Sapelo Island (SAP) NERR Nutrient Metadata
January 2006 - December 2006
Latest Update: May 22, 2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

a) **Reserve Contact**

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c) **Other Contacts and Programs**

none

2) Research objectives

The nutrient monitoring program is designed upon spatial deployment . across a wide variety of marsh types with differing fresh and marine water mixing. These differing dynamics allow scientists and researchers to select from both a wide variety of research sites as well as tailor research programs to specific tidal dynamics and utilize the Reserves SWMP data acquisitions to the maximum extent. Additionally, from a long-term trend perspective the variety of marsh types and hydrology being monitored will allow for a better understanding of the different effects of sea-level rise upon marsh type. Due to a lack of residential development and very low human activity within the watersheds of the sites serve as a proxy for reference conditions with the various marsh and associated hydrology types for the creeks and river stations. All of the sites selected have very little anthropogenicly driven nutrient influences. The following brief descriptions are associated with each nutrient monitoring site. For more detail please refer to the site descriptors located under section (4) of this document and/ or contact the Research Coordinator at the SAP NERR for detailed information of any/all sites.

Lower Duplin: Located at the mouth of the Duplin River with large, rapid and near-complete hydraulic exchange with Doboy Sound within each diurnal cycle. Typical of a high salinity, well mixed estuary site.
Hunt Dock: Located on the upper Duplin with relatively high hydraulic retention requiring an estimated 6-7 diurnal events to complete a total hydraulic exchange. Rainfall may drop salinity precipitously in the basin depending on tidal height, duration and volume of precipitation.

Cabretta Creek: Located on the eastern side of Sapelo Island with direct exchange with the Atlantic Ocean. Creek is typical of high salinity , high oceanic exchange and near complete hydraulic exchange with each diurnal event. Creek is extremely buffered from rainfall (event driven) fluctuations in salinity.
Dean Creek: Located on the Southern end of Sapelo is the primary drainage of the inter-dune (located amid primary and secondary dune systems) meadow. This site is highly susceptible to very high salinity fluctuations associated with rainfall events on both seasonal and short –term, event driven scales. Tidal exchange is complete at each diurnal event and exchange water genesis is the Doboy Sound.

The Duplin River is a tidal basin with no freshwater influence within its headwaters apart from surficial aquifer weeping from the perched lens of water associated with Sapelo Island. This nutrient monitoring effort is tied into the Georgia Coastal Ecosystems, Long-Term Ecological Research (GCE-LTER) initiative and the University of Georgia Marine Extension Service water quality database whose collection and analysis of the water samples facilitates the database. This long-term data set is being developed to provide information on estuarine water mixing within the well-studied Duplin River basin in addition to providing a long-term characterization of water quality as related to nutrient loading within the Duplin River.

a) **Monthly Grab** The monthly grab sampling program focuses on documentation of baseline reference nutrient trends within a wide array of local marsh systems with differing hydrology.
b) **Diel Sampling Program** The diel sampling program focuses on short-term temporal variability over a lunar tidal cycle.

3) **Research methods**

a) **Monthly Grab Sampling Program**

Monthly grab samples were taken at four stations within the Duplin River estuary from January to December 2006. Bottom water samples were taken at the Lower Duplin (LD), Hunt Dock (HD), Cabretta Creek (CA) and Dean's Creek (DC) stations using a Niskin style sampling bottle. All grab samples were taken sequentially in triplicate beginning near the time the last diel sample was collected by the ISCO sampler (this time corresponds to low tide at the end of the tidal cycle). Chronological collection times for each of the four sites varied as two teams of people were conducting the actual sampling. A group of two remained onboard the research vessel to sample at the Hunt Dock and Lower Duplin sites, while the other group drove inland to Cabretta Creek and Dean's Creek. At the time of sample collection, latitude, longitude, time and depth were recorded. All grab samples were collected from the Niskin bottle into an acid-washed (10% HCl) polypropylene beaker for filtering. Two filter towers were set up, one acid-washed tower with a 0.45 um polycarbonate filter for nutrient filtering and one clean tower with a GF/F filter for chlorophyll filtering. A small amount of sample was used to rinse the nutrient filter tower equipped with a filter and then the filtrate was discarded. The tower was then filled to the 250-mL mark. The chlorophyll tower with the GF/F filter was also filled to the 250-mL mark and the two towers were connected by a small piece of tubing. The vacuum pump was turned on to pull the 250 mL through each filter and then the vacuum was released. The nutrient sample tower was disconnected and an acid-washed 250-mL polypropylene bottle was rinsed and filled with the filtrate. Space was left in the sample bottle for expansion during freezing at approximately –18 degC. If the first 250 milliliters went through the chlorophyll filter easily, the filtrate was discarded and an additional 50, 100 or 250 milliliters was filtered, depending on suspended sediment load, to concentrate the sample onto the filter. The chlorophyll filter was then removed with tweezers and placed face up in a petri dish, wrapped in aluminum foil and labeled with the

