended 0.31 m above the bottom substrate. The new station results in sensors being maintained 9 cm deeper as compared to the previous station. Due to station stabilization issues, the Clay Bank station was reestablished on June 5, 2006 at 13:00. The new station coordinates: Lat 37.20800; Long 76.36673 is located approximately 3 meters down river of the old station coordinates: Lat 37.21739; Long 76.3954. The new station retained a similar water depth from the water surface to the bottom of the datalogger as the old station.

Taskinas Creek (TC) component:

The Chesapeake Bay Virginia NERR maintains a long-term water quality monitoring station at Taskinas Creek. The station is located near the mouth of Taskinas Creek where the tidal marsh creek converges with the York River estuary. A simple deployment, consisting of a suspended wire attached to an overhanging tree, was established in September 1995. The datalogger was suspended at a fixed depth approximately 0.5 m above the creek-bed. In September 1997, the deployment was modified so that the datalogger remained secure and stable at all times within a 4 inch PVC housing attached to a piling system. The lower portion of the PVC pipe was milled to allow for water circulation within the pipe and around the datalogger sensors. The datalogger was suspended so that the sensors are maintained 0.5 m above the bottom substrate.

Sweet Hall Marsh (SH) component:

The Chesapeake Bay Virginia NERR maintains a long-term water quality station at Sweet Hall Marsh. This station, established in 2000, is located adjacent to a low-use boathouse where a 6-inch PVC pipe is attached to an adjacent pier piling. The datalogger was suspended so that the sensors remained 0.7 m from the bottom substrate. In contrast to above stations, the Sweet Hall Marsh station is maintained on a two-week deployment interval throughout the year. In order to prepare the Sweet Hall Marsh station for telemetry equipment, a new station platform was installed on May 4, 2006 at the exact location of the old station. All elevations, height off the bottom and total water depth remained the same as the old station platform.

A Sutron Sat-Link2 transmitter was installed at this station on 11/07/05 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00816E. 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 <http://cdmo.baruch.sc.edu>.

5) Site location and character

(a) Goodwin Islands (Lat 37.21739; Long 76.3954)

The Goodwin Islands component of CBNERRVA is located on the southern side of the mouth of the York River. The station is located approximately 400 meters from shore, with an average water depth on the order of 1 meter. MHW depth at the sample location is approximately 1.70 meters. Goodwin Islands are a 315 ha (777 acre) archipelago of salt-marsh islands surrounded by inter-tidal flats and extensive beds of submerged aquatic vegetation dominated by eelgrass (*Zostera marina*) and Widgeon grass (*Ruppia maritima*). Water circulation patterns around the island are influenced by York River discharge and wind patterns of the Chesapeake Bay. Tides at the Goodwin Islands are semi-diurnal and display an average range of 0.7 m (range: 0.4 - 1.1 m). Mean seasonal water temperature values ranged from 13.7-15.6 °C for spring (March-May), 25.7-27.2 °C for summer (June-August), 18.0-19.2 °C for fall (September-November), and 4.7-8.2 °C for winter (January-February, and December). Mean seasonal salinity values ranged from 13.9-23.0 psu for spring, 17.2-23.0 psu for summer, 16.5-24.0 for fall, and 15.9-23.3 psu for winter. Summary water quality statistics were derived from 15-minute interval data for the years 1998-2004. The data logger probes are located 0.5 m above the sandy substrate bottom. Potential activities that could impact the site included, light recreational and commercial boating activity.

(b) Claybank (Lat 37.20800; Long 76.36673)

The Claybank station is located within a shallow (<2m) littoral area approximately 300-400 meters wide along the mesohaline portion of the York River estuary. The site is approximately 26 km upriver from the mouth of the estuary. The shoreline consists of a narrow fringe of salt marsh with some areas armored with bulkhead or stone. Tidal range is on the order of 0.85 meters and depth at MHW is approximately 2.25 meters. This station is located along the north shoreline of the estuary in an area that historically (prior to 1972) supported submersed aquatic vegetation. The sampling station is influenced by a secondary turbidity maximum that moves back and forth in a region of about 20-40 km from the mouth of the York River estuary. Substrate within the region varies from fine sediments to sand. The site is exposed to strong winds from the northwest and re-suspension of sediment during storm events can be high. There is no fresh water input at this site. Seasonal water quality conditions described here are from 2001 through 2003 (Spring: March-May; Summer: June-August; Fall: September-November; Winter: December-February). Mean seasonal water temperature ranged between 14.0-16.2 for spring, 26.1-27.7 for summer, 17.5-19.4 for fall, and 4.9-8.0 °C in winter. Mean seasonal salinity ranged between 15.7-20.3 for spring, 16.5-21.3 for summer, 13.2-21.6 for fall, and 14.3-20.0 ppt in winter.

