

Padilla Bay (PDB) NERR Water Quality Metadata

January – December 2008

Latest Update: December 17, 2014

I. Data Set & Research Descriptors

1) Principal investigator & contact persons:

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2) Entry verification:

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

Edited and raw files are archived on a PC hard drive at Padilla Bay NERR as well as on the Padilla Bay server. The Padilla Bay server is backed up as per Washington Department of Ecology protocols with backup files created weekly and monthly. Nicole Burnett completed this process of entry verification for the 2008 data. Nicole Burnett and Douglas Bulthuis completed final verification and this metadata documentation.

The following QA/QC procedures were used if it was determined that the turbidity values were not from an actual turbidity event. If the value was between 50 and 100 ntu it was marked as turbidity spike and cause unknown (STS, CCU). If the value was between 100 and 500 ntu it was marked as suspect, turbidity spike and cause unknown (1 STS, CCU). If the value was greater than 500 ntu it was marked as rejected due to QAQC checks (-3 GQR).

Starting with the deployment 09-26-13 copper mesh was placed around the outside of the sensor guards at Ploeg and Bayview to reduce the amount of erroneous turbidity data. Two layers of plastic mesh (criss-crossing) were also put in the bottom of the guards. This has lead to much cleaner turbidity data. All turbidity data at Ploeg and Bayview before 09-26-13 should be interpreted with caution. This same guard was tried at Gong but without success. Turbidity data from both Gong and Joe Leary (and Joe Leary Estuary) should be interpreted with caution due to numerous spikes whose origin is unknown (i.e. true event or debris).

3) Research objectives:

The Bay View Channel site has been set out to detect and monitor short-term variability and long-term changes in the southern part of Padilla Bay. The Ploeg Channel site has been set out to detect and monitor short-term variability and long-term change in the northern part of Padilla Bay for comparison and contrast with water quality in the southern part of the bay. The Joe Leary Slough site has been set at the mouth of the slough to measure the effects of tidal "closure" of the tide gates on water in the slough and to detect long-term changes in water quality in the slough associated with implementation of a non point source pollution watershed action plan. The Gong site has been set in the deep water strait west of the northern part of Padilla Bay to monitor short-term variability and long-term change in the waters that are a source for the tidal waters flowing into Padilla Bay. The four sites are set up to provide an indication of the salinity gradient from Joe Leary Slough (freshwater) through Bayview Channel (downstream of freshwater sources from Indian and No Name Sloughs) to Ploeg Channel (remote from freshwater sources but in a tidal channel) to Gong on the marine end of the gradient. Measurements are taken every 15 minutes at the Bayview, Ploeg, Gong and Joe Leary sites, unless otherwise noted.

4) Research methods:

YSI 6600 sondes were deployed in Joe Leary Slough in a vertical position, 0.7 m from the bottom of the slough in a 4 in. diameter ABS pipe with a metal bar secured at the bottom as a stop. That portion of pipe around the sensors is cut out so that only two one-inch wide strips of deployment pipe remain around the sensor guard to allow water circulation around the probes. The ABS pipe is attached to a steel pipe that was driven into the sediment. (This slough was dredged in the fall of 2000 so the area of deployment is much deeper than it had been from 1995 to 2000. To keep the data comparable the YSI is deployed at the same height relative to Mean Sea Level. The slough near the deployment site slowly fills with sediment and is periodically dredged. The height above the bottom thus varies from year to year and during the year. This slough was dredged again in the summer of 2006).

YSI 6600 sondes were deployed in Padilla Bay in a tributary of Bayview Channel. They were deployed using the same design as that in Joe Leary Slough, except that the ABS pipe was attached to two steel pipes. The depth of the YSI was -1.1 m (depth below MLLW) and about 0.75 m above the bottom along the sloping edge of a small channel draining the surrounding intertidal flats from Jan 1 to Jan 16 at 9:00. On Jan 16th 2008, an 8 in galvanized steel pile was installed to replace the 2 in steel pipes. The pile was installed as close to the existing pipe as possible. The YSI is housed in an ABS pipe attached to the pile with hose clamps as described above. The depth of the YSI was about 0.6 m above the bottom.

