

Tijuana River Estuary (TJR) NERR Nutrient Metadata
January-December 2010
Latest Update: May 24, 2013

I. Data Set and Research Descriptors

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b) Laboratory Contact

Nutrient analysis is performed in house.

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c) Other Contacts and Programs

None

2) Research Objectives

The Tijuana River National Estuarine Research Reserve (TRNERR) is impacted heavily by both periodic raw sewage inputs and urban development. Only about a quarter of the reserve's 2,531 acres are tidally influenced. The nutrient monitoring program will provide baseline inorganic nutrient and Chl *a* data for TRNERR. This data will also contribute to national baseline information. Nutrients were sampled at existing YSI water quality sonde locations. The Boca Rio (BR) site is located in a large channel running north to south and approximately 300m north of the Tijuana River mouth. The Oneonta Slough (OS) site is located in the largest and deepest channel in the estuary. These sampling sites are located throughout estuary to provide insight into the possible sources of nutrients. The OS site is predominantly influenced by the US communities. The BR site is influenced by both activity in Mexico and the US. The South Bay (SB) site was established in January 2008 and is located at the mouth of Otay River which flows into San

Diego Bay. The last site is located adjacent to the South Bay datalogger in a salt pond, Pond Eleven (PE). This site was established in July 2008 when sampling for Model Marsh ceased. The South Bay and Pond Eleven sites are not located on the reserve. All sites are tidally influenced.

a) Monthly Grab:

Grab samples were collected monthly at all YSI water quality sonde sites. Monthly grab sampling provides insight into the varying nutrient concentrations within the estuary. This sampling method provides information as to the spatial differences in nutrient levels within the system. The placement of these sites also offers the opportunity to better isolate the possible origin of nutrient inputs as well as the degree of tidal flushing.

b) Diel Sampling Program:

Diel samples were collected monthly at one site. This sampling method provides a temporal perspective of nutrient flux over one tidal cycle at one given site. Given the location of the site, the diel sampling also provides valuable information as to the degree of tidal flushing of nutrients from the estuary.

3) Research Methods

a) Monthly Grab Sampling Program

Monthly grab samples were taken at the YSI sites (Boca Rio, Oneonta Slough, South Bay and Pond Eleven). All samples were collected less than three hours prior to the projected slack low tide ending a diel sampling cycle. Samples were collected vertically, by hand, in amber wide mouth 1 L acid washed (10% HCl) Nalgene bottles. Sample bottles were rinsed three times with ambient water before sampling. Sampling followed a dry period of 72 hours or greater. Samples were taken sequentially, within five minutes of each other. Samples were taken at the depth of and adjacent to the sonde probes in compliance with the NERRS Nutrient and Chlorophyll Monitoring SOP version 1.4. Single grab samples are collected at the sites every month. Triplicate samples are collected every other month at one of the long term monitoring stations (randomly chosen). All samples were immediately stored on ice and delivered to the lab within four hours.

At the time of nutrient sampling, in-situ measurements of temperature, salinity and dissolved oxygen were taken using an YSI 85 meter. This data is not included in this dataset but can be obtained by contacting the reserve.

b) Diel Sampling

Diel samples were collected at the Boca Rio site. Samples were taken at intervals less than 2.5 hours for a total of 12 samples over one lunar day. Samples were collected using an ISCO model 6712 autosampler with a sixty foot sample tube and polypropylene strainer. The strainer was suspended in minnow trap (approximately 15 cm above the channel bottom) between the bank and sonde probe at a depth equal to the sonde probes. The sampler was located approximately 1.5 vertical meters above the strainer. The autosampler was programmed to collect 1 liter per sample utilizing ISCO's 24-bottle kit in a standard tub stocked with ice. At the time of retrieval, the sampling program was suspended, the sample bottles were capped and the ice reservoir was refilled. Samples typically reached the lab within one hour of retrieval.

All sample containers were acid washed. The washing procedure consisted of six rinses with DI water, a soak of at least twenty minutes in 10% HCl and six rinses with Type I reagent water (18 Mohm/cm or greater).