(c) Taskinas Creek (Lat 37.41497; Long 76.71441)

Taskinas Creek Reserve, component of CBNERRVA, encompasses 397 ha (980 acres) and is located within the boundaries of York River State Park near the town of Croaker, Virginia. The small sub-estuary of the York River is located on the southern side of the river, approximately 37 km up river from the mouth of the York River. The Taskinas Creek watershed is representative of an inner coastal plain, rural watershed within the southern Chesapeake Bay system. The watershed is dominated by forested and agricultural land uses with an increasing residential land use component. The non-tidal portion of Taskinas Creek contains feeder streams that drain oak-hickory forests, maple-gum-ash swamps and freshwater marshes. Freshwater mixed wetlands are found in the upstream reaches of Taskinas Creek. The creek is roughly 2 meters deep and 20 meters wide towards the lower end of the creek where substrate is dominated by fine sediment. MHW depth at the sample location is approximately 2.0 meters and mean tide range is 0.85 meters. Mean seasonal water temperature values ranged from 15.2-19.0 °C for spring, 26.8-28.2 °C for summer, 15.7-18.3 °C for fall, and

3.6-9.0 °C for winter. Located within the meso-polyhaline region of the York River estuary, mean seasonal salinity values ranged from 4.0-14.0 psu for spring, 7.0-18.2 psu for summer, 6.9-17.0 for fall, and 5.8-15.3 psu for winter. Summary water quality statistics were derived from 15-minute interval data for the years 1998-2004. Potential activities that could impact the site include residential development, selective hardwood logging, and light recreational boating activity. Wildlife populations have been shown to influence microbiological water quality within the watershed.

(d) Sweet Hall Marsh (Lat 37.57138; Long 76.88424)

Sweet Hall Marsh is the most downriver extensive tidal freshwater marsh located in the Pamunkey River, one of two major tributaries of the York River. The marsh is located approximately 77 km upriver from the mouth of the York River estuary. The reserve is 353 ha (871 acres) in area and includes 331 ha (818 acres) of emergent fresh-water marsh, 14 ha (35 acres) of permanently flooded broad-leaved forested wetlands and approximately 4 ha (9 acres) of scrub-shrub. The marsh community is classified as freshwater mixed. Mean tidal range at Sweet Hall Marsh is on the order of 0.9 meters and MHW depth at the sample location is approximately 1.5 meters. The Pamunkey River, which surrounds Sweet Hall Marsh, can reach depths up to 15 meters. Substrate within the littoral zone and channel is dominated by fine sediment. Mean seasonal water temperature values ranged from 14.7-16.7 °C for spring, 26.7-27.9 °C for summer, 18.6-19.1 °C for fall, and 4.7-6.3 °C for winter. Located within the oligohaline, lower freshwater reaches of the Pamunkey River, mean seasonal salinity values ranged from 0.1-3.4 psu for spring, 0.1-8.4 psu for summer, 0.3-8.4 psu for fall, and 0.1-3.2 psu for winter. Summary water quality statistics were derived from 15-minute interval data for the years 2002-2004. Potential activities that could impact the site include minor municipal point source discharges above and below river of Sweet Hall Marsh, a major industrial discharge site (pulp mill) in the town of West Point and significant groundwater withdrawal near the confluence of the Pamunkey and York Rivers.

6) Data collection period

Sampling at Claybank (CB), Goodwin Islands (GI), Sweet Hall Marsh (SH), and Taskinas Creek (TC) began January 2007. Sampling was continuous through December 2007. Occasional time skips occurred at all sites due to low batteries, water leakage into the battery compartment, and for no apparent reason.

Claybank (CB)

Deployment Date/Time (MM/DD/YY) (HH:MM:SS)	Retrieval Date/Time (MM/DD/YY) (HH:MM:SS)
12/18/06 12:30:00	01/04/07 12:00:00
01/04/07 12:15:00	01/18/07 12:00:00
01/18/07 12:15:00	02/09/07 09:30:00
02/09/07 09:45:00	02/28/07 13:00:00
02/28/07 13:15:00	03/14/07 11:30:00
03/14/07 11:45:00	03/28/07 10:45:00
03/28/07 11:00:00	04/11/07 09:45:00
04/11/07 10:00:00	04/25/07 11:30:00
04/25/07 11:45:00	05/10/07 08:00:00
05/10/07 08:15:00	05/23/07 08:15:00
05/23/07 08:45:00	06/06/07 09:45:00
06/06/07 10:00:00	06/20/07 13:00:00
06/20/07 13:15:00	07/05/07 12:15:00
07/05/07 12:30:00	07/11/07 11:00:00
07/11/07 11:15:00	07/18/07 11:30:00

