

Reserve Name JOB NERR Water Quality Metadata
Months and year the documentation covers: 01/01/2023 to 12/31/2023
Latest Update: 04/15/2024

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@belle.baruch.sc.edu> or Reserve with any additional questions.

I. Data Set and Research Descriptors

1> Principal investigator<s> and contact persons

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2> Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer by Edlyn Jusino. Files are exported from KOR-EXO (YSI Proprietary) program in a Microsoft Excel format by Edlyn Jusino and Angel Dieppa then 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. Then it is converted to a comma-delimited file (*.cdf) and uploaded to the CDMO where it undergoes automated primary QAQC and becomes part of the CDMO's online provisional database. 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 by Edlyn Jusino and Angel Dieppa. The macro inserts station codes, create 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. 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. The final yearly file and metadata was submitted by Edlyn Jusino and Angel Dieppa. For more information on QAQC flags and codes, see Sections 11 and 12.

3> Research objectives –

The principal objective is to record and track long-term changes and short term variability in water quality parameters that can be associated to changes in estuarine habitats. Through this, we support management decisions based on scientific data. A secondary objective is to promote the access and use of reliable baseline information by federal and local agencies, universities, researchers, educators and local communities to enhance the process by which they make decisions regarding their daily

activities. This data is also invaluable in the identification and development of future monitoring and research activities.

A total of four data loggers <YSI EXO-2> are deployed in Jobos Bay. Two sondes are deployed in the inner lagoons of the Mar Negro Component and the other two in the Jobos Bay. The instruments are depth-fixed from a pole at a distance at about 0.5 meters from the bottom at each selected site. Data from stations 9, 10, 19 and 20 are being submitted to the Centralized Data Management Office as part of the System-Wide Monitoring Program. Measurements are taken at fifteen-minute intervals for approximately two-week periods. The sites are identified as representative of areas within the reserve and comparable to the sites that may be receiving impact from human activities from surroundings areas or may act as a habitat gradient in the Bay.

Station number nine <9>, subject to impacts from coastal processes <close to a power plant retentions pond>, collects water quality data in a site associated with runoff from littoral and basin mangrove areas. This sampling station is located in the most inland lagoon, closest to the Thermoelectric Power Plant <oil and natural gas>. It is subjected to runoff, which may include potential oil spill contamination from this industrial facility. Information compiled from historical environmental documents, indicate that station nine <9> was used as a disposal site for residues of the previously operating sugar mill operation, and therefore might have high organic input into the sediments.

Station number ten <10>, located in a mangrove lagoon area towards the southwestern section of Mar Negro is considered the reference or non-impacted site.

Station number <19> is located over a sea grass bed <*Thalassia testudinum*> in the inner western part of the bay just northeast of Cayo Colchones. This station is located near the thermal outfall and operating piers of the Aguirre Power Plant Complex, both activities may have significant effects on sea grass communities. This area is exposed to barge stranding, sediment re-suspension and oil spills. Station number <20> is located on the eastern inner bay section of the Cayos Caribe cays. This station is just south of the mangrove islets associated with the Reserve's coral reefs. Water streams coming through the coral platform may help characterize water conditions of the main marine currents reaching Jobos Bay, as well as possible effects of industrial and chemical activities associated with Phillips Core, AES Coal Energy Plant and Pharmaceuticals located just east to this system.

4> Research methods

The National Estuarine Research Reserve Water Quality Monitoring Program began sampling at Station nine <9> on December 20, 1995 and Station ten <10> on February 1, 1996. Monitoring at station 19 began in April 2004 and at station 20 in June 2004. Long term water quality monitoring is being performed at these stations.

Before each YSI 6600 or EXO-2 data logger is deployed, calibration and maintenance is performed following the Standard Operation Procedures of the NERRS. Calibration standards are only required for pH, salinity, and turbidity, all other parameters are done as described in the manual. Buffer solutions for two-point calibration <pH 7 and pH 10> are purchased from a scientific supply company. Salinity is calibrated with a specific conductance standard 50 mS/cm and is purchased from YSI.

The two-point turbidity calibration is performed using a 0 NTU <DI water> and 124 FNU <for EXO-2> standard purchased from a scientific company. EXO-2 are equipped with dissolved oxygen optical sensors, both are allowed to sit at least 24 hours after proper calibration. Weather conditions and tide stage are recorded in the field observation log during deployment. Measurements of DO, pH, salinity, specific conductance, turbidity, and temperature are taken at the deployment time to check the accuracy and functionality of the instruments.

