

JAC NERR Nutrient Metadata
January 2024-December 2024
Latest Update: 16 June 2025

Note: This is a provisional metadata document; it has not been authenticated as of its download date. Contents of this document are subject to change throughout the QAQC process and it should not be considered a final record of data documentation until that process is complete. Contact the CDMO (cdmosupport@baruch.sc.edu) or reserve with any additional questions.

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

a) Reserve contact

Thomas M. Grothues
Director, Rutgers University Marine Field Station (RUMFS)
JC NERR Research Coordinator
Rutgers University Marine Field Station
800 c/o 132 Great Bay Blvd.
Tuckerton, NJ 08087
609-249-8802
grothues@marine.rutgers.edu

b) Laboratory contact

Carol Jeffery
Laboratory Director
VIMS Analytical Service Center
College of William and Mary
Rt 1208 Greate Road
Gloucester Point, VA 23062
804-684-7213
Email: pollard@vims.edu

c) Other contacts

Gregg P. Sakowicz
Field Researcher IV, SWMP Technician
Jacques Cousteau National Estuarine Research Reserve
N.J. Agricultural Experiment Station
Rutgers University
130 Great Bay Blvd.
Tuckerton, NJ 08087
609-249-8805
e-mail: sakowicz@marine.rutgers.edu

2) Research objectives –

a) Monthly grab

Monthly grab samples for the Jacques Cousteau National Estuarine Research Reserve (JCNERR) are taken along a well-defined salinity gradient of the Mullica River-Great Bay estuarine system. The sites where the samples are taken along this salinity gradient include Lower Bank and Chestnut Neck in the Mullica River and Buoy 126 and Buoy 139 in Great Bay (see site descriptions below). These four sampling sites span a distance of more than 30 km. An additional a monthly grab sample is taken in Little Egg Harbor estuary at Buoy 115 (see site description below). A major objective of this monitoring program is to determine the nutrient concentrations along the aforementioned salinity gradient over a long-term time series. Previous studies have shown that nitrogen standing stocks in the Mullica River-Great Bay Estuary largely consist of nitrate, ammonium, and nitrogen in organic combination. The nitrogen enters at the head of the estuary largely in inorganic form, but in Great Bay it is transformed mainly to organic combination. However, more data are needed to accurately assess the concentrations of the various nitrogen forms along the salinity gradient, and to determine seasonal variations in the concentrations over a protracted period of several years. It is also necessary to obtain continuous monthly measurements of phosphate, which is also a macronutrient of considerable importance to the system.

Monthly grab samples are needed to obtain accurate measurements of nitrate, ammonium, and phosphate because of their overriding importance to primary production in waters of the JCNERR. These data can then be compared to chlorophyll *a* measurements to assess their relationship to phytoplankton biomass. A major goal of JNEERR is to characterize biotic communities along the salinity gradient of the Mullica River-Great Bay Estuary, and it is therefore vital to obtain physical-chemical measurements (including nutrient concentrations) along the gradient. A part of this effort is to determine the nutrient concentrations along the salinity gradient, and how these concentrations are influencing biotic processes down-estuary. In addition, a long-term objective of monthly grab sampling is to develop a nutrient (nitrogen) budget for JCNERR. To develop a budget, data (concentrations) are needed on the various nitrogen species monitored at the SWMP sites as well as data collected on the nitrogen forms associated with atmospheric deposition. An accurate nutrient budget will be useful for analyzing the overall productivity of estuarine waters in the JC NERR, which will be important to resource managers of the system.

b) Diel sampling program

Diel sampling is conducted via an ISCO automated sampler at Chestnut Neck in the Mullica River to assess nutrient concentrations and changes in concentrations over tidal cycles. These data augment/are augmented by monthly grab samples taken at Chestnut Neck (see above). This is a change from prior years when the ISCO sampler was located at Channel Marker 126; this change was opted to study and better understand the influence of nutrients (particularly runoff) lower Mullica River, an area of interest for natural shellfish recruitment as well as nearby shellfish farms. This location is co-located with the jacnewq water-monitoring station, as well as being the closest option to the JC NERR's jacnmet meteorological station.