07/18/07	11:45:00	07/25/07	10:30:00
07/25/07	10:45:00	08/01/07	10:15:00
08/01/07	10:30:00	08/08/07	10:15:00
08/08/07	10:30:00	08/15/07	10:00:00
08/15/07	10:15:00	08/22/07	12:30:00
08/22/07	12:45:00	08/29/07	10:00:00
08/29/07	10:15:00	09/05/07	09:30:00
09/05/07	09:45:00	09/12/07	10:30:00
09/12/07	10:45:00	09/19/07	10:30:00
09/19/07	10:45:00	09/26/07	10:45:00
09/26/07	11:00:00	10/10/07	10:45:00
10/10/07	11:00:00	10/18/07	08:45:00
10/18/07	09:00:00	10/24/07	11:00:00
10/24/07	11:15:00	11/07/07	11:15:00
11/07/07	11:30:00	11/26/07	11:15:00
11/26/07	11:30:00	12/10/07	11:00:00
12/10/07	11:15:00	12/19/07	09:30:00
12/19/07	09:45:00	01/07/08	11:30:00

Goodwin Islands (GI)

Deployment Date/Time (MM/DD/YY) (HH:MM:SS)	Retrieval Date/Time (MM/DD/YY) (HH:MM:SS)
12/18/06	09:45:00
01/04/07	09:30:00
01/18/07	09:30:00
02/08/07	11:15:00
02/28/07	10:30:00
03/14/07	08:30:00
03/28/07	08:30:00
04/12/07	09:15:00
04/25/07	09:00:00
05/10/07	11:00:00
05/23/07	12:00:00
06/06/07	12:45:00
06/20/07	14:45:00
07/06/07	10:15:00
07/11/07	08:30:00
07/18/07	08:15:00
07/25/07	08:15:00
08/01/07	08:00:00
08/08/07	08:15:00
08/15/07	08:15:00
08/22/07	10:15:00
08/29/07	08:15:00
09/05/07	08:15:00
09/12/07	08:15:00
09/19/07	08:15:00
09/26/07	08:45:00
10/10/07	09:00:00
10/18/07	10:15:00
10/24/07	08:30:00
11/07/07	09:15:00

11/26/07	10:00:00	12/10/07	09:30:00
12/10/07	09:45:00	12/19/07	08:15:00
12/19/07	08:30:00	01/07/08	09:30:00

Sweet Hall Marsh (SH)

Deployment Date/Time (MM/DD/YY) (HH:MM:SS)	Retrieval Date/Time (MM/DD/YY) (HH:MM:SS)
12/13/06	13:15:00
01/03/07	14:00:00
01/16/07	12:30:00
01/30/07	13:15:00
02/13/07	14:00:00
02/27/07	14:00:00
03/13/07	12:30:00
03/27/07	11:30:00
04/10/07	11:45:00
04/24/07	11:45:00
05/09/07	12:00:00
05/24/07	12:00:00
06/07/07	12:15:00
06/18/07	13:00:00
07/02/07	12:15:00
07/16/07	12:30:00
07/30/07	12:00:00
08/13/07	12:46:00
08/27/07	12:45:00
09/10/07	12:15:00
09/24/07	11:45:00
10/08/07	12:01:00
10/22/07	13:15:00
11/05/07	12:15:00
11/19/07	13:15:00
12/05/07	12:45:00
12/18/07	12:45:00
01/03/07	13:45:00
01/16/07	12:15:00
01/30/07	13:00:00
02/13/07	13:45:00
02/27/07	13:45:00
03/13/07	12:15:00
03/27/07	11:15:00
04/10/07	11:30:00
04/24/07	11:30:00
05/09/07	11:45:00
05/24/07	11:45:00
06/07/07	12:00:00
06/18/07	12:45:00
07/02/07	12:00:00
07/16/07	12:15:00
07/30/07	11:45:00
08/13/07	12:30:00
08/27/07	12:31:00
09/10/07	12:00:00
09/24/07	11:30:00
10/08/07	11:45:00
10/22/07	13:01:00
11/05/07	12:00:00
11/19/07	13:00:00
12/05/07	12:30:00
12/18/07	12:30:00
01/03/08	13:30:00

Taskinas Creek (TC)