4) Site Location and Character

General Site Characteristics (TJE)

- a) Tidal exchange (extremes): approx. -2 +7 MLLW,
- b) Salinity: 4 ppt (extreme rain events) to 38 ppt
- c) Latitude and longitude: 32 deg 34 min N, 117 deg 07 min W

- d) Potential impacts: storm drain runoff from military airfield and adjacent residential areas, occasional sewage spills (10-15 MGD) into the Tijuana River from Mexico. The area surrounding the estuary is heavily developed with residential housing as is the watershed which drains into the estuary. Approximately 2/3 of the watershed is in Mexico. The North Eastern section of the reserve is bordered by a military helicopter training base. Vegetation in the area is dominated by common pickleweed (*Salicornia virginica*) and Pacific cordgrass (*Spartina foliosa*).
- e) Size: 4532 km²
- f) There is no in house flow monitoring program. However, some data can be found at www.sdcoos.sdsu.edu. It should be noted that this is only offered as a possible source of data and not an endorsement of the data or its quality.

Specific Site Characteristics

Boca Rio (BR)

- a) Orientation of site: Datalogger station is located approximately 300 meters north of the Tijuana River mouth in the middle of a channel running north to south. Latitude is 32 deg 33 min 34.3 sec N, longitude is 117 deg 06 min 43.7 sec W. Channel width is approximately 20 meters.
- b) Tidal range: approximately 2.0m
- c) Salinity range: 0 to 37 ppt
- d) Fresh water input is predominately urban runoff, from the US and Mexico, during rain events.
- e) Depth: approximately 0.2 to 2.2m
- f) Bottom type: Predominately sand with little mud.
- g) Pollutants are those associated with urban runoff from the US and Mexico, agricultural runoff and
- h) sewage spills. No specific data is available as to type or quantity.
- i) Watershed draining site: The area surrounding the estuary is heavily developed with residential housing as is the watershed which drains into the estuary. Approximately 2/3 of the watershed is in Mexico. The North Eastern section of the reserve is bordered by a military helicopter training base. Vegetation in the area is dominated by common pickleweed (*Salicornia virginica*) and Pacific cordgrass (*Spartina foliosa*).

Oneonta Slough (OS)

- a) Orientation of site: The Datalogger station is located on the upper portion of Oneonta Slough approximately 1km from mouth. The channel runs North to South and is located on the northwestern edge of the reserve. Latitude is 32 deg 34 min 05.84 sec N, longitude is 117 deg 07 min 52.57 sec W. Channel width is approximately 20 meters.
- b) Tidal range: approximately 1.8m
- c) Freshwater input is predominately urban runoff, from the US, during rain events. No flow data is available.
- d) Depth: approximately 0 to 1.8m; directly below the datalogger, is approx. 0.55m below Mean Sea Level
- e) Bottom type: Sand and sediment.
- f) Pollutants are those associated with urban runoff from the US, agricultural runoff and sewage spills. No specific data is available as to type or quantity.
- g) Watershed draining site: The area surrounding the estuary is heavily developed with residential housing as is the watershed which drains into the estuary. Approximately 2/3 of the watershed is in Mexico. The North Eastern section of the reserve is bordered by a military helicopter training base. Vegetation in the area is dominated by common pickleweed (*Salicornia virginica*) and Pacific cordgrass (*Spartina foliosa*).

South Bay (SB)

- a) Orientation of site: The datalogger is located at the mouth of Otay River where it flows into San Diego Bay. Latitude is 32 deg 36 min 0.49 sec N, longitude is 117 deg 06 min 56.49 sec W. Channel width is approximately 15m
- b) Tidal range: approximately 2.7m
- c) Salinity range: 1 to 47 ppt

- d) Freshwater input: Runoff and the Otay River
- e) Depth: approximately 0 to 2.7m
- f) Bottom type: very fine mud.
- g) Pollutants are those associated with urban and agricultural runoff. No specific data is available as to type or quantity.
- h) Watershed draining site: The Otay River watershed encompasses 160 sq/mi of San Diego County and discharges into San Diego Bay. The South Bay datalogger is located at the confluence of the Otay River and South San Diego Bay.

