Reserve Name: Jobos Bay (JOB) **NERR Nutrient Metadata**
Months and year the documentation covers: January-December 2013
Latest Update: May 13, 2014

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

a) **Reserve Contact**

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2) Research objectives

The main objective of this monitoring program is to understand the nutrients dynamics within the bay that may come from the watershed affecting the health of the estuary. Inorganic nutrients, particularly nitrogen and phosphorus are naturally found in mangrove and estuarine habitats. They can be significantly increased by human activities reaching the system through non-point source run-off or direct discharge. Eutrophication is defined as gradual accumulation of nutrients and organic biomass accompanied with an increase in photosynthesis and a decrease in the average deep of the water column caused by the accumulation of sediment.

The objective of this study is to provide baseline information on inorganic nutrients and chlorophyll levels in the Jobos Bay estuary. It will also assess nutrients and chlorophyll levels in areas within the reserve that may be receiving impact from human activities from surroundings areas or may act as a habitat gradient in the Bay. In order to compare these with physical (abiotic) water quality parameters, monitoring sites were established at the four YSI's data-sonde stations.

Station number nine (9), was chosen as the impacted site, collects water quality data in a site associated with runoff from littoral and basin mangrove areas. This lagoon has an average depth of 1.5 meters and water regime is subject to high concentrations of tannin pigments associated to red mangroves. Station is characterized by a low water exchange due to a low circulation pattern. This sampling station is located in the most inland lagoon northeast of Mar Negro, closest to the Thermoelectric Power Plant. It is subjected to runoff, which may include potential oil spill contamination from this industrial facility and agrochemicals from agricultural activities within the northern boundary of the Reserve. Information compiled from historical environmental documents, indicate that station nine (9) was used as a disposal site for residues of the previously operating sugar mill operation, and therefore might have high organic input into the sediments. From all four water quality monitoring station, this has the lowest dissolved oxygen values during the year. Benthic vegetation is scarce.

Station number ten (10), located in a mangrove lagoon area towards the southwestern section of Mar Negro is considered the reference or non-impacted site. Station is characterized by a low water exchange due to a low circulation pattern. This lagoon has an average depth of 2 meters and water regime is subject to high concentrations of tannin pigments associated to red mangroves. Benthic vegetation is scarce.

Station number nineteen (19) is located in Jobos Bay surrounded by sea grass beds composed of *Thallasia testudinum*. This station is close to the Power Plant navigation channel, used by barges to bring oil and gas into the Power Plant pier. This area is exposed to barge standings and sediment re-suspension. Oil spills are always a threat.

Station number twenty (20) is located adjacent to Cayos Caribe reef system. Water streams coming from the reef platform may bring to this station an indication of water conditions behind the coral reef. This water are part of the main marine current coming from the eastern side of Jobos Bay that runs along the coast, getting in contact with sensitive areas like agricultural fields, a coal power plant, an oil refinery Phillips Core (shut down in 2005) and other industries.

2) **Research methods**

a) Monthly Grab Sampling Program

Monthly grab samples are taken at the four data-sonde stations. Grab samples are take on the same day at or as near as possible to slack low-tide conditions. Efforts are made to collect samples at approximately monthly intervals. Samples are not influenced by previous storm events. Grab samples are reflective of the water mass sampled by the data-sonde. Because we have shallow and well-mixed water on our stations, two surface grab samples are collected that are reflective of the data-sonde sampling area. Replicate (N=2) sample were collected by hand at an approximate depth of 30 cm.

Grab samples are taken in duplicate (two separate samples collected in different bottles); this will result in a total of eight samples. All samples were collected in amber, Nalgene^{TM} sample bottles that were previously acid washed (10%) rinsed (3x) with distilled-deionized water, dried and followed by rinsing (3x) of ambient water prior to collection of the sample. Samples were immediately placed on ice, in the dark and returned to the laboratory. All samples

are filtered immediately after collection using a vacuum pump. Membrane filters are used for nutrient samples and GF/F are used for Chlorophyll samples. All samples were immediately placed on ice again, in the dark and sent to Virginia Institute of Marine Sciences (VIMS) laboratory next day shipment.