3) Research methods –

a) Monthly grab sampling program

Monthly grab samples were taken at four stations within the Mullica River-Great Bay estuary and at one station in the Little Egg Harbor estuary. Samples were taken at four principle JNEERR datasonde stations (Buoy 126, Buoy 139, Chestnut Neck and Lower Bank) and at one station in Little Egg Harbor estuary (Buoy 115). Samples were collected at approximately 30-day intervals. Effort was made to obtain grab samples at or before slack low tide conditions (+3 hour before low tide), approximately

one month after the previous sampling period. No distinction was made between neap and spring tide conditions. Replicate (N=2) samples were collected by hand with a bucket at an approximate depth of 10 cm. All samples were collected in amber 500 ml Nalgene sample bottles that were previously acid washed (15 % H₂SO₄), rinsed (5x) with distilled-deionized water, and rinsed (1x) with ambient water prior to collection of the sample. Samples were immediately placed on ice in a cooler and returned to the laboratory at the Rutgers Marine Field Station. Once in the laboratory, samples were shaken and processed for nutrient and Chl a analysis. Samples were then frozen in a -20°C freezer and shipped to the Virginia Institute of Marine Sciences (VIMS) Analytical Service Center as soon as possible thereafter. The processed samples were then stored in a -20°C freezer until analyses were performed.

b) Diel sampling program

Monthly diel samples were taken at the principle long-term datasonde station Chestnut Neck (jacnewq). From 2002-2019, diel sampling was conducted at the Buoy 126 (jacb6wq) station until relocated to Chestnut Neck in 2020. This chance was done to sample waters exchanged by/in the mouth of the Mullica River, targeting areas of natural and commercial shellfish beds. Samples were collected monthly, at approximately 30-day intervals (with variability due to weather). Initiation of sampling was typically targeted to commence with the earliest low tide of the day and ran through the low tide of the next day. No distinction was made between spring and neap tide conditions. Twelve samples were collected over a lunar day at 2-hour-and-15-minute intervals using an ISCO auto-sampler. Samples were taken at a fixed depth, approximately 1 meter from the bottom. All samples were collected in clear, plastic, 1000 ml ISCO sample bottles that were previously acid washed (15 % H₂SO₄), rinsed (5x) with distilled-deionized water. Samples were retrieved as soon as possible after completion of the auto-sampler program. Samples bottles were then immersed in ice in an opaque cooler at the Rutgers Marine Field Station to shield samples from light. Once in the laboratory, samples were shaken and processed for filtered for nutrient and Chl a analysis. Samples were then frozen in a -20°C freezer and shipped to the Virginia Institute of Marine Sciences (VIMS) Analytical Service Center as soon as possible thereafter. The processed samples were then stored in a -20°C freezer until analyses were performed.

4) Site location and character –

Site name	Jac5nut, a.k.a “Buoy 115”
Latitude and longitude	39.51880, 74.28720
Tidal range (<i>meters</i>)	2m (estimated)
Salinity range (<i>psu</i>)	21.3-31.9psu (from historical values)
Type and amount of freshwater input	Negligible; this site is dominated by tidal exchange
Water depth (<i>meters</i> , <i>MLW</i>)	12m
Sonde distance from bottom (<i>meters</i>)	N/A
Bottom habitat or type	Sand, macroalgae

Pollutants in area	None of note; potential runoff-carried products from communities and marinas to north on west side of barrier island
Description of watershed	This site was once a secondary water quality (WQ) station but with the damage to (by ice floes) and the replacement (by the U.S. Coast Guard) of the monopod channel marker at this site, affixing of water quality equipment was no longer feasible and this station was abandoned as a secondary SWMP WQ station. It was decided to continue monitoring nutrients as a <i>secondary</i> SWMP station at this site due to the relevance of data to numerous SAV, shellfish, and fish research in this portion of the reserve.