Each YSI data logger hangs inside a 6-inch diameter PVC pipe which is attached to a concrete filled PVC stable pole. Data loggers are at approximately 0.5 meter from the bottom of the selected site.

Data is recorded every 15 minutes. The following measurements are recorded: date, time, temperature, specific conductance, salinity, dissolved oxygen saturation, dissolved oxygen concentration, depth, pH, and turbidity, all station have an optical chlorophyll-a sensor. Chl-a is an optional parameter non-required for SWMP program. Approximately, every two weeks the data loggers are retrieved, inspected, cleaned, data is downloaded into a personal computer and re-calibrated as noted previously. The data logger is then ready to be deployed again.

The data is processed through a standard quality control/quality assurance established for all 29 reserves within the system. It consists in submitting the raw data to the Centralized Data Management Office <CDMO> server where data undergoes through a macro to flag anomalies predetermine for each station. The data is sent back to the reserve to pass through a secondary QA/QC and finally resubmitted to CDMO for the final approval. Data may be available in different stages of the QA/QC process.

A Sutron Sat-Link2 transmitter was installed at the JOB20 station on 07/20/06 and a second station JOB09, transmits data to the NOAA GOES satellite, NESDIS ID # 3B0297EC and NESDIS ID # 3B0424AC respectively. 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>.

Station 20 and Station 9 telemetry was interrupted on 09/20/17 after Hurricane Maria destroyed the platform losing all the equipment. We are planning to reestablish communication in the near future.

5> Site location and character –

The Jobos Bay National Estuarine Research Reserve <JBNERR> is located on the southern coastal plain of the island of Puerto Rico, a reserve within the West Indies geographical area. JBNERR is composed of two major areas: <1> Mar Negro, located on the western margin of the Bay, and <2> Cayos Caribe <a chain of 17 tear-shaped islets located to the southeast> and Cayos Barca <a chain of 7 tear-shaped islets located to the southwest boundaries> both with a back-reef system. The Mar Negro area comprises the bulk of the Reserve, and consists of mangrove forests and a complex system of lagoons and channels interspersed with salt and mud flats. Coral reefs and sea grass beds, with small beach deposits and upland areas fringe Cayos Caribe and Cayos Barca mangrove islands. Few areas in the watershed drain directly to the bay. Rio Seco to the north-east of the bay is active only during heavy rain events during the wet season. A small creek, Quebrada Coqui, near JBNERR’s pier to the north of the bay, drains into an extensive mangrove fringe forest in a laminar flow. During heavy rain events, Station 09 received runoff water from the upland and finally, a diffuse flow of water reached the bay from the local aquifer.

Station 9 is an impacted site and is located on the northeastern section of the Mar Negro component. This sampling station is associated with mangrove lagoon areas and receives runoff from mudflats, the Thermoelectric Power Plant, and adjacent areas. The tidal range varies from 12 to 14 inches near the monitoring station. The salinity in the vicinity of the monitoring station during this quarter varies from 25.5 ppt to 39.1 ppt. The average depth and total depth at station 09 are 0.31 and 0.91 meters respectively. The bottom is covered by a thick layer of thin sediments with a high content of organic material. *Microcoleus sp.* <blue-green algae>, brown and green algae <*Caulerpa sp.*> are also present at this site, but a better assessment is needed. The station pole was located at 17°56'34.87"N and 66°14'18.64"W until 09/02/2010 12:00PM, then it was relocated to 17° 56' 35.0" N and 66° 14' 18.9" W approximately 65.0 meters from original position. The relocation was due to sedimentation issues and the construction of a new telemetry station. Fresh water input to the station comes only from runoff and rain. This station has been subject of several studies indicating the presence of relatively high level of cooper and pesticides compared to other stations. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was

more evident and wide distributed. Although it is not present at Station 9, it is present in the channels toward the station and we expect it will colonize the area in the near future.