volume filtered and sample information. The chlorophyll filter towers were rinsed between replicate grabs with distilled water and the nutrient filter tower was acid-washed and DI water rinsed between samples. Nutrient and chlorophyll filtering between grabs took approximately 10 minutes to complete. At the Cabretta and Dean's Creek sites, a vacuum hand pump was used rather than a mechanical pump, which is available only on the research vessel. The depths at these two sites were estimated as sampling took place from a bridge. Samples were immediately placed on ice, in the dark and returned to the laboratory within six hours. Once in the laboratory, samples were frozen and processed within the specified times (unless flagged) for nutrient and chlorophyll-a concentrations.

b) **Diel Sampling Program**

WWW Tide and Current Predictor for Wolf Island, South End was used to estimate low tide. As close to an early, low, neap tide as possible was selected each month for sampling. The ISCO sampler was deployed at the Lower Dupling (LD) site on the day previous to the grab sample date chosen for that particular month with the sample line suction placed at 1.5 feet below the surface of the water. The ISCO sampler collected the first diel sample two hours later than low tide on the following day and continued collecting samples every two hours for the next 22 hours, representing a full tidal cycle, a total of 12 samples, and ending at low tide when grab sampling began. The ISCO was turned off and the 12 samples were secured with caps upon arriving at the site. The samples were filter processed either in the field after completion of grab sampling at Lower Duplin or back in the laboratory, weather depending. The filtration process for the diel samples follows the same process as for grab samples described above. High-density polypropylene bottles were used to collect the samples after filtration. Polypropylene bottles and filter towers were soaked in 10% HCl in preparation for the fieldwork, then triple rinsed with distilled water. A squeeze bottle was used to acid wash (then rinse with distilled water) beakers and filter towers in the field between filtering of each sample.

4) **Site location and character**

The Sapelo Island National Estuarine Research Reserve is located on the Southeastern Atlantic coast of the United States in McIntosh County, Georgia. The study area encompasses the Duplin River estuary, a tidally flushed drainage system flowing into Doboy Sound from the north and two inland creeks, Cabretta and Dean's Creek. The Duplin River watershed occupies most of the Reserve, which also contains various forest types, sand dunes, a section of ocean beach and minor developed areas. The Duplin River estuary covers 3,300 acres between Sapelo Island and the mainland in McIntosh County. It drains a tidal bay and an extensive network of salt marshes about 6 miles long, into which there is little upland run-off. Diverse estuarine wetlands provide extensive and complex habitat types for fish and wildlife. The island contains several small, interior brackish and freshwater marshes fed by surficial aquifer expression (interdune meadow of Nannygoat beach: south end) and anthropogenic upland ditches and dikes produced in the early 19th century (north end). The upland forests are composed of several diverse habitats including long leaf pine/slash pine forests, climax maritime forests, small amounts of pond cypress bays and naturally regenerated loblolly pine forests which are timbered on a 70 year selectively cut harvest rotation. There are no current studies on pollutants in this area. Sapelo Island is typically considered a pristine environment, with minimal pollutant input.

<u>Locations-</u>
Lower Duplin: Lat: 31 25' 4" N, Long: 81 17' 46" W
Hunt Dock: Lat: 31 28' 43" N, Long: 81 16' 23" W

Cabretta Creek: Lat: 31 26 37.3" N, Long: 81 14 23.7" W
Dean Creek: Lat: 31 23 22.5" N, Long: 81 16 44.2" W

Water Quality site descriptions-
Salinities at all Duplin River sites vary according to localized rainfall and associated runoff. The upper Duplin River site (Hunt Dock) experiences slightly lower salinities associated with rainfall events (2 -3ppt) as compared to the lower Duplin River site. Average salinities range from 15 ppt to 30 ppt depending on seasonal or event rainfall. Average tidal range of diurnal tidal cycle is approximately 2.5 meters twice daily. Due to high turbidity, all Duplin River sites are lacking any persistent submerged aquatic vegetation and have an unconsolidated sandy/mud bottom (soft sediment) typical of southeastern near-ocean estuaries. Marsh sediments are relatively pristine and free of pollutants based on sediment analysis conducted in 1996 by C. Alexander, Skidaway Institue of Oceanography. Watershed is dominated by oceanic tidal influences associated with Doboy Sound. Depths are as follows: Lower Duplin (LD) ranges from 1.5 meters to 6.0 meters depending on tide, and Hunt Dock's maximum depth is 4.27 meters.

