

Sapelo Island (SAP) NERR Nutrient Metadata
January 2003 - December 2003
Latest Update: May 22, 2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

a) Reserve Contact

Dorset Hurley
P.O. Box 15
Sapelo Island, GA 31327
Phone: 912-485-2251
e-mail: dhurley@darientel.net

b) Laboratory Contact

Katy Austin
715 Bay Street
Marine Extension Service Laboratory
University of Georgia
Brunswick, GA 31520
Phone: 912-262-3338
e-mail: klaustin@uga.edu

c) Other Contacts and Programs

none

2) Research objectives

The nutrient monitoring program is designed upon vertical deployment (near benthic and near surface) of two sondes at each station in the upper and lower Duplin River. 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** (same objectives as above)

b) **Diel Sampling Program** (same objectives as above)

3) Research methods

a) **Monthly Grab Sampling Program**

Monthly grab samples were taken at three stations within the Duplin River estuary. Surface and bottom water samples were taken at the Marsh Landing datasonde station (ML = Marsh Landing, Surface, LD = Lower Duplin), bottom samples were taken at Hunt Dock (HD) and surface water samples were taken up river at the Flume Dock (FD), all using a Niskin bottle. All grab samples were taken sequentially in triplicate beginning at Marsh Landing with the collection of the last diel sample, which is collected by the ISCO sampler at low tide at the end of the tidal cycle. At the time of sample collection, latitude, longitude, time and depth were recorded. 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 μ m 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 and 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°C . 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. 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

Tides & Currents' Version 2.0c tide window for Mud River at Old Teakettle Creek was used to estimate low tide. (For the months of October-December, TidelinesOnline.com was used to get low tide information for Mud River at Old Teakettle Creek.) An early, low, neap tide was selected each month for sampling. The ISCO sampler was deployed at Marsh Landing (ML) on the day previous to the grab sample date chosen for that particular month 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 Marsh Landing and the samples were filter processed either in the field after completion of grab sampling at the Flume Dock or back in the laboratory. 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 field work, 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.

c) Table of 2003 Duplin River NERR surface and bottom sampling depths.

Month	Site	Surface sample depth	Bottom sample depth
Jan.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	20
Jan.	Flume Dock (FD) Hunt Dock (HD)	just below surface	14
Feb.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	20
Feb.	Flume Dock (FD) Hunt Dock (HD)	just below surface	9
March	Marsh Landing (ML) Lower Duplin (LD)	just below surface	20
March	Flume Dock (FD) Hunt Dock (HD)	just below surface	11
April	Marsh Landing (ML) Lower Duplin (LD)	just below surface	19
April	Flume Dock (FD) Hunt Dock (HD)	just below surface	5
May	Marsh Landing (ML) Lower Duplin (LD)	just below surface	20
May	Flume Dock (FD) Hunt Dock (HD)	just below surface	9
June	Marsh Landing (ML) Lower Duplin (LD)	just below surface	16
July	Marsh Landing (ML) Lower Duplin (LD)	just below surface	18
July	Flume Dock (FD) Hunt Dock (HD)	just below surface	11
Aug.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	20
Aug.	Flume Dock (FD) Hunt Dock (HD)	just below surface	10
Sept.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	21
Sept.	Flume Dock (FD) Hunt Dock (HD)	just below surface	17
Oct.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	19
Oct	Flume Dock (FD) Hunt Dock (HD)	just below surface	14
Nov.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	21
Nov.	Flume Dock (FD) Hunt Dock (HD)	just below surface	17
Dec.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	22
Dec.	Flume Dock (FD) Hunt Dock (HD)	just below surface	17
AVG	Marsh Landing (ML) Lower Duplin (LD)	just below surface	20
AVG	Flume Dock (FD) Hunt Dock (HD)	just below surface	11

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. 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.

Locations-

Marsh Landing: Lat: 31 25' 4" N, Long: 81 17' 46" W

Lower Duplin: Lat: 31 25' 4" N, Long: 81 17' 46" W

Flume Dock: Lat: 31 28' 58" N, Long: 81 16' 03" W

Hunt Dock: Lat: 31 28' 43" N, Long: 81 16' 23" W

Water Quality site descriptions-

Salinities at all sites vary according to localized rainfall and associated runoff. Upper Duplin River sites (Flume Dock and Hunt Dock) experience slightly lower salinities associated with rainfall events (2 -3ppt) as compared to lower Duplin River sites (Marsh Landing). 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 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 Institute of Oceanography. Watershed is dominated by oceanic tidal influences associated with Doboy Sound. Depth are as follows: Marsh Landing (ML) and Lower Duplin (LD) ranges from 1.5 meters to 6.0 meters depending on tide, Hunt Dock's maximum depth is 4.27 meters, and Flume Dock's maximum depth is 4.27 meters.

5) Coded variable definitions

ML = Marsh Landing; LD = Lower Duplin; HD = Hunt Dock; FD = Flume Dock.

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

Sampling Site codes:

sapmlnut – Sapelo Island nutrient data for Marsh Landing

sapldnut – Sapelo Island nutrient data for Lower Duplin
 saphdnut – Sapelo Island nutrient data for Hunt Dock
 sapfdnut – Sapelo Island nutrient data for Flume Dock

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 duplicates sample are taken utilize a “1” for the first sample and a “2” for the second sample. Diel samples are always labeled with a “1” since only one sample is taken at each interval.