Site name	Jacb6nut, a.k.a “Buoy 126”
Latitude and longitude	39.50790, -74.33850
Tidal range (<i>meters</i>)	2.09m
Salinity range (<i>psu</i>)	21.3-31.9psu
Type and amount of freshwater input	Minimal- dilute from Mullica River, local rain
Water depth (<i>meters, MLW</i>)	<i>2.69m (estimated)</i>
Sonde distance from bottom (<i>meters</i>)	0.5-1.0m, contingent on sediment movement and seasonal mussel bed growth
Bottom habitat or type	<i>Soft sediment, seasonal mussel bed</i>
Pollutants in area	None of note; boat traffic may suspend sediment periodically and an aggregation of seals on a nearby island may be a source of bacteria during winter months
Description of watershed	The closest monitoring station to Little Egg Inlet. This site can be characterized by having strong tidal currents, 2-3 knots, fine to coarse sand bottom with an extensive blue mussel bed surrounding the area. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface. NOTE: Despite the name, this station is a tripod United States Coast Guard channel marker, not a “buoy”

Site name	Jacb9nut, a.k.a. “Buoy 139”
Latitude and longitude	39.49794, -74.38113
Tidal range (<i>meters</i>)	1.95m

Salinity range (<i>psu</i>)	19.7-31.9m
Type and amount of freshwater input	Minimal- dilute from Mullica River, local rain
Water depth (<i>meters, MLW</i>)	<i>2.31m (estimated)</i>
Sonde distance from bottom (<i>meters</i>)	<i>0.5m</i>
Bottom habitat or type	<i>Muddy sand</i>
Pollutants in area	None of note; boat traffic may suspend sediment periodically
Description of watershed	Located 4 kilometers from Buoy 126 on the western side of Great Bay and is located about one to one and one-half kilometers from land. The datasonde at this location is attached to Intracoastal Waterway Channel Marker 139. The closest landform is an extensive salt marsh approximately 1.5 kilometers wide, which borders the upland area. This area is dredged by the U.S. Army Corp of Engineers approximately every five to six years to maintain the channel at a depth of approximately 2.5 meters. The surrounding depth of the bay is approximately 1.5 to 2 meters. This site is characterized by having maximum currents of about 1.5 knots with a muddy sand bottom and with little structure or shell. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface and above. NOTE: Despite the name, this station is a tripod United States Coast Guard channel marker, not a "buoy"

Site name	Jacnenut, a.k.a. "Chestnut Neck"
Latitude and longitude	39.54790, -74.46080
Tidal range (<i>meters</i>)	2.05m
Salinity range (<i>psu</i>)	2.2-27.3psu
Type and amount of freshwater input	Moderate- mid-river station and local rainfall/runoff
Water depth (<i>meters, MLW</i>)	2.04m (estimated)
Sonde distance from bottom (<i>meters</i>)	<i>0.5m</i>
Bottom habitat or type	mixed organic mud/sand bottom
Pollutants in area	None of note; potential runoff from marina lot, organic offal from nearby fish cleaning stations

Description of watershed	Located 12 kilometers up the Mullica River from the mouth of the river. The river begins at a line drawn between Graveling Point and Oysterbed Point on the northwestern side of Great Bay. The Mullica River at this location is quite wide, about 250 meters. The datasonde is attached to the dock of a small marina along the southern shore of the river adjacent to the main channel. This location has never been dredged. The site is characterized by having tidal currents of less than one knot, during both ebb and flood tide, and has a mixed organic mud/sand bottom. Freshwater input is primarily from groundwater and watershed runoff.
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Site name	Jacnut, a.k.a. "Lower Bank"
Latitude and longitude	39.59370, -74.55150
Tidal range (<i>meters</i>)	2.13m
Salinity range (<i>psu</i>)	0.0-19.4psu
Type and amount of freshwater input	Maximum among stations; upper-river station, local rainfall and runoff
Water depth (<i>meters, MLW</i>)	2.19m (<i>estimated</i>)
Sonde distance from bottom (<i>meters</i>)	0.5m
Bottom habitat or type	fine mixed organic mud and sandy sediment, concrete from bridge footers
Pollutants in area	None to note
Description of watershed	Located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about two hundred meters wide. The datasonde is located at the center of a bridge spanning the Mullica River. The northern bank of the river is sparsely developed with single-family houses and has a steep bank about five meters high. The southern shore has an extensive marsh and fresh water wetland area about three kilometers wide. This site can be characterized by having fast tidal currents, just over one knot, deep water, and fine mixed organic mud and sandy sediment. Freshwater input is primarily from groundwater and watershed runoff.

