Waquoit Bay (WQB) National Estuarine Research Reserve Water Quality Metadata
January 2006-December 2006
Latest Update: October 2, 2019

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

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2) Entry verification:

The data are uploaded in three file formats (each to separate files identified with the same file name but with unique extensions) from the YSI 6600 data loggers to a PC with the YSI 6600 EcoWatch software. Two of these (PC6000 and ASCII text formats) are kept on file in the WBNERR archive. The comma delimited format data file (.csv) is imported to the EXCEL spreadsheet program (version 5.0) where it is processed according to standard NERRS CDMO protocol using the CDMO Excel 5.0 macros. File contents initially are examined for anomalies (e.g., sensor malfunction, battery failure, spurious values, etc.) by visualization of data with the Ecowatch Software provided by YSI. The exported .csv files are opened in Microsoft Excel for pre-processing with the EQWin format macro that was developed by the CDMO to reformat the header columns, insert station codes, insert a corrected time column and allow the technician to remove any pre- and post- deployment data from the file. Where deployment overlap occurs between files, the data produced by the newly calibrated Sonde is accepted as being the most accurate. The pre-processed file is then ready to be copied into the EQWin water.eqi file where the data are QA/QC checked and archived in a database. EQWin queries, reports, and graphs are used to discover data set outliers (values which fall outside the range that the instrument is designed to measure) and large changes in the data. Missing data (data logger malfunction or maintenance periods) are represented by a blank space. Outliers (data values not within the design range of the respective sensors except for turbidity and depth) are deleted or noted as anomalous. EQWin is also used to generate statistics, view graphs, create customized queries and reports of the data, cross query the water, weather, and nutrient data, and finally export the data to the CDMO. A record of changes is documented in the Deleted Data section of the metadata file.

Copies of all files are retained at the Reserve. Additionally, the formatted PC6000 data files (.dat), as well as the raw text files (.csv) and final exported text files (.txt) are archived at the CDMO ftp server site. During deployment year 2006, Assistant Research Coordinator MaryKay Fox was primarily

responsible for performing all instrument calibrations. Research Coordinator Chris Weidman and Assistant Research Coordinator MaryKay Fox are responsible for data QA/QC.

3) Research objectives:

For the NERR System-Wide Monitoring Program (SWMP), the YSI data loggers are programmed to record water quality parameters every 30 minutes. A total of four SWMP sites were located in the Waquoit Bay estuarine system during 2006. These four are: 1) Metoxit Point (MP) is located in the middle of Waquoit Bay's main basin; 2) Menauhant (MH), in operation since March 2001, is located adjacent to Eel Pond Inlet on Vineyard Sound – one of the two tidal inlets into the Waquoit Bay estuary; 3) Child's River (CR), in operation since May 2002, located near the head of the tidal section of Child's River— one of the two main surface fresh water sources to Waquoit Bay; and 4) Sage Lot (SL), in operation since May 2002, located in Sage Lot Pond—a relatively pristine tidal pond surrounded by salt marsh and barrier beach, possessing one of the bay's few remaining eelgrass stands.

The main purpose of water quality monitoring program is to aid Waquoit Bay NERR in one of its priority missions - to perform as a natural laboratory and platform for coastal and estuarine research. The long term, continuous detailed monitoring of the estuary's basic hydro-physical parameters is an essential tool and context for any research activities located here. Besides this overarching mission, there are also several specific research interests. One primary issue for the Waquoit Bay ecosystem is the influence of anthropogenic induced alterations by nitrogen enrichment. Waquoit Bay receives nitrogen from several sources, such as septic systems (their leachate percolates into groundwater which then enters the bay), run off from roads, run off containing domestic and agricultural fertilizer and animal waste, and atmospheric sources. This elevated nitrogen loading to the bay has resulted in enhanced eutrophication that has contributed to the alteration of the bay's habitats. For example, thick mats of seaweeds (macroaglae) now cover the bottom where eelgrass meadows thrived in the 1970's. Unfortunately, there are few definitive records of the bay's water quality conditions during that period, which makes it difficult to evaluate the rates of change. To facilitate future evaluation, long-term records from SWMP can be used to track water column conditions. Of particular interest, in this regard are measurements of dissolved oxygen (DO) and turbidity, as well as dissolved nitrogen and chlorophyll concentration (this data is available by contacting the reserve). Such records will facilitate evaluation of changes which may come about from a continuation of watershed alteration that result from current development patterns (i.e., non-sewered residential areas served by private septic systems typically consisting of septic tanks and leach fields) as well as non-industrial commercial development, such as golf courses, cranberry bogs, and retail shopping outlets. The records will be useful for evaluating the efficacy of remediation efforts intended to reduce the nitrogen loading from these sources to Waquoit Bay.

Another focus of long-term research interest is the detection of climate change and the determination of its effects on the estuarine environment. Characterizing the variability of the various water column parameters, such as their scale, magnitude and frequency, is likely to be an important aspect of the estuarine ecosystem that may be sensitive to climate change. Related to this focus is an interest in the impact of storms (hurricanes and northeasters) and other extreme meteorological events on the estuary. For example, what temperature and wind field thresholds exist that might bring about or trigger certain conditions within the bay? The observations recorded by the SWMP will allow for these types of studies.

4) Research methods:

YSI 6600 series Sondes are deployed at each permanent water quality monitoring station at the Waquoit Bay Reserve. Since in-situ instrumentation can only record conditions at a specific location, permanent monitoring stations for SWMP are chosen to be in some way representative of the overall estuary. This is difficult in practice since estuaries by their very definition are coastal regions where large physical, chemical and biological variations tend to occur in space and time, so that often no particular location within the system is "typical" of the overall system. Establishing a number of stations can overcome this problem somewhat, and as of 2002 four permanent stations were established in the Waquoit Bay estuaries. Our current SWMP stations are situated so as to be as representative as much as possible of the estuary and its inputs/outputs. Additional details concerning the station characteristics are discussed in the next section.

The YSI Sondes measure and record ambient water temperature, specific conductivity (and calculate salinity), dissolved oxygen (mg/L and % saturated), turbidity (NTU), water level (m), and pH at 30 minute intervals during deployment periods extending for approximately two to three weeks. Note that the pressure sensors we currently use are un-vented and so variations in atmospheric pressure are recorded as changes in water depth (atmospheric data are available from our SWMP meteorological station (as of 1/2002) and other nearby meteorological observatories), so it is possible to make this correction to the depth data (approximately +1 cm of depth is equal to +1 mb of air pressure), for increased accuracy. Also, at our Metoxit Point site (from 12/2000 to 12/2006), Child's River site (from 3/2003 through 12/2006), Menauhant site (from7/2006 to 12/2006), and our Sage Lot site (from 6/2006 to 12/2006) we have been using a YSI chlorophyll 6025 sensor and these data are available by contacting us directly at the reserve (and included in the raw files sent to CDMO).

Sondes are deployed and retrieved every two to three weeks. The "old" Sonde is retrieved and a "new" replacement Sonde is deployed immediately so that ideally no record gap occurs. The 2-3 week deployment duration is constrained by a combination of battery life (shorter life in colder waters) and fouling of the DO sensor (and other sensors to a lesser degree) during the warm summer months. Prior to deployment (usually within 24 hrs), each instrument is checked and its sensors re-calibrated using standard YSI (Operating Manual) protocols. Similarly, after a deployment, each Sonde is brought back to the laboratory for a post-deployment check, data downloading, instrument and sensor cleaning. Salinity sensors are calibrated with reference seawater that had been previously analyzed with a Guildline salinometer at the Woods Hole Oceanographic Institution (David Wellwood is currently the technician for this instrument). pH sensors are calibrated with 4.0, 7.0 and 10.0 pH standard solutions (3-point calibrations). The turbidity standard used is YSI 6073G turbidity standard for 123.0 NTU, and distilled water (DI) for 0 NTU. Temperature sensors are checked periodically against a calibrated mercury thermometer. The chlorophyll probe is calibrated with distilled water (DI) and a Fluorescent FWT Red Dye (Rhodamine WT) at a 0.5 mg/ L concentration (2-point calibration). Oxygen sensor membranes are inspected before and after each deployment. Oxygen sensor membranes were replaced 24 hours prior to each deployment when the sensor seemed to need reconditioning. Final DO calibration was not done until the membrane had been in place for at least 8 hours. As another check on instrument performance, in-situ measurements of air and water temperature, DO, salinity, water temperature, and pH are made using a hand-held YSI 650 at deployment/retrieval times.

In 2006, SWMP water quality data were collected continuously at our two dockside sites, Child's River and Menauhant, from January through December. Data were collected at our open water sites, Metoxit Point and Sage Lot, beginning in March due to heavy sea ice conditions. Sage Lot data was collected from March 15th through December 31. Metoxit Point data was collected from March 7th through December 31, 2006.

Two types of mooring silos are used to hold the Sondes. The Metoxit Point and Sage Lot stations are located offshore and away from shore structures. The Sonde moorings for these stations consist of a vertical PVC pipe tower (2" ID), about 1.5 meters in height extending from a 120 lb cast concrete base resting on the bottom. Attached to this tower is a 0.7 m PVC pipe section (4" ID), referred to as the silo, that holds the Sonde and is adjustable for setting the depth of the sensor package. The Sondes are lowered and inserted into the 4" PVC silo from the surface at low water, when the top of the tower is only about 0.3 m below the surface. The lower part of the silo section is perforated with numerous 1.5" holes to allow the YSI Sonde's sensors direct exposure to the flow of ambient waters. The Metoxit Point and Sage Lot silos are set so that the sensor package is 0.7 m and 0.5 off the bottom, respectively. This ensures that the sensors are above the macro algal mats in the case of Metoxit Point, and sufficiently into the water column because of the thick eelgrass meadow in Sage Lot. The Menauhant and Child's River stations are dock-side locations and their moorings are a more typical type of silo – a single PVC section (4" ID) mounted vertically on a pier piling. The Menauhant site, located at a yacht club dock, is adjacent to a tidal inlet, and the Child's River site, located at commercial marina and boat yard, is adjacent to the upper reaches of a tidal river. The base of these silos is also ventilated with large holes (1.0" diameter) and their sensor packages (bottom of the Sonde) are both mounted about 0.4 m off the bottom. All mooring silos are painted with antifouling paint at the beginning of the spring season, and periodically checked and scrubbed during the summer season.