Deployment Date/Time (MM/DD/YY) (HH:MM:SS)	Retrieval Date/Time (MM/DD/YY) (HH:MM:SS)
12/13/06	10:00:00
01/03/07	10:30:00
01/16/07	09:45:00
01/30/07	09:15:00
02/13/07	11:00:00
02/27/07	11:15:00
03/13/07	09:45:00
03/27/07	09:00:00
04/10/07	09:15:00
04/24/07	09:00:00
05/09/07	09:15:00
05/24/07	09:15:00
06/07/07	09:00:00
06/18/07	10:00:00
01/03/07	10:15:00
01/16/07	09:30:00
01/30/07	09:00:00
02/13/07	10:45:00
02/27/07	11:00:00
03/13/07	09:30:00
03/27/07	08:45:00
04/10/07	09:00:00
04/24/07	08:45:00
05/09/07	09:00:00
05/24/07	09:00:00
06/07/07	08:45:00
06/18/07	09:45:00
07/02/07	09:00:00

07/02/07	09:15:00	07/09/07	09:45:00
07/09/07	10:00:00	07/16/07	09:15:00
07/16/07	09:30:00	07/23/07	10:45:00
07/23/07	11:00:00	07/30/07	08:15:00
07/30/07	08:30:00	08/06/07	10:15:00
08/06/07	10:30:00	08/13/07	09:00:00
08/13/07	09:15:00	08/20/07	09:00:00
08/20/07	09:15:00	08/27/07	09:30:00
08/27/07	09:45:00	09/05/07	09:30:00
09/05/07	09:45:00	09/10/07	09:00:00
09/10/07	09:15:00	09/24/07	09:00:00
09/24/07	09:15:00	10/01/07	08:45:00
10/01/07	09:00:00	10/08/07	09:00:00
10/08/07	09:15:00	10/22/07	10:00:00
10/22/07	10:16:00	11/07/07	11:31:00
11/07/07	11:45:00	11/19/07	10:15:00
11/19/07	10:30:00	12/05/07	10:00:00
12/05/07	10:15:00	12/18/07	09:45:00
12/18/07	10:00:00	01/03/08	09:30:00

7) Distribution

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. 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.

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 <http://cdmo.baruch.sc.edu/>. Data are available in text tab-delimited format.

8) Associated researchers and projects

As part of SWMP, in addition to this Water Quality monitoring dataset, CBV NERR also monitors Meteorological and Nutrient data. These data are available from the Research Coordinator or online at <http://cdmo.baruch.sc.edu/>

Additional water quality monitoring programs within the York River system include:

- a) USEPA Chesapeake Bay Mainstem and Tributary Monitoring Program. Since 1984, biweekly to monthly water quality sampling at a series of sites located along the mid-river channel has been conducted as part of the Chesapeake Bay Program (www.chesapeakebay.net). Station ID's: York River proper (WE4.2, LE4.3, LE4.2, LE4.1, RET4.3), the Pamunkey River (RET4.1, TF4.2) and Mattaponi River (RET4.2 and TF4.4).
- b) VIMS Shoal Survey. Since 1984, biweekly to monthly water quality sampling at a series of sites located along the shoal areas of the lower York River estuary has been conducted by the Biological Sciences Department at the Virginia Institute of Marine Science. Station ID's include: Guinea Marsh, Goodwin Island, VIMS, Yorktown, Mumfort Islands, Catlett Islands and Clay Bank.
- c) Alliance for the Chesapeake Bay Volunteer Monitoring Program. Physical and chemical (limited nutrients) data are collected by a volunteer network along the York River system (www.Acb-online.org). Station ID's include: Thorofare Creek, Wormley Creek, Blackwell Landing, Pamunkey Trail, Timberneck Creek, Yorktown Naval Weapons Station, Gloucester Point, West Point and Croaker Landing. Note: Some stations may be inactive.
- d) VIMS Juvenile Abundance Monitoring Survey. As part of their Juvenile Abundance Monitoring Surveys, water quality and hydrographic data has been collected since 1968 along a series of sites in the York River estuary (includes the Mattaponi and Pamunkey River systems) by the Fisheries Science Department (www.fisheries.vims.edu/research.html) at the Virginia Institute of Marine Science. Surveys include the VIMS Trawl Survey, the Striped Bass Seine Survey and the Juvenile Shad/River Herring Pushnet Survey.
- e) Virginia Department of Health. The Virginia Department of Health, Division of Shellfish Sanitation's (www.vdh.state.va.us/shellfish) Seawater Sampling Program collects microbial and general water quality and hydrographic data along a series of sites in the York River estuary (includes lower portions of the Mattaponi and Pamunkey River systems).
- f) USEPA Chesapeake Bay Shallow Water Monitoring Program. Since May 2003, CBNERRVA has maintained additional continuous (15 minute) fixed water monitoring stations within the York, Piankatank, James River, Rappahannock River, and Potomac River estuary systems using YSI 6600 EDS Datasondes. Measurements for this program include: temperature, specific conductivity, dissolved oxygen, pH, turbidity, insitu fluorescence, and depth. York River stations are located at Gloucester Point and White House (Pamunkey River). Piankatank River stations are located at Burton's Point, Bland's Wharf, and Dragon Run. James River stations are located at Wythe Point, James River Country Club, 4H Club, Chickahominy Haven, Rice Center, Appomattox, and Osborne Landing. Rappahannock River stations are located at Hicks Landing, Kendale Farms, Bowler's Wharf, Christ Church, and Corrotoman River. Potomac River stations are located Potomac Creek, Colonial Beach, Yeocomico River, and Nomini Bay. An additional surface water quality mapping program, which monitors the above stated parameters, at sub-surface depths of approximately 0.25 m along continuous cruise tracts, occurs on a monthly basis in the York River estuary (see www.VECOS.org). This sub-surface continuous sampling of water quality has been conducted since May 2003 on the York River until present, and for the Pamunkey and Mattaponi Rivers from May 2003 through October 2005.

