

**North Carolina (NOC) NERR Water Quality Metadata**  
**January 1, 2013 – December 31, 2013**  
**Latest Update:** March 15, 2014

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](mailto:cdmosupport@belle.baruch.sc.edu)) or Reserve with any additional questions.

**I. Data Set and Research Descriptors**

**1) Principal investigator(s) and contact persons**

Vacant, Research Coordinator  
400 Commerce Ave.  
Morehead City, NC 28557  
Phone: (252) 838-0884  
Fax: (252) 247-3330  
Email: currently vacant

Byron Toothman, Research Associate  
5600 Marvin K. Moss Lane  
Wilmington, NC 28409  
Phone: (910) 962-2334  
Fax: (910) 962-2410  
Email: [toothmanb@uncw.edu](mailto:toothmanb@uncw.edu)

Heather Wells, Research Associate  
5600 Marvin K. Moss Lane  
Wilmington, NC 28409  
Phone: (910) 962-2335  
Fax: (910) 962-2410  
Email: [wellsh@uncw.edu](mailto:wellsh@uncw.edu)

**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; automated depth/level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12. All QA/QC by the Reserve are performed by Heather Wells and Byron Toothman.

### 3) Research objectives

Four long-term water quality monitoring stations have been established within the estuaries bordering Masonboro and Zeke's Islands of North Carolina's National Estuarine Research Reserve. Instruments are deployed vertically at all sites except East Cribbings, which was anchored to the bottom for the majority of 2012. The East Cribbings site was converted to a vertical deployment structure on December 4, 2012. Measurements are taken at 15-minute intervals for approximately two to four week periods continuously throughout the year. Parameters measured include Depth, Temperature, Salinity, Specific Conductivity, pH, Dissolved Oxygen, and Turbidity. The goal is to assess short-term variability and long-term changes (i.e., localized impacts of seasonal storm events, inter-annual differences from rainfall, magnitude of climatic influence from El Nino/La Nina events, etc.) in estuarine water parameters within relatively pristine sites.

### 4) Research methods

The Estuarine Water Quality Monitoring Program began on March 2, 1992 at the Research Creek site of the Masonboro Island component. A second Masonboro Island site, Loosin Creek, was added on February 26, 2002. Data collection started on May 19, 1994 at the Zeke's Island component (East Cribbings site) and an additional site, Zeke's Basin, was added March 1, 2002. The procedures described below were instituted in June 1995 and thus do not cover data recorded previously.

Two data loggers are assigned to each of the four permanent monitoring stations and are generally not interchanged among sites unless malfunctions occur. Before each YSI 6600EDS is deployed, calibration and maintenance is performed following the manufacturer's instructions. Calibration standards are required for pH, turbidity and salinity; all other parameter calibrations are performed as described in the manual. Buffer solutions for a two-point pH calibration (pH 7 and 10) are purchased pre-made from a scientific supply house. The conductivity and turbidity standards are obtained from YSI. The optical dissolved oxygen probes (ROX) require membrane changes yearly unless scratches or malfunctions occur prior to that time. All sites have been monitored using ROX dissolved oxygen probes since 2009, prior to that time rapid pulse dissolved oxygen probes were used. The rapid pulse membranes were replaced prior to each deployment and allowed to equilibrate prior to calibration.

Data sondes are wrapped in a wet, white towel and placed in a cooler for transport to the site. Monitoring stations are accessed using a small boat equipped with an outboard motor. During deployment the weather conditions and tide stage are recorded in the field observation log. The water quality instrument is placed inside a locked PVC tube that is attached to a piling if vertical deployment, and a steel cage if anchored horizontally approximately (15cm off the bottom). Every 15 minutes measurements are taken for Temperature, Specific Conductance, Salinity, Dissolved oxygen saturation, Dissolved oxygen concentration, Depth, pH, and Turbidity. All data are recorded in Eastern Standard Time. Vertical deployment structures were utilized at Research Creek beginning in 2008-2009, at Loosin Creek in 2009, and at Zeke's Basin in August 2010.

At the end of the sample period the water quality instrument is exchanged with a freshly calibrated instrument and transported back to the laboratory wrapped in a wet, white towel. The weather and water quality measurements are again noted in the field observation log. The calibration drift and the effect of biofouling on the water quality instrument are documented by post-calibration protocols. The water quality data are then uploaded, and sent to CDMO for primary QAQC, and the instrument is cleaned and calibrated as noted previously.

A Sutron Sat-Link2 transmitter was installed at the Research Creek station on August 7, 2006, and at the Zeke's Basin station on November 3, 2008. Both transmit data to the NOAA GOES satellite, NESDIS ID #3B032698. 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>.

## 5) Site location and character

The components of North Carolina's National Estuarine Research Reserve (from north to south) are: Currituck Banks, Rachel Carson, Masonboro Island, and Zeke's Island. They are located along the southeast Atlantic coast of the United States. Currently, only data from Masonboro Island and Zeke's Island components are transferred to the CDMO. The four monitoring sites are:

### A. Research Creek, Masonboro Island

The first Masonboro Island site (formerly called Masonboro Island (MS)) is 0.72 km north east from the mouth of Whiskey Creek, and east of the Intracoastal Waterway (ICW), in a small navigable channel called Research Creek at 34°09'21.7" latitude and 77° 50'59.9" longitude. The site typically has a salinity range of 20-35 ppt and a tidal range that averages around 1.2 meters. The sole source of freshwater is rain and salinity values as little as 10 ppt have been recorded during periods of heavy rain. The creek bottom is characterized by sand and detritus based sediment with areas of soft mud with a depth ranging from 0.2 to 2.6 m. *Spartina* spp. marsh and dunes surround the site, which is relatively unimpacted by manmade perturbations and it is not accessible to road traffic. The site experiences minimal boat traffic.

### B. Loosin Creek, Masonboro Island

The second Masonboro Island site (added in 2002) is 1.2 km east of the ICW, and 2.5 km south west of Masonboro Inlet, in a small navigable channel called Loosin Creek at 34° 10'20.0" latitude and 77° 49'58.1" longitude. The site generally has a salinity range of 22-35 ppt and a tidal range that averages 1.2 meters. The sole source of freshwater is rain and salinity values as little as 15 ppt have been recorded during periods of heavy rain. The creek bottom is characterized by sand and detritus based sediment with areas of soft mud with a depth ranging from 0.1 to 2.5 m. *Spartina* spp. marsh and dunes surround the site, which is relatively unimpacted by manmade perturbations and it is not accessible to road traffic. The site experiences minimal boat traffic.

