Jacques Cousteau (JAC) NERR Water Quality Metadata
1 January 2014 – 08 January 2015
Latest Update: 7 April 2016

I. Data set and Research Descriptors

1) Principal investigator & contact persons

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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. Pre-deployment and post-retrieval readings are identified by depth and salinity values near zero. Excessive pre- and post-deployment data are removed from the file prior to upload with at least one-half hour (2 sample periods) of pre- and post-deployment data retained to assist in data management. During primary QAQC, data are flagged if they are missing, out of sensor range, or outside 2 or 3 standard deviations from the historical seasonal mean. 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. Data management is handled by the JCNERR's SWMP Technician, Gregg P. Sakowicz.

3) Research Objectives

The water quality of the Mullica River and Great Bay has traditionally been relatively clean and free of excessive nutrient loading from anthropogenic sources. This is due to the fact that there is very little development or industry within the drainage basin of the Mullica River and its tributaries. Great Bay had a large source of nutrient loading coming from a menhaden fish processing factory that was in operation from the early 1930's to the early 1960's and affected the lower portion of the bay. The river is relatively deep, three to nine meters in the section that is monitored. Great Bay averages about two meters in depth. The river also has a dark color due to tannins and humic compounds that are a natural product coming from the Pine Barrens and are present in large amounts within the river. It is believed that nutrients entering the river upstream do not get utilized within the river because of the lack of light penetration. The great depth of the river and the dark color from the tannins flowing down the river from the Pine Barrens hinders the utilization of these nutrients by planktonic organisms. Where the river empties into the bay, light penetration reaches the bottom of the bay and allows the utilization of the nutrients by phytoplankton, making this region more productive (Durand 1979). Water circulation questions within this unique estuary can be addressed by the use of datasondes. Because of the close proximity of the lower station (site name: B6) to Little Egg Inlet, the effects of an influx of ocean water can have dramatic effects on both the water quality and on the biological aspect of the region. Upwelling along the coast is a common occurrence during the summer months. The influx of this water into the bay can and does affect larval fish transport into and out of the bay. The cooler ocean waters can have dramatic effects on the growth rates of many different species living in the area. Datasondes have been useful in tracking the physical changes within the estuary due to occurrences such as upwelling and storm events and will be helpful in translating the resulting biological events.

4) Research Methods

YSI datasondes (a.k.a. "dataloggers") are programmed to record temperature, specific conductance, salinity, dissolved oxygen, depth, pH, and turbidity every 15 minutes. Two types/series of datasondes were utilized at the JCNERR in 2014; what are referred to as 6-series (represented by 6600EDS and V2-4 sondes) and EXO sondes. Presently, four SWMP monitoring stations are established in the Mullica River/Great Bay Reserve.

These monitoring sites extend from the fresh water/salt water interface at Lower Bank, approximately 25 kilometers up the Mullica River from the point where it joins Great Bay to the mouth of Great Bay, a distance of eight kilometers. Thus the datasondes cover a total of 33 kilometers in this estuarine system.

Calibration standards required for pH were purchased from Y.S.I. (p/n 003822 (pH 7) and 003823(pH 10)). A two-point calibration was employed for pH, the first being pH 7 followed by pH 10. Calibration of the pH probe was performed via immersion in the standard and using the calibration feature of the EcoWatch (for 6-series sondes) or KOR (for EXO sondes) software and accepting the set-point after stable readings were obtained.

Calibration standards required for conductivity were purchased from Y.S.I.. A standard of 10 mS/cm (p/n 060911) was used to calibrate for conductivity. Calibration of the conductivity probe was performed via immersion in the standard and using the calibration feature of the EcoWatch or KOR software and accepting the set-point after stable readings were obtained.

Dissolved oxygen was calibrated via immersion in a bucket of oxygen-saturated tap water and utilizing the dissolved oxygen calibration function of the datasonde(s). Oxygenation of the water was accomplished via aeration with an aquarium pump and air-stone for a minimum of 2 hours to saturate tap water prior to calibration. The sensor was then allowed to "rest" overnight prior to calibration. Y.S.I. ROX optical D.O. probes were utilized through the entire 2014 period on 6-series sondes (notable because the previous-generation membrane-style polargraphic D.O. probes, utilized in previous years, were less stable and more prone to fouling), and model number 599100-01 dissolved oxygen probes were utilized on EXO sondes. Calibration of the dissolved oxygen probe was performed via immersion in the aerated water and using the calibration feature of the EcoWatch software and and accepting the set-point after stable readings were obtained.