5) Site location and character:

General description of Waquoit Bay estuarine system:
The Waquoit Bay National Estuarine Research Reserve (WBNERR) is located in the northeastern United States on the southern coast of Cape Cod, Massachusetts. About 8,000 people maintain permanent residency in Waquoit Bay's drainage area, which covers parts of the towns of Falmouth, Mashpee, and Sandwich. During summer months, the population swells 2-3 times with the greatest housing concentrations immediate to the coastline (water views and frontage). In addition, the upper portions of the watershed include a military base, Otis Air Force Base and the Massachusetts Military Reservation, portions of which have been designated by the EPA as Superfund sites due to past practices of dumping jet fuel and other volatile groundwater contaminants.

WBNERR's estuaries are representative of shallow tidal lagoons that occur from Cape Cod to Sandy Hook, New Jersey. WBNERR is within the northern edge of the Virginian biogeographic province, on the transitional border (Cape Cod) with the Acadian biogeographic province to the north and east. Like many embayments located on glacial outwash plains, Waquoit Bay is shallow (< 5 m), fronted by prominent barrier beaches (i.e., those of South Cape Beach State Park and Washburn Island), and is backed by salt marshes and upland coastal forests of scrub pine and oak. Two narrow, navigable inlets, reinforced with granite jetties, pass through two barrier beaches to connect Waquoit Bay with Vineyard Sound to the south. A third shallow and generally un-navigable inlet opened through the Washburn Island barrier beach during Hurricane Bob in August 1991, and closed up in February 2002.

Bottom sediments in the bay are organic rich (Corg conc. ~ 3-4%) silts and medium sands. Sediment cores taken in summer of 2002 indicate that the depth of these estuarine sediments is up to 9 m thick in places. Dating work on these sediment cores suggests that the Waquoit Bay basin has been inundated by the sea for about 5000 years, and sedimentation rates over the past 500 years are estimated to be range from 1.6 to 4.9 mm/yr. Thick (up to 0.3 m) macroalgae (seaweed) mats overlie much of the bottom of the bay, and largely consist of species *Cladophora vagabunda*, *Gracilaria tikvahiayae*, and *Enteromorpha*. The dominant marsh vegetation in Waquoit Bay is *Spartina alterniflora* and *Spartina patens*. Dominant upland vegetation includes mixed forests of red oak, white oak, and pitch pine, and other shrubs and plants common to coastal New England. Land-use in the bay's watershed is about 60% natural vegetation, but the remaining land is largely residential housing, with some commercial (retail malls), and minor amounts of agriculture (~3%) (cranberry bogs).
Dense housing developments cover the two peninsulas that form the western shore of the Waquoit Bay estuarine system. Although the developments themselves are outside of the Reserve boundaries, dissolved nitrogen in discharges from their septic systems (via groundwater) and in fertilizer run-off from their lawns has significant effects on the functioning of the Waquoit Bay ecosystem. These impacts have been a primary subject of study at the Reserve since its designation (1988). One outcome of this research has been the delineation of sub-watersheds within the overall drainage area for Waquoit Bay, of which WBNERR is a small part. This knowledge allows for the design of experiments based on the spatial variation of nutrient loading and other land-use related impacts.

At the northern end of the bay, an area comprising a separate sub-watershed, coastal bluffs of glacial till rise 30 feet above sea level. The northern basin of the bay, just below these bluffs, is its deepest area (approximately 3 m MLW), while much of the remainder of the bay is about 1.5 m. Bourne, Bog, and Caleb Ponds are freshwater kettle hole ponds on the northern-most shore of the bay. As components of the same sub-watershed, they have a common albeit minor freshwater outflow into the bay's northern basin via a narrow channel through a brackish marsh. To the east and south, other sub-watersheds surround several tidal and freshwater ponds, including Hamblin and Jehu Ponds, brackish salt ponds that are connected to the main bay by the tidal waters of Little and Great Rivers, respectively. The shorelines of the ponds are developed with residences that are occupied both seasonally and year round. Hamblin Pond and Little River are components of one sub-watershed, and Jehu Pond and Great River are elements of a separate sub-watershed. Further south lays Sage Lot Pond. It is in the least developed sub-watershed and also contains a barrier beach and salt marsh ecosystem of the reserve's South Cape Beach State Park. To the east of Sage Lot Pond and within the same sub-watershed, lies the highly brackish Flat Pond. It receives minimal tidal flows of salt water from Sage Lot Pond through a narrow, excavated and culverted channel. The preponderance of the input to Flat Pond is groundwater and run off, both of which are likely affected (e.g., nutrients, pesticides, bacteria) by an adjacent golf course and near-by upper-scale residential development.

The largest source of surface freshwater to Waquoit Bay is the Quashnet / Moonakis River.
Although named "river", this and Child's River are more appropriately described as "streams" because of their small channels and discharge ~1.0 CFS. A component of yet another sub-watershed, it originates in Johns Pond situated north of the bay and traverses forests, cranberry bogs, residential areas, and the Quashnet Valley Golf Course before entering the bay near the southern "boundary" of the northern basin. ("Quashnet" applies to that portion of the river within the town of Mashpee, and "Moonakis" refers to the brackish estuary at the river's mouth, lying in the town of Falmouth. Quashnet will be used hereafter to refer to the entire river.) The Quashnet River's tidal portion has sufficient

numbers of coliform bacteria to cause it to be closed to shell fishing most of the time. The source(s) of this bacteria (human or avian) is unknown at this time.

The Childs River is the second largest input of surface freshwater to the bay. A component of another sub-watershed, it runs through densely developed residential areas. The Childs River sub-watershed receives the highest nitrogen loading and is the largest nitrogen contributor to the Waquoit Bay system of all the sub-watersheds. In the upper tidal portions of the river we have consistently recorded the highest nutrient and chlorophyll levels and the lowest dissolved oxygen readings of any region in the bay and so this location represents an end-member for looking at anthropogenic inputs and impacts on the system. Another, albeit smaller, source of freshwater is the discharge of Red Brook through brackish marshlands into Hamblin Pond. Additional freshwater enters the bay elsewhere through groundwater seepage (perhaps up to 50% of all freshwater input into the bay), precipitation and the flows of smaller brooks. There is relatively little surface water runoff entering directly into the bay due to the high percolation rates of Cape Cod's coarse, sandy soils.

Knowledge of the homo/heterogeneity of the water masses in Waquoit Bay was originally derived from measurements made by reserve staff and from data obtained by the reserve's volunteer water quality monitoring group, the Waquoit BayWatchers who have collected depth profiles of Waquoit Bay water quality since 1993. Subsequent research by reserve staff (including some numerical modeling by T. Isaji) has revealed that lateral mixing has considerable influence because tidal currents follow a general course through the bay. This results in an overall structure to horizontal patterns of water quality characteristics. The pattern it produces is a gyre in the central portion of the main bay whereby currents follow a generally counter-clockwise flow around a central area that exhibits reduced exchange with the remainder of the bay. The flushing rate within the gyre is diminished when compared with other more peripheral areas of the bay. The location of the gyre meanders slightly, apparently under the influence of tides and wind). Because of the shallow conditions, restricted tidal inlets, and low amplitude tidal forcing of Vineyard Sound here (tides are semi-diurnal with a range about 0.5 m) water levels in the bay are also strongly influenced by wind forcing. Southerly winds increase tidal heights and advance the phase of the flood and retard the phase of ebb (Northerly winds have the opposite effect).

The Metoxit Point station (MP) (41º 34.131' N 70º 31.294' W, 2.2 m deep) initiated in 1998, is located in the main basin of Waquoit Bay and was selected to be within or near the outer regions of the gyre (described above) and more or less represents “typical” water mass conditions and residence times for the bay. The location is at least a half mile from shore, well flushed by tides, and is in an area that is minimally disturbed by routine activities on the bay (e.g. boat traffic, shell fishing, etc.). Bottom sediments at the site are organic rich muds often overlain by thick algal (*Cladophora*) mats. Because of this site’s fairly open exposure to the south (greatest fetch over the bay), we have observed that when sustained southerly winds are greater than about 20 kts, the Metoxit Point site experiences increased turbidity (sediment suspension events). In the autumn of 2003, the absolute elevation of the station to relative to NGVD (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is uncertain at this time (but estimated to be within 0.1 m). Depth to base of the Sonde (base of the sensor guard) at the Metoxit Point site is -1.02 m NGVD. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station can be approximately interpreted as water surface heights above -0.76 m NGVD. However, the sonde silo at Metoxit is lifted from the bottom for maintenance about twice a year and repositioned slightly within a 20 m radius, so that elevation

variations of up to approximately 0.25 m are possible for this open water site. A mean tidal range of 0.46m (SD = 0.17) is calculated based on one month of data (May 2003), with a minimum of 0.13 m and a maximum of 0.91 m. A mean monthly salinity range of 4.2 ppt, from a mean monthly min of 27.8 ppt to a mean monthly max of 32.0 ppt, has been calculated for this site based on one year of observations (2002).

The Menauhant station (MH) (41^{o} 33.156' N 70^{o} 32.912' W, 1.2 m deep), initiated in March 2001, is located within the Eel Pond Inlet at the Menauhant Yacht Club dock. Eel Pond Inlet is the westernmost of the two main tidal inlets into the Waquoit Bay system. The site was chosen because it occupies one of the strategic locations for gauging the system's water mass characteristics. Entering waters represent the marine end-member while outflows represent the final product of estuarine water mass modification and export to shelf waters. The site also has easy walk-in access to a secure private pier that extends into the throat of the inlet. Also, because of the turbulent tidal flow within the inlet, conditions are vertically well mixed, and the site can be maintained year round even through ice-over conditions in the rest of the bay during severely cold winters. Bottom sediments at this site are clean sands and gravels with almost no attached bottom vegetation. Since inception, we have noted that strong south to southeast (onshore) winds tend to produce turbidity events at this site from the wave induced suspension of fine sediments and organic material in the upstream near-shore zone. While we have found that these types of turbidity events are localized to windward near-shore areas in the bay, the transport of these sediments at inlet mouths during such times is perhaps a dominant sedimentation process within the estuarine system. In other words while the choice of our location may be producing a localized signal in one of our measured parameters that signal may reflect key processes in the system at large. In the summer 2006, the absolute elevation of the station relative to NGVD29 (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) and NAVD88 was calibrated. Precision is estimated to be 0.025 m. Depth to base of the Sonde (base of the sensor guard) at the Menauhant site is -0.786 m NGVD29. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.516 m NGVD29 or -0.779 NAVD88. A mean tidal range of 0.48m (SD = 0.19) is calculated based on one month of data (May 2003), with a minimum of 0.11 m and a maximum of 0.99 m. A mean monthly salinity range of 3.9 ppt, from a mean monthly min of 28.5 ppt to a mean monthly max of 32.4 ppt, has been calculated for this site based on one year of observations (2002).