### C. East Cribbings, Zeke's Island

The first Zeke's Island site (formerly called Zeke's Island (ZI)) is located 1.8 km south of Federal Point boat launch in a tidal basin estuary at 33° 56'23.5" latitude and 77° 56'28.1" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site typically has a salinity range of 15-33 ppt, although values as little as 10 ppt have been recorded. Tidal range averages 1.2 meters. Depth varies, but usually can be found to range from 0.5 to 2.7 meters. Bottom type substratum consists of large rocks (“the cribbings”) with sand and detritus based sediment. There are no pollutants from land. Marsh and dunes surround the site. It is not accessible to road traffic but experiences minimal boat traffic.

### D. Zeke's Basin, Zeke's Island

The second Zeke's Island site (added in 2002) is located 0.8 km south east of the Federal Point boat launch in a tidal basin estuary at 33° 57'17.0" latitude and 77° 56'6.0" longitude. This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separates the two bodies of water. The site has a characteristic salinity range of 12-30 ppt, but values below 10 ppt have been observed and are often associated with periods of heavy rainfall. Tidal range averages 1.2 meters. Depth varies, but typically it can be found to range from 0.1 to 1.8 meters. Bottom type substratum consists of sand and detritus based sediment with a layer of soft sulfuric mud. Marsh and dunes surround the site. It is not accessible to road traffic but experiences minimal boat traffic.

## 6) Data collection period

### East Cribbings

| Deployment date | time  | Retrieval date | time  |
|-----------------|-------|----------------|-------|
| 01/16/2013      | 12:45 | 02/15/2013     | 14:00 |
| 02/15/2013      | 14:15 | 03/11/2013     | 11:15 |
| 03/11/2013      | 11:30 | 04/10/2013     | 10:45 |
| 04/10/2013      | 11:00 | 05/14/2013     | 14:45 |
| 05/14/2013      | 15:00 | 06/12/2013     | 13:00 |
| 06/12/2013      | 13:15 | 07/09/2013     | 12:00 |
| 07/09/2013      | 12:15 | 08/07/2013     | 11:45 |
| 08/07/2013      | 12:00 | 09/10/2013     | 13:45 |
| 09/10/2013      | 14:15 | 10/07/2013     | 11:00 |
| 10/07/2013      | 11:15 | 11/06/2013     | 11:45 |
| 11/06/2013      | 12:00 | 12/09/2013     | 15:15 |
| 12/09/2013      | 15:30 | 01/16/2014     | 11:30 |

### Loosin Creek

| Deployment date | time  | Retrieval date | time  |
|-----------------|-------|----------------|-------|
| 01/10/2013      | 11:15 | 02/15/2013     | 13:00 |
| 02/15/2013      | 13:30 | 03/11/2013     | 09:45 |
| 03/11/2013      | 10:00 | 04/08/2013     | 10:00 |
| 04/08/2013      | 10:15 | 05/14/2013     | 12:45 |
| 05/14/2013      | 13:00 | 06/12/2013     | 11:30 |
| 06/12/2013      | 11:45 | 07/09/2013     | 10:45 |
| 07/09/2013      | 11:00 | 08/08/2013     | 11:00 |
| 08/08/2013      | 11:30 | 09/10/2013     | 11:45 |
| 09/10/2013      | 12:00 | 10/09/2013     | 11:00 |
| 10/09/2013      | 11:15 | 11/07/2013     | 10:45 |
| 11/07/2013      | 11:00 | 12/10/2013     | 15:45 |
| 12/10/2013      | 16:00 | 01/16/2014     | 10:15 |

### Research Creek

| Deployment date | time  | Retrieval date | time  |
|-----------------|-------|----------------|-------|
| 01/15/2013      | 13:15 | 01/16/2013     | 12:00 |
| 01/16/2013      | 12:30 | 02/15/2013     | 12:45 |
| 02/15/2013      | 13:00 | 03/11/2013     | 09:45 |
| 03/11/2013      | 10:00 | 03/27/2013     | 09:45 |
| 04/08/2013      | 10:00 | 05/14/2013     | 13:00 |
| 05/14/2013      | 13:15 | 06/12/2013     | 11:15 |
| 06/12/2013      | 11:30 | 07/09/2013     | 10:30 |
| 07/09/2013      | 10:45 | 08/08/2013     | 11:15 |
| 08/08/2013      | 11:30 | 09/10/2013     | 12:15 |
| 09/10/2013      | 12:30 | 10/09/2013     | 10:15 |
| 10/09/2013      | 10:30 | 10/24/2013     | 12:15 |
| 10/24/2013      | 12:30 | 11/07/2013     | 11:00 |
| 11/07/2013      | 11:30 | 12/10/2013     | 16:00 |
| 12/10/2013      | 16:30 | 01/16/2013     | 10:30 |

## **Zeke's Basin**

| Deployment date | time  | Retrieval date | Time  |
|-----------------|-------|----------------|-------|
| 01/16/2013      | 13:45 | 02/15/2013     | 14:30 |
| 02/15/2013      | 14:45 | 03/11/2013     | 11:30 |
| 03/11/2013      | 11:45 | 04/10/2013     | 11:00 |
| 04/10/2013      | 11:30 | 05/14/2013     | 14:15 |
| 05/14/2013      | 14:45 | 06/12/2013     | 13:15 |
| 06/12/2013      | 13:30 | 07/09/2013     | 12:15 |
| 07/09/2013      | 12:30 | 08/07/2013     | 11:00 |
| 08/07/2013      | 11:15 | 09/10/2013     | 14:00 |
| 09/10/2013      | 14:30 | 10/07/2013     | 11:00 |
| 10/07/2013      | 11:30 | 11/06/2013     | 12:15 |
| 11/06/2013      | 12:30 | 12/09/2013     | 15:45 |
| 12/09/2013      | 16:00 | 01/16/2013     | 11:45 |

## **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 the SWMP core monitoring program, the North Carolina Reserve also collects weather data from a meteorological station located at the Research Creek monitoring site and water chemistry/nutrient data from all 4 of the water quality monitoring sites. These data may be correlated with the water quality data.

Additional research projects are ongoing and continually changing. Check with the Research Coordinator or other contact person for an updated list of research.

## **II. Physical Structure Descriptors**

**9) Sensor specifications** – Include the parameter description, units, sensor type, model #, range of measurement, accuracy and resolution for each sensor for all measuring devices (6600, 6600 EDS, 6600 EDS V2, 6600 V2, or EXO).

NOC NERR deployed 6600EDS at Research Creek and Zeke's Basin during 2013 and at East Cribbings and Loosin Creek for January – May 2013. 6600 V2 sondes were used at East Cribbings and Loosin Creek beginning May 14, 2013, with vented V2s at East Cribbings and non-vented at Loosin Creek.