b) **Diel Sampling Program**

Diel samples are taken in long-term data-sonde station 9. Samples are collected over a full lunar cycle (24hr:48min) time period at 2 hour intervals using an ISCO auto-sampler model 6712. Suction line is set to sample at 0.5 meters, and is covered with a mesh to avoid clogging with organic debris. Efforts are made to collect samples at approximately monthly (30 days) interval. Samples are not influenced by previous storm events; an antecedent dry period of 72 hours is desirable but may not be practical at all locations throughout the year. Sampling depth follows the following designs; samples are collected at a fixed depth from the bottom, generally 0.5 meters, and reflect the water mass sampled by the data-sonde. This device automatically samples 1000 ml of water every 2 hrs. A field blank consists of DI water placed in the bottle rack and left open during the diel sampling. All samples are pumped into polyethylene sample bottles that were previously acid washed (10%), rinsed (3x) with distilled-deionized water and dried. At the end of the 24 hr period, the 12 samples are kept in the dark and returned to the laboratory for immediate processing. All samples are filtered immediately after collection, nutrient filtered sample is placed on 250 ml Nalgene bottles and Chl-a filter on amber (empty) vials, stored in a cooler (dark) on ice packs and sent to Virginia Institute of Marine Sciences (VIMS) laboratory.

4) Site location and character

The Jobos Bay National Estuarine Research Reserve (JBNERR) is located on the southern coastal plain of the island of Puerto Rico, a reserve within the West Indies geographical area. JBNERR is composed of two major areas: (1) Mar Negro, located on the western margin of the Bay, and (2) Cayos Caribe (a chain of 17 tear-shaped islets located to the southeast) and Cayos Barca (a chain of 7 tear-shaped islets located to the southwest boundaries) both with a back-reef system. The Mar Negro area comprises the bulk of the Reserve, and consists of mangrove forests and a complex system of lagoons and channels interspersed with salt and mud flats. Coral reefs and sea grass beds, with small beach deposits and upland areas fringe Cayos Caribe and Cayos Barca mangrove islands.

Station number nine (9), was chosen as the impacted site, collects water quality data in a site associated with runoff from littoral and basin mangrove areas. This lagoon has an average depth of 1.5 meters and water regime is subject to high concentrations of tannin pigments associated to red mangroves. Station is characterized by a low water exchange due to a low circulation pattern. The tidal range varies from 12 to 18 inches in the vicinity of the monitoring station. The salinity at the vicinity of the monitoring station during 2012 ranged from 36.0 ppt to 38.5 ppt. Fresh water input consists of rain water, runoff and groundwater flux, the amount of water has not been determined. This sampling station is located in the most inland lagoon northeast of Mar Negro, closest to the Thermoelectric Power Plant. It is subjected to runoff, which may include potential oil spill contamination from this industrial facility and

agrochemicals from agricultural activities within the northern boundary of the Reserve. Information compiled from historical environmental documents, indicate that station nine (9) was used as a disposal site for residues of the previously operating sugar mill operation, and therefore might have high organic input into the sediments. From all four water quality monitoring station, this has the lowest dissolved oxygen values during the year. A thick layer of thin sediments with a high content of organic material covers the bottom. Benthic vegetation is scarce with few brown and green algae present at this site, but is dominated by nitrogen fixing cyanobacteria *Microcoleous lyngbyaceus*. The station is located at 17° 56' 35.0" N and 66° 14' 18.9"W.

Station number ten (10), located in a mangrove lagoon area towards the southwestern section of Mar Negro is considered the reference or non-impacted site. Station is characterized by a low water exchange due to a low circulation pattern. The tidal range varies from 12 to 18 inches. The salinity at the vicinity of the monitoring station during 2012 ranged from 35.0 ppt to 39.0 ppt. Fresh water input consists of rain water, limited runoff and groundwater flux, the amount of water has not been determined. This lagoon has an average depth of 1.5 meters and water regime is subject to high concentrations of tannin pigments associated to red mangroves. The bottom is covered with a layer of fine sediments with organic material, followed by a layer of calcareous material mainly from shells and oysters. Benthic vegetation is scarce but we can find sea grasses (*Thalassia testudinum* and *Halophila decipiens*), calcareous green algae (*Halimeda sp.*), green algae (*Caulerpa sp., Udotea sp.*) and brown algae (*Dictyota sp.*) among others. The station is located at 17°56'17.96"N, 66°15'27.60"W.