Pond Eleven (PE)

- a) Orientation of site: The datalogger is located on the eastern edge of the pond, approximately
- b) 6m from the shoreline at latitude 32 deg 35 min 46.03 N and longitude 117 deg 07 min 05.59 sec W. Channel width is approximately 15m.
- c) Tidal range: approximately 0.6m
- d) Salinity range: 44 to 55 ppt
- e) Depth: approximately 0.3 to 0.9 m
- f) Freshwater input: Runoff and the Otay River
- g) Bottom type: very fine mud.
- h) Pollutants are those associated with urban and agricultural runoff. No specific data is available as to type or quantity.
- i) Watershed draining site: Pond eleven is a salt evaporation pond adjacent to the Otay River. The Pond Eleven datalogger receives input from a tide gate located along the Otay River. The Otay River watershed encompasses 160 sq/mi of San Diego County and discharges into San Diego Bay.

5) Code Variable Definitions

Station code names:

Boca Rio = tjrbnut (Tijuana River Reserve Boca Rio nutrient data)
 Oneonta Slough = tjrosnut
 South Bay = tjrsbnut
 Pond Eleven=tjrpenut

Monitoring program codes:

monthly grab sample program = 1
 diel grab sample program = 2

6) Data Collection Period

Sampling was performed on a monthly basis attempting to sample at approximately 30 day intervals. Samples collected at all sites, other than Boca Rio, were grab samples and so represent a point in time rather than a period. Diel sampling at Boca Rio began with the first of the ISCO samples at the projected slack low tide. Whenever possible, grab sampling at BR coincided with the last ISCO sample.

Grab Samples (all times in PST)

Site	Start Date	Start Time	End Date	End Time
BR	1/30/2010	15:00		
BR	2/25/2010	12:46		
BR	3/23/2010	10:30		
BR	4/27/2010	13:50		
BR	5/27/2010	14:11		
BR	6/22/2010	11:16		
BR	7/20/2010	9:15		
BR	8/26/2010	16:00	8/26/2010	16:02
BR	9/23/2010	14:30		

BR	10/22/2010	14:46
BR	11/2/2010	12:10
BR	12/14/2010	10:05

Site	Start Date	Start Time	End Date	End Time
OS	1/30/2010	13:23		
OS	2/25/2010	12:23		
OS	3/23/2010	9:45		
OS	4/27/2010	13:30	4/27/2010	13:32
OS	5/27/2010	12:20		
OS	6/22/2010	10:53		
OS	7/20/2010	8:45		
OS	8/26/2010	14:35		
OS	9/23/2010	14:10		
OS	10/22/2010	12:00		
OS	11/2/2010	10:38		
OS	12/14/2010	9:40		

Site	Start Date	Start Time	End Date	End Time
SB	1/30/2010	12:23		
SB	2/25/2010	11:41		
SB	3/23/2010	9:00		
SB	4/27/2010	12:30		
SB	5/27/2010	11:46		
SB	6/22/2010	9:55	6/22/2010	9:56
SB	7/20/2010	7:45		
SB	8/26/2010	14:00		
SB	9/23/2010	13:00		
SB	10/22/2010	13:02		
SB	11/2/2010	13:30		
SB	12/14/2010	9:00		

Site	Start Date	Start Time	End Date	End Time
PE	1/30/2010	12:31		
PE	2/25/2010	11:46	2/25/2010	11:48
PE	3/23/2010	9:12		
PE	4/27/2010	12:35		
PE	5/27/2010	11:50		
PE	6/22/2010	10:06		
PE	7/20/2010	7:50		
PE	8/26/2010	14:05		
PE	9/23/2010	13:03		
PE	10/22/2010	13:05		
PE	11/2/2010	10:05	11/2/2010	10:07
PE	12/14/2010	9:10		

Diel Samples (all times in PST)

Site	Start Date	Start Time	End Date	End Time
BR	1/29/2010	14:45	1/30/2010	15:30
BR	2/24/2010	12:30	2/25/2010	13:15

BR	3/22/2010	9:00	3/23/2010	9:45
BR	4/26/2010	13:15	4/27/2010	14:00
BR	5/26/2010	15:00	5/27/2010	15:45
BR	6/21/2010	10:30	6/22/2010	11:15
BR	7/19/2010	9:15	7/20/2010	10:00
BR	8/25/2010	15:00	8/26/2010	15:45
BR	9/22/2010	14:15	9/23/2010	15:00
BR	10/21/2010	14:00	10/22/2010	14:45
BR	11/1/2010	11:30	11/2/2010	12:15
BR	12/13/2010	9:30	12/14/2010	10:15

Note: Time code is based on a 2400 hour clock and refers to Pacific Standard Time. Date format is mm/dd/yyyy.