YSI 6600EDS data sonde:

Parameter: Non-vented Level EDS-S

Units: meters

Sensor Type: Stainless steel strain gauge

Range: 0 to 10ft

Accuracy: +/- 0.06 ft (0.018 m)

Resolution: 0.001 ft (0.001 m)

YSI 6600V2-4 data sonde:

Parameter: Vented Level V2-SV

Units: meters

Sensor Type: Stainless steel strain gauge

Range: 0 to 10m

Accuracy:  $\pm 0.01$  ft,  $0.003$  m

Resolution: 0.001 ft (0.001 m)

YSI 6600 V2 vented data sonde:

Parameter: Vented Level V2-SV

Units: meters

Sensor Type: Stainless steel strain gauge

Range: 0 to 10m

Accuracy:  $\pm 0.06$  ft,  $\pm 0.02$  m

Resolution: 0.001 ft (0.001 m)

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

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

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 (0-10m)

Units: meters

Sensor Type: Stainless steel strain guage

Range 0-30ft

Accuracy: +/- 0.06 ft (0.018m)

Resolution: 0.001 ft (0.001m)

Parameter: pH – bulb probe or EDS flat glass 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

Parameter: Chlorophyll

Units: µg/L

Sensor Type: Optical

Model#: 6025

Range: 0 – 400 µg/L

Resolution: 0.1 µg/L Chl

### **Dissolved Oxygen Qualifier:**

The reliability of the dissolved oxygen (DO) data after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Many reserves have upgraded to the YSI 6600 EDS data sondes, which increases DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and to

exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. The Research Coordinator at the specific NERR site should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor.

#### **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.

#### **10) Coded variable definitions:**

| <u>Sampling station:</u> | <u>Sampling site code:</u> | <u>Station code:</u> |
|--------------------------|----------------------------|----------------------|
| Research Creek           | RC                         | nocrcwq              |
| Loosin Creek             | LC                         | noclcwq              |
| East Cribbings           | EC                         | nocecwq              |
| Zeke's Basin             | ZB                         | noczbwq              |

#### **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

#### East Cribbings

| <u>Deployment Date</u> | <u>depth</u><br>(meters) | <u>DO 1</u><br>(100% sat) | <u>DO 2</u><br>(100% sat) | <u>Sp Cond</u><br>(50 mS/cm) | <u>pH</u><br>(7) | <u>pH</u><br>(10) | <u>BP</u><br>(mmHg) | <u>turb</u><br>(0 NTU) |
|------------------------|--------------------------|---------------------------|---------------------------|------------------------------|------------------|-------------------|---------------------|------------------------|
| 01/16/2013             | -0.016                   | 99.8                      | 99.8                      | 49.90                        | 6.98             | 9.90              | 758.2               | 3.0                    |
| 02/15/2013             | -0.040                   | 99.7                      | 99.7                      | 51.20                        | 6.94             | 9.92              | 758.2               | -0.5                   |
| 03/11/2013             | -0.027                   | 99.2                      | 99.2                      | 48.34                        | 7.00             | 9.97              | 761.2               | -3.2                   |
| 04/10/2013             | 0.025                    | 96.2                      | 96.0                      | 53.91                        | 6.90             | 9.67              | 760.5               | 0.6                    |
| 05/14/2013             | 0.249                    | 98.4                      | 98.4                      | 45.08                        | 7.10             | 9.99              | 760.5               | 13.4                   |
| 06/12/2013             | 0.560                    | 105.5                     | 105.2                     | 45.90                        | 7.11             | 9.34              | 767.3               | -0.2                   |
| 07/09/2013             | 0.307                    | 99.5                      | 99.5                      | 48.23                        | 6.97             | 9.86              | 761.2               | 0.8                    |
| 08/07/2013             | 0.954                    | 101.4                     | 101.4                     | 51.19                        | 7.15             | 9.87              | 765.0               | -0.3                   |
| 09/10/2013             | -0.044                   | *                         | *                         | 49.44                        | 7.19             | 9.41              | 759.0               | 0.6                    |
| 10/07/2013             | -0.129                   | 102.2                     | 102.2                     | 51.65                        | 7.09             | 9.94              | 765.0               | 1.2                    |
| 11/06/2013             | 0.286                    | 100.2                     | 100.1                     | 50.33                        | 7.25             | 10.12             | 769.6               | 0.6                    |
| 12/09/2013             | -0.004                   | 99.3                      | 99.3                      | 50.79                        | 7.15             | 10.00             | 769.0               | 0.2                    |

\*dissolved oxygen values not saved after 9/10/13 deployment

#### Loosin Creek

| <u>Deployment Date</u> | <u>depth</u><br>(meters) | <u>DO 1</u><br>(100% sat) | <u>DO 2</u><br>(100% sat) | <u>Sp Cond</u><br>(50 mS/cm) | <u>pH</u><br>(7) | <u>pH</u><br>(10) | <u>BP</u><br>(mmHg) | <u>turb</u><br>(0 NTU) |
|------------------------|--------------------------|---------------------------|---------------------------|------------------------------|------------------|-------------------|---------------------|------------------------|
| 01/10/2013             | 0.138                    | 103.1                     | 103.2                     | 50.68                        | 6.95             | 9.82              | 769.6               | 0.5                    |
| 02/15/2013             | -0.029                   | 99.1                      | 99.0                      | 49.77                        | 7.03             | 9.98              | 758.2               | -0.6                   |
| 03/11/2013             | 0.057                    | 100.0                     | 100.0                     | 48.77                        | 6.98             | 9.94              | 764.3               | -0.3                   |
| 04/08/2013             | 0.027                    | 100.2                     | 100.3                     | 41.39                        | 7.09             | 9.79              | 760.5               | 0.9                    |
| 05/14/2013             | -0.034                   | 100.8                     | 100.8                     | 47.62                        | 7.02             | 9.91              | 758.2               | 1.5                    |
| 06/12/2013             | 0.088                    | 99.2                      | 99.1                      | 49.97                        | 7.19             | 9.82              | 767.3               | 14.3                   |
| 07/09/2013             | 0.024                    | 100.3                     | 100.3                     | 48.01                        | 7.14             | 9.94              | 762.0               | 4.4                    |
| 08/08/2013             | 0.075                    | 99.7                      | 99.7                      | 26.23                        | 7.16             | 9.67              | 765.0               | 0.2                    |
| 09/10/2013             | -0.012                   | 100.2                     | 100.2                     | 50.44                        | 7.31             | 8.04              | 759.0               | 12.8                   |
| 10/09/2013             | 0.115                    | 100.9                     | 100.8                     | 48.59                        | 7.19             | 9.46              | 765.0               | 1.7                    |
| 11/07/2013             | 0.113                    | 99.5                      | 99.4                      | 50.98                        | 7.11             | 9.92              | 768.1               | -1.4                   |
| 12/10/2013             | 0.022                    | 100.7                     | 100.7                     | 50.12                        | 7.42             | 10.21             | 762.0               | 1.9                    |