II. Physical Structure Descriptors

9) Sensor specifications

CBV NERR deployed only 6600EDS data sondes in 2007. Rapid-pulse DO sensors were deployed at all sites: CB (Claybank), GI (Goodwin), SH (Sweet Hall), and TC (Taskinas Creek) January 2007 – December 2007.

YSI 6600EDS data sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 6560
Range: -5 to 50 C
Accuracy: +/-0.15
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model#: 6560
Range: 0 to 100 mS/cm
Accuracy: +/-0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/-1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation (%)
Sensor Type: Rapid Pulse - Clark type, polarographic
Model#: 6562
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/-2% of the reading or 2% air saturation, whichever is greater; 200 to 500% air saturation: +/-6% of the 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: Rapid Pulse - Clark type, polarographic
Model#: 6562
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/- 2% of the reading or 0.2 mg/L, whichever is greater
20 to 50 mg/L: +/- 6% 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 30 ft (9.1 m)
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH - EDS (exposed bulb)

Units: pH units
Sensor Type: Glass combination electrode
Model #: 6561
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: $\pm 2\%$ of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either depth or water level sensors. Both sensors measure water depth, but by convention, level sensors refer to atmospherically vented measurements and depth refers to non-vented measurements. 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 1.03 cm for every 1 millibar change in atmospheric pressure, and is eliminated for level 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 site can be corrected. The Research Coordinator at the specific NERR site should be contacted in order to obtain information regarding atmospheric pressure data availability.

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
Claybank	CB	cbvcbwq
Goodwin Islands	GI	cbvgiwq
Sweet Hall Marsh	SH	cbvshwq
Taskinas Creek	TC	cbvtcwq

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 *Open - reserved for later flag*
- 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.

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

Sensor Errors

SBO	Blocked Optic
SCF	Conductivity Sensor Failure
SDF	Depth Port Frozen
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

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

13) Post deployment information

End of deployment Post-calibration Readings in Standard Solutions:

ND = no data available for that particular standard

Claybank:

Date (post cal)	Cond (ms) (Std:10)	DO (AirSat) (Std: 100%)	pH (Std:7)	Turb (Std:0)	Depth (Std:0)
01/05/07	9.994	68.0	7.02	0.0	- 0.046
01/19/07	10.040	100.0	7.05	-0.4	0.026
02/09/07	10.010	94.2	7.02	-0.7	- 0.096
03/01/07	10.030	67.0	7.06	0.0	- 0.026
03/15/07	10.020	94.4	7.02	-0.4	0.001
03/29/07	10.150	97.6	6.99	0.3	0.176
04/12/07	10.110	100.1	6.99	0.2	- 0.083
04/26/07	9.972	99.4	7.00	0.1	0.072
05/11/07	9.519	72.1	7.15	-0.1	- 0.001
05/24/07	9.950	100.9	7.03	0.1	0.201
06/07/07	9.147	75.1	7.22	-0.2	0.043
06/21/07	8.560	91.5	7.14	0.3	0.041
07/06/07	9.490	87.1	7.22	0.6	0.004
07/12/07	9.983	101.2	7.02	-0.2	- 0.004
07/19/07	9.796	24.0	7.19	-0.4	- 0.013
07/26/07	9.820	96.9	7.02	0.2	0.078

