

WELLS (WEL) National Estuarine Research Reserve Water Quality Metadata
January-December 2002
Latest Update: July 1, 2021

I. Data Set & Research Descriptors

1). Principal investigator & contact persons:

Address:

Wells NERR
342 Laudholm Farm Road
Wells, ME 04090
Phone: (207) 646-1555
FAX: (207) 646-2930

Contact Persons:

Dr. Michele Dionne, Research Coordinator

E-mail: dionne@wellsnerrcec.lib.me.us; (207) 646-1555 ext. 136

Scott Orringer, Research Associate

E-mail: sorringer@wellsnerrcec.lib.me.us; (207) 646-1555 ext. 112

Jim Dochtermann, SWMP Technician

E-mail: jdoc@wellsnerrcec.lib.me.us; (207) 646-1555 ext. 104

2). Entry verification:

The data are directly downloaded in the YSI-PC6000 format (as a .dat file) and the Comma Delimited format (as a .csv file) from the dataloggers to a PC lap-top. The data are reviewed using the PC6000 software (Eco-Watch). Graphs and basic statistics are then generated with the Eco-Watch program and the information is printed out for each data file. These graphs are used to determine any obvious data outliers and sonde and/or probe malfunction. All downloaded data files from the dataloggers (both raw unedited .dat and .csv files) are then transferred via disk to a Dell Inspiron 4100, where all files are reviewed and formatted for CDMO and stored. Here the raw unedited .csv data files are imported into Microsoft Excel 2000. After a complete month of data has been recorded, each file is ready to review, which requires several steps. The NERR CDMO QA/QC Excel macros are used for all data.

The CDMO cdmomac3.xls macro will allow the user to automatically format column widths to the correct number of decimal places based on YSI sensor

specifications. It also allows the user to QA/QC each data logger generated file for missing data points, fill all cells that do not contain data with periods, and find all data points that fall outside the range of what the data logger is designed to measure (i.e. outliers). The CDMO import.xls macro will allow PC users with 30-minute data to automatically create a monthly Excel file from a two-week deployment and insert periods for missing data. In addition, in November 1999 a graphing capability was added to this macro allowing users to produce single parameter and missing data point graphs on a monthly basis.

A data file is created (from the merged raw unedited .csv data files) in Excel format with a full month of data. The first step is to make sure that the parameter columns are in the correct order, specified by the NERR CDMO. If any parameters are not collected due to probe failure or other causes, the cells with this missing data are filled in with periods (.) and documented and explained in the appropriate section of the metadata. Secondly, missing dates and times are inserted in the data file where data were not collected due to maintenance, sonde failure, etc., and the cells with this missing data are filled in with periods (.) and documented and explained in the appropriate section of the metadata. The first NERR CDMO QA/QC Excel macro is then run to determine if there are any missing dates and times; and if so these missing dates and times are inserted. Next, the second NERR CDMO QA/QC Excel macro is used to find and filter all data readings outside the sonde specification measuring range for each parameter. Here the outlier data generated by the second macro are examined and determined as either explained or unexplained anomalies, as specified by NERR CDMO Operations Manual (Version 4.0). All anomalous data (explained and unexplained) are documented and explained in the appropriate sections of the metadata. The explained anomalous data are then removed from the data file and replaced by periods. The unexplained anomalous

data are investigated for validity based on weather data, field observations, instrument diagnostics, and Eco-Watch printouts. If these data are rejected from the file then these are removed and replaced by periods. Lastly, the third and final NERR CDMO QA/QC Excel macro is used to reformat all the columns in the data file to the correct number of significant digits. After this last step, once the file has been completely formatted and edited as specified by NERR CDMO, the file is saved as a Tab delimited (.txt) text file and sent by FTP to the CDMO. The metadata form is also submitted with the data file to the CDMO, sent also as a text file (text only with line breaks). Jim Dochtermann and Scott Orringer are responsible for this task of entry verification with the analyses of suspect and anomalous data. Michele Dionne supervises, proofs and answers questions with the evaluation of suspect and anomalous data.

The use of the newest (Version 3.0) National Estuarine Research Reserve (NERR) System-Wide Monitoring Program (SWMP) YSI 6-Series Multi-Parameter Water Quality Monitor Standard Operating Procedures began in December 2000 when they became available.

3). Research objectives:

The Webhannet River estuary is located in proximity to heavily used beaches in Wells, Maine. It has a shoreline that is highly developed with residential and commercial structures. The estuary receives water from a 14 sq. mi. watershed that is well forested. We are measuring variations in hydrologic variables in the Webhannet River estuary at the Head of Tide and at the Inlet. Data from Head of Tide will integrate surface and ground water inputs (from both point and non-point sources) from the freshwater watershed into the estuary. Data from the Inlet will integrate surface and ground water inputs from the freshwater watershed and the estuarine watershed. Differences in data between the Head of Tide and the Inlet will indicate inputs from the estuarine portion

of the watershed (on the ebb tide), and inputs from the Gulf of Maine on the flood tide. The instruments will track runoff events via salinity, and will measure pollutant-carrying sediment particles via turbidity. Our working hypothesis is that the freshwater watershed is the primary source of sediment and therefore potential NPS pollutants in the estuary. These two variables will indicate the potential for non-point source pollutants to enter the estuary, and whether they are of upland, estuarine, or Gulf of Maine origin. Other variables measured by the data loggers (DO, temperature, pH, specific conductivity, and water level) will provide important baseline data to track changes in the estuary's physicochemical parameters over the long term. These variables can be affected by changes in human water use, and by natural or human induced changes in inlet and river channel morphology, climate, and organic loadings. The Inlet site is heavily impacted at the Wells Harbor dock and is our long-term monitoring site. The Mile Road site is our creek site. The Head of Tide site is relatively unimpacted, located just east of the Route One Bridge, and is our roving site. The Little River Mouth site is our comparative system site.

4). Research Methods

The Wells NERR YSI monitoring program began in April 1995 at one site (Head of Tide site-HT) and May 1995 at a second site (Inlet site-IN) in the Webhannet River estuary. Two additional sites were added in 2002, Mile Road site-ML began in March in the Webhannet River estuary and Little River Mouth-LM in April in the Little River Estuary. The four data loggers are installed with bottom moorings, as described below. Both data loggers have 1/4 inch black vector mesh placed on the outside (using rubber bands) of the sonde guard to prevent fouling and unwanted animals. All deployment structures (PVC tubes) described below are labeled with the Wells NERR information.

*IMPORTANT CHANGES TO NOTE AT THE INLET SITE (IN) where our telemetry unit is stationed: A new vented level YSI 6600 with its new vented level cable was

deployed to collect its first data on 5/4/99 at 12:00. The YSI telemetry unit began collecting its first data on 3/16/98 at 10:30:00.

The Inlet site (IN) deployment methods are different than the other sites (HT,ML,LM), due to the installation of a YSI telemetry unit. A 23 foot, 4 inch diameter high grade PVC tube was installed against a dock piling. Four steel flat bars with bolts were used to attach this 23 foot PVC tube against the dock piling. A 3 by 1.5 inch PVC transducer was glued on the inside bottom of the PVC tube to allow the sonde to sit exactly 1.0 meter (3.28 ft) off the bottom. Several vertical holes, representative of the sonde guard, were cut out the circumference near the bottom of the PVC pipe to allow water flow to the probes. An "L" shaped steel bar with two end-holes is placed through two created slits about a half of foot from the top of the PVC tube. A stainless steel wire (1/16") is attached to the sonde bail using two stainless steel clips; and to one end of the "L" shaped steel bar for sonde deployment and retrieval. A marine lock is attached through the other end of the "L" shaped steel bar to hold the bar, wire, and sonde in place and for security. A PVC threaded cap screws in to the threaded top of the PVC tube, also for security. A hole was created in the PVC cap to allow the sonde to hook up with the telemetry unit using the 50 foot cable. The collection of data parameters at the Inlet (IN) site are slightly different then at the roving sites, due to the telemetry unit installation. Two to four week variable sampling periods were chosen due to limitations created by the life of the dissolved oxygen membrane and probe fouling. Battery power is not needed anymore within the sonde itself (although, battery power is needed during calibrations and downloading) at the time of deployment at this site because of the telemetry unit's solar battery power. Measurements of temperature, specific conductivity, salinity, percent saturation, dissolved oxygen, depth, pH, and turbidity are recorded at 30 minute intervals throughout the deployment period. Time, date, and battery voltage are

no longer programmed to be recorded by the sonde, since these parameters are already programmed with the Eco-Watch Program (see YSI's Eco-Watch Users Guide).

The other sites, Head of Tide (HT), Mile Road (ML), and Little River Mouth (LM) are deployed similarly, except for sonde height off the bottom (see below). This site uses a 5 foot, 4 inch diameter high grade PVC tube. The PVC tube is attached to a 12 foot, heavy steel sign post using a stainless steel bolt at the bottom of the tube, a stainless steel cable wrap at the top, and several thick electrical cable ties in between. The steel sign post was pounded in about 6 feet into the river bottom, such that the bottom of the PVC tube was flat on the river bottom. The PVC tube has one 3 by 1.5 inch PVC transducer glued on the inside bottom of the PVC tube to allow the sonde to sit exactly at a certain height off the bottom (see below). Several vertical holes, representative of the sonde guard, were cut out the circumference near the bottom of the PVC pipe to allow water flow to the probes. An "L" shaped steel bar with two end-holes is placed through two created slits about a half of foot from the top of the PVC tube. A stainless steel wire (1/16") is attached to the sonde bail using two stainless steel clips; and to one end of the "L" shaped steel bar for sonde deployment and retrieval. A marine lock is attached through the other end of the "L" shaped steel bar to hold the bar, wire, and sonde in place and for security. A flotation buoy is tied to the PVC tubes incase the deployment structure ever gets dislodged. The deployment depth for these sites is such that the probe-end of the data logger is secured 0.30 meters (1.0 ft) off the bottom.

Two to four week variable sampling periods were chosen for the data sonde due to limitations created by the life of the dissolved oxygen membrane, probe fouling, and limited battery power. Measurements of temperature, specific

conductivity, salinity, percent saturation, dissolved oxygen, depth, pH, and turbidity are recorded at 30 minute intervals throughout the deployment period.