**Research Creek**

| <u>Deployment Date</u> | <u>depth</u><br>(meters) | <u>DO 1</u><br>(100% sat) | <u>DO 2</u><br>(100% sat) | <u>Sp Cond</u><br>(50 mS/cm) | <u>pH</u><br>(7) | <u>pH</u><br>(10) | <u>BP</u><br>(mmHg) | <u>turb</u><br>(0 NTU) |
|------------------------|--------------------------|---------------------------|---------------------------|------------------------------|------------------|-------------------|---------------------|------------------------|
| 01/15/2013             | -0.016                   | 99.8                      | 99.8                      | 49.90                        | 6.98             | 9.90              | 758.2               | 3.0                    |
| 01/16/2013             | -0.019                   | 99.0                      | 99.0                      | 50.56                        | 7.00             | 9.19              | 759.0               | -0.2                   |
| 02/15/2013             | -0.019                   | 100.5                     | 100.4                     | 50.88                        | 7.04             | 10.06             | 758.2               | 0.7                    |
| 03/11/2013             | 0.046                    | 100.2                     | 100.2                     | 50.04                        | 7.11             | 10.04             | 764.3               | -0.2                   |
| 04/08/2013             | 0.026                    | 100.8                     | 100.8                     | 50.00                        | 6.98             | 9.47              | 760.5               | 0.3                    |
| 05/14/2013             | -0.045                   | 100.2                     | 100.2                     | 48.59                        | 7.02             | 9.89              | 760.5               | 8.5                    |
| 06/12/2013             | 0.091                    | 82.1                      | 82.1                      | 48.20                        | 7.08             | 10.02             | 767.3               | 0.8                    |
| 07/09/2013             | 0.022                    | 99.0                      | 99.0                      | 49.08                        | 7.09             | 9.41              | 762.0               | 1.2                    |
| 08/08/2013             | 0.055                    | 40.8                      | 40.7                      | 48.44                        | 7.32             | 8.52              | 765.0               | 109.5                  |
| 09/10/2013             | -0.004                   | 100.7                     | 100.7                     | 46.92                        | 7.03             | 9.57              | 759.0               | -1.4                   |
| 10/09/2013             | 0.077                    | 101.3                     | 101.3                     | 50.62                        | 7.04             | 9.96              | 765.0               | 938.9                  |
| 10/24/2013             | 0.112                    | 98.8                      | 99.2                      | 48.75                        | 7.14             | 10.17             | 765.0               | 1.4                    |
| 11/07/2013             | 0.135                    | 101.9                     | 101.9                     | 50.36                        | 6.56             | 9.32              | 769.6               | -0.2                   |
| 12/10/2013             | 0.023                    | 101.9                     | 101.9                     | 49.83                        | 6.96             | 9.87              | 769.0               | 0.6                    |

**Zeke's Basin**

| <u>Deployment Date</u> | <u>depth</u><br>(meters) | <u>DO 1</u><br>(100%sat) | <u>DO 2</u><br>(100% sat) | <u>Sp Cond</u><br>(50mS/cm) | <u>pH</u><br>(7) | <u>pH</u><br>(10) | <u>BP</u><br>(mmHg) | <u>turb</u><br>(0 NTU) |
|------------------------|--------------------------|--------------------------|---------------------------|-----------------------------|------------------|-------------------|---------------------|------------------------|
| 01/16/2013             | 0.142                    | 101.8                    | 102.2                     | 49.95                       | 7.05             | 9.77              | 770.4               | -0.7                   |
| 02/15/2013             | -0.028                   | 100.2                    | 99.7                      | 14.43*                      | 7.11             | 9.92              | 758.2               | 0.7                    |
| 03/11/2013             | 0.026                    | 99.8                     | 99.5                      | 50.69                       | 6.22             | 6.18              | 761.2               | -2.7                   |
| 04/10/2013             | 0.078                    | 99.4                     | 99.4                      | 49.44                       | 7.05             | 9.89              | 760.5               | 0.9                    |
| 05/14/2013             | -0.015                   | 98.1                     | 98.1                      | 53.08                       | 6.65             | 9.64              | 760.5               | -0.5                   |
| 06/12/2013             | 0.069                    | 17.8                     | 17.8                      | 50.22                       | 7.10             | 10.15             | 767.3               | -0.2                   |
| 07/09/2013             | 0.335                    | 100.2                    | 100.2                     | 50.15                       | 7.52             | 10.53             | 761.2               | 0.5                    |
| 08/07/2013             | -0.040                   | 104.2                    | 104.3                     | 49.43                       | 7.28             | 9.94              | 765.0               | 3.4                    |
| 09/10/2013             | 0.013                    | 99.8                     | 99.8                      | 49.62                       | 7.57             | 9.96              | 760.5               | 2.0                    |
| 10/07/2013             | 0.114                    | 99.8                     | 99.8                      | 49.62                       | 7.48             | 9.60              | 765.0               | -0.6                   |
| 11/06/2013             | 0.103                    | 100.8                    | 100.7                     | 30.47                       | 6.01             | 6.70              | 769.6               | 9.1                    |
| 12/09/2013             | **                       | 97.2                     | 97.1                      | 50.71                       | 6.44             | 8.89              | 769.0               | 3.3                    |

\* After rinsing conductivity thoroughly SpCond = 50.09

\*\*Depth not recorded to data sheet, assuming it is within normal range

**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**

The area around our SWMP sites received heavy rainfall, approximately 2.41 inches on June 6-7, 2013. There was a decrease in Salinity/Conductivity initially following this rain event. Inland areas also experienced heavy rain during this time, resulting in decreased salinity of the Lower Cape Fear River Estuary, affecting the Zeke's Basin and East Cribbings sites.

The area around our SWMP sites received over 2 inches of rain on July 12, 2013.

**For all data**

New deployments were flagged as <0> (CND).

Temperature affected measurements (SpCond/Salinity, pH) were rejected anytime the temperature sensor was affected by out of water events (pronounced change in temp values during extreme low tide readings).

Data affected by low tide were coded (CLT). Lower SpCond/Salinity was addressed with <1> (CLT) due to the probability of fresher surface waters being measured as the water level decreased. Salinities approaching zero or less were addressed as <-3> [GOW] (CLT) and affected data were also rejected accordingly.

All depth data corresponding to rejected or suspect SpCond/Salinity data (due to low tide) were also rejected <-3> [SOW] (CLT) or flagged as suspect <1>[SOW](CLT). Depth sensor is located above Conductivity/Temperature (C/T) sensor and will be exposed when SpCond approaches 0.0. It is possible that some probes were still in the water during out of water events. The vertical orientation of the sondes means that shorter probes (pH, C/T) will be affected before longer probes (dissolved oxygen, turbidity).