Calibration of the turbidity probe was performed with a 0 NTU (Nephelometric Turbidity Units) solution (de-ionized water) and a 124/126 NTU standard (supplied by YSI, inc., p/n 607300). Calibration of the Turbidity probe was performed via immersion in each standard and using the calibration feature of the EcoWatch (for 6-series sondes) or KOR (for EXO sondes) software and accepting the set-point after stable readings were obtained.

Used conductivity and pH standards were stored for rinsing probes and performing post-deployment calibration-checks after retrieval and prior to cleaning loggers. Great care was taken to clean the datasondes before calibration, and each used standard was used once as a post-calibration solution and once as a rinse solution before being discarded (unless contamination or dilution was observed or suspected).

Datasondes were deployed by inserting them in PVC pipes that are affixed to a permanent structure (i.e. two US Coast Guard channel markers (Buoy 126 and Buoy 139), one commercial dock (Chestnut Neck), and one bridge (Lower Bank). The bottoms

of the pipes were situated between approximately 0.5 and 1m above the sediment (the variability is the result of currents and shoaling leading to variability of the relative level of sediment below the sonde tubes). A line was used to lower and recover the datasondes within the pipes. A cross-pin (stainless steel or brass bolt) was inserted across the bottom of the pipe and served as an end-stop for the datasonde during its descent, assuring a maximum fixed depth and retaining the datasonde if the line parted. Two-inch vent holes were drilled every 6 inches of the pipe and four two- by ten-inch-wide slots were cut in the bottom of the pipe to allow for circulation of water in the pipe and across the probes. An antifouling paint (Petit Trinidad SLR) was used to coat the last few meters of the PVC pipes, both inside and out, to retard biofouling and subsequent blockage of the holes/vents. An 18" section of 4" copper pipe, vented as described above, was coupled to the lower end of the pipes, serving as an additional antifouling measure. A locking cap provided security.

In 2014, two methods of deployment and data collection were employed. The first being a stand-alone deployment during which a datasonde autonomously collected data on 15-minute intervals on Eastern Standard Time (EST) and record these data internally, to later be downloaded onto a desktop/laptop computer post-retrieval. This method was employed at stations Buoy 139 (B9) and Lower Bank (BA). The second method employed was the pairing of datasondes with telemetry equipment that received data from the datasondes and broadcast it to the GOES satellite for receipt by the NOAA Hydrometeorological Automated Data System (HADS) as well as an independent array at the NERRS CDMO. These data were also recorded independently every 15 minutes in Eastern Standard Time (EST) by the datasondes for redundancy and to continue with the pre-existing NERRS SOP. Telemetry was employed at Buoy 126 (B6) and Chestnut Neck (NE); however telemetry was not active at Chestnut Neck for this reporting period due to ongoing rebuilding of infrastructure destroyed by Superstorm Sandy. For more detail concerning these telemetered datasonde stations, see below:

The Sutron Sat-Link2 transmitter was installed at this Buoy 126 (B6) on 06/22/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00C264. The transmissions are scheduled hourly and contain four (4) data sets 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.

The Sutron Sat-Link2 transmitter was installed at Chestnut Neck (NE) on 09/19/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B03E386. The transmissions are scheduled hourly and contain four (4) data sets 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.

During each sampling period, measurements of specific conductance, salinity, temperature, dissolved oxygen, (percent saturation and concentration measured in mg/L), water level (depth), pH, and turbidity were recorded. After approximately 30 days datasondes were retrieved from the PVC pipe. Deployment periods were occasionally extended during 2012 because of weather-related restrictions of access. A YSI 600 datasonde attached to a hand-held YSI 650-MDS display was then lowered to depth in order to sample in-situ water conditions at approximately the same depth at which data was recorded. A different calibrated and programmed YSI datasonde was then deployed to replace the datasonde being recovered. The recovered datasonde was brought back to the laboratory for downloading, post-deployment calibration checking, cleaning, and re-calibration. For some retrievals (due to spare datasondes being out for repairs or a desire to keep the same datasonde at the same SWMP site for consistency), the datasonde was not replaced but rather brought back to the field station, cleaned and recalibrated as described above, and re-deployed or replaced later that day or the following day.