After the deployment period, the data logger is brought back into the Wells Reserve Laboratory for downloading, cleaning, and calibration. These procedures are carried out to the methods described in the YSI Operating Manual. Calibration standards are needed and used for only specific conductivity (10 mS/cm), pH (buffer solutions of pH 4, 7, and 10), and turbidity (100 NTU). Conductivity and pH standards are purchased from Fisher Scientific. Turbidity standards are purchased from Advanced Polymer Systems, Inc. (Redwood City, CA). The dissolved oxygen membranes are replaced and sit 6-24 hours before each deployment. After approximately 6-24 hours of down time for cleaning, maintenance and recalibration, the YSI Data logger is redeployed for another sampling period. Also, with our extra data sonde, we have been reducing the amount of time of missing data from calibrations and maintenance for this site.

The use of the newest (Version 3.0) National Estuarine Research Reserve (NERR) System-Wide Monitoring Program (SWMP) YSI 6-Series Multi-Parameter Water Quality Monitor Standard Operating Procedures began in December 2000 when they became available.

5). Site location and character

The Wells National Estuarine Research Reserve is located in York County, within the Town of Wells, on the coast of southern Maine and faces the Atlantic Ocean. The Wells NERR is approximately 31 km (20 miles) south of Portland, Maine and 110 km (70 miles) north of Boston, Massachusetts. The Reserve encompasses 1,690 acres along the Gulf of Maine coastline of tidally-flushed wetlands, riparian and transitional upland fields and forests within the Little River Estuary and the larger Webhannet River Estuary. Both estuaries arise in

the sandy glacial outwash plain about eight miles inland. Both rivers empty into Wells Bay, a sandy basin stretching for approximately ten miles along the Atlantic coast. Bordering each river's inlet are double spit barrier beaches attached to the mainland. The backbarrier system in the Webhannet River Estuary is approximately 5 sq. km and is composed of large intertidal marshes (predominantly *S. patens* and *S. alterniflora*), intertidal sand and mud flats, and tidal channels. The watershed for the Webhannet River estuary covers an area of 35 sq. km and has a total of 6 streams, brooks or creeks, which enter the estuary. These tributaries flow across sand and gravel deposits near the headwaters and the impermeable sandy muds of the Presumpscot Formation in the lower reaches. The watershed for the Little River estuary covers an area of 84 sq. km and has a total of 2 tributaries. The backbarrier system in the Little River Estuary is approximately 2.51 sq. km and is composed of large intertidal marshes (predominantly *S. patens* and *S. alterniflora*), intertidal sand and mud flats, and tidal channels. The Webhannet River is connected to the ocean via Wells Inlet, which has a spring tidal prism of 28,200,000 cub. m (Ward 1993). The Little River is connected to the ocean by an unstructured, double spit system and is one of the few tidal inlets along the southern Maine coast that is not stabilized by either natural outcrops or artificial jetties. The force and volume of tidal action affect the salinity level of both rivers. In the Wells region, the annual mean wave height is almost 20 inches. These estuarine systems are dominated by semi-diurnal tides having a range of 8.5 to 9.8 feet. The volume of freshwater influx into both estuaries is moderate to low (on the order of 0.5 cubic meters/second), especially in the summer, because of the rivers' relatively small drainage areas and the presence of deep glacial deposits. The relatively low flows from these two rivers taken in with the 20 inch per year average runoff of the area surrounding the estuaries combine to form a fresh water flow which is dwarfed by tidal flushing. Twelve-foot tides

dwarf the freshwater flow into the Webhannet estuary, which has a drainage area of 14.1 square miles. The Merriland River and Branch Brook meet south of Route 9 to form the Little River which drains an area of 10.75 sq. miles. The Webhannet estuary, fed by both Blacksmith and Depot Brooks, is adjacent to the harbor and greatly developed land. It offers a valuable opportunity for comparison with the relatively pristine Little River estuary. The land use of the Webhannet estuary include a total of 15% for wetland, fresh water, and tidal marsh; a total of 63.7 % for woodland; and a total of 18.6% for developed land compared to a total of 5.7% development in the Little River estuary (WNERR RMA 1996; Holden 1997).

There are three sampling sites in the Webhannet River estuary. These are located at the Head of Tide, Mile Road, and at the Inlet. The tidal range at each of these sites is 2.6-2.9 meters.

The Head of Tide site is located 4 miles south of the Wells Reserve, just downstream of the Webhannet Falls (freshwater) and 10 feet east of Route One (43 deg 17' 54.25227" Latitude, 70 deg 35' 13.82728" Longitude). Route One is used heavily with traffic all year, especially during the summer tourist months. This site has soft mud, sand, and a rocky substrate, and the low and high tide depth is relatively shallow. The salinity range here is 0-31 ppt, with a mean of 3.6 ppt. These headwaters of the Webhannet are relatively undeveloped. This site is located just 10 feet east of the Route One bridge, and is our roving site.

The Mile Road site is located 3.5 miles south of the Wells Reserve, on Mile Road roughly 300' north of the bridge (N43 deg 18.300' Latitude, W 70 deg 34.583 Longitude). This site has soft mud and a rocky substrate, and the low and high tide depth is relatively shallow. The salinity range here is 3.6-33.4 ppt, with a mean of 27.0 ppt.

The Inlet site is located 1.5 miles south of the Wells Reserve, at the Wells Harbor pier (43 deg 19' 12.44804" Latitude, 70 deg 33' 13.82728" Longitude). The mouth of the Webhannet estuary forms an extensive wetland/salt marsh area which is surrounded by development. Wells Harbor, which was most recently dredged in 1971, has moorings for approximately 200 commercial fishing and recreational boats. The mouth of the river flows between two jetties to the Atlantic Ocean. This channel was dredged in 1974. This site has a predominately sand substrate and is characterized by strong current during incoming and outgoing tides. The maximum depth of the Inlet site is 3 meters. The salinity range here is 7-35 ppt, with a mean of 31 ppt. The Inlet site is heavily impacted at the Wells Harbor dock and is our long-term monitoring site.

The Little River Mouth site is located .4 miles of the Wells Reserve. Due to problems with heavy sediment movement in the inlet of the Little River, we were forced to relocate the site (see Sec 14-Other Remarks/Notes). The first location (N 43 deg 20.176 Latitude, W 70 deg 32.497 Longitude) was located in the main channel of the river, just inland of a spit, beside a bank. The second location (N 43 deg 20.083 Latitude, W 70 deg 32.585 Longitude) was located 1/8 mi. southwest of the first site, within an inlet, just inland of a spit. The second site was located in an area of much lower current than the first site and often drains completely during low tides. It was also placed within a pool next to incipient low marsh peat that retains calm water during low tides. The tidal range of the Little River estuary is 2.6-3.0 meters (Mariano and FitzGerald, 1988). Both sites were abandoned (see Sec 14-Other Remarks/Notes). The Little River sites existed in a shallow and relatively pristine system with a sandy to mud bottom and a salinity range of 0 - 32 ppt. There are two major freshwater inputs, the Merriland and Branch Brook Rivers, which converge to form the Little River.

6). Data collection period:

The Webhannet River Head of Tide (HT) site data collection was re-deployed (after being pulled in every December from 1995-2001) on March 12, 15:00 and pulled after December 9, 11:00 for the winter months to prevent ice damage. This site gets a large amount of ice coverage from December through late March. The Webhannet River Mile Road (ML) site data collection was re-deployed (following a CICEET project) on March 19, 9:30 and pulled after December 9, 10:30 for the winter months to prevent ice damage. This site gets a large amount of ice coverage from December through late March. The Webhannet River Inlet (IN) site data collection began May 29, 1995, 13:00. The IN datalogger is ongoing throughout the year and is considered our long-term monitoring site, as this site remains relatively ice-free. The Little River Mouth (LM) site data collection began April 2, 10:00 and ended July 9, 16:00 due to high levels of sediment deposition in the mouth of the estuary.

Deployment and retrieval dates and times, model YSI 6-series sonde and turbidity

probe used for 2002:

BEGAN	ENDED	SONDE	MODEL	TURB	MODEL
Head of Tide Site					
03/12/02, 15:30	04/01/02, 11:30	6600		6136	
04/02/02, 14:00	04/22/02, 08:00	6600		6136	
04/23/02, 10:00	05/14/02, 14:30	6600		6136	
05/15/02, 14:00	06/07/02, 10:30	6600		6136	
06/07/02, 10:30	06/27/02, 10:00	6600		6136	
06/28/02, 13:30	07/18/02, 07:00	6600		6136	
07/18/02, 08:30	08/13/02, 12:30	6600		6136	
08/13/02, 15:00	09/13/02, 08:30	6600		6136	
09/13/02, 10:30	10/01/02, 10:30	6600		6136	
10/01/02, 14:00	10/28/02, 11:00	6600		6136	
10/29/02, 11:30	12/09/02, 10:30	6600		6136	
Mile Road Site					
03/19/02, 09:30	04/10/02, 16:00	6600		6136	
04/11/02, 16:00	04/30/02, 09:00	6600		6136	
05/01/02, 11:00	05/17/02, 09:00	6600		6136	
05/17/02, 09:30	06/05/02, 13:30	6600		6136	
06/05/02, 14:30	07/02/02, 11:30	6600		6136	
07/02/02, 12:00	07/22/02, 15:30	6000		6026	
07/22/02, 16:00	08/22/02, 15:30	6600		6136	
08/22/02, 16:00	09/13/02, 10:00	6600		6136	
09/13/02, 11:00	10/01/02, 13:30	6600		6026	
10/01/02, 14:00	10/28/02, 10:30	6600		6136	
10/29/02, 11:30	12/09/02, 10:00	6600		6136	

Inlet Site			
12/21/01, 11:30	01/08/02, 11:30	6600	6026
01/08/02, 11:30	01/29/02, 10:00	6600	6026
01/29/02, 10:30	-Crash-	6600	6026
02/26/02, 11:30	03/12/02, 15:00	6600	6026
03/13/02, 12:30	04/02/02, 14:00	6600	6026
04/03/02, 15:30	04/22/02, 08:00	6600	6026
04/23/02, 10:00	05/15/02, 13:30	6600	6026
05/16/02, 16:00	06/05/02, 08:30	6600	6026
06/06/02, 10:00	07/01/02, 15:30	6600	6026
07/02/02, 17:00	08/07/02, 10:30	6600	6026
08/09/02, 13:30	09/04/02, 09:30	6600	6026
09/04/02, 10:00	10/02/02, 08:30	6600	6136
10/04/02, 10:00	10/22/02, 10:30	6600	6136
10/28/02, 15:30	12/09/02, 15:30	6600	6136
12/11/02, 16:30	01/06/03, 14:30	6600	---

Little River Mouth Site			
04/02/02, 10:00	04/23/02, 14:30	6000	6026
Moved site due to heavy sediment deposition (05/06/02).			
05/06/02, 15:00	05/21/02, 12:30	6000	6026
05/21/02, 13:00	05/28/02, 16:30	6600	6136
05/30/02, 07:30	06/21/02, 14:30	6000	6026
06/21/02, 15:00	07/09/02, 16:00	6600	6136

7). Distribution

According to the Ocean and Coastal Resource Management Data Dissemination Policy
for the NERRS System-wide Monitoring Program,

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 the 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 of 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 section 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under general information link on CDMO homepage) and online at the CDMO homepage <http://cdmo.baruch.sc.edu>. Data are available in text tab-delimited format, Microsoft Excel spreadsheet format and comma-delimited format.