YSI 6600 sondes were deployed in Ploeg Channel using the same design as that in Bayview Channel including the use of mesh to protect the sensors. The depth of the datalogger was -1.54 m (depth below MLLW) and 0.5 m above the bottom along the sloping edge of a channel draining the surrounding intertidal flats from Jan 1 to Jan 16 at 10:30. On Jan 16th 2008, 8 in galvanized steel piles were installed to replace the 2 in steel pipes. The pile was installed as close to the existing pipe as possible. The YSI is housed in ABS pipe as described above. The depth of the YSI was about 0.33 m above the bottom.

YSI 6600 sondes were not deployed at the Gong site this year due to difficulties with the deployment apparatus. On 10/31/2006 the buoy apparatus that houses the sonde broke free from its mooring, it was probably hit by a large wave or boat. The buoy and sonde were replaced and deployed again 1/22/2009.

In all cases, measurements of temperature, specific conductivity, salinity, percent saturation of dissolved oxygen, depth, pH and turbidity are recorded every 15 minutes. At the end of each deployment, the YSI 6600 is brought back into the laboratory for downloading, cleaning, and recalibration. Before final cleaning and recalibration a post-deployment check is done that consists of recording sensor readings in the standard solutions. The results of these checks are used to help evaluate the validity of the logged data.

All calibrations are conducted according to the protocols in the YSI Environmental Operations Manual for the 6-Series Environmental Monitoring Systems. For the conductivity calibration a conductivity standard of 50 mS/cm was used. The pH calibration is a 2-point calibration using standard buffer solutions with a pH of 7 and 10. ROX oxygen probes only require yearly membrane maintenance and are calibrated in saturated water using 2 air stones to obtain 100% saturation. A 2-point calibration is used for the turbidity probe and the wiper pad is changed prior to each deployment. The standards used are distilled/deionized water for zero and 4000 NTU Formazin solution diluted to 100 NTU.

A Sutron Sat-Link2 transmitter was installed at the Joe Leary station on 12/20/05 and transmits data to the NOAA GOES satellite, NESDIS ID #3B004470 (Where # 3B004470 is the GOES ID for that particular station.) The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at <http://cdmo.baruch.sc.edu>.

5) Site location and character:

General: Padilla Bay (48° 30' N; 122° 30' W) is a shallow embayment in northern Puget Sound. The tide flats are dominated by the eelgrass *Zostera marina*, which covers approximately 3,000 ha. *Zostera japonica*, a recent introduction to the region, now covers about 350 ha of the bay. Tides are mixed semi-diurnal with a mean range of 1.55 m. Salinity varies from about 23 to 32 PSU. Padilla Bay is an "orphaned" estuary in that the Skagit River no longer empties directly into it. Most of the land in the 9300 ha Padilla Bay watershed is agricultural, and is drained by four sloughs which empty into the bay through tide gates. The salinity in Padilla Bay reflects both the sloughs that flow into the bay and the greater Puget Sound-Georgia Basin estuary in which Padilla Bay is located. Major freshwater flows into this area of the Puget Sound-Georgia Basin estuary come from the Fraser and Nooksack Rivers to the north and from the Skagit River to the south. The small Samish River discharges directly north of Padilla Bay.

Joe Leary Slough Site: (48° 31' 05.3" N; 122° 28' 22.8" W) Joe Leary Slough drains land that is predominantly annual crop agriculture, pasture land, and berries with some low-density housing. The slough is characterized by high fecal and nutrient inputs, high turbidity, and low dissolved oxygen concentrations. During the summer, there is low flow and the depth ranges from 0.5-1.5 m. During winter flooding, the slough can reach a depth of 4 m. There is a dam at the mouth of the slough with twelve 4 ft. diameter outfall pipes that have one-way hinged tide gates. Upstream water flows out of Joe Leary Slough when water height in Padilla Bay is lower than water height in Joe Leary Slough (i.e. ebbing tide and low water). Some saline water from Padilla Bay seeps through the tide gates during high water so that the salinity is often 5-10 psu. There are also times when debris may block open one or more of the tidegates causing much more saline conditions on the freshwater side of the tidegates. During these events the salinity may be 25-30 psu and the other parameters may be more representative of saline water. The bottom of the slough is composed of very soft sediment, which is periodically dredged, most recently October 2006. The deployment site is on the freshwater side of the tide gates. The latitude/longitude were measured with a Trimble GeoExplorer II and differentially corrected with post processing providing a manufacturer's stated accuracy of ± 5 m.