7) Associated Researchers and Projects

The research program at the TRNERR focuses on adaptive approaches to wetlands management, which involves coupling scientific investigation with management action. One focal area of research continues to be adaptive restoration, and the TRNERR has a long history of science-based restoration efforts. These programs incorporate descriptive and experimental approaches to investigate biotic and abiotic responses to marsh restoration, including ways to better achieve desired ecosystem responses. Two SWMP sites, based in South San Diego Bay, are associated with planned restoration of salt ponds in that area. Another active area of research is invasive species ecology and management. Although estuaries are typically invaded by a broad suite of species from many habitat types, current research is focusing on terrestrial and riparian invaders able to cross ecotones and invade salt marsh habitats. Researchers at the TRNERR are investigating mechanisms of invasions, impacts of invaders, and ecosystem recovery after exotic species control.

NERR SWMP water quality and weather data are used in a variety of reserve-based and external research and education programs. Water quality data from the Tijuana River, which rarely experiences mouth closure, provides an interesting contrast to data from other regional systems, which experience frequent closure events. Also, SWMP water quality data are incorporated into a high school curriculum developed at the reserve. Tier 1 nutrient sampling is being conducted at all water quality datalogger stations. NERR SWMP meteorological sampling is being conducted at 1 station which is located near the former Tidal Linkage water quality station. In addition, much of the reserve is used as a test bed for research related to adaptive marsh restoration, with recent attention on the Model Marsh.

8) Distribution

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from 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 or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR nutrient 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.

II. Physical Structure Descriptors

9) Entry Verification

Nutrient data are entered into a Microsoft Excel worksheet and processed using the NutrientQAQC Excel macro. The NutrientQAQC macro sets up the data worksheet, metadata worksheets, and MDL worksheet; adds chosen parameters and facilitates data entry; allows the user to set the number of significant figures to be reported for each parameter and rounds using banker's rounding rules; allows the user to input MDL values and then automatically flags/codes measured values below MDL and inserts the MDL ; calculates parameters chosen by the user and automatically flags/codes for component values below MDL, negative calculated values, and missing data; allows the user to apply QAQC flags and codes to the data; produces summary statistics; graphs selected parameters for review; and exports the resulting data file to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database.

Holly Bellringer was responsible for all data QAQC.

10) Parameter Titles and Variable Names by Data Category

Required NOAA/NERRS System-wide Monitoring Program water quality parameters are denoted by an asterisks "**".

Data Category	Parameter	Variable Name	Units of Measure
a) Phosphorus	*Orthophosphate	PO4F	mg/L as P
b) Nitrogen	*Nitrite+Nitrate, filtered	NO23F	mg/L as N
	*Ammonium, filtered	NH4F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
c) Plant Pigments	*Chlorophyll a,	CHLA_N	µg/L

Notes:

1. Time is coded based on a 2400 clock and is referenced to Standard Time.
2. Reserves have the option of measuring either NO2 and NO3 or they may substitute NO23 for individual analyses if they can show that NO2 is a minor component relative to NO3. NO2 levels are predominately low at TJR Reserve and analysis was discontinued as a result.

11) Measured and Calculated Laboratory Parameter

a) Parameters Measured Directly

Nitrogen species:	NO23F & NH4F
Phosphorus species:	PO4F
Chlorophyll a	CHLA_N

b) Calculated Variables

DIN:	NO23F+NH4F
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12) Limit of Detection

Method detection limit as defined in the Code of Federal Regulations, 40 CFR 136, Appendix B, as:

“the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.”

Method Detection Limits (MDL) for measured water quality parameters.

<u>Parameter</u>	<u>Start Date</u>	<u>End Date</u>	<u>MDL</u>
NH4	1/1/2010	12/31/2010	0.003mg/L as N
NO23	1/1/2010	12/31/2010	0.004mg/L as N
PO4F	1/1/2010	12/31/2010	0.003mg/L as N
CHLA_N	1/1/2010	12/31/2010	0.4 ug/L

MDL's are determined by multiplying the standard deviation by the t value for the number of samples run.