08/02/07	9.881	97.8	7.04	-0.9	0.047
08/09/07	9.980	100.8	6.98	-0.2	- 0.020
08/16/07	10.020	55.8	7.01	2.1	0.009
08/23/07	10.070	99.0	7.01	0.3	0.073
08/30/07	9.938	98.4	6.97	-0.6	0.025
09/06/07	10.050	86.9	7.00	-0.4	0.106
09/13/07	9.817	97.7	7.03	1.1	0.077
09/20/07	9.736	86.3	7.03	0.2	0.091
09/27/07	10.010	99.8	7.03	-0.2	0.015
10/11/07	7.723	103.9	7.07	-0.1	- 0.098
10/19/07	9.967	95.0	6.99	-0.1	- 0.055
10/25/07	10.020	99.8	7.03	-0.2	0.049
11/08/07	9.896	87.9	7.03	-0.2	0.174
11/27/07	10.100	94.4	6.91	0.3	0.049
12/11/07	9.950	100.3	7.02	-0.1	0.051
12/20/07	9.877	100.7	7.01	0.2	0.090
01/08/08	9.995	86.2	6.97	-0.2	0.116

Goodwin Island:

Date (post cal)	Cond (ms) (Std:10)	DO (AirSat) (Std: 100%)	pH (Std:7)	Turb (Std:0)	Depth (Std:0)
01/05/07	10.090	100.3	7.07	-1.0	- 0.013
01/19/07	10.030	91.3	7.01	0.0	0.044
02/09/07	10.050	82.2	7.08	-0.1	0.034
03/01/07	9.990	86.7	7.05	0.0	0.186
03/15/07	10.080	98.1	7.06	-0.1	0.023
03/29/07	10.030	101.3	6.99	0.3	0.177
04/13/07	10.090	93.1	7.04	-0.1	0.042
04/26/07	9.951	101.3	6.98	0.1	0.071
05/11/07	10.090	94.4	7.07	-0.4	- 0.003
05/24/07	10.040	83.3	7.00	0.0	0.200
06/07/07	9.530	58.1	7.04	-0.5	0.058
06/21/07	9.665	83.8	7.02	-0.1	0.049
07/06/07	8.439	42.8	6.96	-0.1	- 0.007
07/12/07	10.010	97.8	6.98	0.1	0.004
07/19/07	9.828	101.1	6.99	0.1	- 0.135
07/26/07	9.746	95.5	7.03	0.2	0.073
08/02/07	9.854	101.4	6.98	0.0	0.036
08/09/07	9.999	99.4	6.98	-0.1	- 0.021
08/16/07	9.975	100.1	6.96	1.6	0.000
08/23/07	9.812	97.8	6.96	0.3	0.070
08/30/07	9.887	98.3	7.00	-0.3	- 0.004
09/06/07	9.945	97.6	6.94	-0.7	0.103
09/13/07	9.716	63.4	7.09	- 0.2	0.095
09/20/07	9.675	83.6	6.98	0.1	0.085
09/27/07	9.841	98.2	7.05	-0.3	0.031
10/11/07	7.921	85.3	6.97	0.0	ND
10/19/07	9.887	50.2	7.02	-0.3	- 0.046
10/24/07	10.060	40.1	7.03	-0.2	0.032
11/08/07	9.606	87.5	7.02	0.0	- 0.129
11/27/07	9.977	57.5	6.96	-0.3	0.028
12/11/07	10.050	88.5	7.06	-0.3	0.145

12/20/07	10.120	86.9	6.96	0.4	- 0.044
01/08/08	10.020	83.0	6.95	0.0	0.117

Sweet Hall Marsh:

Date (post cal)	Cond (ms) (Std:10)	DO (AirSat) (Std: 100%)	pH (Std:7)	Turb (Std:0)	Depth (Std:0)
01/04/07	10.100	87.9	7.01	0.0	- 0.072
01/17/07	10.010	102.1	7.04	-0.2	0.261
01/31/07	10.060	104.1	7.02	-0.5	0.241
02/14/07	9.986	97.7	7.03	0.5	- 0.041
02/28/07	10.040	71.6	7.07	-0.1	0.201
03/13/07	10.060	100.8	7.00	-0.4	0.055
03/28/07	10.030	98.7	6.97	-0.2	0.062
04/11/07	10.030	99.5	7.04	-0.1	0.055
04/25/07	9.940	99.1	7.06	-0.1	0.010
05/10/07	9.937	105.7	7.06	0.1	0.027
05/25/07	10.020	108.2	7.09	-0.1	0.130
06/08/07	10.010	99.6	7.06	0.2	- 0.001
06/19/07	10.030	102.2	7.04	0.4	0.012
07/03/07	10.040	102.7	7.03	-0.2	0.104
07/17/07	10.010	103.8	7.04	0.0	0.027
07/31/07	10.120	1.0	7.11	0.1	- 0.005
08/14/07	9.939	32.0	ND	-0.4	- 0.001
08/28/07	10.360	99.3	7.01	-0.3	0.069
09/11/07	10.060	100.6	7.01	-0.5	- 0.051
09/25/07	9.983	101.2	7.14	-0.1	0.095
10/09/07	9.900	102.9	7.07	-0.5	- 0.026
10/23/07	9.907	23.2	7.44	-0.1	0.012
11/06/07	10.110	100.2	7.04	0.0	- 0.007
11/19/07	9.977	101.1	6.93	-0.3	0.087
12/06/07	10.010	102.8	7.04	0.0	0.123
12/19/07	9.785	102.5	7.01	0.0	0.091
01/04/08	10.080	105.1	7.03	0.0	0.263