Station 10 is located in a mangrove lagoon not impacted directly by any upland or marine activities. It provides a reference for comparison of data obtained in other stations, especially to the station in Mar Negro lagoon. The tidal range varies from 12 to 14 inches. The salinity at the vicinity of the monitoring station during this quarter varies from 29.1 ppt to 39.2 ppt. The average depth and total depth at station 10 is 0.29 and 0.84 meters respectively. The bottom is covered with a layer of fine sediments with organic material, followed by a layer of calcareous material mainly from shells and oysters. At this site, we can find sea grass <*Thalassia testudinum*>, calcareous algae <*Halimeda sp.*>, green algae <*Caulerpa sp.*> and brown algae <*Dictyota sp.*> among others. The pole is located at 17° 56' 19.00 N, 66° 15' 27.85 W. Fresh water input to the station comes only from runoff and rain. There is not any direct source of fresh water. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed been observed in the perimeter of the station. See notes below regarding Sargassum arrivals. (Note: Due to problems with sondes and sensors, we stop deploying instruments at this station on 01/30/2022).

Station 19 is located on the western inner section of the bay at a distance of 233 meters from Cayo Colchones Mangroves over sea grass beds <*Thalassia testudinum*>. Tidal ranges in this area vary from 12 to 14 inches. The salinity at the vicinity of the monitoring station during this quarter varies from 30.10 ppt to 36.53 ppt. The average depth and total depth at this station is 0.21 and 1.01 meters respectively. The YSI sonde is deployed at about 0.05 meter from the bottom. The bottom is of sandy composition. Sea grass, algae, echinoderms and other related organisms could be found in the area. The pole is located at 17° 56' 34.49"N, 66° 13' 43.77"W. There is no freshwater input to this area. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed been observed in the perimeter of the station. (Note: Due to problems with sondes and sensors, we instruments were deployed from 01/01/2023 to 04/19/2023).

Station 20 is located in the inner eastern section at about 190 meters of Cayos Caribe Mangrove islets and at about 688 meters from the coral reef barrier. This station is the closest to Mar Caribe. It has a sandy bottom, with calcareous and coral fragments, sea grass <*Thalassia testudinum*> communities, echinoderms and other associated organisms. Tidal ranges in this area vary from 12 to 14 inches. The salinity at the vicinity of the monitoring station during this quarter varies from 30.00 ppt to 37.4 ppt. The average depth and total depth at this station is 0.25 and 0.78 meters respectively. There is no surface freshwater input to this area. The pole is located at 17° 55' 49.14"N, 66° 12' 41.30"W. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed been observed in the perimeter of the station.

Data from stations 9, 10, 19, and 20 is being submitted to the CDMO. Eight sondes are permanently devoted to taking readings from these two sites, to assure continuous readings while sondes are taken out of the water for data upload and maintenance. This will avoid data gaps for the stations between sonde maintenance procedures. Due to errors in calibration, turbidity data in these files is considered inadequate. All monitoring is considered long term.

6> Data collection period – Include each YSI deployment and retrieval date and time <**first** and **last** readings in the water> for each monitoring site for the year. Do not include times of pre- and post-deployment or datasondes' transport. Note when data collection began initially for your Reserve or sample sites.

Station nine <9> water quality monitoring began on December 20, 1995.

Station ten <10> water quality monitoring began on February 1, 1996.

Station nineteen <19> water quality monitoring began on April 1, 2004.

Station twenty <20> water quality monitoring began on May 13, 2004.

Deployment and Retrieval Dates 2023:

Station 09			
Date/	Time In	Date/	Time Out
12/14/2022	08:15	01/09/2023	07:30
01/11/2023	11:30	01/24/2023	09:45
01/26/2023	09:30	02/06/2023	04:30
02/08/2023	13:45	02/21/2023	08:45
02/23/2023	10:45	03/06/2023	13:15
03/09/2023	11:30	03/20/2023	11:00
03/24/2023	10:15	04/03/2023	08:45
04/05/2023	09:45	04/18/2023	10:00
04/19/2023	15:00	05/01/2023	08:45
05/02/2023	14:13	05/16/2023	10:45
05/18/2023	14:00	05/30/2023	10:00
06/01/2023	15:00	06/14/2023	09:30
06/15/2023	14:45	06/26/2023	09:45
06/30/2023	10:30	07/11/2023	11:00
07/13/2023	09:30	07/26/2023	10:00
07/28/2023	14:30	08/15/2023	***
08/17/2023	12:30	09/12/2023	10:15
09/14/2023	13:00	09/26/2023	9:45
09/29/2023	11:15	10/10/2023	10:15
10/13/2023	11:10	11/06/2023	11:42
11/08/2023	15:53	11/27/2023	10:43
11/29/2023	13:47	12/19/2023	09:21
12/21/2023	10:09	01/03/2024	10:21