All negative depth flagged and rejected <-3> [SOW] (CLT) unless affected by barometric pressure and coded as suspect <1> [SNV](CAP).

Dissolved oxygen concentrations <3mg/L was coded <0> (CDA) along with corresponding values for DO% during hypoxic events.

Increased turbidity readings occurred throughout many deployments with unknown causes and were coded as such:

<-3> [STS] (CCU) = rejected turbidity spike

<1> [STS] (CCU) = Suspect turbidity spike

Small negative turbidity values <-2 NTU were flagged as suspect, <1> (CAF).

Chlorophyll data collection began at East Cribbings on 05/14/2013 15:00 and at Loosin Creek on 5/14/2013 13:00. Optical YSI 6025 Chlorophyll Sensors (6-Series) were deployed using YSI 6600 V2 sondes at both locations.

**East Cribbings****General**

This site is within a shallow lagoonal system and the sonde is subject to out of water events, especially at spring low tides. (Vertical deployment has been in place since 12/04/12.

Chlorophyll data collection began 05/14/2013 15:00. An optical YSI 6025 Chlorophyll Sensor (6-Series) was deployed using a YSI 6600 V2 sonde.

Vented V2 sonde deployed at East Cribbings beginning 04/10/2013 11:00.

Missing data due to sonde swap: 09/10/2013 14:00.

Out of water events are described in Depth section.

10/07/13 – 11/06/13, data may have been affected by a failing temperature/conductivity probe. Data were rejected, flagged <3> [SCF] (CSM) for salinity/conductivity, depth, pH, turbidity, and chlorophyll. ONLY temperature looked bad, though QAQC protocols require that the other

parameters are flagged as well. All other parameters looked good, fit conditions for the site and transitioned smoothly between deployments.

### Temperature

February and March deployments begin with disjunct data. Data not flagged.

06/12/13 – 07/09/13, temperature data disjunct from adjacent deployments and seems low for this deployment. The problem may have extended to other deployments of this probe. Flagged <1> [SQR] (CSM).

08/07/13 – 09/10/13, temperature data disjunct from adjacent deployments and seems low for this deployment. The problem may have extended to other deployments of this probe. Flagged <1> [SQR] (CSM).

10/07/13 – 11/06/13, temperature data disjunct from adjacent deployments and seems low for this deployment. Flagged <3> [STF] (CSM) for catastrophic temperature failure.

### SpCond/Salinity

05/14/13 deployment, post calibration was unacceptable. Data were disjunct from surrounding deployments, possibly from a contaminated standard. All data flagged suspect, <1> [SIC] (CDF). Data appear to fit conditions.

06/12/13 deployment, post calibration was unacceptable. All data flagged suspect, <1> [SPC] (CDF). Data appear to fit conditions.

07/09/13 deployment, post calibration was unacceptable. All data flagged suspect, <1> [SPC] (CDF). Data appear to fit conditions but there was a slight increase (4 mS).

10/07/13 – 11/06/13, data may have been affected by a failing temp/cond probe. Flagged <3> [SCF] (CSM) for salinity/conductivity, depth, pH, turbidity and chlorophyll.

### Dissolved Oxygen

Dissolved oxygen data can be quite variable. These cycles often correlate with tidal fluctuation, and may be accentuated by presence of invasive drift algae, *Gracilaria vermiculophylla*.

Values above 100% saturation are not uncommon and values above 200% may occur during warmer months. These reflect conditions at the site, occurring at the same time as elevated pH values and data were retained (unless affected by out of water events, potentially driven by *G. vermiculophylla* presence). Data were not flagged as suspect though some of the upper limits for percent saturation were surpassed.

02/15/13 deployment, variable dissolved oxygen and pH values occurred beginning 03/06/13 through end of deployment. These events correlated with tidal cycles, decreasing on outgoing tides and increasing with incoming tides, and data were retained. This pattern continued in the next deployment and may correlate with the presence of drift macroalgae, *G. vermiculophylla*.

4/10/13 – 5/14/13 deployment, sediment likely filling in deployment tube due to recent weather events. Initially flagged as suspect <1> [SBO] (CMD), due to blocked optics through 04/12/2013 01:45. Following that time data were rejected <-3> [SBO] (CMD), through the end of the deployment.

06/08/2013 17:00, data were rejected <-3> [SBO] (CMD), sediment may have filled deployment tube and cleared naturally by currents and tides.

05/14/2013 through 06/08/2013 17:15, experienced unusually low dissolved oxygen likely due to biofouling/silt accumulation. This was most likely cleared during storm event that coincided with lower salinity around this time.

06/08/2013 17:15 to end of deployment. DO post calibration unacceptable and data flagged as suspect <1> [SPC] (CDF).

10/07/13 – 11/06/13, data may have been affected by a failing temperature/conductivity probe. Flagged <3> [SCF] (CSM) for salinity/conductivity, and depth.

11/06/13 deployment, was coded as suspect with wiper malfunction. The sensor was functioning properly during the calibration procedure, but wiper was parked over the optics upon sonde retrieval. Data appears to fit conditions for the site during this time.

### **pH**

02/15/13 deployment, variable pH and dissolved oxygen values occurred beginning 03/06/13 through end of deployment. These events correlated with tidal cycles, decreasing on outgoing tides and increasing with incoming tides, and data were retained.

04/10/13 deployment, pH post cal was unacceptable and slope was outside acceptable range. All data flagged suspect, <1> [SPC] (CDF). Data appear to fit conditions.

06/12/13 deployment, pH post cal was unacceptable and slope was outside acceptable range. All data flagged suspect, <1> [SPC] (CDF). Data appear to fit conditions.

09/10/13 deployment, pH post cal was unacceptable with low slope and out of range in pH 10 standard.

10/07/13 – 11/06/13, data may have been affected by a failing temp/cond probe. Flagged <1> (CSM) because the post calibration slope was low, values for post cal in pH 7 and 10 were acceptable.

11/06/13 – 12/09/13, pH failed to post calibrate within acceptable range for pH 7. Data appears to fit conditions and pH 10 and slope were within acceptable ranges. Data were flagged as suspect, <1> [SPC] (CDF).

### **Turbidity**

01/16/13 deployment, post calibration was above the acceptable range. Field values appear to reflect conditions for the site, data were flagged as <1> [SPC] (CDF).

03/11/13 deployment, sensor did not pass post calibration within acceptable range. There may have been an issue with the initial calibration as there were several negative readings throughout the deployment. Turbidity data for entire deployment were flagged as suspect.

05/14/13 deployment, post calibration was above the acceptable range. Field values appear to reflect conditions for the site, data were flagged as <1> [SPC] (CDF).