Cabretta Creek is fed directly from waters of the Atlantic Ocean. Cabretta experiences a maximum tidal range of approximately 4.3 meters. Average mean low water depth at the sample site is approximately 3.25 meters. Salinity ranges, with exception to major, long-term precipitation events, from 15-36 ppt., seasonally. The station is located on a small (one-lane), wooden, roadway bridge spanning Cabretta Creek, located on the island's extreme eastern side. The benthos is composed primarily of sand substrate with small, intertidal oyster reef conglomerate communities. Adjacent to the site is extensive, intertidal, bank stabilization (armoring) in the form of woven rip-rap fencing and granite rocks. This manipulation is slowly becoming stabilized via oyster reef community colonization. The adjacent marshes are dominated by Spartina alterniflora with occasional Juncus romerianus in the nearby fringe community habitat. The creek has very little adjacent uplands due to: 1) the low elevational gradient and 2) the areas geologically recent accretion genesis (Holocene) resulting in sandy soils; of which neither condition allows for extensive floral colonization or stabilization.

The Dean Creek site is located on a small wooden bridge spanning Dean Creek, in close proximity to the adjacent Nannygoat Beach causeway. Dean Creek is a small tidal basin fed from the waters of Doboy Sound, which is located on Sapelo Island's south end. With exception to short duration local or long duration regional precipitation events, the creek's salinity normally ranges between 20 and 30 ppt. The benthic community consists of a sandy-mud substrate with occasional, small, intertidal oyster reef community and mean tidal amplitude of approximately 8 feet. Average mean low water depth at the sample site is approximately 1 meter, but fluctuates due to bank erosion. The small creek feeds approximately 150 acres of Spartina alterniflora dominated salt marsh, which is interspersed with small 0.5-1 acre hammocks and salt pans. Fringe community components range from Loblolly pine forests with a sub-canopy of Yaupon holly to Wax myrtle and Sable Palm.

5) **Coded variable definitions**

LD = Lower Duplin; HD = Hunt Dock; CA = Cabretta Creek; DC = Dean Creek.

Each individual sample is given a 3 part name code in addition to other codes. The 3 part name code, "sapldnut" for example, gives the reserve name (sap = Sapelo), station name (LD = Lower Duplin, etc), and SWMP program code (nut = nutrient monitoring program).

Sampling Site codes:
sapldnut – Sapelo Island nutrient data for Lower Duplin
saphdnut – Sapelo Island nutrient data for Hunt Dock
sapcanut – Sapelo Island nutrient data for Cabretta Creek
sapdcnut – Sapelo Island nutrient data for Dean Creek

The monitoring codes are set as "1" to indicate grab samples and "2" to indicate diel samples. Replicates are also given specific codes. Grab samples in which duplicate field samples are taken utilize a "1" for the first sample, "2" for the second sample, and "3" for the third sample. Subsequent lab splits of each field rep are labeled with an "S". Diel samples are always labeled with a "1" for the first lab replicate and a "S" for the second lab replicate. Only one actual sample is taken at each interval with the ISCO sampler.

6) **Data collection period**

Diel sampling for 2006 began at 12:11:00 on January 23, 2006. Grab sampling commenced on January 24, 2006 at 10:21:00 at the Hunt Dock site.

Diel Sampling

Site	Start Date	Start Time	End Date	End Time
LD	01/23/2006	1211	01/24/2006	1011
LD	02/20/2006	1032	02/21/2006	0832
LD	03/20/2006	0908	03/21/2006	0708
LD	04/24/2006	1548	04/25/2006	1348
LD	05/22/2006	1429	05/23/2006	1229
LD	06/19/2006	1308	06/20/2006	1108
LD	07/17/2006	1145	07/18/2006	0945
LD	08/21/2006	1648	08/22/2006	1448
LD	09/18/2006	1540	09/19/2006	1340
LD	10/16/2006	1426	10/17/2006	1226
LD	11/27/2006	1140	11/28/2006	0940
LD	12/18/2006	1612	12/19/2006	1412