Bayview Channel Site: (48° 29' 46.6" N; 122° 30' 01.8" W) Bayview Channel, a major Padilla Bay tributary/distributary, floods and drains intertidal flats including eelgrass beds, mats of macroalgae, and flats without macro-vegetation. The datalogger is located in a tributary channel to Bayview Channel. The tributary drains predominately eelgrass (*Zostera marina* and *Z. japonica*) covered intertidal flats. Bottom sediments beneath the deployment site are fine silt and clay overlying sand. Depth at this site is -1.5 m (depth below MLLW). Pollutants entering the bay include with general non-point source, agricultural non-point source, and fecal coliform bacteria from agriculture, failing septic tanks and wildlife. The latitude/longitude were measured with a Trimble GeoExplorer II and differentially corrected with post processing providing a manufacturer's stated accuracy of ± 5 m.

Ploeg Channel Site: (48° 33' 23.5" N; 122° 31' 46.7" W) Ploeg Channel floods and drains intertidal flats at the north end of Padilla Bay that are comprised of intertidal flats with eelgrass beds (*Zostera marina* and *Z. japonica*) and intertidal flats without macro-vegetation in approximately equal amounts. Bottom sediments beneath the deployment site are fine silt. Depth at this site is –1.5 m (depth below MLLW). Pollutants entering the bay include general non-point source, agricultural non-point source, and fecal coliform bacteria from agriculture, failing septic tanks and wildlife. The latitude/longitude were measured with a Trimble GeoExplorer II and differentially corrected with post processing providing a manufacturer's stated accuracy of ± 5 m.

Gong Site: (48° 33' 30" N; 122° 34' 21" W) The Gong site is located at –18 m water depth on a gradually sloping bottom (from –1 m to –75 m over 2 km) in the strait between Samish and Guemes Islands. Water in the strait flows north and south with tidal currents, the net water movement is apparently south toward the inlet to Guemes Channel. Water from the strait flows onto the intertidal flats in the northern part of Padilla Bay with each tidal cycle. Bottom sediments are mud. YSI 6600 sondes are deployed near the surface at this site 0.5 m below the water surface. The only apparent pollution sources are the general sources of pollution to the Strait of Georgia and Northwest Straits. The latitude/longitude were measured with a Trimble GeoExplorer II and differentially corrected with post processing providing a manufacturer's stated accuracy of ± 5 m.

6) Data collection period: Data collection was continuous from January 1 to December 31 2008 at Joe Leary Slough, Bay View Channel, and Ploeg Channel except as noted in the flagged data (explained in section 11).

Deployment and retrieval times are listed below. The times indicate the first and last measurements made with each deployment. Initial collection began at Bayview and Joe Leary sites in 1995 and at the Ploeg Channel site in 2001.

Bayview Channel

12/13/2007	10:00	1/16/2008	9:00
1/16/2008	*Sonde not deployed, new pile installed		
2/13/2008	16:30	3/13/2008	10:00
3/13/2008	10:15	4/8/2008	10:15
4/8/2008	10:45	4/29/2008	8:45
4/29/2008	9:00	5/22/2008	9:00
5/22/2008	9:15	6/19/2008	12:15
6/19/2008	12:30	7/10/2008	9:45
7/10/2008	10:00	7/31/2008	13:00
7/31/2008	13:15	8/21/2008	8:45
8/21/2008	9:00	9/11/2008	12:15
9/11/2008	12:30	10/1/2008	8:30
10/1/2008	8:45	10/22/2008	10:00
10/22/2008	10:15	11/19/2008	8:30
11/19/2008	8:45	12/16/2008	14:30
12/16/2008	14:45	1/14/2009	14:00