All JAC NERR historical nutrient/pigment monitoring stations:

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
B5	S	jacb5nut	39.51880, -74.28720	Feb 2002-present	NA	Optional/

						Secondary SWMP
B6	P	jacb6nut	39.50790, - 74.33850	Feb 2002- present	NA	NA
B9	P	jacb9nut	39.49794, - 74.38113	Feb 2002- present	NA	NA
NE	P	jacnenut	39.54790, - 74.46080	Feb 2002- present	NA	NA
BA	P	jacbanut	39.59370, - 74.55150	Feb 2002- present	NA	NA

5) Coded variable definitions –

jacnenut = Jacques Cousteau Nacote Chestnut Neck nutrients

monthly grab sample program = 1

diel grab sample program = 2

6) Data collection period –

a) Grab Sampling Program

Station Code	Date	Time First Sample	Time Second Sample
jacb5nut	01/08/2024	11:52	11:54
jacb5nut	02/05/2024	10:34	10:36
jacb5nut	03/22/2024	10:09	10:11
jacb5nut	04/10/2024	13:08	13:10
jacb5nut	05/09/2024	12:45	12:47
jacb5nut	06/12/2024	7:22	7:24
jacb5nut	07/02/2024	8:32	8:34
jacb5nut	08/05/2024	12:42	12:44
jacb5nut	09/13/2024	9:29	9:31
jacb5nut	10/07/2024	14:19	14:21
jacb5nut	11/13/2024	11:47	11:49
jacb5nut	12/10/2024	10:08	10:10
jacb6nut	01/08/2024	11:41	11:43
jacb6nut	02/05/2024	10:22	10:24
jacb6nut	03/22/2024	9:56	9:58
jacb6nut	04/10/2024	12:58	13:00
jacb6nut	05/09/2024	12:35	12:37
jacb6nut	06/12/2024	7:11	7:13
jacb6nut	07/02/2024	8:21	8:23
jacb6nut	08/05/2024	12:32	12:34
jacb6nut	09/13/2024	9:15	9:17
jacb6nut	10/07/2024	14:07	14:09
jacb6nut	11/13/2024	11:35	11:37

jacb6nut	12/10/2024	9:54	9:56
jacb9nut	01/08/2024	11:29	11:31
jacb9nut	02/05/2024	10:11	10:13
jacb9nut	03/22/2024	9:43	9:45
jacb9nut	04/10/2024	12:43	12:45
jacb9nut	05/09/2024	12:26	12:28
jacb9nut	06/12/2024	7:01	7:03
jacb9nut	07/02/2024	8:10	8:12
jacb9nut	08/05/2024	12:23	12:25
jacb9nut	09/13/2024	9:02	9:04
jacb9nut	10/07/2024	13:56	13:58
jacb9nut	11/13/2024	11:15	11:17
jacb9nut	12/10/2024	9:41	9:43
jacnenut	01/08/2024	14:08	14:10
jacnenut	02/05/2024	11:33	11:35
jacnenut	03/22/2024	12:35	12:37
jacnenut	04/10/2024	14:15	14:17
jacnenut	05/09/2024	13:49	13:51
jacnenut	06/12/2024	8:46	8:48
jacnenut	07/02/2024	12:18	12:20
jacnenut	08/05/2024	14:15	14:17
jacnenut	09/11/2024	8:08	8:10
jacnenut	10/07/2024	15:38	15:40
jacnenut	11/13/2024	13:26	13:28
jacnenut	12/10/2024	11:12	11:14
jacbanut	01/08/2024	14:42	14:44
jacbanut	02/05/2024	12:04	12:06
jacbanut	03/22/2024	13:08	13:10
jacbanut	04/10/2024	14:49	14:51
jacbanut	05/09/2024	14:25	14:27
jacbanut	06/12/2024	9:29	9:31
jacbanut	07/02/2024	12:59	13:01
jacbanut	08/05/2024	14:52	14:54
jacbanut	09/11/2024	8:39	8:41
jacbanut	10/07/2024	16:13	16:15
jacbanut	11/13/2024	13:59	14:01
jacbanut	12/10/2024	11:41	11:43

b) Diel Sampling Program

Station Code	Date First Sample	Time	Date Last Sample	Time
jacnenut	01/23/2024	15:00	01/24/2024	15:45
jacnenut	02/27/2024	06:15	02/28/2024	07:00
jacnenut	03/18/2024	11:00	03/19/2024	11:45
jacnenut	04/14/2024	08:15	04/15/2024	09:00

jacnenut	05/20/2024	13:30	05/21/2024	14:15
jacnenut	06/13/2024	09:00	06/14/2024	10:15
jacnenut	07/01/2024	11:30	07/02/2024	12:15
jacnenut	08/06/2024	05:00	08/07/2024	05:45
jacnenut	09/09/2024	06:45	09/09/2024	07:45
jacnenut	10/08/2024	06:30	10/09/2024	07:15
jacnenut	11/11/2024	11:30	11/11/2024	12:15
jacnenut	12/15/2024	03:00	12/16/2024	03:45