Upon retrieval, datasondes were wrapped in a white towel and placed in a cooler for transport back to the laboratory. Datasondes were then placed in an aerated bucket of tap water overnight before post-processing according to SWMP standard operating procedures. Post-processing involves the placing of the un-cleaned datasonde in standards and recording of the displayed values, to judge how well the probes maintained calibration, determine the effect of bio-fouling (if any), and judge whether probe failure occurred during the deployment. After this post-deployment calibration check, probes were cleaned as per SWMP standard operating procedures and either re-calibrated for the next deployment or capped for storage for later calibration and deployment.

Datasondes were programmed to start recording data (ranging from one sample period to a few hours) before they were deployed in the field and allowed to run in either a wet, enclosed environment or an aerated water-filled bucket, so these deployment files often contained “tail ends” of non-deployment data, which were used to diagnose the probes but deleted before the data were processed for import into the yearly datasets. The beginning and end of each in-situ data file was compared to the 600/650MDS handheld unit values and the data were checked for probe failure and fouling.

5) Site Location and Character

The Jacques Cousteau National Estuarine Research Reserve (JCNERR) at Mullica River/Great Bay is located on the northeast coast of the United States on the Atlantic Ocean. The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. There were four active sampling stations in 2014. All four locations can be characterized by having little macroalgae (few to no established beds in the immediate locale; only occasional seasonal and structurally-dependent fouling-type macroalgal communities), fast moving tidal currents, and tidal ranges of approximately 1m (although this can vary significantly depending on moon state, storm events, and coastal wind conditions (e.g.- “blow out tides” associated with strong offshore winds). All sites are in a relatively undisturbed area with minimal impact from development or pollution.

1) Buoy 126 (B6) - 39deg 30'28.44"N, 74 deg 20'18.67"W- located three kilometers from Little Egg Inlet on the eastern side of Great Bay and is 100 meters from the nearest land that is a natural marsh island. This is a naturally deep area that has never been dredged, but it is located about 0.5 kilometers from an area in the Intracoastal Waterway that is dredged regularly. The datasonde at this location is attached to Intracoastal Waterway Buoy 126 and is the closest monitoring station to Little Egg Inlet. This site can be characterized by having strong tidal currents, 2-3 knots, fine to course sand bottom with an extensive blue mussel bed surrounding the area. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface. In 2014, the reported temperature at this station ranged from -1.7°C to 27.8°C, with an average of 14.1°C. The reported salinity at this station ranged from 19.7psu to 32.8psu, with an average of 28.7psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range, as recorded by the datasonde, was 2.54m. It has been some time since the actual depth at this station has been surveyed (sediment deposition and erosion around the structure has effect on the actual depth of the water column at this station), but in 2008 average depth at the B6 station was assessed at 3.91m, with a range of 2.72 to 5.09m. The results of a 2013 sonar depth-survey of reserve waters by the USGS are expected shortly, and we (the JCNERR) plan to independently survey the area in 2015 as well.

2) Buoy 139 (B9) - 39deg 29'24.65"N, 74 deg 22'53.83"W- is located 4 kilometers from Buoy 126 on the western side of Great Bay and is located about one to one and one-half kilometers from land. The datasonde at this location is attached to Intracoastal Waterway Buoy 139. The closest landform is an extensive salt marsh approximately 1.5 kilometers wide, which borders the upland area. This area is dredged by the U.S. Army Corp of Engineers approximately every five to six years to maintain the channel at a depth of approximately 2.5 meters. The surrounding depth of the bay is approximately 1.5 to 2 meters. This site is characterized by having maximum currents of about 1.5 knots with a muddy sand bottom and with little structure or shell. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface and above. In 2014, the reported temperature at this station ranged from -1.5°C to 28.5°C, with an average of 16.1°C. The reported salinity at this station ranged from 18.7psu to 32.1psu, with an average of 27.0psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range, as recorded by the datasonde, was 3.33m. It has been some time since the actual depth at this station has been surveyed (sediment deposition and erosion around the structure has effect on the actual depth of the water column at this station), but in 2008 average depth at the B9 station was assessed at 3.18m, with a range of 2.13 to 4.55m. The results of a 2013 sonar depth-survey of reserve waters by the USGS are

expected shortly, and we (the JCNERR) plan to independently survey the area in 2015 as well.