8). Associated researchers and projects

WELLS NATIONAL ESTUARINE RESEARCH RESERVE RESEARCH AT THE RESERVE for 2002

(Please visit our website: www.wellsreserve.org/research.htm for further information on the Wells NERR research program) :

The Research Program at the Wells NERR conducts and supports research, monitoring, workshops, and research/resource management planning of relevance at local, regional and national levels. The overall aim of our work is to produce science-based information needed to sustain or restore Gulf of Maine coastal habitats and resources, especially those found in salt marsh estuaries and watersheds. During 2000-2001 twenty-three different studies (involving 79 scientists, students, and staff from the Reserve, 26 academic institutions and 19 resource management groups) focused on several related themes: 1) the quality of water resources in salt marsh estuaries and watersheds 2) land conservation strategies to protect coastal watersheds 3) factors controlling salt marsh accretion, erosion and plant community vigor 4) the value of salt marsh as habitat for fish, shellfish and birds, and 5) restoration of salt marsh habitat degraded through human actions.

Estuarine Water Resource Quality

Water quality is monitored continuously at several stations with automated instruments as part of a NERRS systemwide monitoring program, as well as bimonthly at 15-20 stations through our WET volunteer monitoring program. The WET program also monitors two important biological parameters: fecal coliform bacterial contamination (an indicator of human health risk) and phytoplankton productivity (an indicator of estuarine health). These data have 1) allowed us to identify several bacterial "hot spots" that we will be working to eliminate, 2) are used to identify and open areas safe for shellfishing, and 3) have uncovered a relation between tides and low dissolved oxygen (a stressful condition for marine life) that needs further study. Our water quality work has contributed to the designation of several Priority Watersheds in coastal Southern Maine by the Maine Department of Environmental Protection.

Coastal Conservation Strategies

The Coastal Mosaic Project is a new program developed in response to requests for support from the conservation community to increase the quantity, quality and ecological integrity of conserved lands in our region. Research staff organize and facilitate meetings, workshops, and communications for 18 partner conservation groups. A key element of the Project is the Conservation Resource Center, a Reserve staffed GIS facility with a growing database able to provide maps of property, natural features and other data needed to develop effective conservation goals and strategies. The Project is nearing completion of conservation lands maps for 13 Southern Maine coastal towns, and is undertaking an initiative to develop coastal watershed conservation strategies for 12 coastal watersheds within these towns. The Reserve has a particular interest in educating communities about the ecologic and economic benefits of land conservation, especially along estuarine and riverine shorelines.

Salt Marsh Habitats and Communities

Factors that control the dynamics and vigor of salt marsh plant communities and marsh peat formation consequently determine the ability of a salt marsh to persist in the face of sea level rise. Through a combination of experimental

manipulations and long term monitoring, a number of multi-year studies are currently producing data to answer questions concerning the sustainability of salt marsh habitats in this region. These studies are looking at nutrient-plant relations, plant community responses to physical and hydrologic disturbance, and the relative contribution of short-term natural events (e.g. storms) and human activities (dredging, tidal restriction) on patterns of sediment accretion and erosion. The Reserve's marshes and beaches are already among the best studied sites in the U.S. with regard to long term accretion and erosion (over thousands of years).

HABITAT VALUE FOR FISH, SHELLFISH AND BIRDS

The Reserve combines long-term monitoring with periodic surveys and short-term experiments to identify species and measure trends and changes in populations of fish, crustaceans, clams and birds. We have 10 years of data on upland and shore birds with which to assess the status of resident and migratory avian populations, and 8 years of wading bird data that we use as a gross level indicator of salt marsh health, which appears to be stable. Our periodic larval, juvenile and adult fish surveys have produced the best available data for fish utilization of salt marsh estuaries in the Gulf of Maine. In the coming year we plan to develop a long-term monitoring program for finfish that will be coordinated with other sites within the Gulf of Maine and along the east coast. Since 1994 we have been conducting surveys and field experiments to look at the survival and growth of hatchery seed, juvenile and adult softshell clam with regard to habitat characteristics and predation by the invasive green crab.

Salt Marsh Degradation and Restoration

Salt marsh ecosystems in the Gulf of Maine have sustained themselves in the face of sea-level rise and other natural disturbances for nearly five thousand years. Since colonial times large areas of salt marsh (up to half of the total

area) have been lost through diking, draining and filling. Today, the remaining marshland is fairly well protected from outright destruction, but during the past 100 years, and especially since the 1950's, salt marshes have been divided into fragments by roads, causeways, culverts and tide gates. Most of these fragments have severely restricted tidal flow, leading to chronic habitat degradation and greatly reduced access for fish and other marine species. Since 1991, the Wells Reserve has been studying the impact of these restrictions on salt marsh functions and values, and the response of salt marshes to tidal restoration. We have been working to promote an awareness of the damage being done and the benefits of salt marsh restoration throughout the Gulf of Maine.

Research Program Update:

In addition to the Reserve-sponsored projects outlined above, numerous visiting investigators will be involved in on-site research. Topics include: the effects of land use, sea level, and climate on estuarine productivity; the relationship between soil nutrients and plant community patterns; the influence of soil salinity on plant community interactions; the effect of tidal restriction on marsh peat accretion; the comparative ecology of fringe marshes and back barrier marshes; habitat use by upland birds, and the ecology of lyme disease.

- The Wells NERR Research Dept. is working on the following projects: "Ecological processes, energy pathways, and the impact of human activities on Maine marsh-estuarine secondary production: a salt marsh panne model". We used stable isotopic tracers (^{15}N additions and naturally abundant ^{13}C) coupled with secondary production measurements (nekton, invertebrates) to track energy flow on the high marsh surface in southern Maine salt marsh systems. The project is still under way.

"Ecological Functions of Fringing Salt Marshes Susceptible to Oil Spills in Casco Bay, Maine". We examined the ecological function of 9 different fringing marsh systems in Casco Bay that ranged from undisturbed to disturbed. Physical parameters measured included sedimentation rates, total suspended solids, and tidal range. Biological parameters included primary production, macroinvertebrate community composition and secondary production (4cm sediment cores), and resident and transient nekton community composition (fyke net). The project is still under way.

"BENTHIC HABITAT CORRELATES OF JUVENILE FISH DISTRIBUTION IN THE BIGELOW BIGHT AND ADJACENT ESTUARIES: LINKAGES BETWEEN FISH, HABITATS, SUBSTRATE

AND HUMAN ACTIVITY". This project was a collaboration between the Wells N.E.R.R. and several members of the local fishing community. Through the use of beam trawls, gill nets, fish traps, van veen ponar, and a sediment profile imager (SPI camera), we are attempting to correlate benthic habitat type to juvenile groundfish and invertebrate assemblages in estuarine, nearshore, and offshore habitat. Stations were also established near dredge spoil dump sites as well as sewage outflow to determine the impacts of human activity on the coast to benthic habitat. The project is still under way.

- The Wells NERR Research Dept. also completed the work on the following project:

In partnership with the York Rivers Association and the Town of York, the Wells

Reserve conducted a survey of the York River watershed. In this survey, volunteers looked for sources of pollution within a 250-foot buffer of the river

and its tributaries (erosion, trash and debris and runoff from roads and lawns

could have a negative impact on water quality). Most pollutants entering water

bodies come from such undefined sources. Therefore, this type of survey is

the best way to begin to address the problems of pollution in a water body. The

idea of the project was to work with the community and landowners to help them

understand the problems that come from these types of pollution and learn activities they might be able to do on their own land that would help prevent

this pollution from entering the water. The results of the survey will become

part of a Watershed Management Plan to improve and restore the water quality of the York River.

- The Wells NERR Research Dept. is involved with the following CICEET* Projects-

I. Project Title: Estuarine Responses to Dredging: Analysis of Sedimentary and

Morphological Change in Back Barrier Marsh to Aid Local Management and Develop a

Regional Management Tool Principal Investigator (s): Michele Dionne, Wells NERR,

ME; Duncan Fitzgerald, Boston University; Joe Kelley, University of Maine; David

Burdick and Larry Ward, University of New Hampshire

Management Issue: Coastal management tool for assessing the impacts of dredging

in estuaries. Project Summary: An adequate supply of sediment is essential for

maintaining salt marshes. Human activities, such as channel dredging and tidal restriction due to road construction, can alter water flows in estuaries and result in dramatic changes in salt marsh sediment supply, affecting the speed of salt marsh erosion. The objective of this project is to determine the impact of dredging and tidal restriction on salt marshes in the Wells NERR. A digital coastal management guide will be created on CD ROM, providing coastal managers with useful conceptual models for predicting the impacts of dredging and other activities that affect water flow and sediment deposition in salt marshes.