7) Associated researchers and projects–

A number of researchers have expressed interest in our 2024 nutrient data but prefer to wait until the review process is complete.

Water Quality (WQ) and Meteorological (MET) data associated with these Nutrient (NUT) data can be obtained via download from the at www.nerrsdata.org . It is recommended that users utilize the new Advanced Query System (www.nerrsdata.org/aqs) to merge the nutrient and water-quality data into one seamless file.

8) Distribution –

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

Requested citation format:

NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: www.nerrsdata.org; *accessed* 12 October 2022.

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 www.nerrsdata.org. Data are available in comma separated version format.

II. Physical Structure Descriptors

9) Entry verification –

Monthly nutrient and plant pigment data files, in excel format, are sent to the JC NERR by the Virginia Institute of Marine Sciences (VIMS) Analytical Service Center. Files consist of sample ID, sampling date, analysis date, and parameter values expressed in mg/L (ug/L for Chlorophyll). The data are reviewed for values that appear erroneous or illogical. Any samples found to have questionable results are reanalyzed. JC NERR staff (Gregg P. Sakowicz, SWMP Technician/Field Researcher) then performs the following:

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.

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
	Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	Ammonium, Filtered	NH4F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
Plant Pigments:			
	Chlorophyll a	CHLA_N	µg/L
Field Parameters:			
	Water Temperature	WTEM_N	°C
	Specific Conductivity	SCON_N	mS/cm ³
	Salinity	SALT_N	ppt
	Dissolved Oxygen	DO_S_N	% Saturation
	Dissolved Oxygen	DO_N	mg/L
	pH	PH_N	pH units
	Turbidity	TURB_N	FNU

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 NO₃ 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:	NH ₄ F, NO ₂₃ F
Phosphorus species:	PO ₄ F
Other:	CHLA_N

b) Calculated parameters

DIN	NO ₂₃ F+NH ₄ F
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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 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	Revisited
PO4F	01/01/23	12/31/23	0.0016	01/31/2024
NH4F	01/01/23	12/31/23	0.0062	01/31/2024
NO23F	01/01/23	12/31/23	0.0055	01/31/2024
CHLA_N	01/01/23	12/31/23	0.50	01/31/2024

13) Laboratory methods –

i) **Parameter: PO4F**

VIMS Laboratory Method SKALAR Method: O-Phosphate / Total Phosphate, Catnr. 503-365.1, issue 042993/MH/93-Demo1

Method Reference:

- Murphy, J. and J.P. Riley. 1962. A modified single solution method for the determination of phosphate in natural waters. *Analytica Chim. Acta* 27 : 31-36
- EPA 600/R-97/072 Method 365.5 Determination of Orthophosphate in Estuarine and Coastal Waters by Automated Colorimetric Analysis. IN: *Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Matrices -2nd Edition*. National Exposure Research Laboratory, Office of Research and Development. U.S. EPA, Cincinnati, Ohio 45268

Method Descriptor: 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.

Preservation Method: Preservation Method: 60 ml of sample is filtered through a Whatman® Nuclepore Track-Etched Membrane, 0.4 µm disposable disk filter (47mm), and stored at –20 °C until analyzed.

ii) **Parameter: NO23F**

VIMS Laboratory Method: SA461-353.2 - NO2+3

Method Reference:

- U.S. EPA. 1974. *Methods for Chemical Analysis of Water and Wastes*, pp. 207 -212.
- Wood, E.D., F.A.G. Armstrong, and F.A. Richards. 1967. Determination of nitrate in seawater by cadmium-copper reduction to nitrite. *J. Mar. Biol. Assoc. U.K.* 47: 23
- Grasshoff, K., M. Ehrhardt and K. Kremling. 1983. *Methods of Seawater Analysis*. Verlag Chemie, Federal Republic of Germany. 419 pp.
- EPA 600/R-97/072 Method 353.4. Determination of Nitrate and Nitrite in Estuarine and Coastal Waters by Gas Segmented Flow Colorimetric

Analysis. IN: Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Matrices -2nd Edition. National Exposure Research Laboratory, Office of Research and Development U.S. EPA, Cincinnati, Ohio 45268.