Station number nineteen (19) is located in main bay of Jobos Bay. It is surrounded by sea grass beds dominated by *Thallasia testudinum* but may find *Syringodium filiforme*, *Halodule wrightii* and *Halophila decipiens*. Typical macroalgal assembles consist of calcareous green algae (*Halimeda sp.*), green algae (*Caulerpa sp., Udotea sp.* and others) and brown algae (*Dictyota sp.*) among others This station is close to the Power Plant navigation channel, used by barges to bring oil and gas into the Power Plant pier. This area is exposed to barge standings and sediment re-suspension. Oil spills are always a threat. The tidal range varies from 12 in. to 18 in. in the vicinity of the monitoring station. Average depth is 1.5 meters. Fresh water input in the vicinity of the station may come from rain events and groundwater but the amount has not been determined. The salinity at the vicinity of the monitoring station during 2012 ranged from 35.0 to 38.0 ppt. Station is located at 17°56'28.16"N, 66°13'45.29"W.

Station number twenty (20) is located adjacent to Cayos Caribe reef system. Water streams coming from the reef platform may bring to this station an indication of water conditions behind the coral reef platform. These waters are part of the main marine current coming from the eastern side of Jobos Bay that runs along the coast, getting in contact with sensitive areas like agricultural fields, a coal power plant, an oil refinery Phillips Core (shut down in 2005) and other industries. The tidal range varies from 12 in. to 18 in. in the vicinity of the monitoring station. Average depth is 2 meters. Fresh water input in the vicinity of the station comes by runoff from Punta Pozuelo peninsula in Guayama and from rain events. The salinity at the vicinity of the monitoring station during 2012 ranged from 35.0 to 37.5 ppt. Station is located at 17°55'49.07"N, 66°12'41.22"W.

5) Code variable definitions –

Station Code Names:

job09nut – Station 9
job10nut – Station 10
job19nut – Station 19
job20nut – Station 20

Monitoring Programs:

Monthly grab sample program (1)
Diel grab sample program (2)

6) Data collection period –

Diel:

Site	Start Date/ Time	Stop Date/ Time
9	1/23/2013 10:00	1/24/2013 8:00
9	2/19/2013 10:00	2/20/2013 8:00
9	3/13/2013 10:00	3/14/2013 8:00
9	4/23/2013 10:00	4/24/2013 8:00
9	5/14/2013 10:00	5/15/2013 8:00
9	6/19/2013 10:00	6/20/2013 8:00
9	7/16/2013 10:00	7/17/2013 8:00
9	8/20/2013 10:30	8/21/2013 8:30
9	9/17/2013 10:00	9/18/2013 8:00
9	10/15/2013 10:00	10/16/2013 8:00
9	11/12/2013 09:30	11/13/2013 7:30
9	12/10/2013 09:30	12/11/2013 7:30

Grab:

Site	Start Date/ Time	Stop Date/ Time
9	1/24/2013 10:30	1/24/2013 10:31
9	2/20/2013 9:25	2/20/2013 9:26
9	3/14/2013 9:50	3/14/2013 9:51
9	4/24/2013 9:45	4/24/2013 9:46
9	5/15/2013 10:05	5/15/2013 10:06
9	6/20/2013 10:25	6/20/201310:26
9	7/17/2013 9:25	7/17/2013 9:26
9	8/21/2013 8:55	8/21/2013 8:56
9	9/18/2013 9:25	9/18/2013 9:26
9	10/16/2013 10:41	10/16/2013 10:42
9	11/13/2013 8:41	11/13/2013 8:42
9	12/11/2013 9:04	12/11/2013 9:05

Site	Start Date/ Time	Stop Date/ Time
19	1/24/2013 9:45	1/24/2013 9:46
19	2/20/2013 9:10	2/20/2013 9:11
19	3/14/2013 9:30	3/14/2013 9:31
19	4/24/2013 10:15	4/24/2013 10:16
19	5/15/2013 10: 50	5/15/2013 10:51
19	6/20/2013 11:00	6/20/201311:01
19	7/17/2013 10:10	7/17/2013 10:11
19	8/21/2013 9:50	8/21/2013 9:51
19	9/18/2013 9:45	9/18/2013 9:46
19	10/16/2013 11:26	10/16/2013 11:27
19	11/13/2013 9:20	11/13/2013 9:21
19	12/11/2013 8:47	12/11/2013 8:48

Grab (CONT):