In July of 2006, a Sutron Sat-Link2 transmitter was installed at this station and transmits data to the NOAA GOES satellite, NESDIS ID #3B030074. (Where 3B030074 is the GOES ID for that particular station.) The transmissions are scheduled hourly and contain four (4) datasets reflecting fifteen minute data sampling intervals. The telemetry data is "Provisional" data and not the "Authentic" dataset used for long term monitoring and study. This data can be viewed by going to http://cdmo.baruch.sc.edu." From January 2006 to July 15, 2006 water quality data was recorded in 30 minute intervals. From July 15, 2006 onward, the data was recorded in 15 minute intervals.

The Child's River station (CR) (41^{o} 34.793' N 70^{o} 31.854' W, 1.2 m deep), initiated in May 2002, is located on a dock piling at Edwards Boat Yard, a commercial marina near the upper tidal reaches of Child's River— one of the two main surface fresh water sources to Waquoit Bay (see general description of Waquoit Bay watershed above). This location is very strongly stratified, characterized by a salt wedge with fresher river water overlying saline ocean water. Vertical salinity ranges can run from 0-10 ppm at the surface to more than 30 ppm just 1 m below. The Sonde sensors are usually well within the salt wedge portion of the water column, nonetheless this location is also our freshest SWMP site,

and is at the opposite end of Child's River from the seaward Menauhant station. Bottom sediments are fine organic rich muds. This location represents the most terrigenously and anthropogenically-impacted SWMP site. Monthly water quality, collected near this location for the past decade, shows very high chlorophyll concentrations during the warmer months and more recent dissolved nutrient records show very high nutrient-loads. Boat traffic at the marina likely leads to increased turbidity during the boating season as well. As this site is dockside at a private marina, general security is high along with easy access. The station is also serviceable year-round and usually not subject to seasonal shutdown due to ice over. In autumn 2003, the absolute elevation of the station to relative to NGVD (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is uncertain at this time (but estimated to be within 0.1 m). Depth to base of the Sonde (base of the sensor guard) at the Child's River site is -0.86 m NGVD. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.58 m NGVD. A mean tidal range of 0.46 m (SD = 0.17) is calculated based on one month of data (May 2003), with a minimum of 0.11 m and a maximum of 0.95 m. A mean monthly salinity range of 14.7 ppt, from a mean monthly min of15.8 ppt to a mean monthly max of 30.5 ppt, has been calculated for this site based on one year of observations (2002).

The Sage Lot station (SL) (41^{o} 33.254' N 70^{o} 30.612' W, 1.2 m deep), initiated in May 2002, is located in a deeper portion of Sage Lot Pond – a small sub-estuary of Waquoit Bay (20 ha) surrounded by salt marsh and barrier beach. Its small watershed is the least developed of all of Waquoit Bay's sub-watersheds and Sage Lot Pond is considered to be its least impacted and most pristine sub-estuary. Bottom sediments are organic rich muds. Sage Lot Pond possesses one of the few remaining eelgrass beds in the Waquoit Bay system. Indeed the Child's River and Sage Lot Pond sites are considered to represent opposite end-members of nutrient-loading and human-induced influence. Researchers often locate their experiments in these two locations to take advantage of this difference. However, Sage Lot Pond is hydrologically connected to an upstream brackish source -- Flat Pond – via a series of tidal creeks, drainage ditches and culverts. Flat Pond borders a country club and golf course and some concern exists for its impact on the water quality of Sage Lot Pond. Currently, Sage Lot Pond is closed to shellfishing in summer months because of high fecal coliform concentrations, though these are thought to be of avian source. In summer 2006, the absolute elevation of the station to relative to NGVD29 (National Geodetic Vertical Datum, sometimes referred to as 1929 Sea Level) was calibrated. Precision is estimated to be within 0.025 m). Depth to base of the Sonde (base of the sensor guard) at the Sage Lot site is about -0.420 m NGVD29. The calibrated mean depth sensor height above the guard base for our YSI 6600 instruments is 0.26 m (SD<0.01m). Therefore depth readings (uncorrected for air pressure) at this station for this year should be interpreted as water surface heights above -0.160 m NGVD29. A mean tidal range of 0.40m (SD = 0.14) is calculated based on one month of data (May 2003), with a minimum of 0.11 m and a maximum of 0.67 m. A mean monthly salinity range of 4.9 ppt, from a mean monthly min of 27.2 ppt to a mean monthly max of 32.1 ppt, has been calculated for this site based on one year of observations (2002).

6) Data collection period:

SWMP water quality monitoring in Waquoit Bay was initiated in 1995. Several different pilot sites (i.e., North Basin and Central Basin) were occupied for varying durations before settling on our first permanent long term site at Metoxit Point in summer 1998. The Menauhant site was our second

permanent station and began operation in March 2001. Sage Lot and Childs River sites began operation in May 2002. For 2006, data loggers were deployed at the Metoxit Point (MP), Menauhant Yacht Club (MH), Childs River (CR), and Sage Lot (SL) sites as of on the first day of the year. The Metoxit and Sage Lot sites were abandoned for the winter on 1/16/2006 due to heavy sea ice. The Metoxit site was reoccupied and back in operation on March 15th , 2006, and the Sage lot site was reoccupied and back in operation on March 7th , 2006. Both remained in the water until December 31st , 2006. The Menauhant and Childs River sites were in operation continuously throughout 2006. The deployment dates and times for 2006 are indicated below:

BEGAN	ENDED
Metoxit Point Site	
03/07/2006, 13:31:00	03/21/2006, 10:01:00
03/21/2006, 10:31:00	04/22/2006, 12:01:00
04/22/2006, 12:31:00	05/11/2006, 12:01:00
05/11/2006, 12:31:00	05/31/2006, 09:01:00
05/31/2006, 09:31:00	06/13/2006, 09:01:00
06/13/2006, 09:31:00	07/03/2006, 12:31:00
07/03/2006, 13:01:00	07/17/2006, 10:31:00
07/17/2006, 11:01:00	08/02/2006, 09:01:00
08/02/2006 09:31:00	08/23/2006, 07:01:00
08/23/2006, 07:31:00	09/07/2006, 11:31:00
09/07/2006, 12:01:00	09/27/2006, 09:31:00
09/27/2006, 10:01:00	10/20/2006, 11:01:00
10/20/2006, 12:31:00	11/09/2006, 09:01:00
11/09/2006, 09:31:00	12/03/2006, 21:01:00
12/04/2006, 16:01:00	12/20/2006, 15:01:00
12/20/2006, 15:31:00	01/04/2007, 08:31:00

BEGAN	ENDED
Menauhant Site	
12/07/2005, 09:30:00	01/10/2006 09:30:00
01/10/2006, 10:00:00	02/07/2006, 09:30:00
02/07/2006, 10:01:00	03/21/2006, 13:01:00
03/21/2006, 13:31:00	04/22/2006, 13:01:00
04/22/2006, 13:30:00	05/11/2006, 13:31:00
05/11/2006, 14:00:00	05/31/2006, 11:00:00
05/31/2006, 11:30:00	06/13/2006, 10:31:00
06/13/2006, 11:01:00	07/03/2006, 09:30:00
07/03/2006, 10:01:00	07/17/2006, 12:01:00
07/17/2006, 12:15:00	08/02/2006, 10:01:00
08/02/2006 10:31:00	08/14/2006, 15:16:00
08/15/2006, 11:16:00	08/22/2006, 12:16:00
08/22/2006, 12:31:00	09/07/2006, 13:31:00

09/07/2006, 14:01:00	09/19/2006, 14:31:00
09/25/2006, 14:01:00	10/19/2006, 10:16:00
10/19/2006, 10:31:00	11/09/2006, 11:46:00
11/09/2006 12:01:00	11/14/2006 15:46:00
11/14/2006, 16:16:00	11/28/2006, 15:01:00
11/28/2006, 15:16:00	12/06/2006, 17:46:00
12/06/2006, 18:01:00	12/19/2006, 12:01:00
12/19/2006, 12:15:00	01/04/2007, 11:31:00

BEGAN	ENDED
Child's River Site	
12/07.2005, 10:01:00	01/10/2006 10:01:00
01/10/2006, 10:30:00	02/06/2006, 10:30:00
02/07/2006, 10:30:00	03/21/2006, 13:01:00
03/21/2006, 13:31:00	04/20/2006, 10:01:00
04/20/2006, 10:31:00	05/11/2006, 13:01:00
05/11/2006, 13:31:00	05/31/2006, 11:31:00
05/31/2006, 12:01:00	06/13/2006, 10:31:00
06/13/2006, 11:01:00	07/03/2006, 10:01:00
07/03/2006, 10:31:00	07/17/2006, 12:01:00
07/17/2006, 12:31:00	08/02/2006, 09:31:00
08/02/2006 10:31:00	08/22/2006, 12:30:00
08/22/2006, 13:01:00	09/07/2006, 09:31:00
09/07/2006, 10:01:00	09/27/2006, 10:01:00
09/27/2006, 10:31:00	10/20/2006, 10:01:00
10/20/2006 10:31:00	11/09/2006 12:01:00
11/09/2006 12:31:00	11/28/2006 15:01:00
11/28/2006 15:31:00	12/19/2006 12:01:00
12/19/2006 12:31:00	01/04/2007 12:01:00

BEGAN	ENDED
Sage Lot Site	
03/15/2006, 14:01:00	03/28/2006, 11:01:00
03/28/2006, 11:31:00	04/27/2006, 11:31:00
04/27/2006, 12:01:00	05/11/2006, 14:31:00
05/11/2006, 15:01:00	05/31/2006, 10:01:00
05/31/2006, 11:00:00	06/23/2006, 16:01:00
06/23/2006, 16:31:00	07/03/2006, 11:31:00
07/03/2006, 12:01:00	07/17/2006, 13:31:00
07/17/2006, 14:01:00	08/02/2006, 13:01:00
08/02/2006, 13:31:00	08/22/2006, 15:01:00
08/22/2006, 15:31:00	09/07/2006, 08:01:00

09/07/2006, 09:01:00	09/27/2006, 11:31:00
09/27/2006, 12:01:00	10/19/2006, 09:31:00
10/19/2006 10:01:00	11/09/2006 14:31:00
11/09/2006 15:01:00	11/28/2006 16:01:00
11/28/2006 16:31:00	12/20/2006 14:31:00
12/20/2006 15:00:00	01/04/2007 10:01:00

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 referred 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:

As part of SWMP and in addition to this Water Quality monitoring dataset, WQB Reserve also monitors Meteorological and Nutrient data. These data are available from the Research Coordinator or online at http://cdmo.baruch.sc.edu/.