II. Project Title: Microbial Source Tracking in Two Southern Maine Watersheds. A two year project written by Maine Sea Grant associate Kristen Whiting-Grant, and funded by Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET), involving Wells NERR, UNH Jackson Estuarine Lab (JEL), USM Muskie School, AmeriCorps and the Maine Conservation Corps. We are pioneering the use in Maine of genetic analysis as a means of determining the source species associated with bacterial contamination in the Webhannet and Little River Estuary. Volunteers collect water samples from streams and the estuaries, staff test for and isolate E. coli. At JEL, a genetic technique (ribotyping) creates a genetic fingerprint of the bacteria which is compared to known sources. The project is still underway.

*The following information on CICEET taken directly from its website:
(<http://www.ciceet.unh.edu>)

Other Onsite Research:

Michele Dionne, Wells NERR, Nancy McReel, Chuck Lubelczyk
Project Title: Effect of herbivory by deer on forest regeneration

June Ficker

Project Title: Monitoring avian productivity and survivorship

Outside Researchers:

•Theresa Theodose, Ph.D., University of Southern Maine
Project Title: Relationships between soil nutrient availability and species composition of a high salt marsh in southern Maine.

•David Burdick, Ph.D. and Roelof Boumans, Ph.D.

University of New Hampshire, University of Maryland
 Project Title: Sediment dynamics in salt marshes: functional assessment
 of
 accretionary biofilters

•Peter Rand, M.D., Chuck Lubelczyk, Robert Smith, M.D.
 Maine Medical Center
 Project Title: Ecological determinants of the spread of the tick vector
 of Lyme
 disease and other pathogens.

II. Physical Structure Descriptors

9). Variable sequence, range of measurements, units, resolution, and
 accuracy:

YSI 6000/6600 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. Each file contains a two line
 column header at the top of the page which identifies measurements and
 units for each column.

10). Coded variable indicator and variable code definitions:

Site definitions: HT = Head of Tide of Webhannet River
ML = Mile Road near mid-point of estuarine portion of

Webhannet River
IN = Inlet at Webhannet River Mouth
LM = Little River Mouth

File definitions: YSI deployment site/waterquality/month/year (ex:
INWQ0702 =
Webhannet Inlet water quality data from July 2002).

11). Data anomalies:

January, 2002 Sampling Period

Head of Tide: None to report; sonde not deployed until March.

Mile Road: None to report; sonde not deployed until March.

Little River Mouth: None to report; sonde not deployed until April.

Inlet:

a) Small negative and/or zero turbidity values were collected sporadically throughout the following time span: 1/01 2:00 to 1/28 22:00 (logging period recorded 63 anomalies), possibly due to a small calibration error. These data were not deleted.

b) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 1/1 0:30 through 1/28 19:00 (49 values with a range from 53 to 991 NTU; mean of 259 NTU); [not including the seven values > 1000 NTU listed below]; that were not consistent with the overall data record. These suspect data were not deleted, as we are not absolutely sure that these values are bad (the post calibration checked out normal).

Date	Time	Turb
01/04/2002	04:30:00	1359
01/09/2002	11:30:00	1730
01/12/2002	23:00:00	1454
01/22/2002	10:00:00	1326
01/25/2002	18:00:00	1740
01/26/2002	08:00:00	1739
01/27/2002	05:00:00	1736

c) There was a high dissolved oxygen and percent saturation spike that was not consistent with the overall data record. This suspect datum was not deleted, as we are not absolutely sure that this value is bad (the post calibration checked out normal).

Date	Time	DO %	DO mg/L
1/14	16:00	189.8	20.1

February, 2002 Sampling Period

Head of Tide: None to report; sonde not deployed until March.

Mile Road: None to report; sonde not deployed until March.

Little River Mouth: None to report; sonde not deployed until April.

Inlet:

a) No data from 2/1 0:00 to 2/26 11:00; due to failure of telemetry cable causing damage to sonde.

b) The following are 10 high positive turbidity spikes that were not consistent

with the overall data record. This suspect data was not deleted, as we are not

absolutely sure that these values were bad.

Date	Time	Turb
02/26/2002	18:00:00	2055
02/26/2002	20:00:00	1073
02/27/2002	03:30:00	1626
02/27/2002	10:00:00	1010
02/27/2002	14:30:00	2052
02/27/2002	17:00:00	2052
02/27/2002	21:30:00	2042
02/27/2002	22:30:00	2045

March, 2002 Sampling Period

Little River Mouth: None to report; sonde not deployed until April.

Head of Tide:

a) No data on 3/1 0:00 to 3/12 15:00; this was the first logger deployment (3/12

at 15:30) at this site for 2002.

b) Small negative and/or zero turbidity values were recorded throughout the

following time

span: 3/12 15:30 to 3/31 23:30 (logging period recorded 852 anomalies), possibly

due to a small calibration error or faulty probe. These data were not deleted.

c) The following are shallow negative and/or zero depth data (23 values with a

range of 0.00 to -0.02 m; mean of -0.01m) spanning 3/14 1:30 to 3/21 2:00. Sonde

probes suspected to be underwater as other parameters check out normal.

These data were not deleted.

3/14 1:30-6:30

3/16 2:30-7:00, 8:00

3/21 2:00

Inlet:

a) Data points are missing on 3/6 10:30 because sonde had to be momentarily

retrieved to remove telemetry cable.

b) A total of three small negative and/or zero turbidity values were collected

sporadically,
possibly due to a small calibration error. These data were not deleted.

Date	Time	Turb
03/02/2002	10:30:00	-0004
03/03/2002	11:00:00	-0002

b) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 3/1 1:00 through 3/6 7:00 (19 values with a range from 61 to 766 NTU; mean of 273 NTU). There were also eleven sporadic high positive turbidity spikes (>1000 NTU) were collected that were not consistent with the overall data record (range from 1321.1 to 2050.7 NTU, mean of 1787.6 NTU spanning 03/01 6:00 to 03/06 10:30). This suspect data were not deleted, as we are not absolutely sure that these values were bad.

Mile Road

a) No data on 3/1 0:00 to 3/19 9:00; this was the first logger deployment (3/19 at 9:30) at this site for 2002.

April, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 4/01 0:00 to 4/7 7:30 (logging period recorded 30 anomalies), possibly due to a small calibration error or faulty probe. These data were not deleted.

b) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 4/15 7:30 through 4/26 15:30 (333 values with a range from 51 to 198 NTU; mean of 144 NTU). This suspect data were not deleted, as we are not absolutely sure that these values were bad.

Inlet:

a) The following datum is a high turbidity spike (>50 NTU) that is suspect but was not deleted:

Date	Time	Turb
04/30/2002	20:30	0052

Mile Road:

a) The following are shallow negative and/or zero depth data (149 values with a range of 0.0 to -0.31 m; mean of -1.2m). Sonde probes suspected to be

underwater as other parameters check out normal. These data were not deleted.

4/1 9:00
4/3 10:30
4/12 5:30, 6:00
4/12 17:00-18:30
4/13 5:00-7:00, 17:00-19:00
4/14 5:00-7:30
4/14 18:00-19:00
4/15 6:00-8:00, 18:30-19:30
4/16 6:30-9:00, 19:00-20:00
4/17 7:00-9:30
4/18 8:30-9:30
4/19 9:00-11:00, 22:00
4/20 10:00-12:00
4/21 11:00-13:00
4/22 0:00, 12:00-14:00
4/23 1:00, 13:00-15:00
4/24 2:00-3:00, 14:30-16:00
4/25 2:30-4:30, 15:00-17:00
4/26 3:30-5:30, 15:30-18:00
4/27 4:30-7:00, 16:30-19:00
4/28 5:30-8:00, 17:30-19:30
4/29 6:00-8:30, 18:00-20:00
4/30 6:30-9:00

Little River Mouth:

a) All data was deleted from 4/20 11:00 to 4/23 14:30 due to the sonde sensors

being submerged with sediment (see Sec 14-Other Remarks/Notes). Once the sonde

was retrieved and rinsed, all post calibrations checked out normal.

b) The following high positive turbidity spikes were recorded and were not

consistent with the overall data record. This suspect data were not deleted, as

we are not absolutely sure that the values were bad.

Date	Time	Turb
4/4	14:30	0178
4/4	15:00	0113
4/14	15:00	0123
4/14	15:30	0085
4/16	6:30	0064
4/17	7:00	0081
4/17	7:30	0237
4/17	11:00	0134
4/17	23:00	0474

May, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the following time

span: 5/15 14:00 to 5/31 23:30 (logging period recorded 730 anomalies), possibly due to a small calibration error or faulty probe. These data were not deleted.

b) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 5/12 9:00 through 5/14 14:30 (12 values with a range from 50 to 148 NTU; mean of 73 NTU). This suspect data were not deleted, as we are not absolutely sure that these values were bad.

Inlet:

a) All turbidity data points were deleted from 5/13 22:30 through 5/15 13:30 due

to a malfunction with the probe wiper.

b) The following datum is a high positive point (>1000) and is suspect but was

not deleted as we are not absolutely sure that this value is bad.

Date	Time	Turb
05/08/2002	00:00	1162

c) The following are episodes of low dissolved oxygen (range from 2.6 to 3.9

mg/l, mean of 3.5 mg/l) and percent saturation (range from 29.1 to 44.9%, mean

of 40.1%) during several low tide and high tide fluctuations that were not

consistent with the overall data record (at high tide the readings returned to

the consistency of the overall data record). These suspect data were not deleted. Other parameters and recalibration were good, although the DO

post cal

showed drift (44.3%) we are not absolutely sure that these values are bad.

05/30	7:00-8:00, 9:30, 19:30, 20:00-21:00, 07:30
-------	--

05/31	8:00-10:00, 20:30-22:00
-------	-------------------------

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 5/17 11:00 to 5/31 23:30 (logging period recorded 142

anomalies), possibly due to a small calibration error or faulty probe. These

suspect data were not deleted.

b) Larger negative turbidity values were recorded throughout the following time

span: 5/17 9:30 to 5/31 23:00 (logging period recorded 541 anomalies), possibly

due to a small calibration error or faulty probe. These suspect data were not

deleted.

c) The following high positive turbidity value was collected, and this suspect data were not deleted, as we are not absolutely sure that these values were bad.

