NOC NERR Metadata Water Quality Form
January - December 1995
Revised January 11, 2011

I. Data Set & Research Descriptors

1)Principal Investigator(s) and Contacts:

Principal Investigator:

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2)Entry Verification Process:

The data are reviewed using the computer program PC6000 that accompanies the YSI 6000 datalogger or Microsoft Excel for Hydrolab DataSonde 3 data. After the file is uploaded from the water quality instrument, PC6000 is used to plot the data and perform basic statistical analysis (i.e., min., max., mean, std. dev.). This information is printed out and attached to the Field Log for the particular deployment. This printout is used during file review to detect any gross outliers such as data taken when the water quality instrument was removed from the water or those caused by instrument failure. The data are imported into a Microsoft Excel file that contains the current month's cumulative recordings. When a complete month of data has been recorded the file is ready for review. The data review includes several steps. The first step is to format the data so that the parameter columns are in the correct order and the data have the correct number of decimal place holders. Secondly, an Excel macro is used to check for any dates and times that data were not recorded due to maintenance, battery failure, or other causes. Missing dates

and times are inserted into the file and a period is inserted into the cells where data would normally be. An explanation for the missing data is recorded onto the Water Quality Editing Log. Next, the data are filtered using an Excel macro to find readings outside the instrument measurement range and the "normal" range for the site in question. Data outside the instrument range are removed from the file and a period is inserted into the cell(s). An explanation for the missing dates and times are recorded onto the Water Quality Editing Log. Data outside the "normal" range of water quality for a particular site were investigated for validity based on weather data, field observations, QC checks, PC6000 printouts, and instrument diagnostics. If the data are rejected from the file a period is inserted into the cell(s) and an explanation for the missing dates and times are recorded onto the Water Quality Editing Log. The information recorded on the Water Quality Editing Log is transferred to the metadata form. The metadata form is then submitted with the data file to the CDMO. Paul Grimshaw reviewed and edited 1995 data.

3)Research Objectives:

Water quality instruments are deployed at the Masonboro Island and Zeke's Island components of North Carolina's National Estuarine Research Reserve and are anchored to the bottom of the selected sites. Measurements are taken at 30 minute intervals for approximately two week periods. Before a formal protocol was established for NERR water quality monitoring, hourly data at Masonboro and Zeke's Island were recorded as detailed in section 13. These sites are relatively unimpacted by manmade perturbations.

4)Research Methods:

The Estuarine Water Quality Monitoring Program began on 2 March 1992 at the Masonboro Island component, and 19 May 1994 at the Zeke's Island component. The procedures described below were instituted in June 1995 and thus do not cover data recorded previously. At this time we are only performing long term water quality monitoring and not a specific experiment.

Before each YSI 6000 or Hydrolab DataSonde 3 are deployed, calibration and maintenance is performed following the manufacturer's instructions (YSI Manual addendum 7/94, sections 3,4, and 7 and Hydrolab Manual Revision B 4/91, part 3). Calibration standards are only required for pH and salinity; all other parameters are done as described in the manual. Buffer solutions for 2 point calibration (pH 7 and 10) are purchased premade from a scientific supply house. The salinity standard is obtained from filtered seawater taken from Masonboro Sound and analyzed at the Center for Marine Science Research (CMSR)in Wilmington, NC using an osmometer. The dissolved oxygen membranes are replaced before deployment and are allowed to sit at least 24

hrs prior to deployment.

During deployment the weather conditions and tide stage are recorded in the field observation log. Measurements of DO, pH, salinity, specific conductance, and temperature are taken with a calibrated YSI 6000 or other field instruments to check the accuracy of the instrumentation before deployment (as of October 1995). The water quality instrument is placed inside a locked steel cage, then anchored to the bottom, and chained to a post at the monitoring site. Every 30 minutes during the sampling period measurements are taken for temperature, specific conductance, salinity, dissolved oxygen saturation, dissolved oxygen concentration, depth, and pH.

At the end of the sample period the water quality instrument is either brought back to the laboratory or serviced in the field. If the water quality instrument is serviced in the field the DO sensor is either replaced with one that has a new membrane or the old membrane is wiped with lens paper moistened with tap water to remove biofouling. 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 checked by comparing data readings in calibration standards or against a recently calibrated YSI 6000 (as of October 1995). The water quality instrument is then uploaded, cleaned and calibrated as noted previously. The water quality instrument is then ready to be redeployed.

5)Site Location and Character:

The four 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 southeastern coast of the United States in the Atlantic Ocean. Currently, only data from Masonboro and Zeke's Island components are transferred to the CDMO. The two sites are:

1. Research Creek, Masonboro Island
The Masonboro Island site 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 deg 09'21.7" latitude and 77 deg 50'59.9" longitude (GPS position). The site has a salinity range of 18-35 ppt and a tidal range that averages 1.2 meters.