3) Chestnut Neck (NE) - 39deg 32'52.37"N, 74deg 27'38.77"W - located 12 kilometers up the Mullica River from the mouth of the river. The river begins at a line drawn between Graveling Point and Oysterbed Point on the northwestern side of Great Bay. The Mullica River at this location is quite wide, about 250 meters. The datasonde is attached to the dock of a small marina along the southern shore of the river adjacent to the main channel. This location has never been dredged. The site is characterized by having tidal currents of less then one knot, during both ebb and flood tide, and has a mixed organic mud/sand bottom. Freshwater input is primarily from groundwater and watershed runoff. In 2014, the reported temperature at this station ranged from -1.0°C to 28.1°C, with an average of 13.8°C. The reported salinity at this station ranged from 2.1psu to 22.6psu, with an average of 12.9psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range, as recorded by the datasonde, was 2.11m. It has been some time since the actual depth at this station has been surveyed (sediment deposition and erosion around the structure has effect on the actual depth of the water column at this station), but in 2008 average depth at the NE station was assessed at 2.32m, with a range of 1.11 to 3.45m. The results of a 2013 sonar depth-survey of reserve waters by the USGS are expected shortly, and we (the JCNERR) plan to independently survey the area in 2015 as well.

4) Lower Bank (BA) - 39deg 35'37.18"N, 74 deg 33'05.44"W- located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about two hundred meters wide. The datasonde is located at the center of a bridge spanning the Mullica River. The northern bank of the river is sparsely developed with single-family houses and has a steep bank about five meters high. The southern shore has an extensive marsh and fresh water wetland area about three kilometers wide. This site can be characterized by having fast tidal currents, just over one knot, deep water, and fine mixed organic mud and sandy sediment. Freshwater input is primarily from groundwater and watershed runoff. In 2014, the reported temperature at this station ranged from -0.3°C to 31.5°C, with an average of 13.9°C. The reported salinity at this station ranged from 0.0psu to 10.8psu, with an average of 1.8psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range, as recorded by the datasonde, was 2.10m. It has been some time since the actual depth at this station has been surveyed (sediment deposition and erosion around the structure has effect on the actual depth of the water column at this station), but in 2008 average depth at the BA station was assessed at 2.77m, with a range of 1.43 to 3.98m. The results of a 2013 sonar depth-survey of reserve waters by the USGS are expected shortly, and we (the JCNERR) plan to independently survey the area in 2015 as well.

6) Data Collection Period

Data collection at the JCNERR is often performed on a seasonal (rather than year-round) basis due to ice-over conditions in local waters and the damages associated with ice formation and movement. Typically, the target date for redeployment after the winter is mid-March, but is often earlier if conditions permit or later if winter conditions linger and/or stations are significantly damaged post-thaw. Datasondes are pulled and stations deactivated when ice-over conditions are anticipated (typically in early- or mid-December) in an attempt to avoid damage and/or loss of equipment due to the destructive nature of ice movements.

Site	Filename	Deploy Date	Time	Retrieve Date	Time
B6	B6120213	12/02/2013	16:30	01/16/2014	14:00
	B6011614	01/16/2014	14:30	02/20/2014	14:30
	B6041014	04/10/2014	10:00	05/15/2015	14:15
	B6051514	05/15/2014	14:30	06/30/2014	17:15
	B6063014	06/30/2014	17:45	07/29/2014	13:15
	B6072914	07/29/2014	13:30	08/28/2014	15:45
	B6082814	08/28/2014	16:15	10/08/2014	12:30
	B6100814	10/08/2014	12:45	11/03/2014	16:15
	B6110314	11/03/2014	16:30	12/03/2014	14:30
	B6120214	12/03/2014	14:45	01/06/2015	11:15
B9	B9120213	12/02/2013	14:00	01/16/2014	13:45
	B9011614	01/16/2014	14:00	sonde lost to ice floes	
	B9041014	04/10/2014	09:45	05/19/2014	14:45
	B9051914	05/19/2014	15:15	06/30/2014	14:30
	B9063014	06/30/2014	14:45	07/30/2014	14:15
	B9073014	07/30/2014	14:45	09/03/2014	12:15
	B9090314	09/03/2014	12:45	10/14/2014	14:00
	B9101414	10/14/2014	14:15	11/13/2014	15:30
	B9111314	11/13/2014	15:45	12/15/2014	14:30
	B9121514	12/15/2014	14:45	01/06/2015	11:30
NE	NE120313	12/03/2013	15:45	01/10/2014	11:00
	NE011014	01/10/2014	11:30	02/07/2014	12:15
	NE020714	02/07/2014	12:45	03/11/2014	16:15
	NE031114	03/11/2014	16:30	04/21/2014	13:00
	NE042114	04/21/2014	13:30	05/29/2014	13:15
	NE052914	05/29/2014	13:30	07/01/2014	09:15
	NE070114	07/01/2014	12:45	08/12/2014	13:30
	NE081214	08/12/2014	13:45	09/23/2014	11:15
	NE092314	09/23/2014	11:45	10/21/2014	11:30