Date	Time	Turb
05/30/2002	23:00	1975

d) The following is a shallow negative depth datum. Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

Date	Time	Depth
05/03/2002	11:00:00	-0.02

Little River Mouth:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 5/21 13:00 to 5/28 16:30 (logging period recorded 328 anomalies), possibly

due to a small calibration error or faulty probe. These data were not deleted.

b) The following high positive turbidity spikes were recorded and were not

consistent with the overall data record. This suspect data were not deleted, as

we are not absolutely sure that the values were bad.

Date	Time	Turb
05/11	21:00	0054
05/14	10:00	0101
05/14	21:30	0073
05/15	23:00	0049

c) The following are episodes of low dissolved oxygen and percent saturation

during several low tide fluctuations that were not consistent with the overall

data record (at normal tides the readings returned to the consistency of the

overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved

oxygen post-cal, and recalibration were good.

Date	Time	DO%	Domg/L
5/18	13:00	014.4	01.5
5/31	22:00	017.7	01.5
5/31	22:30	011.8	01.0
5/31	23:00	008.7	00.7
5/31	23:30	007.4	00.6

d) The following are 33 episodes of high dissolved oxygen (from 9.4 to 11.7

mg/l, mean of 10.6 mg/l) and percent saturation (from 120.0 to 136.5%, mean of

124.8%) during several high tide fluctuations that were not consistent with

the overall data record (at normal tides the readings returned to the

consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved oxygen post-cal, and recalibration were good.

5/8 10:30
5/9 11:00
5/22 12:00, 13:30
5/23 10:30, 11:30
5/24 10:30-13:00
5/25 11:30-14:30
5/26 12:30-14:30
5/27 12:30-16:30
5/28 15:00

June, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the

following time

span: 6/01 0:00 to 6/25 17:30 (logging period recorded 807 anomalies), possibly

due to a small calibration error or faulty probe. These data were not deleted.

b) There was an increasing and decreasing range of high positive turbidity

spikes (>50 NTU) that occurred during the deployment, from 6/6 9:30 through 6/27

8:30 (21 values with a range from 50 to 105 NTU; mean of 62 NTU). This suspect

data were not deleted, as we are not absolutely sure that these values were

bad.

c) The following are shallow negative and/or zero depth data (36 values with a

range of 0.0 to -0.09 m; mean of -0.04m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

6/11 15:00-16:00
6/26 14:00-22:30
6/27 3:00-10:00

Inlet:

a) There was an increasing and decreasing range of high positive turbidity

spikes (>50 NTU) that occurred during the deployment, from 6/4 19:30 through

6/30 23:30 (189 values with a range from 50 to 161 NTU; mean of 59 NTU). This

suspect data were not deleted, as we are not absolutely sure that these values

were bad.

b) The following are nine episodes of low dissolved oxygen (range from 2.5 to 3.9 mg/l, mean of 3.3 mg/l) and percent saturation (range from 29.0 to 45.2%, mean of 37.9%) during several low tide and high tide fluctuations that were not consistent with the overall data record (at high tide the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved oxygen post-cal, and recalibration were good.

06/01	10:30, 21:00, 22:30
06/04	11:30, 12:00
06/05	00:30, 1:00, 1:30, 2:00

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 6/1 0:00 to 6/5 14:00, possibly due to a small calibration error or faulty probe. These data were not deleted.

b) Larger negative turbidity values were recorded throughout the following time span: 6/1 0:00 to 6/5 14:00 (logging period recorded 169 anomalies), possibly due to a small calibration error or faulty probe. These data were not deleted.

c) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 6/19 23:00 through 6/30 23:30 (84 values with a range from 50 to 200 NTU; mean of 80 NTU); [not including the one value > 1000 NTU listed below]; that were not consistent with the overall data record, possibly due to a faulty probe. These suspect data were not deleted, as we are not absolutely sure that these values are bad (the post calibration checked out normal).

Date	Time	Turb
06/26/2002	10:00	1507

d) The following are shallow negative and/or zero depth data (11 values with a range of 0.0 to -0.08 m; mean of -0.4m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

6/12	6:30, 7:00
6/27	7:00-8:30, 19:30
6/28	7:30-9:00

e) The following are 96 episodes of low dissolved oxygen (from 0.1 to 3.0 mg/l, mean of 0.14 mg/l) and percent saturation (low-range from 0.9 to 38.7%, mean of

17.5%) during several low tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved oxygen post-cal (101.4), and recalibration were good though fouling was noticed on sonde guard and sensors upon retrieval. These fluctuations were consistent with extremely high and low tide events, with high and low specific conductivity and salinity readings.

6/20 1:00-2:00
6/21 2:00-3:30
6/22 2:30-5:00
6/22 15:00-16:30
6/23 4:00-6:00
6/24 4:30-7:00, 18:30
6/25 5:30-8:00, 18:00-19:30
6/26 6:00-8:30, 18:30-20:30
6/27 6:00-9:30, 19:30-21:30
6/28 6:00-10:00, 20:00-22:00
6/29 8:00-10:30, 21:00-23:00
6/30 9:00-11:30, 22:00-23:30

Little River Mouth:

a) All data was deleted from 6/26 22:00 to 6/30 23:30 due to the sonde sensors

being submerged with sediment (see Section 14 of metadata). Once the sonde was

retrieved and rinsed, all post calibrations checked out normal.

b) Small negative and zero turbidity values were recorded throughout the following time span: 6/21 21:00 to 6/26 13:30 (logging period recorded 98 anomalies), possibly due to a small calibration error or faulty probe. These

data were not deleted.

c) The following high positive turbidity spikes were recorded and were not

consistent with the overall data record. This suspect data were not deleted, as

we are not absolutely sure that the values were bad.

Date	Time	Turb
6/8	6:30	0085
6/9	4:00	0138
6/16	13:00	0048
6/19	9:00	0074
6/20	4:00	0079

b) The following are episodes of high dissolved oxygen and percent saturation

during several high tide fluctuations that were not consistent with the overall

data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved

oxygen post-cal, and recalibration were good.

Date	Time	DO%	Domg/L
6/1	12:00	125.1	10.3
6/1	12:30	129.7	10.5
6/1	13:00	132.0	10.7
6/1	13:30	126.7	10.1
6/1	14:00	123.4	09.7
6/2	14:30	124.5	10.0
6/24	12:30	121.4	09.8
6/24	13:00	127.9	09.8
6/24	13:30	123.9	09.3
6/25	14:00	122.1	09.7
6/26	14:30	142.9	10.7
6/26	15:00	122.7	09.1

c) The following are 246 episodes of low dissolved oxygen (from 0.0 to 1.7 mg/l,

mean of 0.7 mg/l) and percent saturation (from -0.3 to 19.9%, mean of 8.1%)

during several high tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned to the consistency of

the overall data record). These suspect data were not deleted, as we are not

absolutely sure that these values are bad. Other parameters, the dissolved

oxygen post-cal, and recalibration were good.

Date	Time
6/1	0:00, 0:30, 21:30-23:00
6/2	0:30-1:30
6/5	0:30-3:00, 5:00
6/6	1:30-5:30, 13:00-16:30, 18:00
6/7	1:00-6:30, 17:30-18:30
6/9	3:00, 6:00-8:00, 18:30-20:00
6/11	17:00-20:30
6/12	5:00-9:30, 17:00-21:00
6/13	6:00-8:30, 17:30-22:00
6/14	6:30, 7:00, 9:00, 10:30, 11:00, 19:00-22:30
6/15	23:00
6/16	10:30-12:00, 20:00-23:30
6/17	0:00, 0:30, 8:30-10:00, 11:30, 12:30, 13:00, 19:00, 21:00-23:30
6/18	0:00-2:00, 9:00-10:00, 13:00-15:00, 19:30-23:30
6/19	0:00-3:30, 12:30-16:00, 23:00, 23:30
6/20	0:00-4:30, 12:30-17:00
6/21	0:00-6:00, 9:30
6/21	12:00
6/21	12:30
6/21	13:00
6/22	16:30-18:00
6/22	18:30

6/23 6:30-7:30
6/25 6:00
6/27 20:30-22:00
6/28 20:30-23:30
6/29 9:30, 18:00, 21:30-23:30
6/30 0:00, 0:30, 7:30, 13:00-23:30

July, 2001 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 7/18 22:30 to 7/31 22:30 (logging period recorded 397

anomalies), possibly due to a small calibration error. These data were not deleted.

b) The following high positive turbidity spike was recorded and was not consistent with the overall data record. This suspect datum was not deleted, as

we are not absolutely sure that the value was bad.

Date	Time	Turb
07/23/2002	15:30	0055

c) The following are shallow negative and/or zero depth data (139 values with a

range of 0.0 to -0.07 m; mean of -0.03m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

7/18 8:30-16:00

7/23 11:30-14:30

7/28 21:00-23:30

7/29 0:00, 0:30

7/29 4:00-13:30, 16:30-23:30

7/30 0:00-1:30, 4:30-14:00, 17:00- 23:30

7/31 0:00-2:30, 5:00-14:30, 17:30- 21:30

d) The following are episodes of high dissolved oxygen and percent saturation

during several low tide and high tide fluctuations that were not consistent with

the overall data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted,

as we are not absolutely sure that these values are bad. Other parameters, the

dissolved oxygen post-cal, and recalibration were good. These fluctuations were

consistent with extremely high and low tide events, with high and low specific

conductivity and salinity readings.

Date	Time	DO%	Domg/L
7/12	12:00	122.0	10.5
7/13	12:30	123.0	10.3
7/15	14:00	119.6	09.8
7/15	14:30	114.9	08.7
7/23	10:30	120.6	09.8

7/23 12:00 121.4 10.4
 7/27 13:30 106.5 10.3
 7/27 14:00 113.0 10.3
 7/28 15:00 107.1 10.0

Inlet:

a) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 7/1 0:00 through 7/31 23:30 (510 values with a range from 50 to 989 NTU; mean of 144 NTU); [not including the two values > 1000 NTU listed below]; that were not consistent with the overall data record, possibly due to a faulty probe. These suspect data were not deleted, as we are not absolutely sure that these values are bad (the post calibration checked out normal).