Grab Sampling

Site	Start Date	Start Time	End Date	End Time
CA	01/24/2006	1044	01/24/2006	1103
CA	02/21/2006	0851	02/21/2006	0908
CA	03/21/2006	0731	03/21/2006	0747
CA	04/25/2006	1255	04/25/2006	1317
CA	05/23/2006	1340	05/23/2006	1405
CA	06/20/2006	1109	06/20/2006	1127
CA	07/18/2006	1001	07/18/2006	1017
CA	08/22/2006	1358	08/22/2006	1425
CA	09/19/2006	1240	09/19/2006	1255
CA	10/17/2006	1327	10/17/2006	1342
CA	11/28/2006	1053	11/28/2006	1110
CA	12/19/2006	1400	12/19/2006	1413

LD	01/24/2006	1101	01/24/2006	1119
LD	02/21/2006	0939	02/21/2006	0952
LD	03/21/2006	0818	03/21/2006	0835
LD	04/25/2006	1333	04/25/2006	1352
LD	05/23/2006	1203	05/23/2006	1218
LD	06/20/2006	1210	06/20/2006	1228
LD	07/18/2006	1000	07/18/2006	1020
LD	08/22/2006	1357	08/22/2006	1420
LD	09/19/2006	1340	09/19/2006	1357
LD	10/17/2006	1420	10/17/2006	1438
LD	11/28/2006	1028	11/28/2006	1055
LD	12/19/2006	1238	12/19/2006	1250
HD	01/24/2006	1021	01/24/2006	1036
HD	02/21/2006	0850	02/21/2006	0908
HD	03/21/2006	0736	03/21/2006	0750
HD	04/25/2006	1252	04/25/2006	1309
HD	05/23/2006	1124	05/23/2006	1136
HD	06/20/2006	1106	06/20/2006	1137
HD	07/18/2006	1048	07/18/2006	1107
HD	08/22/2006	1451	08/22/2006	1503
HD	09/19/2006	1239	09/19/2006	1259
HD	10/17/2006	1320	10/17/2006	1338
HD	11/28/2006	0940	11/28/2006	0950
HD	12/19/2006	1148	12/19/2006	1201
DC	01/24/2006	1204	01/24/2006	1231
DC	02/21/2006	0952	02/21/2006	1011
DC	03/21/2006	0828	03/21/2006	0843
DC	04/25/2006	1351	04/25/2006	1410
DC	05/23/2006	1436	05/23/2006	1458
DC	06/20/2006	1201	06/20/2006	1214
DC	07/18/2006	1103	07/18/2006	1123
DC	08/22/2006	1530	08/22/2006	1551
DC	09/19/2006	1346	09/19/2006	1404
DC	10/17/2006	1504	10/17/2006	1519
DC	11/28/2006	1200	11/28/2006	1216
DC	12/19/2006	1505	12/19/2006	1523

7) **Associated researchers and projects**

As part of the SWMP long-term monitoring program, SAP NERR also monitors Meteorological and Water Quality data which may be correlated with this Nutrient dataset. These data are available from the Research Coordinator or online at http://cdmo.baruch.sc.edu/.

For a complete viewing of associated projects visit the following website and search the collaborators links:
http://gce-lter.marsci.uga.edu/lter/
http://www.uga.edu/marine_advisory/

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 water quality/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 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 text tab-delimited format, Microsoft Excel spreadsheet format and comma-delimited format.

II. Physical Structure Descriptors

9) **Entry verification**

A Lachat QuikChem 8000 FIA+ is used to analyze nutrient concentrations. The instrument is calibrated daily for each parameter to be tested using a series of working standards. Once the calibration run is complete and satisfactory (r >/= 0.99900 up to 1.0000), the samples are set up for analysis. A set of mid-range check standards is used before the sample run, after approximately every 10 samples and at the end of the run to ensure the instrument is in control. The check standards must remain within + or – 10% of their original value during the entire run. Also, a blank sample is run and then spiked with each analyte to a known concentration, which must come out within + or – 10% as well. Once the run is complete, the raw data is reviewed on the computer attached to the Lachat QuikChem 8000 FIA+ instrument, and the timing is checked to ensure proper integration of sample peaks. Once this is completed, the data is exported onto a floppy disk and transferred to another computer. Here the raw text file is converted to an Excel file and calculations are performed to obtain the appropriate units (ie. uM to mg/L). The data file for each month is saved and the results are copied into a comprehensive file with all results. A data quality management (DQM) report is filed with the results. The data was entered and reviewed by Katy Austin Smith, Research Professional II and Lab Manager at the University of Georgia Marine Extension Service.