2. East Cribbing, Zeke's Island
The Zeke's Island site is located 1.8 km south of Federal Point boat launch in a tidal basin estuary at 33 deg 56'23.5" latitude and 77 deg 56'28.1" longitude (GPS position). This site receives minimal freshwater input from leakage of the Cape Fear River through the 5.6 km rock jetty that separate the two bodies of water. Thus, the ocean tidal input through New Inlet is a major factor in maintaining the high salinity; however during

rainy periods major drops in salinity may occur. The site has a salinity range of 15-35 ppt and a tidal range that averages 2 meters.

6)Data Collection Period

Research Creek data collection began on 2 March 1992, while East Cribbing data collection commenced on 19 May 1994. All monitoring is considered long term.

7)Associated Researchers and Projects

Lancaster, J./UNC Chapel Hill
Ross, S./NOC NERR
Masonboro Island surf zone fish survey

NOC NERR
Climatological monitoring

Ross, S./NOC NERR
Grimshaw, P./NOC NERR
Effects of non-point source pollution on estuarine water quality

Ross, S./NOC NERR
Grimshaw, P./NOC NERR
Bichy, J./NOC NERR
Water quality & nekton monitoring

Ross, S./NOC NERR
Stokesbury, K./NOC NERR
EMAP - Estuaries

Mallin, M./UNC-Wilmington
Tidal creek survey

II. Physical Structure Descriptors

8) Sensor specifications, range of measurements, units, resolution, and accuracy:

YSI 6000 datalogger

Variable	Range of Measurements	Resolution	Accuracy
Date	1-12, 1-31, 00-99 (Mo,Day,Yr)	1 mo, 1 day, 1 yr	NA
Time	0-24, 0-60, 0-60 (Hr,Min,Sec)	1 hr, 1 min, 1 s	NA
Temp	-5 to 45 (c)	0.01 C	+/- 0.15C

Sp COND	0-100(mS/cm)	0.01mS/cm	+/-0.5% Of reading + 0.001mS/Cm
Salinity	0-70 Parts per thousand (ppt)	0.01 ppt	+/- 1% of Reading or 0.1 ppt, (whichever is greater)
DO	0-200 (% air saturation)	0.1% @air sat	+/-2% @air Saturation
DO	200-500 (% air saturation	0.1% @ air sat	+/- 6% @ Saturation
DO	0-20 (mg/l)	0.01 mg/l	+/- 0.2mg/l
DO	20-50 (mg/l)	0.01 mg/l	+/- 0.6mg/l
Depth (shallow)	0-9.1 (m)	0.001m	+/- 0.018m
PH	2-14 units	0.01 units	+/- 0.2units
Turb	0-1000 NTU	0.1 NTU	+/- 5% of Reading or 2 NTU (whichever is greater)

Data columns are separated by tabs

Hydrolab DataSonde 3

Variable	Range of Measurements	Resolution	Accuracy
Date	1-12, 1-31, 00-99 (Mo,Day,Yr)	1 mo, 1 day, 1 yr	NA
Time	0-24, 0-60, 0-60 (Hr,Min,Sec)	1 hr, 1 min, 1 s	NA
Temp	-5 to 50 (C)	0.01 C	+/- 0.15C
Sp COND	0-100(mS/cm)	0.01mS/cm	+/-0.5%
Salinity	0-70 Parts per thousand (ppt)	0.1 ppt	+/- 0.2ppt
DO	0-200 (% air saturation)	0.1% @air sat	+/-2% @air Saturation
DO	0-20 (mg/l)	0.01 mg/l	+/- 0.2mg/l
DO	20-50 (mg/l)	0.01 mg/l	+/- 0.6mg/l
Level	0-10 (m)	0.01m	+/- 0.09m
PH	2-14 units	0.01 units	+/- 0.2units

Data columns are separated by tabs

9) Coded variable indicator and variable code definitions:

Site definitions: RC=South Research Creek, Masonboro Island*
EC=East Cribbing, Zeke's Island*

File definitions: site/month/year (ex.: ZI0895 = Zeke's Island data from August of 1995).

*The RC site was formerly designated as Masonboro Island (MS) and EC was formerly designated as Zeke's Island (ZI). Name changes were made on 1/11/2011 to be consistent with later station designations made necessary by the addition of an additional station in each component, and to clearly indicate that the station location throughout the North Carolina Reserve's historical data set. Raw file names were not changed. Please contact the Reserve directly or the NERRS Centralized Data Management Office for more information on this update.