09/05/2013 00:00 - 09/10/2013 13:45 Elevated turbidity values were rejected. Probe likely fouled by mud or algae. Barnacles were found growing on the wipers upon retrieval. Flagged <-3> [SSM] (CBF).

### **Chlorophyll.**

Negative values rejected and flagged <-3> [SNV]. Occasional values of 500ug/L were recorded. This exceeds the working range of the probe (0-400ug/L) and were rejected and flagged <-3> [SQR] (CCU).

06/21/2013 01:45 - 06/21/2013 02:15 data spiked to 500ug/L. Data were rejected due to QAQC checks, cause unknown, flagged as <-3> [SQR] (CCU).

Chlorophyll data not uploaded for 07/09/13 – 08/07/13 deployment.

## **Loosin Creek**

### **General**

This site typically has low turbidity values, occasionally these values approach zero and fit conditions of the site. Negative one readings were retained and marked as (CAF), acceptable calibration/accuracy error of the sensor.

During the early morning hours of 01/08/13, extremely low dissolved oxygen concentrations were recorded. A large fish kill was observed during the days that followed. Atlantic menhaden were both the victim and likely cause of hypoxic events in small lagoons behind the Masonboro Island near our SWMP station. These data were retained and flagged as <0> (CFK).

A chlorophyll sensor was added at this site on 05/14/13.

Missing data due to sonde swap: 02/15/13 13:15, 04/08/13 10:00, 08/08/13 11:15 and 10/09/13 11:00.

Missing data due to battery failure: 12/02/13 – 12/10/13.

### **Depth**

Out of water events occurred and resulted in rejected or suspect data in the February 15, 2013 deployment.

There were several times that changes in barometric pressure affected the depth sensor. The depth records were flagged as suspect, <1> [SNV] (CAP) when the values were negative but the sensors were still in the water.

An out of water event occurred on 03/06/13 and all parameters were rejected for 21:15 and 21:30. Depth records on either side of this event were flagged as suspect due negative values, sensor affected by barometric pressure changes.

The first reading in the 03/11/13 deployment, at 10:00, may have occurred as sonde was lowered into deployment structure. The data were retained but the reading may have been collected at the wrong depth, flagged as <1> (CWD).

### **SpCond/Salinity**

An out of water event occurred on 03/06/13 and SpCond/Salinity affecting readings 21:00 through 21:45. The sensor was likely in the water for the 21:00 and 21:45 readings but may have sampled a fresh water lens resulting in lower values than those normally found at this site.

04/08/13 deployment, SpCond/Salinity did not pass post calibration with acceptable range. Records were rejected beginning 4/25/13 through the end of the deployment.

05/14/13 deployment, SpCond/Salinity did not pass post calibration with acceptable range. Though values seem to fit conditions for the site, records were flagged as suspect for the entire deployment.

07/09/13 deployment, SpCond/Salinity did not pass post calibration with acceptable range. Though values seem to fit conditions for the site, records were flagged as suspect for the entire deployment. Lower than normal values were recorded for 7/12/13. Records indicate that the area received over 2 inches of rain on this date and these values reflect the fresh water pulse from these rain events. These records were flagged as <1> [SPC] (CRE), significant rain event.

08/08/13 deployment, SpCond/Salinity did not pass post calibration with acceptable range. Values decreased around the middle of the deployment and probes were fouled upon retrieval. From 08/25/13 through the end of the deployment records were flagged as suspect.

12/18/13 2:00 and 2:15, SpCond/Salinity values dropped at low tide, and may be sampling a fresh water lens. It appears that all probes were still in the water for these readings.

### **Dissolved Oxygen**

During the early morning hours of 01/08/13, extremely low dissolved oxygen concentrations were recorded. A large fish kill was observed during the days that followed. Atlantic menhaden were both the victim and likely cause of hypoxic events in small lagoons behind the Masonboro Island near our SWMP station. These data were retained and flagged as <0> (CFK).

Following the 02/15/13 and 03/11/13 deployments, the dissolved oxygen sensor wiper had the macroalgae *Enteromorpha* wrapped in the assembly. Data may have been affected by the presence of algae but it was retained without flagging as the post calibration values were within acceptable ranges.

### **pH**

A decrease in pH values on 01/08/13 was recorded during the fish kill event described in the dissolved oxygen section. These data were retained and flagged as <0> (CFK).

04/08/13 deployment, pH probe passed calibration and post calibration but slope was low. Values for the deployment seemed low and were flagged as suspect. This probe did not calibrate properly for the next deployment and was retired.

06/12/13 deployment, pH probe passed calibration and post calibration but slope was low. Values fit conditions for the site and were retained. There were instances of elevated pH ~8.3 on 06/12/13-06/14/13 at low tide, but high turbidity values were recorded at these times too. Macroalgae may have been present during deployment and biofouling was documented upon sonde's retrieval.

08/08/13 deployment, pH did not pass post calibration with acceptable range. Values increased around the middle of the deployment and probes were fouled upon retrieval. From 08/25/13 through the end of the deployment records were flagged as suspect.

09/10/13 deployment, pH did not pass post calibration with acceptable range. The entire deployment was flagged as suspect.

10/09/13 deployment, pH did not pass post calibration with acceptable range. The sensor was heavily fouled with algae upon sonde retrieval. Though the drift may have occurred mid deployment, the entire deployment was flagged as suspect.

12/10/13 deployment, pH did not pass post calibration with acceptable range. The values were elevated and the entire deployment was rejected.

### **Turbidity**

Beginning 01/24/13, turbidity values were slightly elevated with the tidal cycles and flagged as suspect <1> [SWM] (CTS). The sensor passed post calibration with acceptable values but was

missing the turbidity wiper upon retrieval. Values were increasingly elevated and rejected from 02/07/13 through the end of the deployment using the <-3> [SWM] (CTS) code. All values above 1000 NTUs were also rejected during this time. The following deployment did not reflect the elevated turbidity pattern, and it was assumed that the missing wiper impacted the quality of the data. Low values during this time may reflect conditions of the site but the flagging was extended to entire dataset due to QAQC checks.

Following the 02/15/13 deployment, the dissolved oxygen sensor wiper had macroalgae, *Enteromorpha* wrapped in the assembly. Turbidity data may have been affected by the presence of algae and values above 1000 NTU were rejected.

Following the 03/11/13 deployment, macroalgae *Enteromorpha* was wrapped around the wiper assemblies. Shortly after the deployment began, elevated turbidity values were flagged as suspect. As values continued to be elevated and remained high, turbidity was rejected beginning 03/15/13. Records through the end of the deployment were flagged as suspect or rejected.

05/14/13 deployment had elevated turbidity values beginning around 06/05/13. Data from this time through the end of the deployment were rejected. Following this deployment, algae and mud were present on the sensors.