Ploeg Channel

12/13/2007	10:30	1/16/2008	10:15
1/16/2008	*Sonde not deployed, new pile installed		
2/13/2008	15:15	3/13/2008	9:15
3/13/2008	9:30	4/8/2008	9:30

4/8/2008	9:45	4/29/2008	9:15
4/29/2008	9:30	5/22/2008	7:45
5/22/2008	8:00	6/19/2008	9:30
6/19/2008	10:00	7/10/2008	9:00
7/10/2008	9:30	7/31/2008	13:30
7/31/2008	13:45	8/21/2008	9:30
08/21/2008	09:45	09/11/2008	12:45
09/11/2008	13:00	10/1/2008	8:15
10/1/2008	8:30	10/22/2008	10:15
10/22/2008	10:30	11/19/2008	8:30
11/19/2008	8:45	12/16/2008	14:45
12/16/2008	15:15	1/14/2009	14:30

Joe Leary

12/13/2007	11:30	1/16/2008	14:00
1/16/2008	14:15	2/14/2008	14:00
2/14/2008	14:15	3/21/2008	10:30
3/21/2008	10:45	4/9/2008	10:00
4/9/2008	10:15	4/29/2008	12:15
4/29/2008	12:30	5/22/2008	8:15
5/22/2008	8:30	6/19/2008	7:15
6/19/2008	7:30	7/11/2008	7:45
7/11/2008	8:15	7/16/2008	7:30
7/16/2008	8:00	7/31/2008	7:45
7/31/2008	8:00	8/21/2008	11:15
8/21/2008	11:30	9/11/2008	7:45
9/11/2008	8:00	10/2/2008	8:00
10/2/2008	8:15	10/22/2008	7:45
10/22/2008	8:00	11/18/2008	10:00
11/18/2008	10:15	12/16/2008	12:15
12/16/2008	12:30	1/14/2009	16:15

7) Distribution

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and process the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or

indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

Requested citation format:

National Estuarine Research Reserve System (NERRS). 2012. System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: <http://cdmo.baruch.sc.edu/>; accessed 12 October 2012.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page <http://cdmo.baruch.sc.edu/>. Data are available in comma delimited format.

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8) Associated researchers and projects:

The Padilla Bay NERR collects weather parameters that include Temperature, Relative Humidity, Barometric Pressure, Wind Speed, Wind Direction, LI-COR and Precipitation. The weather station is located at the Southern end of Padilla Bay and can be viewed in near real-time at <http://cdmo.baruch.sc.edu/>.

In addition, water samples are collected at all 4 YSI sites and are filtered for nutrients and chlorophyll a.

*See Meteorological and Nutrient data at <http://cdmo.baruch.sc.edu/> for more information.

II. Physical Structure Descriptors

9) Sensor Specifications:

PDB NERR deployed 6600EDS sondes in 2008. All of the sondes are configured the same way.

YSI 6600EDS data sonde:

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Thermistor

Model #: 6560

Range: -5 to 45 °C

Accuracy: +/-0.15 °C

Resolution: 0.01 °C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: 4-electrode cell with autoranging

Model #: 6560

Range: 0 to 100 mS/cm

Accuracy: +/-0.5% of reading + 0.001 mS/cm

Resolution: 0.001 mS/cm to 0.1 mS/cm (range 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: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/-1% of the reading or 1% air saturation, whichever is greater 200-500%
air saturation: +/- 15% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)
Units: milligrams per Liter (mg/L)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/-15% of the reading
Resolution: 0.01 mg/L

Parameter: Non-Vented Level – Shallow (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 (EDS flat probe)
Units: pH 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

Dissolved Oxygen Qualifier (Rapid Pulse / Clark type sensor):

The reliability of dissolved oxygen (DO) data collected with the rapid pulse / Clark type sensor after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Some Reserves utilize the YSI 6600 EDS data sondes, which increase DO accuracy and longevity by reducing the environmental effects of fouling. Optical DO probes have further improved data reliability. The user is therefore advised to consult the metadata for sensor type information and to exercise caution when utilizing rapid pulse / Clark type sensor DO

data beyond the initial 96-hour time period. Potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. If there are concerns about fouling impacts on DO data beyond any information documented in the metadata and/or QAQC flags/codes, please contact the Research Coordinator at the specific NERR site regarding site and seasonal variation in fouling of the DO sensor.