10) Data anomalies (suspect data):

File MS0195- DO data removed due to heavy probe fouling. See next section.
File ZI0195- Instrument out of water at low tide, all data removed. See next Section.
File MS0295- DO probe malfunction, DO% and DO mg/l removed. See next section.
Instrument position shifted. Exposed at low tide. All data Removed. See next section.
File ZI0295- High DO membrane fouling, data removed. See next section.
Instrument out of the water at low tide, all data removed. See Next section.
File ZI0495- DO probe malfunction, data removed. See next section.
File ZI0595- DO probe malfunction, data removed. See next section.
File MS0795- pH probe malfunction, data removed. See next section.
File ZI0795- Heavy DO probe membrane fouling, data removed. See next section.
File MS0895- pH probe malfunction, data removed. See next section.
File ZI1095- Instrument out of water at low tide. All data removed. See next Section. Specific conductance sensor out of range, specific conductivity and salinity data removed. See next section
File MS1195- Instrument out of water at low tide, all data removed. See next Section.

File ZI1295- The post calibration check for salinity was out of range by 10

ppt for the sample period of 12/1/95-12/31/95 at East Cribbing.
The deployed unit's readings were 10 ppt lower than the profiler's measurements. This may have been caused by sensor drift during the long deployment or the two days of inactivity related to a delay in retrieval of the unit after its program had ended.

11) Missing data:

Approximately every 2-3 weeks, there is a period of between 1 to 24 hrs (occasionally longer) of missing data due to maintenance and calibration. During the maintenance period all parameters will be missing.

A record and explanation of missing data that are not related to routine maintenance is kept in the field log for the particular deployment. All parameters recorded when the water quality instrument is exposed to air during a sample, either by an extremely low tide or physical displacement from its original location, are removed. Special note should be made regarding missing dissolved oxygen (DO) saturation (%), DO concentration (mg/l), specific conductance, salinity, and temperature measurements. If the DO saturation (%) data are removed, due to sensor malfunction or other circumstances, the DO concentration (mg/l) will also be missing. The DO concentration (mg/l) is calculated from DO saturation (%) and temperature data using formulae that can be found in Standard Methods for the Examination of Water and Waste Water (ed. 1989). This is also true for specific conductance and salinity data. Salinity (ppt) is determined by the YSI 6000 using specific conductance data, temperature data, and algorithms found in Standard Methods for the Examination of Water and Waste Water (ed. 1989). If the temperature sensor malfunctions and the corresponding data are removed, all parameters requiring these data (DO saturation, DO concentration, specific conductance, salinity, and pH) for calculation or temperature compensation will also be removed.

January 1995

File Name MS0195

1/1 0:00-1/4 10:00	DO membrane fouling; DO % and DO mg/l data removed
1/4 11:00-16:00	Maintenance
1/13 22:00-1/18 14:00	DO membrane fouling; DO % and DO mg/l data removed
1/18/15:00-1/19 12:00	Maintenance

File Name ZI0195
No turbidity readings taken

1/5 12:00-14:00	Maintenance
1/7 16:00-17:00	Instrument out of water at low tide*
1/12 16:00, 19:00-20:00	Instrument out of water at low tide*
1/13 16:00-17:00, 21:00	Instrument out of water at low tide*
1/14 16:00-18:00	Instrument out of water at low tide*
1/19 12:00-16:00	Maintenance

February 1995

File Name MS0295

2/1 14:00-17:00	Maintenance
2/1 18:00-2/20 13:00	DO probe malfunction; DO % and DO mg/l data removed
2/16 14:00-17:00	Instrument moved out of position by someone and thus exposed at low tide*
2/17 1:00-5:00	"
2/17 14:00-16:00	"
2/18 3:00-5:00	"
2/18 15:00-17:00	"
2/19 4:00-5:00	"
2/19 16:00-18:00	"
2/20 4:00-6:00	"
2/20 14:00- 2/21 17:00	Maintenance

File Name ZI0295
No turbidity readings taken

2/1 22:00-2/2 13:00	DO membrane fouling; DO % and mg/l data removed
2/2 14:00-2/3 17:00	Maintenance
2/21 11:00-16:00	Maintenance
2/26 15:00-17:00	Instrument out of water at low tide*
2/27 17:00-18:00	Instrument out of water at low tide*

March 1995

File Name MS0395

3/5 12:00-3/6 16:30	Maintenance
3/19 11:30-13:30	Maintenance

File Name ZI0395
No turbidity readings taken

3/1 00:00-3/22 13:30	No depth recorded, Hydrolab deployed
3/5 10:30-3/6 16:30	Maintenance
3/22 14:00-3/24 13:30	Maintenance
3/24 14:00-3/31 23:30	Instrument not programmed to record DO concentration (mg/l), file not available to recover data

April 1995

File Name MS0495
No turbidity readings taken

4/4 12:00-16:30	Maintenance
4/17 14:30 to 4/18 17:30	Maintenance

File Name ZI0495

4/1 0:00-4/7 14:00	Instrument not programmed to record DO concentration (mg/l), file not available to recover data
4/7 14:30-4/8 16:30	Maintenance
4/26 16:00-4/27 12:00	Maintenance
4/27 12:30-4/30 23:30	DO probe malfunction; DO % and DO mg/l data removed