***No Data

[illegible]

Station 10			
Date/	Time In	Date/	Time Out
12/21/2022	10:30	01/09/2023	11:00
01/11/2023	10:30	01/24/2023	12:00
01/26/2023	14:00	02/06/2023	10:30
02/08/2023	10:15	02/21/2023	09:15
02/23/2023	10:15	03/06/2023	12:45
03/09/2023	10:45	03/20/2023	11:30
03/24/2023	09:45	04/03/2023	8:30
04/05/2023	10:15	04/18/2023	23:15
04/19/2023	***	05/01/2023	***
05/02/2023	15:15	05/16/2023	09:45
05/18/2023	14:30	05/30/2023	***
06/01/2023	15:30	06/14/2023	10:30
06/16/2023	05:00	06/26/2023	10:15
06/30/2023	11:15	07/11/2023	10:30
07/13/2023	***	07/26/2023	***
07/28/2023	15:15	08/15/2023	9:30
08/17/2023	12:30	09/12/2023	10:15
09/14/2023	8:30	09/26/2023	5:15
09/29/2023	10:36	10/10/2023	09:37
10/13/2023	10:41	11/06/2023	11:18
11/08/2023	15:21	11/27/2023	10:09
11/29/2023	13:18	12/19/2023	08:46
12/21/2023	09:45	01/03/2024	09:45

Station 20			
Date/	Time In	Date/	Time Out
12/14/2022	05:30	01/09/2023	06:00
01/11/2023	09:30	01/24/2023	09:00
01/26/2023	14:45	02/06/2023	12:30
02/08/2023	09:00	02/21/2023	07:30
02/23/2023	11:15	03/06/2023	12:15
03/09/2023	12:00	03/20/2023	11:45
03/24/2023	11:00	04/03/2023	8:15
04/05/2023	***	04/18/2023	***
04/19/2023	***	05/01/2023	***
05/02/2023	14:00	05/16/2023	10:45
05/18/2023	13:30	05/30/2023	10:15
06/01/2023	14:00	06/14/2023	11:30
06/15/2023	13:45	06/26/2023	10:30
06/30/2023	10:00	07/11/2023	11:45
07/13/2023	09:00	07/26/2023	09:30
07/28/2023	14:30	08/15/2023	***
08/17/2023	7:00	09/12/2023	4:30
09/14/2023	7:45	09/26/2023	4:45
09/29/2023	09:27	10/11/2023	09:10
10/13/2023	09:20	11/06/2023	10:13
11/08/2023	14:10	11/27/2023	09:37
11/29/2023	12:18	12/19/2023	08:14
12/21/2023	08:42	01/03/2024	08:36

***No Data

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 2020.

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.nerrsdata.org. Data are available in text tab-delimited format.

8> Associated researchers and projects

The Jobos Bay NERR maintains four water quality monitoring stations as part of the System Wide Monitoring Program <SWMP> to monitor variability in the estuarine environment. Meteorological station collects continuous information that support water quality data intended to address short-term variability and long-term changes in estuarine water parameters within the bay <i.e., localized impacts of seasonal storms and hurricane events, variability due to tidal circulation, seasonal and interannual differences in rainfall, magnitude and influence of major events such hurricanes, spatial extent of oceanic and tidal forcing.

Our water quality monitoring program is a key component of SWMP. Variables measured include Temperature, Dissolved Oxygen, Turbidity, pH, Salinity and Depth in 4 permanent stations equipped with YSI data sondes. The program supports a nutrient monitoring at the same stations, nitrogen, phosphorus, and chlorophyll are measured in a monthly basis. Also, a diel nutrient sampling is performed in a monthly basis.

SWMP data has been used by:

- Caribbean Regional Association for the Caribbean Regional Coastal Ocean Observing System <CariCOOS> who monitors Real Time data from our SWMP stations.
- Environmental Quality Board for their biennial Puerto Rico 305/303<d> Integrated Report
- Puerto Rico Energy Power Authority <PREPA>
- Department of Natural and Environmental Resources
- Ocean Physics Education (OPE) an educational effort by physical oceanographer Dr. Edwin Alfonso-Sosa.