13) Laboratory Methods

a) Parameter: PO4F

Method Reference:	Method 4500-P F (2005), Standard Methods for the Examination of Water and Wastewater 21 st ed.
Method Descriptor:	The orthophosphate ion (PO_4^{3-}) reacts with ammonium molybdate and antimony potassium tartrate under acidic conditions to form a complex. This complex is reduced with ascorbic acid to form a blue complex which absorbs light at 880 nm. The absorbance is proportional to the concentration of orthophosphate in the sample.
Preservation Method:	Filtered with 47mm membrane filter with pore size .47um and stored at or below -10°C.
Instrumentation:	Thermo Spectronic Aquamate Spectrophotometer

b) Parameter: NH4F

Method Reference:	Method 4500-NH ₃ F (1995), Standard Methods for the Examination of Water and Wastewater 19 th ed. EPA-600/4-79-020, Revised March 1983, Method 350.1USEPA, 40 CFR, Part 36 Table 1B, footnote 6, 1994.
Method Descriptor:	This method is based on the Berthelot reaction. Ammonia reacts with alkaline phenol, then with sodium hypochlorite to form indophenol blue. Sodium nitroprusside (nitroferricyanide) is added to enhanced sensitivity. The absorbance of the reaction product is measured at 630 nm, and is directly proportional to the original ammonia concentration in the sample.
Preservation Method:	Filtered through 47mm membrane filter with 0.47um pore size and store at or below -20° C for less than 72 hours.
Instrumentation:	Thermo Spectronic Aquamate Spectrophotometer

c) **Parameter: NO₃F**

Method Reference:	Method 4500-NO ₃ ⁻ E (1995), Standard Methods for the Examination of Water and Wastewater 19 th ed. USEPA, Methods for Chemical Analysis of Water and Wastes, Method 353.2. Methods of Determination of Inorganic Substances in Water and Fluvial Sediments. Book 5. Chapter A1. U.S. Dept. of the Interior. U.S. Geological Survey.
Method Descriptor:	Nitrate is quantitatively reduced to nitrite by passing of the sample through a copperized cadmium column. The nitrite is determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is read at 520 nm.
Preservation Method:	Filtered through 47mm membrane filter with 0.47um pore size and stored at or below -20° C for less than 21 days.
Instrumentation:	Thermo Spectronic Aquamate Spectrophotometer

d) **Parameter: CHLA**

Method Reference:	USEPA Method 446.0. In <i>Vitro</i> Determination of Chlorophylls a, b, c ₁ , c ₂ , and Pheopigments in Marine and Freshwater Algae by Visible Spectrophotometry. Rev 1.2. September 1997.
Method Descriptor:	Samples are filtered through 47 mm glass fiber filters. Chlorophyll is extracted with aqueous acetone and chl concentrations are determined with a spectrophotometer.
Preservation Method:	Filtered through 47mm glass fiber filter, stored in a desiccator, at or below -20° C for less than 30 days.
Instrumentation:	Thermo Spectronic Aquamate Spectrophotometer

14) **Field and Laboratory QAQC programs**

Precision

- i) **Field Variability:** Single grab samples are collected at all sites. Triplicate grab samples are collected every other month at a randomly chosen site.
- ii) **Laboratory Variability:** A minimum of 10% of all samples are replicated (N=2).
- iii) **Inter-organizational splits:** NONE

b) Accuracy

- i) **Sample Spikes:** A minimum of 10% of all samples are spiked, in duplicate. Percent recovery must range between 95% and 105% to be considered under control.
- ii) **Standard Reference Material Analysis:** NONE
- iii) **Cross Calibration Exercise:** NONE

15) 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_). QAQC flags are applied to the nutrient data during secondary QAQC to indicate data that are out of sensor range low (-4), rejected due to QAQC checks (-3), missing (-2), optional and were not collected (-1), suspect (1), and that have been corrected (5). All remaining data are flagged as having passed initial QAQC checks (0) when the data are uploaded and assimilated into the CDMO ODIS as provisional plus data. The historical data flag (4) is used to indicate data that were submitted to the CDMO prior to the initiation of secondary QAQC flags and codes (and the use of the automated primary QAQC system for WQ and MET data). This flag is only present in historical data that are exported from the CDMO ODIS.