Taskinas Creek:

Date (post cal)	Cond (ms) (Std:10)	DO (AirSat) (Std: 100%)	pH (Std:7)	Turb (Std:0)	Depth (Std:0)
01/04/07	10.080	101.3	6.99	-0.1	- 0.068
01/17/07	9.976	104.7	7.06	0.0	0.250
01/31/07	10.050	100.2	7.01	0.1	0.071
02/14/07	10.020	97.7	7.01	-0.1	- 0.182
02/28/07	9.990	95.3	7.01	0.0	0.852
03/14/07	10.050	99.0	7.07	0.2	0.021
03/28/07	9.964	98.8	7.02	-0.1	0.066
04/11/07	10.030	97.5	7.00	-0.1	0.087
04/25/07	10.010	98.3	7.06	-0.0	0.013
05/10/07	9.894	47.2	7.03	0.0	0.007
05/25/07	10.040	100.3	7.00	-0.3	0.133
06/08/07	9.982	67.9	ND	0.4	0.002
06/19/07	10.010	210.0	6.97	0.8	0.015
07/03/07	9.777	100.7	7.08	0.3	0.106
07/10/07	9.929	97.5	7.03	0.7	0.017

07/17/07	9.969	96.8	7.04	0.2	0.032
07/24/07	9.933	100.7	6.97	0.2	0.064
07/31/07	9.993	100.6	7.07	0.3	- 0.004
08/07/07	9.969	91.0	6.94	0.5	- 0.011
08/14/07	9.958	100.8	7.08	0.2	0.035
08/21/07	9.921	99.9	7.03	0.0	0.044
08/28/07	10.020	99.9	7.05	0.1	0.070
09/06/07	9.732	99.6	7.00	-0.1	0.113
09/11/07	10.010	97.7	7.04	-0.4	- 0.050
09/25/07	8.075	101.6	6.98	-0.1	ND
10/02/07	10.030	98.9	7.10	0.3	0.118
10/09/07	10.000	98.2	6.97	-0.1	- 0.024
10/23/07	9.812	98.3	7.04	-0.1	0.020
11/08/07	9.915	100.9	7.02	-0.2	0.156
11/20/07	10.000	102.3	6.99	-0.2	0.094
12/06/07	9.914	101.0	7.00	0.2	0.122
12/19/07	9.854	100.2	7.02	-0.2	0.071
01/04/08	9.994	101.8	6.98	-0.1	0.253

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.

Storm Events:

April 2007 – Wind and Rain events

Claybank:

For the following dates and times, all data values were influenced by a Nor’easter. Data suspect, data retained.

04/15/2007 17:15:00 – 04/17/2007 23:45:00

For the following dates and times, temperature, specific conductivity, salinity, dissolved oxygen, and pH values were influenced by heavy winds; which caused upwelling of bottom water. Data suspect, data retained.

04/22/2007 14:15:00 – 04/22/2007 15:30:00

04/24/2007 14:45:00 – 04/24/2007 17:15:00

Goodwin Island:

For the following dates and times, all data values were influenced by a Nor’easter. Data suspect, data retained.

04/15/2007 16:00:00 – 04/17/2007 23:45:00

Sweet Hall Marsh:

For the following dates and times, all data values were influenced by a Nor'easter. Data suspect, data retained.

04/16/2007 06:45:00 – 04/18/2007 00:30:00

Taskinas Creek:

For the following dates and times, all data values were influenced by a Nor'easter. Data suspect, data retained.

04/15/2007 16:45:00 – 04/17/2007 23:45:00

May - Storm Event and New Moon (rain and wind)**Claybank:**

For the following dates and times, all data values were influenced by a storm event which produced heavy winds and rain (30-40 mph). During this time period a New Moon affected tidal patterns. Data suspect, data retained.

05/16/2007 02:00:00 – 05/17/2007 23:45:00

Goodwin Island:

For the following dates and times, wind event and water currents caused datalogger to bounce around inside of tube causing erratic depth readings. Data suspect, data retained.

05/06/2007 08:00:00 – 05/08/2007 03:15:00

For the following dates and times, temperature, specific conductivity, salinity, dissolved oxygen, pH, and depth values were influenced by a storm event which produced heavy winds and rain (30-40 mph). During this time period a New Moon affected tidal patterns. Data suspect, data retained.