II. Physical Structure Descriptors

9> Sensor specifications –

YSI EXO-2 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 auto ranging

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 dependent>

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 <0.004 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: +/- 0.01 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

Parameter: Chlorophyll
Units: micrograms/Liter
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 400 ug/Liter

Accuracy: Dependent on methodology
Resolution: 0.1 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:
$$<<1013-BP> * 0.0102> + \text{Depth/Level} = \text{cDepth/cLevel}.$$

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

Sampling station:	Sampling site code:	Station code:
Station 9	ST09	job09wq
Station 10	ST10	job10wq
Station 19	ST19	job19wq
Station 20	ST20	job20wq

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 data sonde, 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 FRecord 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

STATION 09					Post Deployment Calibration Values			
	Time In	Date Out	Time Out	SpCond <50mS/cm>	DO%	pH <7>	Turb <0 NTU>	
	Date In	Date Out	Time Out	SpCond <50mS/cm>	DO%	pH <7>	Turb <0 NTU>	
	12/14/2022	08:15	01/09/2023	07:30	22.76**	99.8	7.02	0.27
	01/11/2023	11:30	01/24/2023	09:45	50.70	100.7	7.00	0.11
	01/26/2023	09:30	02/06/2023	04:30	36.61	99.8	7.04	0.59
	02/08/2023	13:45	02/21/2023	08:45	49.73	101.4	7.01	0.58
	02/23/2023	10:45	03/06/2023	13:15	49.78	97.4	7.06	0.11
	03/09/2023	11:30	03/20/2023	11:00	49.69	99.9	7.04	0.56
	03/24/2023	10:15	04/03/2023	08:45	49.47	100.3	6.92	0.39
	04/05/2023	09:45	04/18/2023	10:00	50.02	98.9	7.07	0.09
	04/19/2023	15:00	05/01/2023	08:45	49.83	99.5	7.03	0.54
	05/02/2023	14:13	05/16/2023	10:45	50.11	98.8	7.00	0.70
	05/18/2023	14:00	05/30/2023	10:00	50.64	99.4	7.07	0.37
	06/01/2023	15:00	06/14/2023	09:30	50.17	100.8	7.02	0.07
	06/15/2023	14:45	06/26/2023	09:45	49.97	99.5	7.08	0.9
	06/30/2023	10:30	07/11/2023	11:00	50.52	96.4	7.06	0.87
	07/13/2023	09:30	07/26/2023	10:00	50.11	96.6	7.06	0.92
	07/28/2023	14:30	08/15/2023	***	50.32	100.5	7.01	-0.51
	08/17/2023	12:30	09/12/2023	10:15	27.47	76.2	7.07	1.41
	09/14/2023	13:00	09/26/2023	9:45	48.80	96.1	7.14	0.04
	09/29/2023	11:15	10/10/2023	10:15	51.37	106.0	7.18	0.02
	10/13/2023	11:10	11/06/2023	11:42	51.73	99.4	7.02	0.00
	11/08/2023	15:53	11/27/2023	10:43	51.00	99.4	7.04	1.82
	11/29/2023	13:47	12/19/2023	09:21	49.008	99.8	7.05	0.02
	12/21/2023	10:09	01/03/2024	10:21	50.070	99.8	7.10	0.07