	NE102114	10/21/2014	11:45	12/03/2014	10:15
	NE120314	12/03/2014	10:45	01/08/2015	14:30
BA	BA120313	12/03/2013	16:15	01/10/2014	11:45
	BA011014	01/10/2014	12:00	03/10/2014	08:30
	BA031014	03/10/2014	09:00	04/21/2014	18:15
	BA042114	04/21/2014	18:45	05/30/2014	09:30
	BA053014	05/30/2014	10:00	07/02/2014	08:00
	BA070214	07/02/2014	12:45	08/18/2014	16:00
	BA081814	08/18/2014	16:15	09/30/2014	13:30
	BA093014	09/30/2014	13:45	11/11/2014	13:30
	BA111114	11/11/2014	14:00	01/08/2014	15:00

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 process 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.nerrsdata.org/; *accessed* 12 October 2012.

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 comma delimited format.

8) Associated Researchers and Projects

As per the requisites of the national SWMP program, the JCNERR performs nutrient sampling and meteorological monitoring correlated with the water-quality data addressed in this report. Data can be accessed by visiting www.nerrsdata.org

During 2014, weekly ichthyoplankton sampling at Little Sheepshead Creek Bridge (LSCB) continued as part of the long-term sampling conducted by the Rutgers University Marine Field Station (RUMFS) in the Jacques Cousteau National Estuarine Research Reserve (JCNERR). Presence and abundance of larval fishes are determined with a plankton net (1 m, 1 mm mesh) deployed during night flood tides from a bridge near Little Egg Inlet (New Jersey) in the Great Bay/Little Egg harbor portion of the JCNERR.

RUMFS conducts annual trawl survey at numerous sites from offshore of Little Egg Inlet to the freshwater interface up the Mullica River. SWMP data are regularly used in the analysis of community composition and species assemblage.

A wire-mesh trapping survey of fish and crustaceans conducted by RUMFS within the RUMFS boat basin also continued in 2014 as part of long-term sampling within the Reserve.

Dr. Mark Sullivan's class at Stockton College has extensively utilized the JCNERR's SWMP dataset, including WQ data, in their curriculum.

Dr. Paul Jivoff of Rider University conducts regular surveys of local crab populations and utilizes the SWMP dataset.

Over-wintering populations of seals near the B6 site were observed/studied over the winter of 2012-2014 as a joint Rutgers University/Stockton College program; SWMP data from B6 were utilized in these observations/study.

II. Physical Structure Descriptors

9) Sensor Specifications

JAC NERR utilized three datasonde types during this reporting period: YSI non-vented 6600EDS and YSI non-vented V2-4 datasondes were utilized, interchangeably at all stations. The 6600EDS and V2-4 sondes were phased out and replaced by Exo2 sondes at Buoy 139 (B9 or jacb9wq) on 06/30/2014 and Lower Bank (BA or jacbawq) on 08/18/2014.

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

Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
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: +/- 15% or 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, polargraphic
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

or

Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
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: +/- 15% 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 – bulb probe
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6561 or 6561FG
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: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

YSI EXO Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 599870-01
Range: -5 to 50 C
Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .005
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model#: 599870-01
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: 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

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% or 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 (0.04 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: +/- 0.01 units within +/- 10° of calibration temperature, +/- 0.02 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

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 1.03 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.

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.