Site	Start Date/ Time	Stop Date/ Time
10	1/24/2013 10:15	1/24/2013 10:16
10	2/20/2013 9:47	2/20/2013 9:48
10	3/14/2013 10:22	3/14/2013 10:23
10	4/24/2013 10:01	4/24/2013 10:02
10	5/15/2013 10:27	5/15/2013 10:28
10	6/20/2013 10:40	6/20/201310:41
10	7/17/2013 9:50	7/17/2013 9:51
10	8/21/2013 9:20	8/21/2013 9:21
10	9/18/2013 8:50	9/18/2013 8:51
10	10/16/2013 11:01	10/16/2013 11:02
10	11/13/2013 9:00	11/13/2013 9:01
10	12/11/2013 9:24	12/11/2013 9:25

Site	Start Date/ Time	Stop Date/ Time
20	1/24/2013 9:35	1/24/2013 9:36
20	2/20/2013 8:57	2/20/2013 8:58
20	3/14/2013 9:20	3/14/2013 9:21
20	4/242013 10:25	4/24/2013 10:26
20	5/15/2013 9:24	5/15/2013 9:25
20	6/20/2013 9:05	6/20/2013 9:06
20	7/17/2013 9:15	7/17/2013 9:16
20	8/21/2013 8:35	8/21/2013 8:36
20	9/18/2013 8:30	9/18/2013 8:31
20	10/16/2013 10:21	10/16/2013 10:22
20	11/13/2013 8:21	11/13/2013 8:22
20	12/11/2013 8:40	12/11/2013 8:41

7) Associated researchers and projects

The JBNERR water quality monitoring data has been incorporated into the Puerto Rico Environmental Quality Board (EQB) Integrated Report 303(d)/305(b) of the Federal Clean Water Act. This document consists of a water quality inventory and list of impaired waters and it's used by the Environmental Protection Agency (EPA) to inform Congress of the progress made at the national level towards the achievement of the statutory water quality goals and purposes established by the Federal Clean Water Act.

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 this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient 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 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/ or http://nerrsdata.org. 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; 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 automatically flags and codes values below MDL. Due to the fact that VIMS lab. Does not report the actual value when it is below the MDL, we flag this data manually. Then, the macro calculates parameters chosen by the user (NO3 and DIN) and automatically flags for component values below MDL and negative values; allows the user to apply QAQC flags and codes to the data; graphs selected parameters for review; append files; and export the resulting data files to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database.

Samples are pre-processed at JBNERR laboratory. Consist of filtration of samples, measure pH, and temperature parameters and finally the samples are stored in a cooler with ice-packs for overnight delivery to VIMS. Analysis results were sent from the VIMS Laboratory in digital and hardcopy format.

Files consisted of sampling station ID, date, replicate number, and parameter values expressed in unit concentrations. Nutrients results are reported by VIMS in mg/L and pigments in ug/L. The CDMO rounding macro is applied to the data after unit conversion calculations. Data are double-checked to insure correct data transfer.

Data is reported with the number of decimal places that conserves the laboratory number of significant figures, i.e., four decimal places for all nutrients and two decimals for CHLA, PHEA.

Enid Malavé (SWMP technician) entered and double-checked 2013 sampling dates, locations, times, field parameters, and replicates from the original field data sheets provided by SWMP technician. Missing data are verified through inspection of field logs, inserted into the data files, and denoted by a blank space. VIMS laboratory reports any value below the MDL as the <MDL value, ie. <0.0002 for NO2. When entering those values below the method detection limit (MDL) are flagged and coded as <-4> [SBL] automatically. All data is processed by CDMO Nutrient QAQC Excel macro described below.

10) Parameter titles and variable names by category

Data Category	Parameter	Variable Name	Units of Measure
Phosphorus and Nitrogen:			
	*Orthophosphate	PO4F	mg/L as P
	*Ammonium, Filtered	NH4F	mg/L as N
	*Nitrite, Filtered	NO2F	mg/L as N
	*Nitrate, Filtered	NO3F	mg/L as N
	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
Plant Pigments:			
	*Chlorophyll a	CHLA_N	µg/L
	Phaeophytin	PHEA	µg/L
Carbon:			
Other Lab Parameters:			
	Silicate, Filtered	SiO4F	mg/L as SI
Microbial:			
Field Parameters:			
	Water Temperature	WTEM_N	ºC

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.