*Bad sensor, **Fouling, ***No Data

STATION 10					Post Deployment Calibration Values		
Date In	Time In	Date Out	Time Out	SpCond <50mS/cm>	DO%	pH <7>	Turb <0 NTU>
12/21/2022	10:30	01/09/2023	11:00	51.04	104.4	7.02	0.04
01/11/2023	10:30	01/24/2023	12:00	50.02	100.1	7.04	0.19
01/26/2023	14:00	02/06/2023	10:30	49.33	99.5	7.02	0.20
02/08/2023	10:15	02/21/2023	09:15	50.09	100.4	7.01	-0.05
02/23/2023	10:15	03/06/2023	12:45	49.67	100.1	7.04	0.40
03/09/2023	10:45	03/20/2023	11:30	49.54	99.9	7.07	0.23
03/24/2023	09:45	04/03/2023	8:30	49.44	100.2	7.02	0.25
04/05/2023	10:15	04/18/2023	23:15	49.84	99.1	7.10	-0.02
04/19/2023	***	05/01/2023	***	50.03	101.0	7.04	0.14
05/02/2023	15:15	05/16/2023	09:45	50.40	99.4	7.04	0.27
05/18/2023	14:30	05/30/2023	***	49.57	95.5	7.06	0.39
06/01/2023	15:30	06/14/2023	10:30	50.44	101.3	7.04	0.46
06/16/2023	05:00	06/26/2023	10:15	50.24	98.3	7.07	-0.40
06/30/2023	11:15	07/11/2023	10:30	50.32	97.3	7.00	0.47
07/13/2023	***	07/26/2023	***	***	***	***	***
07/28/2023	15:15	08/15/2023	9:30	50.12	98.5	7.07	0.01
08/17/2023	12:30	09/12/2023	10:15	***	***	***	***
09/14/2023	8:30	09/26/2023	5:15	49.21	103.0	7.16	0.16
09/29/2023	10:36	10/10/2023	09:37	50.87	99.1	7.17	0.97
10/13/2023	10:41	11/06/2023	11:18	50.05	101.6	7.10	0.00
11/08/2023	15:21	11/27/2023	10:09	51.64	98.2	7.08	0.25
11/29/2023	13:18	12/19/2023	08:46	50.61	88	7.04	12.35
12/21/2023	09:45	01/03/2024	09:45	50.25	99.9	7.09	0.12

*Bad sensor, **Fouling, ***No Data

STATION 19					Post Deployment Calibration Values		
Date In	Time In	Date Out	Time Out	SpCond <50mS/cm>	DO%	pH <7>	Turb <0 NTU>
12/21/2022	11:15	01/09/2023	10:30	49.70	99.3	7.02	0.22
01/11/2023	12:15	01/24/2023	11:30	49.93	100.6	7.07	0.20
01/26/2023	13:15	02/06/2023	11:30	49.20	100.3	6.99	0.04
02/08/2023	09:30	02/21/2023	08:15	***	98.4	7.15	0.01
02/23/2023	09:30	03/06/2023	13:30	49.73	101.2	6.92	0.21
03/09/2023	09:45	03/20/2023	10:00	30.20**	99.0	7.05	0.20
03/24/2023	09:00	04/03/2023	09:45	49.29	103.8	7.05	0.33
04/19/2023	09:00	04/18/2023	08:45	49.99	98.3	7.17	-0.038

*Bad sensor, **Fouling, ***No Data

STATION 20					Post Deployment Calibration Values		
Date In	Time In	Date Out	Time Out	SpCond <50mS/cm>	DO%	pH <7>	Turb <0 NTU>
12/14/2022	05:30	01/09/2023	06:00	30.13**	99.5	7.03	0.69
01/11/2023	09:30	01/24/2023	09:00	14.26*	100.5	7.12	0.23
01/26/2023	14:45	02/06/2023	12:30	50.02	99.9	6.99	-0.07
02/08/2023	09:00	02/21/2023	07:30	1.10*	99.4	7.00	0.02
02/23/2023	11:15	03/06/2023	12:15	23.61**	100.4	7.12	0.07
03/09/2023	12:00	03/20/2023	11:45	44.47	99.0	7.06	0.41
03/24/2023	11:00	04/03/2023	8:15	46.87**	101.0	7.00	0.48
04/05/2023	***	04/18/2023	***	***	***	***	***
04/19/2023	***	05/01/2023	***	33.19**	101.0	7.01	0.11
05/02/2023	14:00	05/16/2023	10:45	15.58*	100.1	7.02	0.01
05/18/2023	13:30	05/30/2023	10:15	12.29*	102.5	7.04	0.17
06/01/2023	14:00	06/14/2023	11:30	10.75*	104.3	70.07	-0.16
06/15/2023	13:45	06/26/2023	10:30	6.73*	100.6	7.00	0.35
06/30/2023	10:00	07/11/2023	11:45	3.86*	108.0	7.09	0.28
07/13/2023	09:00	07/26/2023	09:30	17.92*	103.3	7.08	0.11
07/28/2023	14:30	08/15/2023	***	8.72*	102.8	7.06	-0.36
08/17/2023	7:00	09/12/2023	4:30	54.82	104.1	7.10	0.21
09/14/2023	7:45	09/26/2023	4:45	46.96	101.1	8.93	-0.06
09/29/2023	09:27	10/11/2023	09:10	50.90	99.0	7.01	0.52
10/13/2023	09:20	11/06/2023	10:13	50.49	99.1	7.01	0.39
11/08/2023	14:10	11/27/2023	09:37	28.19	98.3	7.03	0.19
11/29/2023	12:18	12/19/2023	08:14	49.045	99.5	7.12	0.00
12/21/2023	08:42	01/03/2024	08:36	23.130	104.2	7.09	0.11

*Bad sensor, **Fouling, ***No Data

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.