Method Descriptor: Nitrate is reduced quantitatively to nitrite by cadmium metal in the form of an open tubular reactor. The nitrite thus formed plus any originally present in the sample is colorimetrically detected at 540 nm, following its diazotization with sulfanilamide, and subsequent coupling with N-1-naphthylethylenediamine dihydrochloride. The dissolved nitrate concentrations of the samples are calculated as NO₃-N.

Preservation Method: 60 ml of sample is filtered through a Whatman® Nuclepore Track-Etched Membrane, 0.4 µm disposable disk filter (47mm), and stored at -20 °C until analyzed.

iii) **Parameter: NH₄F**

VIMS Laboratory Method: SA156-350.1 - NH₃

Method Reference:

- U.S. EPA. 1974. Methods for Chemical Analysis of Water and Wastes, pp. 168-174.
- Standard Methods for the Examination of Water and Wastewater, 14th edition. p 410. Method 418A and 418B (1975).
- Annual Book of ASTM Standards, Part 31. "Water", Standard 1426-74, Method A, p 237 (1976).
- EPA 600/R-97/072 Method 349.0. Determination of Ammonia in Estuarine and Coastal Waters by Gas Segmented Continuous Flow Colorimetric Analysis. IN: Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Matrices -2nd Edition. National Exposure Research Laboratory, Office of Research and Development U.S. EPA, Cincinnati, Ohio 45268.

Method Descriptor: Ammonia reacts with alkaline phenol and hypochlorite to form indophenol blue in an amount that is proportional to the ammonia concentration. The blue color is intensified with sodium nitroprusside. The reaction is catalyzed by heat at 37°C. The range is 0.01 – 2.0 mg L⁻¹.

Preservation Method: 60 ml of sample is filtered through a Whatman® Nuclepore Track-Etched Membrane, 0.4 µm disposable disk filter (47mm), and stored at -20 °C until analyzed.

iv) **Parameter: CHLA**

VIMS Analytical Service Center

Method Reference: EPA 445.o

Method Descriptor: Chlorophyll-containing phytoplankton in a measured volume of water are concentrated by vacuum filtration onto a glass fiber filter. The pigments are extracted from the phytoplankton onto a 90% acetone solution with the aid of a mechanical tissue grinder. The samples are steeped in the dark at 4°C for a minimum of

two hours, but not to exceed 24 hours, to ensure complete extraction of the pigments. The filter slurry is centrifuge at 675 grav for a minimum of 15 minutes or longer as necessary to clarify the solution. The supernatant is transferred to a glass cuvette and fluorescent is measured before and after certification with a 1.0 N HCl solution. A standard curve is repaired from known concentrations of chlorophyll a standards the concentration is reported in ug /L.

Preservation Method: Analyzed immediately; stored in dark at -20 °C for “a few” days is permissible.

14) Field and Laboratory QAQC programs –

[Instructions/Remove: This section describes field variability, laboratory variability, the use of inter-organizational splits, sample spikes, standards, and cross calibration exercises. Include any information on QAQC checks performed by your lab.]

a) Precision

- i. **Field Variability** - For the monthly grab sampling program, JC NERR collects two successive grab samples for the determination of water mass variability.
- ii. **Laboratory Variability** – replicates of all nutrient samples are run
- iii. **Inter-organizational Splits** – none

b) Accuracy

- i. **Sample Spikes** – blanks
- ii. **Standard Reference Material Analysis** – none
- iii. **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 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
GSM	See metadata

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 NERR 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 NO₃F 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.

F_record CSM flag explanation(s):

Grab samples: Typically, detailed "Record Comments" concerning weather conditions at the time of sampling are maintained and reported. In 2024 these records were largely lacking and therefore are not reported in the dataset. Meteorological data are collected by the JC NERR's jacncmet SWMP station and available for download at nerrdata.org. It is worth noting that grab samples are consistently collected during the latter half of ebb or low tide during periods not impacted by major storm and/or surge events.