05/16/2007 00:45:00 – 05/17/2007 06:00:00

Sweet Hall Marsh:

For the following dates and times, all data values were influenced by a storm event which produced heavy winds and rain (30-40 mph). During this time period a New Moon affected tidal patterns. Data suspect, data retained.

05/16/2007 05:00:00 – 05/17/2007 23:45:00

Taskinas Creek

For the following dates and times, all data values were influenced by a storm event which produced heavy winds and rain (30-40 mph). During this time period a New Moon affected tidal patterns. Data suspect, data retained.

05/16/2007 01:30:00 – 5/17/2007 23:45:00

July – Wind event (upwelling of bottom water)

Claybank:

For the following dates and times, temperature, specific conductivity, salinity, dissolved oxygen, and pH values were influenced by heavy winds; which caused upwelling of bottom water. Data suspect, data retained.

07/06/2007 12:30:00 – 07/06/2007 13:30:00
07/07/2007 13:30:00 – 07/07/2007 14:15:00
07/07/2007 15:00:00 – 07/07/2007 16:45:00
07/08/2007 14:15:00 – 07/08/2007 15:30:00
07/08/2007 16:30:00 – 07/08/2007 17:30:00
07/09/2007 15:15:00 – 07/09/2007 16:15:00
07/09/2007 16:45:00 – 07/09/2007 18:45:00
07/20/2007 12:45:00 – 07/20/2007 15:15:00
07/21/2007 14:45:00 – 07/21/2007 16:15:00

October – Storm Event (Wind and rain)

Goodwin Island:

For the following dates and times, all data values were influenced by a storm event which produced heavy winds and rain. Storm event produced 5 inches of precipitation. Data suspect, data retained.

10/23/2007 00:00:00 – 10/28/2007 23:45:00

Sweet Hall Marsh:

For the following dates and times, all data values were influenced by a storm event which produced heavy winds and rain. Storm event produced 5 inches of precipitation. Data suspect, data retained.

10/24/2007 00:00:00 – 10/28/2007 23:45:00

Taskinas Creek:

For the following dates and times, all data values were influenced by a storm event which produced heavy winds and rain. Storm event produced 5 inches of precipitation. Data suspect, data retained.

10/18/2007 00:00:00 – 10/28/2007 23:45:00

December – Wind

Claybank:

For the following dates and times, turbidity values were influenced by windy conditions. Data suspect, data retained.

12/03/2007 11:15:00 – 12/03/2007 14:00:00

12/03/2007 18:15:00 – 12/04/2007 01:00:00

12/16/2007 16:30:00 – 12/17/2007 13:30:00

Taskinas Creek:

For the following dates and times, all data values were influenced by a storm event which produced heavy winds (30-40 mph). Data suspect, data retained.

12/01/2007 00:00:00 – 12/05/2007 10:15:00

12/12/2007 00:00:00 – 12/13/2007 23:45:00

12/15/2007 00:00:00 – 12/16/2007 23:45:00

Missing Data**January – Lost Communication/circuit board failure****Taskinas Creek:**

For the following dates and times, all data are missing due to an internal error within the sonde.
01/01/2007 00:00:00 – 01/03/2007 10:15:00

December**Goodwin Island:**

For the following dates and times, all data are missing due to an internal error within the sonde.

12/19/2007 18:00:00 – 12/19/2007 18:15:00

Sonde/Probe malfunction**February – Ice****Goodwin Island:**

For the following dates and times, depth transducer froze due to extremely cold conditions and exposure at low tides. Data rejected.

02/06/2007 04:00:00 – 2/06/2007 09:15:00

02/19/2007 04:15:00 – 2/19/2007 04:45:00

Sweet Hall Marsh:

For the following dates and times, all data are affected by a sonde malfunction.

01/19/2007 14:15:00 – 01/23/2007 12:00:00

For the following dates and times, depth transducer froze due to extremely cold conditions and exposure at low tides. Data rejected.

02/05/2007 18:30:00 – 2/13/2007 13:45:00

02/16/2007 04:30:00 – 2/16/2007 08:15:00

02/17/2007 04:15:00 – 2/17/2007 08:00:00

Taskinas Creek:

Depth data from 2/13 11:00 to 2/27 11:15 was incorrectly calibrated. The depth offset that was used was 0.82 when it should have been 0.082. Depth have been corrected by subtracting 0.738 to the values.

Station Installation/Station Maintenance

October – Station Maintenance

Goodwin Island:

For the following dates and times, station tube was removed and replaced with new tube. Data rejected.

10/05/2007 09:45:00 – 10/05/2007 10:45:00