The Reserve has carried out a citizen-staffed water quality monitoring program (separate from the SWMP WQ monitoring) since 1993. Water quality measurements are carried out at 8 sites within Waquoit Bay estuary for the purposes of 1) constructing a long time series of water quality information to determine trends, as well as 2) providing a sentinel role to detect unusual changes and events. Parameters currently measured are air and water temperature, salinity, water clarity (Secchi disk), dissolved oxygen, and chlorophyll a concentration, and nutrients (N, P). Monthly and Bi-weekly (June-September) measurements are made year-round on a set schedule. Chl _a samples are processed and

analyzed using a spectrophotometer at WBNERR. Dissolved inorganic nutrient samples are currently analyzed by Matt Charrette at WHOI. All data is processed and archived at WBNERR and is publicly available through our web site (www.waquoitbayreserve.org).

II. Physical Structure Descriptors

9) Sensor specifications:

YSI 6600EDS data logger
All sondes in rotation at WQB for 2006 were YSI 6600EDS models.

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model #: 6560
Range: -5 to 45 °C
Accuracy: +/-0.15 °C
Resolution: 0.01 °C

Parameter: Chlorophyll
Units: microgram per Liter (µg/Liter)
Sensor Type: optical, fluorescence, with mechanical cleaning
Model #: 6025
Range: 0 to 400 µg/L Chl; 0-100 Percent Full Scale (%FS) Fluorescence
Accuracy: No specification provided
Resolution: 0.1 µg/L Chl; to 0.1 % FS

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model #: 6560
Range: 0 to 100 mS/cm
Accuracy: +/-0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependent)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 1.0% of reading or 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation (%)
Sensor Type: Rapid Pulse – Clark type, polarographic

Model #: 6562
Range: 0 to 500 % air saturation
Accuracy: 0-200 % air saturation, +/- 2 % of the reading or 2 % air saturation, whichever is greater; 200-500 % air saturation, +/- 6 % of the reading
Resolution: 0.1 % air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)
Units: milligrams per Liter (mg/L)
Sensor Type: Rapid Pulse – Clark type, polarographic
Model #: 6562
Range: 0 to 50 mg/L
Accuracy: 0 to 20 mg/L, +/- 2 % of the reading or 0.2 mg/L, whichever is greater; 20 to 50 mg/L, +/- 6 % of the reading
Resolution: 0.01 mg/L

Parameter: Non-Vented Level – Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: units
Sensor Type: Glass combination electrode
Model #: 6561
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 ° scatter, with mechanical cleaning
Model #: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 5 % reading or 2 NTU (whichever is greater)
Resolution: 0.1 NTU

YSI 600QS/YSI 650 EDS data logger (Hand-held YSI for field comparison)
Parameter: Temperature, Conductivity/Salinity, Dissolved Oxygen, pH, Depth
See above for probe specifications.

The reliability of the dissolved oxygen (DO) data after 96 hours post-deployment for non-EDS (Extended Deployment System) data Sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments(Wenner et al. 200*). Many reserves have upgraded to YSI 6600 EDS data Sondes, which increase DO accuracy and longevity by reducing the environmental

effects of fouling. The user is therefore advised to consult the metadata and to exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, ie. periodicity analysis. It should be noted that the amount of fouling is site specific and that not all data are affected. The Research Coordinator at the specific NERR site should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor. WQB used only 6600EDS sondes in 2006.

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either depth or water level sensors. Both sensors measure water depth, but by convention, level sensors refer to atmospherically vented measurements and depth refers to non-vented measurements. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.03 cm for every 1 millibar change in atmospheric pressure, and is eliminated for level sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or Digital Calibration Log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR site can be corrected. The Research Coordinator at the specific NERR site should be contacted in order to obtain information regarding atmospheric pressure data availability.

10) Coded variable definitions:

All NERRS sites are required to use the following file naming convention.

File definitions: NERR Reserve/YSI deployment site/data type code/year
Our sites names are designated:
a) Metoxit Point= **MP**
b) Menauhant Site= **MH**
c) Child's River = **CR**
d) Sage Lot= **SL**

Example: wqbmpwq2006 (designates yearly data for the Metoxit Point site)

Station Codes:

Sampling Station	Sampling Site Code	Station Code
Metoxit Point	MP	wqbmpwq
Menauhant Site	MH	wqbmhwq
Child's River	CR	wqbcrwq
Sage Lot	SL	wqbslwq

11) Anomalous/Suspect Data:

On 01/07/2019 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.

NOTE 1: SMALL NEGATIVE TURBIDITY ANOMALIES: Slight negative turbidity values sometimes occur as a result of small calibration offsets. Often these turbidity minimum values are between 0 and -2 NTU. All of these small negative turbidity values (the minimum for a given deployment) should be considered to be within 2 NTU of the true datum for correction purposes. Consequently, we have not deleted any of these small negative turbidity data.

NOTE 2: SMALL NEGATIVE DEPTH ANOMALIES: This type of anomaly occurs due to barometric pressure differences between time of calibration and the reading. In all such cases, barometric pressure differences are checked as well as comparison with other parameters for indications of aerial exposure to verify that all data are valid submerged readings.

NOTE 3: SHIFT TOWARDS HIGHER pH UNITS ANOMALIES. There is some concern within the NERRS SWMP community that since NERRS began using YSI flat glass pH probes that we have more problems with them. Also, since telemetry was initiated at the Menauhant station in July 2006, there appears to be some potential for stray electrical interference with the pH signal as well. As of March 2007, we are still uncertain as the magnitude of the effect on our pH data. Based on data from past years, it appears that there is small positive offset of between 0.2 and 0.6 pH units in the telemetered data since July 12, 2006 at Menauhant. **We are currently retaining this pH data, but consider it suspect and provisional at this time (March 2007).**

January 2006

Metoxit Point:
No data were collected this month due to ice.

Sage Lot:
No data were collected this month due to ice.

Childs River:
No retained anomalous data this month

Menauhant:
All pH data from 1/10/2006 10:00 – 1/31/2006 23:30 appear to be suspect, an offset error by 0.6 pH units higher. This data were retained but we suggest that the data, when used, be subtracted by 0.6 units for this time period (see note 3).

February 2006

Metoxit Point:
No data were collected this month due to ice.

Sage Lot:
No data were collected this month due to ice.

Childs River:
No retained anomalous data this month

Menauhant:
a) DO data for entire deployment from 1/20/2006 12:30 to 2/10/2006 11:30 are anomalous, displaying an odd upward trend throughout deployment. This phenomenon is also reflected in the Child's River data for the same time period. These data were retained.

b) pH data suspect, and offset error of 0.6 pH units higher. This data was retained but we suggest that the data, when used, be corrected by subtracted 0.6 units for this time period.
2/01/2006 00:00 – 09:30 (see note 3).

c) Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

d) Negative depth anomalies were recorded for this month: See note 3. These data were retained.

March 2006

Metoxit Point:
No data were collected until 03/07/2006, 13:00 due to winter sea ice.

Sage Lot:
No data were collected until 03/15/2006, 14:00 due to ice.

Childs River:
No retained anomalous data this month

Menauhant:
No retained anomalous data this month

April 2006

Metoxit Point:
No retained anomalous data this month.

Sage Lot:
Negative depth anomalies on 04/15/2006 07:30 to 08:00 were caused by barometric pressure differences between calibration and readings. These depth readings are valid submerged readings (See note 2).

Childs River:
Turbidity data are elevated from 4/13 through 4/20, likely due to a storm event which brought periods of wind and rain over this period.

Menauhant:
Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

May 2006

Metoxit Point:
No retained anomalous data this month.

Sage Lot:
No retained anomalous data this month.

Childs River:
Turbidity data are suspect for the following dates and times. There were shrimp inside the netting of the sonde, the water at the site appeared "pea-green", and the post cal values were slightly off (3.0 in 0.0 std and 128.1 in 123.0 std). Readings increased steadily throughout the deployment and there was a sharp drop with the beginning of the new deployment.

05/31/2006 12:00 – 06/13/2006 10:30

Menauhant:
No retained anomalous data this month.

June 2006

Metoxit Point:
All parameters are suspect for the following dates and times. It appears that the tower was struck by boat traffic, cutting the buoys attached to the tower, sending the sonde approximately 0.39 meters deeper than its normal deployment and possibly planting it in the bottom sediment. Please use these data with caution.

06/13/2006 09:30 07/03/2006 12:30

Sage Lot:
Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

Childs River:

Turbidity data are suspect for the following dates and times. There were shrimp inside the netting of the sonde, the water at the site appeared "pea-green", and the post cal values were slightly off (3.0 in 0.0 std and 128.1 in 123.0 std). Readings increased steadily throughout the deployment and there was a sharp drop with the beginning of the new deployment.

05/31/2006 12:00 – 06/13/2006 10:30

Several anoxic events occurred towards the end of the month, so there are a few DO data (mg/L and %) dates that are slightly negative. We have retained these data.
06/24/2006, 20:00-20:30
06/25/2006, 02:30, 08:00-10:30

Menauhant:
No retained anomalous data this month.

July 2006

Metoxit Point:
All parameters are suspect for the following dates and times. It appears that the tower was struck by boat traffic, cutting the buoys attached to the tower, sending the sonde approximately 0.39 meters deeper than its normal deployment and possibly planting it in the bottom sediment. Please use these data with caution.

06/13/2006 09:30 07/03/2006 12:30

Turbidity data are suspect for the entire 7/17/06 11:00 – 8/02/06 09:00 deployment due to potential small calibration or probe error – this probe eventually failed and was replaced. The probe calibrated fine, but post cal readings were 0.5 in 0.0 NTU standard and 76.9 in 123.0 NTU standard. Small negative values up to -8 are common and appear to be the baseline for readings. These data should be used for trend analysis only.

Sage Lot:
Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

Childs River:
No retained anomalous data this month

Menauhant:
Turbidity reading suspect 7/17/06 at 12:15. Beginning of deployment, bottom sediment may have been disturbed

Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

August 2006

Metoxit Point:
No retained anomalous data this month.