10) **Parameter Titles and Variable Names by Data Category**

Data Category	Parameter	Variable Name	Units of Measure
i) Phosphorus:	*Orthophosphate	PO4F	mg/L as P
ii) Nitrogen:	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	*Nitrite, Filtered	NO2F	mg/L as N
	*Nitrate, Filtered	NO3F	mg/L as N
	*Ammonium, Filtered	NH4F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
iii) Other Lab Parameters:			
	*Chlorophyll a	CHLA_N	µg/L
iv) Field Parameters:			
	none		

Notes:
1. Time is coded based on a 2400 hour clock and is referenced to Eastern Standard Time (EST).
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 and Calculated Laboratory Parameters**

i) **Variables Measured Directly**

Nitrogen species:	NO2F, NO23F, NH4F
Phosphorus species:	PO4F
Other:	CHLA

ii) **Computed Variables**

NO3:	NO23F-NO2F
DIN:	NO23F+NH4F

12) **Limits of Detection**

Method Detection Limits (MDL), the lowest concentration of a parameter that an analytical procedure can reliably detect, have been established by the UGA Marine Extension Service Laboratory. The MDL is determined as 3 times the standard deviation of a minimum of 7 replicates of a low concentration sample. Table 1 presents the current MDLs; these values are reviewed and revised periodically.

Table 1. Method Detection Limits (MDL) for measured water quality parameters.

Parameter	Variable	Mean Conc.	Std. Dev.	MDL	Dates in use
		mg/L as N or P		mg/L as N or P	
Ammonium	NH4F	0.047	0.001	0.003	Dec.'01 – Dec.'06
Nitrite	NO2F	0.126	0.001	0.004	Dec.'01 – Dec.'06
Nitrite + Nitrate	NO23F	0.126	0.001	0.004	Dec.'01 – Dec.'06
Orthophosphate	PO4F	0.087	0.001	0.002	Dec.'01 – Dec.'06

Chl-a	CHLA			0.0	Dec.'01 – Dec.'06

13) **Laboratory Methods**

ii) **Parameter: NH4F**
QuikChem Method: 31-107-06-1-E
Method Reference: U.S. EPA 1983. USEPA-600/4-79-020. Method 350.1.
Standard Methods 4500-NH_3 H.
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter and subjected to hypochlorite, which in the presence of phenol, catalytic amounts of nitroprusside and excess hypochlorite, yields indophenol blue, which measured at 630 nm is proportional to the original ammonia concentration.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 2-3 days

iii) **Parameter: NO23F**
QuikChem Method: 31-107-04-1-C
Method Reference: U.S. EPA 1974. Method 353.2.
Standard Methods 4500-NO_3 F.
Method Descriptor: Samples were filtered with 0.45 um polycarbonate filters. Filtered sample is subjected to cadmium reduction column to reduce nitrate to nitrite. The sample nitrite is then determined by diatizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye which is measured at 520 nm and is proportional to the original nitrate + nitrite concentration. The NO2F concentration (below) is subtracted from this result to give NO3F.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 2 weeks

iii) **Parameter: NO2F**
QuikChem Method: 31-107-04-1-C
Method Reference: U.S. EPA 1974. Method 353.2.
Standard Methods 4500-NO_3 F.
Method Descriptor: Samples were filtered with 0.45 um polycarbonate filters. Nitrite in a filtered sample is measured by closing off the cadmium reduction column so that the nitrate is not converted and the sample follows through the same chemistry as with NO3F to yield the original nitrite concentration.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 1-2 days

iv) **Parameter: NO3F**
QuikChem Method: 31-107-04-1-C
Method Reference: U.S. EPA 1974. Method 353.2.
Standard Methods 4500-NO_3 F.
Method Descriptor: Nitrate is calculated from NO23F minus NO2F results.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 2 weeks

v) **Parameter: DIN**
Method: DIN is calculated by adding the NH4F and NO23F results together.

vi) **Parameter: PO4F**
QuikChem Method: 31-115-01-3-A
Method Reference: U.S. EPA 1978. Method 365.1.
Standard Methods 4500-P E.
Method Descriptor: Samples were filtered with 0.45 um polycarbonate filters. Filtered sample is subjected to ammonium molybdate and antimony potassium tartrate under acidic conditions to form a yellow 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: Samples filtered and stored frozen (-18 degC).
Holding Time: 30 days

vii) **Parameter: CHLA**
APHA Standard Methods: 10200 H.
Method Reference:
Method Descriptor: Suspended sediment and other material in a water sample is concentrated onto a 47 mm GF/F filter under low vacuum. The sample is stored in a petri dish wrapped in aluminum foil in an airtight plastic bag kept on ice while in the field. The samples are then kept frozen and in the dark until analysis. The acetone extraction method is used to extract the chlorophyll over 2-24 hours and a spectrophotometer is used to obtain readings, which are calculated into a final result.
Preservation Method: Filters are stored frozen (-18 degC).
Holding Time: 28 days