Date	Time	Turb
07/26/2002	21:00	1103
07/29/2002	11:00	1139

b) The following are ninety one episodes of low dissolved oxygen (range from 2.6 to 3.9 mg/l, mean of 3.5 mg/l) and percent saturation (range from 1.1 to 49.1%, mean of 32.0%) during several low tide and high tide fluctuations that were not consistent with the overall data record (at high tide the readings returned to the consistency of the overall data record). These suspect data were not deleted. Other parameters and recalibration were good, although fouling was noticed on probe upon retrieval and DO post cal showed drift (13.1%) we are not absolutely sure that these values are bad.

7/12 8:30, 19:30
 7/13 8:30
 7/14 7:00-9:00
 7/16 11:00, 11:30
 7/17 10:00, 23:30
 7/18 0:30, 12:00
 7/19 1:00, 1:30
 7/20 1:30, 3:00
 7/21 1:00, 3:00, 4:30
 7/22 1:30, 2:30, 3:00, 5:00
 7/23 3:30-5:00, 6:00
 7/24 5:00, 5:30
 7/26 5:30, 8:00, 19:00
 7/27 5:30, 6:00, 7:00-9:00, 19:30- 21:00
 7/28 6:00-9:30, 20:00, 20:30, 21:30
 7/29 6:00-10:00, 19:00, 20:00-22:00
 7/30 7:30-9:00, 10:00, 19:00, 20:00, 21:00, 21:30, 23:30
 7/31 7:00, 8:30, 9:00, 10:00, 10:30, 19:30, 21:00, 21:30, 22:30-23:30

Mile Road:

a) Zero turbidity values were recorded throughout the following time span: 7/25 12:00 to 7/31 17:00 (logging period recorded 14 anomalies), possibly due to a small calibration error or faulty probe. These data were not deleted.

b) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 7/1 0:00 through 7/23 19:00 (37 values with a range from 51 to 181 NTU; mean of 98 NTU); [not including the one value > 1000 NTU listed below]; that were not consistent with the overall data record, possibly due to a faulty probe. These suspect data were not deleted, as we are not absolutely sure that these values are bad (the post calibration checked out normal).

Date	Time	Turb
07/02/2002	18:00	1363

c) The following are 96 episodes of low dissolved oxygen (from 0.2 to 3.0 mg/l, mean of 2.3 mg/l) and percent saturation (low-range from 2.1 to 38.0%, mean of 29.4%) during several low tide and high tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved oxygen post-cal (73.7), and recalibration were good though fouling was noticed on sonde guard and sensors upon retrieval. These fluctuations were consistent with extremely high and low tide events, with high and low specific conductivity and salinity readings.

7/1	10:00-12:00
7/1	17:00-17:30
7/1	23:00-7/2 00:30
7/9	4:30
7/10	5:30, 6:00
7/11	6:00, 18:30
7/12	7:00, 19:30
7/13	7:30-8:30, 20:00, 20:30
7/14	8:30, 9:30
7/15	22:00, 22:30
7/16	10:00, 23:00, 23:30
7/18	0:00, 0:30
7/19	1:00, 1:30

Little River Mouth:

a) No data is available for entire month. All data was deleted from 7/1 0:00 to 7/9 16:00 due to the sonde sensors being submerged with sediment (see Sec 14- Other Remarks/Notes). Once the sonde was retrieved and rinsed, all post calibrations checked out normal.

August, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 8/01 0:00 to 8/13 12:30 (logging period recorded 229 anomalies), possibly due to a small calibration error. These data were not deleted.

b) The following high positive turbidity spike was recorded and was not consistent with the overall data record. This suspect datum was not deleted, as we are not absolutely sure that the value was bad.

Date	Time	Turb
08/21/2002	01:00	0510

c) The following are shallow negative and zero depth data (303 values with a range of 0.0 to -0.09 m; mean of -0.03m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

8/5	10:30-18:30, 22:30-23:30
8/6	0:00-19:00
8/16	15:30, 16:00, 19:30-23:30
8/17	0:00-5:30, 10:00-17:00, 21:00-23:30
8/18	0:00-6:30, 8:30-17:30, 22:00-23:30
8/19	0:00-7:30, 9:30-18:30, 23:00, 23:30
8/20	0:00-7:00
8/22	15:30-21:30
8/23	1:00-4:30
8/24	5:30, 6:00, 7:00, 8:00, 9:00-11:00, 14:00-22:30
8/25	2:30-11:30, 14:30-23:30
8/26	3:00-5:30, 11:30, 12:00, 15:00-23:30

d) The following are episodes of low and high dissolved oxygen and percent saturation during several low tide and high tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved oxygen post-cal, and recalibration were good. These fluctuations were consistent with extremely high and low tide events, with high and low specific conductivity and salinity readings.

Low readings:

Date	Time	DO%	DO mg/L
------	------	-----	---------

8/14	3:30	036.1	02.8
8/14	4:00	034.4	02.6
8/14	4:30	033.1	02.5
8/14	5:00	035.2	02.7
8/15	4:00	033.9	02.6
8/15	4:30	036.4	02.8
8/15	5:00	028.1	02.2
8/15	5:30	033.1	02.5
8/15	6:00	032.5	02.7
8/16	5:30	037.2	02.9
8/17	7:30	035.8	02.9

High readings:

Date	Time	DO%	DO mg/L
8/25	12:00	150.5	12.2
8/26	12:30	165.2	13.6
8/27	13:00	185.2	14.8
8/27	14:30	159.5	12.4
8/27	15:00	161.6	12.6
8/27	15:30	157.5	12.5
8/27	16:00	143.8	12.8
8/28	14:00	155.7	13.4

Inlet:

a) There was an increasing and decreasing range of high positive turbidity spikes (>50 NTU) that occurred during the deployment, from 8/1 0:30 through 8/31 16:30 (370 values with a range from 50 to 832 NTU; mean of 235 NTU); [not including the two values > 1000 NTU listed below]; that were not consistent with the overall data record, possibly due to a faulty probe. These suspect data were not deleted, as we are not absolutely sure that these values are bad (the post calibration checked out normal).

Date	Time	Turb
08/03/2002	15:00	1037
08/05/2002	16:30	1182

b) The following are 260 episodes of low dissolved oxygen (range from -1.0 to 3.0 mg/l, mean of 0.9 mg/l) and percent saturation (range from -12.8 to 38.7%, mean of 11.9%) during several low tide and high tide fluctuations that were not consistent with the overall data record (at high tide the readings returned to the consistency of the overall data record). These suspect data were not deleted as we are not absolutely sure that these values are bad. For the first deployment period: other parameters and recalibration were good, although fouling was noticed on probe upon retrieval and DO post cal showed drift (13.1%). For the second deployment period: other parameters, DO post cal, and recalibration were good.

8/1 5:30, 6:00, 8:00, 9:00, 10:00, 10:30, 11:30, 17:00, 20:00, 20:30-23:30
 8/2 0:00, 0:30, 5:30, 6:30, 7:00, 8:00-9:00, 10:30-12:30, 22:00-23:30
 8/3 0:00-1:30, 5:30, 7:00, 9:00, 10:30-13:00, 19:00, 21:30-23:30
 8/4 0:00-3:00, 9:00-14:30, 22:30, 23:00
 8/5 0:00-15:00
 8/6 1:30-4:30, 14:30-16:00
 8/7 1:30-5:30, 10:30
 8/12 7:30-8:30, 21:00
 8/13 21:00, 22:30
 8/14 11:00, 22:30, 23:30
 8/15 11:30, 23:30
 8/16 0:30, 10:30, 11:00, 12:30, 22:30, 23:00
 8/17 0:00-2:30, 11:30-12:30, 23:00
 8/18 1:00-3:30
 8/19 2:00-4:30
 8/20 3:30-5:30
 8/21 3:30-7:00, 17:30-18:30
 8/22 4:00-6:30
 8/23 3:30-7:30, 18:30, 19:00
 8/24 4:30-8:30, 19:00-20:00
 8/25 6:00-9:00
 8/26 4:00-10:00, 19:00-21:30
 8/27 6:30-9:00, 19:00-22:30
 8/28 3:30-4:30, 9:30, 10:00, 19:30-22:30
 8/29 8:30-11:30, 22:00, 23:30
 8/30 22:00-23:30
 8/31 0:30, 1:30, 9:30-11:30, 23:00, 23:30

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 8/1 4:30 to 8/31 5:30 (logging period recorded 102 anomalies), possibly due to a small calibration error or faulty probe. These

data were not deleted.

b) The following are shallow negative depth data (12 values with a range of -

0.01 to -0.08 m; mean of -0.4 m). Sonde probes suspected to be underwater as

other parameters check out normal. These data were not deleted.

8/22 17:00, 17:30

8/23 5:30-6:30

8/24 6:00-7:00

8/25 6:30, 7:00, 19:00

8/26 7:30

c) The following are 25 episodes of low dissolved oxygen (from 1.2 to 3.0 mg/l,

mean of 2.4 mg/l) and percent saturation (low-range from 15.9 to 38.1%, mean of

32.4%) during several low tide and high tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned

to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. For the first deployment period: other parameters and recalibration were good, although fouling was noticed on probe upon retrieval and DO post cal showed drift (48.6%). For the second deployment period: other parameters, DO post cal, and recalibration were good.

8/5 2:30
8/6 3:00-4:00
8/7 4:30
8/8 5:00
8/9 6:00
8/10 5:30
8/12 21:30
8/13 9:00,22:30
8/17 0:30-1:30
8/19 2:30, 3:30
8/20 3:30, 4:00
8/21 4:00-5:30
8/22 5:00-6:00

September, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 9/7 8:00 to 9/29 4:00 (logging period recorded 73 anomalies), possibly due to a small calibration error. These data were not deleted.

b) The following high positive turbidity spikes were recorded and were not consistent with the overall data record. This suspect data were not deleted, as we are not absolutely sure that the values were bad.