Sage Lot:
Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

Childs River:
One anoxic event occurred towards the beginning of the month, so there are a few DO data (mg/L and %) dates that are slightly negative. We have retained these data.
08/05/2006, 06:30-07:30

Menauhant:
No retained anomalous data this month.

September 2006

Metoxit Point:
No retained anomalous data this month.

Sage Lot:
No retained anomalous data this month.

Childs River:
No retained anomalous data this month

Menauhant:
a) Salinity data suspect. The data is very spikey with many 1 ppt downward spikes. Data still useful so will keep. We suspect that there is some feedback with telemetry instrumentation involved with Salinity and/or SpCond probe or Sonde (9/17-10/19).
09/17/2006, 00:00 – 09/30/2006, 23:30

b) Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.

October 2006

Metoxit Point:
a) 10/20/06 12:30 – 10/23/06 10:30 During deployment, the Sonde tower cables broke off and the Sonde tube fell to the bottom of the bay. The Sonde was then attached to a floating buoy during this timeframe until staff was able to repair the tower. The Sonde was suspended 1.408 meters below the surface. Depth data was deleted for this time period; all other data retained. Contact the Reserve to obtain raw depth data from this time period.

Sage Lot:
No retained anomalous data this month.

Childs River:
No retained anomalous data this month

Menauhant:

Salinity data suspect. The data is highly variable (very spikey) with many 1 ppt downward spikes. Data still useful so will keep. We suspect that there is some feedback with telemetry instrumentation involved with Salinity and/or SpCond probe or Sonde (9/17-11/14).
10/01/2006, 00:00 – 10/19/2006, 10:00
10/19/2006, 11:00 – 10/31/2006, 23:30 (data looks less variable (less spiky))

November 2006

Metoxit Point:
No retained anomalous data this month.

Sage Lot:
pH data from 11/09/2006 00:00 to end of deployment 11/28/2006 16:00 exhibited an offset (higher) in relationship to the other data by 0.2 pH units. We kept the data but suggest reducing the data by 0.2 pH units when using the data.

Childs River:
No retained anomalous data this month

Menauhant:
a) Salinity data suspect. The data is slightly less variable than last month. Data still useful so will keep. We suspect that there is some feedback with telemetry instrumentation involved with Salinity and/or SpCond probe or Sonde (9/17-11/14).

11/01/2006 00:00 – 11/14/2006 15:45

b) Dissolved oxygen data from 11/14 16:15 are suppressed through the end of the deployment at 11/28 15:00. These data should be considered suspect. A substitute sonde was deployed on 11/14 at 16:15 and was not calibrated prior to deployment due to staff miscommunication.

b) Negative turbidity anomalies were recorded for this month: See note 1. These data were retained. However, at the end of the month, a strong storm event with winds from the south, impacted all water quality parameters and left its signature on all parameters accordingly (October 27th-30th). This data was retained to document this storm event.

c) Negative depth anomalies were recorded for this month: See note 2. These data were retained.

December 2006

Metoxit Point:
No retained anomalous data this month.

Sage Lot:
No retained anomalous data this month.

Childs River:
Some small negative turbidity anomalies were recorded this month: See note 1. These data were retained.

Menauhant:
a) Negative turbidity anomalies were recorded for this month: See note 1. These data were retained.
b) Negative depth anomalies were recorded for this month: See note 2. These data were retained.

12) Deleted Data:

NOTE 1: BIOLOGICAL-RELATED TURBIDITY ANOMALIES: This type anomaly includes turbidity readings that are either outside of the normal range or spikes way above background and unrelated to increased sediment suspension or decreased water column clarity. We believe these records are real (and not sensor malfunction), though not reflective of actual water column turbidity. These extreme values are likely due to biological factors (such as small fish, crabs, or other marine organisms). Our criteria for flagging these data are single spikes (above rather constant background) over 50NTU that are more than 10 times surrounding values. These readings were deleted.

NOTE 2: SUSPENSION EVENT RELATED TURBIDITY ANOMALIES: This type of anomaly includes turbidity readings that were either outside the normal range, or spikes way above background that are related to elevated turbidity levels indicative of wind wave-induced suspension (at the Menauhant site typically), or prop wash-related suspension events (at the Childs River site typically). We believe these are real (and not sensor malfunction), though not reflective of actual water column turbidity. These extreme values are likely due to large floating particles (i.e., seaweeds, detritus, etc.) suspended in the water column during storm events usually from strong southerly winds in the Waquoit Bay area. (see end of section 5 for more detail on these events at this site). Our criteria for flagging these data are values over 100NTU that are more than 5 times the magnitude of surrounding values, and linked to high winds. These readings were deleted.

January:

Metoxit Point:
No data were collected this month due to ice.

Sage Lot:
No data were collected this month due to ice

Childs River:
No data deleted this month.

Menauhant:
a) Temperature probe failure. All data except for DO% and Depth were deleted.

01/04/2006, 14:30 - 01/10/2006, 09:30

February:

Metoxit Point:

No data were collected this month due to ice.

Sage Lot:
No data were collected this month due to ice

Childs River:
No data deleted this month.

Menauhant:
No data deleted this month

March:

Metoxit Point:
No data were collected until 03/07/2006, 13:00 due to winter sea ice.

Sage Lot:
No data were collected until 03/15/2006, 14:01 due to winter sea ice.

Childs River:
No data deleted this month.

Menauhant:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

03/29/2006 04:30, 14:00

April:

Metoxit Point:
04/22/2006, 12:00 –all parameters deleted. Sonde was being retrieved at the time and was part way to surface.

Sage Lot:
pH data for period from 04/22/2006, 00:00 to end of deployment on 04/27/2006, 11:30 are suspect, due to failure. These data have been deleted.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

04/15/2006, 00:00-04/20/2006, 10:00

Menauhant:

a) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

04/08/2006, 11:30
04/18/2006, 17:30

b) Dissolved Oxygen, both mg/L and percent (%) data deleted due to strange, steep drop. Unexplained microenvironment problems/changes. These data were deleted.
04/03/2006, 12:30 – 04/22/2006, 13:00

May:
Metoxit Point:
No deleted data this month.

Sage Lot:
No deleted data this month.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

05/08/2006, 10:30
05/20/2006, 06:30, 17:00
05/22/2006, 14:00, 14:30, 16:00
05/25/2006, 06:00, 07:30
05/28/2006, 08:30
05/29/2006, 08:30, 09:30, 12:30, 16:30
05/30/2006, 04:30, 07:00

Menauhant:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

05/24/2006, 22:30
05/25/2006, 17:00
05/28/2006, 00:00 - 23:30 (all day)
05/29/2006, 00:00 - 23:30 (all day)
05/30/2006, 00:00 - 23: 30 (all day)
05/31/2006, 00:00 - 11:00

June:

Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

06/19/2006, 07:30

06/24/2006, 16:30

b) pH probe problem – EDS brush parks overtop pH probe from 06/29/2006, 16:00 - 07/03/2006 12:30. pH data deleted for this period.

Sage Lot:
No data was deleted for this month.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

06/02/2006, 05:00
06/08/2006, 01:30

Menauhant:
No data was deleted for this month

July:

Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1 & 2). These data were deleted.

07/01/2006, 12:00
07/03/2006, 18:30
07/29/2006, 19:00
07/30/2006, 17:30
07/31/2006, 17:30 – 08/02/2006, 09:00

b) pH probe problem – EDS brush parks overtop pH probe from 06/29/2006, 16:00 - 07/03/2006, 12:30. pH data deleted for this period.

c) pH probe problem – unknown cause from 07/25/2006, 13:30 - 08/02/2006, 09:00. pH data deleted for this period.

d)Conductivity probe appears fouled for period 07/30/2006, 15:30 - 08/01/2006, 13:30 as values drift downward to unusually low values and shift suddenly back up at end of period. Salinity, Specific Conductivity and affected Dissolved Oxygen mg/L (concentration) and depth parameter data were deleted for this period.

Sage Lot:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

07/02/2006, 09:00

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

07/09/2006, 13:30 – 23:30 (all day)
07/10/2006, 00:00 – 23:30 (all day)
07/11/2006, 00:00 – 23:30 (all day)
07/12/2006, 00:00 – 08:30

Menauhant:

a) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

07/06/2006, 21:15
07/15/2006, 12:45

b) Sonde pulled out of water for maintenance related to telemeter (real time). All data were deleted for the following dates and times.

07/19/2006, 08:30, 08:45
07/20/2006, 12:45–14:00
07/26/2006, 06:31– 06:46

c) The following Specific Conductivity and Salinity data were considered suspect likely due to a slow, steady decline in values over time. These data were deleted along with the affected DO mg/L and Depth parameters.

07/27/2006, 00:00 – 07/31/2006, 23:30

August:

Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1 & 2). These data were deleted.

07/31/2006, 17:30 – 08/02/2006, 09:00
08/04/2006, 19:00
08/09/2006, 07:00
08/17/2006, 14:00 – 08/23/2006, 07:00
08/31/2006, 02:00

b) pH probe problem – unknown cause from 07/25/2006, 13:30 – 08/02/2006, 09:00. pH data deleted for this period.

c) Conductivity probe appears fouled for period 07/30/2006, 15:30 – 08/01/2006, 13:30 as values drift downward to unusually low values and shift suddenly back up at end of period. Specific Conductivity, Salinity, and Dissolved Oxygen mg/l (concentration) data were deleted for this period.

Sage Lot:
a) It appears that the temperature/conductivity probe failed on 08/14/2006, 09:00. All data except DO % and Depth were deleted.

b) Conductivity/Salinity Data for period ranging from 08/20/2006, 00:00 to end of deployment on 08/22/2006, 15:00 are suspect, likely due to fouling or failure. Specific Conductivity, Salinity, and affected Dissolved Oxygen mg/L (concentration) data have been deleted.

c) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

08/28/2006, 08:00
08/29/2006, 13:00

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

08/11/2006, 07:00
08/14/2006, 16:30
08/17/2006, 17:00
08/18/2006, 13:30
08/22/2006, 07:30
08/23/2006, 08:30
08/25/2006, 06:30
08/26/2006, 07:30
08/27/2006, 10:00
08/28/2006, 11:00
08/29/2006, 12:30, 15:00
08/30/2006, 06:30
08/31/2006, 13:30

Menauhant:
a) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

08/20/2006, 11:30 – 08/22/2006, 12:15

b) Oxygen membrane failed during deployment. All dissolved oxygen (mg/L and %) were deleted.