14) **Reporting of Missing Data, Data with Concentrations Lower than Method Detection Limits**

Nutrient/Chla comment codes and definitions are provided in the following table. Missing data are denoted by a blank cell " " and commented coded with an "M". Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDL's for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 14) of this document. Measured concentrations that are less than this limit are replaced with the minimum detection limit value and comment coded with a "B" in the variable code comment column. For example, the measured concentration of NO23F was 0.0005 mg/L as N (MDL=0.0008), the reported value would be 0.0008 with a "B" placed in the NO23F comment code column. Calculated parameters are comment coded with a "C" and if any of the components used in the calculation are below the MDL, the calculated value is removed and also comment coded with a "B". If a calculated value is negative, the value is removed and comment coded with an "N".

Note: The way below MDL values are handled in the NERRS SWMP dataset was changed in November of 2011. Previously, below MDL data from 2002-2006 were also coded with a B, but replaced with -9999 place holders. Any 2002-2006 nutrient/pigment data downloaded from the CDMO prior to December November of 2011 will contain -9999s representing below MDL concentrations.

Comment Code	Definition

A	Value above upper limit of method detection
B	Value below method detection limit
C	Calculated value
D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
H	Sample held beyond specified holding time
K	Check metadata for further details
M	Data missing, sample never collected or calculated value could not be determined due to missing data
P	Significant precipitation (reserve defined, see metadata for further details)
U	Lab analysis from unpreserved sample
S	Data suspect, see metadata for further details

15) **QA/QC Programs**

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a. **Precision**
   i. **Field Variability** – Field replicates are successive grab samples. These are done in triplicate. Samples are filtered and placed on ice before the next sample is grabbed (usually about 10 minutes between grabs).
   ii. **Laboratory Variability** – Laboratory replicates are done in duplicate.
   iii. **Inter-organizational splits** –Samples were analyzed by one lab.

b. **Accuracy**
   i. **Sample Spikes** – A blank sample is spiked with each set for each analyte to obtain a 100 % recovery + or – 10 %. One or two sample unknowns are spiked with each set for each analyte to obtain a 100 % recovery + or – 20 percent under ideal conditions.
   ii. **Standard Reference Material Analysis –**April 2006
   iii. **Cross Calibration Exercises** - None.

16) **Other Remarks**

On 05/22/2025 this dataset was updated to include embedded QAQC flags and codes for anomalous/suspect, rejected, missing, and below detection limit data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than using the original single letter codes used for the nutrient and pigment dataset along with the detailed sections in the metadata document for suspect, missing, and rejected data. Please note that prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all. Suspect, missing, rejected and below minimum detection flags and appropriate three letter codes were embedded retroactively for dataset consistency. The QAQC flag/codes corresponding to the original letter codes are detailed below.

Flag/code	If also C	Historic Letter Code	Historic Code Definition
<1> [SUL]		A	Value above upper limit of method detection
<-4> [SBL]	<-4> [SCB]	B	Value below method detection limit
no need to flag/code unless combined		C	Calculated value
<-3> [GQD]	<3> [GCR]	D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
<1> (CHB)		H	Sample held beyond specified holding time
<0> (CSM) unless other flag		K	Check metadata for further details
<-2> [GDM]	<-2> [GCM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<-3> [SNV] and <1> [SCC] for components		N	Negative calculated value
(CRE) or F_Record {CRE}		P	Significant precipitation (reserve defined, see metadata for further details)
<0> (CUS)		U	Lab analysis from unpreserved sample
<1> (CSM)		S	Data suspect, see metadata for further details

There were no significant (major) rain/storm events in 2006.

Explanation of K codes: Multiple PO4 values were coded with a "K". Each of these samples was initially out of range for PO4, but then diluted and rerun. Values were calculated using a dilution factor.

Explanation of S codes: Additional PO4 values were out of range (0.068 mg/L as P), but overlooked and not diluted/rerun. These data should be considered suspect and were coded with an "A,S"

Times for grab samples that were taken at the same/date time as diel samples were adjusted by one minute due to importation of data into EQWin.