Depth Qualifier:

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

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

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve's associated meteorological station during data ingestion. These corrected depth/level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving

forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

10) Coded variable indicator and variable code definitions:

Sampling station:	Sampling site code:	Station code:
Bayview Channel	BY	pdbbywq
Ploeg Channel	BP	pdbbpwq
Joe Leary	JL	pdbjlwq
Gong Surface	GS	pdbgsqw

11) **QAQC flag definitions** – This section details the automated and secondary QAQC flag definitions.

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

- 5 Outside High Sensor Range
- 4 Outside Low Sensor Range
- 3 Data Rejected due to QAQC
- 2 Missing Data
- 1 Optional SWMP Supported Parameter
- 0 Data Passed Initial QAQC Checks
- 1 Suspect Data
- 2 *Open - reserved for later flag*
- 3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

12) **QAQC code definitions** – This section details the secondary QAQC Code definitions used in combination with the flags above.

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

- GIC No instrument deployed due to ice
- GIM Instrument malfunction
- GIT Instrument recording error; recovered telemetry data
- GMC No instrument deployed due to maintenance/calibration

GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata
Corrected Depth/Level Data Codes	
GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
SDF	Depth port frozen
SDG	Suspect due to sensor diagnostics
SDO	DO suspect
SDP	DO membrane puncture
SIC	Incorrect calibration / contaminated standard
SNV	Negative value
SOW	Sensor out of water
SPC	Post calibration out of range
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSM	Sensor malfunction
SSR	Sensor removed / not deployed
STF	Catastrophic temperature sensor failure
STS	Turbidity spike
SWM	Wiper malfunction / loss

Comments

CAB*	Algal bloom
CAF	Acceptable calibration/accuracy error of sensor
CAP	Depth sensor in water, affected by atmospheric pressure
CBF	Biofouling
CCU	Cause unknown
CDA*	DO hypoxia (<3 mg/L)
CDB*	Disturbed bottom
CDF	Data appear to fit conditions
CFK*	Fish kill
CIP *	Surface ice present at sample station
CLT*	Low tide
CMC*	In field maintenance/cleaning
CMD*	Mud in probe guard
CND	New deployment begins
CRE*	Significant rain event
CSM*	See metadata
CTS	Turbidity spike
CVT*	Possible vandalism/tampering
CWD*	Data collected at wrong depth
CWE*	Significant weather event

13) Post deployment information

End of deployment post-calibration readings in standard solutions.

Site

BY

Date	SpCond (mS/cm)	DO%	pH (7)	pH (10)	Turbidity (o)	Turb (100)
1/16/2008	49.84	95.70	6.99	10.00	0.00	98.50
3/13/2008	49.88	92.10	7.00	10.01	0.10	99.10
4/8/2008	49.83	100.5	7.03	10.03	0.1	98.6
4/29/2008	49.71	97.20	6.99	9.97	-0.20	99.20
5/22/2008	49.93	100.00	7.06	10.02	1.20	97.00
6/19/2008	50.16	103.30	7.05	9.99	0.30	100.20
7/10/2008	50.20	103.30	7.06	10.03	0.10	96.40
7/31/2008	50.08	101.00	7.05	10.04	0.10	98.50
8/21/2008	50.45	100.50	6.97	9.95	0.00	98.70
9/11/2008	50.41	101.80	7.02	10.01	0.00	97.20
10/1/2008	50.55	100.30	7.00	102.00	0.00	99.30
10/22/2008	50.38	103.60	7.00	10.01	-0.10	95.80
11/19/2008	49.72	98.10	7.05	9.98	-0.10	98.70
12/16/2008	49.37	101.10	7.10	10.21	0.00	98.90
1/14/2008	50.40	101.80	7.03	10.02	0.10	98.70