08/05/2006, 00:00 – 08/14/2006, 15:15

c) The following Specific Conductivity and Salinity data were considered suspect likely due to a slow, steady decline in values over time. These data, along with affected DO mg/L were deleted

08/01/2006, 00:00 – 08/02/2006, 10:00
08/12/2006, 00:00 – 08/14/2006, 15:15

September:
Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Notes 1 & 2). These data were deleted.

09/07/2006, 04:30
09/20/2006, 11:00 – 09/27/2006, 12:30

Sage Lot:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

09/03/2006, 06:00
09/07/2006, 06:30
09/15/2006, 01:00 and 05:00
09/24/2006, 15:30 and 17:00
09/27/2006, 13:30

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

09/02/2006, 06:30, 07:30, 16:00
09/03/2006, 10:30, 16:00
09/04/2006, 05:30, 13:30
09/05/2006, 06:30, 09:30
09/06/2006, 12:30
09/10/2006, 12:30
09/22/2006, 08:30
09/27/2006, 06:00
09/28/2006, 06:00, 09:30
09/29/2006, 08:30

Menauhant:
a) Oxygen membrane failed during deployment. All dissolved oxygen (mg/L and %) were deleted.

09/07/2006, 14:00 – 09/19/2006, 14:30
09/30/2006, 22:15 – 23:30

b) Sonde pulled out of water for maintenance related to telemeter (real time). All data were deleted for the following dates and times.

09/13/2006, 09:30 – 10:15, 12:00-12:15
09/19/2006, 14:45-15:30

c) Turbidity reading suspect 9/25/06 18:00, extreme outlier. Reading was deleted.

October:

Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1 & 2). These data were deleted.

10/08/2006, 12:30
10/15/2006, 09:00

b) 10/20/06 12:30 – 10/23/06 10:30 Depth data was deleted for this time period; all other data retained. During deployment, the Sonde tower cables broke off and the Sonde tube fell to the bottom of the bay. The Sonde was then attached to a floating buoy during the timeframe above until staff was able to repair the tower. The Sonde was suspended 1.408 meters below the surface. Contact the Reserve to obtain raw depth data from this time period.

c) Sonde was out of water for repair briefly from 10/23/2006, 10:00-10:30 – all data were deleted for this time period.

Sage Lot:
No data was deleted for this month.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

10/01/2006, 09:30, 14:30, 15:30, 16:30
10/02/2006, 07:30
10/03/2006, 07:30, 11:00
10/04/2006, 07:30, 09:00, 14:30
10/05/2006, 10:30, 12:00
10/07/2006, 20:30
10/08/2006, 06:30, 22:00
10/09/2006, 08:00
10/10/2006, 06:30, 09:00
10/11/2006, 17:00
10/12/2006, 10:30, 22:00
10/14/2006, 02:30, 08:30, 10:00-11:00, 14:30, 16:00
10/16/2006, 09:00, 16:00
10/19/2006, 06:30
10/20/2006, 07:00
10/31/2006, 07:30

Menauhant:
a) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

10/06/2006, 00:15-02:15, 10:30
10/18/2006, 03:30

b) Oxygen membrane failed during deployment. All dissolved oxygen (mg/L and %) were deleted.

10/01/2006, 00:00 – 10/02/2006, 10:00

c) Sonde pulled out of water for maintenance related to telemeter (real time). All data were deleted for the following dates and times.

10/02/2006, 10:15-11:00
10/04/2006, 08:30-8:45
10/06/2006, 15:45-16:00
10/09/2006, 08:15-09:00

November:

Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1 & 2). These data were deleted.

11/07/2006, 04:30
11/09/2006, 18:00
11/19/2006, 16:30
11/21/2006, 11:30

b) The following Turbidity data were considered suspect owing to air bubbles related to recent deployment. These data were deleted.

11/09/2006, 09:30 – 11/09/2006, 14:30

c) Dissolved oxygen readings from 11/29/2006 00:00 to end of deployment on 12/03/2006 21:00 are suspect, due to what appears to be membrane failure or electrode fouling. These data were deleted.

Sage Lot:
No data was deleted for this month.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

11/11/2006, 09:30

11/16/2006, 06:00, 16:30
11/20/2006, 15:30
11/21/2006, 06:00

Menauhant:
a) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

11/07/2006, 12:30
11/09/2006, 17:15
11/25/2006, 04:00

b) Sonde pulled out of water for maintenance related to telemeter (real time). All data were deleted for the following dates and times.

11/10/2006 13:45

December:

Metoxit Point:
a) The following Turbidity data were considered suspect owing to likely biologically related interference (See Note 1). These data were deleted.

12/03/2006, 16:30

b) Dissolved oxygen readings from 11/29/2006 00:00 to end of deployment on 12/03/2006 21:00 are suspect, due to what appears to be membrane failure or electrode fouling. These data were deleted.

c) pH probe values anomalously high for entire deployment period from 12/04/2006, 16:00 – 12/20/2006, 15:00 due to probe failure. These data were deleted.

Sage Lot:
a) pH data from 12/20/2006 15:00 to end of the month are suspect, due to what appears to be probe failure. These data were deleted.

Childs River:
The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

12/30/2006, 13:30

Menauhant:
a) The following Turbidity data were considered suspect likely due to a biological or a suspension related event (See Notes 1 & 2). These data were deleted.

12/06/2006, 18:00-23:15
12/09/2006, 11:30

12/12/2006, 22:15
12/16/2006, 07:00

b) Sonde pulled out of water for maintenance related to telemeter (real time). All data were deleted for the following dates and times.

12/08/2006, 14:15, 14:30

13) Missing data:

Data in this section are considered missing if no data were ever recorded for a given time period due to equipment failure where no probes deployed or Sonde / sensors out of water due to deployment / retrieval overlap or maintenance/calibration of equipment. For more details on Deleted Data, see section 12 and on Data Anomalies, see section 11. The Waquoit Bay NERR Research Coordinator can also be contacted about other issues concerning deleted, missing or anomalous data.

January:

Metoxit Point:
No Data were collected from 01/01/2006, 00:00 to 03/07/2006 13:00 due to winter ice conditions at this open water site.

Sage Lot:
No Data were collected from 01/01/2006, 00:00 to 03/15/2006 14:00 due to winter ice conditions at this open water site

Childs River:
There is no missing data this month.

Menauhant:
There is no missing data this month.

February:

Metoxit Point:
No Data were collected from 01/01/2006, 00:00 to 03/07/2006 13:00 due to winter ice conditions at this open water site.

Sage Lot:
No Data were collected from 01/01/2006, 00:00 to 03/15/2006 14:00 due to winter ice conditions at this open water site

Childs River:
02/06/2006, 11:00 – 02/07/2006, 10:00: Battery died.

Menauhant:
There is no missing data this month.

March:

Metoxit Point:
No Data were collected from 01/01/2006, 00:00 to 03/07/2006 13:00 due to winter ice conditions at this open water site.

Sage Lot:
No Data were collected from 01/01/2006, 00:00 to 03/15/2006 14:01 due to winter ice conditions at this open water site

Childs River:
No missing data this month.
Menauhant:
There is no missing data this month.

April:
Metoxit Point:
No missing data this month.

Sage Lot:
No missing data this month.

Childs River:
No missing data this month.

Menauhant:
No missing data this month

May:
Metoxit Point:
No missing data this month.

Sage Lot:
05/31/06 10:30. Deployment/Retrieval interval.

Childs River:
No missing data this month.

Menauhant:
No missing data this month

June:
Metoxit Point:
No missing data this month.

Sage Lot:

No missing data this month.

Childs River:
No missing data this month.

Menauhant:
No missing data this month.

July:
Metoxit Point:
No missing data this month.

Sage Lot:
No missing data this month.

Childs River:
No missing data this month.

Menauhant:
No missing data this month

August:
Metoxit Point:
No missing data this month.

Sage Lot:
No missing data this month.

Childs River:
08/02/2006, 10:00. Deployment/Retrieval interval.

Menauhant:
a) Deployment/Retrieval interval

b) Sonde pulled out of water for maintenance related to telemeter (real time). All data were deleted for the following dates and times.

08/14/2006, 15:30 – 08/15/2006, 11:00

September:

Metoxit Point:
No missing data this month.

Sage Lot:
09/07/06, 08:30. Deployment/Retrieval interval.

Childs River:
No missing data this month.

Menauhant:
09/19/2006, 14:45 – 09/25/2006, 13:45. Sonde taken out to recalibrate oxygen probe, Sonde stopped recording shortly there after.

October:

Metoxit Point:
10/20/2006, 11:30-12:00: Deployment/Retrieval interval with Sonde silo maintenance/repair issues.

Sage Lot:
No missing data this month.

Childs River:
No missing data this month.

Menauhant:
Sonde pulled to recalibrate Oxygen probe due to membrane puncture during deployment. Missed two readings.

10/04/2006, 09:30-09:45

November:

Metoxit Point:
No missing data this month.

Sage Lot:
No missing data this month.

Childs River:
No missing data this month.

Menauhant:
11/14/2006 16:00. Deployment/Retrieval interval.

December:

Metoxit point:
12/03-2006, 21:30 – 12/04/2006, 15:30: Battery died.

Sage Lot:
No missing data this month.

Childs River:

No missing data this month.

Menauhant:
No missing data this month.