Diel samples: Because these samples are collected autonomously with an ISCO sampler, F_records are typically not reported- unless concurrent with a major storm and/or storm surge events. Meteorological data are collected by the JC NERR's jacncmet SWMP station and available for download at nerrdata.org.

A few blanks returned with notably elevated (e.g.- more than one order of magnitude over parameter MDL) values. Associated parameters (the directly-measured parameter as well as calculated parameters) were flagged as suspect and with a CSM comment. It is also worthwhile to note that *the values of the collected samples themselves appear to fit patterns and/or anticipated ranges, so it is up to the user to determine if these should be incorporated in analyses or rejected*. The samples and values were as follows:

- January Grabs: the NO₂ DI and Filter blanks returned notably elevated (0.0116 and 0.0130) vs the 0.0055 MDL
- March Grabs: the NH₄ Filter Blank returned notably elevated (0.0141) vs the 0.0062 MDL
- April Grabs: the NO₂ DI blank returned notably elevated (0.0812) vs the 0.0055 MDL

Sample hold times for 2024: Samples are held at -20°C. NERRS SOP allows nutrient samples to be held for up to 28 days (CHLA for 30) at -20°C, plus allows for up to 5 days for collecting, processing, and shipping samples. Samples held beyond that time period are flagged suspect <1>and coded (CHB). If measured values were below MDL, this resulted in <4> [SBL] (CHB) flagging/coding.

Sample Descriptor	NH4F analysis date	No23F analysis date	PO4F analysis date	ChlA Analysis Date
01/08/2024, all grabs	01/17/2024	01/17/2024	01/17/2024	01/31/2024
02/05/2024, all grabs	02/29/2024	02/29/2024	02/29/2024	02/27/2024
03/22/2024, all grabs	04/01/2024	04/01/2024	04/01/2024	04/15/2024
04/10/2024, all grabs	04/29/2024	04/20/2024	05/02/2024	04/29/2024
05/09/2024, all grabs	06/06/2024	06/06/2024	06/06/2024	06/03/2024
06/12/2024, all grabs	06/25/2024	06/25/2024	06/25/2024	07/01/2024
07/02/2024, all grabs	07/18/2024	07/18/2024	07/18/2024	07/29/2024
08/05/2024, all grabs	08/21/2024	08/21/2024	08/21/2024	08/29/2024
09/11/2024, NE and BA grabs	10/02/2024	10/02/2024	10/02/2024	09/24/2024
09/13/2024, B6, B9, B5 grabs	10/02/2024	10/02/2024	10/02/2024	09/24/2024
10/07/2024, all grabs	10/22/2024	10/22/2024	10/22/2024	10/23/2024
11/13/2024, all grabs	12/09/2024	12/09/2024	12/09/2024	12/10/2024
12/10/2024, all grabs	01/06/2025	01/06/2025	01/06/2025	01/06/2025
01/23-24/2024, all diels	01/31/2024	01/31/2024	01/31/2024	01/31/2024
02/27-28/2024, all diels	03/06/2024	03/06/2024	03/06/2024	03/07/2024
03/18-19/2024, all diels	04/01/2024	04/01/2024	04/01/2024	04/15/2024
04/14-15/2024, all diels	04/29/2024	04/20/2024	05/02/2024	04/29/2024
05/20-21/2024, all diels	06/06/2024	06/06/2024	06/06/2024	06/03/2024
06/13-24/2024, all diels	06/25/2024	06/25/2024	06/25/2024	07/01/2024
07/01-02/2024, all diels	07/18/2024	07/18/2024	07/18/2024	07/29/2024
08/06-07/2024, all diels	08/21/2024	08/21/2024	08/21/2024	08/26/2024
09/09-10/2024, all diels	10/02/2024	10/02/2024	10/02/2024	09/24/2024
10/08-09/2024, all diels	10/22/2024	10/22/2024	10/22/2024	10/23/2024
11/11-12/2024, all diels	12/09/2024	12/09/2024	12/09/2024	12/10/2024
12/15-16/2024, all diels	01/06/2025	01/06/2025	01/06/2025	01/06/2025