Conductivity/Salinity comments:

JOB09WQ: The Cond/Temp all data reject because Post Calibration out of range.<-3> SPC

JOB10WQ:

JOB19WQ: From 02/16/2023 at 15:45 to finish not recognize sensor and don't read where post-deployment Check (-3, SCF)

JOB19WQ: Low Conductivity and Salinity values from 03/10/2023 at 14:15 to finish 03/20/2023 at 10:00 (-3, SSM).

JOB20WQ: Low Conductivity and Salinity values in certain periods from 01/05/2023 to 01/09/2023, (1, SPC)

JOB20WQ: Low Conductivity and Salinity values in certain periods from 01/15/2023 AT 8:45 to Finish 01/24/2023, (-3, SSM)

JOB20WQ: Low Conductivity and Salinity values in certain periods from 01/14/2023 at 9:30 to Finish 01/15/2023 at 00:30 (-3, SSM)

JOB20WQ: Low Conductivity and Salinity values from 02/08/2023 at 15:45 to Finish 02/21/2023 at 07:30 (-3, SCF)

JOB20WQ: Show low Conductivity and Salinity values from 03/04/2023 at 07:00 to finish 03/06/2023 at 12:15 on post-deployment found dirt calcium accumulation. (-3, CSM, SCF).

JOB20WQ: Low Conductivity and Salinity values from 03/12/2023 at 19:15 to Finish 03/20/2023 at 11:45 (-3, SSM).

DO Data comments:

JOB09WQ:
JOB10WQ:
JOB19WQ:
JOB20WQ:

pH Data comments:

JOB09WQ: The pH sensor malfunction from 12/19/2022 at 07:00 to 01/09/2023 at 07:30, (1, SSR)
JOB09WQ:
JOB10WQ:
JOB19WQ:
JOB20WQ: On 12/14/2022 at 5:30 to 01/09/2023 at 6:00 pH all data <1> SSR.
JOB20WQ:

Chlorophyll Data comments:

JOB09WQ:
JOB10WQ:
JOB19WQ:
JOB20WQ:

Turbidity Data comments:

JOB09WQ:
JOB10WQ:
JOB19WQ:
JOB20WQ:

Depth Data Comment

Additional Notes:

JOB09WQ:

JOB20WQ: On 04/04/2023: YSI Exo Sonde #13J10771: DO 18C104349 sensor replaced for a new DO sensor 14K100069 but don't read.

JOB20WQ: On 12/19/2022 at 6:00 to 01/09/2023 pH sensor 15G101000 replaced in field for a new pH sensor 22L101170 but don't read, (1, SSR)

JOB20WQ: On 09/28/2023: YSI Exo Sonde #14K101410: pH sensor tip module replaced 22K100450, Model: 577603-02.

JOB20WQ: On 01/10/2023: YSI Exo Sonde #13J10771: C/T 22K101003 sensor replaced for a new C/T sensor 17K103475 but don't read.

JOB20WQ: On 02/22/2023: YSI Exo Sonde #13J10771: C/T 17K103475 sensor replaced for a new C/T sensor 22K101001 but don't read.

JOB20WQ: On 04/19/2023: YSI Exo Sonde #13J10771 are replaced for new Sonde #14K101410.

JOB20WQ: On 04/19/2023: YSI Exo Sonde #14K101410: C/T 22K101001 sensor replaced for a new C/T sensor 22K101004 but don't read.

JOB20WQ: On 08/17/2023: YSI Exo Sonde #14K101410: C/T 22K101004 sensor replaced for a new C/T sensor 22K101002 but don't read.

JOB20WQ:

Other:

Significant rain events:

Date	Precipitation (mm)	Event associated with
04/08/2023	33.5	
05/22/2023	31.7	
05/28/2023	38.4	
06/29/2023	52.6	
08/10/2023	29.0	
08/21/2023	44.5	
10/03/2023	53.8	
10/04/2023	107.9	
10/29/2023	53.3	
12/17/2023	46.5	