BP

Date	SpCond (mS/cm)	DO%	pH (7)	pH (10)	Turbidity (o)	Turb (100)
1/16/2008	50.50	103.60	7.07	10.14	0.00	99.40
3/13/2008	49.65	99.90	7.05	10.07	0.20	99.50
4/8/2008	49.75	101.80	6.98	9.97	0.00	99.10
4/29/2008	50.05	102.90	7.02	10.04	-0.40	98.30
5/22/2008	49.76	102.40	7.11	10.08	-0.20	98.70
6/19/2008	50.31	93.10	6.99	9.97	-0.10	99.80
7/10/2008	49.60	102.10	7.08	10.01	0.80	95.10
7/31/2008	50.08	95.70	7.04	10.06	0.10	98.30
8/21/2008	49.56	101.20	7.00	10.09	-0.20	99.30
9/11/2008	50.19	101.70	7.04	10.00	-0.10	97.20
10/1/2008	49.72	99.10	6.99	9.97	0.10	98.90
10/22/2008	50.37	102.60	7.00	9.98	0.10	97.80
11/19/2008	50.36	98.70	7.07	10.03	0.00	99.20
12/16/2008	51.06	101.50	7.04	10.10	-0.20	100.90
1/14/2008	49.98	102.20	7.12	10.07	0.20	99.80

JL

Date	SpCond (mS/cm)	DO%	pH (7)	pH (10)	Turbidity (o)	Turb (100)
1/16/2008	50.22	99.10	7.07	10.06	0.20	101.50
2/14/2008	50.98	100.80	6.98	9.97	0.00	99.00

3/21/2008	50.31	101.50	6.93	9.93	3.00	96.50
4/9/2008	50.56	102.40	7.01	10.03	-0.10	99.50
4/29/2008	49.73	102.10	7.04	10.05	0.00	99.50
5/22/2008	49.78	100.80	7.02	10.04	0.10	97.90
6/19/2008	50.36	102.30	6.94	9.98	0.00	100.20
7/11/2008	49.89	103.80	7.02	10.00	0.10	95.20
7/16/2008	50.46	101.30	6.93	9.91	-0.30	106.70
7/31/2008	50.02	100.50	7.08	10.06	-0.30	93.80
8/21/2008	50.26	100.20	6.99	10.00	-0.10	101.30
9/11/2008	50.52	100.20	7.03	10.03	-0.20	95.50
10/2/2008	49.85	101.50	6.90	9.90	-0.20	97.20
10/22/2008	50.25	103.40	7.05	10.06	0.10	96.90
11/18/2008	49.70	99.50	7.08	10.09	-0.20	100.10
12/16/2008	49.55	99.90	7.09	10.12	0.00	100.10
1/14/2009	50.18	102.10	7.15	10.10	0.40	99.30

14) Other Remarks/notes

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for “not a number” and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

Bayview Channel (BY):

All sensors

All data are missing from 1/1/08 00:00 to 1/16/08 9:00 because the batteries in the sonde died after only 17 days of deployment even though the starting voltage was 11.5 when deployed 12/13/07.

The sonde was not deployed from 1/16/08 9:00 to 2/13/08 16:15 because the new piles were being installed. Once they were installed we had to wait for a proper tide to install the ABS pipe to house the sonde.

Turbidity

10/21/08 to 10/22/08 10:04 any spikes could be from seaweed that was wrapped around the sensor guard and the DO sensor wiper.

11/19/08 8:21 to 12/16/08 14:36 the spikes could be from a sand lance that was in the guard.

DO

The post cal check for the deployment 2/13/08 14:30 to 3/13/08 10:12 was low for unexplained reasons. All DO values should be interpreted with caution.

Ploeg Channel (BP):

All sensors

The data logger appears to have been stuck in the deployment tube about 1.8m above standard deployment depth for the following period 1/1 00:00 to 1/5 5:15.

The sonde was not deployed from 1/16/08 10:30 to 2/13/08 15:00 because the new piles were being installed. Once they were installed we had to wait for a proper tide to install the ABS pipe to house the sonde.