Date	Time	Turb
9/23	1:00	0701
9/23	20:00	0148
9/24	15:30	0462

c) The following are shallow negative and/or zero depth data (238 values with a range of 0.0 to -0.28 m; mean of -0.06m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

9/3 15:00, 16:00-17:30, 23:00, 23:30
9/4 0:00-18:30, 23:00-23:30
9/5 0:00-8:00, 11:00-18:30
9/9 15:30-23:00
9/10 4:00-11:30, 16:30-23:30
9/11 0:00, 4:30-12:30, 17:30-23:30
9/12 0:00-1:30, 4:30-13:30, 17:30-23:30
9/13 0:00-2:00, 6:00-8:30, 11:30-14:30
9/27 16:30-23:30
9/28 0:00-2:00, 4:00-9:30

d) The following are episodes of high dissolved oxygen and percent saturation during several low tide and high tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, the dissolved oxygen post-cal, and recalibration were good. These fluctuations were consistent with extremely high and low tide events, with high and low specific conductivity and salinity readings.

Date	Time	DO%	Domg/L
9/2	18:30	122.9	11.4
9/2	19:00	120.1	10.6
9/9	11:00	125.8	10.3
9/10	12:00	140.6	10.7
9/11	12:30	137.6	10.8
9/12	14:00	139.2	11.4
9/13	15:00	136.9	11.2
9/22	10:30	120.3	10.5

Inlet:

a) The following are missing data points due to time gaps in the data file.

9/04 9:30:00, 10:00:00
 9/05 - 9/13 All 0:00 time points
 9/18 - 9/30 All 0:00 time points

b) Small negative and/or zero turbidity values were recorded throughout the following time

span: 9/4 10:30 to 9/30 23:30 (logging period recorded 1156 anomalies), possibly

due to a small calibration error. These data were not deleted.

c) The following are high positive turbidity spikes (>50 NTU) that occurred

during the deployment that were not consistent with the overall data record,

possibly due to a faulty probe. These suspect data were not deleted, as we are

not absolutely sure that these values are bad (the post calibration checked out normal).

Date	Time	Turb
09/11/2002	12:30	0181
09/10/2002	22:00	1293

d) The following are 133 episodes of low dissolved oxygen (range from - .3 to

3.0 mg/l, mean of 1.3 mg/l) and percent saturation (range from - 4.3 to 37.9%,

mean of 16.0%) during several low tide and high tide fluctuations that were not

consistent with the overall data record (at high tide the readings returned to the consistency of the overall data record). These suspect data were not deleted. For the first deployment period: other parameters, DO post cal, and recalibration were good. For the second deployment period: other parameters and recalibration were good, although fouling was noticed on probe upon retrieval and DO post cal showed drift (62.4%).

Date Time

9/1 0:00-13:00, 14:30, 20:30-23:30
9/2 0:00-4:00, 7:30-15:30, 21:30-23:30
9/3 0:00-4:30, 8:00-9:00, 12:30-16:30, 21:30-23:30
9/4 0:30-5:00
9/20 2:30-6:30, 16:00-18:00
9/21 2:30-7:00, 15:30-17:30, 19:00
9/22 4:00-7:30
9/26 19:00
9/27 20:00

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 9/1 5:30 to 9/5 9:30 (logging period recorded 11 anomalies), possibly due to a small calibration error or faulty probe. These

data were not deleted.

b) The following are high positive turbidity spikes (>50 NTU) that occurred

during the deployment that were not consistent with the overall data. These

suspect data were not deleted, as we are not absolutely sure that these values

are bad (the post calibration checked out normal).

Date	Time	Turb
09/07/2002	07:30	0058
09/11/2002	03:30	0052
09/17/2002	16:30	1774

c) The following are shallow negative and/or zero depth data (48 values with a

range of -0.01 to -0.28 m; mean of -0.08 m). Sonde probes suspected to be

underwater as other parameters check out normal. These data were not deleted.

9/4 2:30
9/5 3:00-4:00, 15:30, 16:00
9/6 4:00-5:30, 16:30-19:30
9/9 6:30-8:00, 19:00-20:00
9/10 7:00-8:30, 19:00-21:30
9/11 7:00-9:30, 20:00-22:30
9/12 8:30-10:00

d) The following are 52 episodes of low dissolved oxygen (from 0.6 to 3.0 mg/l,

mean of 1.9 mg/l) and percent saturation (low-range from 7.8 to 36.4%, mean of 25.1%) during several low tide and high tide fluctuations that were not consistent with the overall data record (at normal tides the readings returned to the consistency of the overall data record). These suspect data were not deleted, as we are not absolutely sure that these values are bad. Other parameters, DO post cal, and recalibration were good.

9/4 2:30, 3:00
9/5 3:30-5:30
9/7 4:30-6:30, 17:30, 18:00
9/8 5:30-7:00, 17:30-19:30
9/9 6:00-8:00, 18:30-20:30
9/10 7:00-8:30, 19:30-21:30
9/11 8:00, 9:00, 21:00-22:00
9/22 6:00, 6:30
9/24 7:00

October, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 10/1 3:30 to 10/31 23:30 (logging period recorded 123

anomalies), possibly due to a small calibration error or faulty probe. These

data were not deleted.

b) The following high positive turbidity spike was recorded and was not consistent with the overall data record. This suspect datum was not deleted, as

we are not absolutely sure that the value was bad.

Date	Time	Turb
10/17	10:30	0563

c) The following are shallow negative and/or zero depth data (115 values with a

range of 0.0 to -0.09 m; mean of -0.03m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

10/1 14:00-16:30
10/2 2:00-17:30
10/2 21:00-23:30
10/3 0:00-7:00
10/5 0:00-8:00, 12:00-18:30
10/7 14:30-19:00
10/16 11:30-17:30
10/31 23:00-23:30

Inlet:

a) The following are missing data points due to time gaps in the data file.

10/01	0:00
10/02	0:00
10/29	0:00

10/30 0:00

10/31 0:00

b) Turbidity data was deleted from 10/4 10:00 to 10/22 10:30 due to a faulty probe.

c) Turbidity data is missing from 10/28 15:30 to 10/31 23:30 due to unavailability of all turbidity probes, all turbidity probes were inoperative.

d) Small negative and/or zero turbidity values were recorded throughout the following time

span: 10/1 0:30 to 10/2 8:30 (logging period recorded 43 anomalies), possibly

due to a small calibration error. These data were not deleted.

e) The following are 53 episodes of low dissolved oxygen (range from 4.0 to 4.4

mg/l, mean of 4.2 mg/l) and percent saturation (range from 44.8 to 51.1%, mean

of 48.1%) during several low tide and high tide fluctuations that were not

consistent with the overall data record (at high tide the readings returned to

the consistency of the overall data record). These suspect data were not deleted. For the first deployment period: other parameters and recalibration

were good, although fouling was noticed on probe upon retrieval and DO post cal

showed drift (62.4%). For the second deployment period: other parameters and

recalibration were good, although a bubble was noticed under probe membrane upon

retrieval and DO post cal showed drift (50.2%). For the third deployment period:

other parameters, DO post cal, and recalibration were good.

10/2 2:00

10/18 17:30-23:30

10/19 0:00-8:00, 9:00, 10:00

10/20 3:00, 5:00, 20:00-23:30

10/21 0:00-4:30, 5:30, 9:30, 10:00, 11:00

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 10/1 16:30 to 10/31 22:30 (logging period recorded 568

anomalies), possibly due to a small calibration error or faulty probe. These

data were not deleted.

b) The following high positive turbidity value was collected, and this suspect

data were not deleted, as we are not absolutely sure that these values were bad.

Date	Time	Turb
10/31/2002	07:30	0897

c) The following are shallow negative and/or zero depth data (10 values with a range of 0.0 to -0.07 m; mean of -0.03m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted:

10/3 2:00, 2:30

10/5 3:30-4:30, 16:30-17:00

10/7 19:00

10/20 4:30-5:00

November, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the following time span: 11/1 0:00 to 11/30 23:30 (logging period recorded 1246

anomalies), possibly due to a small calibration error or faulty probe. These data were not deleted.

b) The following are shallow negative and/or zero depth data (262 values with a range of 0.0 to -0.21 m; mean of -0.06m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted.

11/1 0:00-18:30, 21:30-23:30

11/2 0:00-7:00, 10:00-19:30, 22:30-23:30

11/3 0:00-3:30

11/4 13:00-21:00

11/5 1:30-3:30

11/6 2:00-9:30

11/6 16:30-18:00

11/10 17:30-23:30

11/11 0:00-3:00, 5:30-15:00, 18:00-19:00

11/22 22:00-23:30,

11/23 2:30-11:30, 14:30

11/29 3:00-5:00, 7:30-17:00, 20:00-23:30

11/30 0:00-5:30, 9:00-18:00, 21:30-23:30

Inlet:

a) The following are missing data points due to time gaps in the data file.

11/01-11/30 All 0:00 time points

b) Turbidity data is missing for entire month due to unavailability of all

turbidity probes, all turbidity probes were inoperative.

c) All temperature, salinity, specific conductivity, DO mg/L, depth, and pH data

was deleted from 11/12 23:00 to 11/30 23:30 due to temperature/specific conductivity sensor failure.

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the

following time

span: 11/1 5:00 to 11/30 22:30 (logging period recorded 506 anomalies), possibly due to a small calibration error or faulty probe. These data were not deleted.

b) The following high positive turbidity value was collected, and this suspect data were not deleted, as we are not absolutely sure that these values were bad.

Date	Time	Turb
11/02/2002	01:30	1203

c) The following are shallow negative and/or zero depth data (73 values with a range of 0.0 to -0.21 m; mean of -0.07m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted:

11/1 1:30, 2:00, 13:30-14:30
11/2 2:00-3:30, 14:30-16:00, 3:30- 4:30
11/4 17:00-18:00
11/6 6:00, 6:30, 19:00
11/8 20:00-21:30
11/9 21:00-22:00
11/10 22:00-23:00
11/11 23:00, 23:30
11/18 16:00-18:00
11/21 18:30
11/22 18:00-19:30
11/23 18:30-21:00
11/24 7:00-8:30
11/24 19:30-22:00
11/28 23:30
11/29 0:00-1:00, 12:30
11/30 0:00-2:00
11/30 13:00-14:00

December, 2002 Sampling Period

Head of Tide:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 12/1 0:00 to 12/5 5:30 (logging period recorded 141 anomalies), possibly due to a small calibration error or faulty probe. These

data were not deleted.

b) No data from 12/9 11:00 to 12/31 23:30. This datalogger was pulled for the year (winter months) to prevent ice damage.

c) The following are shallow negative and/or zero depth data (93 values with a range of 0.0 to -0.21 m; mean of -0.6m). Sonde probes suspected to be underwater

as other parameters check out normal.