06/12/13 deployment had elevated turbidity values beginning around 07/04/13. Data from this time through the end of the deployment was flagged as suspect. This sonde experienced heavy biofouling and did not pass post calibration with acceptable values.

07/09/13 deployment, turbidity did not pass post calibration with acceptable range. Though values seem to fit conditions for the site, records were flagged as suspect for the entire deployment.

09/10/13 deployment, turbidity did not pass post calibration with acceptable range. Values were increased and flagged as suspect for the entire deployment.

11/07/13 deployment, turbidity values were elevated. This probe passed post calibration within acceptable range, but data was flagged as suspect 11/12/13- 11/20/13 due to QA/QC checks and values above sensor limits were rejected. Values were near or above the sensor limits beginning 11/20/13, and data was rejected through the remainder of the deployment. Batteries failed on 12/02/13 resulting in missing data until 12/10/13.

## **Chlorophyll**

Chlorophyll sensor was added on 5/14/13. Negative chlorophyll values were flagged as <-3> [SNV] (CSM).

Elevated values around 500 ug/L were recorded on 12/16/13 and macroalgae may have been present within the guard. Values were flagged as suspect.

## **Research Creek**

### **General**

Missing due to sonde swap: 01/16/13 12:15, 04/08/13 9:45, 11/07/13 11:15, and 12/10/13 16:15.

### **SpCond/Salinity**

Dips in salinity occurred during low tide. There may have been some stratification and sensors may be measuring a fresh water lens as approaching the surface.

12/17/12 deployment, SpCond/Salinity was just outside of acceptable range during post calibration. This was the same probe as the one from 10/17/12 deployment, and data were flagged as suspect.

Lower than normal values were recorded for mid April. Records indicate that the area received over an inch of rain on April 12, 2013 and approximately half an inch of rain on April 15, 2013. Records were retained and flagged as <0> CRE, significant rain event.

Lower than normal values were recorded for 7/12/13. Records indicate that the area received over 2 inches of rain on this date and these values reflect the fresh water pulse from these rain events. These records were flagged as <0>(CRE), significant rain event.

08/08/13 deployment, failed to pass post calibration with acceptable values. Data were flagged as suspect.

09/10/13 deployment, failed to pass post calibration with acceptable values. Data were flagged as suspect.

### **Dissolved Oxygen**

Dissolved oxygen dips occur often at this site and correlate with tidal cycles. These records were retained.

06/12/13 deployment, dissolved oxygen failed post calibration. The probe had a slight crust on it upon retrieval and had low values for the post calibration. Since the time of sensor drift was uncertain, the entire deployment was flagged as suspect, failed post calibration due to biofouling.

08/08/13 deployment, dissolved oxygen failed post calibration and wiper was nonfunctional upon retrieval. Barnacles were found on the optics as well. Data from the beginning of the deployment seems to fit conditions for the site and were retained. Beginning 08/12/13 15:45 turbidity values increased and may indicate the loss of wipers. Data from this point through the end of the deployment were marked as suspect and values decreased over time. Beginning 09/01/13 through the end of deployment, data were rejected due to sensor drift.

### **pH**

01/01/13 - 01/15/2013 13:00, pH failed post calibration with values lower than standards and the slope was acceptable. Data were flagged as suspect for the entire deployment but appeared to fit conditions.

01/16/2013 12:30 - 02/15/2013 12:30 pH data rejected due to probe failure. Probe failed post calibration and calibration slope was far below acceptable limits, flagged as <-3>[SSM](CSM).

04/08/13 deployment, pH failed post calibration with values lower than acceptable range in pH 10 and the slope was low. Data were flagged as suspect for the entire deployment but appear to fit conditions.

07/09/13 deployment, pH failed to pass post calibration with acceptable values and slope was low. Data for the entire deployment were flagged as suspect.

08/08/13 deployment, pH failed to pass post calibration with acceptable values and slope was low. Values for the entire deployment seem elevated and were coded as suspect.

09/10/13 deployment, pH failed to pass post calibration with acceptable values and slope was low. Data for the entire deployment were flagged as suspect.

11/07/13 deployment, pH failed to pass post calibration with acceptable values and slope was low. Data for the entire deployment were flagged as suspect.

### **Turbidity**

01/15/2013 13:00 - 01/16/2013 12:00 turbidity probe failed post calibration. This was a very short deployment and data seem to fit conditions and agrees with adjacent deployments.

03/11/13 deployment, turbidity probably had filamentous algae wound around the wiper. Data seems to be affected from 3/21/13 through the end of the deployment and were rejected <-3> [SBO] (CBF).

05/14/13 deployment, turbidity was heavily fouled upon retrieval. The wiper was missing from the probe and algal growth was on the optic. Post calibration values were not acceptable and data were rejected from 5/29/13 through the end of the deployment.

08/08 deployment, failed post calibration and turbidity wiper was nonfunctional upon sonde retrieval. Beginning on 8/12/13 through 8/20/13 values were elevated and rejected due to potential wiper malfunction. Values decreased from 8/20/13 through 8/30/13, but data were flagged as suspect because there may have been wiper malfunctions during this time. Turbidity data were rejected from 8/30/13 through the end of the deployment.

Following the 10/09/13 deployment, the turbidity wiper was parking over the optics. Values were elevated beginning 10/15/13 through the end of the deployment and were rejected. The motor did not turn the wiper assembly during post calibration.

### **Zeke's Basin**

#### **General**

This site is within a shallow lagoonal system and the sonde is subject to our of water events, especially at spring low tides.

Growth of invasive *Gracilaria vermiculophylla* has been heavy around this site. Increased biomass, sedimentation, and decaying organic material are becoming a chronic problem in this location. Optical probes are increasingly affected.

During the following time periods a low tide likely caused multiple sensors to be exposed to some extent. Data were rejected and flagged <-3> [SOW] (CLT).

04/21/2013 13:00 - 04/21/2013 14:15

06/03/2013 12:00

Battery failures: 03/31/13 – 04/10/13

Missing data due sonde swap: 0505/14/2013 14:30, 09/10/2014 15:15, 10/07/2014 11:15, and 12/09/13 15:45.

Out of water events are described in Depth section.

Sonde possibly buried by sediment and/or *G. vermiculophylla* around 07/11/2013 12:45 and appears to have been unburied by storm activity around 07/20/2013 20:45. Data were rejected and flagged as <-3>[SBF](CCU).

#### **Depth**

Out of water events occurred and resulted in rejected or suspect data in the following deployments: 11/06/13 deployment (11/08/13, 11/13/13, 12/07/13), 04/10/13 deployment (04/21/2013 13:00-04/21/2013 14:30), and 06/03/2013 12:00.