Although the sonde was deployed from 8/21/08 9:34 to 9/11/08 12:48 the file could not be found on the sonde when retrieved.

Salinity

Salinity and specific conductivity data for the deployment beginning 4/8/08 and ending 4/29/08 was marked as suspect because it was much higher than the previous or following deployments. The data should be interpreted with caution.

DO

All dissolved oxygen data between 4/21/08 and 8/12/08 were marked as suspect unless the DO% was less than zero in which case the data was marked as rejected. This data was QAQC'd in 2014. It is not known if the sensor was malfunctioning, or if there was an unusual environmental factor causing the erratic jumps of data. The sensors post-calibrated normally except those mentioned below. It was found in 2014 that an over abundance of *Saccharina latissima* wrapped around the base of the pile where the YSI is housed can cause similar trends.

The post cal check for the deployment 6/19/08 9:42 to 7/10/08 9:11 was low for unexplained reasons. All DO values should be interpreted with caution.

During deployments 12/16/07 to 1/14/08 and 10/22/08 to 11/19/08 the DO sensor malfunctioned when the temperature dropped below 7.7°C. The data appear to be normal at temperatures above this level.

Depth

The deployment beginning 10/22/08 and ending 11/19/08 were marked as suspect because the data was collected at the wrong depth. This data was QAQC'd in 2014. It could not be determined the cause. It is likely however that the sonde was stuck in the deployment tube and didn't reach the resting place. This is evident by the slight decrease in depth from the previous deployment and the slight increase in depth to the following deployment. All of the other data appears to line up at the beginning and end of the deployment so it has not been marked as suspect.

Joe Leary (JL):

For the deployment 1/16/08 to 2/14/08 the original .DAT file has been lost. This is the file that comes from the sonde. The exported version of this file (.CSV) is still available.

All sensors

During the deployment 7/11/08 to 7/16/08 the DO, salinity and pH sensors were malfunctioning. However the temperature, depth and turbidity (see note in turbidity section below) sensors appear to have been working correctly but the data should be interpreted with caution.

Salinity

The Joe Leary site is located on the freshwater side of a slough that is controlled by mechanical tidegates. When the tide is high on the outside of the gates the gates close and the saline water should remain on the outside. However, there is commonly some saline water that seeps into the freshwater side creating water

that is 5-10 psu. Several times each year one or more of the tidegates gets blocked open with debris creating a much more saline environment on the freshwater side. During these events the salinity can be up to 25-30 psu and it may affect the other parameters so that the readings are more representative of saline water. For the 2008 data the salinity and specific conductivity during these events have been marked as CSM. Previous year's data are not flagged in this way during these events.

DO

During the deployment 3/21/08 to 4/9/08 the DO sensor malfunctioned when the temperature dropped below 7.7°C. The data appear to be normal at temperatures above this level.

The barometric pressure was calculated wrong for the calibration on 6/18/08. So the DO and the depth for the deployment of 6/19/08 to 7/11/08 are off. The barometric pressure was recorded as 787.4 instead of 764.54 which means the DO was calibrated to 103.6 instead of 100.6 and the depth was calibrated to 0.373 instead of 0.062.

Depth

During the deployment 3/21/08 to 4/9/08 the depth sensor port was blocked with debris. The data should be interpreted with caution.

For the deployment of 6/19/08 to 7/11/08 see note in DO section.

The deployment beginning 10/22/08 and ending 11/18/08 the data was collected at the wrong depth. This data was QAQC'd in 2014. It could not be determined the cause. It is likely however that the sonde was stuck in the deployment tube and didn't reach the resting place. This is evident by the slight decrease in depth from the previous deployment and the slight increase in depth to the following deployment. All of the other data appears to line up at the beginning and end of the deployment so it has not been marked as suspect.

Turbidity:

The post cal check for the deployment of 7/11/08 to 7/31/08 was high for unexplained reasons. All turbidity values should be interpreted with caution.

The post cal check for the deployment 7/16/08 to 7/31/08 was low for unexplained reasons. All turbidity values should be interpreted with caution.