10) Coded Variable Definitions

Sampling Station:	Sampling Site Code	Station Code
Buoy 126	B6	jacb6wq
Buoy 139	B9	jacb9wq
Lower Bank	BA	jacbawq
Chestnut Neck	NE	jacnewq

jac = three-letter abbreviation for the Jacques Cousteau National Estuarine Research Reserve

wq = water quality data

example 1: B6011614= this demonstrates the naming convention for deployment files. This denotes a deployment at Buoy 126 starting on 01/16/2014.

example 2: jacb6wq2014= water quality data from JCNERR's Buoy 126 station for the year 2014

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
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

Deployment filename Datasonde ID#, Dissolved Oxygen #1 depth measured/expected offset, Specific Conductivity, pH7, pH10, Turbidity0

Deployment Name	Sonde Name	DO 100%	Depth m	SpCond 10mS/cm3	pH (7)	pH (10)	Turb 0NTU
B6120213	V2A	101.2	0.004/0.007	10.05	7.10	10.07	1.8
B6011614	loaner	98.7	-0.094/-0.072	10.12	7.05	10.05	1.2
B6041014	11	98.8	0.046/0.064	9.90	6.99	9.90	1.3
B6051514	loaner	99.5	0.050/0.030	9.93	7.20	9.83	-0.1
B6063014	11	96.0	-0.004/-0.010	4.63	7.21	9.84	1459
B6072914	YSI	100.1	-0.011/-0.017	10.05	7.10	10.12	15.7
B6082814	13	97.4	0.110/0.120	10.03	7.04	9.98	0.2
B6100814	V2B	sonde not post-calibrated (non-functional upon retrieval)					
B6110314	V2A	104.5	0.041/0.050	9.94	7.06	10.08	-0.4
B6120214	13	100.5	0.050/0.057	10.00	7.06	10.04	0.7
B9120213	11	100.1	-0.001/0.007	10.01	7.09	9.99	1.1
B9011614	14	N/A- sonde lost to ice					
B9041014	13	97.2	0.063/0.058	8.42	7.10	9.67	0.1
B9051914	11	97.5	0.040/0.046	9.75	7.10	10.05	1.8
B9063014	Mr. pink	101.9	0.038/0.016	9.74	7.15	10.06	1.0
B9073014	Mr. Blue	103.5	0.122/0.117	9.74	7.15	10.13	1.5
B9090314	Mr. Orange	100.7	-0.004/-0.001	9.90	7.19	10.14	0.1
B9101414	Mr. Blonde	100.7	0.044/0.046	9.79	7.09	10.09	0.2
B9111314	Mr. White	101.8	0.029/0.027	10.01	6.99	10.04	1.1
B9121514	Mr. Blue	100.5	0.063/0.061	9.95	7.17	10.20	0.2
NE120313	14	96.7	0.143/0.139	10.16	7.01	10.01	1.9

NE011014	13	100.8	0.101/0.102	10.13	6.98	9.95	2.9
NE020714	V2A	99.9	-0.090/-0.090	9.93	6.72	9.85	2.4
NE031114	V2B	97.4	0.038/0.038	10.10	7.02	10.04	0.7
NE042114	V2A	96.1	0.088/0.080	9.83	7.27	10.18	8.6
NE052914	13	98.7	-0.017/-0.008	9.73	7.21	10.07	-0.2
NE070114	13	95.2	0.020/0.000	10.24	7.00	10.01	0.1
NE081214	V2B	100.2	0.140/0.146	9.75	7.15	10.15	6.8
NE092314	V2A	99.5	-0.044/-0.046	9.98	7.20	10.19	0.3
NE102114	13	99.6	0.042/0.056	9.78	7.10	9.97	3.3
NE120314	loaner	101.6	0.203/0.154	10.10	7.02	9.99	1.2
BA120313	loaner	99.6	0.153/0.139	10.22	6.99	9.98	1.8
BA011014	V2B	101.7	-0.043/-0.035	9.98	7.05	10.02	1.8
BA031014	V2A	100.3	-0.004/0.001	9.88	6.98	10.00	1.2
BA042114	V2B	96.7	0.060/0.059	9.93	7.00	10.01	0.1
BA053014	V2A	97.8	0.018/-0.002	9.92	7.05	10.04	0.7
BA070214	V2A	97.6	-0.029/-0.039	10.08	7.06	10.07	-0.7
BA081814	Mr. Blonde	103.6	0.042/0.047	10.08	7.16	10.19	5.8
BA093014	Mr. White	99.9	0.010/0.000	10.18	7.19	10.24	5.4
BA111114	Mr. Orange	100.7	0.149/0.158	9.69	7.00	9.90	7.9

14) Other Remarks/Notes

This section details comments concerning data in the data set that are not adequately described by the coding convention or require additional comment/qualification.