The depth sensor was affected by changes in barometric pressure. This resulted in negative depth readings while the sensors were still in the water. These values were flagged as suspect <1> [SNV] (CAP). The following were significantly more negative and likely due to some unknown error:

10/11/2013 18:45, 10/11/2013 22:15, and 10/11/2013 18:15.

### **SpCond/Salinity**

Immediately prior and following out of water events, low SpCond/Salinity values are often observed. These values were outliers from the norm but may be measuring a fresh water lens as the probes approach the surface. These values were retained but flagged as suspect.

Sporadic temporary small dips in salinity at low tide are assumed to be lower salinity surface waters. Often these were associated with out of water events and may be coded as suspect, low tide <1> CLT or as suspect sensor out of water <1> [SOW] (CLT).

02/15/13 deployment, salinity post calibration failed. Post calibration value was 14.3mS/cm in 50 mS/cm standard. Data look alright but increase ~ 2 mS/cm following subsequent deployment. Data were flagged as suspect <1> [SPC] (CSM) for 02/15/2013 14:45 - 03/11/2013 11:45.

11/06/13 deployment, salinity post calibration failed and data flagged as suspect for entire deployment. There were some out of water events that resulted in rejected data (described in depth section).

### **Dissolved Oxygen**

Especially during summer months, oxygen data can be quite variable. These cycles often correlate with tidal fluctuation and were likely driven by presence of drift algae (*Gracilaria vermiculophylla*).

High values were recorded for dissolved oxygen, sometimes surpassing 200% saturation. These reflect conditions at the site, occurring at the same time as elevated pH values and data were retained (unless affected by out of water events, potentially driven by *G. vermiculophylla* presence). Data was retained.

04/10/13 deployment, hypoxia events increase in frequency and intensity until DO remains in a state of hypoxia. This lasts until 06/08/2013 ~17:00. Upon sonde retrieval on 5/14/13, the sonde guard was found to be caked in soft, anoxic, organic sediments as well as an invasive macroalgae, *Gracilaria vermiculophylla*. Accumulation of this sediment is probably the cause of hypoxia and was temporary in nature, as the next deployment did not indicate an accumulation of sediments. Post calibration of DO for the 4/10/13 deployment was unacceptable. Data were initially flagged suspect from the beginning of the deployment <-1> [SBO] (CMD). When the hypoxia stabilized at <0.5mg/L the data were rejected until the values returned to normal <-1> [SBO] (CMD) part way through the 5/14/13 deployment. DO probe passed post calibration following this deployment and data seemed valid and as such were not flagged.

08/07/13 deployment, DO post calibration was high. Data toward the end of deployment were disjunctive. This station may have been clogged with invasive *G. vermiculophylla*, also causing hypoxia. Data were flagged <1> [SBF] (CDA) for during hypoxia and <1> [SBF] (CCU) during all other times. This is to indicate that the station was fouled through the whole deployment.

11/06/13 deployment passed post calibration with acceptable ranges. There were several incidences that the DO dropped to zero mid deployment. These records were retained and likely resulted from mud in the guard and anoxic conditions.

12/09/13 deployment, failed post calibration and all values flagged as suspect for deployment.

### **pH**

Several pH values >9.0 were associated with high DO and presumed to be resulting from high rates of photosynthesis and a large standing crop of macrophytic algae, *G. vermiculophylla*, in the area. The

algal biomass is not ephemeral and therefore not considered an “algal bloom”. These data were closely scrutinized and retained after determining the cause.

01/16/2013 13:45 - 02/15/2013 14:30 deployment – pH post cal unacceptable and bad calibration slope. All data flagged suspect. <1> [SPC] (CSM).

02/06/2013 14:00 - 02/09/2013 11:30 Within that deployment pH dropped significantly and drifted back to expected values over a few hours time <-3> [SSM] (CSM).

03/11/2013 11:45 - 03/31/2013 12:15– pH post cal unacceptable and bad calibration slope. All data flagged suspect. <1> [SPC] (CSM), until sonde battery failure/end of deployment.

Following the 07/09/13 deployment, pH post cal was unacceptable but the calibration slope was okay. Data were flagged suspect <1> [SPC] (CSM) from 07/20/2013 21:00 through the end of the deployment. Data from the beginning of this deployment were disjunct but this is likely an artifact from changing the sonde and moving away invasive *Gracilaria* that had been crowding the station from the prior deployment.

08/07/13 deployment, pH post cal was high in pH 7.0 standard only. Data fit conditions for the site and were flagged <1> [SPC] (CCU).

09/10/13 deployment, pH post cal failure I pH 7.0 standard and slope was low. Data fit conditions for the site and were flagged <1> [SPC] (CCU).

10/07/13 deployment, pH post calibration failure in standards and slope was outside of acceptable range. Values for the entire deployment were flagged as suspect.

11/06/13 deployment, pH probe did not pass initial calibration checks. Probe was deployed anyway because there was no replacement available. All data rejected <-3> [SSM] (CSM).

12/09/13 deployment, pH post calibration failure and values for the entire deployment were flagged as suspect.

### **Turbidity**

Periods of elevated turbidity values were crosschecked with weather data to determine if they were driven by weather. Turbidity at Zeke’s Basin station is particularly sensitive to high or sustained winds due to winds during periods of low water and is a normal occurrence. All data above 1000 NTU were rejected <-3> [STS] (CSM).

03/06/2013 21:45 - 03/11/2013 11:30, data disjunct preceeding new deployment, likely from algal fouling following windy/choppy conditions a few days earlier.

11/06/13 deployment, turbidity failed post calibration. All records were flagged as suspect except those rejected due to being above sensor limits. On 11/27/13 there were negative values and lots of variability.

12/09/13 deployment, turbidity failed post calibration. These were many records mid deployment that were above the sensor range and rejected. The rest of the deployment was flagged as suspect. There were also several times the turbidity values dropped to zero or negative, most likely due to a partial out of water event. These values were rejected.

### **Turbidity and Dissolved Oxygen**

06/11/2013 00:00 - 07/09/2013 12:15, heavy macro algal growth in the area has heavily fouled the station at times. Probes were likely buried in silt during these times. Data rejected due to blocked optic from biofouling. DO post calibration failed due to heavy biofouling, flagged as <-3> [SBO] (CBF).

07/09/13 - 07/20/2013 21:00 It is possible that heavy rafts of loose macroalgae (*G. vermiculophylla*) along with sediment became lodged around the station. Salinity, SpCond, DO, pH and turbidity appear to be affected. Data were rejected for this time period was obviously abnormal and was rejected <-3> [SBF] (CCU). All data except turbidity returns to normal following this time period and were retained. Turbidity post calibrated fine but was elevated and disjunctive preceding the next deployment and there was excessive mud in the sonde guard. For this reason it was rejected and flagged <-3> [SSD] (CCU).