11) Measured or calculated laboratory parameters

a) **Parameters measured directly**

Nitrogen species:	NH4, NO2, NO23
Phosphorus species:	PO4F
Other:	CHLA, PHEA, SiO4, WTEM

b) **Calculated parameters**

NO3	NO23-NO2
DIN	NO23+NH4

12) Limits of detection

Method Detection Limits (MDL), the lowest concentration of a parameter that an analytical procedure can reliably detect, has been established by the VIMS Nutrient Analytical Laboratory. The MDL is determined as 3 times the standard deviation of a minimum of 7 replicates of a single low concentration sample. These values are reviewed and revised periodically.

Parameter	Start Date	End Date	MDL
PO4F	1/23/13	12/31/13	0.0020 mg/L
NH4F	1/23/13	12/31/13	0.0056 mg/L
NO2F	1/23/13	12/31/13	0.0016 mg/L
NO23F	1/23/13	12/31/13	0.0047mg/L
CHLA_N	1/23/13	05/31/13	0.10 ug/L
CHLA_N	6/19/13	6/31/13	0.50 ug/L*****
CHLA_N	7/01/13	12/31/13	0.10 ug/L
PHEA	1/23/13	5/31/13	0.10 ug/L
PHEA	6/19/13	6/31/13	0.50 ug/L****
PHEA	7/01/13	12/31/13	0.10 ug/L

13) Laboratory methods

i) Parameter: NH4F
VIMS Laboratory Method:
EPA or other Reference Method:
Method Reference: US.EPA 1974. Methods for Chemical Analysis of Water and Wastes pp.168-174
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter.
Preservation Method: Samples are stored at 4°C up to 24 hours, followed by freezing @ 20°C.

Summary of Method:
Automated Continuous flow, segmented stream, no bubble gating. Dual wavelength detection and matrix correction.

Chemistry:
Alkaline phenol and hypo chlorite react with ammonia to form indophenols blue that is proportional to the ammonia concentration. The blue color formed is intensified with sodium nitroprusside. Reaction is heat catalyzed at 37°C. The range is 0.001-2.0 mg/L.
Interferences:
Alkalinity over 500mg/L
Acidity over 100 mg/L
Ca and Mg ions will precipitate unless complexed
Color intensity is pH dependent

ii) Parameter: NO2F
VIMS Laboratory Method:
EPA or other Reference Method: 353.4
Method Reference: US.EPA 1994. USEPA 600/R-97/072. Method 353.4
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter.
Preservation Method: Samples are stored at 4°C up to 24 hours, followed by freezing @ 20°C.

Summary of Method:

Automated continuous flow, segmented stream, no bubble gating. Dual wavelength detection and matrix correction.
Chemistry:
An adaptation of the diazotization method. Under acidic conditions, nitrite ion reacts with sulfanilamide to yield a diazole compound, which couples with N-1 napthylenediamine dihydrochloride to form a soluble dye, which is measured colorimetrically. The range is 0.001 to 0.050 mg/L.

Interferences:
NCl3 false positive
These metal ions cause precipitation at high concentrations:
Sb +3, Au +3, Bi +3, Fe +3, Pb +2, Hg +2, Ag +, PtCl6-2, VO3-2
Cupric ion may catalyze decomposition of diazole compound.

iii) Parameter: NOx F
VIMS Laboratory Method:
EPA or other Reference Method: 353.4
Method Reference: US.EPA 1994. USEPA 600/R-97/072. Method 353.4
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter.
Preservation Method: Samples are stored at 4°C up to 24 hours, followed by freezing @ -20°C.

Summary of Method:
Automated continuous flow, segmented stream, no bubble gating. Dual wavelength detection and matrix correction.

Chemistry:
Nitrate is reduced to nitrite by a copper/cadmium reductor column. The nitrite ion then reacts with sulfanilamide to form diazole compound. This compound then couples with n-1-napthylenediamine dihydrochloride to form a reddish/purple azo dye. The color development chemistry is the same as that used in nitrite, Method #5. Range is 0-1.2 mg/L.

Interferences:
High concentrations of Fe, Cu (>10 mg/L)
Oil and Grease will coat Cd column
Residual Chlorine oxidizes Cd column
Sulfates will consume Cd column in the formation of S -2

iv) Parameter: PO4F
VIMS Laboratory Method:
EPA or other Reference Method: 365.5
Method Reference: US.EPA 1994. USEPA 600/R-97/072. Method 365.5
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter.
Preservation Method: Samples are stored at 4°C up to 24 hours, followed by freezing @ -20°C.