6) Data collection period

Diel sampling for 2003 began at 14:50:00 on January 14, 2003. Grab sampling commenced on January 15, 2003 at 12:50:00 at the Marsh Landing site.

Diel Sampling

Site	Start Date	Start Time	End Date	End Time
ML	01/14/2003	1450	01/15/2003	1250
ML	02/24/2003	1228	02/25/2003	1028
ML	03/24/2003	1130	03/25/2003	0930
ML	04/21/2003	0956	04/22/2003	0756
ML	05/20/2003	1013	05/21/2003	0813
ML	06/23/2003	1400	06/24/2003	1200
ML	07/21/2003	1213	07/22/2003	1013
ML	08/18/2003	1031	08/19/2003	0831
ML	09/15/2003	0904	09/16/2003	0704
ML	10/20/2003	1403	10/21/2003	1203
ML	11/17/2003	1130	11/18/2003	0930
ML	12/15/2003	0955	12/16/2003	0755

Grab Sampling

Site	Start Date	Start Time	End Date	End Time
ML	01/15/2003	1250	01/15/2003	1312
ML	02/25/2003	1045	02/25/2003	1101
ML	03/25/2003	0931	03/25/2003	0954
ML	04/22/2003	0757	04/22/2003	0824
ML	05/21/2003	0813	05/21/2003	0828
ML	06/24/2003	1200	06/24/2003	1232
ML	07/22/2003	1013	07/22/2003	1038
ML	08/19/2003	0831	08/19/2003	0851
ML	09/16/2003	0704	09/16/2003	0722
ML	10/21/2003	1157	10/21/2003	1220
ML	11/18/2003	0930	11/18/2003	0945
ML	12/16/2003	0755	12/16/2003	0812
LD	01/15/2003	1318	01/15/2003	1331
LD	02/25/2003	1109	02/25/2003	1124
LD	03/25/2003	1001	03/25/2003	1027
LD	04/22/2003	0830	04/22/2003	0849
LD	05/21/2003	0835	05/21/2003	0851
LD	06/24/2003	1240	06/24/2003	1302

LD	07/22/2003	1048	07/22/2003	1105
LD	08/19/2003	0855	08/19/2003	0911
LD	09/16/2003	0727	09/16/2003	0752
LD	10/21/2003	1228	10/21/2003	1247
LD	11/18/2003	0948	11/18/2003	1003
LD	12/16/2003	0820	12/16/2003	0837
HD	01/15/2003	1405	01/15/2003	1418
HD	02/25/2003	1155	02/25/2003	1209
HD	03/25/2003	1054	03/25/2003	1108
HD	04/22/2003	0927	04/22/2003	0943
HD	05/21/2003	0927	05/21/2003	0945
HD	07/22/2003	1128	07/22/2003	1151
HD	08/19/2003	0945	08/19/2003	1007
HD	09/16/2003	0822	09/16/2003	0840
HD	10/21/2003	1318	10/21/2003	1338
HD	11/18/2003	1033	11/18/2003	1056
HD	12/16/2003	0903	12/16/2003	0926
FD	01/15/2003	1436	01/15/2003	1453
FD	02/25/2003	1320	02/25/2003	1333
FD	03/25/2003	1118	03/25/2003	1131
FD	04/22/2003	1005	04/22/2003	1020
FD	05/21/2003	1020	05/21/2003	1038
FD	07/22/2003	1211	07/22/2003	1227
FD	08/19/2003	1025	08/19/2003	1046
FD	09/16/2003	0858	09/16/2003	0915
FD	10/21/2003	1349	10/21/2003	1402
FD	11/18/2003	1112	11/18/2003	1126
FD	12/16/2003	0930	12/16/2003	0944

7) Associated researchers and projects

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 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 ($r \geq 0.99900$ 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 ppm). 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, Research Coordinator I 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 NO23 or NO2 or 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.'03
Nitrite	NO2F	0.126	0.001	0.004	Dec.'01 – Dec.'03
Nitrite + Nitrate	NO23F	0.126	0.001	0.004	Dec.'01 – Dec.'03
Orthophosphate	PO4F	0.087	0.001	0.002	Dec.'01 – Dec.'03

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-NH₃ 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: NO₃F**

QuikChem Method: 31-107-04-1-C

Method Reference: U.S. EPA 1974. Method 353.2.

Standard Methods 4500-NO₃ 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 diazotizing with sulfanilamide and coupling with N-(1-naphthyl)-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-NO₃ 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-NO₃ 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

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** – NOAA/NERRS Analytical Laboratory Intercomparison Test Study: Sept. 2003 (Lab ID = 2)
- 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> [GQR]	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> [GQM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<3> [SNV] and <1> [SOC] for components (CRE) or F_Record (CRF)		N	Negative calculated value
<0> (CUS)		P	Significant precipitation (reserve defined, see metadata for further details)
<1> (CSM)		U	Lab analysis from unpreserved sample
		S	Data suspect, see metadata for further details

a) Times for grab samples were adjusted by one minute due to importation of data into EQWin.

b) Rep number had to be changed to an 'S' where Diel and Grab samples were collected a the same date, time, station in order to process into EQWin.