These data were not deleted.

12/1 0:00-6:00, 11:00-23:30
12/2 0:00-1:00, 11:30-20:00, 23:00-23:30
12/3 0:00-4:30

12/6 3:30
12/7 16:30-21:00
12/8 3:30, 10:30-12:30, 16:00-18:30

Inlet:

a) The following are missing data points due to time gaps in the data file.

12/1-12/9 All 0:00 time points

b) Turbidity data is missing from 12/1 0:00 to 12/9 15:30 due to unavailability

of all turbidity probes, all turbidity probes were inoperative.

c) All temperature, salinity, specific conductivity, DO mg/L, depth, and pH data

was deleted from 12/1 0:00 to 12/9 15:30 due to temperature/specific conductivity sensor failure.

d) Small negative and/or zero turbidity values were recorded throughout the

following time span: 12/11 16:30 to 12/31 22:30 (logging period recorded 426

anomalies), possibly due to a small calibration error. These data were not

deleted.

e) There was an increasing and decreasing range of high positive turbidity

spikes (>50 NTU) that occurred during the deployment, from 12/1 23:30 through

12/30 6:30 (11 values with a range from 163 to 672 NTU; mean of 327 NTU); that

were not consistent with the overall data record. These suspect data were not

deleted, as we are not absolutely sure that these values are bad (the post

calibration checked out normal).

Date	Time	Turb
12/15	23:30	0488
12/16	2:00	0381
12/16	7:00	0475
12/16	17:30	0451
12/17	18:00	0672
12/19	9:30	0197
12/20	21:00	0163
12/22	10:00	0116
12/22	11:00	0240
12/28	7:30	0222
12/30	6:30	0189

Mile Road:

a) Small negative and/or zero turbidity values were recorded throughout the

following time span: 12/1 7:00 to 12/9 4:30 (logging period recorded 131 anomalies), possibly due to a small calibration error or faulty probe.

These

data were not deleted.

b) The following high positive turbidity value was collected, and this suspect data were not deleted, as we are not absolutely sure that these values were bad.

Date	Time	Turb
12/04/2002	11:00:00	1276

c) The following are shallow negative and/or zero depth data (34 values with a range of 0.0 to -0.22 m; mean of -0.07m). Sonde probes suspected to be underwater as other parameters check out normal. These data were not deleted:

12/1	1:00-3:00, 13:30-16:00
12/2	2:00-4:30, 15:00-17:00
12/3	3:30-4:30
12/5	19:00, 19:30
12/7	20:00-21:30
12/8	8:00, 8:30, 21:00

d) No data from 12/9 10:30 to 12/31 23:30. This datalogger was pulled for the year (winter months) to prevent ice damage.

12). Missing data:

Missing data are denoted by a period in the data set. Data are missing due to equipment failure where no probes were deployed, maintenance/calibration of equipment, elimination of obvious outliers or elimination of data due to calibration problems (both pre and post). For more details on deleted data, see the Data Anomalies Section. To find out more details about missing data, contact the Research Coordinator at the site submitting the data.

13). Post deployment information

End of Deployment Post-calibration Readings in Standard Solutions:

Site	Date	Sp.Cond(mS) Turbidity(NTU)	DO (%) (Std: 100)	Dochg(mv) (Std: Variable)	Depth(m)	pH (Std:7)		
HT	04/01/02	9.99	101.4	n/a	-0.023	7.01	-0.5	
HT	04/22/02	9.93	96.0	n/a	-0.018	7.09	-0.4	
HT	05/14/02	9.96	97.5	n/a	-0.109	7.05	1.0	
HT	06/07/02	10.04	94.4	n/a	0.062	7.07	2.3	
HT	06/27/02	10.00	98.5	n/a	-0.128	6.98	-4.4	
HT	07/18/02	10.06	98.0	n/a	0.0	7.0	0.7	
HT	08/13/02	9.96	93.4	n/a	0.043	7.03	-2.0	
HT	09/13/02	9.49	111.0	n/a	0.084	7.06	9.2	

HT	10/01/02	9.74	98.0	n/a	-0.013	6.96	-5.6
HT	10/28/02	10.89	98.1	43.1	-0.008	7.05	-0.1
HT	12/09/02	9.88	104.5	39.0	0.111	6.98	-0.2
ML	04/10/02	10.01	96.5	n/a	0.94	7.07	-0.2
ML	04/30/02	9.96	85.5	n/a	-1.103	7.13	3.4
ML	05/17/02	9.97	86.1	n/a	0.137	7.04	1.7
ML	06/05/02	10.05	82.8	n/a	0.154	7.06	-1.4
ML	07/02/02	10.11	101.4	n/a	-0.046	7.11	3.1
ML	07/22/02	10.05	73.7	n/a	0.179	7.08	0.2
ML	08/22/02	9.95	48.6	n/a	0.121	7.22	0.1
ML	09/13/02	9.99	99.3	n/a	-0.004	7.04	0.8
ML	10/01/02	10.38	89.0	n/a	-0.02	7.08	0.0
ML	10/28/02	10.25	87.9	45.1	-0.003	7.03	-1.9
ML	12/09/02	10.07	75.6	48.2	0.114	7.04	0.0
IN	01/08/02	10.53	108.4	39.4	0.028	7.09	-0.1
IN	01/29/02	10.06	114.4	n/a	0.171	7.09	0.2
IN	03/12/02	9.99	104.1	n/a	-0.020	7.09	0.4
IN	04/02/02	10.0	96.6	n/a	-0.049	6.98	0.0
IN	04/22/02	9.94	96.0	n/a	0.050	7.22	-0.6
IN	05/15/02	10.01	44.3	n/a	0.010	7.04	-0.2
IN	06/05/02	10.09	94.3	n/a	-0.021	7.07	-0.4
IN	07/01/02	10.06	89.3	n/a	0.021	7.07	-0.1
IN	08/07/02	10.01	13.1	n/a	0.017	7.11	0.4
IN	09/04/02	9.96	96.0	n/a	-0.094	7.01	0.1
IN	10/02/02	9.82	62.4	n/a	0.001	7.05	-2.5
IN	10/22/02	10.14	50.2	56.3	0.00	7.04	23.5
IN	12/09/02	6.56	101.2	55.3	0.00	6.96	n/a
IN	01/06/03	10.03	92.6	53.3	0.00	6.98	0.2
LM	04/23/02	10.05	99.5	n/a	0.407	7.17	0.0
LM	05/21/02	10.01	99.0	n/a	0.048	7.04	0.0
LM	05/28/02	10.07	100.9	n/a	0.029	6.97	-4.8
LM	06/21/02	9.97	88.9	n/a	0.015	7.00	0.0
LM	07/09/02	10.07	97.9	n/a	0.022	7.12	0.2

14). Other Remarks/Notes:

On 07/01/2021 this dataset was updated to include embedded QAQC flags for anomalous/suspect data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than detailed in the metadata alone (as in the anomalous/suspect, deleted, and missing data sections above). Prior to 2006, rejected data were deleted from the dataset

so they are unavailable to be used at all, but suspect data were only noted in the metadata document. Suspect data flags <1> were embedded retroactively in order to allow suspect data to be easily identified and filtered from the dataset if desired for analysis and reporting purposes. No other flags or codes were embedded in the dataset and users should still refer to the detailed explanations above for more information.

A) IMPORTANT CHANGES TO NOTE AT THE INLET SITE (IN): where our telemetry unit is stationed: A new vented level YSI 6600 with its new vented level cable was deployed to collect its first data on 5/4/99 at 12:00. The YSI telemetry unit began collecting its first data on 3/16/98 at 10:30:00 (see Section 4-Research Methods). The telemetry unit failed some time between 02/03/02 and 02/26/02. Water contaminated the vented level cable and shorted out the attached vented level 6600 sonde. Both the cable and sonde were sent back for repair and returned in September. The cable was then re-attached and the sonde deployed but there has been no communication to the field boxes since.

B) IMPORTANT CHANGES TO NOTE AT THE INLET SITE (IN): For all data collected from 2/26 11:30 through 9/4 11:30, a non-vented YSI 6600 was used.

C) IMPORTANT CHANGES TO NOTE AT THE INLET SITE (IN): In early 2002, the datasonde was improperly programmed. The interval setting was confused with the start up time as adjustments were being made to allow for the DO probe warm up time. This caused the sonde to take a reading every 29 minutes, causing the data set to be off more and more each day. Importing of the file in this way caused there to be extra rows of data. In order to have a correct monthly file of data, the technicians edited the raw file to adjust for these extra rows of data. Both the original raw file and the edited raw file are being stored on the CDMO server. Please contact reserve for further questions.

D) IMPORTANT CHANGES TO NOTE AT THE LITTLE RIVER MOUTH SITE (LM): The deployment for this site was the first ever for the SWMP program at the Wells NERR. We deployed the sonde in the mouth of the Little River on 4/01/02 and upon

retrieval on 4/23/02 we noticed a serious accumulation of sediment that buried the probes of the sonde. We located another site within an inlet adjacent to the main channel and deployed the sonde again on 5/06/02. We had several successful deployment periods at this new site but found the sonde buried again on 7/09/02. We needed time to re-evaluate the situation and did not deploy again at the Little River Mouth for the rest of the year.

E) The use of the newest (Version 3.0) National Estuarine Research Reserve (NERR) System-Wide Monitoring Program (SWMP) YSI 6-Series Multi-Parameter Water Quality Monitor Standard Operating Procedures began in December '00 when they became available.

F) With our extra data sonde, we have been reducing the amount of time of missing data from calibrations and maintenance for all sites. Some months have no missing data from the use of this extra sonde.

G) Any time a reference is made to turbidity data being negative and/or zero, it was recorded as a negative in the raw data file and a zero in the edited data file due to the formatting of Excel. The technician edited none of these data points by hand nor did he/she delete any of them.