Summary of Method:
Automated continuous flow, segmented stream, no bubble gating. Dual wavelength detection and matrix correction.
Chemistry:
Ammonium molybdate and antimony potassium tartrate react in a sulfuric acid environment to form an antimony-phospho-molybdo complex, which is reduced to a blue colored complex by ascorbic acid. Reaction is heat catalyzed at 40 °C. Range is 1-50 ppb.

Interferences:
Fe +3 at concentrations greater than 50 mg/L
SiO2 at conc.>10mg/L positive interference- not naturally present
Hydrogen sulfide
Mercuric Chloride (used as preservative by some)

v) Parameter: CHLA_N and PHA

VIMS Laboratory Method:
EPA or other Reference Method: 445.0
Method Reference: US.EPA 1997. USEPA 600/R-97/072. Method 445.0
Method Descriptor: Samples were filtered with a 0.47 μm membrane filter, placed dry in an amber vial and stored with ice packs. They were kept in the dark and extracted at VIMS using 90% acetone.
Preservation Method: Samples are stored at 4°C up to 24 hours, followed by freezing @ -20°C.

Summary of Method:
The two methods for determining Chlorophyll a given here are with 1) a scanning spectrophotometer and 2) a Turner Design fluorometer. The method used requires filtering a known quantity of water through a glass fiber filter. This filter is later ground with a tissue grinder made of Teflon/glass. Approximately 2-3 mL's of 90% acetone are added to the filter before grinding. Acetone is also used to wash the filter in to 17 x 150 test tube with tight fitting cap. The sample is steeped at least 2 hours and not exceeding 24 hours at 4 °C, in the dark. The samples are centrifuged and read on spectrophotometer or fluorometer. If the samples cannot be read within that time period, storage in the freezer at –20 °C for a few days is acceptable. If pheaophytin measurements are desired, the sample is acidified and read again.

14) Field and Laboratory QAQC programs

a) **Precision**

i) **Field variability**

Two successive true replicate grab samples are collected for the monthly grab samples at each of the four stations ensuring that replicate samples are collected at the same depth. They are collected successively by hand within the same minute.

ii) **Laboratory variability –**10% of samples are replicated and RPD should not exceed 20% except in specific circumstances which are defined

iii) **Inter-organizational splits** –None

b) **Accuracy**

i) **Sample spikes**

The VIMS Analytical Service Center for Nutrients analyzes a matrix spike once for every ten samples Standard reference material analysis – This will result from samples sent out from EPA to each lab. 10% of samples are spiked acceptable range is 80-120% recovery except in specific circumstances which are defined.

ii) **Cross calibration exercises** - 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 rejected due to QAQC checks (-3), missing (-2), suspect (1), and that have been corrected (5). All remaining data are flagged as "good" (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 use of the automated primary QAQC system (for WQ and MET data only) and initiation of secondary QAQC flags and codes. This flag is only present in historical data that are exported from the CDMO ODIS.

-3 Data Rejected due to QAQC
-2 Missing Data
-1 *Open - reserved for later flag*
0 Good Data
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

Wind speed

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/notes

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 I, Part 12) of this document. If additional information on missing data or MDLs is needed, contact the Research Coordinator at the reserve submitting the data.

Missing Data:
No missing data.

Rain Event:

Date	Rainfall (inches)	Comment
4/23/13	0.32	Day of sampling
4/24/13	0.29	Day of sampling
8/18/13	0.80	Two days before sampling
8/19/13	0.50	One day before sampling
12/08/13	0.43	Two days before sampling

Other significant rain events:

On 5/07/13 we registered a 1.97 inches of rain.
On 7/19/13 we registered a 1.34 inches of rain. Tropical Storm near of PR
On 9/5/13 we registered a 7.25 inches of rain. Tropical Storm Gabrielle
On 9/7/13 we registered a 1.03inches of rain.
On 9/9/13 we registered a 2.49 inches of rain.
On 10/5/13 we registered a 1.24 inches of rain.
On 10/9/13 we registered a 1.26 inches of rain.
On 11/4/13 we registered a 2.24 inches of rain.