- 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
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

16) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the sample or sample collection, sensor errors document common sensor or parameter specific problems, 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. However, a record flag column (F_Record) in the nutrient data allows multiple comment codes to be applied to the entire data record.

General errors

GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GDM	Data missing or sample never collected
GQD	Data rejected due to QA/QC checks
GQS	Data suspect due to QA/QC checks

Sensor errors

SBL	Value below minimum limit of method detection
SCB	Calculated value could not be determined due to a below MDL component
SCC	Calculation with this component resulted in a negative value
SNV	Calculated value is negative
SRD	Replicate values differ substantially
SUL	Value above upper limit of method detection

Parameter Comments

CAB	Algal bloom
CDR	Sample diluted and rerun
CHB	Sample held beyond specified holding time
CIP	Ice present in sample vicinity

CIF	Flotsam present in sample vicinity
CLE	Sample collected later/earlier than scheduled
CRE	Significant rain event
CSM	See metadata
CUS	Lab analysis from unpreserved sample

Record comments

CAB	Algal bloom
CHB	Sample held beyond specified holding time
CIP	Ice present in sample vicinity
CIF	Flotsam present in sample vicinity
CLE	Sample collected later/earlier than scheduled
CRE	Significant rain event
CSM	See metadata
CUS	Lab analysis from unpreserved sample

Cloud cover

CCL	clear (0-10%)
CSP	scattered to partly cloudy (10-50%)
CPB	partly to broken (50-90%)
COC	overcast (>90%)
CFY	foggy
CHY	hazy
CCC	cloud (no percentage)

Precipitation

PNP	none
PDR	drizzle
PLR	light rain
PHR	heavy rain
PSQ	squally
PFQ	frozen precipitation (sleet/snow/freezing rain)
PSR	mixed rain and snow

Tide stage

TSE	ebb tide
TSF	flood tide
TSH	high tide
TSL	low tide

Wave height

WH0	0 to <0.1 meters
WH1	0.1 to 0.3 meters
WH2	0.3 to 0.6 meters
WH3	0.6 to > 1.0 meters
WH4	1.0 to 1.3 meters
WH5	1.3 or greater meters

Wind direction

N	from the north
NNE	from the north northeast
NE	from the northeast
ENE	from the east northeast
E	from the east
ESE	from the east southeast
SE	from the southeast
SSE	from the south southeast
S	from the south
SSW	from the south southwest
SW	from the southwest
WSW	from the west southwest

W	from the west
WNW	from the west northwest
NW	from the northwest
NNW	from the north northwest
<i>Wind speed</i>	
WS0	0 to 1 knot
WS1	> 1 to 10 knots
WS2	> 10 to 20 knots
WS3	> 20 to 30 knots
WS4	> 30 to 40 knots
WS5	> 40 knots

17) Other Remarks

Data may be missing due to problems with sample collection or processing. Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDLs for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 12) of this document. Concentrations that are less than this limit are censored with the use of a QAQC flag and code, and the reported value is the method detection limit itself rather than a measured value. For example, if the measured concentration of NO₂3F was 0.0005 mg/l as N (MDL=0.0008), the reported value would be 0.0008 and would be flagged as out of sensor range low (-4) and coded SBL. In addition, if any of the components used to calculate a variable are below the MDL, the calculated variable is removed and flagged/coded -4 SCB. If a calculated value is negative, it is rejected and all measured components are marked suspect. If additional information on MDL's or missing, suspect, or rejected data is needed, contact the Research Coordinator at the Reserve submitting the data.

Note: The way below MDL values are handled in the NERRS SWMP dataset was changed in November of 2011. Previously, below MDL data from 2007-2010 were also flagged/coded, but either reported as the measured value or a blank cell. Any 2007-2011 nutrient/pigment data downloaded from the CDMO prior to November of 2011 will reflect this difference.

- a) No samples were collected within 72 hours of a rainfall event.
- b) Data was rounded by using the CDMO developed nutrient rounding macro (NutrientRound.xls).

7/19/10 – NO₂/3 samples were not processed due to equipment failure.