May 1995

File Name MS0595
No turbidity readings taken

5/4 12:00-5/5 15:30	Maintenance
5/16 11:30-5/17 17:30	Maintenance

File Name ZI0595
No turbidity readings taken

5/1 0:00-5/5 4:00	DO probe malfunction; DO % and DO mg/l data removed
5/5 4:30-17:30	Maintenance
5/5 18:00-5/31 23:30	Depth not recorded
5/7 16:30-5/18 14:30	Power loss
5/31 15:00-19:30	Maintenance

June 1995

File Name MS0695
No turbidity readings taken

6/1 18:30-6/2 14:30	Maintenance
6/19 11:30-14:30	Maintenance

File Name ZI0695
No turbidity readings taken

6/1 00:00-04:00	No depth readings taken, HydroLab deployed
6/1 04:30-6/5 14:30	Maintenance
6/23 12:30-17:00	Maintenance

July 1995

File Name MS0795
No turbidity readings taken

7/11 8:30-7/12 1:30	Maintenance
7/13 8:30-7/15 11:30	Maintenance

7/20 6:00-7/31 23:30 pH probe malfunction
7/26 2:00-7/27 19:00 Maintenance

File Name ZI0795
No turbidity readings taken
7/9 0:00-7/16 11:30 DO membrane fouling; DO % and DO mg/l data removed
7/16 12:00-7/18 13:00 Maintenance

August 1995

File Name MS0895
No turbidity readings taken
8/1 0:00-8/3 11:00 pH probe malfunction
8/3 11:30-8/4 18:30 Maintenance
8/4 19:00-8/7 21:30 Instrument deployed without pH probe
8/7 22:00-8/10 15:00 Power loss
8/10 15:30-8/14 17:00 Maintenance
8/14 17:30-8/26 11:00 Instrument deployed without pH probe
8/26 11:30-8/31 23:30 Batteries shorted out

File Name ZI0895
No turbidity readings taken
8/4 14:30-15:30 Maintenance
8/22 15:00-16:00 Maintenance

September 1995

File Name MS0995
No turbidity readings taken
9/1 0:00-17:00 Maintenance
9/4 14:30-9/8 12:30 Maintenance
9/21 14:30-9/30 23:30 Batteries shorted out

File Name ZI0995
No turbidity readings taken
9/12 10:30-12:00 Maintenance
9/30 17:30-23:30 Maintenance

October 1995

File Name MS1095
No turbidity readings taken
10/1 0:00-10/13 10:00 Batteries shorted out
10/23 11:00-12:00 Maintenance

File Name ZI1095
No turbidity readings taken
10/1 07:30-09:30 Instrument out of water at low tide*
10/1 21:00-22:00 Instrument out of water at low tide*
10/2 08:30-10:30 Instrument out of water at low tide*

10/2 15:00-17:00	Maintenance
10/2 17:30 to 10/9 11:00	Specific conductance sensor out of range; specific conductance and salinity data removed
10/9 11:30-12:00	Maintenance
10/19 12:30-17:00	Maintenance

November 1995

File Name MS1195
No turbidity readings taken

11/6 11:00-12:00	Maintenance
11/22 00:30-01:30	Instrument out of water at low tide*
11/22 05:00-17:00	Maintenance

December 1995
File Name MS1295
No turbidity readings taken

12/8 14:30-15:30	Maintenance
12/16 16:00-12/20 10:00	Saltwater leaked into battery chamber and corroded batteries causing power loss
12/24 16:00-16:30	Instrument out of water at low tide*
12/25 4:00-4:30	Instrument out of water at low tide*

File Name ZI1295
No turbidity readings taken

12/21 10:00	Maintenance
12/31 16:00-23:30	Maintenance

*All parameters removed; see detailed explanation in the introduction of section 11

12) Notes:

January 1995

Data from Research Creek during 1/1/95 0:00 - 1/31/95 23:00 were collected in hour intervals.

Data from East Cribbing during 1/1/95 0:00 - 1/31/95 23:00 were collected at one hour intervals.

February 1995

Data from Research Creek during 2/1/95 0:00 - 2/28/95 23:00 were collected in hour intervals.

Data from East Cribbing during 2/1/95 0:00 - 2/28/95 23:00 were collected at one hour intervals.

March 1995

Data from Research Creek during 3/1/95 0:00 - 3/5/95 23:30 were collected in hour intervals.

Data from 3/1/95 0:00 - 3/22/95 13:30 in file ZI0395 were collected using a Hydrolab DataSonde 3.

Data from East Cribbing during 3/1/95 0:00 - 3/5/95 23:00 were collected in one hour intervals.

May 1995

Data from 5/5/95 18:00 - 5/3