14) YSI 6600 Post deployment information:

End of Deployment Post-calibration Readings in Standard Solutions:

Site	Date	Salinity (ppt) (std-30.28)	DO% (std-Sat Air)	pH (std-7.0)	Turbidity (std-0 NTU)
MP					
	03/28/06	29.97	101.8	7.21	0.1
	04/22/06	29.87	100.6	7.05	-0.1
	05/11/06	29.76	97.3	7.18	0.1
	05/31/06	29.88	98.6	6.93	-0.6
	06/13/06	29.93	101.7	6.99	2.3
	07/03/06	24.06	106.7	9.03	17.5
	07/17/06	30.64	100.0	6.93	-0.1
	08/02/06	29.84	100.2	7.42	4.0
	08/23/06	29.62	82.5	6.97	1.0
	09/07/06	29.82	75.4	6.85	0.9
	09/27/06	30.28	95.4	6.89	0.4
	10/20/06	30.23	110.5	6.91	-0.1
	11/9/06	30.59	99.6	6.74	1.0
	12/04/06	29.74	100.3	6.96	4.3
	12/20/06	-----	102.2	7.68	-0.3
	01/04/07	30.11	97.3	7.21	16.7

Site	Date	Salinity (ppt) (std-30.28 ppt)	DO% (std-Sat Air)	pH (std-7.0)	Turbidity (std-0 NTU)
MH					
	01//10/06	30.50	106.4	7.30	0.2
	02/07/06	30.11	98.8	7.23	0.4
	03/21/06	30.46	101.4	7.01	0.0
	04/22/06	31.03	107.9	7.28	0.4
	05/11/06	29.32	109.1	7.28	0.7
	05/31/06	29.90	100.1	6.85	-3.4
	06/13/06	30.69	101.6	6.99	2.9
	07/03/06	29.40	108.8	6.95	6.0
	07/17/06	30.43	103.9	6.98	-0.3
	08/02/06	29.06	100.5	7.17	0.5
	08/14/06	30.35	>70.0	7.26	1.0
	08/22/06	32.26	100.6	6.97	0.3
	09/07/06	29.69	102.6	6.91	3.0
	09/25/06	30.12	97.1	6.84	0.3
	10/19/06	30.68	89.1	6.82	1.0

	11/09/06	30.74	100.5	7.22	0.3
	11/14/06	------	------	-----	---
	11/28/06	29.82	59.5	7.25	0.0
	12/06/06	29.69	97.8	7.01	-.09
	01/04/07	30.33	101.6	7.09	0.5

Site	Date	Salinity (ppt) (std-30.28 ppt)	DO% (std-Sat Air)	pH (std-7.0)	Turbidity (std-0 NTU)
CR					
	01/10/06	29.06	99.6	7.25	0.1
	02/07/06	30.04	102.0	7.23	-0.1
	03/21/06	29.73	103.3	7.25	0.1
	04/20/06	29.88	97.0	7.17	0.1
	05/11/06	29.39	99.7	7.52	0.4
	05/31/06	29.39	98.8	6.79	-0.6
	06/13/06	30.38	101.9	6.92	3.0
	07/03/06	30.61	101.5	6.80	4.9
	07/17/06	30.36	95.5	6.91	-1.6
	08/02/06	28.97	99.1	6.84	-0.4
	08/22/06	30.06	95.3	7.26	0.9
	09/07/06	26.89	78.6	6.83	5.1
	09/27/06	30.40	82.6	7.20	0.3
	10/20/06	30.58	91.2	6.84	0.1
	11/09/06	30.54	99.4	7.18	0.2
	11/27/06	28.73	104.3	7.14	0.9
	12/19/06	29.90	75.3	7.08	-1.1
	01/04/07	29.22	122.1	7.15	-0.4

Site	Date	Salinity (ppt) (std-30.28 ppt)	DO% (std-Sat Air)	pH (std-7.0)	Turbidity (std-0 NTU)
SL					
	03/28/06	30.57	111.4	7.03	0.2
	04/27/06	29.85	90.6	6.80	0.7
	05/11/06	29.10	107.9	7.01	0.4
	05/31/06	29.04	98.1	6.88	0.0
	06/23/06	30.26	109.6	6.96	0.2
	07/03/06	29.73	98.5	6.95	8.6
	07/17/06	30.16	100.3	6.92	-0.4
	08/02/06	29.78	101.1	6.99	0.9
	08/22/06	28.78	98.9	6.92	0.1
	09/07/06	27.39	94.9	6.85	2.7
	09/27/06	30.16	96.8	6.93	-0.4
	10/19/06	30.60	91.9	7.08	0.1
	11/09/06	30.34	99.3	7.00	0.6

11/28/06	29.55	103.3	7.02	0.9
12/20/06	28.52	101.9	7.08	-0.7
01/04/07	30.60	107.5	7.30	-0.2

15) Other remarks/notes:

On 10/02/2019 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.

2006 proved to be a windy year at WQB, with the remains of many tropical storms and hurricanes that weakened as they moved northward up the Atlantic coast. The main storm that affected WQB was the October storm (10/27 to 10/31/2006). Winds from this storm came directly from the south, which result in the most damage to beaches (high erosion rates). Sustained wind speeds averaged from 35 to 58 mph, and the highest gust was 77 mph.

YSI 650 In-field pre deployment and retrieval Water Quality Parameters
A hand-held YSI 650 was used for field calibration and data were recorded at YSI deployment depths. Sonde deployment and retrieval (or last / first) comparisons for each site in addition to the hand-held measurements are shown below in Tables 1-4. They represent another form of post-check on retrieved Sonde data as it is assumed that the recently calibrated deployed Sonde is highly accurate on its initial measurement. If the assumption holds true we should expect last / first readings to be quite similar within the usual 30 minute (15 minute MH site Sonde) time difference between readings if the retrieved instrument was still reading accurately. Large differences indicate potential problems. However there are some caveats to this comparison approach. If time differences between retrieval and deployment are much greater than 30 min, then parameter differences should be also greater, and certainly lose any usefulness beyond a few hours. Also, at certain times some parameters are changing quite rapidly and a 30 min interval could allow for real and rather large differences. One example is DO during late morning and early afternoon, when DO is often ramping up rapidly -- or salinity can change rapidly in areas where the gradients (both vertical and horizontal) are large (i.e., Child's River).

Table 1: MH:

MP	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH
ysi 650									
Deploy	01/10/06	09:43	3.2	-----	29.75	----	----	----	7.70
Retrieve	02/07/06	09:52	3.59	48.31	30.55	98.7	10.65	----	7.70
ysi 650									
Deploy	02/07/06	09:52	3.59	48.31	30.55	98.7	10.65	----	7.70
Retrieve	03/21/06	13:10	3.78	45.95	28.96	70.9	7.81	0.60	7.64

ysi 650									
Deploy	03/21/06	13:10	3.78	45.95	30.38	70.5	7.57	0.60	7.64
Retrieve	04/22/06	10:10	12.49	45.25	29.25	104.5	9.29	0.740	7.78
ysi 650									
Deploy	04/22/06	10:10	12.49	45.25	29.25	104.5	9.29	0.740	7.78
Retrieve	05/11/06	13:27	12.91	46.66	30.28	110.7	9.67	0.870	7.72
ysi 650									
Deploy	05/11/06	13:27	12.91	46.66	30.28	110.7	9.67	0.870	7.72
Retrieve	05/31/06	11:13	18.67	46.65	30.37	112.3	8.75	0.735	7.72
ysi 650									
Deploy	05/31/06	11:13	18.67	46.65	30.37	112.3	8.75	0.735	7.72
Retrieve	06/13/06	10:33	17.98	47.11	30.69	107.8	8.50	0.463	7.71
ysi 650									
Deploy	06/13/06	10:33	17.98	47.11	30.69	107.8	8.50	0.463	7.71
Retrieve	07/03/06	9:51	22.73	41.59	26.69	86.6	6.40	0.496	7.65
ysi 650									
Deploy	07/03/06	9:51	22.73	41.59	26.69	86.6	6.40	0.496	7.65
Retrieve	07/17/06	12:05	24.91	46.83	30.43	81.1	5.64	0.536	7.67
ysi 650									
Deploy	07/17/06	12:05	24.91	46.83	30.43	81.1	5.64	0.536	7.67
Retrieve	08/2/06	10:10	26.19	46.17	29.12	109.0	7.45	0.767	7.56
ysi 650									
Deploy	08/2/06	10:10	26.19	46.17	29.12	109.0	7.45	0.767	7.56
Retrieve	08/14/06	14:30	----	----	----	----	----	----	----
ysi 650									
Deploy	08/15/06	12:00	22.9	47.09	30.06	91.4	6.58	0.60	7.24
Retrieve	08/22/06	12:16	23.85	46.20	29.99	114.2	8.12	0.389	7.67
ysi 650									
Deploy	08/22/06	12:16	23.85	46.20	29.99	114.2	8.12	0.389	7.67
Retrieve	09/07/06	13:37	22.26	45.75	29.69	117.5	8.61	0.662	7.66
ysi 650									
Deploy	09/07/06	13:37	22.26	45.75	29.69	117.5	8.61	0.662	7.66
Retrieve	09/25/06	14:00	----	----	----	----	----	----	----
ysi 650									
Deploy	09/25/06	14:00	----	----	----	----	----	----	----
Retrieve	10/19/06	10:18	15.24	47.44	30.91	97.7	8.11	0.776	7.76
ysi 650									
Deploy	10/19/06	10:18	15.24	47.44	30.91	97.7	8.11	0.776	7.76
Retrieve	11/09/06	11:47	11.60	47.86	31.08	88.7	7.92	0.603	7.73
ysi 650									
Deploy	11/09/06	11:47	11.60	47.86	31.08	88.7	7.92	0.603	7.73
Retrieve	11/14/06	15:46	----	----	----	----	----	----	----
ysi 650									
Deploy	11/14/06	15:46	----	----	----	----	----	----	----
Retrieve	11/28/06	15:03	10.13	47.11	30.47	148.5	13.75	0.772	7.60
ysi 650									
Deploy	11/28/06	15:03	10.13	47.11	30.47	148.5	13.75	0.772	7.60

Retrieve	12/06/06	18;15	6.76	48.07	30.90	91.5	9.12	0.979	7.80
ysi 650									
Deploy	12/06/06	18;15	6.76	48.07	30.90	91.5	9.12	0.979	7.80
Retrieve	12/19/06	12:16	7.81	49.26	31.83	116.7	11.29	0.877	7.74
ysi 650									
Deploy	12/19/06	12:16	7.81	49.26	31.83	116.7	11.29	0.877	7.74
Retrieve	01/04/07	11”37	6.34	49.32	31.73	101.2	10.13	0.940	7.92

Table 2: MP:

MH	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH
ysi 650									
Deploy	03/21/06	10:15	3.18	45.95	28.96	70.9	7.81	0.60	7.15
Retrieve	04/22/06	13:16	11.71	45.20	29.18	102.6	9.27	0.494	7.75
ysi 650									
Deploy	04/22/06	13:16	11.71	45.20	29.18	102.6	9.27	0.494	7.75
Retrieve	05/11/06	12:12	12.50	44.87	28.98	85.6	7.61	1.078	7.50
ysi 650									
Deploy	05/11/06	12:12	12.50	44.87	28.98	85.6	7.61	1.078	7.50
Retrieve	05/31/06	09:15	19.58	46.62	30.34	70.7	5.41	1.167	7.53
ysi 650									
Deploy	05/31/06	09:15	19.58	46.62	30.34	70.7	5.41	1.167	7.53
Retrieve	06/13/06	9:27	18.62	43.52	27.95	83.3	6.59	1.007	7.63
ysi 650									
Deploy	06/13/06	9:27	18.62	43.52	27.95	83.3	6.59	1.007	7.63
Retrieve	07/03/06	13:10	23.27	42.14	27.09	97.8	7.14	1.448	7.70
ysi 650									
Deploy	07/03/06	13:10	23.27	42.14	27.09	97.8	7.14	1.448	7.70
Retrieve	07/17/06	10:40	26.12	45.30	29.29	100.1	6.87	1.259	7.88
ysi 650									
Deploy	07/17/06	10:40	26.12	45.30	29.29	100.1	6.87	1.259	7.88
Retrieve	08/02/06	09:07	27.00	43.87	28.20	103.6	7.06	1.156	8.04
ysi 650									
Deploy	08/02/06	09:07	27.00	43.87	28.20	103.6	7.06	1.156	8.04
Retrieve	08/23/06	07;18	24.31	45.65	29.58	41.3	2.92	1.354	7.50
ysi 650									
Deploy	08/23/06	07;18	24.31	45.65	29.58	41.3	2.92	1.354	7.50
Retrieve	09/07/06	11:44	20.98	45.92	29.82	131.3	9.82	1.335	7.33
ysi 650									
Deploy	09/07/06	11:44	20.98	45.92	29.82	131.3	9.82	1.335	7.33
Retrieve	09/27/06	09:42	20.10	46.09	29.94	90.1	6.82	1.115	7.56
ysi 650									
Deploy	09/27/06	09:42	20.10	46.09	29.94	90.1	6.82	1.115	7.56
Retrieve	10/20/06	11:01	15.39	45.70	29.65	106.2	8.86	1.167	7.86
ysi 650									
Deploy	10/20/06	11:01	15.39	45.70	29.65	106.2	8.86	1.167	7.86

Retrieve	11/09/06	09:14	11.40	45.82	29.56	94.9	8.61	0.598	7.71
ysi 650									
Deploy	11/09/06	09:14	11.40	45.82	29.56	94.9	8.61	0.598	7.71
Retrieve	12/04/06	15:36	8.47	46.29	29.74	95.3	9.19	0.899	7.72
ysi 650									
Deploy	12/04/06	15:36	8.47	46.29	29.74	95.3	9.19	0.899	7.72
Retrieve	12/20/06	15:40	7.08	47.80	30.73	104.4	10.34	0.989	7.98
ysi 650									
Deploy	12/20/06	15:40	7.08	47.80	30.73	104.4	10.34	0.989	7.98
Retrieve	01/04/07	08;35	4.93	46.56	29.62	91.0	9.55	0.899	7.91

Table 3: CR:

CR	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH
ysi 650									
Deploy	01/10/06	10:10	4.51	---	26.96	126.4	13.61	0.83	7.87
Retrieve	02/07/06	10:15	6.16	39.53	24.87	95.7	100.07	0.66	7.71
ysi 650									
Deploy	02/07/06	10:15	6.16	39.53	24.87	95.7	100.07	0.66	7.71
Retrieve	03/21/06	13:17	7.4	---	26.43	83.5	8.44	---	7.85
ysi 650									
Deploy	03/21/06	13:17	7.4	---	26.43	83.5	8.44	---	7.85
Retrieve	04/20/06	10:10	12.3	45.84	29.3	---	---	---	---
ysi 650									
Deploy	04/20/06	10:10	12.3	45.84	29.3	---	---	---	---
Retrieve	05/11/06	13:15	12.83	45.03	29.10	109.2	9.63	1.137	7.68
ysi 650									
Deploy	05/11/06	13:15	12.83	45.03	29.10	109.2	9.63	1.137	7.68
Retrieve	05/31/06	11:40	21.45	42.16	27.13	92.9	7.01	0.934	7.63
ysi 650									
Deploy	05/31/06	11:40	21.45	42.16	27.13	92.9	7.01	0.934	7.63
Retrieve	06/13/06	10:45	19.47	42.13	27.11	66.7	5.22	1.171	7.41
ysi 650									
Deploy	06/13/06	10:45	19.47	42.13	27.11	66.7	5.22	1.171	7.41
Retrieve	07/03/06	10:05	23.28	28.74	17.83	5.0	0.38	0.815	7.08
ysi 650									
Deploy	07/03/06	10:05	23.28	28.74	17.83	5.0	0.38	0.815	7.08
Retrieve	07/17/06	12:13	25.57	36.49	23.05	80.3	5.76	0.840	7.67
ysi 650									
Deploy	07/17/06	12:13	25.57	36.49	23.05	80.3	5.76	0.840	7.67
Retrieve	08/02/06	9:55	27.00	39.48	25.11	75.9	5.25	0.563	7.82
ysi 650									
Deploy	08/02/06	9:55	27.00	39.48	25.11	75.9	5.25	0.563	7.82
Retrieve	08/22/06	12:35	25.00	39.18	24.94	75.9	5.45	0.923	7.55
ysi 650									
Deploy	08/22/06	12:35	25.00	39.18	24.94	75.9	5.45	0.923	7.55
Retrieve	09/07/06	9:45	21.10	41.85	26.89	75.0	5.70	0.990	7.05

ysi 650									
Deploy	09/07/06	9:45	21.10	41.85	26.89	75.0	5.70	0.990	7.05
Retrieve	09/27/06	10:15	20.78	42.24	27.18	85.1	6.50	0.916	7.61
ysi 650									
Deploy	09/27/06	10:15	20.78	42.24	27.18	85.1	6.50	0.916	7.61
Retrieve	10/20/06	9:56	15.66	44.60	28.86	73.3	6.11	1.062	7.60
ysi 650									
Deploy	10/20/06	9:56	15.66	44.60	28.86	73.3	6.11	1.062	7.60
Retrieve	11/09/06	12:08	10.90	46.02	29.73	82.3	7.53	1.092	7.65
ysi 650									
Deploy	11/09/06	12:08	10.90	46.02	29.73	82.3	7.53	1.092	7.65
Retrieve	11/27/06	15:15	10.40	44.44	28.57	89.2	8.32	1.417	7.63
ysi 650									
Deploy	11/27/06	15:15	10.40	44.44	28.57	89.2	8.32	1.417	7.63
Retrieve	12/19/06	12:34	8.54	46.46	29.90	92.8	8.94	1.457	7.81
ysi 650									
Deploy	12/19/06	12:34	8.54	46.46	29.90	92.8	8.94	1.457	7.81
Retrieve	01/04/07	12:03	6.03	44.89	28.56	113.3	11.67	1.469	8.04

Table 4: SL: 2006

SL	Date M/D/Y	Time hh:mm:ss	Temp C	SpCond mS/cm	Salinity ppt	DO % %	DO Conc mg/L	Depth m	pH
ysi 650									
Deploy	03/15/06	13:40	5.86	-	27.22	83.5	8.71	-	7.70
Retrieve	03/28/06	10:40	6.86	-	29.05	115.3	11.6	-	6.60
ysi 650									
Deploy	03/28/06	10:41	6.86	-	29.05	115.3	11.60	0.762	6.60
Retrieve	04/27/06	11:49	13.25	45.36	29.37	114.8	10.01	0.607	7.80
ysi 650									
Deploy	04/27/06	11:49	13.25	45.36	29.37	114.8	10.01	0.607	7.80
Retrieve	05/11/06	14:35	13.98	44.06	28.50	140.6	12.16	0.760	7.84
ysi 650									
Deploy	05/11/06	14:35	13.91	44.06	28.50	140.6	12.16	0.760	7.84
Retrieve	05/31/06	10:23	23.18	41.84	26.86	95.7	7.01	0.376	7.72
ysi 650									
Deploy	05/31/06	10:23	23.18	41.84	26.86	95.7	7.01	0.376	7.72
Retrieve	06/23/06	16:15	23.89	42.54	27.40	168.4	12.2	0.654	8.09
ysi 650									
Deploy	06/23/06	16:15	23.89	42.54	27.40	168.4	12.2	0.654	8.09
Retrieve	07/03/06	11:35	23.83	37.28	23.64	86.2	6.36	0.382	7.44
ysi 650									
Deploy	07/03/06	11:35	23.83	37.28	23.64	86.2	6.36	0.382	7.44
Retrieve	07/17/06	13:35	28.93	43.99	28.27	112.7	7.43	0.447	7.93
ysi 650									
Deploy	07/17/06	13:35	28.93	43.99	28.27	112.7	7.43	0.447	7.93
Retrieve	08/02/06	13:10	28.69	44.31	28.51	121.6	8.03	0.176	7.72
ysi 650									

Deploy	08/02/06	13:10	28.69	44.31	28.51	121.6	8.03	0.176	7.72
Retrieve	08/22/06	14:50	25.32	43.56	28.05	134.1	9.38	0.522	7.90
ysi 650									
Deploy	08/22/06	14:50	25.32	43.56	28.05	134.1	9.38	0.522	7.90
Retrieve	09/07/06	08:18	20.13	42.52	27.39	85.8	6.62	0.377	6.93
ysi 650									
Deploy	09/07/06	08:18	20.13	42.52	27.39	85.8	6.62	0.377	6.93
Retrieve	09/27/06	11:24	19.61	44.81	29.02	97.2	7.50	0.651	7.58
ysi 650									
Deploy	09/27/06	11:24	19.61	44.81	29.02	97.2	7.50	0.651	7.58
Retrieve	10/19/06	9:16	14.23	44.66	28.85	90.6	7.78	0.644	7.64
ysi 650									
Deploy	10/19/06	9:16	14.23	44.66	28.85	90.6	7.78	0.644	7.64
Retrieve	11/09/06	14:48	12.15	46.04	29.81	99.8	8.90	0.546	7.72
ysi 650									
Deploy	11/09/06	14:48	12.15	46.04	29.81	99.8	8.90	0.546	7.72
Retrieve	11/28/06	16:18	9.99	43.52	27.92	98.9	9.34	0.556	7.68
ysi 650									
Deploy	11/28/06	16:18	9.99	43.52	27.92	98.9	9.34	0.556	7.68
Retrieve	12/20/06	14:37	5.50	44.74	28.52	101.9	10.63	0.581	7.49
ysi 650									
Deploy	12/20/06	14:37	5.50	44.74	28.52	101.9	10.63	0.581	7.49
Retrieve	01/04/07	10:05	5.42	46.86	29.37	98.0	10.15	0.500	7.80