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. Occasionally, supplementary data are available from proximal non-SWMP stations. If additional information and/or missing data are needed, contact the Research Coordinator at the reserve submitting the data.

Occasionally negative turbidity values between -0001 and -0002 NTU's/FNU's are recorded. Because such values fall within the range of accuracy (+/-2 NTU/FNU) of the 6-series turbidity probes, these data are considered suspect but not rejected.

Occasionally negative turbidity values less than -0002NTU's/FNU's are recorded. Because such values fall outside the range of accuracy (+/-2 NTU/FNU) of the 6-series turbidity probes, these data were rejected and flagged with a <-3> <SNV> (negative value) designation in the dataset.

Note to users: When utilizing these data, it is always best to also review the SWMP Meteorological (MET) dataset from this reserve to provide weather conditions that may affect the SWMP Water Quality (WQ) data from this reserve. For example, strong

precipitation and strong sustained winds may cause elevations in turbidity and alter dissolved oxygen levels. Periods of drought may alter salinity patterns and lead to anoxic conditions in poorly-circulated regions of reserve waters. Hurricane and Nor'easter events may alter WQ parameters in the above, and other, manners. Provisional MET data from the JCNERR's MET station (station code: jacncmet) are available at the CDMO website: http://nerrsdata.org/

Site-specific comments:

B6

This station was deactivated on 02/20/2014 due to damages to the station by ice floes. The station was reactivated on 04/10/2014, but the instrument deployed on that date is still deployed at the time of this report and not included in this report.

Heavy fouling of the b6063014 deployment was observed upon retrieval on 07/29/2014; a significant portion (07/20/2014-07/29/2014) of this deployment was flagged as suspect.

A combination of a failing temperature/conductivity sensor and a short in a leaking communication cable may have interfered with some values starting on 10/29/2014 03:00 (as evident by a sudden drop in pH values); all data from this point through 11/02/2014 10:45 have been marked suspect (with a few intermittent and obviously bad values rejected), after which an outright failure of the temperature probe resulted in the majority of the data from this deployment (through 11/03/2014 16:15) to be rejected.

B9

This station was damaged by ice floes in early 2014, and the datasonde at this station was unfortunately lost, so all data collected during that deployment period (01/16/2014-02/20/2014) were also lost. This deployment is, however, referenced numerous times in this metadata document in hopes that the unit will eventually be located and recovered. This station was officially deactivated on 02/20/2014 and reactivated on 04/10/14 after the spring thaw.

The B9041014 deployment experienced biofouling of, and sediment accumulation in, the conductivity sensor ports that artificially depressed salinity/conductivity measurements during the latter half of the deployment. Because it is difficult to determine exactly when this started to affect the measurements, an (estimated) start-date of 04/30/14 was selected and data from 04/30/14 00:00 until the end of the deployment on 05/19/14 14:45 was flagged to reflect this.

On 12/12/14 21:15 a significant drop in Specific Conductivity and Salinity values was observed. While such large changes within such narrow timeframes are often indicative of sensor issues, a substantial rain event 12/08-09/2014 followed by a long period of

sustained offshore winds starting on 12/09/2014, combined with lunar tides, drove a regional “blow out event” that caused tides to run much lower than usual/predicted and may have suppressed tidal input/increased river input into the reserve. The suppression of Specific Conductivity and Salinity values is evident at other SWMP stations (particularly Chestnut Neck jacnewq) as well, but was most evident at this (usually) high-salinity station.

NE

A significant rain event overnight 08/12-13/2014 appears to have depressed salinity and possibly ph values at the river (NE and BA) stations for quite some time after the event.

BA

A significant rain event overnight 08/12-13/2014 appears to have depressed salinity and possibly ph values at the river (NE and BA) stations for quite some time after the event.